

Genetics, Statistics, and Regulation at the National Institute of Agricultural Botany, 1919-1969

Dominic Joseph Berry

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The candidate confirms that the work submitted is his own and that appropriate credit has been given when reference has been made to the work of others.

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Abstract

The National Institute of Agricultural Botany, founded in 1919 and still operating today from its same Cambridge headquarters, is one of Britain's oldest agricultural science institutes. Using the extensive and hitherto unexamined archive materials held by NIAB, this thesis offers both a new history of the Institute from 1919 to 1969, and an analysis of that history in the light of wider historiographies of science. It is well known that state patronage of science in Britain entered a new phase towards the end of the nineteenth century. The number of national laboratories, organisations, and institutions dedicated to scientific work grew rapidly, as did the number of professional scientists. The agricultural sciences and their institution's benefited as much, if not more, from the state's newfound interest in science, and yet hardly anything at all is known about them. This historiographical oversight is all the more troubling when one considers the changes that took place within British agriculture and the global food industry at this time. The thesis makes three important new points in particular. Firstly, that scientific regulatory bodies (often marginalized in preference for basic research centres) offer a valuable new perspective for historians interested in relations between science and the state. Secondly, that the techniques used during regulation and assessment (which draw upon the latest scientific developments and theories), can reveal a great deal about an institution's social location. Finally, appreciating the perspective on variation and heredity held by agricultural scientists and plant breeders, one which will be shown to be quite different from more general biologists, offers solutions and problems for contemporary historiography on issues ranging from the impact of Mendelism on plant breeding to the history of plant patenting.

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List of Abbreviations

AIC – Agricultural Improvement Council
ARC – Agricultural Research Council
ASTA – Agricultural Seed Trade Association
CSC – Cereal Synonym Committee
CSAC – Cereal Seeds Advisory Committee (of the FPD)
CTAC – Cereals Trials Advisory Committee
CTS – Committee on Transactions in Seeds
DC – Development Commission
DIA – Design and Industries Association
DSIR – Department for Scientific and Industrial Research
FPD – Food Production Department (of the Board of Agriculture)
HGWC – Home-Grown Wheat Committee
HPS – History and Philosophy of Science
HRS – Horticultural Research Station (Cambridge)
ICI – Imperial Chemical Industries
IP – Intellectual Property
JIC – John Innes Centre
KWI – Kaiser-Wilhelm-Institutes
MAF – Ministry of Agriculture and Fisheries
MAFF – Ministry of Agriculture, Fisheries, and Food
MRC – Medical Research Council
NA – National Archives (at Kew)
NAAS – National Agricultural Advisory Service
NACAM – National Association of Corn and Agricultural Merchants
NAS – Norfolk Agricultural Station
NFU – National Farmers' Union
NIAB – National Institute of Agricultural Botany
NPL – National Physical Laboratory
NRDC – National Research Development Corporation
NSDO – National Seed Development Organisation
NVRS – National Vegetable Research Station (Cambridge)
OSTS – Official Seed Testing Station
P.P. – Parliamentary Papers
PBI – Plant Breeding Institute (Cambridge)
PBRs – Plant Breeders' Rights
RASE – Royal Agricultural Society of England
RCT – Randomised Control Trial
RES – Rothamsted Experimental Station
RL – Recommended List
SPC – Seed Production Committee
STS – Science and Technology Studies
WPBS – Welsh Plant Breeding Station (Aberystwyth)

Introduction

Despite the efforts of some food processors, economists, multi-national corporations, politicians, chemists and nutritionists, the majority of people still eat food. It is shameful that the greater part of that majority still do not have access to enough of it. Different solutions to this problem cover a wide range of possibilities, from tighter official control of international food manufacture and distribution, to an expansion of scientific funding leading to further gains in agricultural productivity around the world. These different solutions in turn conform to different political ideals, though the extent to which participants in this debate are willing to acknowledge this fact varies, and varies on all sides. The present thesis has done virtually everything it can to avoid taking on this debate. It has done so not because it is unimportant, on the contrary, what has come to be called 'food security' appears to be perhaps the most pressing and urgent dilemma of this century, coupled as it is to the issues of climate change and population growth.¹ It is however an issue much too large and poorly defined to be tackled in a PhD thesis. Instead, the next five chapters will consider the history, role and significance of one form of actor within this international and interdisciplinary 'working world'; the agricultural science institute.² The latter covers a very wide variety of potential organizations, some consisting merely of sheds in the middle of fields, others of expensive laboratories in the middle of cities, others still of talking-shops and commercial bodies that stretch the definition of agricultural 'science' to a point that some might find distasteful. This much heterogeneity can be dizzying, and calls for a massive international collaborative and comparative scholarly effort, one which currently appears to be emerging from the different disciplines of history and philosophy of science, science and technology studies, development studies,

¹ The literature on these issues is obviously vast. The following references, which are works written with a popular audience in mind, are taken from a list of the '13 Books on the Food System That Could Save the Environment' compiled recently by the think tank 'Food Tank'. They are offered as an historical artefact, and an entry point to the contemporary discussion. Bittman (2013), Bloom (2011), Carpenter (2011), Hauter (2012), Jayaraman (2013), Kaufman (2012), Ladner (2011), Lappé (2010), Madigan (2009), Pollan (2013), Sharpless (2013), Stuart (2009), Thurow (2013). See also Frow et al. (2009).

² Agar (2013). While Agar's 'working worlds' innovation is deliberately construed broadly, and contains multiple meanings, its principal significance is the way in which social and economic problem solving is placed at the forefront of our historical investigations into science in the twentieth century. This is obviously particularly attractive in a thesis dedicated to agricultural science. Frustratingly, the agricultural working world features hardly at all in what is an otherwise very wide-ranging book. As environmental issues continue to creep up the political and social agenda, agriculture's currently marginalized position within the history of science is set to change.

environmental humanities, business studies and environmental ethics.³ It is important therefore to provide something of a focal point. This thesis is dedicated to the history and significance of the National Institute of Agricultural Botany (NIAB), located to this day in Cambridge, UK.

Approaching its centenary in 2019 – and that of the Official Seed Testing Station (OSTS) in 2017 – NIAB and its Director, Dr. Tina Barsby, have sought a thoroughgoing investigation of the Institute's first hundred years of operation and its contemporary working practices. This thesis marks the first stage of that project, dedicated to NIAB's foundation and first fifty years. A further PhD student at the University of Leeds, Matt Holmes, is currently exploring the second fifty years, while a third PhD student will conduct an anthropological investigation of NIAB's laboratory practices, scheduled to begin in September 2015.⁴ It is clear that the Institute deserves this attention, not merely because many have devoted and continue to devote their careers to NIAB's survival, but because it is a truly unique institution. Rivalled only by the likes of Rothamsted Experimental Station and the John Innes Centre in terms of longevity, NIAB has remained at its Cambridge headquarters since their completion in 1921. These headquarters have seen considerable expansion and contraction over the past 100 years, as have the number of different locations occupied by the Institute across the UK, and the variety of academic and non-academic institutions with which it has collaborated. Sociologically the Institute also sits in some unique territory; a charitable organisation established with the intention of making a profit; a scientific institution with an emphasis on intervention in industry; an independent organisation initially established with private and public money, which was almost absorbed by the civil service but today has come to be run as a not-for-profit company. NIAB has witnessed, taken part in, and been influenced by, any number of important changes in the history of twentieth century science and farming. The following five chapters attempt to reconstruct just some of them.

Section I: NIAB in the existing historiography

Before explaining how this thesis will tackle the history of NIAB 1919-1969, it is important to survey the existing accounts. The official biography, published in 1997 and

³ A recent work of synthesis, Jorgensen et al. (2013), brings environmental history and science and technology studies together.

⁴ For a brief time, another student pursued this second PhD project, but found they were happiest back in the lab and in front of the easel. HPS awaits their return.

written by two past employees of the Institute – Peter Wellington (who Directed the Institute between 1970 and 1981) and Valerie Silvey (a former Deputy-Director who has given generously with her time and expertise throughout this project) – has been a constant source of interesting, helpful, and reliable information.⁵ Many of the key moments highlighted in the present thesis will be found in their analysis, though the paths taken between them could not be more different. This is perhaps inevitable, as the task Silvey and Wellington set themselves was far more ambitious, taking in the full rather than merely the half century. Aside from this difference in scope, these authors are not burdened by the concerns of historians and philosophers of science, which – depending on the audience – may or may not play in their favour. Aside from their account, NIAB has received hardly any other historical attention. E. John Russell in his 1966 *A History of Agricultural Science in Great Britain*, which remarkably remains the most comprehensive history of the subject to date, dedicates four pages to the Institute. There he describes NIAB as being “not itself mainly engaged in research” though nevertheless “indispensable to the Plant Breeding and other research Institutes.”⁶ Russell’s strict definition of ‘research’ is one that most historians and philosophers of science would no longer sympathise with, and is accordingly discarded in this thesis. At the same time, precisely what Russell meant by this description is worth bearing in mind, as NIAB’s apparent ‘applied’ status has at times been a source of concern and confusion.⁷ Finally, the historians of science Paolo Palladino and Berris Charnley have each had something to say of the Institute. While neither have taken NIAB as the central focus of their study, their interpretations nevertheless deserve to be considered in greater detail.

To no small extent this thesis, and the ongoing investigation of NIAB, has been inspired by the work of Charnley. In his recently completed PhD thesis, Charnley explores the emergence of Mendelism and its influence on the world of British (and colonial) plant breeding.⁸ NIAB features in this work as an important location for Sir Rowland Biffen (1874-1949); plant breeder, geneticist, and the first Professor of Agricultural Botany at the University of Cambridge.⁹ He emphasises the Institute’s

⁵ Silvey and Wellington (1997).

⁶ Russell (1966) p. 345.

⁷ For an important contribution that historicizes the pure/applied distinction, see Gooday (2012).

⁸ Charnley (2011). Nathan Crowe has reviewed the thesis for the online resource *Dissertation Reviews*, which can be read here <<http://dissertationreviews.org/archives/3288>> last accessed 12/1/2014.

⁹ Charnley (2011) pp. 67-75.

location at the centre of the Universities' agricultural research network, the greater part of which was based alongside NIAB on and around Huntingdon Road. NIAB is listed by Charnley as one of six key discipline-building locations for early Mendelians, including the Cambridge School of Agriculture, the Home Grown Wheat Committee, the John Innes Research Institute, the Cambridge Plant Breeding Institute and the British Seed Corn Association.¹⁰ In addition, he pays special attention to NIAB's work in the commercial release of Biffen's varieties.¹¹ There is little in Charnley's characterisation of NIAB's founding and functions with which to take issue. All that might be said is that the account of the Institute's origins given in the present thesis is considerably deeper (which is to be expected) and leaves the presumed purpose of NIAB in greater doubt (in ways that are quite unexpected). It is also somewhat funnier.

In as much as this thesis is indebted to Charnley, both he and it are in turn indebted to the pioneering studies of Paolo Palladino into the history of British plant breeding in the twentieth century.¹² While much of this work will be drawn on and further supported in this thesis, his use of NIAB – an Institute that he admittedly keeps at arms-length – is problematic. Palladino underestimates the extent to which Cambridge academics were directly and personally embroiled in the “extra-academic, commercial world” of agricultural plant breeding and seed trading found at NIAB.¹³ The present thesis will remove any doubt that figures at Cambridge such as Rowland Biffen, Herbert Hunter and G.D.H. Bell had commercial ambitions and pursued them vigorously, with no apparent compunction about grubby connections to trade. More specifically with regard to his characterisation of NIAB, Palladino overemphasises the role of seed-traders and millers in determining the form and functions that the Institute eventually came to adopt.¹⁴ They were important, but not all-powerful. What is exceptionally valuable about Palladino's approach, and which has been influential in the current thesis, is the emphasis he places on the multiple groups interested in research (food processors, farmers, plant breeders, politicians, merchants, geneticists) and how these can and will attempt to reorientate that research towards their own

¹⁰ Charnley (2011) p. 79.

¹¹ Charnley (2011) pp. 155-160.

¹² Palladino (1990), (1993), (1994), (1996), (1997), (2002), with Colin Thirtle and Jenifer Piesse (1997), and with Colin Thirtle et al. (1998). Palladino has also attempted an intervention in agricultural development studies, Palladino (1987).

¹³ Palladino (1990) p. 466.

¹⁴ Palladino (1990) pp. 467-468.

ends, more or less successfully, depending on their social position.¹⁵ Both of Palladino's problematic claims about NIAB are clearly linked; removing Cambridge academics from the NIAB picture helps to create space for forceful external commercial actors. There are two explanations for Palladino's interpretation of NIAB, one historiographical and the other methodological. Regarding the former, Palladino acknowledges a debt to Harwood's description of scientific 'elites' who prefer to keep commercially inclined institutions like NIAB at a distance to themselves.¹⁶ With regard to the latter, it is only very recently that NIAB's own archival material has been made available to historians, as will be explained shortly. It has only been possible to present something like a complete picture of Cambridge plant breeding, one that fully incorporates the NIAB perspective, thanks to this archival material.

There is therefore, a clear and identifiable need for the present thesis, one which focusses upon NIAB while also addressing the concerns of historians and philosophers of science. The Institute and its extensive and unexploited archive materials offer an exceptionally rare opportunity for historians interested in agricultural science and industry. Indeed, these archive materials alone would make NIAB a worthy candidate for historical scrutiny due to their breadth and depth. It has been a key achievement of this PhD project that all of the historical materials housed at NIAB, for the period 1900 to around 1970, have now been catalogued and are available for consultation by appointment at the Institute's headquarters. The detailed handlist describing these collections is included as Appendix 1 and can be downloaded from the archive website <niabarchive.wordpress.com>. The NIAB Archive identification numbers (referenced throughout the thesis) correspond to this handlist. For those who feel this thesis has been undermined by too close a study of one institution – in the stead of a more systematic analysis of British agricultural science across the UK – the weight of this entirely new primary source material is offered in reply. A focus on NIAB can illuminate some otherwise very dark areas of understanding with regard to the history of agricultural science, its relationship with the agricultural industry, and twentieth century Britain.

While what follows is clearly an institutional history, it also takes Michael A. Finn's lead, in that it attempts to go further than such a project has traditionally

¹⁵ See Horrocks (1993) for an important account of science in the British food processing industry at the turn of the twentieth century.

¹⁶ My thanks to Palladino for discussing this point in detail with me. See Harwood (1993).

implied.¹⁷ The history of NIAB certainly provides the narrative backbone to the following five chapters, which also progress chronologically. However, the aim in each chapter is to explain how concentrating on different aspects of the Institute's work can help explain wider changes in the history of science and agriculture. Topics include the First and Second World Wars, statistics, plant science, genetics, intellectual property, and state provision for agricultural science research. These discussions are embedded within two primary historiographical contexts; the history of agricultural science in the twentieth century (principally in Britain) and the history of plant breeding (throughout the world). The former will be surveyed in Section II of this introductory Chapter, and the latter in Section III. A fourth and final Section will outline the rest of the thesis, highlighting the main arguments of each chapter and the structure that they constitute as a whole.

Section II: Agricultural science in the twentieth century

The historiography of agricultural science in the twentieth century has focussed on a wide variety of countries, though Britain has featured hardly at all. This is perhaps due to the latter's reputation as the first country to industrialise, its relatively small land mass, and the apparent insignificance of its own agricultural industry to the majority of its contemporary occupants. The most extensive and influential accounts, those of Jonathan Harwood, Deborah Fitzgerald, Helen Tilley and Harro Maat, have focussed on Germany, North America, Africa and the Netherlands respectively. In addition, two recent journal special issues, one edited by Harwood and the other by Sarah Wilmot, have helped define the boundaries of agricultural science, demonstrate its importance in the history of biology more generally, and highlight the peculiar challenges that agriculture offers for historians and philosophers of science.¹⁸

Harwood's most important work in this historiographical context (his plant breeding work will be considered in Section III) is *Technology's Dilemma*. While Harwood highlights its potentially fruitful extension to the British context, the arguments and approach in *Technology's Dilemma* cannot easily be transferred to the NIAB case, as his focus is on agricultural colleges and teaching departments rather than agricultural science institutes. On a strict translation, NIAB would instead form part of the 'habitat' of the University of Cambridge, upon which it would exert some

¹⁷ Finn (2012) p. 6. The introduction to Finn's thesis, which focussed on the West Riding Lunatic Asylum, was used as a template for this one, as, despite everything, it was really quite good.

¹⁸ Harwood (2006), Wilmot (2007).

transformative pressure.¹⁹ This being said, it is remarkable the extent to which his account of ‘academic drift’ (in which educational departments, no matter how applied in focus, steadily pursue increasingly specialised and more prestigious basic research) can be applied to NIAB. As we shall see, NIAB becomes increasingly orientated towards basic research during its first fifty years of operation. This finding suggests that agricultural science institutes, while also influencing academic departments, can themselves go through such a process of drift. Moreover, considering the orientation of the scholars at the University of Cambridge – who have rarely seen their research as anything other than basic – and the extent to which NIAB interacted with staff from the University, this finding also suggests that agricultural science institutes are equally capable of being influenced by the academic departments proximate to them. The potential for this kind of boot-strapping is particularly alarming on a Harwoodian account, considering the extent to which he considers academic drift to be a driving force of agricultural industrialisation.²⁰

Fitzgerald has focussed on the emergence of an industrial ideal in US agriculture in the early twentieth century. There is a great deal in this analysis that can inform the history of NIAB, particularly the extent to which apparently scientific innovations depended on a whole host of other support systems (including social systems, such as banking and legislative change) before they could influence industry.²¹ Her chapters on quantification and mechanization have been particularly influential, the former with regard to its importance for state intervention (in the same sense described by Theodore Porter, and which James Scott has characterised as making society ‘legible’ to the state) and the latter with regard to the process of professionalization in agricultural disciplines.²² Though the entire discipline of agricultural engineering (described by Fitzgerald) cannot be taken as a direct equivalent of NIAB – which is an institution not a professionalizing discipline – her story is nevertheless instructive. In the same way that Fitzgerald’s agricultural engineers had to exert their authority amidst a sea of rival experts (some involved in the sale of agricultural products, others in the sale of agricultural inputs, and others from within the farming community itself), so did NIAB have to constantly negotiate with such communities before it could assume its pivotal and much defended independent

¹⁹ Harwood (2005) p. 36.

²⁰ Harwood (2005) p. 29.

²¹ Fitzgerald (2003) p. 5.

²² Porter (1995), Scott (1998) p. 82.

position within UK agriculture.²³ However, having tactically aligned themselves closely with industry as a way of gaining professional recognition, Fitzgerald's agricultural engineers became "unable to play a significant role in testing and regulation".²⁴ The potential for such 'regulatory capture' at NIAB, an institute explicitly dedicated to testing and regulation, which was also aligned closely with its own primary industrial community (plant breeders), has been kept in view throughout this thesis.

Of the existing historical accounts, Maat's *Science Cultivating Practice* is the most similar to that which is attempted here, though his scope is wider (addressing both agricultural science research and teaching), and his period of focus is longer (covering 1863-1986). Nevertheless, Maat's account is one of the few to address the entirety of the period under discussion in this thesis (1919-1969), while focussing on a variety of agricultural research institutes, one of which – the Institute for Variety Research of Cultivated Crops – might be considered the Dutch NIAB.²⁵ However, the latter receives only a very brief mention. As with the existing historical research in all other countries, institutions like NIAB (which primarily play a role in regulating the agricultural industry, apparently eschewing plant breeding work themselves), have simply not attracted the attention of historians of science.²⁶ For a stronger equivalent to the NIAB story described here, we would need to leave the bounds of agriculture and turn to something like Eileen Magnello's history of the National Physical Laboratory, another national scientific institution concerned with regulation and standardisation.²⁷ Maat's account has also been most influential thanks to his efforts to integrate the domestic agricultural picture with that of the Dutch colonies. The majority of previous historical accounts have either limply pointed to the imperial context as an important location for agricultural experts, ignored it all together, or, conversely, focussed on the imperial context without considering how this influenced or relied upon domestic agricultural research and education. Maat instead attempts to build links between the two, setting them in a joint context. This is a perspective that this thesis has attempted to emulate, though the vast majority of the discussion is admittedly confined to the UK. So too with the work of Helen Tilley.

²³ Fitzgerald (2003) p. 83.

²⁴ Fitzgerald (2003) p. 103.

²⁵ Maat (2001) pp. 137-138.

²⁶ One important exception is Lino Cambrubí who focusses on rice seed testing and regulation in Francoist Spain (and its links with genetics) in ways that the present thesis parallels. Cambrubi (2010).

²⁷ Magnello (2000).

Tilley offers a highly sophisticated historiographical tool for understanding the relationship between the knowledge of scientific experts and the knowledge maintained by the societies in which they work.²⁸ Her account of colonial Africa in the interwar years quite rightly sets agricultural experts alongside those other experts (ecological, medical, social and anthropological) invested in the project of colonial development, in a way that helps situate the current thesis in the broadest possible discussions of science in the twentieth century. In a chapter dedicated to agriculture, Tilley introduces the concept of ‘vernacular science’ as a way to characterise local or indigenous knowledge, without carrying over much of the analytical baggage of previous historical and sociological interpretations, which have often been too keen to romanticize such knowledge while caricaturing the dystopian visions pursued by arrogant colonial scientists.²⁹ To some readers it might seem inappropriate to take a tool specifically designed to deal with the intricate and politically sensitive issues surrounding African colonial and post-colonial development, and suggest its suitability for understanding the relationship between scientists and farmers in Britain. While the two contexts are by no means equivalent, this thesis has nevertheless assumed something of an equivalence in the relationship between farmers and scientists. Much of the research pursued by NIAB, and the attempts at UK development that it made, required an understanding of local peculiarities and the working knowledge of regional farmers. Rarely was the relationship one-sided or non-interactive. The essential problem that Tilley identifies, that “Defining what constituted agricultural progress and what ends it was to serve was fraught with contradictions” might be said of any nation, at any time.³⁰

Within Britain the history of agricultural science in the twentieth century has been dominated by two key figures; Paul Brassley and Abigail Woods. Their various works are referenced throughout this thesis, which has accordingly been heavily influenced by them. Admittedly, Brassley has rarely ventured into agricultural science itself, focussing instead on technical change in farming, which has often – though not always – been prompted by scientific innovation. His most recent work, the co-edited collection *War, Agriculture and Food: Rural Europe from the 1930s to the 1950s*, has been helpful for determining what was and was not peculiar to the UK.³¹ Importantly,

²⁸ Tilley (2011). My thanks to Elizabeth Haines for pointing me in Tilley’s direction.

²⁹ Tilley (2011) p. 122.

³⁰ Tilley (2011) p. 137.

³¹ Brassley et al. eds. (2012).

the only chapter in this collection to discuss agricultural science in some detail is that on Britain and Austria authored by John Martin and Ernst Langthaler.³² Martin has also dedicated an entire volume to the importance of agricultural science and technology for the creation of modern agriculture in Britain.³³ While this latter work has helped highlight the lack of attention these topics have received, it contains no analysis of science and technology themselves, nor is it informed by the existing literature in the history of science and technology which speaks directly to his subject. As a result, Martin's treatment of science and technology is fairly simplistic. Nevertheless, some of the general trends he highlights, for instance the increasingly interventionist nature of agricultural policy from the interwar period onward, will find support in the present thesis (though they have also been identified by earlier authors). The most significant author in the current historiographical context is Abigail Woods.³⁴ Her focus on animal husbandry and veterinary science provides an important balance to not only this thesis, but also the greater part of the history of science literature, which has tended to find plant life much more manageable.³⁵ In particular, Woods' article 'Rethinking the History of Modern Agriculture' has clearly set out the existing historiographical terrain and established the challenges facing contemporary researchers.³⁶ The present thesis has built on this work, avoiding teleology in its account of technical change, attempting instead to discover the causes behind these changes, while uncovering the potential agricultural industries and histories that otherwise might have been.

Finally, while this thesis is dedicated to the agricultural, it should be remembered that nationally funded agricultural science in the twentieth century is but one important aspect of a larger story. Numerous historians have charted the rise of increasing state patronage of science in non-agricultural industries (as they will stubbornly be referred to throughout this thesis) in Britain around the turn of the twentieth century. Whether supported by 'public scientists', or for the advancement of colonial exploitation, as part of the communist or Fabian agenda, or motivated by concerns over national security, various heterogeneous groups sought for and secured increased national funding for science and technology, from which NIAB was but one

³² Martin and Langthaler (2012) pp. 62-63.

³³ Martin (2000).

³⁴ Woods (2004), (2007), (2009a), (2009b), (2011a), (2011b), Woods and Matthews (2010).

³⁵ For a discussion of technical changes in poultry keeping in twentieth century Britain, and late twentieth century public responses to such intensive methods, see Karen Sayer, (2008) and (2013) respectively. On poultry and rabbits as both experimental and commercial organisms see Marie (2008).

³⁶ Woods (2012).

beneficiary.³⁷ Similarly, historians have highlighted that throughout roughly the same period, though with much more varying degrees of success, scientific and non-scientific experts had begun to permeate government. Whether in the pursuit of ‘national efficiency’, or understood as a rising professional class, in response to the administrative demands of empire, or thanks to the ambitions of some scientists to gain control over national policy, the position of science within the state was changing.³⁸ In this respect the extent to which NIAB either profited from or encapsulated these changes is less clear. While some recent scholarship has attended more specifically to the position of experts within state agricultural intervention, such studies have been in the minority.³⁹

Section III: Plant breeding

To some extent, the separation of plant breeding historiography from that of agricultural science in the twentieth century is artificial. A number of the key authors mentioned above, Harwood, Maat and Palladino chief amongst them, have published work that integrates both contexts. On the whole however, the majority of historians who have come to the history of plant breeding have not pursued these plants beyond the confined and controlled fields of geneticists and plant breeders. They have come to the topic of plant breeding with a wide variety of motivations, whether through an interest in the long history of botany, the history of commodities, the use of plants as scientific models, theories of heredity, evolutionary biology or, most recently, issues surrounding intellectual property in the biosciences. Many of the questions addressed by these authors can be pursued without any interest in farming, the agricultural

³⁷ For some of the more general introductions to this historiography see Alter (1987), MacLeod ed. (1988) and Poole and Andrews eds. (1972). On science and communist ideology see Werskey (1978) and for the efforts of the Fabians see Olby (1991). The most recent treatment of the growth of state support for science in relation to empire is Hodge (2007) while Edgerton (2005) emphasises the patronage of science within the services following the Great War.

³⁸ On national efficiency see Searle (1971). Harold Perkin’s study of the rise of the professional class remains highly influential, Perkin (1989). In numerous articles Roy MacLeod has highlighted the increasing dependence upon experts in the administration of the British empire, see in particular MacLeod (1993) and (1994), see also Worboys (1979) and (1996). Andrew Hull has emphasised that scientists have often not just sought increased funding from the state, but also fought for a role within policy formation itself, Hull (1999).

³⁹ Abigail Woods has recently written two complementary pieces on the role of veterinarians within the Board (later Ministry) of Agriculture, one published – Woods (2013a) – and the other forthcoming. Clark (2001) demonstrates that entomologists began to seek an improvement in their professional status in the late nineteenth and early twentieth century by emphasising their potential economic utility in domestic and colonial agriculture.

industry, or global food networks. It is for this reason that the two historiographical contexts have here been introduced separately. It is one of the aims of this thesis that they become much further integrated.

The historiography of plant breeding is obviously international in scope.⁴⁰ Some authors have focussed on the life and times of particularly influential plant breeders based in particular countries (though often with international renown and impact).⁴¹ Others have considered particular plant breeding stations.⁴² One recent and innovative thesis has focussed on the various methods used by breeders in the twentieth century to promote change in their plant stocks, while others have focussed on how certain plants become models thanks to their malleability.⁴³ The liveliest area of historical research is the link between horticultural and agricultural plant (and animal) breeding and the rise of Mendelian genetics, a topic that the present thesis also addresses directly.⁴⁴ Some significant geneticists have themselves paid particular attention to the history of that disciplines relationship with plant breeding.⁴⁵ Barbara Kimmelman's PhD thesis is perhaps the most crucial work in this respect, weaving together as it does the ambitions of agricultural researchers in the US, with the expectations of American agricultural policy, and the arrival of the new Mendelian theory, in a way that has defined much of the research agenda since.⁴⁶ Her observation that the politics of the Progressive era, which emphasised "scientific reform from above" i.e. technocracy, was "an antidote to the Populist thrust of political and economic reform from below" seems to have also influenced Harwood and Palladino, whose work on plant breeding will be discussed shortly.⁴⁷ The most provocative question that most historians engaged in this work have attempted to answer has been the extent to which developments in genetic

⁴⁰ Two particularly influential collections of essays are Olsson ed. (1986) and Roll-Hansen and Broberg eds. (1997).

⁴¹ Luca Iori's recently completed PhD thesis, on agricultural genetics and plant breeding in Italy in the early twentieth-century, is largely focussed on the life of the Italian plant breeder Nazareno Strampelli, though the thesis encompasses much more in the process; Iori (2013). On the Americans William Jasper Spillman, R.A. Emerson and Luther Burbank see Carlson (2005), Kimmelman (1992) and Palladino (1994) respectively. On generations of the Vilmorins in France see Gayon and Zallen (1998), on Nilsson-Ehle in Sweden see Åkerberg (1986), on Wilhelm Johannsen in Denmark see Churchill (1974) and Roll-Hansen (1989), (2009). On Wilhelm Rimpau and Ferdinand von Lochow in Germany see Wieland (2006).

⁴² Bell (1975), Elina et al. (2005), Maat (2001), Müller-Wille (2005), (2008b), Olby (1989).

⁴³ On the former, see Curry (2012), on the latter see Leonelli (2007), Ankeny and Leonelli (2013).

⁴⁴ Allen (2000), Bowler (1989), Cooke (1997), Derry (2012), Marie (2004), Müller-Wille (2007), Olby (1985), (1987), (2000), Richmond (2006), Saraiva (2010), Theunissen (2008).

⁴⁵ Darlington (1981).

⁴⁶ Kimmelman (1987). For key dates and details regarding the development of agricultural science in the US in the nineteenth century see Marcus (1985).

⁴⁷ Kimmelman (1987) p. 23.

theory resulted in changes in breeding practice, and vice versa.⁴⁸ The majority of authors have tended to agree with Christoph Bonneuil's recent conclusions (in work based on France) that plant breeders "despite an initial interest in – and a fairly good knowledge of – Mendel's laws and Johannsen's pure-line theory never came to see them as the breeder's panacea, and regarded them instead as being of only limited value."⁴⁹ The work of four authors in particular have influenced the discussion of plant breeding in this thesis.

Jonathan Harwood has published extensively on the topic.⁵⁰ However, it is his most recent work, published only in 2012, that has the greatest bearing on the present thesis. *Europe's Green Revolution and Others Since* traces the history of German publicly funded plant breeding, while making a persuasive case for the relevance of this research for contemporary development studies and 'Green Revolution' programmes.⁵¹ The latter is a provocative challenge, and one that this thesis extends in places. A focus on the lessons that European development might have for the developing world is also highly complementary to Tilley's analysis, explored above. As with Kimmelman, Harwood emphasises the extent to which governmental reforms that increased public provision for agricultural education and research around the turn of the century were often considered important for disrupting growing political unrest.⁵² In addition, his argument that there is more than one logic by which to organise the breeding industry, and that therefore "Deciding upon the role that public-sector institutions should play is fundamentally a political matter" immediately lifts our discussion of NIAB out of mere institutional history making, and places it directly at the centre of important and ongoing economic and political debates.⁵³ What NIAB was for, and the extent to which it ought to compete with, cooperate with, or even facilitate large private plant breeding firms, are questions kept firmly in view throughout this thesis. However, and has been the case with all of Harwood's most extensive publications, the secret of its success lies in its comparative nature. In *Europe's Green Revolution*, comparison is made between a 'cosmopolitan' breeding strategy (employed by large private breeding firms with the

⁴⁸ In a forthcoming publication Jonathan Harwood takes on this question comprehensively, making a case for a limited impact of Mendelism on breeding. Harwood (forthcoming). My thanks to the author for sharing a draft of this paper with me.

⁴⁹ Bonneuil (2006) p. 284. See also Fitzgerald (1990), Palladino (1993), Harwood (1997) and Wieland (2006).

⁵⁰ Harwood (1997), (2000), (2009), (2010).

⁵¹ Harwood (2012).

⁵² Harwood (2012) p. 30.

⁵³ Harwood (2012) p. 96.

intention of producing a ‘one plant fits all environments’ commercial mega-variety) and a ‘local’ breeding strategy (pursued largely by state-funded plant breeding institutions in the south of Germany, surrounded by farms of the smallest average size in the country, with the aim of refining a varieties suitability for a particular location).⁵⁴ As rich and interesting as the conclusions Harwood draws from this model are, they are of limited use when discussing NIAB. It would certainly be an important and valuable job of work to see whether or not UK institutions can be similarly characterised, but this effort cannot be made while focussing on one single institution, as this thesis does. Lastly, Harwood’s parallel historical account has been exceptionally useful in constructing the overarching narrative of this thesis. It appears that Germany and the UK have shared broadly similar histories, from the emergence of public support for improved agricultural education in the late nineteenth century (often from amongst wealthier farmers and the landed interest), to expanding state provision for research in the early twentieth century, the establishment of numerous scientific institutions in the interwar period, and finally to the eventual wartime and post Second World War emphasis on productivism (with suitable help from agricultural scientists). This latter period, again within Germany, has been the subject of an important study by Susanne Heim.

Heim focusses on plant breeding in Kaiser-Wilhelm-Institutes (KWI) during the Nazi regime.⁵⁵ The importance attached to agricultural research for the expansion and maintenance of the German state is well evidenced, Heim uncovering that “Agricultural research did not just receive more funds than any other subject area; in fact, in most years it received more funding than all the other natural science and technical branches put together”.⁵⁶ In turn, KWIs were highly dependent upon funding from the Reich Ministry of Food and Agriculture, with, for example, the Institute for Plant Breeding Research receiving over 80% of its funding from this source.⁵⁷ While this helps to further establish the comparison with UK institutes, and NIAB in particular, Heim’s thesis is most useful when she analyses the slippery nature of the terms in which agricultural scientists can refer to the organic material of interest to them, particularly during times of military crisis.

⁵⁴ Harwood (2012) p. 45.

⁵⁵ Heim (2003).

⁵⁶ Heim (2003) p. 9.

⁵⁷ Heim (2003) p. 26.

The double, or triple, role assigned to plants, as research objects, raw materials, and strategic resources, allows scientists to move between these different areas. In wartime, they make use of political and military power (for example during an occupation) in order to gain access to interesting breeding material. At one moment, they legitimise this appropriation by appeals to national interests; at another, by concern for the common heritage of humanity, or by the unselfish striving of science for knowledge. No mention is made of the researchers' interest in the plants or seeds as building blocks for their own careers. Nor is any mention made of the fact that, in the 'food war', control of plant genetic resources could become an issue on which survival depended, i.e. a central issue for war strategy.⁵⁸

Heim's primary concern is with the appropriation of novel genetic material (seeds) by German scientists following military occupations in Eastern Europe. However, her point becomes all the more important if thought of in terms of *control over all germ lines*, rather than just the acquisition of novelty through clearly ethically problematic means. Expanded in this manner, Heim's story can be seen as but one element of a larger problem, regarding how scientists and legislators come to build systems for the control and management of novelty, regardless of whether or not that novel material originated in an occupied territory (or, for that matter, a colony). Focussing on the plant material in this way means we can expand her analysis into non-combatant periods, with clearly uncomfortable results. Acknowledging the slipperiness of the meaning attached to the objects studied in agricultural science, and the seeds in particular, allows us to appreciate how regulatory achievements can be dressed up as scientific achievements (see the discussion of intellectual property in Chapters 3, 4 and 5 of this thesis), economic failures can be seen as merely the product of scientific ignorance (see Chapters 1 and 2 for the emphasis on agricultural science as a technological fix) and we can understand how ambitious scientists make use of national emergencies to achieve their scientific aims (see the discussion of NIAB's Recommended Lists and seed multiplication programmes found in Chapter 4). At one moment seeds are natural resources, at another a legitimate object of scientific study, at another the product of a highly sophisticated scientific breeding programme, at another the product of a highly sophisticated legislative process, at another, they are illegal and therefore 'black market' commodities, at another, a source of food or essential for the creation of other agricultural and industrial products, at another, the solution to economic and agricultural failings (thereby carrying political significance), at

⁵⁸ Heim (2003) p. 175.

another, important elements of national security strategy. Seed identity is terrifically over determined.

Any thoroughgoing assessment of the seed owes a considerable debt to the work of Jack Kloppenburg. His array of books and publications on plant breeding and agricultural seeds have had just as much, if not more, impact in HPS as they have done in their more direct sociological and development studies audiences.⁵⁹ His 1988 monograph, *First the Seed: The Political Economy of Plant Biotechnology*, has recently gone through its second edition, and remains central to the investigation and interpretation of plant breeding.⁶⁰ Two key themes in his work have informed this historiography and in turn the present thesis; commodification and institutional divisions of labour. Commodification, a concept drawn from Marxist historical theory, is the process by which items that otherwise resist ownership assume the position of a commodity in the economy. Seeds (capable of generating more plants and more seeds) are difficult to own, and thus to extract profit from. Any number of different process might go into seed commodification, and their number will be added to in this thesis. It is a process closely aligned with what has been termed ‘appropriationism’, in which parts of the extant agricultural industry are turned into industrially produced inputs, rather than being sourced from agricultural processes themselves.⁶¹ The classic example to give is that of fertilizer; where once a farmer relied largely upon the excrement of their own animals to improve soil fertility, they now select from a range of fertilizers sold to them by large agri-chemical firms. What was once a relatively amorphous input, which was the direct responsibility of the farmer, has – since the late nineteenth century – increasingly been replaced by a commodity. Translating this problem into plant breeding terms, Kloppenburg has been particularly concerned by the extent to which farmers have become separated from seed multiplication.⁶² Where once farmers habitually saved and shared seed amongst themselves, they are now reliant upon an ever-shrinking number of large seed firms, and increasingly disbarred

⁵⁹ Kloppenburg (1984), (1991), (1996), (2009), (2010a), (2010b), (2011), (2012), Kloppenburg and Martin (1984), Buttel et al. (1984), Kloppenburg and Lee Kleinman (1987a), (1987b), (1988a), (1988b)

⁶⁰ Kloppenburg (1988), (2004).

⁶¹ Goodman et al. popularised the term, which is most impressive when understood as part of converging trends. “Although separate trajectories can be identified, the dominant tendency has been the convergence of mechanical, chemical and genetic innovations to form a complementary, increasingly integrated technological package, which encompasses both the labour process and the natural production process.” Goodman et al. (1987) p. 34. See also Kuyek (2007) and Lewontin (2000).

⁶² Kloppenburg (2004) p. 10.

from sharing seed between themselves through legislation (either on the grounds of intellectual property protection or environmental health). This separation in turn entails a certain amount of 'deskilling', a complementary phenomenon, more fully explored by Fitzgerald.⁶³ The second of the two key themes in Kloppenburg's work to be discussed here, his emphasis on institutional divisions of labour, is also linked to commodification and deskilling. Private enterprise attempts to bring about the correct division of labour between itself and the state, restricting the role of the state to only those tasks from which it is too difficult to extract capital. As with the majority of the authors above, the topic of public and private enterprise, and public and private patronage of science, features heavily in the present thesis. So too with the last author whose work in the historiography of plant breeding is to be discussed here, Paolo Palladino.

It is important to return to Palladino's work at this point for two key reasons. Firstly, none of the authors discussed in this section on plant breeding historiography have taken the UK as their primary research context, while Palladino has. Secondly, while his views on NIAB were discussed earlier, these are far from his most central research concerns, and far from his most influential research results. Palladino was early to identify the diversity of opinion amongst agricultural plant breeders regarding the importance of Mendelism in early twentieth century Britain, lining up a series of Mendelian enthusiasts and sceptics.⁶⁴ While the relatively sharp division Palladino has attempted to draw is now giving way to a more gradated perspective, he nevertheless mapped the territory of the British discussion, which will be extended further in Chapter 3. To explain these individuals' divergent views on genetical theory and its proper relationship with the practice of plant breeding, Palladino emphasises differences in the kinds of institution in which each breeder worked. This historiographical approach has been particularly influential in Chapter 2 of the present thesis, which compares and contrasts NIAB and the Rothamsted Experimental Station in order to explain their divergent views on statistical theory, and its proper relationship with the practice of field trialling. Finally, in order to understand how NIAB fits within the context of British agricultural science policy, it has been important to attend to broader changes in the latter. Collaborating with a number of authors, Palladino has

⁶³ Fitzgerald (1993). Kathy J. Cooke has argued that the process of deskilling need not always occur when an agricultural input is increasingly commodified (as in the case of seed certification in the US), but can also be halted or reversed. Cooke (2002).

⁶⁴ Palladino (1990), (1993).

provided the most detailed account of these changes, one which is free of the more propagandistic elements of the official record.⁶⁵ As with Kimmelman and Harwood, Palladino has advanced the interpretation that states sponsoring agricultural science research ought best to be understood as thereby avoiding much trickier political decisions.

The decision to establish agricultural research institutions was motivated in large part by governments' desire to weaken the farmers' demands for subsidies and protection, rather than by any consideration of the long-range economic effects of support for agricultural research.⁶⁶

This interpretation is more adequate for assessing the motivations of state patrons in the early twentieth century rather than later (immediately before and subsequent to the Second World War), when increased support for agricultural science was a pre-condition precisely for such subsidies and protection. In addition, though early patrons of agricultural science may well have had other political and economic fish to fry, this did not keep the agricultural science institutions that they supported from going on to actually have important long-range economic effects. NIAB certainly did, though perhaps in ways that one might not expect.

Section IV: Thesis outline

A comprehensive history of the agricultural sciences in Britain has yet to be written. Indeed, despite numerous calls for greater attention, the agricultural sciences remain underrepresented in the history of science more generally. Instead we have a handful of different authors who have each given attention to individual parts of a much larger picture. In such a situation, focussing on one institution – NIAB – is a productive strategy. It provides both a narrative and chronology to the thesis, while allowing us to explore whatever themes and extant historiographical discussions might cut across its path. In this respect the thesis has been motivated by two ambitions; firstly, making the history of a scientific institution (one whose work is often of a very dry nature) entertaining and historically informative; secondly, drawing out the most important lessons for the history of science that NIAB might teach us. Investigating any institution requires sensitivity to the numerous approaches one might take, and consideration of the potential pitfalls. In important respects, the archive material available at NIAB has

⁶⁵ Palladino et al. (1991), and Piesse (1997). The most extensive official account remains Cooke (1981).

⁶⁶ Palladino (1990) p. 467.

placed a constraint on the kinds of topics that might be addressed. For instance, this is a thesis largely built on the meetings of committees, and the surviving correspondence between different key (male) individuals associated with the Institute. The reason for this is that these are the materials that have best survived. For instance, a thorough investigation of the NIAB staff in the first fifty years of its existence is not attempted in this thesis, as it would have required a more dedicated search for evidence, both within the Institute's archives and elsewhere. For this earlier period, most of the relevant files are scattered. Whereas, on the other hand, the work of the committees associated with the Institute's founding, trialling, regulating, and seed multiplication work, have all survived virtually intact. Similarly, the actual results of NIAB's trialling work (outside of its published results) have not been maintained in the historical archive. As a result, the actual findings produced by the Institute's research programmes, and the potential ways in which these results might therefore be investigated by historians and philosophers of science, is not considered. These latter questions, those of NIAB's staff, and further questions, such as the internal structure of the organisation, its potential status as a 'hybrid' institute, and the extent to which NIAB may have inspired a certain 'style' of work, will all need to be addressed by further researchers (and the results of this thesis reassessed in their light), should we begin to approach something like a complete history of NIAB.⁶⁷

As for the potential pitfalls inherent in any institutional history, these are numerous.⁶⁸ Focussing on one institution can cause myopia, can lead an investigator to take the institution (as a historical object) too seriously, and also – particularly when working closely with an institution that still exists – a certain amount of hesitancy when drawing to the surface events and decisions that do not paint the organisation in a favourable light. The problem of myopia has been overcome by attempting to find the richest extant historiographical terrain in which to place NIAB within each Chapter. While the focus therefore remains on the Institute, the results in each Chapter, and the historiographical discussions to be informed, are not derived from this focus, but are rather the shortest distance between NIAB and the history of science more broadly. Pursuing these questions has, in places, required the use of archive materials held elsewhere, including the National Archives, the archives of the Royal Institute of British architects, and the publications of the Norfolk Agricultural Experiment Station. As for the problem of taking 'NIAB' the historical object too seriously, and failing to see its

⁶⁷ On 'hybrid' institutions see Bourret et al. (2011), Fransman (2001), and Zaheer (2006).

⁶⁸ Douglas (1986).

incompleteness and constant need for reconfirmation of its identity (indeed, even talking of NIAB as though it has an identity or is a 'person' in some sense) has been dealt with by adopting an ironic distance from the actors and the institution. Lastly, the question of drawing to the surface events and circumstances that do not reflect well on NIAB. It is fortunate that the contemporary Institution is mature enough, and interested enough in its own history (and what might be learnt from it) that at no point has any friction arisen from the results of this historical research. Nevertheless, an effort has been made to leave behind the more journalistic aspects of some histories of science, which are more often dealing with less recent periods. A brief overview of the structure of the thesis now follows, which is then expanded upon by more detailed descriptions of the content and arguments to be found in each Chapter.

The thesis is organized around five predicates that are often attached to NIAB, with the aim of interrogating their meaning and the extent to which they are accurate. The predicates emerged quite naturally from an engagement with the primary material, and the numerous attempts that have been made at various times, by various parties, to succinctly describe the Institute. The five predicates are; *Seed Multiplier*; *Field Trialler*; *Plant Identifier*; *National Institute*; and *Independent*. Each chapter is dedicated to one of these predicates. The thesis also progresses chronologically, so that each predicate is considered in a different period of the Institute's history. While it is possible to investigate any of these predicates in any given period, each has been assigned to one in particular for the very good reason that these were periods in which that aspect of NIAB was particularly important; *Seed Multiplier* upon the Institute's foundation; *Field Trialler* during NIAB's first ten years of operation; *Plant Identifier* in the decade before the Second World War; and *National Institute* during and after that global catastrophe. The fifth and final Chapter, addressing NIAB's *Independent* status between 1955 and 1970, brings some synthesis to the thesis, by showing how all four preceding predicates interacted. At the same time therefore, this fifth Chapter also delivers on the promise that all four earlier predicates could have been investigated at any given point in time. Each of NIAB's four distinct predicates (and the fifth synthetic one), remain ripe for historical exploration and analysis right up to the present day.

Chapter 1 is dedicated to explaining how and why NIAB was founded. A number of factors came together, including a growth in the amount of state patronage of science immediately before the First World War, fears about agricultural self-sufficiency which were exacerbated by the war, increasing state intervention in industry as a result

of the war, and new models of state-craft to be found in Europe and North America. However, one figure in particular, Lawrence Weaver, did more than any other to found the Institute. An immensely interesting character, Weaver has otherwise almost completely escaped historical attention. Bringing together the architectural, industrial, artistic, commercial, and philanthropic threads of early twentieth century Britain, Weaver is used as the focal point of this Chapter, helping to explain not only NIAB's successes but also its deficiencies. Despite bearing the stamp of its historical context most plainly, NIAB's purpose was nevertheless highly ambiguous, an ambiguity that stemmed directly from Weaver's tactics. On the surface, NIAB had ostensibly been established to act as an official seed multiplication centre, ensuring that plant varieties produced by breeders at nationally funded research stations occupied a larger proportion of the arable market. This Chapter explains why then, when NIAB's headquarters were built on Huntingdon Road in Cambridge, around 80% of its offices were taken up with an entirely different organisation, the Official Seed Testing Station for England and Wales.

Of all the possible activities that NIAB could have immediately engaged in, Chapter 2 focusses upon that which the Institute chose; the field trialling of varieties under different geographic and climatic conditions to determine their differential economic value. In some respects this was an obvious choice, in others a troubling one. To this day field trialling remains agricultural science's most conspicuous feature, whether as a stomping ground for GM activists, or in providing an evocative backdrop for the hyper-attentive, piercingly perceptive, and thoughtful scientist. This Chapter considers the value attached to field trials by different elements of the agricultural and agricultural science communities. The 1920s see the rise not only of NIAB's trialling programme, but also that of the randomized control trial (RCT), which on most accounts was swiftly taken up as a sophisticated solution to the problem of experimental bias. This Chapter runs against this historiography, showing that the RCT was actually resisted at NIAB for quite some time, and for reasons that are most revealing. It is shown that the different constituencies that NIAB and its counterpart (the Rothamsted Experimental Station), each served, alongside the different goals of their research programmes, were the cause of their division over the value of the RCT. The decision to adopt the RCT was and remains a social and political one, not simply the most scientific or rational course of action. This is an argument with important implications for public-policy makers today.

Chapter 3 focusses on the 1930s and NIAB's efforts to rid the British cereal market of 'synonyms'. This phenomenon and the problems it caused for industry and science are explained in detail. The Chapter then uncovers how NIAB and the agricultural geneticists with which it worked attempted to police the varietal market, emphasising the difficulties they faced along the way. These problems were of both a biological and social nature. On the terms of biology, agricultural plants were found to be highly variable, and arguably came to be understood largely in terms of this variability, a perspective that set the majority of agricultural plant breeders against that naïve deterministic Mendelism that otherwise proved so popular elsewhere. As for the social, NIAB's programme was highly controversial, and ran into significant resistance both without and within the Institute. Both of these biological and social factors have important implications for current historiography surrounding the creation of intellectual property rights over plants. The Chapter concludes by taking an international comparative perspective on the problem of synonyms, looking at the various efforts made by different governments within different political contexts to manage and control the varietal market. Expanding on the insights of Kimmelman and Harwood, a strong case is made for the distinct perspective of the agricultural geneticist, as opposed to the more general geneticist. (As a result, this latter group could in turn prove to be more stratified than otherwise appreciated).

Chapter 4 concerns the work of the Institute during the Second World War. At present, while the efforts of farmers, allotment holders, and even gardeners, have all received considerable historical attention, the work of agricultural scientists during the war has been almost completely overlooked. This Chapter attempts to redress this imbalance by uncovering how NIAB responded to the war, the role it assumed throughout, and the most important implications of this period for the Institute's future. Too often, perhaps, it has been assumed that the demands of the war on Britain's food production capacities must have meant that agricultural science simply ceased to exist. This is far from the truth. The war offered considerable opportunities for ambitious agricultural scientists (and plant breeders in particular), who established some of the most important new 'rationalising' industrial and economic mechanisms of the twentieth century (namely Seed Certification and the Recommended List), precisely at this time and as war still raged. NIAB was only able to implement these systems thanks to its national status. Having uncovered the Institute's wartime and immediate post-war history, the second half of the Chapter is dedicated to exploring what the

Institute's national status actually entailed, considering the 'national' systematically in terms of 'security', 'geography' and 'efficiency'.

NIAB emerged from the Second World War stronger than ever, though this security did not remain settled for long. Chapter 5 deals with three important developments, all of which challenged the Institute's purportedly independent nature, and which altered NIAB's position in both the short and the long term. Firstly, the Ministry of Agriculture attempted to take over the Institute, a change that would have made NIAB part of the civil service. Movements in this direction began in the early 1960s, reaching a peak later that same decade. Thanks to NIAB's status as a national Institute (Chapter 4), the Ministry was able to exert greater pressure on NIAB through its control over funding. This had serious implications for the Institute's field trialling programme and the value of this activity for farmers (Chapter 2). Secondly, the Chapter explains how and why NIAB came to lose its position as the UK's official seed multiplication centre, a function that had inspired its creation (Chapter 1), had been nursed throughout the interwar period, and then developed rapidly and on an impressive scale during and subsequent to the Second World War (Chapter 4). Remarkably, considering the prestige attached to this activity and its lucrative nature, the loss of these multiplication functions were apparently welcomed by the Institute. Thirdly and relatedly, this Chapter witnesses the arrival of Plant Breeders' Rights (PBRs), a form of patent over plant varieties. It is argued that the schemes established at NIAB during the war, and expanded in the years that followed, acted as proof of principle for intellectual property rights in plants, despite persistent biological and social phenomena that posed problems to them (Chapter 3). The successful establishment of PBRs in the UK, was as much a bureaucratic and political accomplishment, as it was the result of any change in genetic understanding or plant breeding practice.

As a whole this thesis reconstructs the history of NIAB over a period of a little more than fifty years. Some important aspects of this history, and decisions made by NIAB, are worth flagging at the start. For instance, on no less than three separate occasions, people intimately involved with NIAB's work suggest the need for the Institute's closure or reformulation. NIAB is permanently 'at a cross-roads', a phrase which is used repeatedly within numerous committee meetings throughout this entire period. In addition NIAB is implicated in developments within the agricultural industry that have otherwise had an amorphous quality about them. How agriculture across the globe came to be so dependent on nitrogen based fertilizers is one such development,

which often is simply taken to have been a progressive and natural move, regardless of any negative repercussions that might have been identified subsequently. NIAB's decision to change the foundation of its trialling programme, so as to test varieties for maximal response to N, offers at least one concrete historical explanation for how British agriculture came to move in this direction. Most importantly however, we see how part of the agricultural academic-industrial-scientific network – the plant breeding industry – came to be transformed. Varieties enter the twentieth century much as they left the nineteenth. Through NIAB we see changes in the language used to refer to them, changes in the methods used to control them, and ultimately how they became intellectual property. At the turn of the twenty-first century, both a fuller appreciation of the multiple pressures under which agricultural science institutes operate, and a better understanding of the motivations behind decisions made in the past, are essential.

1. *Seed Multiplier*: The Wartime Founding of NIAB and the OSTs, 1914-1921

While this chapter introduces NIAB, and introduces it as primarily a seed multiplier – modelled after the famous Svalöf station in Sweden – this Chapter will also demonstrate that not all of the Institute’s early supporters agreed with this orientation. Indeed, many of those involved in NIAB’s founding did not truly understand what kind of organisation they were pledging their support to. Far from proving detrimental to the Institute’s success, this ambiguity was actually essential to it. NIAB’s primary architect, Lawrence Weaver, used the various and often conflicting interests of a number of groups in order to pool funding and resources, leading to the founding of the Institute in 1919 and the completion of its Cambridge headquarters in 1921. NIAB’s ultimately ambiguous purpose left open the range of possible institutional incarnations that did actually unfold, and which go on to provide the content of the thesis. In and of itself therefore, this story would only be of importance to those with a pre-existing interest in NIAB. Fortunately, the range of characters, and the overlapping contexts in which the following discussion takes place – First World War and post-war Britain, architecture, agriculture, and science in service to the state – make the founding of NIAB an important, and all too rare, case study in the history of twentieth century British science.

Section I: Science and the Great War

Entering the centenary of the First World War, historians of science have been slow to realise the research opportunities that such an important historical period provides. Chemistry continues to dominate the picture, thanks to its significance in munitions and its notoriety for introducing novel means of waging war; namely poison gas.¹ Roy MacLeod has been the historian most committed to uncovering the history of science in the First World War, and by some margin.² While his research has leant heavily towards the chemical and the martial, in key recent publications and his 2007 (as yet

¹ Ayerst et al. (1980), Haber (1986), Johnson (2002), Jones (1969), (1983), Patton (1998), Szöllösi-Janze (2000), Whittemore (1975). The most important recent collection of essays is MacLeod and Johnson (2006).

² MacLeod (1970), (1988a), (1988b), (1988c), (1989), (1993b), (1994a), (1994b), (1995a), (1995b), (1995c), (1998a), (1998b), (1999a), (1999b), (2003), (2014), MacLeod and Andrews (1970), (1971), MacLeod and E.K. MacLeod (1975), MacLeod and Johnson (2002), (2006a), (2006b).

unpublished) Leverhulme Lectures, MacLeod has stressed the need for an expansive and synthetic approach to the period, one not focussed so heavily on industrial munitions making. There remains a need for a “comprehensive and comparative picture of the ways in which the war took up and harnessed the full spectrum of the natural and social sciences – both in relation to the conduct of military operations, and in relation to the changing ethos and practices of knowledge production.”³ In truth, MacLeod has been emphasising the need for such a broader engagement with the Great War for some time, highlighting the importance of science for agriculture in the First World War very early on.⁴ Despite this, few historians of science, with the exception perhaps of historians of medicine, have risen to the challenge.⁵ Aside from chemistry and medicine, the only other topic that has inspired substantial historical research has been the realignment of scientists and science with the state, changes prompted by the necessity for a national mobilisation of resources. Again however, the overall picture remains a patchwork. The growth in government sponsorship of research, as evidenced by the formation of bodies such as the Department of Scientific and Industrial Research (DSIR), founded in 1916, and the Medical Research Council (MRC) – whose earlier incarnation had been established in 1913, and the MRC itself in 1919 – alongside more specialised bodies, such as the Board of Invention and Research, form a base upon which to build.⁶ Meanwhile, the significance of Turners’ ‘public scientists’, political agitators who sought to take much of the credit for these gains in patronage, have also been investigated.⁷ They and the political bodies they had formed, most notably the British Science Guild, found that the war provided new opportunities to make their case. Lastly, the importance of communications technology for the state and the War effort, and the importance of this intellectual property for its inventors, has begun to receive much needed critical attention.⁸

³ MacLeod (2009) p. 38.

⁴ MacLeod (1993) p. 478.

⁵ Roger Cooter’s entry in Bynum and Porter (eds.), (1993) has been particularly influential. See also Cooter et al. (1998), (1999), Harrison (1996) and Whitehead (1999). My thanks to Jessica Meyer and Claire Jones for discussing the topic with me.

⁶ On the DSIR see Alter (1987), Clarke (2010), Hull (1999), MacLeod, Roy and E.K. Andrews (1970), Varcoe (1970), Vernon (1994). On the Board of Invention and Research see MacLeod, Roy and E.K. Andrews, (1971). On the MRC, see Austoker (1989), Thomson (1973), (1975). My thanks to Andrew Black for discussing the origins of the MRC with me at the 2014 British Society for the History of Science Postgraduate conference, which could not have been better organised.

⁷ Turner (1980), Hull (1994), (2002).

⁸ Gooday (2013).

Agriculture currently holds both a marginal and intriguingly contradictory position within this historiographical picture. With respect to marginality, some decades ago Robert Olby uncovered that one of the most important developments in the history of state patronage of science in Britain – the formation of the Development Commission (DC) in 1909 – was aimed squarely at the agricultural sciences.⁹ In one or two places, the agricultural and horticultural science institutes which the DC established (many only after the war), have indeed gone on to be investigated.¹⁰ The present history of NIAB, itself a DC institution, constitutes one more. Yet the Commission, its significance, and the extent of its contribution to the agricultural sciences (and twentieth-century British science), has not been considered with anything like the rigour of its industrial and medical *successors*.¹¹ With respect to agriculture's contradictory historiographical status, on the one hand, it is often mentioned in the same breath as the chemical industry, which could “produce both civilian fertilizer and military explosives”.¹² Here the agricultural industry is placed in opposition to that of munitions, a move that alongside similar juxtapositions (such as the mirroring of battle fields with farming fields), has provided a poignant backdrop to wartime events that many authors have found irresistible.¹³ At the same time however, during and after the war, an equally large number of authors punctured this very distinction. Fertilizers can be understood as no more civilian, and perhaps no less militaristic, than shells and machine guns; the efforts of farmers on the home-front no less war making than soldiers on the front-line. This was precisely the kind of rhetoric relied upon by successive governments in the First and Second World Wars. It is a rhetoric that continues to benefit farming today, particularly in the public imagination, and which is echoed in that most recent academic-military-industrial conundrum ‘food security’. Neither view of agriculture – as ultimate symbol of peace, or warfare by other means –

⁹ Olby (1991). For an exception to the rule that the DC has been persistently marginalized, see Kraft (2004).

¹⁰ On the Rowett Research Institute, see Smith (1998). For a thorough investigation of the founding of the Plant Breeding Institute see Charnley (2011). On the Research Institute in Dairying, later the National Institute for Research in Dairying, see Vernon (1997).

¹¹ Keith Vernon has expanded analysis of DC policy; Vernon (1997). Meanwhile, Paul Brassley has emphasised the extent to which the foundation of the DC was less a grand political intervention and more a continuation of ongoing developments; Brassley (1995). The Commission, which underwent considerable transformations and name changes, was only broken up in 2000. More biographical detail can be found in Rogers (1999).

¹² MacLeod and Johnson (2006) p. 222.

¹³ Clare Griffiths' observation that in the Second World War, official war artists found it “difficult to distinguish scenes of farming at war from scenes of farming at peace” helped reach this broader historiographical point. Griffiths (2012) p. 215.

is right or wrong; both are shorthands that circumvent the messy and contingent business of historical analysis. The following chapter therefore keeps this rhetoric at bay, while demonstrating how, why and to what end(s) the National Institute of Agricultural Botany was founded. If by 1918 “Britain had become a gigantic military-academic-industrial complex, co-opting and managing much of the nation’s scientific workforce”, to what extent was this reflected in the agricultural sciences and agricultural science institutes?¹⁴

The chapter begins by giving a brief overview of British agriculture upon entering the First World War. The aim is merely to provide something of the context from which NIAB will eventually emerge. The picture is one of decreased arable output, heavy reliance on cheap food imports and *laissez-faire* domestic agricultural policy. As evidence of the extent to which the latter attitude prevailed, the section ends with a case study, focussing on unsuccessful pre-war efforts to establish a national seed testing station. These circumstances are then interrupted by the Great War. Two important cases of agricultural intervention inspired by the war are considered, the first in Section III, the second in Section IV. These two examples are particularly important not only because both initiatives exemplify a changed approach to agriculture, one which has been more readily identified after the Second World War, but also because both have persisted to this day (though in somewhat different forms), both depended upon agricultural scientists, and, most importantly, both led directly to the foundation of NIAB. Section III tips over the border of 1914 and continues the earlier story about seed testing, describing how and why the Official Seed Testing Station for England and Wales (OSTS) eventually came to be founded in 1917. The founding of the Station is not only important for histories of British agricultural policy, but also because the OSTS was essential to the formation of NIAB in ways that have not been appreciated until now. Primary responsibility for founding the OSTS lay with one Lawrence Weaver, who is introduced at the end of Section III as the single most important figure in the creation of NIAB. How and why Weaver, an architectural journalist and building trade ‘consultant’ (for want of a better word) – who had absolutely no background in agriculture or science – would nevertheless be motivated to found an agricultural science institute, is here introduced as a central question for the Chapter. The second important case of government intervention in agriculture is addressed in Section IV. The significance of this second case is that it is NIAB’s progenitor. The NIAB idea

¹⁴ MacLeod (2014) p. 451.

emerged from Weaver's wartime responsibilities in the Food Production Department (FPD) and his close contact there with key agricultural scientists, bureaucrats, and seed traders. He would come to draw upon these three communities in order to build support and funds for NIAB. As Weaver did so, each community diverged on the issue of NIAB's purpose. Section V is therefore dedicated to Weaver's campaign, which began towards the end of the Great War, and soon resulted in the foundation of NIAB in 1919. It is argued that Weaver's efforts to reconcile the often contradictory demands of agricultural scientists, seed traders and bureaucrats (dealt with in Section V parts (A), (B) and (C) respectively) resulted in the Institute's ultimately ambiguous status. The chapter concludes on this note of confusion, and with NIAB's royal opening in 1921.

Section II: Agriculture and seed testing upon entry to the Great War, 1900-1914

Towards the end of the 1870s, British agriculture entered a state of depression.¹⁵

It has been variously ascribed to a worldwide change in the general level of prices brought about mainly by changes in the supply of gold in relation to the monetary demand; to the adoption of the British Government in 1846 of free trade, whose ill-effects had been postponed for a generation, but not avoided; and to the culmination, in a vastly increased production, of all those technical changes in manufacture and transport called the industrial revolution.¹⁶

The result was a dramatic reduction in arable output (wheat fell from 50.7 million CWT in 1872 to 31.1 million CWT in 1913) with a concomitant rise in imports; a continued reduction in the size of the agricultural workforce; and a move towards dairying and fruit growing (both of which enjoy something of a natural protection against cheaper imports due to their susceptibility to fast spoilage).¹⁷ Provided food prices continued to remain small and stable thanks to access to abundant international supplies, government inaction was almost inevitable. "By 1905-9 the self-sufficiency ratio [i.e. percentage of UK food consumption produced at home] stood at little more than 40 percent, and deducting imported feeding stuffs and imports from Ireland, was barely 30 per cent."¹⁸ Access to cheaper food imports was considered essential to rapid industrial

¹⁵ Cooper (1989), Dewey (1989), Howkins (1991), (2003), Perren (1995), Tracy (1989), Whetham (1978), Wordie (2000). The two part *Agrarian History of England and Wales volume VII, 1850-1914* is comprehensive; Collins (2000).

¹⁶ Orwin and Whetham (1971).

¹⁷ Perren (1995) pp. 7-16.

¹⁸ Collins (2000) p. 40.

growth.¹⁹ There was however something more to this *laissez faire* attitude than merely apparent economic necessity. Even government initiatives that would not have amounted to protectionism (at least not directly) were held with suspicion. Nor was this situation, and the extent to which it made Britain vulnerable to blockade, (or for that matter, the potential damage that might be done to Germany through blockade) ignored prior to the Great War. On at least one interpretation, these potentials and vulnerabilities were a key cause for both the war and how it unfolded.²⁰ How an increased desire for government intervention in agricultural and non-agricultural industries eventually emerged (often with a greater dependence upon staff with considerable expertise), around the turn of the twentieth century, has been a subject of scholarly attention.²¹ In agriculture for instance, it was only the threat posed by Joseph Chamberlain and his alternative tariff-reform programme that, as Robert Olby has argued, finally prompted the Liberal Party to suggest solutions to the agricultural problem, solutions that appealed to the transformative power of science, and which were given substance by the creation of the DC in 1909.²² A good example of this change towards interventionist solutions, one which has until now escaped attention, is the long history of efforts to regulate seed quality. The eventual formation of a national regulator – to be discussed in Section III – is an interesting and clear point in this wider history of British public policy, while also being – as we shall see in Section’s IV and V – fundamentally important for the history of NIAB.

The seed trade and plant breeding in Britain was well established before the end of the nineteenth century, though the growth and extent of the industry has yet to be investigated. There is an important distinction between trade in seed ‘for sale as seed’ and that of seed as an immediate foodstuff. Seed traders therefore should not be confused with grain merchants.²³ Throughout this thesis the term ‘trader’ shall be used when referring to people engaged in the sale of seed for growing purposes, and ‘merchant’ for foodstuff (though quoted texts do not adhere to this distinction). This is

¹⁹ “The world competed to keep the larder of John Bull fully stocked with all the necessaries and luxuries of life.” Rew (1920) p. 27.

²⁰ Offer (1989).

²¹ See Woods (2013) for the most recent contribution to this historiography, which sets agriculture firmly at its centre. My thanks to the author for sharing a draft of this paper well in advance of publication. Some of the most influential sources include Gooday (2008), MacLeod (1988a), (1996), Pyenson and Sheets-Pyenson (1999). On increased government intervention in agriculture across Europe as a result of the war, see Zieman (2014).

²² Olby (1991) p. 512. For a helpful and thorough commentary on the tariff reform debate see Cain (1979).

²³ Remarkably little is still known about the history of these (mostly large and multinational) merchant corporations. For recent work see Jones (2002) and Montague (2000).

also a good point at which to clarify any confusion around the phrase ‘seed multiplier’ as used thus far. Obviously anyone growing an agricultural crop is multiplying seed; in most crops this is precisely the point. By focussing on *multiplication* however, the intention is to better clarify the intended future of this seed for planting and not for growing as foodstuff. While the terms ‘trader’ and ‘merchant’, and ‘multiplier’ or ‘grower’, help distinguish between the two functions, they tell us nothing of the individuals or companies involved, many of whom would engage in both activities at least to some extent. The most fundamental difference between the two is that merchants obviously represent a far larger proportion of the arable economy.²⁴ Nevertheless, judging by the number of individuals engaged in seed trading and the strength of their representative organizations, it was clearly itself a profitable business, with distinct expectations and business practices. Traders demanded a much better quality of seed than did merchants. Seed which is to be sown requires a high level of purity (freedom from foreign matter), decent health, freedom from disease and, of course, that the variety purchased be the actual variety one goes on to grow. Producing a seed crop is therefore far more labour intensive than a crop for consumption. One has to be more attentive when removing weeds, lest their seed be included in the harvest and subsequently promulgated. This in turn means good quality land has to be used in the first place. More attention also has to be paid to crop rotation in case the seed of a different variety enter the stock, and much more time given over to removing rogues. As an example of this distinction in action, consider one seedsman’s wartime complaint that “growers were imbued with the idea that the only patriotic thing to do was to grow foodstuffs. Farmers preferred to grow crops for food as they only took half the time and half the labour required for seed crops”.²⁵ Traders are therefore somewhat set apart from the arable industry at large. As with the rest of the agricultural industry at this time, regulation of the business was on voluntaristic terms.

Britain was host to several seed testing stations, many attached to universities, that could give guarantees as to purity and germination when asked. However they were small and none considered authoritative. Instead, those farmers or traders looking for an authoritative guarantee (i.e. one that might actually impinge upon the price asked for a stock of seed) had to turn to the continent. There several countries

²⁴ Looking purely at the differences in demand, an average acre could be expected to produce around 30 bushels of wheat while only 2-3 bushels per acre would be required for sowing. Turner et al. (2001) pp. 141-167.

²⁵ NA, MAF 36/223, Meeting of Seeds Advisory Committee 10/7/1917.

had established official national seed testing stations. Zurich, for instance, was a particularly popular destination for British seed samples looking to receive a recognised guarantee. In 1901 a committee of the Board of Agriculture and Fisheries was formed to look in to the seed trade in general and the desirability of a UK testing station in particular. The overwhelming majority of witnesses believed that such a station would be desirable if only to avoid the inconvenience of sending their seed samples abroad. All but two of the eight Committee members subsequently recommended that:

every encouragement should be given to seed merchants to give a guarantee with the seeds they sell, and that farmers should be advised to buy only subject to such guarantee, and to test the seeds they have purchased. In order to reduce to a minimum all difficulties in the way of such practice, they recommend the establishment of one central seed-testing station, under Government auspices²⁶

Why did nothing come of this recommendation? This question becomes all the more important when one considers that a directly analogous government institution, the National Physical Laboratory (NPL), had been founded earlier, in 1900, also with the aim of standardising and thereby improving the quality of inputs within its own related industries.²⁷ The history of that organisation might be thought to provide a clue for the case of seed testing, what with the extent to which private testers attempted to prevent the NPL's foundation. "At the centre of the storm was the Laboratory's right to undertake, in return for fees, work such as the analysis of steel samples, which could be carried out by private practitioners."²⁸ The complaint from private testing stations in this instance was that a national testing station took remunerative work out of their hands. However this does not appear to be the case within seed testing. There were no large private seed testing firms who dominated the market (at least, no clear signs of consistent trade protest on similar grounds) nor indeed does there appear to have been an analogously healthy market for seed testing services. For many farmers, especially during the depths of the agricultural depression, paying for an organisation to test and certify the quality of their seed before sowing was quite obviously a luxury. To some extent this accords well with Palladino's account of seed testing at this time. On his view, calls for the foundation of a seed testing station only became consistent enough to prompt government action following the improved economic conditions of the war. "Wartime governmental price supports encouraged farmers everywhere to produce

²⁶ Report of the Departmental committee appointed by the Board of Agriculture (1901) p. XIV.

²⁷ The official biography is Magnello (2000). On the NPL in the Great War see Hutchinson (1969).

²⁸ Moseley (1978) pp. 242-243.

more, and this led them to pay greater attention to the seed they purchased.” However, he also states that the majority of traders were actually against the formation of such a station, presumably (though this is not spelt out) because they did not wish to have a national arbiter interfere with their business practices. It was therefore only possible to foist a national seed testing station upon traders under the egis of war.²⁹ As will become clear, this interpretation does not sit easily with the account of the station’s origins to be given in Section III. Aside from the economic conditions that pertained in arable farming at the turn of the century, there are two other possible explanations for the failure to create a national seed testing station prior to the war.

Firstly, despite its recommendations, the committee of the Board of Agriculture and Fisheries had also agreed that the seed trade was not in a state of disrepair and that effort on the part of individual enterprise had already greatly improved the quality of seed stocks. Whatever case there might have been for government intervention was thereby robbed of any real sense of urgency. A second important factor was the status of the two committee members (mentioned above) who rejected the majority report, William Thisleton-Dyer and Leonard Sutton. Thisleton-Dyer is already well known to historians of science as the influential champion of laboratory techniques in botany whom, in 1885, was made Director of the Royal Botanic Gardens at Kew.³⁰ In his summary of the committee’s findings he refused to accept the need for a seed testing station on the grounds that such tests could not be considered reliable on scientific standards. “The analysis of a sample of manure appears to be regarded as analogous to the testing of a sample of seed. In point of fact it is not so. The former is exhaustive and complete, and probably fairly represents the bulk from which the sample is drawn.”³¹ So much for the science of seed testing. Leonard Sutton on the other hand, speaking as a partner in one of Britain’s most well established seed trading firms, offered his own objections. He believed that if the government truly desired an increase in the general health and value of available seeds, they should not induce farmers to only buy seeds of a certified quality. In doing so he believed farmers would rely entirely upon this guarantee and not make use of the seed testing station themselves. There would therefore be no mechanism to ensure that seed stocks actually planted were of any higher quality, while an artificial value would be attached to the products of those

²⁹ Palladino (2002) p.47.

³⁰ Brockway (1979), Drayton (2000).

³¹ Report of the Departmental committee appointed by the Board of Agriculture to enquire into the conditions under which agricultural seeds are at present sold, (London: Wyman and Sons Ltd., 1901) p. XV.

traders able to get a certificate. Moreover he argued that a principle had been established by the Botanist of the Royal Agricultural Society (another of these disparate locations to which a seed sample might be sent) that was in need of protecting; that “the reports he gives to seedsmen should be for their information only, and not to be used directly or indirectly for the sale of seeds over the bulks of which he [the Botanist] could have no control”.³² Again, the distance between official certification and the realities of actual seed planting was foremost in Sutton’s mind. Lastly, he urged that directly detrimental consequences could follow. “If Government undertakes this work it will kill voluntary effort on the part of the seedsman, and have the effect of levelling down the whole seed trade”. Seed purification was a process that conveyed a professional status on the trade and the trader. “No seedsman is too poor to buy a forty shillings test cabinet and no school board boy, who has mastered the three R’s, too ignorant to work it, under proper supervision, for trade purposes.”³³ With such a united front from two highly respected proponents of science and industry, little wonder a national seed testing station did not emerge prior to the war. How this situation eventually changed is the subject of the next section.

Section III: The Food Production Department, Lawrence Weaver and the founding of the OSTS, 1914-1917

Accounts of food production in the First World War have focussed upon a major shift in policy introduced by the coalition government of David Lloyd George in December 1916. Prior to this point in the war, the agricultural industry had been expected to increase output without direct state involvement, and in some crops it had, though not by the scale thought necessary.³⁴ The new government brought with it the ‘plough policy’, and in early 1917 the formation of the Food Production Department (FPD) to oversee it.³⁵ As we enter into a discussion of wartime government programmes for the expansion of agricultural production – with a focus on the FPD’s improvement of seed quality and growing of pedigree seed – it is worth explaining that such schemes carry limited weight in the historiography of First World War food supply. The general

³² For the official history of the RASE see Goddard (1988).

³³ Report of the Departmental committee appointed by the Board of Agriculture to enquire into the conditions under which agricultural seeds are at present sold, (London: Wyman and Sons Ltd., 1901) p. 192.

³⁴ See Hibbard (1919) p. 219 for the agricultural industries’ voluntary increase in production (in some crops) following the changed conditions of war. Wheat for instance rose from 1,905, 933 acres in 1914 to 2, 335, 091 in 1915.

³⁵ For the war’s effects on agrarian society see Dakers (1987), Horn (1984) and Zieman (2014).

consensus maintains that the rapid increase of arable land that occurred during the 1917-1918 food production campaigns, though impressive, were nowhere near the scale boasted at the time, nor as crucial.³⁶ Instead attention has turned towards the importance of government control of food imports and exports, international trade, and food control through mechanisms such as rationing.³⁷ However, the significance of the two primary FPD schemes discussed in this Section and Section IV, can be salvaged, as they are not themselves concerned with improving merely the quantity of nationally produced seed, but the quality (though subsequent effects on yield were obviously desired). That such work was attempted during a time when quantity of food supply was widely thought to be critical, can either be interpreted as lending further support to the above view (that imports were known to be secure enough to provide for immediate needs) or, on the other hand, taken as remarkable evidence of the importance placed upon the perpetuation and expansion of certain 'pedigree' varieties at this time. So too with seed quality and the decision to establish a national seed testing station during the war.

Early in 1914 the Board of Agriculture commissioned an investigation into nine of the largest seed testing stations in Europe. The extensive report that followed was published the same month as the nation went to war. Its most striking feature is the variety of permutations that existed across the continent with regard to the funding of these stations and the kind of work pursued. Budapest, for instance, was unusual for having relatively stringent legislation with regards to disease control and fraud. More typical was its seed testing station, occupied purely with this activity and independent from any other organisation (Figure 1.1). It was also typical in that the majority of seed samples for testing came from traders rather than farmers. Conversely the Munich station was unusual, as it was used far more by farmers and agricultural societies. In 1913 traders had commissioned only 1,620 tests, while farmers and agricultural societies had tested 3, 639.³⁸ Again, the work of this station was entirely restricted to

³⁶ Dewey argues that the food production campaign only returned agricultural output to levels comparable to the 1870s, and that far from the 24% increase in output over the War boasted by T.H. Middleton, the real figure is closer to 1.7%; Dewey (1989) p. 225. Barnett on the other hand concludes that food control (through rationing and the control of imports) was the real basis of Britain's survival. Of the often quoted 3 million acres increased over these campaigns, she argues only 750, 000 could actually support wheat crops. Barnett (1985) p. 205.

³⁷ Barnett (1985), Dewey (1989), Harris, (1982), Whetham (1978), Cooper (1989).

³⁸ Board of Agriculture and Fisheries (1914b) p. 54. The way in which, and the reasons why, certain national stations were more heavily used by either commercial traders or farmers, would make an interesting topic of research, especially considering Cooke's efforts to characterise seed

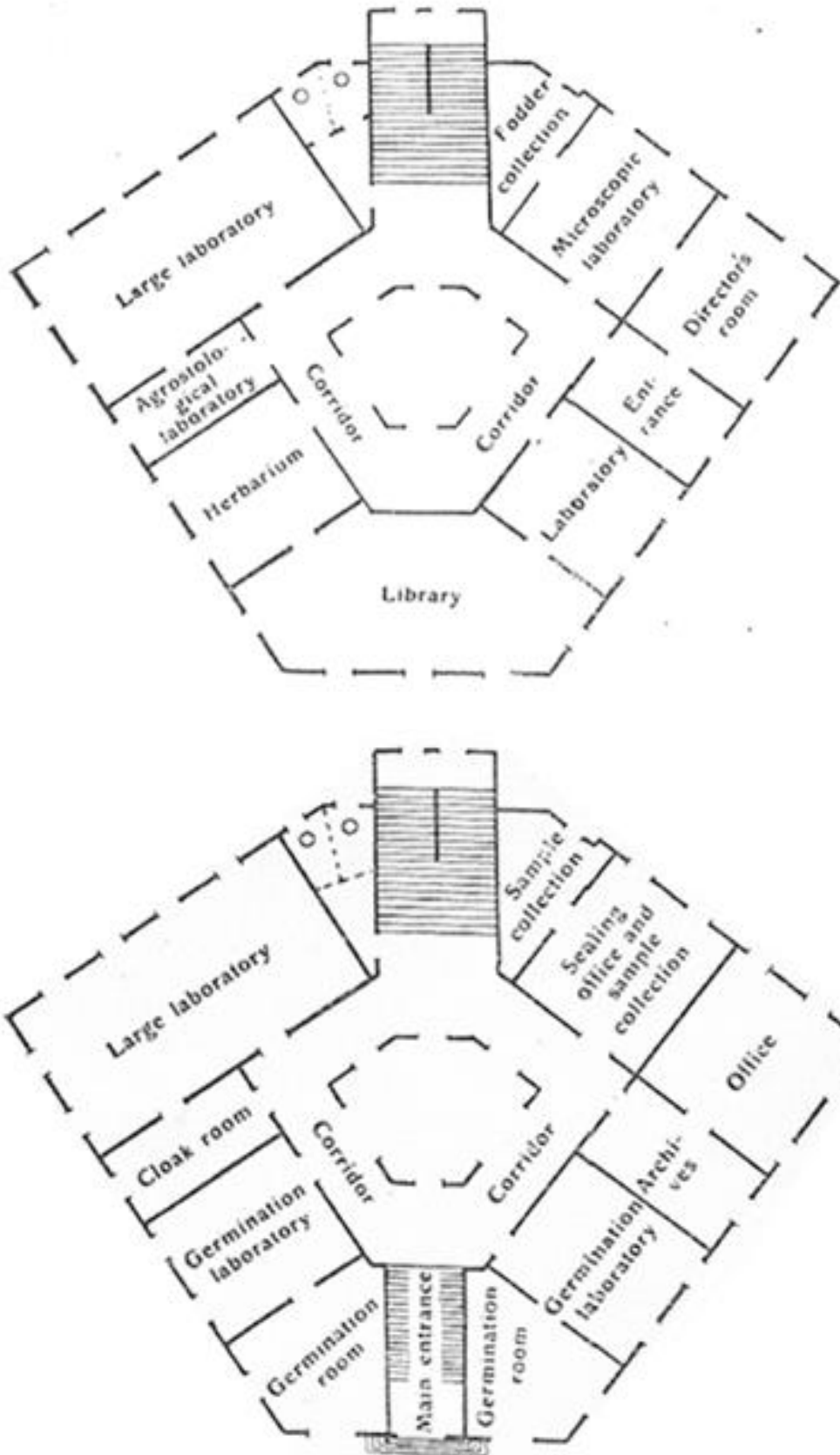


Figure 1.1: Plan of Royal Seed Control Station Budapest. Board of Agriculture and Fisheries (1914) Supplement, p. 41.

certification as, on the whole, expanding a farmers' status as a skilled operative. Cooke (2002). This argument cannot perhaps stand for all seed certification arrangements.

that of seed control. Vienna on the other hand had developed “a great Experiment Station” that appears to have investigated virtually every aspect of agricultural botany.

The objects at which this Station has zealously aimed have been not only the extension and perfection of scientific methods of investigation of the different seeds traded in, and the organisation of seed control proper, but also investigation and experimentation, begun soon after to (sic) inception of the Station, in the provinces of agricultural seeds, cultivation of fodder plants, and later of seed breeding, together with various field trials on the agricultural value of widely advertised trade seeds sent for analysis.

As with the vast majority of European countries, this station enforced its seed control without legislation, relying instead on the market value of the guarantees given.

Back in the UK trading firms had increasingly begun to see the importance of these guarantees, especially as much business was done across Europe. In 1909 and 1914 respectively, the Irish and Scottish Boards of Agriculture established national seed testing stations of their own (Figure 1.2). With the outbreak of the War it was argued that the quality of stocks of British seed had declined rapidly, resulting in fresh calls from English traders desiring a national station of their own, a campaign led to a large extent by a Mr A.G. Leighton of Staffordshire.³⁹ Accordingly one of the first actions of the newly formed FPD was to establish such a station and pass the ‘Testing of Seeds



Figure 1.2: Seed Testing Station for Department of Agriculture and Technical Instruction for Ireland. Board of Agriculture (1914a) p. 591.

³⁹ NA, MAF 33/22. Further information about Leighton has not been forthcoming.

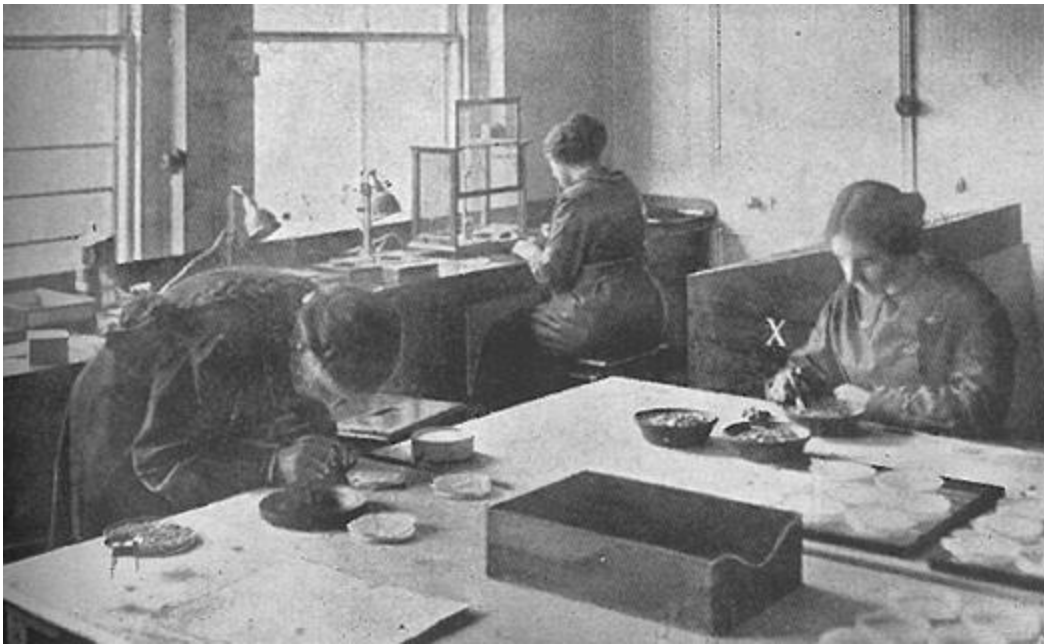


Figure 1.3: Above, the main laboratory of the FPD Seed Testing Station. Below 'Girls' picking out germinated seeds. Board of Agriculture (1917) p. 491.

Order 1917'. The Order required that all seed sales, excluding cereals, must be preceded by the testing of a sample of the seed stock by one of the three national testing stations. Cereals were initially excluded from compulsory certification, despite their occupying the largest section of the seed market, as a concession to the trade during negotiations. (Remember, compulsory legislation was still very rare across Europe at this time). Other considerations included that the initial budget of the seed

testing station amounted to a little over £1500, and that the inclusion of cereals would have made the workload unmanageable. As it was, the staff consisting of “two botanical assistants and a clerk, and eight messenger girls...specially trained to act as enumerators” found the volume of work in the first season overwhelming, temporary staff having to be called in at peak times.⁴⁰ The Seed Testing Station initially operated out of offices in the FPD (Figure 1.3), its first Director being George Stapledon (1882-1960) a rising star in agricultural science who would later establish the Welsh Plant Breeding Station.⁴¹ The purpose of the station and its female ‘enumerators’ was to establish the percentage of pure seed contained within the sample, the percentage of weed seeds present and, perhaps most importantly, the percentage of seeds capable of germination. This all involved a great deal of repetition and counting (the gender and status of Seed Testing Station employees cannot be discussed here, but will be addressed in a forthcoming publication).⁴² The 1917 Order then required that the results of all of these tests be given to any purchaser prior to the sale of seed. It also provided for more active regulation of the trade. Representatives of each national station were now permitted to enter any shop, warehouse or other premises where seed was offered for sale and take a sample (without payment and of the necessary representative size) to be tested according to the same standards. Seed found to be below standard could then not be legally sold. The speedy establishment of the Seed Testing Station, and swift negotiation of the 1917 Act with the trade, had been the responsibility of one key FPD employee in particular. It was not for nothing that Cambridge Professor of Agricultural Botany, Rowland Biffen, called this legislation “the Lawrence Weaver act for the extermination of the unjust seedsman”.⁴³

Lawrence Walter William Weaver (Figure 1.4) is one of the most interesting and overlooked figures in early twentieth-century Britain. His premature death at the age of 54 may have something to do with his current marginalization. Roman Catholic (Irvingite to be precise), architectural critic, close personal friend of Richard Stafford Cripps, Director of UK exhibits at the 1924 British Empire Exhibition, founder of the Ashted Potteries and, of course, NIAB, the character of Lawrence Weaver is one around which the themes of this chapter will coalesce. Weaver never attended university, having left school at the age of seventeen apparently with the intention of

⁴⁰ NA, MAF 33/22 ‘Memorandum on Seed Testing’.

⁴¹ Palladino (1990) p. 457, Moore-Colyer (1999), Russell (1961), Waller (1962).

⁴² Berry, forthcoming, ‘Testing British Seed: The Great War origins of the Official Seed Testing Station for England and Wales’.

⁴³ NIAB, C-5.10, ‘Donations and Subscriptions Folder’ Biffen to Weaver 3/12/1917.



Figure 1.4: Sir Lawrence Weaver (1876-1930), portrait by Walter Stoneman 1920. National Portrait Gallery.

becoming a dentist. Eventually however, he went in to the architectural industry, helping to sell building materials, while pursuing an interest in the subject of architecture and garden design that eventually led him to publish on the same. In 1910 he was given the position of architectural editor for the magazine *Country Life*.⁴⁴ At the

⁴⁴ Williams-Ellis (1933) p. 23. Weaver's biographer and successor as President of the DIA, Clough Williams-Ellis, was a major figure amongst those interwar campaigners who sought to protect – as they saw it – the English countryside. His 1928 *England and the Octopus* was particularly influential. Jeans (1990). Weaver's *English Leadwork: Its Art and History*, first published in 1909, was republished with a new introduction on Weaver by Andrew Naylor in 2002. Weaver (2002).

outbreak of the War he enlisted in the Royal Naval Volunteer Reserves. This did not prevent him from staying in the UK and attending the first general meeting of the Design Industries Association (DIA) in London in January 1916. This organisation, which was devoted to improving British manufacturing and design, has attracted remarkably little attention.⁴⁵ The DIA was opposed to the protection of British industry through the imposition of tariffs, particularly on rival German products, on the grounds that “you cannot tariff out brains”. The Association is of crucial importance for understanding Weaver’s views and the eventual establishment of NIAB, the idea for which will be discussed in Section IV.⁴⁶ Importantly the DIA did not consider itself to be responding to an immediate wartime problem, but rather one of long term and lasting public policy. The Association fed on “public recognition of the need for leaving no stone unturned to strengthen British Industry in the commercial struggle”. The war merely happened to have “given a greater impetus to the movement than it would otherwise have had.”⁴⁷ By now relatively well known to his audience thanks to his journalistic efforts, Weaver – who would eventually become President of the DIA – moved to speak at this inaugural meeting, urging that “The Association ought to secure the co-operation of the Trades Union Leaders.” The desire to collaborate with such easily identifiable and powerful representative organisations is a signature of Weaver’s approach, as we shall see in his efforts to found NIAB. The DIA contains another important precedent for Weaver in this respect. A pamphlet describing its aims explained that

This association aims at the development of British Industries through the cooperation of the Manufacturer, the Designer, and the Distributor...Sound design is not only an essential to technical excellence, but furthermore it tends towards economy of production: the finest necessity of sound design is FITNESS FOR USE. Modern industrial methods, and the great possibilities inherent in the machine, demand the best artistic no less than the best mechanical and scientific abilities.⁴⁸

Those who have been too quick to dismiss the DIA (and thus Weaver) as in thrall to the ‘arts and crafts’ movement, with the latter’s avowed opposition to mechanical

⁴⁵ See Woodham (1996) for an overview of such organisations, though focusing on the mid-to-late twentieth century.

⁴⁶ RIBA, PEH1/1, Memorial presented to Hubert Llewellyn Smith at the Board of Trade in January 1915. Full quote reads “A National movement is better than legislation for developing a nation’s industry, and keeping out German goods by making better English ones, better than reprisal tariffs and similar foolishness...you cannot tariff out brains.”

⁴⁷ RIBA, PEH 2/2, First General Meeting Jan 27th 1916.

⁴⁸ RIBA, Design Industries Association Pamphlets Etc. 1915-1920, ‘Design & Industries Association’ Nov 1915.

manufacture and standardization over crafted goods, should take note of the actual position of the DIA, which was to work *with* the latest developments in machine manufacture, but to ensure design and the skills of individuals were not forgotten. Another pamphlet, written not long after the first general meeting, and around the same time that Weaver would make his debut in the world of agriculture, highlighted the DIA's perspective on the issue of quantity and quality (which on a charitable reading might be considered analogous to the food production discussion that began this Section).

There are plenty of folk advocating increased production while our propaganda concerns itself with a general raising of the standard of quality in manufactured goods. During the last few months the attitude of business men towards the scientist has changed from one of neglect or mistrust to one of profound respect. It is our endeavour to create a similar respect for the competent designer in the minds of manufacturers, trade-buyers, and an ever growing number of members of the general public.⁴⁹

Arguably much of the DIA's perspective on art and science in non-agricultural industries, which inspired Weaver's loyalty to their cause, would subsequently be taken with him when in early 1917 a place was found for him in the new FPD.⁵⁰ Weaver worked directly for the Controller of Food Supplies, Sir Arthur Lee, and was almost immediately tasked with founding the first national Seed Testing Station for England and Wales, in which the issue of quality was paramount. From these unlikely beginnings – the throwing of an architectural tradesman, author, and critic into the nation's wartime food production programme – NIAB would emerge.

Section IV: The Cereal Seeds Advisory Committee and the inspiration for NIAB, 1917-1918

Weaver was not blind to the oddity of his new situation. To friends he jested "it was now generally conceded in agricultural circles that "Lawrence Windbag-Weaver" is the Prince and Panjandrum of artificial manures."⁵¹ Nevertheless, his duties in the FPD became extensive, ranging from fertilizers to farm labour, and of course supplies of all seeds. Aside from the formation of the Seed Testing Station, one of Weaver's earliest

⁴⁹ RIBA, DIA/32-50, 'The war and the DIA' in *The Journal of the Design Industries Association, July 1916-Summer 1919*, March 1917.

⁵⁰ The patronage of George (later Lord) Riddell, owner of the *News of the World and Country Life*, was decisive in this respect. On Riddell see Morris (2004).

⁵¹ Williams-Ellis (1933) p. 47.

responsibilities was as Chairman of the Cereal Seeds Advisory Committee (CSAC), convened in May 1917. Its purpose was to ensure that the UK grew, retained or imported enough seed for sowing in each rotation.⁵² Through CSAC Weaver met for the first time each of the three key figures with whom he would negotiate and collaborate in order to build NIAB. Section V parts (A), (B) and (C) focus in turn on Rowland Biffen (representative for agricultural science), George Peddie Miln (President of the

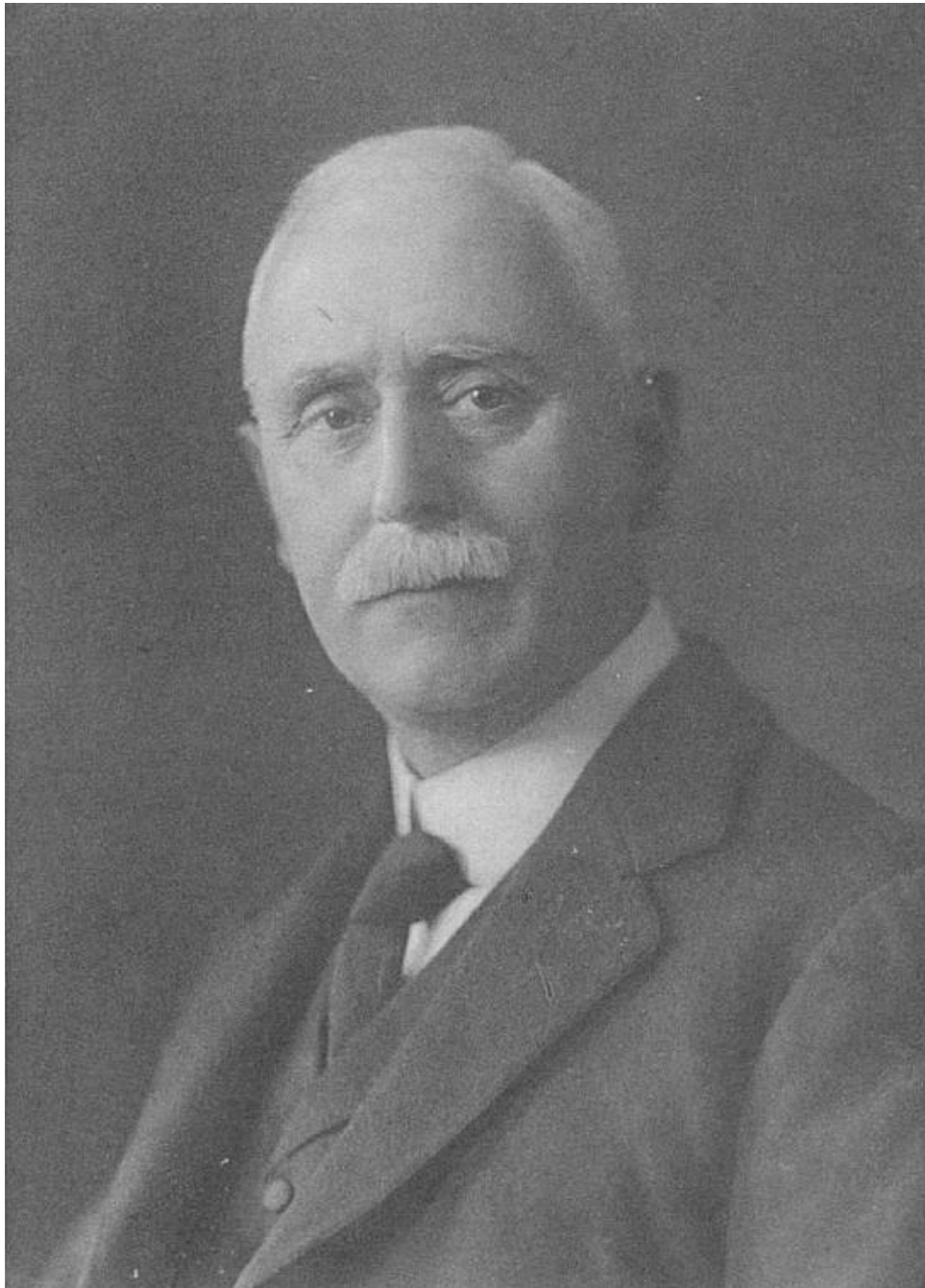


Figure 1.5: Thomas Hudson Middleton (1863-1943). Portrait published in Russell (1944).

⁵² NA, MAF 36/223, Meeting of Seed-Corn Committee (later Cereal Seeds Advisory Committee) 25/5/1917.

Agricultural Seed Trade Association, ASTA), and Thomas Hudson Middleton (agriculturalist and bureaucrat par-excellence). In order to preserve the narrative, these three members of CSAC will be introduced here, alongside one or two other key Committee figures. This Section will then go on to explain what CSAC did, thereby explaining how Weaver struck upon the NIAB idea.

By far the most significant member of CSAC was Thomas Hudson Middleton (Figure 1.5), who had actually been made provisional Director of the entire FPD upon its opening. Despite completing a B.Sc. in engineering in Glasgow in 1883 and a B.Sc. in agriculture at Edinburgh in 1889, lecturing at the Indian Agricultural College of Baroda before accepting the position of lecturer at the University College of Wales, eventually becoming Professor of Agriculture at the University of Newcastle in 1899, and Drapers Professor of Agriculture at Cambridge in 1902 (only leaving to become Assistant Secretary to the Board of Agriculture in 1902), Middleton has nevertheless been a victim of E.J. Russell's swinging definition of 'science'; "though not himself a scientist [he] had sound scientific instincts".⁵³ Middleton had become particularly important by this time, as he had been instrumental in getting both the plough policy adopted and therefore the FPD founded. During the earlier Asquith coalition, when Lord Selborne (President of the Board of Agriculture) had attempted to provoke the government into intervening in food production, Middleton had written several influential articles and pamphlets supporting such policies. In one he compared the potential output of human food in three systems of farming; raising meat on grass, milk on grass and finally meat alongside arable farming.

The differences are very striking. A well-managed arable farm is shown to be capable of supplying about twenty-seven times as much human food as is now produced by our poorest enclosed pastures, five times as much as pastures of moderate quality, twice as much as rich pastures and about one-half more than well-managed grass dairy land⁵⁴

Emphasising Middleton's scientific and bureaucratic credentials at this point is important, considering the intervention he will make in Section V (C).

Leading the trade delegation on the Committee was George P. Miln (Figure 1.6), owner of one of the UK's largest plant breeding firms – Garton's of Warrington – and, as already explained, President of the ASTA. Representing that heterogeneous

⁵³ Russell (1966) p. 202. More biographical detail on Middleton can be found in his Royal Society Fellows obituary, again written by Russell; Russell (1944).

⁵⁴ Middleton (1915) p. 532.



**Figure 1.6: George Peddie Miln (1861-1928).
Portrait held by Mr Barnaby Miln, Edinburgh.**

community of private plant breeders and seed traders, this Association, and Miln himself, eventually constitute one of the single largest groups involved in the formation of NIAB, Miln becoming one of two ASTA members on NIAB's first Council. How Weaver gains their support shall be explained in Section V (B). Important as Miln was, he was only one amongst a very large number of trade representatives on the Committee, many of whom also play a part in NIAB's foundation. These included J.E.N. Sherwood, a Director of Hurst & Sons seed traders and merchants, (another of the country's largest firms) and an active member of the ASTA, who would become the second ASTA member alongside Miln on NIAB's Council; Mr A. E. K. Wherry, a seed merchant who represented the National British and Irish Corn Trade Association, and who would later help build NIAB's trust fund; William Hasler who represented not only his family's long running and wealthy seed firm but was also President of the British Seed Corn Association, and who would eventually become a founding member of NIAB's council;

and lastly Arthur Sutton, brother to Leonard whom we saw earlier in 1900 testifying to the lack of need for a national seed testing station. As we shall see, during the Great War Arthur helps Weaver overturn the opinion of his brother and those (seemingly few) like him that remained in the trade.

The final significant Committee member to be introduced is Professor Rowland Biffen of the Cambridge Plant Breeding Institute (Figure 1.7), who acted as the Board of

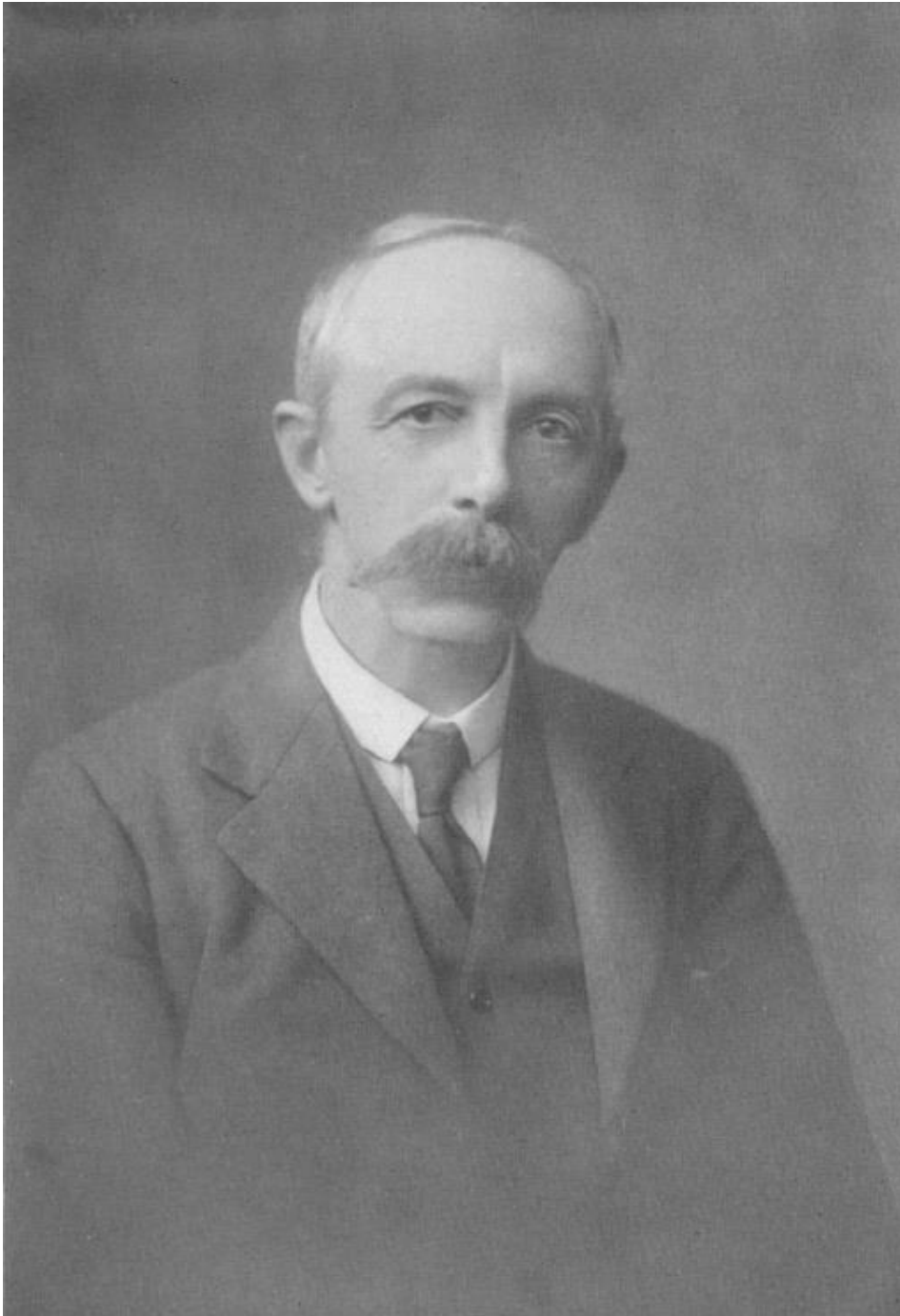


Figure 1.7: Sir Rowland Biffen (1874-1949). Portrait published in Brooks (1950).

Agriculture's scientific advisor on the Committee.⁵⁵ Biffen was by this time a world famous plant breeder, known for his successes with Little Joss, and for recently having released a second wheat variety, Yeomen, which also came to receive much acclaim.⁵⁶ The significance of Biffen and his Cambridge agricultural science colleagues had been emphasised anew thanks to the war.⁵⁷ Biffen's success was crucial for Weaver, not only in providing inspiration for NIAB, but also as a resource when attempting to negotiate NIAB's funding from the DC, as will be shown in Section V (A). Biffen also provided a direct link to a community of plant breeders and traders who had been involved with schemes to increase the acreage under purportedly superior varieties (including his own) long before the state became a reliable patron. Private organisations such as the Home Grown Wheat Committee (HGWC) of the National Association of British and Irish Millers, established in 1901, supported the efforts of breeders (Biffen included) with the aim of improving British plants to the extent that they could be purchased in preference to cheaper foreign imports. For instance, the lack of 'strength' in British wheat, an important characteristic in baking, has become a well-known aspect of plant breeding research sponsored by the HGWC at this time.⁵⁸ Following his collaboration with the HGWC, Biffen was instrumental in the creation of the British Seed Corn Association, alongside the equally well known plant breeders Edwin Sloper Beaven and John Percival (both of whom play significant roles in Chapters 2 and 3 of this thesis). Though somewhat interrupted by the war, the Association remained active throughout this period and sought "to organize a national co-operative to manage the trade in improved crop varieties".⁵⁹

Through meetings of CSAC, and other committees like it, Weaver developed a sense for the problems facing agriculture. In working to overcome them during the war, he would hit upon the NIAB solution. Indeed, the connection could not be more direct, as to ensure a sufficient supply of seed, CSAC was instructed to become something akin to a national seed trader, which – at least on some views – is what NIAB was for. The

⁵⁵ Biffen was part of a much larger reorganisation of the nation's academic talent. See Irish (2012) for an account that focusses in a large part on the University of Cambridge during the Great War, arguing that the University, and its allied counterparts around the world, became deeply invested in the war very early on. Following conscription in 1916 "Hitherto, academics could continue their studies and not volunteer for active duty if they did not wish. Now, one had to be engaged in work of national importance to avoid active service. This led to a new drive to get academics with relevant skills to utilise them as best they could, be they of military age or not." Irish (2012) p. 101. Biffen was 40 in 1914.

⁵⁶ Charnley (2011).

⁵⁷ Glazebrook (1917) p. 11.

⁵⁸ Charnley (2011) pp. 181-186, Palladino (1993) p. 312.

⁵⁹ Palladino (1994) p. 422.

Committee had been set to this task before Weaver had actually become Chair, and had instead originated with Middleton. This not entirely successful enterprise merits attention here for three reasons; firstly, because it was where Weaver got the idea for NIAB; secondly, because the complexities that led to its failure would be replicated on a larger scale by NIAB itself (see Chapter 2); thirdly, because it allows us to see agricultural scientists actively pursuing wartime food production work in ways that have until now been ignored. The extent to which these scientists might be thought to have acted opportunistically is one also worth bearing in mind as the work of this Committee is uncovered.

CSAC began its '1917 purchasing scheme' (as I shall call it) by enquiring after the availability of certain pedigree varieties "of which total quantities were likely to be small and which would otherwise be milled".⁶⁰ A notice was placed in the press and offers of acres covering each of the desired varieties trickled in. By July the acreage offered amounted to:

Wilhelmina:	1853
Victor:	5966
Little Joss:	7808
Browick:	1955
Total:	17, 582

Each of the varieties requested had been initially bred by well-known and respected plant breeders. Little Joss had of course been produced by Biffen, while Wilhelmina had been bred at Wageningen by L. Broekema around 1900.⁶¹ Browick had been bred by R. Banham of Norfolk in the late nineteenth century and was one of the parent plants of Biffen's most recent wheat, Yeomen.⁶² Victor on the other hand had been produced by Miln's firm Gartons. Having identified the available acreages for the above varieties, a selection team (headed by Biffen) visited the farms growing them and decided whether or not the supplies were worth purchasing. Crops deemed to have been bred to a high enough standard would be transported by the farmer to the nearest dealer who would act as an agent for the Department at a fixed rate of commission. From there the seed would be checked, cleaned and prepared for sale as in any other trading establishment. Biffen and his selection party inspected somewhere in the region of 20, 000 acres over a three week period in the summer of 1917. Such was one Cambridge scientists' war.

⁶⁰ NA, MAF 36/224 Cereal Seeds Advisory Committee, 14/5/1917.

⁶¹ For more on Wilhelmina see Maat (2001) p. 122.

⁶² Engeldow (1950) p. 17.

The problem remained that seed was needed for the immediate autumn sowing season. It was decided to invite farmers to clean potentially suitable crops and pay them three shillings a quarter over the going rate.⁶³ This compensation was thought necessary as the previous season had been poor growing, thus any seed deemed good enough quality for sowing would also fetch a high price at the mills. Once again traders would act as agents on behalf of the Department. The 1917 purchasing scheme began as planned, while also throwing up the kinds of problems faced by any active member of the industry. Mr A. W. Dean, a farmer and seed grower on CSAC, suggested that if the Department was to sell seed to farmers it was only right that it be put to a germination test. It was agreed that these tests should be carried out, especially with the 1917 Act under negotiation, though a non-warranty clause should also be included with every sale. This was common practice for seed firms and there was no suggestion that a national trader should behave otherwise.⁶⁴ As the national Seed Testing Station would not open until November, Biffen agreed that the seed testing facilities at Cambridge could be used for the stocks traded under the 1917 purchasing scheme. It was around this time, while the 1917 purchasing scheme appeared to be going so well, that Weaver first conceived of NIAB. Addressing the committee in August he thanked them for their efforts, believing “their work would mark the commencement of a new era in the purchase of pure stocks of grain.”⁶⁵ As confident as Weaver may have been at this time, the scheme did not live up to expectations. However, this failure had little effect upon his belief in the need for NIAB.

Seed of the 1916 crop that had been swiftly bought for autumn sowing was, by November 1917, having to be offered up for sale for milling purposes. Seed traders had been able to deliver on their promise that the usual channels could supply farmers with enough seed. The principle of national seed multiplication and trading had not yet been proven. Nor was the situation much better for the 1917 harvest, despite the fact that CSAC had had enough time to organise the system from start to finish; selecting farmers, inspecting crops, even purchasing their preferred seed sacks. Again, these stocks were not taken up as readily as had been hoped. In the same month that the 1916 crop was being sold to the mills, the Committee was relying upon a potential sale of 12, 000 quarters to France in order to avoid the 1917 crop suffering the same fate.⁶⁶

⁶³ A quarter equates to eight bushels or one quarter tonne.

⁶⁴ NA, MAF 36/224, Cereal Seeds Advisory Committee 15/6/1917.

⁶⁵ NA, MAF 36/224, Cereal Seeds Advisory Committee 13/8/17.

⁶⁶ NA, MAF 36/224, Cereal Seeds Advisory Committee 2/11/17.

All the while the trade members of CSAC had urged upon Weaver that there was really no need for government interference; normal channels could handle any demand. Perhaps leaving the sale of this seed in the hands of the very traders who doubted the need for such a state-sponsored initiative was somewhat naïve. (The need for competent and competitive management of seed sales is a theme that will recur in Chapters 2 and 5). When the potential for this scheme arose again in 1918, Weaver had clearly lost the initiative, reporting that the President of the Board of Agriculture recommended “a free market for cereal seed in the coming season”.⁶⁷ Despite this, Weaver remained wedded to the need to establish an institute to perpetuate this work. The NIAB idea had been salvaged by a problem that had come to light during CSAC’s 1917 activities, one which now attracted attention away from the scheme’s unsatisfactory performance.

When the selection committee had gone out to inspect the crops, it was found that roughly 1/3rd of the acreage under offer had to be rejected as, according to Biffen’s standards, it was of unsatisfactory quality.⁶⁸ It was this perceived problem, a Boer War moment for British agriculture, that gave new definition to NIAB’s purpose regardless of the 1917 purchasing scheme failure. This was at the very least William Bateson’s understanding.

It is unlikely that, except under strong pecuniary inducements, anyone will take the special care which such work [the multiplication of plant varieties] demands, when he feels that the chief credit for success will go to someone else. In work of this kind we are in the hands of the grower, and a bad result can always be ascribed to the inherent peculiarity of the material. Perhaps the Cambridge Svalof Station may supply this want.⁶⁹

The reference to Svalöf will be explained shortly. Here it is important to emphasise that in Bateson’s view, and that of Weavers, unless credit for the qualities a variety possess also went to the grower invested in multiplying that variety, the situation uncovered by Biffen would persist. (This has interesting implications for mid-twentieth century understandings of varietal identity and the prestige of the plant breeder, explored in Chapter 3). To briefly return to the ideology that motivated the Design Industries Association, it is interesting to note that in the same pamphlet describing the DIA’s aims, quoted from above, the authors go on to write that “In order to attract the best brains it is advisable to associate the name of the Designer with the article produced,

⁶⁷ NA, MAF 36/224, Cereal Seeds Advisory Committee 24/5/18.

⁶⁸ NA, MAF 36/224, Cereal Seeds Advisory Committee 2/11/17.

⁶⁹ JIC, Bateson Letters Collection #2148, Bateson to Daniel Hall, February 1918.

and this should be recognised as a commercial asset to both Manufacturer and Distributor.”⁷⁰ The argument is not that Weaver directly picked up and applied such a notion, rather that his schemes – in agriculture and design – seem to display similar patterns of thought.

In making the problem of quality NIAB’s core concern, the failure of the 1917 national seed trading scheme could be forgotten. Indeed, even after the decision had been made to leave the 1918 crop to the free market, the problem of quality was nevertheless used to legitimise a continuation of that very same scheme (and in turn the NIAB idea). Weaver went ahead with seed purchasing plans on a similar basis to those already described, though this time under the auspices of concern for seed quality. He was forced to explain this ‘Selected Stocks Seed Wheat 1918’ scheme, as he called it, to CSAC’s anxious trade members, who had heard talk of such a proposal.

The scheme was brought forward with the object of securing high quality (and not Quantity) in certain varieties of wheat, and he thought the Committee would agree as to the desirability of pure stocks of seed wheat being available for anyone who required them. It was not proposed with the same intention as the 1917 Little Joss etc. scheme, which was largely concerned with securing adequate supplies.⁷¹

Most important is that during this meeting Weaver never mentioned his plans to create an entirely new national institution expressly for this purpose, despite the fact that this meeting took place only days before NIAB’s unveiling. Throughout 1918 Weaver had been carefully and gradually building support for NIAB, waiting for the most opportune moment to launch the Institute. He had concentrated on the three elements most crucial to the Institute’s success; Rowland Biffen (and his plant varieties), the seed trade (and their control of the distribution network) and the Development Commission (and its money).

Section V: Gathering support for NIAB (and the ambiguity of its purpose), 1918-1919

(A): Rowland Biffen – Curbing the ambitions of agricultural science

The earliest evidence of Weaver discussing NIAB arises in a private letter from Biffen dated the 3rd of December 1917.⁷² Weaver had clearly asked Biffen to consider how a

⁷⁰ RIBA, Design Industries Association Pamphlets Etc. 1915-1920, ‘Design & Industries Association’ Nov 1915.

⁷¹ NA, MAF 36/224, Cereal Seeds Advisory Committee 9/7/18.

⁷² NIAB, C-5.10, ‘Donations and Subscriptions Folder’ Biffen to Weaver 3/12/1917.

new institute might extend the work of the PBI, what position it might take with regards to science and industry and along what lines it might be organised. Evidently they had also discussed Svalöf (Figure 1.8), the Swedish Plant Breeding institute (established in 1886), as Biffen references it as a point of mutual inspiration.⁷³ From NIAB's perspective the most interesting feature of this Swedish institute was the way in which it went about marketing and selling its varieties. In 1891 a separate company was formed to complement the breeding work of the Institute and take over the multiplication and sale of its most successful plants.⁷⁴ This arrangement had proved successful enough that some of the profits could go towards funding the research side of the organization while the rest went to the shareholders. It was this institutional division of labour that Weaver coveted. More to the point, it was Svalöf's reputation as a prosperous scientific plant breeding establishment that Weaver sought to replicate, and in which he saw solutions to the problems of the British arable industry. Biffen began by explaining that if they were going to extend the PBI on Svalöf lines the new Institute would need to be made permanent, "that means an endowment fund rather than bricks + mortar."⁷⁵ It is likely that Biffen had in mind the position of Rothamsted research station and its large endowment fund.⁷⁶ Biffen was also fairly pragmatic when



Figure 1.8: Svalöf Headquarters in 1919. Akerman et al. (1948) p. 25.

⁷³ The work of this institute and the breeding methods adopted there have been most recently explored by Staffan Müller-Wille; Müller-Wille (2005).

⁷⁴ For details see the Station's official history. Akerman et al. (eds.) (1948).

⁷⁵ NIAB, C-5.10, 'Donations and Subscriptions Folder' Biffen to Weaver 3/12/1917.

⁷⁶ Rothamsted has been the subject of a recent historical study. Parolini (2013).

it came to the realities of fund raising.

If you can, persuade Mr “Unknown” that it is the research side which matters most...But if the commercial side appeals to him more, then, I should try to fall in with his views in the hopes of making sufficient profits to get an endowment fund together in time.

‘Mr Unknown’ was Robert McAlpine, the owner of a large Scottish civil engineering firm whom Weaver had worked for prior to the war, helping to establish their London offices. Weaver wished to keep him fairly close to his chest at this point in case support for the project was not forthcoming. Biffen then went on to describe the work of the PBI and the success of certain varieties created through his scientific breeding method. Here he dropped his usual bashful tone and unblinkingly stated “as far as these three crops [wheat, barley, oats] are concerned the subject of breeding has been systematised + now it is mainly a matter of routine work to go on turning out improved cereals”.⁷⁷ Confident in his ability to produce valuable varieties on a regular basis, the multiplication and commercial capacities of NIAB were its most attractive features in the agricultural science community. Biffen complained that he was not in a position to take advantage of these novel varieties because he could not grow them on to sufficient scale. “The result is that the first purchasers can often make bigger profits out of our new varieties than we can ourselves. The redoubtable Little Joss, of which you’ve heard more than enough lately brought us in £800.”⁷⁸ The proposed scheme was to produce a fully functioning Svalöf in the UK. Biffen wasn’t even decided as to whether or not two institutions would be necessary or if a commercial side could be created at the PBI.

I’ve never been able to decide which would be the better plan. For several reasons it seems advisable to retain the whole work in our own hands. On the other hand the research work is so pressing, particularly at the times when the seed distribution is at its height, that I think that anyone in charge of the Plant Breeding Institute would like to be free from the business side of the scheme.

Nowhere in Biffen’s outline did he consider how this may affect the seed trade, other than returning to the PBI profit it was rightly owed.⁷⁹ Here Weaver’s vision crucially

⁷⁷ NIAB, C-5.10, ‘Donations and Subscriptions Folder’ Biffen to Weaver 3/12/1917.

⁷⁸ NIAB, C-5.10, ‘Donations and Subscriptions Folder’ Biffen to Weaver 3/12/1917.

⁷⁹ Palladino, who did not have access to the archive materials upon which the present argument is made, seems to have believed that to some extent seed traders conceived of and created NIAB, forcing the institute upon Biffen. “Rowland Biffen, the first director of the Plant Breeding Institute, objected to the organisation of the institute [NIAB].” Biffen was in actual fact amongst its primary architects and worked exceptionally closely with Weaver throughout this period. The

diverged from Biffen's. They also diverged in another important respect. Biffen believed such a commercial venture should only require somewhere in the region of £3000 to begin with. This would be enough to purchase the land, granary, seed cleaning equipment and farming machinery necessary for a national seller of high quality and pure seed stock. Weaver had much grander designs.

He spent January 1918 working on a memorandum that expanded upon Biffen's work at the PBI, the success at Svalöf, and how this might be most fruitfully adapted to the UK. In February he approached McAlpine with this document and his hopes set on a sum much higher than £3000. "I shot my bolt at my £30, 000 friend today and missed, but I picked up £10, 000 and £1, 000 a year for five years out of the wreckage, so now I am going to hunt other unfortunate folk for the balance."⁸⁰ This generosity was not only a measure of Weaver's skill in manipulating money from others, but was also a valuable investment for McAlpine who at that time was in the market for a Baronetcy. One biographer points the arrow in the other direction, saying that on receiving the title McAlpine "celebrated the honour by donating £15, 000 to help set up the Institute of Agricultural Botany at Cambridge."⁸¹ As he did not receive the Baronetcy until June it is safer to conclude that the latter resulted in the former. The memorandum that Weaver presented McAlpine gives a clear description of Weaver's vision for the Institute and his departure from Biffen. He begins by making a parallel with Rothamsted, that the new institute would "bring scientific botany to bear on the improvement of the plant in the same way that Rothamsted has revolutionised the treatment of the soil by chemistry."⁸² He then went on to carefully explain the extent to which he thought the Svalöf model was applicable to the UK. At every point that the subject of trade competition arose Weaver gave every assurance possible that this would not be the aim of the new institute. Their hold over the supply network made them more valuable as a delivery system for Biffen's varieties, rather than a competitor with NIAB. Paragraph headings included 'Importance of not Antagonising the Seed Trade' and 'Care not to compete with Seed Trade'. Weaver explained that NIAB's involvement with a new variety:

second-hand account that lead Palladino in this direction was written some years later. Whether or not Biffen's attitude towards NIAB changed over time would make an interesting research question, particularly considering the disappointing performance of Yeoman II discussed in Chapter 2. Palladino (1990) p. 452.

⁸⁰ NIAB, C-5.10, 'Donations and Subscriptions Folder' Weaver to Biffen 13/2/1918.

⁸¹ Russell (2004).

⁸² NA, MAF 33/22 'Memorandum on the Establishment of a National Institute of Agricultural Botany' January 1918.

would cease as soon as it had been grown to a point which established it as a variety of proved value, and ensured its wide distribution. Thereafter the Institute would do no more than certify the purity of stocks in the hands of farmers and seedsmen if asked to do so, and would proceed with the next urgent problem.⁸³

Weaver clearly wished to avoid offending the seed trade, even before discussing NIAB with any members of that industry.⁸⁴ This either reflects the strength of the trade and its power over the supply network, their likely response to any such national scheme or, at the very least, their strength as perceived by Weaver. The reaction Weaver received from the first trader whom he considered influential and trustworthy enough to share his plans with is therefore most revealing.

I feel that government schedules of this kind are inclined to weaken individual competitive enterprise and I certainly think it is incorrect and not fair to maintain that the Trade has not done very much indeed in the direction of improving stocks.⁸⁵

This was the reaction of J.E.N. Sherwood, whom we saw earlier amongst the members of CSAC. Weaver had sent a copy of his memorandum to Sherwood a few days after meeting with McAlpine. Despite Weaver's every assurance to the contrary, Sherwood was territorial enough, or wise enough, to know trade competition when he saw it, declining to give Weaver any of his own money and advising that the support of the seed trade would not be forthcoming. In an immediate reply Weaver wrote that:

the cooperation of the Trade is the essence of the whole scheme, and for that reason I at once rejected the methods of Svalof which tend to competition with the Trade. I must have expressed myself with more than my usual obscurity if I gave the idea that it was a Government scheme. The idea is that the proposed Trust shall be managed quite independently and the only Government

⁸³ NA, MAF 33/22 'Memorandum on the Establishment of a National Institute of Agricultural Botany' January 1918.

⁸⁴ Palladino, who again, did not have access to the archive materials upon which the present argument is made, has argued that this Svalöf arrangement was "unanimously rejected by the British seed trade" who actually succeeded in *preventing* its emergence by creating NIAB *themselves*. Firstly, the seed trade were only one competitive influence over NIAB's orientation. Secondly, as we see later in Section V, the trade was really supporting the OSTs, not NIAB. Finally, the extent to which they prevented this Svalöf arrangement from arising really depends upon the extent to which one can consider NIAB's plant breeding programme a success. If nothing else, Weaver creates in NIAB the thin end of a wedge that leaves open the potential for direct trade competition (which actually arises over time, see Chapter's 4 and 5). Palladino (1990) pp. 451-452.

⁸⁵ NIAB, C-5.10, 'Donations and Subscriptions Folder' J.E.N. Sherwood to Weaver 21/2/1918.

atmosphere about it will be the presence on the Trust of men nominated by the Board of Agriculture – two out of the nine.⁸⁶

Sherwood's initial reaction to the NIAB memorandum had been an important learning exercise for Weaver, who would spend the rest of the year defending NIAB in just this way; emphasising that the organisation was not to compete with the trade and was not a government department.⁸⁷ In this he was ultimately successful, eventually extracting not only £1000 from the initially reluctant Sherwood, but also a little under £15, 000 from traders through a subscription list at the ASTA. How had Weaver achieved this transformation of NIAB's fortunes? The answer is alluded to at the end of his reply to Sherwood. Again combating the notion that NIAB was to be a government department, Weaver turned towards his last big success with the seed trade. "It is precisely because I don't want the Seed Testing Station to stiffen into an "official" and repressive Institution that my scheme proposes its transfer to an Institution independent of the Government but working with it."⁸⁸ Tellingly, this only became the 'Official' Seed Testing Station after further petitioning by seed traders themselves, and only after they felt it was virtually under their control through their seats on NIAB's council. This thesis argues that it was the promise of a future, purpose built, and independent national seed testing station (which would remain independent in perpetuity) – which Weaver bound to NIAB – that secured his success with the trade, not support for NIAB itself.

(B): George Miln – Appeasing the agricultural seed trade

Weaver first tentatively mentioned NIAB in front of seed traders during an FPD committee meeting in February 1918, though not CSAC. Arthur Sutton brought everyone's attention to a new scientific plant-breeding institute in Holland that was looking for UK varieties on which to work. Most of the members of this Committee felt that they could just as easily arrange for this kind of work to be undertaken if they desired, "it was not necessary to go to Holland in this connection".⁸⁹ It was after this general agreement that Weaver ventured "a scheme was being considered for the establishment of an Institution of Agricultural Botany in this country". Aside from another member mentioning similar plans in Scotland, Weaver's comment aroused no

⁸⁶ NIAB, C-5.10, 'Donations and Subscriptions Folder' Weaver to J.E.N. Sherwood 22/2/1918.

⁸⁷ Silvey and Wellington, NIAB's only biographers to date, have argued that Weaver overcame this trade hostility "by patient negotiation and an appeal to patriotic duty". This overlooks the concessions that Weaver had to first make to the trade while making these patient negotiations. Silvey and Wellington (1997) p. 4.

⁸⁸ NIAB, C-5.10, 'Donations and Subscriptions Folder' Weaver to J.E.N. Sherwood 22/2/1918.

⁸⁹ NA, MAF 36/223 Seeds Advisory Committee 26/2/1918.

further interest. Having tempted fate, he retreated from approaching the seed trade as a body for the time being. This tactic proved vitally important in securing the eventual patronage of the trade. He returned instead to building up support from both influential seedsmen and also businessmen in closely allied industries. Of the first group Weaver succeeded in getting £1000 from Sherwood, Sutton and Sir William Coats Cross (a Glaswegian seed trader) alongside donations from three other “liberal-minded men in the trade”.⁹⁰ Of the second group, the largest donation came from the National Association of British and Irish Millers.⁹¹ It is clear that for this organisation the most vital work was the extension of Biffen’s research programme, presenting NIAB with a sum of £5000 “for the commercial development of scientific research in the breeding of farm and garden crops.”⁹² This support was perhaps unsurprising, considering that it had been left to the HGWC – of which Biffen was a member – to make this decision on the National Associations’ behalf. By June NIAB’s fund stood at roughly £20, 000. All the while, Weaver had been improving trade relations further by closely collaborating with traders on a revision of the 1917 Testing of Seeds Order.

From the beginning, ASTA support for NIAB was inextricably linked to their desire for an official seed testing station. On the opening of the FPD Station in November 1917, the President of the Board of Agriculture declared that “it has in it a seed which will grow and will prove of inestimable value to the agriculture of the future, and that we shall have in time to come an Institute of Applied Botany”.⁹³ Weaver had begun working towards this aim by collaborating with the trade on an extension of the 1917 Testing of Seeds Order, to include cereals. When he first presented CSAC with a draft, they balked at the inclusion of cereals on the grounds that there is very little time between harvesting and sowing wheat. “If the test were insisted on, sowing might be delayed.”⁹⁴ This was resolved by making an allowance of up to one month after the sale of seed wheat in which the necessary declarations could be made to the purchaser, rather than prior to purchase. Weaver had another chip with which to

⁹⁰ NA, MAF 33/22 Minutes of ASTA Extraordinary Meeting 16/7/1918.

⁹¹ NA, MAF 33/22 Humphries to Weaver 29/4/1918. It seems likely that we see here an example of an idea explored by Sabine Clarke in the context of the Department of Scientific and Industrial Research. Work which industry might otherwise be expected to undertake, could legitimately be appropriated by government institutions, provided that it was of a national character which allowed all members of an industry to profit from its results equally. Clarke (2010) p. 288. For more on the rhetorical strategies employed in such negotiations, see Calvert (2006) and Kline (1995).

⁹² NA, MAF 33/22 Note of 27/6/1918.

⁹³ NIAB, C-5.5, ‘Trust Deed Folder’.

⁹⁴ NA, MAF 36/224 Cereal Seeds Advisory Committee 24/5/1918.

bargain, as the ASTA pursued a change in the nature of the seed test declarations. At a meeting in April 1918 they had pressed upon Weaver their desire to change the declarations required, moving away from actual results and towards declarations of minimum standards.⁹⁵ They argued the use of standards would make the whole process quicker. It would also of course to some extent disguise the true worth of seed stocks. Supplies that would once have given a sliding scale of purity would instead be lumped together as equally valuable. At this point Weaver replied that it would have to wait for review in May as all the agricultural departments involved were prepared to resist the ASTA and keep the declarations as actual results. His negotiations (on behalf of the trade and with the trade regarding cereal seed), were clearly successful. At that May meeting any resistance had been forgotten. "Subject to the adoption of this "standard" method, the committee unanimously agreed that cereals should be included in the order."⁹⁶ This was a crucial victory not only for the ASTA but also for NIAB. Writing to Weaver a few days later, Miln (in his capacity as President of the ASTA rather than as a CSAC member) expressed how well he thought the Testing of Seeds Order had left that meeting. "I think the trade will generally look upon it favourably and would in consequence be more responsive to any appeal that would be made to them to support your [NIAB] scheme."⁹⁷ Weaver was now in a position to attempt such an appeal.

The new 1918 Order came into law on the 17th of June and Prothero, President of the Board of Agriculture, thought it politick to address the seed trade in person soon after, or at least, Weaver did. A few days beforehand Prothero wrote to Weaver, "you promised me a note of what you want me to say to the seedsmen at Kelvedon on Friday."⁹⁸ Weaver used such opportunities to the fullest possible extent. For instance it is almost certain that the speech given by Prothero on the opening of the Seed Testing Station (quoted previously), which mentioned the potential good an agricultural institute might do, was orchestrated by Weaver, who then went on to quote this speech in any documents or correspondence supporting NIAB. He was about to do the same but this time with regard to the 'Official' Seed Testing Station. Prothero's actual speech hasn't survived so instead we have to rely on one of Weaver's reports. The

⁹⁵ See Gooday (2004) on the long history and significance of such arguments within a wide array of industries (though admittedly in tests with a smaller variance of result), and depending on the physical rather than biological sciences.

⁹⁶ NA, MAF 36/224 Cereal Seeds Advisory Committee 24/5/1918.

⁹⁷ NA, MAF 33/22 Miln to Weaver 4/6/1918.

⁹⁸ NA, MAF 33/22 Prothero to Weaver 25/6/1918.

“President of the Board of Agriculture (the Right Hon. R.E. Prothero, M.P.), announced in his speech at Kelvedon on June 28th, 1918, that the Board will remove to the new Institute [NIAB] the Official Seed Testing Station”.⁹⁹ Weaver is here being more than a little creative with the truth, as the Seed Testing Station was still not at this time the ‘Official’ Seed Testing Station. This name change only came later, in 1920, after further pressure from the trade.¹⁰⁰ In addition, and just as before, Weaver now went on to repeat Prothero’s promise, using it as the basis for his next assault on the seed trade. This time, rather than approach them directly as he had done in February, he worked through the influential seedsmen he had already convinced to support NIAB. This tactic was particularly well received by Miln, who gave Weaver the platform and support necessary to gain the trust of the ASTA.

“I am very glad to hear that you have abandoned the idea of speaking about your proposed Institute to the members of the Advisory Committee” Miln wrote to Weaver.¹⁰¹ Instead, Miln was to arrange an extraordinary meeting of the ASTA to be held in their offices on Mark Lane. “The chief reason is that it is practically the hub of the Seed Trade, and I am inclined to think that the sentiment of the members would be more readily appealed to than if such a Meeting were held in your official quarters.”¹⁰² Weaver appeared before the ASTA a month later and, addressing an audience of between 200-300 seed traders, seems to have been more than a little deferential. “He came before them in a penitent mood because he recognised his own ignorance...he felt some explanation was due for his “butting in” as the organiser of an Institute which was designed to serve an industry of which he knew nothing commercially or technically.”¹⁰³ From there the meeting could perhaps most easily be described as an OSTs sandwich. Weaver was introduced by Miln as the sympathetic craftsman of both 1917 and 1918 seed testing orders, explaining that although the latter “was not yet in free circulation he could assure them they would find it rather better than the previous one so far as the interests of the seed trade are concerned”. Weaver himself began by

⁹⁹ NIAB, C-5.5 ‘Trust Deed Folder’.

¹⁰⁰ This only became the state recognised title with the passing of the Seeds Act 1920. The previous 1917 and 1918 orders (there was also a 1919 amendment) were enforced by powers under the Defence of the Realm Act. At the end of hostilities Weaver sought to have this legislation put on a more permanent basis. He also then went on to use this Act to say “The Ministry shall establish and maintain either alone or in conjunction with any other bodies or persons an official testing station for England and Wales”. At this point the OSTs funding was still not entirely agreed upon. He could then point to this piece of legislation when anyone thought of challenging the move of the testing station to Cambridge.

¹⁰¹ NA, MAF 33/22 Miln to Weaver 4/6/1918.

¹⁰² NA, MAF 33/22 Minutes of ASTA 15/7/18.

¹⁰³ NA, MAF 33/22 Minutes of ASTA 15/7/18.

discussing the establishment of the Seed Testing Station before moving onto NIAB. Most important is that Weaver spends almost no time explaining the purpose of the Institute, other than how he “began to dream of an English Svalöf” or that it will “be a potent instrument in the great national policy of food production at home”. But as he was also clear that it was not to compete with the trade, very little of any value could be gleaned from this mention of Svalöf or appeals to patriotism. In fact the closest one got to an actual description of its purpose came during Miln’s reassuring introduction. The “new Institute would not interfere with the enterprise of any firm or individual in going one better than Prof. Biffen and his scientific assistants at Cambridge.”¹⁰⁴ What Weaver did concentrate on was the amount of money already gathered from other sources and that “an Institute provided with the monetary help of the trade could reasonably expect to ask the Government that it should be consulted as to the details of any scheme of seed control which the future might bring forth.” Arthur Sutton then ended the meeting by reminding everyone how well Weaver had treated the trade during the creation of both seed testing Orders. Thus in no small way was trade support for NIAB dependent upon not only their past successes with Weaver (the founding of the Seed Testing Station, the switch from actual results to minimum germination standards) but upon their trust in Weaver and also NIAB’s intended purpose. This became particularly clear when Weaver began to thrash out the functions of the Institute in its Trust Deed. In November of 1918 Miln wrote to Weaver having reviewed a draft of this document. “There is only one clause which occurs to me may give rise to some criticism....I think if this is allowed to remain as it is a further sentence ought to be added explaining that this trade refers to the sales and requirements of the Institute only.”¹⁰⁵ The clause in question stated “To buy, sell and deal in all seeds, plants, tools...for the testing or production of seeds or ancillary purposes”.¹⁰⁶ Weaver wrote back a few days later, doing all he could to placate Miln, though remaining firm on the form of the deed and emphasising the importance of trusting himself and those involved. “Whatever words you put in the Trust Deed will be no protection at all if the Council does not mean to play the game, but I am quite sure that you have no fear as to the bona-fides of everybody concerned with it.”¹⁰⁷ Miln might not have found much

¹⁰⁴ NA, MAF 33/22 Minutes of ASTA 15/7/18.

¹⁰⁵ NIAB, C-5.5, Miln to Weaver 8/11/1918.

¹⁰⁶ NIAB, C-5.5, Draft Trust Deed, 1st Proof’.

¹⁰⁷ NIAB, C-5.5, Weaver to Miln 12/11/1918.

comfort in these words had he known of the purpose to which the Development Commission wished to put NIAB.

(C): Thomas Middleton – Charming the Development Commission

“In view of the valuable results achieved at the Plant Breeding Research Institute at Cambridge, the Commissioners are in principal prepared – apart from the question of the new Institute - to consider sympathetically such proposals as the Board of Agriculture may support for the extension of its operations.”¹⁰⁸ Such was the DC’s initially cool reaction to Weaver’s proposed Institute, and such was the importance of Biffen’s work to NIAB’s eventual foundation. Olby has argued that within DC institutions “long-term research could be carried out without the need to achieve concrete results of economic benefit in the short-term”.¹⁰⁹ This description does not apply to NIAB and overlooks a crucial aspect of the DC’s activities. In a memorandum of 1916 the Commissioners stated that organisations “other than those of an educational or experimental nature should return directly to the Fund a commercial rate of interest”.¹¹⁰ The DC attempted to force NIAB to conform to the latter institutional model before agreeing to fund it, defining its purpose accordingly. Ironically, in so doing they only succeeded in making the Institute’s purpose all the more ambiguous. Both the DC and Treasury were led to believe the Institute’s commercial work would be profitable enough to make NIAB self-supporting in a matter of years.¹¹¹ However, Weaver was in actual fact attempting to create the kind of scientific research institute that Olby describes, while the model sought by the DC was far more commercial. In this instance, rather than the DC aiding Weaver, they frustrated his plans and attempted to confine NIAB’s purpose along purely commercial lines. However, Weaver remained wedded to his all-purpose institute and was in a very strong bargaining position. All DC projects were funded on a pound-for-pound basis and Weaver would eventually extract £40, 000 from private sources. Furthermore, NIAB was receiving inside help, being supported by none other than Daniel Hall (1864-1942). Olby has already stressed the extent to which Hall dominated the agenda of the DC, and with it, British agricultural science.¹¹² Hall not only contributed an article for Weaver’s memoranda on NIAB, but oversaw its passage through the Commission. The single most important document

¹⁰⁸ NA, MAF 33/22 Warner to Board of Agriculture 14/11/1918.

¹⁰⁹ Olby (1991) p. 520.

¹¹⁰ Johnson (1968) p. 19.

¹¹¹ One wonders if they were aware of the results of the 1917 trading attempt.

¹¹² Olby (1991) p. 518.

required by the DC in this funding process was the Trust Deed. With the ASTA now firmly on side, Weaver could direct his attention towards the shape of this deed and the legal basis of the Institute.

Around July 1918, he decided that NIAB must take the form of a charity. Weaver made this decision swiftly so as not to lose momentum, “the sooner we get the trust deed established, the better, before some pious donor dies or other inconvenient incident disturbs us.”¹¹³ A much more serious concern was that NIAB should be as autonomous and wealthy as possible:

I have been making enquiries and find that if the Institute is Godfathered by the Public Trustee, it will have none of the advantages belonging to an Institution, which is technically a charity, in as far as it is for public use and not for private gain. If we come under the Charity Commission, the whole of our income will be paid to us, free of Income Tax and, as I gather from a talk with my friend Bower at the Charity Commission, we might, with a little ingenuity, escape paying Income Tax on any profits which result from selling seeds.¹¹⁴

In this respect an important precedent had already been set in the form of the John Innes institute. Indeed Weaver wrote to the John Innes for a copy of their Trust Deed when looking for a template upon which to base NIAB’s. With this draft, Weaver and (the very recently made Sir) Daniel Hall delivered their case to the DC in November 1918. Weaver managed to come out of this meeting with all the funding that he could have asked for, though at the cost of the all-purpose institute he had designed. In the initial draft of the Trust Deed NIAB’s purpose was to “promote research and other scientific methods of husbandry for the benefit of agriculture, horticulture, and any of the allied or accessory trades or industries”. Most of this was now erased and reduced to “the improvement of existing varieties of seeds, plants and crops.”¹¹⁵ His explicit statement that NIAB should aid in the “creation” of new varieties was deleted and only the introduction and distribution of new varieties remained. Weaver also clearly had grander designs with regards to NIAB’s educational role. In the first draft he wrote that NIAB shall “afford practical and scientific training for those engaged or desiring to be engaged in the industry or employment of agriculture or horticulture and especially in those branches of it which relate to plant breeding and seed raising and to provide bursaries or scholarships.” This scientific reference was again deleted and the practical training offered was reduced to only those “desiring to be engaged in seed testing and

¹¹³ NA, MAF 33/22.

¹¹⁴ NA, MAF 33/22.

¹¹⁵ All references to the draft trust deed can be found in NA, T161/3.

variety testing or other branches of the work proper to the institute.” This restriction of purpose further applied to NIAB’s intended publications which were initially to include “the practice and science of agriculture and horticulture”. This was now confined to only the work of the Institute. In any history of NIAB this is the picture one must contend with; that when Weaver conceived of NIAB he saw an all-purpose scientific institution for agricultural botany, one perhaps more akin to that established at Vienna than Svalöf. It was to be concerned with the education of persons looking to improve agricultural crops across the entire British Empire. Even this aspiration was reduced to merely the “United Kingdom”, the “British Empire” presumably considered too ambitious an undertaking by the DC. In their report on this conference the commissioners wrote that for “the rapid and extensive distribution among farmers of the improved seed varieties produced by the Plant Breeding Institute at Cambridge an institution on the lines proposed would be the most efficient means”. This conclusion had been reinforced by a subsequent meeting with Biffen and Weaver a few days later. There Biffen had pleaded for its role as relieving the PBI “of work not properly belonging to research” and of course “enabling the proceeds of the distribution of the new varieties to be more fully secured”. This is precisely the kind of commercial institution that would have caused outcry amongst the trade and which Weaver had had to disguise with the OSTs. However, and again just as the ASTA was blinded with the OSTs, Weaver was blinding the DC with Biffen’s high performing varieties and their potential to revolutionise agriculture. In this instance, he was disguising the all-purpose institute he intended to create. Not long after gaining this assent, Weaver began to consider building laboratories at NIAB for plant pathology research, precisely the kind of activity that the DC had eliminated (with red pen no less) from the original Trust Deed.¹¹⁶ These inconsistencies soon became more explicit.

One of the first points the DC wished to make was that Weaver’s application actually referred to two different organisations. “(1) the National Institute of Agricultural Botany with the primary object of distributing new seed varieties and (2) an official seed testing station.”¹¹⁷ (Note again their focus on NIAB’s distribution work). Weaver had either not found it necessary to distinguish between the two or had played upon this ambiguity. Indeed in the first funding application of December 1918 both NIAB and the OSTs appear to be comparable organisations.

¹¹⁶ NA, T 161/3, (Subsection 208/1).

¹¹⁷ NA, MAF 33/33 Treasury Note 8/1/1919.

OSTS: £15, 000 grant for the buildings and £5, 500 towards annual maintenance
 NIAB: £18, 495 grant for land and buildings and £4, 500 towards annual salaries¹¹⁸

This was not to last. Despite the DC having had a very clear idea as to NIAB's purpose, they failed to adequately ensure this was not ignored by Weaver. By July the following year Weaver was asking for almost £30, 000 for the buildings of the OSTs, a further £15, 000 for a hostel for its staff and merely £8, 000 for the offices of NIAB. Weaver was even bold enough to argue that the grant of £40, 000 for the OSTs was "in any case a Government obligation", referring to its inclusion in the 1918 Testing of Seeds Order.¹¹⁹ The DC refused to accept these vastly inflated figures, instead demanding that reductions be made. The single biggest cut that Weaver made was the hostel, which was completely scrapped.¹²⁰ This he bemoaned terribly: "While it is felt that the maintenance of a highly efficient staff will be gravely prejudiced if no hostel is provided, this seems to be the one part of the complete building on which a large saving can be made."¹²¹ What Weaver did not mention was that he had no intention of allowing this accommodation not to be built. Instead he yet again set about disguising the hostel behind a desirable distraction. Weaver arranged for some of NIAB's land to be leased to the Housing Association for Officers' Families, an organisation that found housing for injured soldiers and the families of soldiers that had died in the war. Weaver, who was the treasurer of this body, then erected 14 houses on the NIAB site. These buildings, which can be seen nearing completion in 1920 in Figure 1.9, "would be occupied by



Figure 1.9: Houses for Housing Association for Officer's Families. Photographs held by NIAB archive. These two images were reunited by Tricia Cullimore, to show construction in action.

¹¹⁸ NA, T 161/3 Report of the DC 19/12/1918.

¹¹⁹ NA, T 161/3 Application to DC 23/7/1919.

¹²⁰ NA, T 161/3 Memorandum by Weaver on Reductions 21/10/1919.

¹²¹ NA, T 161/3 Memorandum by Weaver on Reductions 21/10/1919.

widows of officers and provide rooms for the staff from London.”¹²² With the placing of this wool delicately over their eyes, the DC agreed to Weaver’s reduced application. He had achieved no mean feat. Not only had Weaver succeeded in giving the trade what they desired, a first rate OSTs (Figure 1.10), he had got the DC to willingly acquiesce in the undermining of their own scheme for NIAB. After all, none of this money was to go toward seed cleaning machinery, a granary, or extra farm land, all expensive and vital if one is to sell seed at a commercial scale.¹²³ Seemingly only T.H. Middleton was in a position to see this discontinuity.

It was Middleton, now a Development Commissioner himself, who had led the earlier charge against Weaver. He now attempted to completely reorientate the institution in line with the original plans agreed by the DC and Treasury; that NIAB was to be a commercial institute selling pure stocks of valuable seed. He took action by circulating two weighty memoranda, one on the history of the Seed Testing Station (which he noted was *now* to become the ‘Official’ station) and another decrying the close association of NIAB and the OSTs. Both memoranda were an attempt to bring clarity to the question of NIAB’s purpose. Middleton’s history of the OSTs describes how the station had always developed in relation to the size of the work at hand. It also charts a rise in professionalisation, beginning with the previously mentioned messenger girls and ending in 1918 with “a Director, Assistant Director, 3 Women Botanists, 14 Women Assistants, 3 Women Clerks, a laboratory and 4 women messengers”.¹²⁴ This was not only a sign of the growing volume of the work required but a response to those traders who felt this work demanded better educated women. At Weaver’s crucial July ASTA meeting, one trader had criticized the existing state of affairs. He complained that “there were not only differences in different testing stations but differences in the same station...He was sure that flappers, with hair down their backs, were not properly trained seed testers.”¹²⁵ For Middleton, accentuating this professionalisation drew attention to how well the existing system provided for the trades seed testing demands, undermining those who claimed an ‘Official’ station of the proposed scale was a necessary expense. He then went on to argue that bringing NIAB and the OSTs together under one roof was a mistake. “A seed testing station should be an

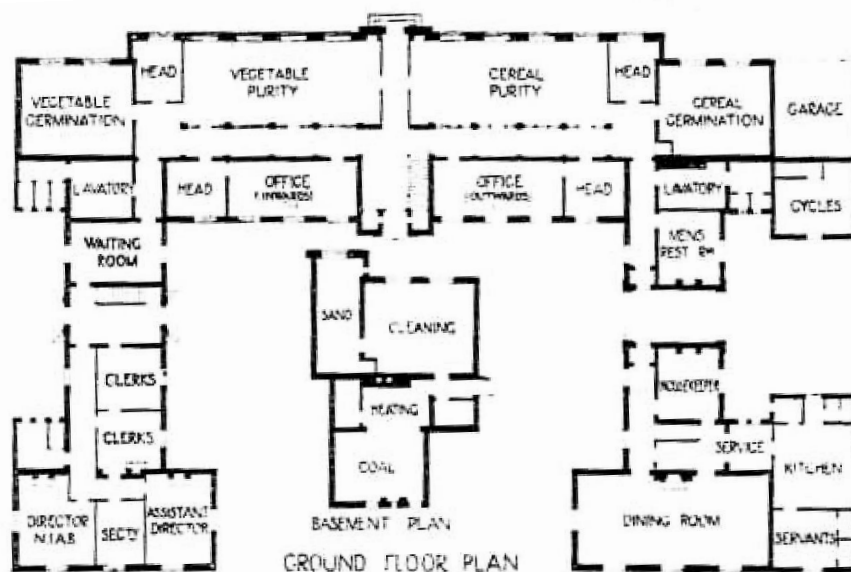
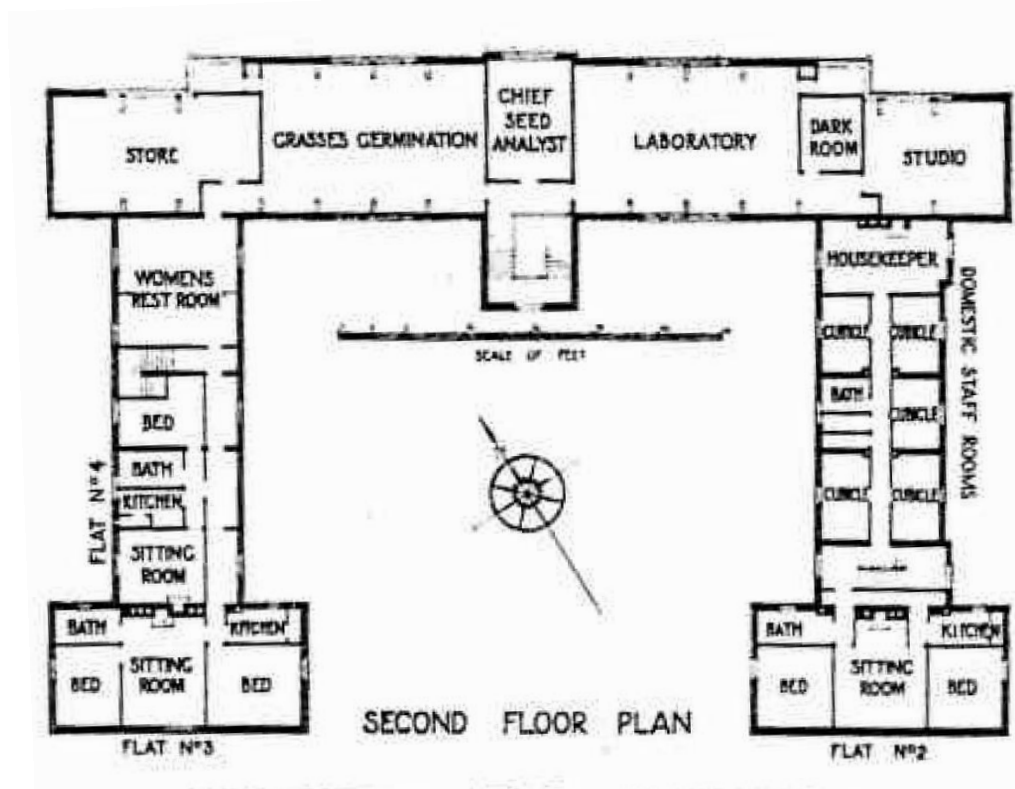
¹²² NA, MAF 208/3 Parker to Treasury 5/9/1922.

¹²³ Weaver’s assertion that NIAB was to become self-sufficient within a few years of operation often made relations with the Treasury difficult. Here NIAB’s story is again similar to that given by Moseley of the National Physical Laboratory. Moseley (1978).

¹²⁴ NA, MAF 33/22 dated 4/9/1919.

¹²⁵ NA, T161/3 (Subsection 208/1).

independent institution, and should not be governed by the same Council as that set up for the N.I.A.B. which has a wholly different, and in some respects incompatible function." If anything NIAB would be in need of the OSTs's services itself. "Buyers of seed from the N.I.A.B. and rival sellers, of whom there will be many, would indeed have strong reason for complaint if the one public seed testing station were so controlled."



PLANS OF THE INSTITUTE'S HEADQUARTERS AT CAMBRIDGE

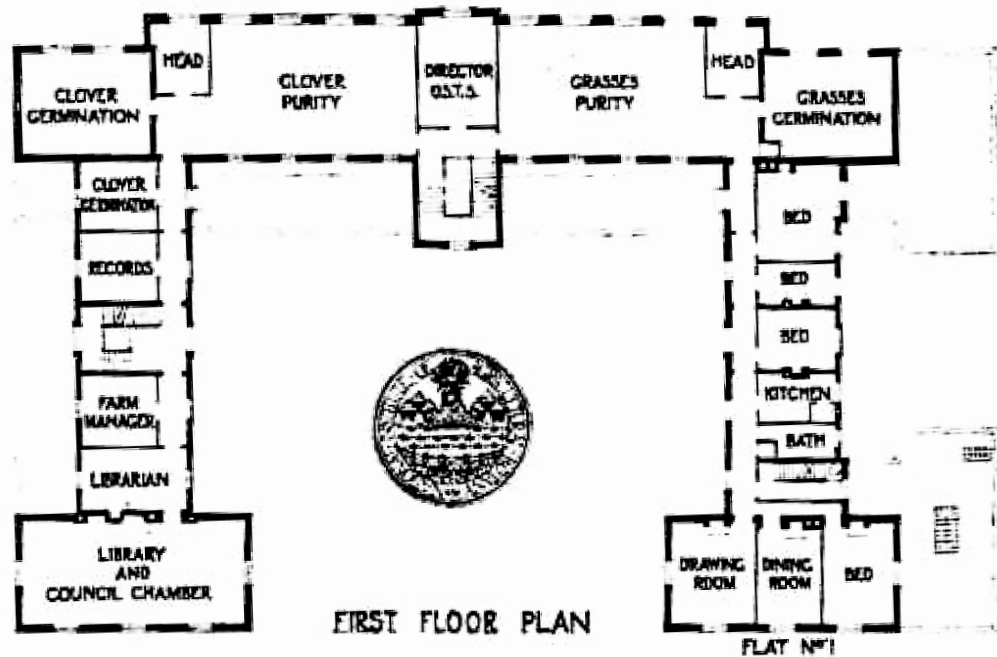


Figure 1.10: Floor plans of the Cambridge Headquarters demonstrating that roughly 80% of this building was given over to the OSTs, the NIAB offices being restricted to some offices in the tip of the West wing on the ground and first floors. From 1st NIAB report 1919-1920.

In the second memoranda Middleton argued that NIAB had already received a substantial sum of public money and had not set aside enough resources to carry out the work of the Institute. "I take the view that the really important work which the N.I.A.B. have in hand is the 'growing-on' for market of the improved strains of plants raised by scientific plant breeders; the testing of the best new (or old) strains of our existing crops and pasture plants; the isolation of pure lines and the growing on of those selected strains." Middleton therefore possessed a very clear understanding of NIAB's purpose (one very similar to the '1917 purchasing scheme' he had pioneered in the FPD) and feared it had been side tracked by the OSTs "because representatives of the seed trade strongly advocate this course".¹²⁶ Frustratingly, how Weaver managed to overcome these criticisms is hidden in bureaucratic pleasantries. A note written sometime after November 1919 merely states "Mr Weaver has had a very satisfactory interview with Sir Thomas Middleton, and that everything is now alright". The ambiguous nature of NIAB's position remained unchanged, Weaver got the rest of his funding from the DC, and Middleton's eminently sensible criticisms were seemingly left unanswered. This didn't stop Middleton from attempting to pin down the nature of the

¹²⁶ NA, MAF 33/22 dated 4/9/1919.

Institute once more. Later that November he again wrote to Weaver, though this time a little more warily:

While I regard this as your “show” and think that you are entitled to the greatest credit for having raised so large a sum of money and having nursed the institute to its present stage of development, I feel so strongly that you may endanger its ultimate success by giving the seed Station precedence over crop-testing and seed-growing that I urge you to bring my letter before your council and have a full dress debate on ‘Policy’ at this stage.¹²⁷

A Council meeting was organised swiftly and unanimously voted that the building of a seed testing station should begin immediately. A somewhat flustered Miln stated

the trade subscribers had supported the Institute almost wholly because of the promise that had been given from the beginning that the first work (in point of time) would be the building and equipping of a first-rate seed testing station at Cambridge, and that any departure from this policy...would be regarded by the subscribers of something like £25,000 in cash as a direct breach of faith.¹²⁸

By no means was Weaver forced into this position. As he explained to Middleton in his reply, the Seed Testing Station was “a bait to secure the support of the Trade”.¹²⁹

Conclusion: NIAB built, 1921

By summer 1921, NIAB’s headquarters (and thus those of the OSTs) were nearing completion on Huntingdon Road. For a short time it had been contemplated that the Institute might be built in Oxford as the University there was in the business of reviving its Chair in Agricultural Economics. While proximity to such trade expertise was considered valuable, Cambridge always seems to have been the most likely location, just along the same stretch of road as the University Farm and Biffen’s PBI. In June, Weaver read a paper on NIAB at the International Conference on Seed Control, that year held in Copenhagen. Referring specifically to the building consisting of both the OSTs and NIAB he explained that “This apparent confusion of function may seem novel to many of you, but it is based on experience gained during the hard testing time of the last few years. English Institutions are often construed on lines which may offend logical instincts but they are generally found to work well in practice.”¹³⁰ Weaver perhaps had every right to be optimistic. By this point he had collected £47, 689 in

¹²⁷ NIAB, C-1, Council Papers, Paper No. 19, Middleton to Weaver 22/11/1919.

¹²⁸ NIAB, C-4, Council Minutes, Dec 1919.

¹²⁹ NA, MAF 33/22 Weaver to Middleton.

¹³⁰ NIAB, C-1, Council Papers, No. 38.

private donations, a sum which the DC then matched pound-for-pound. Part of this sum included the value of the 250 acre farming estate at St. Ives gifted to NIAB by Frederick Hiam, valued at just over £9000. This was an astonishing amount of money. Unfortunately, because the DC has attracted so little historical attention, we do not know the extent to which NIAB and the OSTs were unique in receiving such a sum. The Institute's impressive headquarters were completed by October 1921 (Figures 1.14 and 1.15), and on the 14th King George V and Queen Mary came to officially open the new Institute (Figures 1.11 and 1.12), each ceremoniously planting a Mulberry tree; the King outside of NIAB, the Queen outside of the Housing Association buildings (some of which were taken up by eleven OSTs employees). What the Royal couple were officially opening was a source of confusion, particularly amongst the press. 'The National Seed-Testing Institute' boasted the headline of the *Mark Lane Express*, the primary organ of the seed trade.¹³¹ Testing and trialling work took centre stage and no mention was made of NIAB's seed multiplication functions. The *Cambridge Chronicle* gave a more typical account, running with the headline 'Science and Food Production', focussing on Biffen's scientific work while describing "The thousands of people who lined the route"



Figure 1.11: Lawrence Weaver, King George V and Queen Mary leaving the NIAB opening ceremony on the 14th of October 1921. The building in the background is one of the homes built by the Housing Association for Officers Families. Photograph held by NIAB Archive.

¹³¹ NIAB, C-5.31, Royal Visit to Cambridge.



Figure 1.12: Queen Mary planting a tree in front of the Housing Association for Officers' Families buildings. Photograph held by NIAB Archive.

of the procession, which included “a large number of school children, and their shrill cheers especially pleased the royal visitors” (Figure 1.13). Meanwhile the report published by the *Cambridge Daily News* caused Weaver considerable trouble with the trade, speaking of NIAB’s commercial work in terms that were far too bald for their liking. Weaver had to write to the Editor only a few days after publication, explaining that “two passages in your report of the proceedings at the National Institute of Agricultural Botany last Friday have caused a certain amount of heart-burning among members of the seed trade.” He enclosed a letter of clarification which he wished for the paper to publish in their next issue and which helps expose precisely how different the perspectives on NIAB seen in Section V had really been.

I wish to call attention to...the paragraph in which you state that the Institute will combine a research institute for plant breeding with a company for the development and distribution on a commercial scale of new and improved varieties of farm seeds. This description was given to press representatives not as applying to the new National Institute of Agricultural Botany but as a description of the famous Station at Svalof in South Sweden. In this country we already have plant breeding institutes, such as that so successfully carried on at Cambridge under Professor Biffen, and we also have in the seed trade an efficient and satisfactory organisation for distributing seed

to farmers. The scope of the National Institute is to fill the gap between these two existing organisation.¹³²

How NIAB was to fill this 'gap' remained to be seen. Within a few months of opening the Director would have to apply for further funding as they had overspent on the headquarters building to the extent that NIAB's activities could not be pursued. Furthermore, despite their vital importance to seed trading, NIAB owned no seed cleaning facilities or granary, both of which were not acquired until late into the 1920s. In the eyes of its public creditors NIAB was supposed to be a self-supporting organisation returning profits to the DC through the sale of pedigree seed, yet this revenue stream was virtually non-existent. In some sense then, NIAB's decision to only release novel varieties after three years of trialling (on the grounds that this was the only way to be certain novel varieties were superior to those already on the market) can perhaps be best understood as a way of buying the Institute time while it attempted to secure its position.¹³³ Before the first full series of these trials even reached completion, the DC was demanding a dramatic reorientation of the Institute's activities. It is for this reason, as we shall see in Chapter 2, that NIAB becomes primarily



Figure 1.13: Photographic account of the Royal visit, published in the *Cambridge Chronicle*. NIAB, C-5.31, Royal Visit to Cambridge.

¹³² NIAB, C-5.31, Royal Visit to Cambridge. Weaver to the Editor of the *Cambridge Daily News* 18/10/1921.

¹³³ This measure did not only apply to varieties coming from the PBI, as Palladino has been led to believe. Any new variety that wished to be given the NIAB seal of approval had to undergo this trialling procedure. In this instance, the need to delay the point at which the Institute could be reasonably expected to turn a profit is just as big an incentive as the trade influence he describes. As we shall see Chapter 2, this trialling was at least not enough to discourage Biffen, his *Yeomen II* actually being somewhat fast-tracked. Palladino (1990) p. 453.

a trialling centre, dropping any pretence to self-sufficiency in the process.

At the opening of the Institute, if you had asked Weaver what was NIAB's purpose, he might have been able to tell you about the poor condition of seed supply or the need for agricultural reconstruction. Were you to press him further, the all-purpose scientific institute that he had set out to create would not have been far from his mind. Indeed, he said as much immediately before the Institute's official opening, at that same Copenhagen conference quoted from above. "I desire to make quite clear what are the functions of the Institute. It is designed to bring into one organisation, I might almost say, under one roof, all activities for the improvement of agricultural seed."¹³⁴ Had you asked the same question of Biffen or Hall, the answer would have been that NIAB was a nationally funded seed multiplier, built to rapidly increase the quantity of seed available from PBI varieties, returning enough profit so as to fund further research at the PBI and repay substantial DC loans. Had you asked Miln he might have emphasised varietal trialling, or perhaps have even given a similar answer to Biffen, though he wouldn't have been particularly interested. After all, traders such as himself were going to be doing the actual selling of varieties; NIAB was *just* a nationally funded seed multiplier. Whether or not this entailed competition with the



Figure 1.14: The rear of NIAB and OSTS headquarters. The rear door faces that section of buildings for the Housing Association for Officers' Families that were directly behind the Institute, the rest of those houses running parallel to the Institute.

¹³⁴ NIAB, C-1, Council Papers, No. 38.



Figure 1.15: The headquarters viewed from the perspective of Huntingdon Road. Image held by NIAB archive.

trade was far from clear. In 1921, NIAB was still none of these things. Throughout the following years this ambiguity of purpose continued to shape the Institute as NIAB set about constructing a programme of work.

2. *Field Trialler*: Trialling Methods and the Resistible Rise of Randomization, 1921-1931

This Chapter is dedicated to what became NIAB's primary responsibility: the field trialling of old and new plant varieties to determine their comparative agricultural value. Considering the emphasis placed upon the commercialisation of pedigree varieties throughout the previous chapter, this change in orientation – from a seed multiplier to a field trialler – should (and did) come as a surprise. Why trialling became NIAB's primary function, despite the emphasis placed on seed multiplication by a large body of its supporters (and more importantly the Institute's largest financial supporter, the DC) is a question inherited from the previous Chapter. Multiplication plans did continue, but they did so on a scale far too small to make NIAB financially self-sufficient. The argument of the Chapter is not that this shift amounted to a revolutionary change at NIAB. After all, trialling was one of a number of functions envisioned for the new Institute in the years leading to its foundation. The argument is rather that immediately after the First World War, the Institute simply did not prioritise its commercial work, instead seeking to establish more solid (less controversial) foundations upon which to build its reputation within the British agricultural industry. As we shall see, field trialling is ideal for these purposes as it is both congruous with the Institute's broadly defined aims (to 'Grow More' as emblazoned on its Headquarters and official seal, Figure 2.1), and eminently sensible (answering the 'varietal question' was something a number of countries around the world had begun to attempt by the turn of the twentieth century).¹

Section I: NIAB and the significance of trialling

Perhaps in part because of its eminently sensible outward appearance, the significance of NIAB's trialling programme has been read in quite a different direction. It has been argued that the field trialling activities pursued by NIAB largely benefitted private plant breeders and members of the trade by subsidising the costly business of breeding.

¹ Jonathan Harwood introduces the 'varietal question' in an account focussing on Germany; Harwood (2012) pp. 37-39. Indeed, trialling had been an important function of the German Agricultural Society from as early as 1886; Wieland (2006) p. 318. "In interwar France, as in many other countries, the function of screening and comparing existing varieties fell to publicly funded research stations." Bonneuil (2006) p. 301. As for the Netherlands, see Maat (2001) p. 135. On Italy, trialling – ostensibly as part of a breeding program – is covered extensively in Iori (2013).



Figure 2.1: NIAB crest above the Institute's main entrance. Photograph held by NIAB archive.

Government support for trials “placed the burden of research on the state and thus reduced the costs incurred by the seed trade while developing new varieties”.² This is an important point, and one which will be given substantial support in this Chapter when it is shown that trade pressure from within NIAB was largely responsible for ending the Institute’s more ambitious multiplication plans in favour of trialling. At the same time however, this Chapter also emphasises more humble (though no less significant) features of NIAB’s trialling programme that might otherwise be lost. Field trials mattered to more people than just plant breeders. They also mattered to farmers. No doubt in Britain in the early twentieth century, trials mostly mattered to wealthier farmers, those who could afford to take real advantage of them. However the Chapter does not concentrate on the results of field trials themselves, and how these might influence (or fail to influence) the agricultural industry at large, with all the attendant inequalities – of access to knowledge and capacity for action in the face of knowledge – such an investigation would entail. The aim of the Chapter is instead to analyse the methods of field trials themselves, uncovering their potential value for *all* farmers, whether they be large, wealthy mid-century Cambridgeshire landowners, or small, poor farmers across the world today. A certain amount of complementarity in much of the

² Palladino (1990) pp. 450-453.

relationship between farmers and scientists regardless of the nation or period in which they reside, highlighted while addressing Tilley in the introductory Chapter, should be born in mind throughout. The aspects of the field trial that this Chapter highlights have been under attack, and in many places utterly lost, thanks to the increasing demand for statistically lead methods and the Randomized Control Trial (RCT) in particular, which have captured a significant proportion of the public and public-policy imagination. How and why NIAB resisted the RCT therefore holds important historical and political lessons.

The controversy that this chapter will focusses on has already made a small number of appearances in the existing literature. Ian Hacking – writing of both randomization as a principle and RCTs as a method – has pointed out that their use was “widely contested from their inception”, though as his concerns lie elsewhere, he does not pursue the topic further.³ Deirdre McCloskey and Stephen Ziliak get much closer in their somewhat sensationalist *The Cult of Statistical Significance* (2008). This is a highly entertaining and persuasive work that, as its name suggests, focusses upon the problem of statistical significance rather than randomization, though the latter closely allied topic is also of interest to them in key places. Their account of the particular disagreement to be addressed in the present Chapter is however less persuasive than it might be, due to their ‘hero’ and ‘villain’ approach to the two main protagonists; William Sealy Gosset and R.A. Fisher. Both of these individuals are essential to the story told in the present Chapter, alongside Edwin Sloper Beaven, all of whom will be introduced more fully at the appropriate moment. In the meantime, McCloskey and Ziliak “lament what could have been in the statistical sciences if only Fisher had cared to understand the full import of Gosset’s insights”.⁴ Elsewhere they write of Gosset as “Charming, rustic, humble, and mysterious...a very Woody Guthrie of mathematical statistics.”⁵ Fisher on the other hand is ‘waspy’.

Gosset patiently tried for a quarter century to teach Fisher about human relations, such as the importance of being kind and telling the truth and practicing humility and giving credit to other scientists and being accurate about history.⁶

³ Hacking (1988) p. 429.

⁴ McCloskey and Ziliak (2008) p. xv.

⁵ McCloskey and Ziliak (2008) p. 212.

⁶ McCloskey and Ziliak (2008) p. 214.

With the need for accurate historical accounts in mind, this Chapter will step back from this part psychological and rhetorical approach, and replace it with the steady and less controversial methods of institutional comparison. The debate will not be seen solely as between Fisher and Gosset, but between Rothamsted Experimental Station (RES) and NIAB, the different communities with which they wished to work, and the different ends that defined their means.

The Chapter is organised around two distinct problems, which are ultimately brought together. Section II addresses the question of how and why NIAB came to reconstitute itself as primarily a field trialler rather than a seed multiplier. This transformation was all but complete by around 1925. As briefly mentioned above, the primary causes were the Institute's unstable financial situation, the controversial nature of its commercial ambitions, and pressure from members of the seed trade who could influence policy thanks to their seats on NIAB's Council. Section III takes on a second problem, that of the trialling methods actually adopted by agricultural scientists. Section III (A) uncovers the history and development of NIAB's preferred trialling method, the 'half-drill strip'. Section III (B) contrasts the half-drill strip with what would become its primary competitor, the RCT. Overall, Section III provides the background to the debate between NIAB and RES that will eventually unfold in the late 1920s. (Giuditta Parolini's recently completed study of twentieth century agricultural statistics in Britain, which focusses a great deal on Rothamsted, has been particularly useful for the purposes of institutional comparison).⁷ Indeed, despite Fisher's methods being published in the mid-1920s (and on most accounts, being taken up swiftly and without controversy) randomization was only introduced into NIAB's trialling methods in the early 1930s, and even then not systematically. Section IV is dedicated to this controversy, explaining how and why NIAB resisted the RCT. Staff at NIAB recognised that the adoption of the RCT came with losses as well as gains. These losses will be introduced here and subsequently revisited in Chapter 5. At the same time, Section IV also ties together the Chapter's two separate problems; NIAB's status as a field trialler and its choice of trialling methodology. NIAB's half-drill strip placed a heavy burden on its seed multiplication capacities. This forced the Institute to revisit the question of seed multiplication, one which had ostensibly been solved. Only by finally successfully securing its position as a field trialler – a campaign that threatened the Institute with *closure* – could NIAB's preferred trialling methods also prevail over randomization. In

⁷ Parolini (2013).

one move, NIAB's status as a field trialler and its choice of trialling methodology became secure.

Section II: The demise of the Svalöf model, 1921-1924

Despite the massive sums dedicated to the Institute upon its foundation, NIAB began in financial crisis. In November 1921 the Director, Wilfred H. Parker (of whom more will be said in Chapter 3), succeeded in negotiating a grant of £1420 and a further loan of £5539 from the DC to help save the Institute from grinding to a halt under the weight of its own debt. In addition, £5000 of NIAB's investments had to be released, the interest on which would otherwise have gone towards providing the Institute an annual income.⁸ Parker had to make further requests for aid in September 1922. Once again he wrote to the Treasury and the DC, this time asking for a grant of £5645 to cover over-expenditure on the OSTs building and a loan of £5712 to cover half the outlay on NIAB's offices.⁹ Vice-chairman of the DC, Vaughan Nash, provided the Commission's response; NIAB's Council "were in error in assuming (as apparently they did assume when they discovered that these estimates were being exceeded) that they might proceed without further sanction from Their Lordships and rely upon their outlays being re-imbursed by advances from the Development Fund."¹⁰ Despite this forbidding start, the DC was prepared to help NIAB as best it could. Not only was the £5621 loaned in 1919 for the building of the OSTs to be turned into a grant, but the newly requested £5645 grant towards the OSTs was also to be accepted. On the other hand, the loan for NIAB was denied.¹¹

⁸ NIAB, D-1, Directors Monthly Reports, November 1921.

⁹ NA, T 161/3 (former reference S. 208/2) Letter from Parker to The Secretary of the Treasury, 5/9/1922. How such sums were arrived at - considering that this was actually one and the same building - must have once again rested upon the basis of square footage, though even on these grounds such numbers look a little creative.

¹⁰ NA, T 161/3 (former reference S. 208/3) Report of the Development Commissioners on the application from the National Institute of Agricultural Botany for further advances the Development Fund in aid of expenditure on the Institute's buildings and other properties, 31/10/1922.

¹¹ Here NIAB was perhaps a little lucky that a large sum of unallocated money had just been made available by the Corn Production Acts (Repeal) Bill. This highly controversial episode in the history of twentieth-century British agriculture, sometimes referred to as 'the Great Betrayal', has been dealt with by numerous agricultural historians. Whetham (1974), Cooper (1986), Cooper (1989), Penning-Rowsell (1997). This support of agricultural science, with £1 million that was otherwise meant to directly subsidise farming, is an important moment in the history of state patronage of science and deserves further scrutiny. Currently the only other recorded instance of an agricultural science institute benefitting directly from this windfall (aside from NIAB) is found in Keith Vernon's account of the history of the National Institute for Research in Dairying. Vernon (1997) p. 326.

NIAB's partial success with the DC in 1922 was thanks to the latter's abiding conception of the Institute as a British Svalöf. The requests for the OSTs were granted on the grounds that these debts hampered NIAB's commercial potential. The DC wrote that they

recognise the great importance of developing the Institute on the lines of the original programme – that is as an institution which will secure for the agriculturalists of this country the very valuable benefits which the Svalöf Institute has conferred on Sweden. They see no reason why the programme aimed at should be less successful than that as Svalöf has been, nor have they changed their view that if a seed business in the valuable plants which this Institute can command, is prudently conducted, the work should be self-supporting and earn sufficient profits to repay the loans made to the Council.¹²

The loan for NIAB was denied for much the same reason. From the perspective of the DC, the Commissioner's had already paid for Svalöf, it was up to the Council of NIAB to produce it. In return for this financial assistance, the DC now demanded a fresh report on NIAB's seed multiplication methods and how they were to be made remunerative.

Back in Cambridge, NIAB's Director had begun to stimulate debate with his 1922 publication 'The Testing, Multiplication and Distribution of New Forms of Farm Crops'. This small pamphlet did not clarify the Institute's future in certain terms, but instead opened up the discussion. Parker stressed that NIAB was going to first look for candidate varieties, test them against competitors and only multiply those that proved themselves superior (and then only if the original plant breeder wished for NIAB to do so, otherwise the Institute would simply recommend the variety).¹³ On a quick reading therefore, such a publication hardly moved beyond previous statements of NIAB's methods and goals. The implicit separation of trialling work from multiplication work could, for instance, be understood as a statement of the obvious. It was always going to have been necessary to trial varieties before selling them. One might also read this pamphlet as an important political move. In order to avoid looking purely like a multiplication farm for the Cambridge PBI, Parker was here emphasising how new varieties might originate from any breeder, not just publicly funded ones. Yet in other respects the pamphlet is more problematic. Trialling had previously only ever been referred to as merely a necessary part of the process of bringing a new variety to

¹² NA, T 161/3 (former reference S. 208/3) Report of the Development Commissioners on the application from the National Institute of Agricultural Botany for further advances the Development Fund in aid of expenditure on the Institute's buildings and other properties, 31/10/1922.

¹³ Parker (1922). A copy can be accessed at the British Library: UIN: BLL01000578633

market. It was NIAB's capacity as a seed multiplier and 'semi-commercial' operation that had always been emphasised in negotiations with the DC. The separation of trialling from multiplication left open the possibility that one activity might now prosper at the expense of the other. In addition, it had never been suggested, as Parker now did, that NIAB might trial a variety even if it was not eventually going to be handed over to the Institute for multiplication. Two appropriately divergent conceptions of NIAB soon followed.

In March 1923 NIAB's secretary, F.C. Hawkes, outlined a new conception of the Institute, one which focused on building its reputation for high quality seed.¹⁴ On Hawkes' view NIAB's current and future prospects were not good. Not only did he believe that in order to break even, the Institute would need to market at least one new variety every year, he also thought it was unlikely that any new variety – other than Biffen's HH wheat, to be discussed shortly – would soon be available for distribution. More importantly, thanks to the three years of testing required before a variety could be sold (the minimum level of rigour that NIAB believed necessary) even if the PBI or some other breeder did produce a new variety, this income would be many years off. In contradiction to Weaver's emphasis that NIAB should not engage in work that directly competed with the trade (at least, that the Institute should not do so overtly), Hawkes' scheme was not restricted to new varieties. His plan instead involved the Institute selling NIAB 'brand' pure lines of existing plant varieties. He admitted that this commercial venture contradicted Weaver's 1919 memorandum, but at the same time highlighted that it conformed very well with the aims outlined in Parker's more recent pamphlet, in which the Director had also opened up the possibility of more aggressive commercial activities. Should the trade fail to purchase the entire stock of a NIAB variety, wrote Parker, the Institute would be entitled to sell its seed to farmers directly, bypassing the seed traders who were otherwise relied upon as distributors. By this time the potential conflict of interest faced by those seed traders tasked with distributing the 1917 and 1918 wartime seed stocks, as seen in Chapter 1, had finally been identified as a potential limit on the successes of those multiplication schemes, and also therefore on any potential future success that NIAB might enjoy. In polar opposition to Hawkes' scheme sat Edwin Sloper Beaven (Figure 2.2), the trade representative that came to so dominate the Institute's early activities and who conceived of NIAB in yet another distinct way.

¹⁴ NIAB, T-1, Crop Improvement Committee Paper No. 12, circulated 20/3/1923.



Figure 2.2: Edwin Sloper Beaven (1857-1941).

Beaven, who is already relatively well known to historians of British agricultural science, had been breeding barley varieties on his own estate in Warminster before the turn of the century, and on Russell's account ranks amongst the 'last of the amateurs' in British agricultural science.¹⁵ As far as amateurs go, Beaven had access to the ear and resources of the most influential agricultural scientists of the early twentieth century and, through his membership on NIAB's Council, would come to change the arrangements of agricultural trials across Britain and the empire. Made wealthy by the maltings into which he married, Beaven was a "prosperous member of the British upper-middle class with a serious interest in science".¹⁶ As a strong believer in the superiority of private commercial solutions to agricultural problems over and above the

¹⁵ Russell (1966) pp. 260-263.

¹⁶ Palladino (1994) p. 419.

interventionist programmes of the state, Beaven did not mince his words in reply to Hawkes' memorandum.¹⁷ "Dr. Beaven...dissented from the proposals; he felt that the Institute was not capable of undertaking large commercial enterprises successfully".¹⁸ It would be hard to find clearer or more direct evidence of the confusion of purpose that surrounded NIAB upon its opening, as emphasised throughout Chapter 1. Beaven instead argued that the Institute should give up pretensions to self-sufficiency, presumably instead working on a permanently reduced state grant.¹⁹ While Hawkes had emphasised NIAB's commercial potential, Beaven instead capitalised on the Director's implicit separation of seed multiplication from field trialling in the latter's 1922 pamphlet. Beaven claimed that the Ministry of Agriculture in Ireland had vastly increased the value of barley by merely conducting extensive trials and uncovering the best existing varieties. NIAB should therefore offer this service to British agriculturalists. Such a scheme, as has been earlier emphasised by Palladino, was most amenable to commercial breeders. Concentrating on field trialling not only provided a trialling service to seed traders, but also diverted attention and resources from NIAB's Svalöf activities. Beaven was thus personally and commercially invested in seeing NIAB become a national trialling centre; personally, because his reputation was closely associated with his distinctive trialling methodology, to be discussed in Section III (A); commercially, because a national clearing house was far more appealing than a national competitor.

Aside from the likes of Beaven and his trade colleagues, trialling was an attractive option for NIAB for other important reasons. The congruence of field trialling with the Institute's broad aims, and the activities' eminently sensible appearance have already been highlighted in the introduction. Four other attractive qualities can now be drawn out. Firstly, field trialling is complicated. This emphasises the scientific credentials of the Institute's staff, helping to build its reputation. Secondly, field trialling is expensive. If this were not the case, trialling would not constitute a sizeable enough activity to drain resources from more controversial activities (such as seed multiplication) or sizable enough to warrant the continued existence of NIAB. Commercial seed multiplication work was all the less desirable at a time when the arable industry was slipping back into a state of depression, as it did in the interwar

¹⁷ Palladino first highlighted this aspect of Beaven's perspective, evidenced most directly by the dedication written for Beaven in Daniel Hall's *A Pilgrimage of British farming, 1910-1912*. Hall (1913). Palladino (1994) pp. 423-424.

¹⁸ NIAB, T-1.2, Minutes of the 8th Meeting of the Crop Improvement Committee, 19/4/1923.

¹⁹ NIAB, C-1, Council Paper No. 65.

period.²⁰ Thirdly, the practice had become a central and distinguishing feature of the agricultural sciences by this time.²¹ Most widely celebrated within the UK was the work conducted by Rothamsted on soil and fertilizers.²² Finally, and most importantly for the present Chapter, provided the trialling arrangement chosen was of the right character, field trials could form a genuinely important source of information for farmers, not just breeders. As Harwood has argued, the greater the emphasis placed upon local geographical and climatic conditions, the less likely the result is to be of value to (or desired by) a private breeder, and the more likely it is to be of benefit to farmers, particularly those working in the vicinity.²³ While the question of geography will arise in this Chapter, the aim is to demonstrate that choice of trialling method itself – only part of which includes the problem of trialling location – can reflect different attitudes to agricultural, commercial and scientific communities.

With all of these incentives in mind, NIAB eventually steered something of a middle course between the DC's, Hawkes' and Beaven's conceptions, though clearly listing toward the latter. Rather than entirely give up the sale of premium seed, the imminent sale of Biffen's new HH wheat was touted as sufficient proof of the seed multiplication principle. It was agreed that in 1924 HH would be multiplied and 2000 quarters (500 tonnes) made available to the trade.²⁴ This was a far smaller amount of seed than had been anticipated by Hawkes, who had contemplated a figure of 5000 quarters. At the same time NIAB adopted Beaven's trialling scheme. To the DC they argued that presently "Such trials are generally unsystematic and uncoordinated nor is it generally recognised what care and skill require to be given if a variety trial is to become more than a demonstration."²⁵ The very early distinction between *tralling* and

²⁰ Brassley et al. (2006), Webber (1982). Savage (1996) pg.122 on the place of agricultural science within Ministry of Agriculture policy following the removal of agricultural subsidies. Savage is also useful for placing Lawrence Weaver in better bureaucratic context. Science was all the more important for those who, witnessing this retreat by the British government, took inspiration from the huge state-planned expansion of agricultural production that took place in Russia at this time. Griffiths (2000), Yaney (1982).

²¹ See Tyler (1973) p. 3 for the importance of field trialling as an activity around which the burgeoning network of agricultural education centres could coalesce.

²² Russell (1966) is in a large part a history of Rothamsted and its place within British agricultural science. Russell was himself director of the Institute between 1912 and 1943. For more on Russell see Thornton (1966). On the growth of the domestic fertilizer industry see Thompson (2000).

²³ Harwood (2012).

²⁴ NIAB, T-1, Minutes of the 9th Meeting of the Crop Improvement Committee, 24/5/1923.

²⁵ NA, T 161/3 (former reference S. 208/4) Memorandum on the Crop Improvement work and the financial position of the Institute for submission to the Development Commissioners, August 1923.

demonstration contained in this passage will be returned to in Section IV. So soon after its foundation, NIAB's existence was no longer to be justified by the potential fruits of Mendelian research, but upon the complexity of the varietal market faced by farmers. Indeed, it was now even suggested that merely introducing novel varieties might do more harm than good.

The Council regret that the estimates which they made in the early stage of the Institute's existence as to the prospect of realising at an early date a substantial profit from the distribution of new forms will not materialise. *Indeed the Council are of opinion that the mere multiplication of the number of existing forms is of no benefit to agriculture, but rather the reverse.* They will not attempt to distribute any new forms which do not show outstanding merit. Such forms are only rarely produced and it is obvious therefore that only at intervals of a few years will substantial profits be forthcoming from this source.²⁶ (Emphasis added)

This early twentieth century belief in an overabundance of new varieties has important consequences for the history of intellectual property in plant breeding, which will be discussed in Chapter 5. Having made these proposals to the DC on the Institutes reorientation, NIAB now asked for its financial arrangements to be altered accordingly, asking for the £16, 453 of its remaining loans to be turned to grants and to have all interest on its loans expunged. The Institute's decision to instigate widespread trials of extant varieties was therefore at one and the same time an evaluation of Mendelian successes, a solution to NIAB's precarious financial position, an end to its 'semi-commercial' status and, quite clearly, a victory for its seed trade representatives.

How could MAF and the DC respond? After restating the main thrust of NIAB's report, MAF's own memorandum (circulated to the DC in November 1923) made a strong case for the continued patronage of NIAB on the grounds that trialling was an essential task that "must be done by an impartial and authoritative body".²⁷ With Lawrence Weaver ensconced as head of the Ministry's Land and Supplies Division, it is unlikely that MAF could have concluded otherwise. After a longer series of negotiations, the DC also accepted that NIAB was likely to become a radically different Institute, one requiring constant state support; "the Commissioners desire to express

²⁶ NA, T 161/3 (former reference S. 208/4) Memorandum on the Crop Improvement work and the financial position of the Institute for submission to the Development Commissioners, August 1923.

²⁷ NA, T 161/3 (former reference S. 208/4) Future Policy of the National Institute of Agricultural Botany, Cambridge: Proposals of the Institute. That this was circulated to the DC in November 1923 is gleaned from NA, T 161/3 (former reference S. 208/4) Letter from R.T. Warner to the Treasury on behalf of the DC, 7/3/1924.

agreement with the view of the Council of the Institute that, quite apart from the production and distribution of the seed of new varieties, the work of testing undertaken by the Institute is of great importance to agriculture and fully justifies the Institute's existence."²⁸ A more candid response to NIAB's transformation came from the office of Eric St. John Bamford, a civil servant who had acted as Private Secretary to Stanley Baldwin during the latter's time as Financial Secretary to the Treasury.²⁹ An unofficial report on NIAB written for Bamford, considered the Institute a failure and contemplated its closure. "It appears" wrote the report's author

that the breeding of new varieties is slow, the testing is costly, the multiplication requires additional plant sts. and of the only profitable work – distributing and marketing – there is little demand. One would have imagined that all this would have been known before but, however that may be, it seems pretty clear that, as things stand at the present, unless we are prepared to like [the fuss?] of forcing the undertaking to close down, which no doubt would be politically impractical – especially in view of the large amounts subscribed voluntarily at its inception – the concessions recommended by the M.A.F. and Dev. Comm. are the best that are likely to produce any effective result from the State's investment³⁰

These concessions included funding NIAB until at least 1927 (despite the initial agreement that the Institute would become self-sufficient) that payment on their existing loans – which still stood at over £16, 000 despite a number of considerable reductions – would be deferred, and that the Institute could realign itself as a field trialler rather than a commercial seed multiplier. In return NIAB was to submit a full reassessment of its position by no later than 1926; it was to make no further requests for funding to expand its facilities; and there would be no room for an increase in the annual grant it received.³¹ Bamford replied to this unofficial report a week later. His note reads: "Owing to Sir L. Weaver's enthusiasm the Institute has a very fine + costly building; but its work turns out to be neither as extensive, nor as important, nor as remunerative as was expected. I think we can only concur in the DCs

²⁸ NA, T 161/3 (former reference S. 208/4) Letter from R.T. Warner to the Treasury on behalf of the DC, 7/3/1924.

²⁹ For more on Bamford see his *Times* obituary. 'Sir Eric Bamford', *The Times*, (1957), Apr 15, p. 14.

³⁰ NA, T 161/3 (former reference S. 208/4) Hand written note headed 'Bamford', first sentence beginning "Under the original scheme it was anticipated..." 10/3/1924.

³¹ NA, T 161/3 (former reference S. 208/4) Francis Floud to the Secretary of the Treasury 7/11/1923.

recommendations.”³² While NIAB’s status as a field trialler was ostensibly settled, for the DC there was still a chance that some remunerative version of Svalöf might survive. Rather than immediately turn the remaining loans to grants, the DC agreed to freeze the interest and defer all payments until after HH had proven or disproven the financial capacities of seed multiplication. The persistence of NIAB’s status as a seed multiplier had important implications in the late 1920s, as will be seen in Section IV of the present chapter, and throughout the rest of its first fifty years, particularly in Chapters 4 and 5.

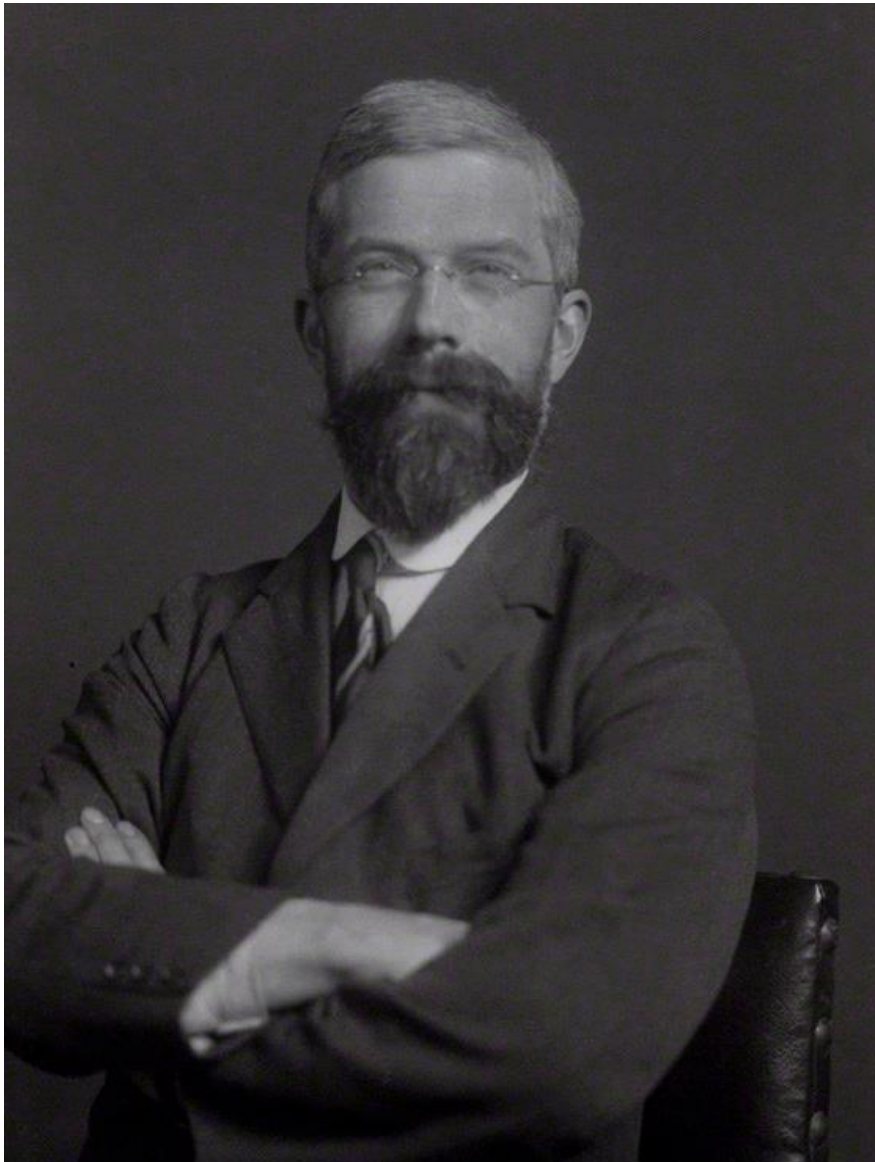
Section III: The trialling methods and social commitments of E.S. Beaven and R.A. Fisher

While the question of NIAB’s purpose was debated, the Institute’s preliminary trialling programme was constructed.³³ The aim of this Section is to explain how different trialling methods reflect the social commitments of experimenters. Section III (A) uncovers the origins of Beaven’s ‘half-drill strip’. This was the method that NIAB adopted in its flagship trials, those assessing the yield of different varieties. In developing his method Beaven had relied upon and collaborated with people directly involved with the realities and practicalities of agriculture as faced by farmers. Thanks to this pedigree, NIAB could easily and economically embed its trials within the existing agricultural education and extension network, rather than merely rely on a small number of stations owned by the Institute itself.³⁴ That many locations for trials were necessary was thanks both to the variable nature of agricultural plants when grown under different conditions and NIAB’s financial situation, which required that the Institute sought collaborative partnerships with sites other than those under its direct control. Section III (B) will compare this method to that of ‘randomization’ advanced by

³² NA, T 161/3 (former reference S. 208/4) Hand written note headed ‘Bamford’, first sentence beginning “Under the original scheme it was anticipated...” 10/3/1924. Note written at the end of this report signed EST Bamford, 17/3.

³³ Between September 1921 and February 1930 Parker wrote a monthly report on NIAB largely focusing upon changes in Committee/Council members, distinguished guests, the continuing work of the OSTs and the content and location of field trials. All of these can be accessed in the NIAB archive and constitute an essential resource for this chapter. NIAB, D-2. They do, however, capture little of the disagreements and divergences which are clearly evident in the minutes of NIAB’s various committees. This reflects the function of the Director’s Monthly Reports which was merely to chart the Institute’s gradual progress for the benefit of all Council members, regardless of their own professional perspective.

³⁴ The interwar period saw an expansion in the number of county agricultural advisors and the eventual creation of the Agricultural Advisory Service. Holmes (1988). NIAB looked to work closely with such organizers, often succeeding in having them grow small repetition plots of varieties for the instruction of farmers in each region. An example of a very large trial that relied upon this cooperation is discussed at the end of Section IV in the present Chapter.



**Figure 2.3: Ronald Aylmer Fisher (1890-1962). Photograph taken 1931.
Image held by the National Portrait Gallery.**

a rival agricultural scientist – R.A. Fisher (Figure 2.3) – working at a rival agricultural science institute, Rothamsted Experimental Station. In numerous accounts it is held that Fisher introduced truly scientific trials to the agricultural industry through his advocacy of randomization, as popularised in his 1925 *Statistical Methods for Research Workers* and elaborated on in a subsequent article.³⁵ “A dramatic change in the design of experiments occurred in the first half of the twentieth century, from systematic design to the randomized design of experiments. Fisher was largely responsible for these changes in experimentation and statistics.”³⁶ While some farmers may well have often visited Rothamsted, the Institute did not share NIAB’s collaborative orientation.

³⁵ Fisher (1925), (1926).

³⁶ Hall (2007) p. 295.

At present it appears that all of RES's flagship research was conducted upon its own grounds, rather than across the country and in dedicated collaboration with farmers and colleges, as was the case at NIAB. This is an exceptionally strong point to make about RES, though without further dedicated scrutiny of the Station and its archives, it cannot be made too boldly. It is a conjecture based on both the existing secondary literature, which makes no mention of research done on sites other than those owned by RES, and the Station's own annual reports.³⁷ The latter but rarely mention work undertaken in collaboration in the sense found at NIAB. For instance, the sections dedicated to botany and field trialling in RES's fiftieth anniversary report focus entirely, and quite proudly, only on work conducted on its Harpenden and Woburn sites. 'Broadbalk', 'Hoosfield', 'Barnfield' and other farms attached to RES headquarters are addressed in detail, while there is no mention of any work carried out across the country. At its most limited therefore, the present argument is merely that collaborative work undertaken in shared spaces, often owned by other organisations, mattered far more to the poorer and botanically focussed NIAB, than the richer chemically and statistically focussed RES, and (as we shall see), this was reflected in their chosen trialling methodologies. Indeed the very nature of Rothamsted's investigations – aimed largely at soil structure and composition and not varietal differentiation – may well have actively discouraged the multiplication of trials across a wide geographic area in the majority of the Station's experiments. Unlike plant varieties, chemicals (fertilizers, pesticides, fungicides, etc.) were only thought to be valuable when they acted independently of geographic and climatic conditions.³⁸ Regional variation was a problem to be controlled for, not incorporated into experimental design. Following this outline of the fundamental differences between Beaven's and Fisher's methodologies, Section IV will demonstrate how NIAB overcame Fisher's methodological challenge. For those who have claimed a revolutionary status for Fisher, the story told in Section IV is therefore highly problematic. This Chapter gives an alternative view of the rise of the RCT in the interwar years, one also wedded to the

³⁷ The most important secondary sources include Fream (1888), Grey (1922), Parolini (2013), Russell (1966). For the fiftieth annual report see Anonymous (1958).

³⁸ In Britain there does not appear to be an analogue for Harwood's German community of private plant breeders who had 'cosmopolitan' all-encompassing ambitions for their plant varieties. Instead, all breeders appeared to be 'playing the same game' so to speak, at different times stressing the cosmopolitan or local aspects of their breeding programmes and varieties when appropriate. This is perhaps due to the differences in the size between the two countries, but also perhaps because the British plant breeding industry, particularly with regard to public versus private breeders, was much less disaggregated. Harwood (2012) p. 45.

agricultural industry, but which is substantially different. Those who rejected randomization did not do so irrationally, while Fisher's promotion of randomization was linked with his own values and priorities, and those of the institution at which he worked. Randomization may well appeal to a certain statistical ideal, but impedes the capture of important botanical information, while failing to facilitate the valuable social functions attached to national trialling work.

(A): The origins of Beaven's 'Half-Drill Strip'

Earlier we saw Beaven's distaste for government initiatives and belief in the power of the market to solve agricultural problems. Nevertheless, he conducted this discussion around the table of an institution maintained by national funding and tasked with the protection of British agriculture. Moreover, he did so as a long term collaborator with local county initiatives, such as the Wiltshire Technical Education Research Committee and the Norfolk Agricultural Station (NAS).³⁹ While membership to the latter seems to have been largely restricted to the wealthiest farmers, Beaven's attention was nevertheless directed toward agricultural problems as they were actually faced in the field.⁴⁰ Furthermore, his field trialling methodology was developed alongside some of the leading figures in applied statistics, most notably Thomas Barlow Wood and William Sealy Gosset.

Wood (Figure 2.4) was made Drapers Professor of Agriculture at the University of Cambridge in 1907 and married Beaven's daughter, Margaret, in 1914.⁴¹ While his own research came to focus upon animal physiology and genetics (an institute for which was assembled for him by the DC alongside Biffen's PBI) much of his career had been built around field trialling and agricultural demonstration work. Wood had, for instance, been intimately involved in the foundation of NAS and in 1905 arranged for its experimental programme to become the responsibility of the University.⁴² Established by wealthy Norfolk farmers, this Station was an important early location for agricultural trialling and research. This was true not only for Wood but also for Biffen and Beaven,

³⁹ On his work with the Wiltshire Committee see Palladino (1994) p. 420.

⁴⁰ Figures for the changing membership of the Norfolk Agricultural Station can be found in its own institutional history, Hutchinson and Owers (1980) p. 61. While in 1930 there were only 496 members for a county consisting of 6898 holdings (with a holding consisting of twenty acres or more), by 1957 these figures stood at 1121 and 6103 respectively.

⁴¹ For more biographical detail see Russell (1930).

⁴² Morley Agricultural Foundation archive, Norfolk Agricultural Station annual report: 1922-1923, p. 5. Copies of these reports have been scanned and uploaded to the Foundation's website. <http://www.tmaf.co.uk/archived-reports>



Figure 2.4: Thomas Barlow Wood (1869-1929). Portrait from Russell (1930).

both of whom trialled varieties there. NAS also sold premium quality seed and by 1914, just as the experimental work of the station was interrupted by the First World War, it had sold 467 coombs of wheat and 864 coombs of barley, large quantities of the latter being strains of Archer gifted by Beaven himself.⁴³ It was with this background, and that of his work at Cambridge, that Wood introduced statistical techniques into agricultural field trials.

Wood's 1910 paper 'The Interpretation of Experimental Results' co-authored with the Cambridge astronomer F. J. M. Stratton, was the first publication to address the probable error of results produced in a field trial.

It might seem at first that no two branches of study could be more widely separated than Agriculture and Astronomy. A moment's consideration, however, will show that they have one point in common: both are at the mercy

⁴³ Morley Agricultural Foundation archive, Norfolk Agricultural Station annual report: 1915-16, p. 10. A coomb equates to four bushels, or 1/8th of a tonne. NAS was successful enough in its cooperative seed multiplication strategy that it could come to afford larger premises and farms. See Hutchinson and Owers (1980) for more detail.

of the weather. The astronomer's measurements come short of absolute accuracy because of a great number of varying atmospheric conditions, each of which is equally likely to make any one result high or low. He has to obviate this unavoidable lack of accuracy by making many independent observations, and taking their average. This is, or should be, the method followed by the agriculturalist.⁴⁴

Wood's primary motivation was a professional one. Strong conclusions and recommendations had too often been based upon single trials. As farmers increasingly depended upon the pronouncements of agricultural scientists, he argued, the more certain the latter ought to be of their conclusions. What is more, the field trial had become a location of primary importance for the relationship between scientists and farmers. "By laying down such local plots and meeting farmers on them to inspect and discuss the results, the staffs of the various institutions have been brought into touch with the agricultural public, and a mutual understanding has resulted." To ensure that these field trials performed both social and research functions, it was necessary to guarantee that "the precision of the methods adopted was capable of solving the problems posed."⁴⁵

It is instructive that such concerns do not feature at all in a paper published less than a year later, in the very same journal, and written by agricultural scientists who were nevertheless attempting to achieve the same ends. In 1911 Daniel Hall, our DC figurehead seen in Chapter 1, and W. B. Mercer – both of RES – set their discussion in decidedly statistical terms, making no reference to Wood's paper. In a demonstration of what privately funded institutions can do (especially when further inflated by grants from the Development Fund), researchers at Rothamsted had selected an acre of wheat that appeared uniform. This had been separated out into 500 separate plots. The plants in each were then individually harvested and measured, supplying the data for an analysis of variation across the field. Their chief conclusion after this mammoth task was that "the error attached to a single plot cannot be greatly reduced by increasing its area above one-fortieth or one-fiftieth of an acre, and that the probable error can be reduced to a working minimum by taking four or five similar plots scattered about the field under experiment."⁴⁶ In other words, the ideal plot size (according to standards of economy set by statistical analysis) was about one fortieth of an acre. Attention is drawn to this particular experiment and publication for four reasons. Firstly, and most

⁴⁴ Wood and Stratton (1910) p. 425.

⁴⁵ Wood and Stratton (1910) p. 434.

⁴⁶ Hall and Mercer (1911) pp. 126-127.

obviously, because of its common cause with Wood. But also conversely (and secondly) its divergence, thanks to its preoccupation with solving statistical puzzles and producing statistically based rationales for research. These differences reflect the nature of the institutions at which these authors worked. Rothamsted – the premier British agricultural science institute – never depended upon the support of the local farming community in the way that even relatively elite institutions (such as NAS and the University of Cambridge) did. Thirdly, Hall and Mercer’s emphasis upon the ‘scattering’ of plots amongst the experiment foreshadows later work, again sponsored by RES, and which we come to in Section III (B). Finally, the authors include an appendix which describes how best to arrange experimental plots. Written by William Sealy Gosset (Figure 2.5), this appendix partially anticipates the half-drill strip eventually popularised by himself and Beaven.



Figure 2.5: William Sealy Gosset (1876-1937).
Photograph taken the year of his death.
From McMullen (1939).

Gosset was a brewer and statistician who worked for Guinness between 1899 and his death in 1937, aged 61.⁴⁷ In his appendix to Mercer and Hall's paper, Gosset sets out the rationale for what will eventually become known as Beaven's half-drill strip. He approaches the problem of experimental error from a remarkably different perspective to that of Mercer and Hall. The latter had assumed that the ideal trial would be the largest possible (because this would eliminate more experimental noise) and had then gone on to demonstrate that – beyond a certain size – trials actually begin to converge upon virtually the same experimental value. Gosset not only assumed the reverse – that the smallest trials would produce the most reliable results – but had also attended to a different kind of trial: the multiple-variety trial. These are the kind of trial that would eventually be conducted by NIAB. In a multiple-variety trial, unlike the single-variety trial conducted by Hall and Mercer, all forms of environmental variation (be they flooding, chemical composition of the soil or even the feeding habits of rabbits) are significant and location dependent. It is therefore not desirable to average them out of the experiment. Instead it is important that the varieties under comparison are grown in environments as similar as possible i.e. on the smallest manageable plots.

...if we are comparing two varieties it is clearly of advantage to arrange the plots in such a way that the yields of both varieties shall be affected as far as possible by the same causes to as nearly as possible an equal extent. To do this it is necessary, from what has been said above, to compare together plots which lie side by side and also to make the plots as small as may be practicable and convenient.⁴⁸

His alternative space saving suggestion was to compare one variety against another by setting them side by side, ensuring they experience the same geographic and climatic variations. As we shall see, this is the fundamental basis of the half-drill strip, though significantly it is not yet so named. Not only does Gosset not use that name, but he had also set aside the question of trialling practicalities.

In 1911 Gosset does not make any reference to how his suggested plot formation might actually be sown. In a diagram he differentiates between his two

⁴⁷ For more biographical detail on Gosset see his two testimonial pieces in *Biometrika*, McMullen (1939) and Pearson (1939) and also his 'Statistical Biography', Plackett and Barnard (1990). A little more of the industrial and commercial context in which Gosset worked can be gleaned from Dennison and MacDonagh (1998) including the diversity of his statistical investigations on the behalf of Guinness, which included mortality rates among brewery workers and the effect of advertising upon sales (p. 132 and p. 183 respectively). For his collaboration with Beaven see Box (1987).

⁴⁸ Hall and Mercer (1911) pp. 128-129.

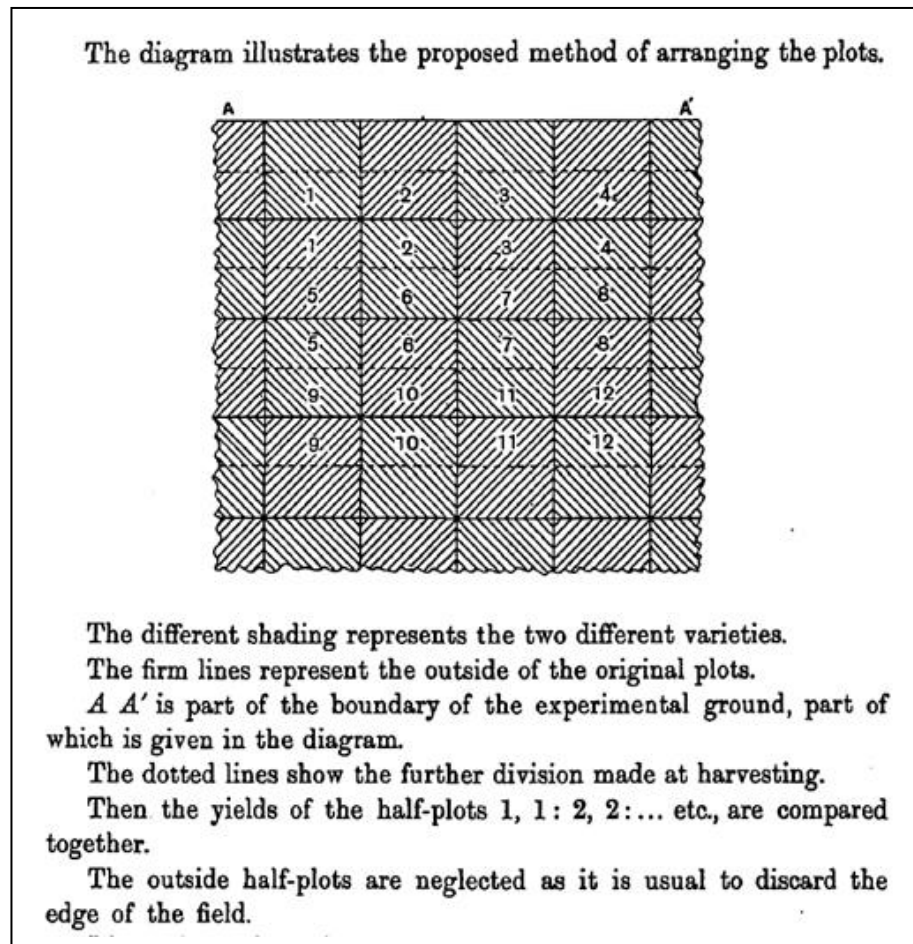


Figure 2.6: Gosset's representation of an ideal plot layout for the comparison of two varieties. From Mercer and Hall (1911) p. 130.

varieties with two different types of shading; lines that from left to right travel downward and lines that from left to right travel up (Figure 2.6). This can make discussing the diagram difficult, so instead a colour-coded version (Figure 2.7) is referred to. The lines that from left to right travel down are designated variety X (in green), while the lines that from left to right travel up correspond with variety Y (in red). It should now be easier to appreciate that Gosset's proposed arrangement would have required a constant switching of varieties either within the seed delivery box (in the instance of the blue arrow) or either side of the seed box (in the instance of the white). If one drilled the field vertically (the white arrow from plots 1 and 2 to plots 9 and 10) variety X appears in the top plot on the left hand side, then on the right (at the boundary between 2 and 6) and then once again on the left (at the boundary between 5 and 9) and so on. In the same way, if one drilled the field horizontally (the blue arrow from plot 1 to plot 4), variety X is first found in the top plot, which is then swapped for variety Y (at the boundary between the discarded edge plot and plot number 2) which is swapped once again for X, and so on. This arrangement allowed Gosset to make as



Figure 2.7: Colour-coded representation of Gosset's 1911 plot layout.

many different comparisons as possible between two varieties and also between plots of the same variety. However, it would be practically impossible to sow, or at least not possible without a great deal of time, care, and patience. Gosset's arrangement would pose less of a difficulty for crops sown by hand rather than by tractor or horse, or for exceptionally small plots, but would still require a great deal of care and attention. We are left holding onto these possibilities because in his five page long appendix Gosset merely seeks to establish the logic of the approach, leaving aside questions of practicality (other than to say plot sizes cannot become too small, because edge plots are always discarded.) It was Beaven, deeply embedded in agricultural science and industry, who put the 'half-drill' into the half-drill strip.

Beaven's method was first described by Wood in the NAS annual report for the years 1914-1915. "Attempts have been made the last two seasons to use the strip test devised by Mr E.A. Beaven, of Warminster. This consists in blocking the middle coulter of the drill, and dividing the seed box in the middle with a piece of board...In this way strips of the two varieties are sown side by side with a space between them left by the blocked coulter."⁴⁹ Little else was explained. It would be Beaven himself who eventually came to publish a full account of the method, though some seven years later. The First World War obviously constitutes part of the delay, though the main reason for eventually publishing in 1922 was that his method was to become the preferred

⁴⁹ Morley Agricultural Foundation archive, Norfolk Agricultural Station annual report: 1915-16, p. 16.

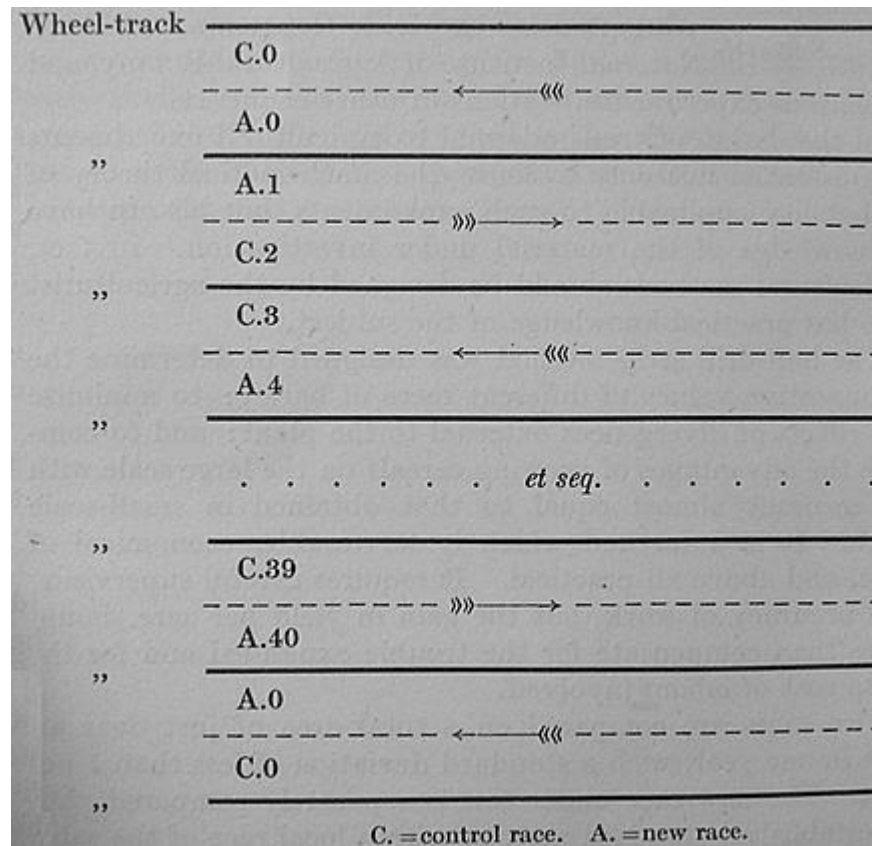


Figure 2.8: Diagram of Beaven's half-drill strip showing the direction of the drill as it crosses the field. One half of the drill (C) is fed with the control variety, the other (A) the variety against which it is to be tested.

method for the flagship yield trialling programme of the recently opened National Institute of Agricultural Botany. In two articles in the *Journal of the Ministry of Agriculture*, Beaven explained the rationale behind NIAB's trialling work and the method to be adopted.⁵⁰ It goes without saying that his emphasis on trialling should be read in light of the developing debate over NIAB's purpose, as discussed in Section II. He supplied diagrams explaining how fields should be sown (Figure 2.8). "The effect is that after each "turn" of the drill, two half-drill-strips of the same race are seeded alongside, so that when the drill has made 21 "turns" there are 10 drill-wide-strips (20 half-drill-strips) of each race and two half-drill-strips- one at each end of the series." Such an arrangement overcame problems of sowing as inherited from Gosset's preliminary scheme.⁵¹ Beaven also explained how the machinery should be prepared, highlighted possible problems in the process of drilling, explained that on land that is highly irregular it is best to have strips cross over this variability as often as possible (so as to better absorb the anomalies) and took care to address concerns as to intricacy.

⁵⁰ Beaven (1922a) and (1922b).

⁵¹ Gosset endorses this method soon after. Gosset (1923).

Drilling will be found to be much less complicated than would appear from the above directions. Once the drill has been adjusted this goes forward as rapidly as with ordinary drilling. It is quite possible to drill 6 or 8 acres, viz. 6 or 8 separate yield trials in one day if the drill is made ready the day before and if the superintendent is familiar with the method, and has two or three intelligent helpers, one of whom must be an expert drills man.⁵²

Having been fully implemented by NIAB, the legitimacy of Gosset and Beaven's half-drill strip soon found itself challenged by a competitor.

(B): R. A. Fisher, *Rothamsted and randomization*

Of all the figures presented in this thesis Fisher perhaps needs the least introduction. Even those historians for whom he is more readily recognised as a population geneticist are aware of his earlier career as an agricultural statistician at RES.⁵³ However, few have attempted to investigate how this work was received by the wider agricultural science community. This is unfortunate as his much celebrated *Statistical Methods for Research Workers* – published in 1925 – constituted a major challenge to precisely this community and the results produced by institutions such as NIAB. The controversy which followed has been overlooked by Nancy Hall, the most recent historian to investigate the origins of Fisher's advocacy of randomization (what this entails shall be explained shortly) and who actually gives his agricultural context substantial attention. Instead, it is emphasised how close was the friendship between Fisher and William Sealy Gosset, who in the present Chapter is one of the strongest opponents of randomization.⁵⁴ When Hall, for instance, does come to the fact that Gosset never accepted randomization she writes that "Student [Gossett's pen name] did not adopt Fisher's view of the need for randomization" before moving on to repeat how "*Statistical Methods*, examined today, appears to be just another statistics book, but it was the first to advocate randomization rather than systematic experimental design".⁵⁵ Fisher's daughter, Joan Fisher Box, describes much more of the disagreement between Fisher and Gosset, concluding pragmatically that

⁵² Beaven (1922b) p. 440.

⁵³ The most comprehensive account of Fisher's life remains that of his daughter, Joan Fisher Box; Box (1978). On the influence of his time at Rothamsted on his eugenic views, see Mazumdar (1992). A standard interpretation of his importance in agriculture can be found in Gower (1988), Street (1990) and Armitage (2003). Fisher is also the central figure in Parolini (2013).

⁵⁴ Hall (2007) p. 299.

⁵⁵ Hall (2007) pp. 312-313.

On the basis of what was practicable in field trials, Gosset's arrangement had something to be said for it which Fisher's criticism did not touch. Nor did Gosset's response touch the correctness of Fisher's argument on behalf of randomization. It is a pity that the two great scientists and great friends should have spent the last year of Gosset's life divided by a quarrel which did credit to the understanding of neither. Their papers are sharp, if not actually unfair to each other. Fisher's initial rage was excessive, and his later actions lacked magnanimity. He had been touched on a tender point; it was a matter of right reasoning and he was adamant.⁵⁶

To Fisher, the issue of randomization may well have appeared as a matter of right reasoning. To Gosset, Beaven and the agriculturalists with which they worked, it was much more. Until a more systematic investigation of the reception of *Statistical Methods* within agricultural science institutes contemporary to RES is carried out, it will not be possible to know how unusual NIAB was in its dismissal.

The novelty that Fisher introduced to a wide scientific audience in 1925 was the requirement that the plots to which varieties/fertilizers/pesticides are assigned in agricultural trials (or their equivalent in other experiments i.e. the kinds of person a new medicine is to be tested on) be completely randomized.⁵⁷ Treatment or varietal plot assignment had to be decided by the use of some physical random process – such as selecting shuffled cards from a pack or coloured balls from a bag – rather than by some 'pseudo-random' decision dependent upon an experimenters' choices. This deployment of randomization is not to be confused with the randomization of samples taken from a population. By this time the randomization of samples was a common feature of agricultural trials, as we saw with the 'scattering' discussed by Mercer and Hall in their 1911 paper. Nancy Hall's argument that Fisher thereby "imported randomness from sampling into experimental design" and that "randomness that is a *property* of sampling became a *requirement* of experimental design" is very persuasive.⁵⁸ The proposed benefit from Fisher's randomization is that it prevents the

⁵⁶ Box (1978) p.270. Gigerenzer et al. mention the existence of a debate, even suggesting that randomization was "probably Fisher's most controversial contribution to the methodology of comparative experiments" but do not explore Gosset's objections, instead painting him as an "intermediary" figure between the views of Karl Pearson on the one hand and R.A. Fisher on the other. Gigerenzer et al. (1989) pp. 74-80. It is interesting to note that, for Fisher at least, there was potentially a filial element to his disagreement with Gosset, a Guinness employee, Fisher having married into the Gratton-Guinness arm of this dynasty. Fisher even entered into a correspondence with Rupert Guinness around 1925, following the latter's interest in the inheritance of scientific genius. Moore (2007) pp. 129-130.

⁵⁷ Though Hacking (1988) looks to consider the longer history of randomization in experiment prior to Fisher, he fully acknowledges that it was the work of the latter that inspired the widespread adoption of randomization.

⁵⁸ Hall (2007) p. 296.

experimenter from possibly biasing the trial and also ensures that any measure of significance is valid. This he put in direct contrast with the likes of Beaven's half-drill strip.

The first requirement which governs well-planned experiments is that the experiment should yield not only a comparison of different manures, treatments, varieties, etc., but also a means of testing the significance of such differences as are observed...the peculiarity of agricultural field experiments lies in the fact, verified in all careful uniformity trials, that the area of ground chosen for the experimental plots may be assumed to be markedly heterogeneous, in that its fertility varies in a systematic, and often a complicated manner from point to point. For our test of significance to be valid the difference in fertility between plots chosen as parallels must be truly representative of the differences between plots with different treatment; and we cannot assume that this is the case if our plots have been chosen in any way according to a pre-arranged system; for the systematic arrangement of our plots may have, and tests with the results of uniformity trials show that it often does have, features in common with the systematic variation of fertility, and thus the test of significance is wholly vitiated.⁵⁹

Fisher elaborated upon precisely how different randomly arranged trials are from their systematic counterparts in a subsequent article, published a few months later.

The *estimate* of error afforded by the replicated trial depends upon differences between plots treated alike. An estimate of error so derived will only be valid for its purpose if we make sure that, in the plot arrangement, pairs of plots treated alike are not nearer together, or further apart than, or in any other relevant way, distinguishable from pairs of plots treated differently. Now in nearly all systematic arrangements of replicated plots care is taken to put the unlike plots as close together as possible, and the like plots consequently as far apart as possible, thus introducing a flagrant violation of the conditions upon which a valid estimate is possible.⁶⁰ (Emphasis in original)

It seems likely that Gosset and Beaven's continuous multiple-variety half-drill strips were the archetype which Fisher here had in mind. The primary differences, therefore, between the RCT and the half-drill strip were that; on the Beaven method, the experimenter grew each variety alongside its control; on the Fisherian method, the experimenter had no say over where in the field each variety was to be trialled; and finally, that on the Fisherian method, little could be gleaned about the performance of varieties from simply looking at them in the field, knowledge (of any kind, never mind of a more reliable kind), could only be produced after statistical manipulation of the

⁵⁹ Fisher (1925) pp. 224-226.

⁶⁰ Fisher (1926) p. 506.

results, whereas on the Beaven method, at least something of use to the regional farmer could be achieved in the field.

Moreover in Fisher's view, multiple-variety trials were experiments of a "simple type". The ignorance surrounding multiple-variety trials and the numerous influences that might be argued to have contributed to their results fatally undermined their significance (in all senses) and thus their status. For Fisher, far more complex were those like the trials conducted at Rothamsted, "involving manuring or cultural treatment, the comparisons involving single factors, e.g., with or without phosphate, are of far higher interest and practical importance than the much more numerous possible comparisons involving several factors."⁶¹ He included a practical example of such an experiment, complete with plot diagram (Figure 2.9) pointing out that the experimenter should not be put off by how counter-intuitive a randomized arrangement might look. "Note what a "bad" distribution chance often supplies; the chloride plots are all bunched together in the middle of the first block, while they form a solid band across the top block on the right; in the bottom block on the right, too, all the early plots are on one side, and all the late plots on the other."⁶² Fisher's judgment

	2 M EARLY	2 S LATE		2 S LATE			1 S EARLY
1 S EARLY	1 M EARLY	1 M LATE	1 S LATE	2 M EARLY	2 M LATE	1 M EARLY	1 M LATE
	2 M LATE		2 S EARLY		1 S LATE		2 S EARLY
2 S EARLY	2 M EARLY		1 M LATE		2 S EARLY	2 S LATE	2 M LATE
	1 S LATE	1 S EARLY	1 M EARLY	1 M LATE			1 S LATE
2 M LATE		2 S LATE		2 M EARLY		1 M EARLY	1 S EARLY
2 S EARLY	2 M LATE	1 S EARLY	2 M EARLY	2 S LATE	2 S EARLY	2 M EARLY	
		1 M LATE		1 M EARLY	2 M LATE		1 M LATE
2 S LATE	1 M EARLY		1 S LATE			1 S EARLY	1 S LATE
2 M EARLY	1 M EARLY	2 M LATE	2 S LATE	1 S EARLY			1 S LATE
1 S LATE			1 M LATE	1 M EARLY	2 S EARLY	2 M LATE	
1 S EARLY		2 S EARLY			2 M EARLY	2 S LATE	1 M LATE

FIG. 1.—A COMPLEX EXPERIMENT WITH WINTER OATS.

Figure 2.9: Diagram of a randomized 'complex' manurial treatment trial as conducted at Rothamsted. Two types of nitrogenous manure, Sulphate (S) and Muriate of ammonia (M) in different quantities (0,1,2) are compared, the manurial dressing occurring either early or late in the season. Fisher (1926) p. 512.

⁶¹ Fisher (1926) p. 511.

⁶² Fisher (1926) p. 511.

of the value of 'simple' multiple-variety trials as compared to 'complex' manorial trials lends weight to the argument that the scientific orientations of these two institutions – Rothamsted towards chemistry and NIAB towards botany – alongside their social commitments – Rothamsted acting relatively independently and answerable only to other scientific professionals, NIAB having to adopt a more collaborative posture and answerable at least to some extent to farmers – impinged upon their assessments of the value of randomization. A farmer looking for evidence of varietal adaptability to his region would rarely have the opportunity (or inclination) to invest time and resources in an experiment arranged so poorly, regardless of the statistical reliability of its results. More to the point, a plot such as that described in Fisher's diagram, would suffer from precisely the same problems of sowing as discussed with regard to Gosset's 1911 layout. It would most certainly not constitute a persuasive demonstration of varietal suitability to agricultural conditions on the field scale. But then, this was not Fisher's aim.

In the fourth and final Section the history of the reception of randomization by agricultural scientists located outside of Rothamsted is uncovered. NIAB provides a particularly important perspective as one of the few large national institutions engaged in trials of a size comparable to those of Rothamsted. Section IV will also expand upon the thesis that the collaborative perspective leant to NIAB's activities, as opposed to the private concerns pursued by Fisher and his RES colleagues, helped constitute their rival understandings of the means and aims of agricultural field trials. Away from the agrochemical corporations that worked so closely with RES, where fields of single varieties grew to demonstrate the influence of the soil's chemical and physical constitution upon plant growth, in NIAB's plots, where concern for the plight of all farmers (not just the wealthiest) was at the very least notional, the differential response of varieties to different environmental conditions relied upon trialling methodology of a vastly different nature.

Section IV: The challenge of randomization and Middleton's revenge, 1924-1931

Before turning to the challenge of randomization directly, it is important to outline the kind of organisation with which Fisher (and RES) were now having to cooperate and compete. Things had begun to look a little brighter at NIAB by 1924. As we saw in Section II, by this time it had been guaranteed state support for the immediate future and had all but negotiated a new status as a field trialler. Multiplication of Biffen's HH

had continued on its planned modest scale, and was released in 1924 as Yeoman II, distributed in officially branded seed sacks.⁶³ NIAB made use of the British Empire Exhibition (opened in Wembley and of which Lawrence Weaver was coordinator of British exhibitions) to advertise the new wheat by baking and offering loaves to the public made from Yeoman II flour.⁶⁴ Subsequently they received tenders from plant breeders and traders for 6572 quarters, a greater number than even Hawkes had anticipated in his more ambitious programme and, more importantly, over twice as much as NIAB had actually grown. In order to accommodate all those who had applied, tenders were halved. In total 2580 quarters of Yeoman II was offered to traders and breeders, which realised £2727.⁶⁵ Of this £1350 was paid to the PBI and £1422 to the DC, the latter being a contribution to the money still owed and one of the conditions attached to the DC's changing terms of agreement with NIAB.⁶⁶ Svalöf was not dead yet. The Institute's reputation had also begun to grow. A good number of prestigious persons had visited the Institute, while it had also hosted important international events. The former had included; N.I. Vavilov (December 1921); Reginald Ruggles Gates (March 1922); Henry de Vilmorin, heir to Louis de Vilmorin's world renown breeding firm (July 1922); Hermann Nilsson-Ehle (June 1923); Thomas Middleton, who played such a decisive role in the previous Chapter and will do so once again in the final Section of the present (July 1923); and Sir William Haldane (November 1923).⁶⁷ Regarding international events, NIAB accommodated both the Imperial Botanical Conference and part of a meeting of the British and Foreign Seed Trade conference (both in 1924). However, most important had been the meeting of the Fourth International Seed Testing Conference which Weaver had conspired to have hosted by the OSTs, again in 1924 (Figure 2.10). The joint chairman of the meeting, alongside Weaver, was Wilhelm Johannsen, by far the most well-known and internationally celebrated member of the delegation. This meeting has another significance, as one of the earliest international meetings following the First World War to include a delegate from Germany, Professor Voigt. Such scientific internationalism (to whatever extent it had existed in the first place), had been overthrown during the Great War, and took at

⁶³ Charnley and Radick (2013) p. 231.

⁶⁴ For more on the significance of the British Empire Exhibition see Macleod (1993a).

⁶⁵ NIAB, T-1, Crop Improvement Committee Minutes, Minutes of the 19th Meeting 2/3/1925.

⁶⁶ NIAB, E-1, Executive Committee Papers, No. 101 'Notes on the Crop Improvement Work of the Institute 1921-1930', February 1930.

⁶⁷ NIAB, B-1, 1921 Visitor's book.



Figure 2.10: The Fourth International Seed Testing Congress, 1924, hosted by NIAB and the OSTs. At the centre is sat Lawrence Weaver alongside Wilhelm Johannsen. Also pictured are Sir Daniel Hall, George Stapledon and Rowland Biffen.

least a decade to recover.⁶⁸ It is unfortunate that within the confines of this thesis it is not possible to do justice to the history of the OSTs and international seed testing. As has already been demonstrated by some historians, the development of seed testing, the associated international regulations and especially the female employees allied with this practice around the world, present a rich subject for historians of science.⁶⁹ Precisely how the OSTs functioned within the British agricultural industry is most certainly worthy of study. Moreover, the Station played an important role for NIAB, directly associating the Institute with a tangible and practical enterprise the value of which was easily measured by the number of seed samples annually received and analysed. Thus in yet another way NIAB's reputation grew stronger. Other than to remark upon the increasingly international nature of seed testing standards in this period (it was at this 1924 meeting that the International Seed Testing Association was formed) and to highlight how deeply embedded Wilhelm Johannsen was within the world of commercial breeding (a point rarely stressed in the context of his abstract genotypic and phenotypic theorising, though neatly demonstrated by Figure 2.10),



Figure 2.11: A photograph of a chessboard trial being hand dibbed and sown at the Cambridge PBI. Taken from Biffen and Engledow (1926) p. 34.

⁶⁸ Crawford (1993), Irish (2012) pp. 296-303, Kevles (1971). Kremontsov (2005) is particularly important for his focus on genetics in the interwar period.

⁶⁹ See Lloydlangston (2002) for an excellent recent account of Canadian seed testing and its female workforce in the nineteenth and twentieth century.

discussion must now pass over the OSTs.⁷⁰ It is to R.A. Fisher's challenge to NIAB's expertise that we now turn.

It was Frank Engledow (of whom much more is said in Chapter 3), University of Cambridge agricultural botanist and member of NIAB's Crop Improvement Committee, who was first to publicly respond to Fisher's challenge. In 1926 in a two part article co-authored with the Cambridge statistician George Udney Yule, Engledow set out both the statistical basis to trialling work and the practical difficulties faced by experimenters. Their statistical section is restricted to a discussion of 'chessboard' trials; small plots, usually squares of four feet by four feet, hand sown and harvested primarily used in the early stages of breeding work when one needs to be able to compare many varieties against one another simultaneously (Figure 2.11).⁷¹ These were also Fisher's preferred method for implementing randomization, transformed thereby into 'Latin squares'.⁷² Yet Engledow and Yule make no mention of randomization. In the subsequently published second section (dedicated to the practicalities of yield trialling) the authors explain in a very full and satisfactory way how their chessboard plot arrangement might be randomized by pulling plot numbers and varieties out of a hat. Having done so they write

We do not propose to follow these theoretical questions further for the reason that their importance appears to us nullified by practical considerations. The simplicity attaching to a repeating form of scatter [as used in their own example]...carries two solid advantages. It facilitates sowing, observation of the growing plots, and harvest. Anything which facilitates work in careful yield trials at such periods is of great value. Sowing randomized plots would call for constant reshuffling of the seed packets if the plots were, as is usual, sown one after another from beginning to end of the whole series. It might be avoided by sowing all the A plots wherever they might be, and so on, but for this the sower would have to tramp over his tilth again and again, and so poach it. A second advantage of simplicity is insurance against mistakes. In any considerable piece of plot work there is great risk of mistakes of the "damn fool" order. An A label on a B sheaf may be more upsetting to results than the adoption, in the face of theoretical objection, of a systematically repeating pattern of plots.⁷³

This is their assessment of the value of randomization on small hand sown plots. When they turn to full scale yield trials – the kind of trial they believed necessary if knowledge useful to farmers was to be generated and which of course Engledow helped to

⁷⁰ For more on Johannsen as a figure embedded with the world of commercial plant breeding, see Berry (2014).

⁷¹ Engledow and Yule (1926a) p. 120.

⁷² Fisher (1925) p. 229.

⁷³ Engledow and Yule (1926b) p. 258.

organise at NIAB – “Anything resembling a chessboard “scatter” of plots is impossible”. Instead “Dr E.S. Beaven of Warminster has devised the “Half-Drill-Strip” method, which very ingeniously overcomes the kind of difficulty we have considered...We commend it to all concerned with field-scale trials.”⁷⁴ More resistance to randomization will emerge at the end this Section. Beforehand, it is important to make two points. Firstly, to briefly address the way in which Engledow and Yule’s endorsement introduces an imperial context, and secondly, to highlight the way in which the half-drill strip method reignited the debate over NIAB’s status as a field trialler or seed multiplier. In doing so, Section IV brings the problems of Section II and III together.

Engledow and Yule’s articles were published in the *Empire Cotton Growing Review*. Throughout the empire, botanists in various forms of scientific institution were exploiting, expanding and exporting the planets natural resources.⁷⁵ Attempts were made around the turn of the century, particularly after the devastation of the Great War, to improve provision for colonial agricultural science, to increase the quality of the applicants to these posts and increase their number.⁷⁶ In 1925 the University of Cambridge was co-opted into a new scheme sponsored by the Colonial Office, offering intensive training in agricultural science for the latter’s probationers.⁷⁷ This arrangement also came to benefit NIAB, which was made responsible for providing training in the conduct of agricultural yield trials. Every year around the end of July and the beginning of August, a group of Colonial Office Scholars would come to NIAB for one week’s theoretical instruction, followed by three weeks at a trial station, gaining experience in the recording and managing of a harvest. This close association with NIAB ensured they were given a good working knowledge of the half-drill strip. This was one of the more direct ways in which Beaven’s methods, alongside the publications of those such as Engledow and Yule, were exported across the empire. Between 1925 and 1930, fifty Colonial Office Scholars received such instruction at NIAB. It was not just Beaven’s method that thereby grew in legitimacy, but NIAB’s own status as an agricultural trialling institute. At the same time however, and somewhat Ironically, NIAB’s adherence to Beaven’s half-drill strip, also came to reignite the debate over NIAB’s

⁷⁴ Engledow and Yule (1926b) p. 261.

⁷⁵ For more on the long history of imperial botanical science see Brockway (2002), Drayton (2000), Masfield (1972) and Storey (2004). For the twentieth century see Clark (2001), Kraft (2004), Worboys (1979) and (1996).

⁷⁶ See Hodge (2007) and MacLeod and Andrews (1969).

⁷⁷ Hodge (2007) p. 98.

entire position as a trialling body rather than a multiplication center, once again bringing the Institute close to closure.

The half-drill strip is a seed hungry trialling method. Leaving aside the amount of seed required from the variety one proposes to test, the amount of seed required from the control variety – which has to be sown alongside *all* of the trial varieties – is substantial. What is more, to ensure fairness in the results it was necessary to supply all of the seed of any single variety from just one location. Seeds grown under particularly favorable conditions would be of a generally better condition. If this kind of variable wasn't controlled for, wily plant breeders could grow a half acre of their crop under intensive fertiliser and pesticide regimes, giving the seeds of their new variety a head start in NIAB's trials. To ensure fairness, the Institute considered it imperative that they themselves supervise the growing of seed stocks. This put a considerable strain on the Institute's land and much of NIAB's seed had to be grown on contract (another way in which NIAB's lack of resources ensured it came to collaborate and work closely with the farming industry at large). This problem became all the more acute with the realisation that the land at Hiam Farm was too poor to produce reliable results. In October 1926 moves were made to have the farm sold.⁷⁸ NIAB hoped to transform this capital not only into further land at their headquarters (helping to solve the seed stock location problem) but also into a granary and seed cleaning plant. These were essential facilities for any organisation working with large quantities of seed. Until this point, NIAB had relied upon its trade members to dress and package the stocks used in its trials and the small seed stocks they had begun to sell annually to the trade.⁷⁹ For practical and economic reasons such an arrangement could not continue indefinitely.

Unfortunately, 30 acres of land, a seed cleaning plant and a granary were expensive, especially at a time when NIAB was only officially guaranteed funding until 1927. Fortunately NIAB believed the amount realisable from Hiam Farm would be just enough to cover the extra acres and the erection of this plant, provided the DC continued to match them £ for £. Unfortunately NIAB had approached the DC with such a scheme once before – around 1919 – under the terms of the Svalöf model. On that occasion an answer had been postponed until the point at which the DC would begin to

⁷⁸ NIAB, E-5.8, Council Papers- Executive Committee Minutes, October 1926, date of meeting 19/10/1926.

⁷⁹ NIAB did therefore manage to implement Biffen's, Beaven's and Hawkes' different memorandums! Though in somewhat different forms than that from which their authors (aside from Beaven) had intended. While Hawkes had sought to make these activities profitable, NIAB would only sell on small samples of 'non-proprietary' varieties i.e. those varieties that no single breeding firm or individual held a claim over.

receive an annual income from the Institute's seed sales. Asking for this assistance in 1926, on the condition that NIAB's best multiplication asset (Hiam Farm) be sold, while also protesting that the Svalöf model was impracticable, was akin to asking that the DC purchase a larger sword to fall on. Fortunately NIAB could rely upon strong Ministry support as Lawrence Weaver had been joined at MAF by Daniel Hall, who had left the DC to become Secretary to the Ministry. Unfortunately Hall's chair on the DC had since been taken by Thomas Henry Middleton, a vocal defender of the Svalöf model who (as we saw in Chapter 1) had been the only person to anticipate that overemphasis on the OSTs would come at the expense of NIAB's commercial ambitions. Fortunately at this time Middleton was in India serving on the Royal Commission on Agriculture.⁸⁰ Provided NIAB could persuade the DC that these proposals were dictated by the demands of their trialling program, they would be able to accomplish quite a coup. Unfortunately, just as NIAB neared completion of this agreement, Middleton came home.

Henry Dale (from MAF) and Vaughan Nash (the DC secretary we encountered earlier) met with Weaver and Parker on the 19th October 1926. The latter reportedly made some very strong representations:

it was emphasized that members of the Executive Committee and Council were convinced that it was essential that seed should be grown under the Institute's own control and that it should have the exclusive handling of it; in fact in this department it must be entire master of its own house. It was also pointed out that so strongly did certain members feel on this point that if some arrangement could not be made to satisfy this requirement they felt very definitely that the trials and the trial stations should be abandoned.⁸¹

At this point a Commissioner with more invested in the Svalöf model might well have called their bluff. Instead, Nash reportedly responded "that he could not possibly sanction anything on his own responsibility...this was a matter which required some mature consideration." By April 1927 the Ministry had given sanction to NIAB's Hiam Farm plan.⁸² The DC also gave approval to NIAB's future as a trialling center (requiring constant state support) and the sale of Hiam Farm.⁸³ Then, in July 1927, Middleton returned to England and immediately opposed the sale of the farm, refusing to

⁸⁰ On Middleton's movements at this time see Russell (1944) p. 566.

⁸¹ NIAB, T-1, Crop Improvement Committee Paper No. 54, October 1926.

⁸² NIAB, E-5.8, Council Papers- Executive Committee Minutes, Jan-Mar 1927, meeting 12/4/1927.

⁸³ NIAB, E-1, Executive Committee Papers, No. 75, '8th Report of the Council, for 1/4/1926-31/3/1927'.

countenance that the DC might actually help build a granary when NIAB had no intention of becoming a commercial enterprise.⁸⁴

During July and August there were important negotiations with Sir Thomas Middleton of the Development Commission about the disposal of the Hiam Farm and the proposed granary and seed cleaning plant. He strongly opposed the Institute's plans, but as official consent to the sale of the farm had been obtained during Sir Thomas's visit to India and no better alternative offered itself, the farm was eventually sold to the Hiam Estates Ltd. for £3000⁸⁵

While Middleton failed to block the sale of the farm, he fared much better in preventing the purchase of new facilities. In October 1927, when decisions as to the long term future of the Institute were having to be made, the DC finally reported to NIAB the nature of its future grant (an annual block grant of £4500 from the DC and £5325 from MAF for a minimum of four years, along with the agreement that NIAB's loans would only be called in should it close). It was also reported that "The Development Commission have refused to consider the application for a granary and seed cleaning plant until the Institute is likely to be putting a new variety on the market."⁸⁶ Middleton held NIAB to the standards of the Svalöf model. Without the DC's approval, NIAB could not spend one penny of the money released from Hiam Farm on new facilities. Having come so far, and having devoted so much energy turning NIAB into a national trialling center, the Council decided to make one last bid to save the integrity of this work as they saw it. In a reply to MAF, to be circulated to the DC, they wrote:

The Council, as practical men, cannot agree that it is possible for the Institute's work to be done in the way the Development Commission suggest; and they feel bound to state, with a full appreciation of the gravity of their action in so doing, that acquiescence in the Commission's decision would fatally prejudice the whole future of the Institute's work.⁸⁷

To clarify these wholly English sentiments; NIAB's Council threatened to close the Institute down.

In March 1928, following subsequent negotiations, NIAB finally gained the DC's agreement to its proposals, drawing up plans for new facilities at the cost of £4385.⁸⁸ It helped that at this time the Commission was fighting and losing a battle over its

⁸⁴ NIAB, E-5.8, Council Papers- Executive Committee Minutes, Jun-Jul 1927.

⁸⁵ NIAB, E-5.8, Council Papers- No. 89, Executive Committee Minutes, 21/7/1927-26/10/1927.

⁸⁶ NIAB, E-1, Executive Committee Papers, No. 77, 'Results of application for a granary'.

⁸⁷ NIAB, E-1, Executive Committee Papers, No. 80, 'Renewed application for granary'.

⁸⁸ NIAB, E-1, Executive Committee Papers, No. 82.

administrative territory. A sub-committee of the Committee for Civil Research had concluded that national agricultural research should revert to the model of the Medical Research Council, transferring power away from both MAF and the DC.⁸⁹ Despite the best efforts of some of the members of both organisations, in 1931 the Agricultural Research Council came into being. Even without this distraction, NIAB's threat of closure was perhaps enough to ensure that the DC swallowed this bitter pill. It had already been agreed that NIAB would become a national trialling Institute in principle (and funding agreed on these grounds) it was perhaps only a matter of time before the DC followed through in deed. With this agreement reached, and their capacity for seed production dramatically increased, NIAB could pursue their *trialling* program to the fullest. Of course Fisher's challenge still remained, and was perhaps now felt sharper than ever. In June 1930 – following the expansion of their trial grounds and the completion of NIAB's new seed facilities – Parker assessed and clarified the Institute's methods.⁹⁰

I have discussed with Sir Daniel Hall the question of the methods of trial and at his suggestion have also talked over the matter with Dr. Fisher of Rothamsted. As an outcome of these discussions I remain of opinion...[that the present methods of yield testing]...are the best of any of the methods in which ordered, as distinct from random, distribution is practised. The adoption of random distribution on a field scale is ruled out by the absence of suitable implements, by the greater technical skill required in handling and by the great increase in statistical work which they entail.⁹¹

Parker expanded upon these points in the Eleventh Report of the Council, drafted in January the following year.

The longer the experience of the system of attaching the Institute's sub-stations to Agricultural Colleges and Experimental Stations, the more evident is the mutual benefit which springs from it. The Institute knows that the trials are being conducted under the best possible conditions and it obtains results from several different but typical environments; the College or Experimental Station is provided with abundant material for educational and advisory purposes; and all parties gain from the fact that the work is brought vividly to the notice of the many farmers who visit these centres every year, for the trials and plots are themselves the best demonstration of the lessons which they teach...Indeed many a farmer cannot grasp the difference that choice of variety may make to his own results until he has seen a set of these trials. It is all the more

⁸⁹ DeJager (1993). For more on MAF and DC resistance to the Agricultural Research Council see Snelling (1976) pp. 102-105

⁹⁰ Eventually published as an article in NIAB's journal. Parker (1931).

⁹¹ NIAB, C-1, Council Papers, No. 103, 'National Institute of Agricultural Botany, Methods of Trial', dated June 1930.

important that the trials should be under careful cultivation and observation throughout their course; no amount of statistical analysis can compensate for errors in the field or discover those practical points of difference measurable by eye alone...⁹²

None of these concerns are anywhere near as easily discerned from within the experimental fields of Rothamsted. Firstly, as Parker mentions here, even those substations that were 'owned' by NIAB, were actually run collaboratively. By 1930 MAF had agreed to establish five permanent or semi-permanent substations for NIAB, each equipped with an official Crop Recorder and run in collaboration with a local agricultural education institute or college. The counties, towns and partners were; Norfolk (Morley, Norfolk Agricultural Station), Essex (Good Easter, East Anglian Institute of Agriculture), Shropshire (Newport, Harper Adams College), Hampshire (Long Sutton, Lord Wandsworth College) and Somerset (Bridgwater, Cannington Court Farm Institute). This network shifted and changed over time, as various counties and colleges either fell in or out of love with NIAB, but the number only ever grew. With the arrival of the Second World War, the number of substations doubled, as will be seen in Chapter 4. In addition, the Institute had branched out from this small number of dedicated stations, to cooperate with a large and wide variety of farmers and agricultural organisations across the UK, borrowing land and resources, and (where possible) incorporating the results of private farmers and other organizations into its investigations. Here the botanical nature of NIAB's investigations might have played another role, as farmers themselves were trusted to carry out these trials, in ways that the investigations at Rothamsted did not permit. In agricultural fields, managed and sown in ways familiar to farmers, NIAB could deepen the relations between itself and agriculturalists. There appears to have been no comparable effort at RES to bring farmers into the research process on the scale, or to the extent, sought at NIAB. Indeed it was these elements that were emphasised in NIAB's largest and most ambitious national trial, begun in 1931 and unfortunately cut short by the global financial crisis.⁹³

Adopting neither randomisation nor the half-drill strip, the intention of this trial was to discover the relative value of certain varieties under a remarkably wide variety

⁹² NIAB, C-1, Council Papers, No. 106, 'Draft: National Institute of Agricultural Botany, Eleventh Report of the Council', dated Jan 1931. See also Parker (1930b).

⁹³ Having succeeding in getting 93 returned results in 1931, these numbers dwindled as the economic circumstances bit. In 1932 there were 51 returns, 1933 only 41, 1934 and 1935 saw a small improvement, with 55 and 69 respectively, until the final years, in which only 20 were returned for 1936 and 10 for 1937. Parker (1932), Parker and Tozer (1932), Brandreth (1935a), (1935b), (1937) and (1938).

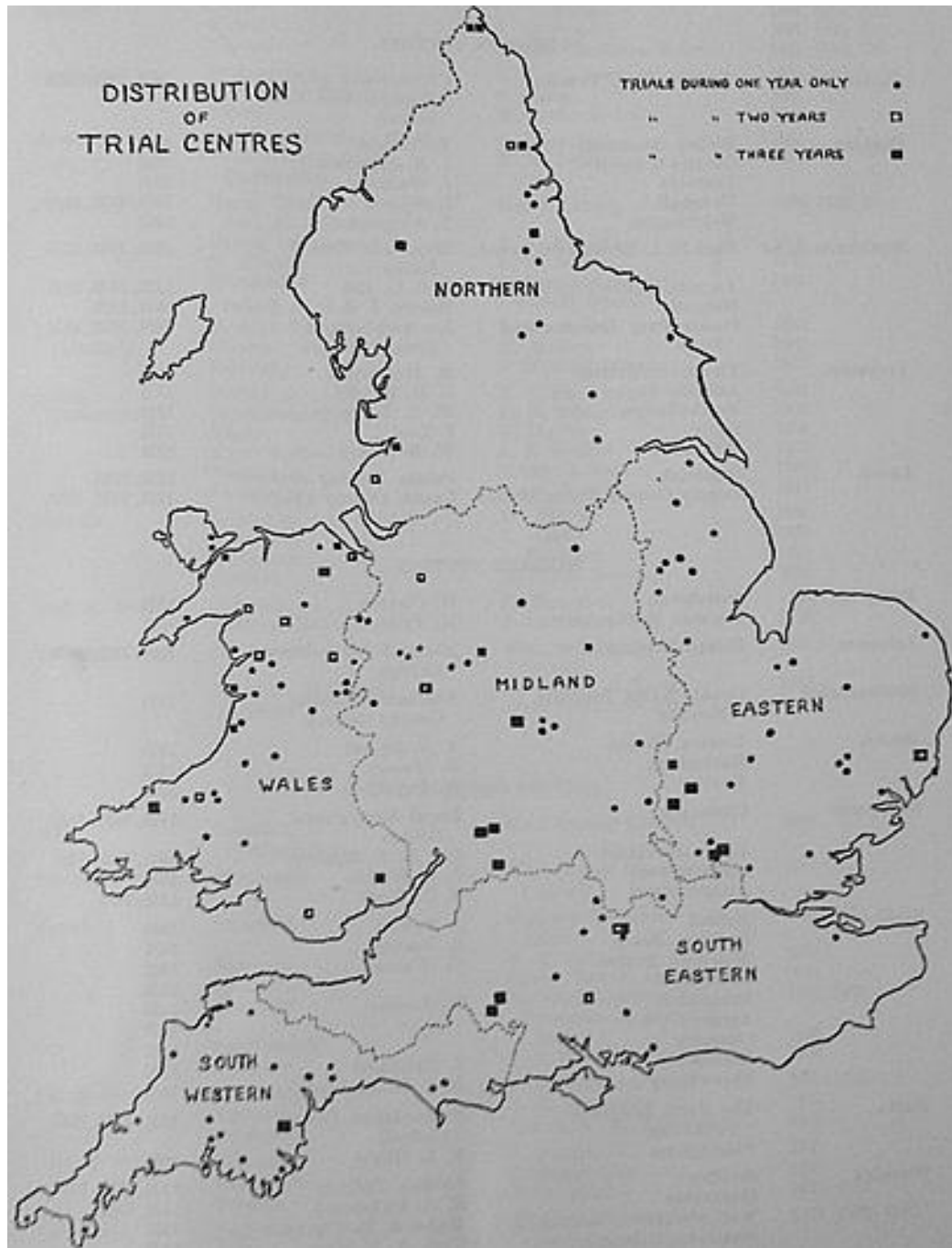


Figure 2.12: Map of trial centres that participated in NIAB's County Oat Trials between 1931 and 1933. Taken from Brandreth (1935a).

of different conditions. It was also an opportunity to expand the social base from which NIAB drew its results, and increase the number of farmers collaborating directly with the Institute.⁹⁴ 107 centres over 46 counties took part in the first year's trial which, due

⁹⁴ In Brandreth (1935a) pp. 10-13 there is included a list of all the centres and farmers that had participated in the county oat trials up to 1933. It is included as an Appendix as a cross-section of those that were able/inclined to cooperate with NIAB and had an interest in its results. See Appendix 2.

to the crops ubiquity, focused on varieties of oat (Figure 2.12).⁹⁵ Fisher himself helped NIAB analyse this data when the first report was compiled. Whether this constituted a significant admission on Fisher's part of the social value attached to non-randomized trials, or that the scattered nature of these trials across the country made the data (though not the trials themselves) sufficiently random to warrant his attention, or simply that in this instance Fisher wished to be a congenial collaborator, is unclear. Either way, NIAB, its trialling centres and the crop recorders and Colonial Officer's trained there, continued to collaborate closely with a wide variety of actors within the agricultural industry. The half-drill strip seems to have remained in use until around the early 1930s, by which time – as we shall see in Chapter 3 – the Institute had secured far more of its own private land, and more importantly, was having to deal with a far greater number of varieties in its trials. A seed and land hungry method such as the half-drill strip was perhaps just too demanding. The losses that a switch to randomization would entail also offered gains, in economies of land and resources.

Conclusion

This chapter has described two interconnected narratives; the first, that of the continued confusion surrounding NIAB's purpose; the second, that of the Institute's efforts to construct a trialling programme and defend its methods from external challenges. With regard to the first, we have seen how NIAB sought to free itself from the financial (and politically sensitive) obligation to multiply pedigree seed on a competitive scale, by reorienting the Institute towards national trials. These efforts are brought to a triumphant end in 1927 when NIAB's representatives manage to overcome the resistance of Thomas Middleton at the DC and succeed in building the facilities they required for *trialling*, despite their concomitant suitability for *multiplication*. With regard to the second, it has been shown that NIAB adopted a trialling methodology most amenable to its scientific, commercial and national agenda; the half-drill strip. Based upon the work of some of the most well respected contemporary statisticians, the half-drill strip could be picked up and implemented with little difficulty in a large number of different environments, making few assumptions as to resource availability (primary resources including machinery, manpower and time). For an institution such as NIAB, which saw direct interaction with the farming community as essential to its success, trials sown in ways familiar to and respected by

⁹⁵ NIAB, C-8.60, Annual Reports, 1930-1931.

farmers could demonstrate the value of varieties across the country. This stands in stark contrast to the method advanced by R.A. Fisher at Rothamsted; the randomized control trial. Only practicable on small scale plots, dependent on a large amount of time, dedication and statistical analysis, unsuited to convincing farmers of the value of a variety or treatment, randomized control trials conformed much better to the standards of the statisticians and chemists that worked at Harpenden than the agricultural botanists in Cambridge.

If we glimpse a little beyond the confines of the period studied in this chapter, we find that Fisher's conflict with Gosset over randomization eventually spilled over into the public domain. The last article Gosset ever wrote – published posthumously – was titled 'Comparison between Balanced and Random Arrangements of Field Plots'.⁹⁶ In it Gosset defended the systematic methods used by himself, Beaven and their colleagues at NIAB. He did so largely on statistical grounds, perhaps because these were the only terms in which Fisher could see the debate. Nevertheless, some of the realities attached to agricultural trials still emerge.

It will be seen then that the difference between Prof. Fisher and myself is not a matter of mathematics – heaven forbid – but of opinion. He holds that balanced arrangements may or may not lead to biased means according to the lie of the ground, but that in any case the value obtained for the error is so misleading that conclusions drawn are not valid, while I maintain that these arrangements tend to reduce the bias due to soil heterogeneity and that so far from the conclusions not being valid they are actually less likely to be erroneous than those drawn from artificially randomized arrangements. Further, that in the really important agricultural experiments which are carried out at more than one centre – and it was of these that I was speaking – the very slight disadvantage that an occasional result at an individual station may not be recognized as significant owing to over-estimation of the error at that station is more than offset by the greater precision of the experiment as a whole.⁹⁷

Gossett here seems to confirm the view that RES and Fisher were primarily concerned with trials conducted only at one centre rather than in multiple fields. It is also telling that it is around this time that randomization in cereal trials first begins to appear in NIAB's journal with any regularity. In the mid-1930s spring barley trials, for instance

The half-drill strip method of trial is no longer rigidly followed. Under intensive manuring it was found that when this method – with its narrow strips – was used, the weaker strawed varieties frequently interfered with the growth of the adjacent ones through lodging on them. For this reason plots relatively shorter

⁹⁶ Student (1938).

⁹⁷ Student (1938) p. 367.

in length and greater in width have accordingly been used in the high-farming trials; at first these were laid out in Latin squares, but with the increase in the number of varieties tested the randomized blocks method was adopted.⁹⁸

Note that NIAB's experimenters diverged from the half-drill strip because of problems of interference (solved by making squatter blocks and reducing the surface area between plots of different varieties) not because of statistical misgivings and, moreover, that this only took place on the 'high-farming' trials. NIAB by this time had come to differentiate between trials of value to all farmers, and those whose results would only be replicable on a farm after considerable expense. Was NIAB perhaps moving towards a model of trialling preferable to commercial plant breeders, just as Rothamsted's methods appear to have been preferable to the agrochemical firms with which it worked? The results produced in a 'high farming' trial would show a new variety in the best light, perhaps even in conditions it could never hope to achieve in typical practice. This story is complicated by the outbreak of the Second World War and Beaven's death in 1941. A discussion of NIAB's trialling activities and how they changed beyond this period shall have to be postponed until chapters 4 and 5.

With regard to the universal aspects of the relationship between farmers and agricultural scientists, regardless of period or nationality, the importance of demonstration for contemporary field triallers has been highlighted by Christopher Henke in work on North America.⁹⁹ Speaking of the local nature of trials for many farmers he writes "This authenticity makes field trials a powerful demonstration for growers, but the local, place-bound qualities of field trials also make them difficult to control; in many ways advisors also need to strike a kind of balance when using field trials as a means of intervention." He adds that "Advisors can give their research trials an aura of realism and commercial relevance by placing them in a growers field, but this also means special risks to the experiments scientific status."¹⁰⁰ The present Chapter has uncovered the lengthy history of this problem, while setting out a path that escapes the apparent tension between the importance of a trial as a demonstration, and its scientific status. The latter is only undermined if the superiority of statistically, rather than 'communally', rigorous methods is assumed. If it is remembered that the decision to adopt the RCT, or any other seemingly hyper-rational

⁹⁸ Armstrong (1938) p. 238. See also Thompson (1938) p. 275. "The method of trial used in 1933, 1934 and 1935 was the Beaven's half-drill strip system, but in 1936 and 1937 the trials were carried out on the randomized system."

⁹⁹ Henke (2008).

¹⁰⁰ Henke (2008) pp. 114-115.

method, is precisely that – a decision – then important middle ground that acknowledges the value of trials for a wide variety of people, rather than just statisticians, can be salvaged.

It should also be acknowledged that randomized control trials have been thoroughly scrutinized by philosophers of science, though with a focus on the medical rather than the agricultural context. Many of these arguments look to undermine the status of randomized control trials as qualitatively different from non-randomized trials, along with the often made claim that RCT's provide an unbiased objective method.¹⁰¹ Hacking even points out that Gosset was a vocal critic of randomization, but gives his alternative position only a cursory examination. "Gosset and a majority of traditionalists believed that "matched" or "balanced" arrangements were less subject to error, more instructive, and in general entitled one to draw firmer inferences."¹⁰² While this is all certainly true, the position adopted by agricultural scientists aligned with Gosset was much more sophisticated than one might assume from Hacking's passing comment. More importantly, the lumping of Gosset alongside all other 'traditionalists' plays into the hands of Fisher's disciples, suggesting both that Gosset's views were long developed over many generations and indistinguishable from the other 'systematic' designs of the time – rather than a direct result of his own agricultural and industrial researches as explained in Section III (A) – and that the arrival of randomization in the 1920s witnessed the beginning of a new theoretical epoch. Attention to the history of NIAB and its resistance to randomization provides an important new challenge to advocates of the RCT.

Finally, the plant variations that NIAB's trials attempted to correct for, caused further and perhaps more essential, problems. When one recognises, as NIAB most certainly had by 1930, that plants can demonstrate wide fluctuations in variability depending upon the conditions under which they are grown, one can begin to question the extent to which genetic constitution determines a plants appearance. James Tabery has put the apparent neglect of the environment by the wider genetics community at the core of Lancelot Hogben's dissent from eugenics.

The role of the environment was of such prominence in the pages of *Genetic Principles* because Hogben felt that biologists had generally learned to neglect it in response to theoretical developments of the previous century. More

¹⁰¹ Cartwright (2007), Cartwright and Munro (2010), Pearl (2000), Thompson (2011), Urbach (1985), (1993) and Worrall (2007).

¹⁰² Hacking (1988) p. 429.

specifically, the death of Lamarckism, the discovery of cellular fertilization, and finally the rise of Weismann's theory of the germ plasm ushered in a generation of biologists with no theoretical interest in the environment.¹⁰³

As we have begun to see in this Chapter, and will see all the more clearly in the next, this characterisation of genetics at large – though no doubt accurate on Hogben's part – nevertheless does a disservice to agricultural geneticists. Indeed, as one historian has already shown, this differential response of plants to different environments even caused R.A. Fisher to question his more stringent eugenic views.¹⁰⁴ This variability also caused problems for the varietal market, masking truly novel plants while disguising older types. As the next Chapter will demonstrate, there was at this time much confusion over the identity of agricultural crops in Britain, so much so that in 1930 NIAB launched a campaign to identify cereal varieties and bring the varietal market under control. In doing so, the Institute would confront proponents of a naïve Mendelism, with important consequences for the existing genetics historiography.

¹⁰³ Tabery (2008) p. 734.

¹⁰⁴ Mazumdar (1992).

3. *Plant Identifier*: The Cereal Synonym Committee and the Commercial Life of Genetics, 1930-1937

By 1930 NIAB had firmly established itself as a field trialler, and had agreed its future state funding on these terms. As its trialling programme expanded, so did the Institute's own headquarters, with a series of purchases of nearby land. More of the Institute's development will emerge in the present Chapter. It has been necessary to begin by stressing the extent to which NIAB's status and position within the agricultural industry had improved by this time, as the Institute was about to embark upon a project that relied entirely upon this reputation. The main focus of the Chapter will be on NIAB's role as a trusted, reliable and official controller of plant identities, arbitrating between real varieties and mere pretenders.¹ This is a function that the Institute continues to carry out today, responsible as it is for conducting the statutory tests for Distinctness, Uniformity and Stability on all purportedly new varieties. (The origins of this legislation are uncovered in Chapter 5.) In many ways the work described in this Chapter is intimately tied up with that explored in Chapter 2. After all, the varietal trials analysed there required from the very beginning that NIAB's staff had at least some idea of the identity of the varieties under examination. In addition, differentiating between the capacities of different varieties, as NIAB's national trialling programme aimed to do, sees the Institute acting as a national arbiter over plants and their identities in ways that will become much more concrete in the present Chapter. Finally, and as indicated at the end of Chapter 2, the presence of extreme variability in agricultural fields – which was there emphasised as a challenge for statisticians – was also a challenge for botanists, plant breeders and geneticists. The early twentieth century saw radical changes in the scientific understanding of heredity.² The work of plant breeders has become central to this historiography. The present Chapter contributes to this discussion by considering the extent to which agricultural geneticists were much more

¹ Though Daston and Galison concentrate on the interpretation of images, their 'trained judgement' a "necessary supplement to objectivity" that they see emerging particularly strongly in the early twentieth century, bears a striking resemblance to the kind of process of lengthy apprenticeship that eventually produced the expert plant breeder and identifier. "Neither eighteenth-century sage nor nineteenth century lay ascetic, the scientists of the twentieth century entered as an expert, with a trained eye that could perceive patterns where the novice saw confusion." Daston and Galison (2007) p. 328. That they also link this to the growth in state patronage of science and the newfound social position of scientists, is also surely significant in the NIAB case.

² On the pre-history see Müller-Wille and Rheinberger (2007), (2011). Key work includes Beurton et al. (eds.) (2000), Bowler (1989), Fox Keller (2000), Gayon (1998), Gaudillière and Rheinberger (2004), Sapp (2003), Thurtle (2007).

sceptical of that naïve Mendelian determinism, (which seemingly depended on Wilhelm Johannsen's distinction between genotype and phenotype), that otherwise seems to have run rampant throughout much of biology and medicine in the early twentieth century.³ While for some historians the 1930s have represented a golden age for the Mendel-Morgan chromosomal school, agricultural geneticists, and plant breeders in particular, simply found it insufficient.⁴

Section I: Plant breeding geneticists and the utility of plant synonyms

At least two influential historians of science have already suggested that agricultural geneticists were set apart from their more general biological contemporaries. Barbara Kimmelman, drawing upon the American case (though also making connections with international work), has written that

The agricultural context may have contributed more than quantitative institutional support for genetics; it may have encouraged a qualitatively distinctive institutional home for genetic work, in which researchers paid more attention than did researchers elsewhere to complex rather than simple characters and to physiological and biochemical phenomena underlying the transmission and expression of inherited characters.⁵

More recently Jonathan Harwood has reflected upon the perspective of the agricultural (as opposed to the more generally biological) geneticist, in relation to the phenomena of 'correlation'; the alleged positive and negative links between certain phenotypic characters. For geneticists the existence of correlations placed constraints upon what could be expected from hybridization and limited the potential results of breeding programmes. It might, for instance, prove to be the case that high-yield could not be combined with malting quality (in Barley) if it turned out that these characters were

³ A full list of recent publications on the topic can be found in Berry (in press 2014), which is partially based on this Chapter and is submitted separately.

⁴ Nils Roll-Hansen has characterised this historical period, and the attitude of British plant breeders within it, as one of 'Mendelian pessimism'. This language is resisted in the present Chapter as inappropriate, on the grounds that it takes for granted the essential correctness of the broad genetic (Mendel-Morgan) framework with which plant breeders took issue, while introducing an emotional element to the arguments of those who disagreed ('pessimism'), thereby undermining the potential importance of their criticisms. Instead, it was precisely this broad genetic framework that at this time was being *created* within biology (of which plant breeding is but one part). Agricultural geneticists were avowedly Mendelian, but being an avowedly Mendelian plant breeder was different to being an avowedly Mendelian oncologist or marine biologist. A plant breeders' response to Mendelism might look like pessimism to an outsider, especially one for whom the limits of genetics' explanatory power seem quite far off. However, carrying this perspective into plant breeding itself, would be a mistake.

⁵ Kimmelman (1997) p. 184. See also, Kimmelman (1987), (1983) and (2006).

negatively correlated. Harwood shows how in wrestling with this problem more generally biological geneticists preferred to eliminate the problem of correlations by reducing phenotypes to collections of unit characters, the combining and recombining of which might perpetuate phenotypic relationships, but by no means militated against the *eventual* separation or union of desired characters. On the other hand, agricultural Mendelians continued to investigate plants as whole organisms, looking to understand the physiological basis behind apparent correlations.

Plant-breeders' concern with the correlation of parts seems to have been brushed aside by (many) Mendelians in much the same way as embryologists' emphasis upon the development of an integrated whole and evolutionists' insistence upon the coordinated character of evolutionary change: it was shelved as a puzzling anomaly that might one day be resolved.⁶

In this chapter both Kimmelman's and Harwood's insights will be extended. This will be achieved through an investigation of plant synonyms and NIAB's work as a plant identifier.

Synonyms arise in plant breeding when the same variety is traded under different names, while homonyms are names shared by several different varieties (usually due to that names reputation).⁷ Synonyms have already been used as investigative tools by a number of historians of biology.⁸ In the twentieth century they caused problems for both academic and commercial plant breeders. The concerns of the former included; field trials becoming rife with unnecessary and costly duplication; the conclusions of hereditary investigations proving of no value beyond the immediate stocks under study; national and international comparative work becoming saturated with artificial anomalies; and, above all, superior varieties deteriorating as their identity takes on a life beyond the trial ground. In this last respect the concerns of agricultural scientists are indistinguishable from those of plant breeders in the private sector. For this latter community, synonyms were often perceived as robbing plant breeders of income rightly owed to them for the years of work that had gone into producing a new variety. The place of such complaints in the wider history of intellectual property has

⁶ Harwood (2004) p. 17. For an explanation of resistance to Mendelism in France, one with a focus on development in the terms of embryology (and physiology and microbiology), see Burian et al. (1988).

⁷ Throughout this period 'synonym' was typically used to describe both problems. The earliest use of 'homonym' to describe the possibility of several different varieties sharing the same name is found in Percival (1934), p. 87.

⁸ Charnley and Radick (2013), Gaudilliere and Kevles (2008) p. 3, Harwood (2012) p. 84, Palladino (1990) pp. 450-453.

already attracted a good deal of historical attention, and will be returned to again in Chapter 5.⁹ However, despite being widely recognised, synonyms were also controversial. Declaring that one trader had taken on a variety produced by someone else and sold it under their own name, or had sold a different variety as another (more valuable) variety, cut to the core of the trade. The long history of the synonym problem will be covered in more detail in Section II. Here it is enough to explain that the issue of synonyms had largely been sidestepped by the trade and the government, until, in 1930, NIAB decided to embark on a programme to eliminate them from the British market. This chapter is dedicated to the work of the Institute's short-lived 'Cereal Synonym Committee' (CSC), which ceased to operate annually in 1937. The work of the CSC will be explored from the perspective of the two communities highlighted above; academic and commercial plant breeders.

There are two main motivations for comparing and contrasting academic and commercial breeders. Firstly, to show that differences of opinion on the issue of synonyms can be found on both sides of this divide (which in this period, as previous historians have already pointed out, was not much of a divide at all, at least not in Britain.)¹⁰ Secondly, by comparing and contrasting the locations of particular individuals, within the broader industrial, academic, and professional culture of plant breeding, it is possible to pinpoint crucial social factors that helped decide (which is not necessarily to say determine) a given individual's perspective on the issue of synonyms and the proper method for their management. To state the argument in its briefest terms; those who sought the most stringent controls on synonyms, whether academic or commercial breeders, were those who drew considerable social and financial credit from their status as the breeder of *particular* (and economically successful) varieties. On its own such a conclusion would not be surprising, particularly writing from the perspective of the early twenty-first century when aggressive control over proprietary plant material and germ-lines has become ubiquitous. In the first place then, this

⁹ See Charnley and Radick (2013), MacLeod and Radick (2013) and Radick (2013) in a recent special issue of *Studies In History and Philosophy of Science* dedicated to the history of science and intellectual property, which pays special attention to the history of plant breeding as a useful context in which to pursue these problems.

¹⁰ See Kevles (1980) for more on the peculiarly close connection between academic and commercial breeders in Britain in the interwar period. Marie (2004) gives the most complete and recent account of British genetics in the twentieth century. Her thesis is particularly important for demonstrating the way in which no single research programme, such as the work on *Drosophila* in the United States, came to dominate the UK research agenda. Contrast the UK story told in the present Chapter with the strenuous efforts of the US agricultural geneticist R.A. Emerson, found in Kimmelman (1992).

Chapter is important for reminding us just how alien such a perspective on varietal ownership was when it first began to emerge in the pre-war and interwar years. Secondly, if the correspondence between a breeder's personal identification with certain varieties and his desire to see this intellectual property protected is not surprising, then the way in which the new science of genetics provided a reservoir of justifications for them when arguing this case, certainly is.¹¹ Especially, as we shall see, when agricultural geneticists themselves did not necessarily acknowledge the adequacy of these new genetic claims.

The structure of the Chapter is as follows. Section II introduces the long history of plant synonyms, focussing entirely on cereal crops.¹² The aim is to explain why cereal synonym identification was not attempted in any systematic sense until 1930. Section III introduces W.H. Parker, NIAB's Director and his eventual response to the problem of synonyms – the CSC – which he brought to life in 1930. Despite having been with the Institute since its opening, Parker has not been introduced in this thesis until now for the simple reason that his influence over the Institute did not become important until this period, one which sees the death of Sir Lawrence Weaver in 1930. Not everyone involved with NIAB agreed with Parker that it was desirable, let alone possible, for one organisation to act as an official plant identifier. Section IV traces the consequences of putting the CSC to work, explaining how synonyms were identified and policed, and the extent to which the programme might be considered a success. It is shown that much more went into producing varietal identity than simply a plants genetic inheritance, with implications for the history of genetics at this time. The final Section considers

¹¹ My thanks to Chris Kenny for the phrase 'reservoir of justifications' which emerged during one of the lively seminar discussions that are commonplace in the Centre for History and Philosophy of Science at the University of Leeds.

¹² The history of potato synonym identification, work prosecuted by Dr. R.N. Salaman (eventual founder of the Potato Virus Research Station) cannot be addressed here in detail, despite the fact that this campaign was of fundamental importance in setting a precedent for the CSC. The potato case also highlights how differences in the biological material under investigation can make synonym identification more or less controversial. The Wart Diseases of Potato Order 1912 made it illegal to sell varieties of potato susceptible to wart within regions known to carry the disease. At the same time it became necessary that all purportedly new immune varieties be tested at a government station to demonstrate their immunity. This government testing station, at Ormskirk, was subsequently taken over by NIAB upon the latter's foundation. Before entering the list of varieties recommended for farmers to purchase, NIAB made it a requirement that they also had to show distinctness. Salaman explains how this combination of legislation and institutional routine protected potato varietal identity: "no immune variety can be officially listed until it is certified as distinct by the Potato Synonym Committee of the National Institute of Agricultural Botany. There is no legal bar to the introduction of new susceptible varieties, but in practice, no new variety is launched to-day which has not passed successfully the test for immunity." Salaman (1949) p. 173.

NIAB from an international perspective in order to provide another measure of the Institute's efforts. The similarities and differences amongst European and North American countries allows us to appreciate the significance of political and economic context for shaping the scientific response to synonyms and the direction taken by genetics. Genetics left the response to synonyms and plant intellectual property underdetermined. Only in those countries where a naïve genetic determinism was given a political or economic lead was varietal identity reduced to its genotype. The Conclusion looks over the combined British and international perspectives, to emphasise the point that any given breeder's response to the synonym problem was due to the extent to which they professionally identified with their own varieties.

Section II: Synonyms – the prehistory to a problem

One of the earliest to publicly denounce synonyms was our very own E.S. Beaven, whom as we have already seen, was immersed in the commercial community of agricultural plant breeders. As early as 1909 he had proposed the elimination of synonyms through the introduction of a plant register. "It is very important to know [in breeding and trialling] what is being compared. It is useless to simply compare two bulks of seed that are differently labelled unless the labels correspond to something definite in the ancestry of the plants, and unless the growers interested can be sure of obtaining the stocks of the same races as those compared."¹³ He was not alone amongst private breeders, who actually made some of the first practical challenges to synonymity. One of the best examples of this activity is the 1920 trade catalogue published by Dunns (the agricultural plant breeder and seed trader) which attempted to include all of the then known varieties of wheat (Figure 3.1). No commercial or private actor had attempted to produce such a publication before.¹⁴ Wheat was one of the few crops which Dunns did not itself breed, acting instead solely as a multiplier and seller, which meant that their intervention could not suffer accusations of self-interest. This is not to say their motivations were entirely selfless; while offering some assistance to the farmer, the completion of this catalogue also helped to demonstrate how knowledgeable Dunns' employees were, and advertise the strength of their variety museum. They also admitted that the enormous number of names found in the

¹³ Beaven (1909) p. 122.

¹⁴ My thanks to Tricia Cullimore for bringing this catalogue to my attention.

DUNNS ON SEED WHEATS.

Specimens of
over
100 Varieties
of
Wheat
are exhibited
at
Dunns
Farm Plant
Museum
together with
samples
of Wheat
harvested
all
over the
World.

1 & 2. Little Joets.
3. Burgoyne File.
4. Yeoman.
5. Ambrose Stand
Up.
6. Browick.
7. Bonfactor.
8. Victor.
9. Nursery.
10. Rivetts.
11. Red Lammis.
12. Square Head
Masters.
13. Square Head
Red.
14. Hybrid Red
Chaff White
Wheat.
15. Red Standard.
16. Universal.
17. Essex
Conqueror.
18. Percival Blue
Cone.

Scale: 1/2 of actual size.

SOME POPULAR VARIETIES OF WHEAT.

DUNNS FARM SEEDS, LTD.

Figure 3.1: Excerpt from Dunns' special issue catalogue that attempted to describe all known wheat varieties grown in Britain. Held in the NIAB archive.

catalogue (over 400) did not equate to as large a number of varieties. “It is not suggested that they are all distinct varieties. Essex Rough Chaff, Kentish Red Chaff, Square Head’s Masters have at least a dozen names, each in different localities.” However, their catalogue made no effort to challenge the claims of *plant breeders* with regard to the issue of synonymy. All of the ‘synonyms’ listed by Dunns were merely those that emerged from the day-to-day movement and sale of varieties; that body of names the waxed and waned each season, intended to titillate, reassure, or (in the least defensible situation) sell an unpopular variety more quickly. Lammas, for instance, was also sold as ‘English’, ‘Flaxen’, ‘Clover Red’, ‘Burwell’ or ‘Old Kent Red’.¹⁵ What differentiates these synonyms (or perhaps ‘aliases’) from those with which this Chapter is concerned, is that nobody involved with their creation expected social or financial credit for their efforts. While those at Dunns may well have had a good idea as to which supposed novelties were identical with existing varieties, they were not in the business of declaring any *professional breeder’s* produce a synonym. The closest they got to doing so arises in the case of ‘Square Head Success’, one of the first varieties to be eventually designated a synonym by NIAB’s CSC. Dunns’ catalogue merely calls this variety, “a variety of the Square Head Masters type, selected by Messrs. Toogoods.” As Dunns well knew, professional breeders put great store in their ability to cultivate and recognise distinct varieties. An accusation of synonymy was a serious judgment on both that traders’ business practices and skills as a plant breeder. This was one of the main disincentives for tackling the problem of synonyms in a public and systematic way. There were other perhaps more important reasons, related to agricultural science.

“No one likes to risk the consequences of publishing a ‘list of synonyms’” wrote Frank Engledow, assistant Director of the Cambridge PBI (Figure 3.2, and whom we saw in Chapter 2), “but such a thing would be of value to agriculture. For a farmer may try a form of wheat, and finding it of no use to him, give it up; then five years later he is persuaded to buy it under a new name and to bear, once more, the expense of testing it.”¹⁶ As with Dunns then, the fear of litigious reprisals also kept agricultural scientists such as Engledow from taking on those traders who sold synonyms. Two rather more fundamental problems made such an intervention difficult if not impossible for agricultural scientists. Both of these problems are linked to the phenomenon of plant fluctuation – the capacity for agricultural crops to demonstrate widely different appearances within different climates, different years, and even within the same field.

¹⁵ NIAB, Seed Catalogue Collection, ‘Dunns on Seed Wheats’ (1920).

¹⁶ Engledow (1923) p. 402.



Figure 3.2: Frank L. Engledow (1890-1985), Assistant Director of the PBI and long standing member of NIAB's council, of which he took the Chair in 1931.

Both will be stated briefly, and then discussed in more detail below. Firstly, methods for making consistent plant identification possible (particularly within cereal crops) were only just coming to be developed. Here fluctuation complicated matters by disturbing varietal appearance and behaviour, making the job of accurate plant identification much more difficult. Secondly, it was well known that different varieties showed a differential response to different environments and annual climatic changes. Here the continued presence of fluctuation provided a source of credit for the breeders who wrestled with it, while making room for claims to varietal distinctness, often (though not always) on the grounds of 'acclimatization'.

The development of reliable methods for plant identification had been the centrepiece of a paper delivered at the Fourth International Seed Testing Congress held at NIAB in 1924 (see Chapter 2). While the majority of papers focussed solely upon seed testing, that given by Dr. F Chmelař (a delegate from Brünn) took the opportunity to

discuss the relationship between seed testing and varietal identity.¹⁷ Chmelař began by considering the difficulties that surrounded varietal identification, pointing to the successes that had already been had with sugar-beet and potatoes.¹⁸ He then compared these to wheat, telling his knowledgeable audience that “The determination of varieties of corn is the most difficult as they are very numerous; and it is necessary, very often, to distinguish varieties of which the difference is but slight, or rather where it is only biological.” After explaining some of the methods he had himself tried, Chmelař went on to say that to achieve any kind of success

it is not only necessary to have collections of seed, ears, tubercles, roots and collections of leaves and inflorescences, but also to establish trial gardens of varieties. The material to be observed must be taken, it is true, directly from the plant breeders, and it is necessary to cultivate the plants normally with a view to their having a normal appearance. To know thoroughly the biological qualities of plants, trials should be made several years in succession.¹⁹

The commentary subsequent to Chmelař’s paper reveals the extent to which this problem had attracted expert attention, and the multiple ways in which scientists had attempted to find a satisfactory solution. “A discussion followed on the various methods of identification of different species and varieties viz., biological, biometrical, morphological, pathological, physico-chemical, and what the Polish delegate aptly said might be described as the Bertillon method.”²⁰ While the nature of some of these methods can be surmised from their names, others were clearly highly inventive; uncovering them would be beyond the scope of this Chapter. At their core lies a need to deal with plants whose identities are capable of changing annually (hence Chmelař’s emphasis on seasonal trials) can be exceptionally similar (requiring the services of a well-tended museum) and which, at their worst, can converge upon almost identical morphologies despite possessing distinct pedigrees (or as Chmelař put it, held differences that were ‘only biological’). This fluctuation therefore also posed a significant challenge to genetics. If varieties continually underwent morphological and physiological change, to what extent were they stable? If different environments drew

¹⁷ The connections between the two are numerous; varietal identity and seed cleanliness were two of the most important ways in which breeders attempted to add value to their stocks; the morphological characters of seeds and the presence of certain diseases could sometimes be used to identify a varieties country of origin; seed samples sent into the OSTs would, when requested, be grown on to establish identity, and so on.

¹⁸ This information is taken from an English summary of his paper published in the report of the congress.

¹⁹ *Ibid.* p. 108.

²⁰ *Report of the Fourth International Seed Testing Congress (1925)* p. 108.

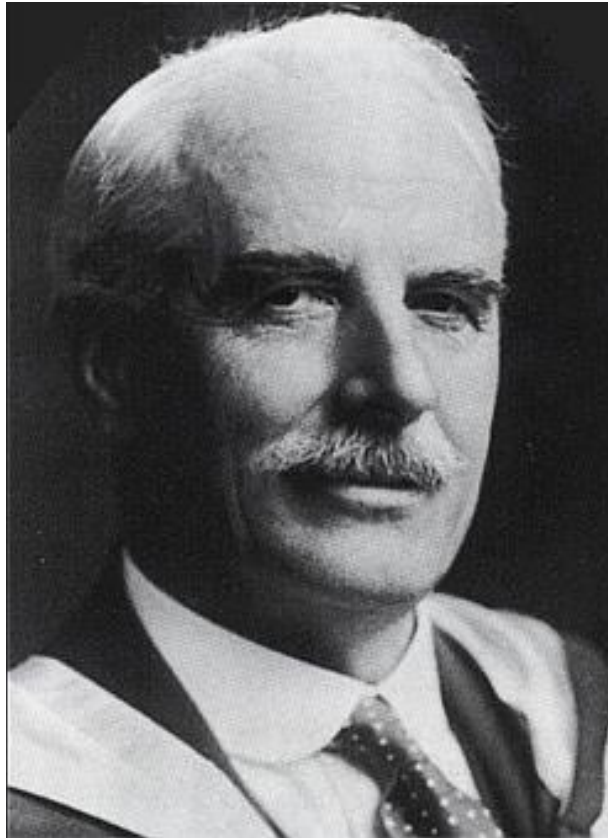


Figure 3.3: John Percival (1863-1949). Image in Caligari and Brandham (2001).

out different plant characteristics, to what extent could varietal identity be defined by its genotype? It was concerns such as these that ensured agricultural geneticists diverged from the wider genetics community.

As for the second problem – that of fluctuation as a source of credit for breeders – it was very widely recognised that without due attention and the necessary levels of husbandry, all varieties would vary wildly and deteriorate. Seed multiplication was a process that conveyed skill and professional identity upon the multiplier, while also binding the hereditary identity of that seed stock with that same multiplier, regardless of the varieties original breeder. For evidence of this perspective in action, return to Chapter 1 and consider Weaver and Bateson’s concern that seed multiplier’s demonstrated a distinct lack of concern for varietal purity when some other breeder, rather than themselves, was to receive plaudits for the variety in question. This problem cut in both directions, as breeders often felt that the years of selection and reselection they had undertaken in the face of fluctuation (their shepherding of varieties through uncertainty) entitled them to reintroduce a seed stock under a new name. Reading University’s pioneer agricultural botanist, John Percival (Figure 3.3) – who will eventually become a corresponding member of NIAB’s CSC – helps us to

appreciate how in the interwar years, a plants identity consisted of more than just its genotype.²¹

In some instances farmers and seedsmen have raised stocks of well-known sorts from a single ear, or by the methods of mass selection; they may also have given much attention and care to the cultivation of an old variety of wheat for a great many years, and feel justified in giving a new name to the forms so improved. How far this practice is to be defended or condemned is difficult to decide.²²

The value added to crops by the attentive care of a breeder was (and to some extent remains) an important part of the commodification process, one that is all too easily lost sight of in an age of anti-seed saving legislation and hybridised varieties that are built to last no longer than a single season.²³ In the first half of the twentieth century, breeders could legitimately draw upon their status as custodians of varietal identity. What is more, they went much further, and embedded mechanisms of hereditary change within this process. Many believed that varieties grown under particular conditions of soil or climate eventually acclimatized to those conditions. The longer this continued the more acclimatized they became, further differentiating the stock from that of its origin and further justifying a breeders decision to claim distinctness.

A most instructive case, one which allows us to see this plant breeding industry in action, is provided by the firm Carters, one of the largest traders of its kind in the UK. Berris Charnley has already drawn attention to how in 1923 Carters claimed to have produced ‘Yeomen King’ much to the chagrin of Yeoman’s originator, Rowland Biffen, who responded in 1926 by publishing an attack upon their methods, denying that any heritable change had been induced in his variety.²⁴ However, this story continued to unfold. Carters seem to have taken Biffen’s challenge relatively seriously, and in 1926 employed a Professor of Agriculture, Thomas Wibberley (Figure 3.4) to begin overseeing their plant breeding activities. Little is known of Wibberley, though his early use of the phrase ‘factory farming’ has been noted by Abigail Woods.²⁵ Prior to joining Carters, Wibberley had been Harrington Professor of Agriculture at University College Cork “becoming known for his work on the breeding and introduction of new varieties

²¹ Percival has been the subject of a Linnean Society special issue. Caligari and Brandham (eds.) (2001).

²² Percival (1934) p. 87.

²³ Kloppenburg (1988).

²⁴ Charnley (2011) p. 142.

²⁵ Woods (2012) p. 175.



Figure 3.4: Professor Thomas Wibberley (1880-1930). Image taken from Carters' seed catalogue 1927, held in NIAB archive.

of oats and and wheats".²⁶ His time in Carter's employ was cut short by his unexpected death in 1930. It is what Wibberley achieved (or claimed to have achieved) in this brief period of time that makes his case so instructive. Carter's granted Wibberley the first few pages of their 1927 cereals catalogue. His essay (an extended advert) charted the rapid improvements in scientific breeding that had begun to take place. He heaped praise on Biffen, George Stapledon (of the Welsh Plant Breeding Institute) and Herbert Hunter (recently employed at the Cambridge PBI) the Svalöf plant breeding station, and all the valuable varieties they had produced. He then, however, went on to consider the lives that varieties enjoy once free from their originators.

only the experienced realise how very difficult it is to produce an entirely new type of cereal, by cross breeding. One may cross fertilize a very large number of plants, without obtaining a single plant in any way superior to either parent. Even when one is successful in breeding a new type of plant with some distinct superior feature, *e.g.*, the milling qualities of Biffen's "Yeoman", a large amount of work has still to be done to acclimatize, and in other ways, make the variety suitable for ordinary farming conditions.²⁷

²⁶ Anonymous (1931) p. 118.

²⁷ NIAB, Seed Catalogue Collection, 'Carters cereal catalogue' (1927).

If one then turned to the varieties in Carters' catalogue, these now included 'Yeoman-Wibberley's Strain', 'Little Joss- Wibberley's Strain', 'Little Joss- Wibberley's Spring Strain' and 'Square Heads Master- Wibberley's Strain'. While the latter variety might not be all too surprising (for decades Square Heads Master had been one of the most widely grown varieties in the UK and had experienced something of an identity crisis) both Yeoman and Little Joss were varieties famous for their having been bred by Rowland Biffen. As though it was not enough to claim that Little Joss was unstable (and capable of producing two strains) Carters added insult to injury by playing precisely upon the currency attached to Biffen's name, boasting that their seeds had been grown from his original stock. Considering the on-going search for a reliable method of plant identification and the continued claims to non-Mendelian mechanisms of heredity (selection and acclimatization) W. H. Parker's decision to establish the Cereal Synonym Committee in 1930 was no small one.

Section III: W.H. Parker and the formation of the Cereal Synonym Committee, 1930

Wilfred Parker had assumed the Directorship ahead of number of candidates, but behind others. O.T. Faulkner, a student of T.B. Woods' whom the latter recommended to the position, was an early candidate. Not long before NIAB's foundation Faulkner had relocated to India to work on wheat and cotton on behalf of the Indian Agricultural Service.²⁸ He was not selected. Another was A.S. Gaye, a lawyer who before the war had come to work for the Board of Education and then became Private Secretary to the President of the Board of Agriculture. Since the war he had been employed as Director of Flax Production in MAF.²⁹ However, by far and away the most favoured candidate was William Gavin (1886-1968), of whom much more will be said in Chapter 4. Weaver even pursued Gavin to the stage of negotiating terms, such was his desirability. Gavin's early biography is remarkably similar to that of Weaver, though unlike Weaver, Gavin had studied for an agricultural degree at Cambridge and had been working for a large farming company – Strutt & Parker Farms – at the outbreak of the Great War.³⁰ Like Weaver however, he had immediately enlisted in the Royal Naval Volunteer Reserves

²⁸ NIAB, K-1.2 'Appointment of Director', Faulkner to Weaver correspondence, (?)1918. My very sincere thanks to Tricia Cullimore for digitizing this entire folder, of over 100 pages, for me when I could not travel to Cambridge.

²⁹ NIAB, K-1.2, 'Appointment of Director', Gaye to Weaver 21/1/1920.

³⁰ See Gavin (1967) for a history of this farming firm, who worked thousands of acres of land across Essex, some of which they owned, but much on contract. Such an business approach to farming was widely touted as the key to the industry in the future, and Strutt and Parker were important as pioneers on these terms.

only to be plucked out by a wealthy patron (Mr Strutt of that same company) and placed under the leadership of Lord Ernle at the Board of Agriculture. At the end of the war, Gavin returned to private industry, taking a position with ICI. Despite being extremely interested in the NIAB Directorship, it simply did not pay as much as he was then earning. Gavin sought something closer to £1500-£2000 per annum, while NIAB was only offering £1000. Thomas Middleton, who was again closely involved with this decision, wrote to Weaver on the subject.

Gavin is a personal friend of mine, I have a very high opinion of his ability and energy, and I would gladly see him make a large income, but, were he to consult me on this matter, I would advise him not to go to Cambridge unless he is prepared to take the post at a salary comparable with the stipends paid by the University. If he wants £1500 or more he should go into commerce.³¹

After weeks of negotiation, this is ultimately what Gavin decided to do, writing to finally decline the offer in January 1920. This apparently left Weaver with the only option of advertising for the position. "Middleton is very keen that we should advertise it, and I am inclined to agree with him. There seems to be no other candidate known to any of us who has the very complete set of qualifications possessed by Gavin, and I think we had better have recourse to the open market and see who turns up."³² No one particularly attractive turned up, and so Wilfred Parker was given the job (Figure 3.5).

Parker had been working with Biffen at the PBI, and seems to have been offered the position prior to the interviews that took place. If he did make any official application to the post it has not survived in the archive, which otherwise gives a very full account of the applicants and their careers. Parker is therefore best understood as a safe choice, someone whom Biffen clearly could work well with and whom instilled enough trust in Weaver to be given the opportunity. These origins certainly explain his somewhat 'light touch' during the period of Weaver's Council Chairmanship. As one close colleague wrote on Parker's death;

His youth, his inexperience, and his respect for authority, all tended to make him hide his initiative and capacity for administration behind the all powerful personality of Weaver. When the break came and Weaver handed over the reigns, the day of trial dawned for Parker calling forth his gifts of understanding, patience, and tact...Readjustments took a little time until NIAB stabilised under Parker's guidance.³³

³¹ NIAB, K-1.2, 'Appointment of Director', Middleton to Weaver 11/12/1919.

³² NIAB, K-1.2, 'Appointment of Director', Weaver to Wood 21/1/1920.

³³ Quoted in Silvey and Wellington (1997) p. 13. Original from Salaman (1939) p. 420.

It does not seem to stretch the facts too far to suggest that Parker's decision to tackle synonyms – a plan that he began to put in to motion in the late 1920s and eventually brought to fruition with the formation of the CSC in 1930 (the year of Weaver's death) – at this time was precisely so as to help put the Institute on a more solid foundation, and to begin defining it in the terms of his own Directorship. He had in fact singled out the issue of synonyms in one of his first publications as Director, which compared the lack of control over plant identity in Britain to the more extensive measures taken in Europe and North America.³⁴ However, it was not until 1929 that he began to arrange for NIAB to take on this responsibility. The Institute's financial difficulties described in Chapter 2, alongside the scientific and commercial problems of fluctuation and the potential for litigation, discussed above, sufficiently account for this delay. Fortunately



Figure 3.5: Wilfred H. Parker (1889-1938) NIAB Director 1919-1937.

³⁴ Parker (1921).

NIAB's pre-existing commitment to the elimination of potato synonyms meant that Parker's cereals plans did not equate to the introduction of a radically new responsibility for the Institute, though this hardly made them any less controversial.³⁵ Parker therefore began proceedings with a typically NIABian conspiracy.

Before alerting members of the seed trade to his movements, Parker organised a meeting with the Royal Agricultural Society of England (RASE) and the National Farmers Union (NFU) at the latter's offices in October 1929.³⁶ Here they circulated a list of synonyms that they believed to have already uncovered. William Hasler, driving force behind the National Association of Agricultural and Seed Merchants and a patron of Biffen's through the British Seed Corn Association (see Chapter 1) attended as Chairman of NIAB's Crop Improvement Committee. Not breeding novel varieties himself, though profiting from the sale of those produced elsewhere, Hasler was more sensitive than most to the potentially damaging nature of NIAB's relationship with this scheme. It was he who reminded everyone present that "the provisional list of cereal synonyms which had been distributed in the course of the discussion should be regarded as confidential."³⁷ A vote was taken and plans to begin policing cereal synonyms were set in motion. It now came time to address those seed traders who *did* produce their own varieties, inviting the Agricultural Seed Trade Association (ASTA) to a meeting in January 1930, once again in the offices of the NFU. While seed traders were far from overjoyed by the prospect of yet more interference in their industry from outsiders, the CSC nevertheless emerged, incorporating members of each organisation; the ASTA hoping once again to influence policies by helping shape them and resisting the worst possible outcomes. Nor were they going to fight this battle alone. One of the ASTA's most influential supporters resided within NIAB itself. E.S. Beaven might have been decidedly against the propagation of synonyms, but he nevertheless refused to accept that a national body could legitimately act as arbiter when it came to the existence or nonexistence of distinct varieties. In 1909 all that he had proposed was a voluntary system of plant registration, one that allowed dealers and farmers in search of distinct crops to obtain them, without infringing upon the activities of firms that wished to continue multiplying and selling 'selected' seed on whatever grounds they desired. Plans for the appropriate management of synonyms reflected vastly different ideas as to the adequacy and location of plant breeding expertise. Those whose

³⁵ See Footnote 11, this Chapter.

³⁶ NIAB, K-10.29, Appendix to Crop Improvement Committee Paper No. 98.

³⁷ NIAB, K-10.29, Appendix to Crop Improvement Committee Paper No. 98.

loyalties lay primarily with commercial producers (Beaven and his commercial colleagues), failed to see the benefit in creating a national arbiter, *especially when one considered the inherent difficulties of plant identification*. Those whose loyalties lay ostensibly with the consumer and, lest it be forgotten, their own continued efforts to gain professional recognition (Parker and his academic colleagues), failed to see the harm in centralising decisions over varietal identity, *especially when one considered the inherent difficulties of plant identification*. A state of affairs that on one account was a manifesto for inaction was, on another, quite the reverse. These tensions between academic and commercial communities came to the fore during the debate between Parker and Beaven that followed the CSC's creation.

Beaven argued that no breeder worth his salt would allow the judgment of another man (scientific or otherwise) to decide whether or not he had produced a distinct variety. In a series of memorandums and letters sent between himself and the Director in 1930, he made this position clear. Parker had proposed a scheme in which any purportedly new variety would have to be submitted to NIAB before it could even be given a name. After NIAB had certified the variety to be distinct, the producer could go on to name it and enter it into NIAB's trials. "I could not support such a proposal" responded Beaven

for the simple reason that I should not myself as a plant-breeder necessarily accept the decision of the N.I.A.B. in such a case, and I feel quite sure that it would be impossible to get the seedsmen in general to agree to it. Do you think the head of the P.B.I. would accept the judgment of the N.I.A.B. on such a point if he differed from it?³⁸

Here Beaven is not merely arguing that academic and commercial breeders are a match for one another when it comes to the identification of distinct plant varieties. His use of NIAB and the PBI as examples also achieves something much more subtle. NIAB was subordinate to the PBI in the eyes of the academic community (thanks to the prestige attached to the former's research agenda), in the same way that NIAB now apparently sought to make private breeders subordinate to itself. In addition Parker's scheme was also based on a strong academic, rather than commercial, reading of the situation, and on the new genetics in particular. R.H. Biffen was by far the single most important advocate of the new genetical perspective that was emerging at this time. Writing of the powers of selection often touted by commercial breeders, he states that

³⁸ NIAB, K-10.29, Appendix to Crop Improvement Committee Paper No. 98.

There is even now no trustworthy evidence that selection on such lines [those taken from a single plant] can result in any alteration to a stable type of wheat. The evidence, derived from attempts to alter easily measurable characteristics, rather than a vague one such as yield per acre, points in the opposite direction and the view is now general that the plant – as long as it is self-fertilized or pollinated by a plant similar to itself – is, as far as human efforts go, unchangeable. To use a modern term, a stock of any wheat uncontaminated by admixture with other sorts is a “pure line.”³⁹

Biffen is here arguing that any change that could not be reasonably argued to have influenced the genotype is really no change at all. This logic provided the basis for Parker’s proposal in that (once a varieties identity had been established) it was considered possible for that variety to be tracked and controlled across the generations. This is a very concise summary of the new genetic era into which plant breeding would eventually be led. However, it had not been led there yet. In making his argument, Biffen had side-lined the problems outlined above, saying nothing about the variation exhibited by plants in every given season, nor anything about those ‘vague’ characters such as yield. Plant fluctuation ensured that even the most persistent hereditary characters would manifest themselves differently depending upon the location in which they were grown. Biffen’s Mendelian account could certainly be included alongside those that “comprised an impossible view of the organism” and what is more, Beaven knew it.⁴⁰ He made this point in his memorandum to Parker. The morphological markers that identification relied upon, such as tint of grain, length of ear, and angle of leaves, were all subject to fluctuation and are thereby “masked by environmental conditions” he wrote.⁴¹ A plant could not be defined by its genetic complement alone if different environments, and different annual climates, produced different plants. Fluctuation causes even greater problems in this respect if one sets aside the ‘easily measurable characteristics’ required for plant identification and concentrates instead upon those ‘vague’ (and much more economically significant) characters such as yield. In trying to marginalize these problems, Biffen was in the minority.

Five years prior to Biffen’s above pronouncement, his co-author Frank Engledow had already stressed the extent to which varieties could not be defined by their genetic constitution alone. A plant character was after all

³⁹ Biffen and Engledow (1926) p. 8.

⁴⁰ Müller-Wille (2008a) p. 15.

⁴¹ NIAB, K-10.29, Appendix to Crop Improvement Committee Paper No. 98.

only a manifestation and one depending in part for its precise form upon environment. Upon what else does it depend? The customary answer is, upon a “factor” or upon two or more “factors.” Let this answer be accepted and let it further be accepted – as thanks to Morgan and his collaborators it now well may – that the factor is a “something” in a chromosome. That a “factor” exists and segregates is a helpful idea and a very well tried one, but in what manner does the factor operate? Its presence is responsible for a potentiality, the potentiality controlled by growth-environment produces a certain manifestation – but what is the exact physiological nature of the potentiality? This seems to be the enquiry upon which genetic effort – forsaking the simple ratio-quest – should now concentrate.⁴²

By 1930, a decade’s worth of data gathered by NIAB had turned this observation into a maxim. In any given year, and any given location, plants varied wildly. It was by far and away the most commonly remarked upon phenomenon in *The Journal of the National Institute of Agricultural Botany*. Parker emphasised the problems this caused in the breeding of improved varieties, stating

no one with any knowledge of agricultural crops, or indeed of biology in general, will delude himself into anticipating that there can be one “best” variety for all the variations of soil, season and culture to be found in even so small an area as the British Isles⁴³

By the time he came to codify NIAB’s trialling procedures (after the ten years of debate and refining described in Chapter 2) he placed the following paragraph on the front page in bold lettering.

It can be taken as proven that two plots of the same variety of any farm crop grown in the same apparently uniform field and treated alike in every respect may differ from one another in yield by twenty per cent. or more solely as a result of differences in soil conditions.⁴⁴

NIAB largely refrained from considering the implications of such findings, and rarely commented on any theoretical implications of its work, concentrating instead on displaying its results as appropriately as possible and drawing out the statistical relations between them. At the same time however, recognition of this variation made it easier to sympathise with those breeders who had reselected varieties in the face of fluctuation, or exposed varieties to certain geographical conditions over a number of seasons before selling it as ‘acclimatized’. Throughout the 1930s the extent to which

⁴² Engledow (1921) pp. 191-192.

⁴³ Parker (1930a) p. 246. As Harwood has shown, in Germany, large commercial firms were committed to precisely such a delusion. Harwood (2012) p. 45.

⁴⁴ Parker (1930b) pp. 313-314.

plants fluctuated was emphasised by the greater part of the commercial community (consisting of small-to-medium sized seed houses) as well as being recognised as a significant problem by the academic community of agricultural geneticists.⁴⁵ The policies actually adopted by the CSC following Parker's and Beaven's exchange reflect NIAB's position between these two communities, while also bringing into sharp relief just how alien were Biffen's views at this time.

The CSC decided that provided a breeder used the varietal name as defined by NIAB (and their academic experts) they could continue to make claims as to acclimatization or selection by giving the name of the firm in brackets as a suffix. This compromised position, while entirely at odds with Biffen's more draconian (and we might say naïve) views, ensured all breeders could legitimately continue to practice methods of selection, no matter how stable the original variety was claimed to be. (In the Conclusion to this Chapter, it is argued that Biffen's naïve views were due to his position within the academic community, and the extent to which this was connected to his varieties, while his failure to bring his perspective to actuality was due to the national political and economic context of British plant breeding.) For our current purposes, it should be instantly recognised that the policy promoted by NIAB was one already very familiar to agricultural breeders. It was after all very similar to Carters' existing strategy for the sale of 'Wibberley's – Little Joss'. This is problematic as until now the policies of NIAB's CSC have been judged unambiguously successful. Silvey and Wellington write that "the elimination of synonyms...curbed some commercial activities, which seed firms had regarded as legitimate and profitable." NIAB's success is assumed on the grounds of the 'trade disenchantment' that followed.⁴⁶ Palladino on the other hand has suggested that success largely followed because the work of the Committee was actually *supported* by private breeders. At a time in Britain when breeders could claim no form of IP upon their varieties, the CSC could act in lieu of such protection, actively pursuing the smaller firms who continued this practice, while not being in a position to damage larger firms. "Although they were highly effective in eliminating most synonymous varieties, some of the larger seed firms – e.g. Carter's – persisted in marketing synonymous varieties, notwithstanding exposure. The campaign to eliminate synonymous varieties appears to have been very effective in eliminating

⁴⁵ As will become clear later, the largest seed houses (capable of benefitting from economies of scale) were always attracted to the possibility of gaining proprietary rights over their varieties, downplaying the extent to which they fluctuated or were suitable in only certain environments.

⁴⁶ Silvey and Wellington (1997) p. 26.

the smaller seed firms from the market.”⁴⁷ While some large firms certainly supported the establishment of breeder’s rights (see Chapter 5), there is no evidence that NIAB’s synonym policy provided any such protection. Breeding firms, small or large, could give the appearance of cooperating with the CSC in the elimination of synonyms while at the same time changing their trade practices hardly at all. The reduction that followed (in the number of variety names) should not be taken to indicate that inter-varietal differentiation ceased, or that private firms stopped selling the varieties of their competitors. This becomes all the clearer if we turn to how NIAB’s policies were actually implemented.

Section IV: Putting policy into practice, 1930-1937

NIAB already had a list of suspected synonyms with which to work. Some of these had been grown under observation at the Institute, while others seemed likely after a painstaking search through seedsman’s catalogues.⁴⁸ Others were brought to the attention of NIAB by the academic breeders who were co-opted onto the CSC. Herbert Hunter and Biffen (who had by this time retired from the University of Cambridge) provided precisely this kind of expertise, while John Percival was elected a member at large. Hunter, who had recently been working on the breeding of a new variety of oat, presented the first synonym report on a variety of Carters’ under the name ‘Giant Black Winter Oat’ which his investigations had suggested was actually an established variety known as ‘Bountiful’.⁴⁹ This was the kind of egregious synonymity that NIAB sought to eliminate, the use of an entirely different name for a variety otherwise already available. In this much NIAB’s policies were certainly successful. They confronted them by publishing annual lists of synonyms complete with the names of the firms that sold them. Circulated widely in the agricultural press and the *Journal of the Ministry of Agriculture*, these acted as a very strong deterrent to the more blatant cases of synonymity. So much so, that by 1934 NIAB was having to deal with the threat of litigation. Herbert Smith, secretary of both the ASTA and the National Association of Corn and Agricultural Merchants, was asked by these two bodies to consider the legality of NIAB’s actions. He felt compelled to warn Thomas Edward Miln (who had inherited control of Gartons following the death of his father, George – see Chapter 1 – and who was acting at the Synonym Committee’s commercial representative) that

⁴⁷ Palladino (1990) p. 453.

⁴⁸ The collection of this material held by NIAB’s archive is exceptionally rich.

⁴⁹ NIAB, T-2.5, Minutes of Cereal Synonym Committee.

should he continue to serve he was likely to be taken to court. “A lengthy discussion ensued during which it was pointed out to Mr. Smith that, even if the Cereal Synonym Committee made a mistake in its findings, the damages which were likely to be awarded would only be nominal, for the Committee acted solely in the interests of the public.”⁵⁰ Whether or not Miln, a large private breeder and originator of his own varieties, would have been able to plead this successfully was (thankfully for NIAB) never put to the test.

Aside from publishing lists of synonyms, some of NIAB’s other methods were much more exacting. For instance, in those cases where a breeder believed to have developed something distinct and truly worthy of a new name, but NIAB disagreed, the Institute responded by grinding down the breeder’s skills to their finest components. The breeder in question was invited to attend NIAB’s Cambridge headquarters. There they would be presented with a plot containing several different varieties, including their own, and asked to point out which was their creation. Unfortunately, though unsurprisingly, NIAB’s records contain very little information about such encounters, only a very small number of which actually took place. On one occasion, a Mr McCormick of Edward Webb & Sons “inspected with the Committee plots of certain cereals of which the seed had been obtained from Messrs. Webbs...He could not distinguish it [Standup White] from Wilhelmina, and Webbs would not raise any objection to the Committee reporting to that effect.”⁵¹ McCormick could afford to be ambivalent about such a performance as Standup White was a stock that he had only recently taken over, of a variety he had not bred, and which Webbs considered to have “no commercial importance”.⁵² The status of their ‘New Cross Barley’ was a different matter. NIAB claimed that it was indistinguishable from Spratt-Archer, a claim that Webbs accepted up to and including the stocks of that year. In 1932, they protested, they had begun to use this name for a new hybrid; to include ‘New Cross Barley’ in NIAB’s synonym list would be grossly unfair. This is an interesting case as it exemplifies both the fluid nature of plant names and identities in the early twentieth century, while perfectly capturing another part of the tension between the academic and commercial communities. From the academic perspective, New Cross Barley was the name given to a particular stock of seed, which had been sold on the basis of it being a distinct variety, when in fact it was a synonym for Spratt-Archer. From the commercial perspective,

⁵⁰ NIAB, E-6.13, Exec sub-committee box file, minutes 1-126, minutes of 17th meeting 15/3/1934.

⁵¹ NIAB, T-2.5, Minutes of the fifth meeting of the Cereal Synonyms Committee 9/8/32.

⁵² NIAB, T-2.5, Minutes of the fifth meeting of the Cereal Synonyms Committee 9/8/32.

New Cross Barley and any notoriety attached to it, was the property of the Webbs and could be applied to any productions (within bounds of fairness defined by themselves) that might emerge from their seed house.⁵³ “Messrs. Webbs considered that the Committee had no claim to control the naming of varieties, and Mr. McCormick stated that the new stock was being sold under the same name as the old ‘for business reasons’”. NIAB obliged Webbs by merely recording in the 1932 synonym list that some earlier stocks of New Cross were really Spratt-Archer. Considering the level of resistance that emerged in response to NIAB’s fairly minimal interference, the CSC’s decision to allow breeders to attach their firm’s name to a variety becomes all the more understandable, despite its apparent affront to naïve genetic principles.

NIAB’s policies effectively reduced the number of new names introduced to varietal nomenclature. At the same time however, this did little to tackle the most pressing concern for farmers; deciding which stocks of seed would provide the best results and at what price to purchase them. While NIAB’s trialling work helped to indicate which varieties were better suited to various locations and growing conditions, upon turning to trade catalogues, farmers were still faced with as wide a variety of choices as before. To be sure, these now orbited around more familiar and fewer utterly alien names, but claims to uniqueness continued unabated. The majority of breeders simply fell in line with NIAB’s policy, this being the easiest way to avoid the stigma attached to the CSC’s synonym lists. Even here however, provided a firm used the ‘true’ variety name, this very minimal rule could be bent. For instance, when an agent of the firm Messrs. John Swain was found to be selling synonyms and asked to conform to NIAB’s prefix-suffix system, rather than add the companies name (as recommended by NIAB) they instead attached the earlier synonymous variety name. “The Committee agreed that though Messrs. Swain’s new practice was not unexceptionable it was a great improvement on the past and that it was not necessary for the Committee to make any further protest”. It no doubt helped that the Director of this firm was the highly reputable Major Hansford, who was later elected to NIAB’s Council by the RASE. Other breeders confronted the logic of NIAB’s policies more directly. Many breeders argued that the characteristics that made their plants distinct would only emerge when grown on an agricultural scale. Small observation plots could

⁵³ Here we find a botanical analogue for Theunissen’s Dutch cattle breeders for whom pedigree, if interrupted by undesirable morphological characteristic (i.e. coloured spots on short horns) was subordinate to the market’s ideal type. “At issue here was not a genotype but a commercial ‘brand’.” Theunissen (2008) p. 656.

not demonstrate a greater resistance to disease, or winter hardiness for instance. These breeders could delay entry into a synonym list for a little longer by convincing NIAB to conduct large scale examinations, perhaps as part of the first year of what would eventually become a three year trial. More often, if it looked likely that a stock was going to be identified as a synonym, the firm in question would simply retire the name. A more difficult case was presented by that of Mr. E. Wyatt Toogood of Messrs. Toogood & Sons Ltd., who claimed that their 'Squarehead's Success' (with which we began this Chapter) was not a synonym of 'Squareheads' Master' for the very good reason that it was in fact *truer to type* than the latter, due to the fifteen years of selection they had practiced. NIAB in this instance did not agree that the non-germinal contribution (if indeed we submit to calling this non-germinal) made by the breeder warranted a distinct name. As neither party backed down, 'Squarehead's Success' remained in NIAB's synonym leaflets until it was finally pulled from Toogood's

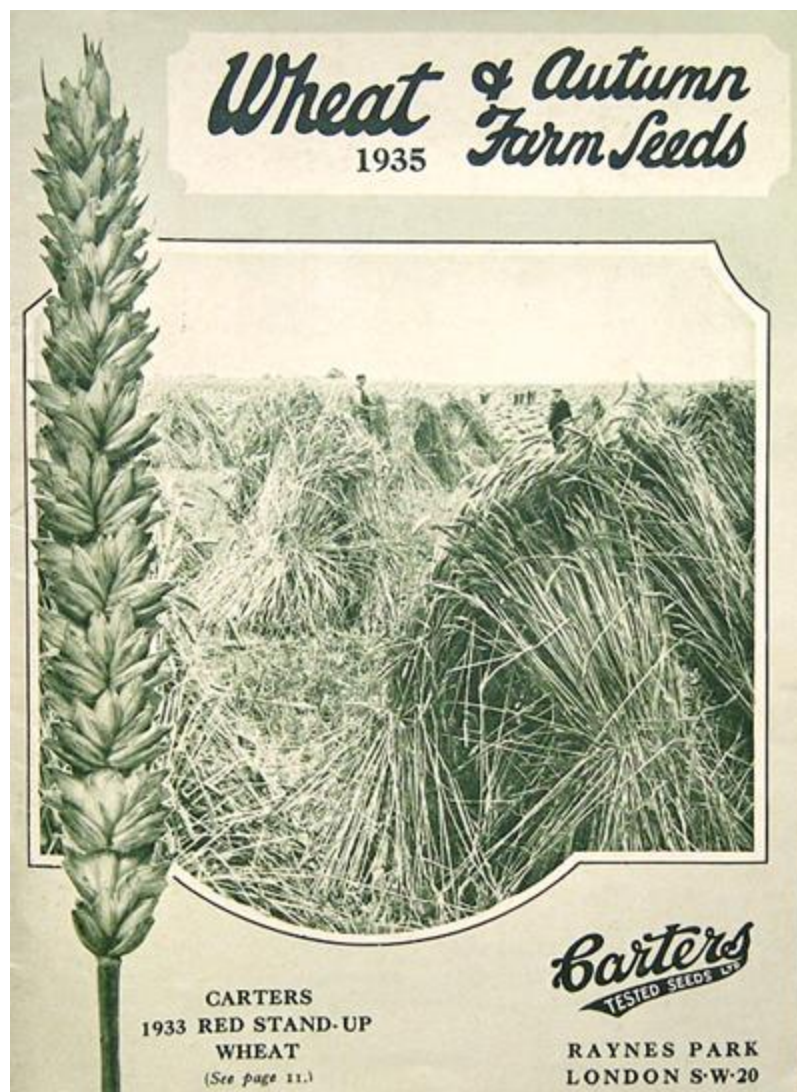


Figure 3.6: Front cover of the 1935 Wheat catalogue from Carters seed firm, showing persistence of Red Stand-up as 1933 Red Stand-up.

catalogue in 1937. Had the firm known that this was to be the last year in which NIAB would publish a synonym list, it is doubtful that they would have obliged. Finally, the most extreme case is once again provided by the firm of Carters. In 1932, the first year in which NIAB published its synonym results, 'Red Standup' was pronounced a synonym of 'Squarehead's Master'. Carters responded the following year by calling the variety by a new name – '1933 Red Standup' (Figure 3.6). The CSC must have swiftly realised that this particular cat and mouse game would only be brought to an end either by litigation or legislation, and, while continuing to include 'Red Standup' in their list of available synonyms, did not deign to subject '1933 Red Standup' to the same scrutiny.

This Section can be read as a response to Christoph Bonneuil's challenge that greater attention needs to be paid to the "material practices of observation, recording, book-keeping, processing and manipulating" that went into producing 'pure' organic forms.⁵⁴ However, it also charts a failure of this process. Within interwar British agriculture, a pure variety did not exist. Leaving aside the more Lamarckian mechanism of acclimatization, the process of maintaining varietal identity itself was a source of cultural and financial credit for breeders, one in which they also embedded hereditary mechanisms. A pure form may very well be perpetuated in the hands of one man, but would be transformed in the fields of another. This also causes problems for those historians who have considered Wilhelm Johannsen's bean experiments, and his introduction of the phenotype/genotype distinction a watershed moment in the history of biology.

A clear distinction between genotype and phenotype is widely considered to be the foundation stone of classical genetics. Such a distinction made it possible to go beneath inheritance as the mere morphological similarity of parent and offspring and investigate the behaviour, and eventually the nature, of the underlying factors (genes) that were transmitted from one generation to the next. The terms "genotype," and "phenotype," and "gene" were introduced by the Danish plant physiologist and geneticist Wilhelm Johannsen. He is recognized both for this contribution to conceptual clarification and for his bean selection experiment. This experiment became paradigmatic, an "exemplar" in the sense of Thomas Kuhn. It made the distinction between genotype and phenotype empirically operational, and thus gradually provided convincing evidence for stability, or "hardness," in the genotype.⁵⁵

For agricultural geneticists, the morphological *dissimilarity* between parent and offspring was just as likely, if not more likely, to attract scientific attention. 'Hard'

⁵⁴ Bonneuil (2008) p. 105.

⁵⁵ Roll-Hansen (2009) p. 458

elements were emphasised by geneticists' naïve to the complexities of agricultural plant breeding. Johannsen himself, embedded in the commercial world of plant breeding and seed testing (Chapter 2), through experiments in barley breeding and communication with scientific colleagues at Svalöf (the world renowned Swedish plant breeding station seen to have inspired the creation of NIAB in Chapter 1) would no doubt have readily recognised this complexity.⁵⁶ What is more, even if this distinction could be shown to have been adopted operationally elsewhere, we can say with certainty that it was alien to interwar Britain. One does not need to resort to Lamarckian hereditary mechanisms to recognise that varietal identity was constituted by a great deal more than its pedigree or Mendelian unit characters.

The work of the CSC was brought to a close in 1937.⁵⁷ Officially this was because so few synonyms were now being released (fulfilling their scientific and commercial goals). They were seemingly not concerned that this was not accompanied by a reduction in claims to distinctness (which was the value of the enterprise for farmers). While implementing this policy, breeders had found new ways to either adapt to NIAB's working practices, or escape their judgement entirely. At the same time, NIAB's interference caused significant resentment, particularly their presumption to superior expertise. Indeed, it was perhaps no coincidence that 1936 had seen the creation of the Standing Joint Committee on Relations with the Seed Trade, a body of six representatives (an uncharacteristically large proportion of which were nominated by the ASTA) tasked with improving NIAB's relations with the seed trade.⁵⁸ That Wilfred Parker was forced to leave NIAB in 1937 due to ill health (eventually succumbing to the illness in early January of the following year) also sapped momentum from the cause, and left NIAB without a Director upon entry to the Second World War. How the Institute fared shall be discussed in the following Chapter. The final Section of the present Chapter concentrates upon what the CSC tells us about agricultural geneticists around the world, and the economic, political, agricultural and scientific relations required to maintain varietal identity.

⁵⁶ One might be tempted to say that Johannsen was no Johannsenian, though it is something of a mouthful. For the influence of his work on Barley in this respect see Roll-Hansen (2009) p. 471. For the importance of Svalöf and the Carlsberg brewery in the development of his concept of purity, which, significantly, is removed from the complexities of agricultural fields, see Müller-Wille (2007) p. 801.

⁵⁷ A brief revival occurred during the Second World War (between 1942-45) and again in 1958, but little activity surrounded these meetings.

⁵⁸ NIAB, C-1, Council Papers Book 140-205, between number 145 and 156.

Section V: The international perspective

This final Section will take an international perspective, to consider how other nations attempted to control varietal identity at this time. Scientists elsewhere appear to have faced the problems caused by fluctuation, though often coming to radically different solutions depending on the political and economic conditions in which they worked. Only in those countries where political or economic circumstances made the idea particularly attractive, did plant identities come to be reduced to their genotypes, and again, most often by those who gained significant social or financial credit from their association with particular varieties.

Firstly, the case of the Netherlands appears to share some similarities with Britain. Both witnessed a long development in the improvement of agricultural varieties from the nineteenth century onwards, initially taken on by farmers and private breeders, only later attracting academic breeders.⁵⁹ In 1912 with the creation of the Institute for Plant Breeding, the Netherlands saw the arrival of cereal variety regulation much earlier than in Britain. Initially this constituted policing the entry of certain varieties into a nationally recommended register. Soon more ambitious (academic) experts were looking to make regulation more exacting, by only allowing the multiplication of the best registered varieties.⁶⁰ Things did not remain settled however, and throughout the 1930s and 1940s the influential commercial sector won back some important concessions, codified in the creation of the Associated Dutch General Inspection Service in 1931. It was only later that varietal identity was legislated for, under the 1941 Breeders Decree, which conformed to the new genetical rationality by confirming the right of a breeder to collect a levy on their productions wherever they were multiplied.⁶¹ Why was this contest between academic and commercial communities drawn out for so long? “A major reason for this entanglement was because the Institute for Plant Breeding had no exclusive knowledge or method available that allowed it to become the centre of expertise in the seed sector”.⁶² As we saw in Britain, academic breeders could not shake off the expertise of their commercial counterparts.

⁵⁹ Maat (2001) pp. 122-123.

⁶⁰ This bears a similarity with the rationale behind NIAB’s trialling work as seen in chapter two. Only improved new varieties would pass through NIAB’s trials safely. Maat (2001) p. 135.

⁶¹ Maat (2001) pp. 135-136.

⁶² Maat (2001) p. 130.

European fascist states, particularly those of Italy and Germany, provide further revealing points of comparison for what has come to be called ‘genetic modernism’ and its role in state building.⁶³ Tiago Saraiva has emphasised the importance of the infrastructure created and maintained by Mussolini’s regime when looking to protect the identity of the new Mendelian varieties being created by academic breeders such as Nazareno Strampelli.⁶⁴ The state’s maintenance of a large multiplication and supply network prevented private interests from taking on these varieties themselves (and thereby differentiating their stocks from that of the varieties’ origin) but also meant that when differentiation did take place (particularly through the ‘acclimatizing’ of seeds to local conditions) the varieties’ identity was still never questioned. Strampelli’s varieties remained his, they simply took on a local form. Here, as with NIAB, seed sacks bearing an official stamp were important instruments for the maintenance of plant identity within this supply network.⁶⁵ In the German context, Harwood has identified how different plant breeding programmes (pursued in different kinds of institution) focussed upon different biological phenomena and benefited different economic constituencies. A ‘local’ approach to plant breeding, pursued in the state-funded research institutions (largely built in the least wealthy agricultural regions) required greater sensitivity to the vast amounts of variation displayed by plants when grown in different geographic regions, in order to breed plants that benefitted peasant farmers and small-to-medium sized private seed firms. These breeders were by no means ignorant of the developments in Mendelian-genetics, attempting to apply and expand them where possible.⁶⁶ Meanwhile, a more ‘cosmopolitan’ approach was pursued by the largest and wealthiest commercial seed houses, looking to multiply single varieties on a massive scale (thereby economising) to be sold and grown in all regions. Here the differential response to different environments displayed by varieties was downplayed. While Harwood does not reflect upon this, it seems that there is congruence here between the ‘cosmopolitan’ approach to breeding and those who were strongly in favour of stringent control over varietal identity, often supporting the creation of IP. Ernst Baur, who in an earlier publication Harwood has already highlighted as being

⁶³ See the recent special edition dedicated to the subject of fascism and agriculture and edited by Saraiva and Wise (2010), which includes Gausemeir (2010) and Bonneuil and Thomas (2010). The other articles in this special edition are cited elsewhere in this thesis.

⁶⁴ Saraiva (2010) pp. 460-476.

⁶⁵ Saraiva (2010) p. 474.

⁶⁶ “Peasant-friendly plant breeding, therefore, was no less ‘scientific’ than was commercial breeding or that conducted at the universities; it was simply designed with a different group of users in mind.” Harwood (2012) p. 7.

strongly in favour of IP rights for breeders, was in his more recent account also an exceptionally vocal supporter of commercial breeders and their cosmopolitan approach.⁶⁷ Soon after the rise to power of the Nazi party, the 1934 Seed Decree introduced a scheme of compulsory registration for varieties “whose published results made clear which varieties were merely duplications”.⁶⁸ Harwood however loses sight of the heterogeneity that existed within the commercial breeding community itself when he considers those who benefitted from the 1934 legislation.

One group that undoubtedly gained were commercial breeders. By allowing the sale only of certified seed, by placing highly bred seed at the top of the hierarchy of certified varieties, by granting breeders (for the first time) license fees from farmers who sold replanted versions of original varieties (*Nachbau*), and by fixing seed prices, the Seed Decree not only enlarged the market for commercial varieties and guaranteed the breeder a profit margin but also protected his intellectual property against cheap copies.⁶⁹

Armed with the NIAB perspective, we can more easily recognise that commercial breeders were by no means ‘one group’, and that all of the gains here listed by Harwood were only to be had by the largest firms, capable of maximising profits through rapid and extensive seed multiplication. So too with the final nation to be discussed, the United States.

The US offers an important point of comparison as an example of a non-fascist state that nevertheless implemented strong IP legislation very early on (1930, the same year in which NIAB’s CSC was established). However this legislation only applied to asexually reproduced plants. Here we see yet another reason for the peculiar perspective of the agricultural geneticist distinct even perhaps from the horticultural geneticist; the nature of the organic material upon which they worked.⁷⁰ Why only asexually reproduced plants were included has not been sufficiently explored. It is important to emphasise what this separation meant for breeders of sexually reproduced varieties, as it exposes the distinction between agricultural geneticists and other (horticultural/medical/population etc.) geneticists at its most fine grained. In the

⁶⁷ For Baur on IP see Harwood (1993) p. 238. On Baur and the ‘local’ and ‘cosmopolitan’ see Harwood (2012) p. 85.

⁶⁸ Harwood (2010) p. 581.

⁶⁹ This is perhaps merely a symptom of attempting to deal with three such highly differentiated communities as scientists, farmers and private breeders. All that needs to be pointed out is that not all of those who were private breeders were also ‘cosmopolitan’ breeders. Some of them were small, perhaps even on the boundary of becoming ‘peasant-farmers’ themselves, and accordingly adopted a ‘local’ approach. Harwood (2010) pp. 581-582.

⁷⁰ Kimmelman has already made a very strong case for importance of the organic material studied by agricultural geneticists, though only in the American context. Kimmelman (1992).

US, as seen elsewhere, the push for IP came from the largest and wealthiest seed houses and nurseries, those with easy access to the ear of government.⁷¹ The most vocal commercial interests in support of IP rights were horticulturalists who (in a way similar to potato breeders) were largely concerned with managing the identity of crops propagated by cuttings. For these breeders therefore, the powers of selection in maintaining varietal identity were much less significant. However, unlike in the UK, potatoes were one of only two crops (the other being Jerusalem artichokes) whose identity was not protected by the 1930 Plant Patent Act. Fowler has highlighted that for the architects of the 1930 bill “This exception is made because this group alone, among asexually reproduced plants, is propagated by the same part of the plant that is sold as food”. He goes on to add “The omission would ease the concerns of those who would be troubled that the bill would deprive farmers of the assumed right to use the products of their field as they saw fit.”⁷² A history of the efforts of American cereal breeders, either for or against IP, remains to be written. (Deborah Fitzgerald’s excellent study of corn breeding cannot be taken as representative as such hybrids do not require patents in order to maintain control of their identity. They also thereby eschew the whole problem of ‘hard’ heredity, and have perhaps contributed to the widespread belief that ‘soft’ heredity was eliminated during the rise of genetics.⁷³) Considering the difficulties discussed in this Chapter, it seems likely that in addition to Fowler’s suggestion, agricultural geneticists’ concern with non-germinal contributions to plant identity, and the difficulties posed by plant identification in the first place, made such legislation difficult to enforce (without resorting to fascist infrastructure) and dependent upon a studied genetic naivety. It would not only have been a farmers right to do what he wished with his seed that would have been interrupted by the Plant Patent Act had it covered sexually reproduced plants, but the status they and many commercial breeders drew upon as custodians of varietal identity.

None of this is to say that more stringent controls were never considered in Britain. Some certainly felt that something like IP legislation was necessary. For instance, the head of NIAB’s Potato Synonym Committee, R.N. Salaman (Figure 3.7) – who by this point had pursued potato synonymy for a decade – argued strongly that potato and cereal IP should be pursued in tandem.⁷⁴ In reply to Salaman the CSC said

⁷¹ Fowler (2000) and Kevles (2007).

⁷² Fowler (2000) p. 635.

⁷³ Fitzgerald (1990). On the rise of hard heredity see Fox-Keller (2000) and Mayr (1982).

⁷⁴ For more on Salaman see Painter (1995) and Smith (1955).



Figure 3.7: Redcliffe Nathan Salaman (1874-1955). Image in Smith (1955).

“they recognised the authority of the views expressed by the Potato Synonym Committee but they felt that in the case of cereals the difficulties were such that, even if legislation were adopted it might be impossible to enforce.” Instead they felt they had more than enough material to begin effecting change within the industry. “The Committee came unanimously to the conclusion that their work was much more likely to be fruitful of result if they confined themselves to voluntary measures”.⁷⁵ Why Plant Breeder’s Rights only emerged much later in the UK has proved an interesting and

⁷⁵ NIAB, T-2.5, Minutes of Cereal Synonym Committee, 9/12/1931.

many sided question.⁷⁶ However, the simplest answer seems to be that in Britain, where academic and commercial agricultural breeders enjoyed a closer relationship than that to be found elsewhere (and embodied by NIAB), the difficulties attached to varietal identification discussed so far, alongside the strong resistance brought by those such as Beaven, made legislation a highly unattractive solution for the greater part of the breeding community. NIAB's Executive Committee explained this to MAF when the Ministry offered to create such legislation. "They [the Committee] consider that it is preferable to avoid legislation on the subject and that every effort should be made to effect the Institute's purposes by persuasion. Considerable progress they believe can be made by dealing with the obvious cases and by concentrating upon the future rather than the past."⁷⁷ As convinced of the stability of his varieties as Biffen might have been, thanks to the very close relationship between academic and commercial breeders that existed in Britain, any attempt to use the machinery of the state in order to regulate varietal identity, particularly considering the difficulties highlighted in this chapter, would have been held as nigh on fascistic.

Conclusion

If some academic breeders such as Biffen were convinced that only the germinal contribution mattered when defining plant identity, they were in the minority. It is, arguably doubtful that Biffen truly believed it himself. The same year in which NIAB began policing cereal synonyms, Frank Engledow drew to a close an exhaustive series of investigations which had focussed upon the problem of environmental contingency, fulfilling his own desire to forsake 'the simple ratio quest'. Matters had not improved.

The internal factors of yield are the whole of the basal physico-chemical activities which constitute plant growth and life. They are, in fact, identical with the ultimate heritable characters of Mendelian unit characters. Every variety of a crop plant represents, of course, a separate assemblage of such unit characters. But in the existing state of knowledge, yield or Mendelian or other investigation is compelled to deal with merely outward manifestations of these basal physico-chemical processes or unit characters. In speaking of dense and lax ears, or early and late maturation, it must be recognised that these represent complex expressions or manifestations of several true unit characters (*i.e.* activities). Moreover, the exact form of expression is directly governed by the external factors of environment.⁷⁸

⁷⁶ For a different perspective see Charnley (2013a) and (2013b).

⁷⁷ NIAB, C-1, Report of Executive Committee 7/11/28-3/1/29.

⁷⁸ Engledow and Ramiah (1930) p. 267.

By 1939 and the Seventh International Genetical Congress, plant variability and the non-equivalence of varietal identity with its germinal complement had even turned from vice to virtue.

It is clear from data available that in cultivated crops natural and human selective forces tend to establish a balanced mixture rather than a single type to the exclusion of others. This emphasizes the importance of studying the genetics of heterogeneous populations. While uniformity in a crop has agricultural advantages, genetic variability is necessary to ensure a flexible response to environment, and the breeder must set an upper limit to the standard of uniformity desirable in his strains. It must also be realized that breeding has to be a continuous process to maintain this uniformity against the tendencies in the opposite direction.⁷⁹

The Congress' special session dedicated to plant breeding methods suggests such views were very widely shared, though unfortunately little of this discussion is recorded. The published summary merely states "A lively discussion followed [the opening paper, given by Otto Frankel] in which the speakers were sharply divided. Some were satisfied that present-day methods, in which genetic analysis played only a small part, were as good as might be desired. Others contended that consideration of the genetic foundations of variation is now hardly sufficient; and that chance played too large a part in selection."⁸⁰

Why then had Biffen attempted such an (unsuccessful) coup in the British seed market? It seems that the most likely answer emerges from his location within the academic and commercial communities. The immutable identity of Biffen's varieties mattered more to him than any other academic breeder at this time. The power of his hybrids to transform agriculture had been instrumental in his gaining public funds and had even been referenced in the Houses of Commons and Lords.⁸¹ His identity as an academic breeder was tied more than most to his varieties as testaments to his breeding prowess and scientific expertise. By way of one final comparison, consider that equally accomplished academic breeder John Percival. Like Biffen, he was proud of the distinct varieties he had originated ('Blue Cone' was particularly well respected and widely grown). However, unlike Biffen, Percival had made his reputation by other means, and was no more attached to his varieties than any other commercial

⁷⁹ Punnett (1941)p. 156. This statement was taken from a paper delivered by J.B. Hutchinson of the Cotton Research Station, Trinidad.

⁸⁰ Punnett (1941) p. 37

⁸¹ See in particular HC Deb 08 March 1910 vol 14 cc1312; HC Deb 18 July 1918 vol 108 cc1264-336; HL Deb 07 May 1919 vol 34 cc487-539.

breeder.⁸² This is reflected in the way Percival managed the sale of his varieties. Rather than trying to establish and command his own breeding empire (as Biffen had done with the PBI, NIAB, and its stamp-approved seed sacks) Percival entered into a contract with the private firm of Dunns, who would multiply, advertise and sell varieties on his behalf, just as they did for all the other breeders they represented.⁸³ In this respect therefore, we might well expect Biffen to have more in common with the likes of E.S. Beaven. To a certain extent this is what we find, especially when we remember that Beaven was amongst the first to publicly denounce the producers of synonyms. Yet, at the same time, his own varieties did not matter as much to him as they did Biffen, or rather, they mattered less to him than did his status within the commercial breeding community and the free access to germinal material this gained him. For Beaven, even ‘pure races’ (seeds taken from selected single plants) within which “characters acquired by the individual from the effects of environment...are not inherited” would lose their identity if not maintained by a watchful breeder.⁸⁴ When it came to hybrids, the situation was even worse.

Even if the Mendelian hypothesis of unit characters is fully accepted, there are evidently so large a number of characters which may be genetically different, to a greater or lesser extent, in the original pair of parent plants, that some amount of ‘splitting’, especially in the characters which are not obvious, or which normally fluctuate widely with environment, may go on but pass unnoticed.⁸⁵

Commercial breeders in Britain shared, acclimatized, hybridized, selected, imported, hunted for sports and ultimately relied upon their expert eyes to differentiate that fine line between novelty and synonymy. They did not shut the door on selection, as Biffen had attempted to.

The picture that emerges from international comparative work is that only those who stood to gain cultural or financial credit from their identity as the breeder of *particular* varieties supported their protection through legislative or regulatory mechanisms; i.e. it reflected their location within the commercial community. In fascist states, it was the regime itself that stood to gain credit for its sponsorship of the agricultural sciences. Here claims to distinctness brought on by local breeders could

⁸² Percival’s *Agricultural Botany*, published in 1900, was the first full-length treatment of the topic and helped to define the science. It ran through numerous editions and remains influential today. Percival (1900).

⁸³ See Bunting (2001) p. 19.

⁸⁴ Beaven (1947) p. 54. This manuscript was published some six years after Beaven’s death.

⁸⁵ Beaven (1947) p. 56.

obviously not be tolerated (nor were they likely to emerge!) In more liberal climates, only those wealthy enough to pursue economies of scale sought to protect varietal identity, confronting those who undermined 'hard' heredity. For instance Philippe de Vilmorin, owner and operator of one of the wealthiest plant breeding establishments in Europe, declared it "proven that the external factors have no hereditary influence, that is to say that there exists no 'inheritance of acquired characters' as hypothesized by Lamarck".⁸⁶ On the view advanced by this Chapter, it seems quite clear that de Vilmorin is here protecting his investments from those breeders who made a good trade out of taking overseas productions, growing them for a few years, and claiming to have 'acclimatized' or 'improved' them through selection. In order to hold such a view, one has to define varietal identity purely by pedigree or genotype, and blind oneself to the generations of labour that go into their maintenance. This chapter argues that beliefs as to the plasticity of plants mapped on to the social and economic contexts inhabited by various commercial and academic breeders. The extent to which any (academic or commercial) breeder believed novel varieties to be immutable, corresponded with the extent to which they, as a plant breeder, relied upon the potential financial and cultural credit gained from their production. These arrangements settled, the theoretical principles adhered to by certain agricultural breeders, and the experimental problem choices made by certain agricultural geneticists, collapsed accordingly.

⁸⁶ Quoted in Bonneuil (2006) p. 289. That de Vilmorin is making this case in France of all countries, considering the otherwise widespread persistence of Lamarckian mechanisms, and scepticism regarding the new genetics, goes to show how attractive the latter was for those private breeders looking to better protect the identities of their varieties. See Burian and Gayon (1988).

4. *National Institute: Agricultural science in the Second World War, 1939-1955*

Throughout the thesis thus far, NIAB's status as a national institute has been exceptionally important.¹ Founded and subsequently supported in large part by national funds (as seen in Chapter 1), the Institute's activities (described in Chapters 2 and 3), were only possible thanks to the legitimacy conveyed upon them by its national remit. In this Chapter, NIAB's status as a national scientific institute is brought more clearly into focus. As with the previous Chapters, this enquiry could have begun at any point in the Institute's history, and again (as with the preceding Chapters) it has been postponed until now so that it might be pursued during a period when being a national scientific institute carried more significance than usual. If we take a broad view, it is already well known that the Second World War was good for nationally funded science and scientific institutes.² Less well known is the extent to which agricultural science in particular benefitted from the war, while the ways in which agricultural science contributed to the war effort are practically invisible. It is not yet possible to address this very large story comprehensively, so instead this Chapter offers a selective history of the war, one told from NIAB's perspective. At a time when state intervention had a particular cache, NIAB's behaviour was all the bolder. The fifteen years covered by this Chapter see British agriculture and agricultural science's fortunes radically altered.

While not forgetting earlier formative developments, this Chapter focusses upon a very distinct period in the history of British agriculture and agricultural science.³ With the coming of war, laissez-faire economic policies were abandoned and the

¹ There are few models for this investigation of national scientific institutions in Britain, Magnello's history of the National Physical Laboratory was particularly helpful. Magnello (2000).

² Agar (2012), pp. 263-300. Edgerton (1997) pivots about the Second World War, emphasising the 'deepening' (p. 768) of nationally funded science that came during and subsequent to the war, but is keen to emphasise a more continuous process of change. On the Second World War as inspiring and depending on expensive nationally funded scientific ventures, see Galison and Hevly eds. (1992), on Britain in particular Edgerton (2011) and Hartcup (2000), and on British biology in particular see Balmer (2001).

³ There is of course a pre-history to the emergence of state managed farming, and due sensitivity must be given to Brassley's warning that repeated use of the Second World War as either the beginning or the end of our agricultural histories has served to distort our view of the twentieth-century. Brassley (2000). The first three Chapters of this thesis should be understood as militating against this tendency. Amongst the most important interwar developments were the establishment of Marketing Boards for commodities such as milk, potatoes and hops, alongside protectionist measures on imports and subsidy programmes, such as the 1932 Wheat Act. For more on these initiatives see Astor and Rowntree (1935), (1938), Brassley et al. (2006), Cooper (1989), Grigg (1989), Howkins (2003), Mollett (1960), Perren (1995), and Whetham (1978).

principles of agricultural protection and subsidisation that we live with today were established. National agricultural output grew rapidly thanks to this direct state intervention, and continued to do so following the war. Conversely, by the end of this period – the mid-1950s – increased output as an aim in itself began to diminish (a result of the new problems of surplus) and would have to be defended anew.⁴ In addition, one might argue that agriculture's war only ended in the mid-1950s, as the last of the wartime food rationing measures was only relinquished in 1954. As for agricultural science, it is already recognised that a significant expansion of national funding occurred as a direct result of the war.⁵ These fifteen years also see the rise of the Agricultural Research Council (ARC), a body founded in the previous Chapter, but which only consolidated its position as the premier patron of national agricultural science after the war. As we shall see, the ARC's story – which culminates with the Agricultural Research Act (1956) divesting MAF of control over research funding – is patterned by much more confusion than might be seen from the surface.⁶ In turn, this helps to explain why the arrangements for British agricultural science funding remained somewhat unsettled after 1955.⁷ This Chapter therefore concerns an easily identifiable and significant period in the history of modern agriculture, one which has received a considerable amount of attention – though not from historians of science – and which has often been likened to a revolution.⁸

The official, semi-official and popular histories of this 'revolution' have been largely descriptive, uncritical and celebratory.⁹ Fortunately a raft of more recent scholarship has already done much to question and revise this picture.¹⁰ Two important conclusions have emerged. Firstly, the purported increases in British agricultural

⁴ Self and Storing provide good examples of this momentary change in emphasis away from production, including the release of the MAF propaganda film 'The Farm as a Business' in 1954. Self and Storing (1962), p. 152.

⁵ Cooke (1981) provides a general overview of these changes. Though Russell's history ends with the Second World War, his concluding chapters consider the development of some scientific institutions beyond this point, along with contemporary problems identified by him at the time of writing. Russell (1966).

⁶ Thirtle et al. (1991), p. 129.

⁷ Spedding (1984).

⁸ The obvious exceptions are Brassley (2000), Wilmot (2007), Woods (2007), (2011a), (2011b) and (2012).

⁹ The most significant of the official and semi-official accounts include Hammond (1954), Murray (1955) and Whetham (1952). Of the more popular accounts see Hurd (1951), Menzies-Kitchin (1945), Ministry of Information (1945), Seddon (1989) and Ward (1988).

¹⁰ The two most important academic collections are Short et al. (2006) and Brassley et al. (2012), the latter incorporating an international perspective. Langthaler (2012) compares English and Austrian farming, concluding that arguably a form of revolutionary change occurred in the former that was not replicated by the latter.

productivity during the war have been grossly exaggerated. Just as with the First World War, greater significance is now placed upon the control measures of the Ministry of Food, rather than the production programmes of the Ministry of Agriculture, for ensuring enough food reached enough tables.¹¹ Nor was the undeniably large and rapid expansion of agricultural output due to the adoption of new technologies and techniques, but was instead achieved through the greater exploitation and expansion of available land. “Far from the traditional image of war stimulating a wave of output-increasing technical change and using every national resource as efficiently as possible, it appears that agriculture was only managing to produce a reduced diet by using as many resources as it could lay its hands on.”¹² With this historiographical context in mind, this Chapter will concentrate upon the ways in which NIAB adapted to and exploited the changed social and economic conditions of war. The second important conclusion that emerges from recent scholarship is that farming became more scientific as a direct result of the war. This conclusion has been conserved from the earlier official histories, though no longer forms part of an explanation for any supposed increase in productivity. Short et al. write that “scientific and productivist methods were now thrust upon more and more farmers, and the national farm became more business-like in this drive to modernity in the countryside.”¹³ Whether through the actions of the War Agricultural Executive Committees, a general warming towards scientific methods thanks to their new public profile, or as a direct result of the intervention of agricultural scientific research, it is believed that farming became more scientific.¹⁴ Rather than accept these claims at face value, this Chapter will reconstruct what one aspect of a more scientific agriculture – the production of seed – actually consisted of.

¹¹ Martin and Langthaler (2012) p. 64, Collingham (2011) p. 101, Edgerton (2011) pp. 229-231.

¹² Brassley (2006) p. 48.

¹³ Short et al. (2006) p. 15.

¹⁴ On the scientific influence of the War Agricultural Executive Committees see Short (2012) p. 179. The argument that farmers became increasingly inclined toward scientific agriculture as their situation improved is not spelt out precisely by Martin (1992), though is heavily implied throughout his work. For example he writes of the ‘transformation’ in British farming which was “accompanied by the general adoption of a more scientific approach to farming problems associated with the proliferation of a multiplicity of state agencies to regulate methods of production.” P. 95. Throughout, Perkins relies on the profit incentive for the adoption and uptake of new agricultural technology, while emphasising state exhortation of farmers to become more scientific, particularly in Britain; Perkins (See also Holderness (1985), p. 10, pp.108-109. As for the direct results of agricultural scientific research, see Blaxter and Robertson (1995) which is an unashamed celebration of the successes of agricultural science. “What has been remarkable about the modern revolution in agriculture, distinguishing it from earlier ones, is that the technologies that have been adapted are for the most part based on the application of a mature agricultural science.” P. 36.

The Chapter is broken down into two Sections, concluding in a third. Section I recounts NIAB's war; from an abortive scientific coup in 1939, to 1955 and the receipt of over £140,000 from MAF to double the size of the Institute's headquarters. The aim is to recreate what a straightforward history of NIAB in the Second World War might look like, highlighting changes that we would expect and how they fit together in a grander scheme, while attempting to avoid any complicating factors. The latter are reserved for the second Section. Section II focusses upon three problems, each of which is associated with a distinct aspect of NIAB's national status; national 'security', 'geography' and 'efficiency'. Though this three stranded understanding of the 'national' in NIAB is not meant to be exhaustive (there are others one might wish to parse out) these three are the most important. Section II (A), dedicated to national 'security', describes the actions and influence of NIAB's Seed Production Committee (SPC), the Institute's most prominent (though currently unrecognised) contribution to the war effort. The changed economic and social challenges presented by the war, allowed NIAB to pursue its Svalöf agenda to a greater extent than previously thought appropriate. Section II (B), focussing on national 'geography', uncovers serious criticisms of NIAB that came to the surface during the war. It was argued that the Institute had failed to serve British agriculture in its entirety, having instead focussed far too closely on the south-east of England. For the third time in this thesis, important and influential people closely associated with the Institute contemplated its closure. These issues emerge during a heated debate with the Welsh Plant Breeding Station (WPBS). Section II (C), concerned with national 'efficiency', turns to consider the related NIAB initiatives of Seed Certification and the Recommended List, both of which began during the Second World War and afterward became central features of the seed industry. While ostensibly designed to improve agricultural efficiency and protect farmers from purchasing unreliable seed, both Seed Certification and the Recommended List also had other, perhaps more important motivations. Both schemes can be interpreted as extending control over, and constricting, the varietal market, to the benefit of food processors and large trading firms. In this respect, they form part of the prehistory of contemporary efforts to control the agricultural seed market, embodied most overtly in plant patents, a story that will spill over into Chapter 5. Lastly, Section III assesses the extent to which NIAB's position was improved or undermined by the war, and the role played by its national status throughout these developments.

Section I: A War Story, 1939-1955

In September 1939, when war was declared, NIAB remained without a Director. After the death of Wilfred Parker, Maurice Armand Bailey (previously senior botanist to the Ministry of Agriculture in Egypt and plant breeder at the Empire Cotton Growing Corporation in Sudan) had been selected to replace him. Bailey however had then also died a few months later.¹⁵ This made reacting to the war somewhat slower and more difficult than it might otherwise have been. Indeed, in the preceding months the potential for war, or the need for possible reorganization, were rarely mentioned in NIAB's numerous committee meetings. This silence may well have been because the changes demanded by war, whenever it would come, were all too obvious to need much articulating. A meeting of the Standing Joint Advisory Committee in September 1938, had agreed to the following proposition.

In view of the international situation and the considerable possibility of an outbreak of hostilities, the committee considered in what manner the Institute could be of the greatest assistance in the event of war. It was thought that all trials should be discontinued and that the Institute should concentrate all its efforts upon the multiplication of pure stocks of cereals for distribution through the seed trade with a view to securing the maximum yield.¹⁶

Few other examples can be found. Considering that by this point, ministerial plans for a massive expansion of agricultural production in the event of a war had been developing for several years, NIAB almost gives the appearance of tranquillity.¹⁷

On the 26th of September 1939, after internal communications amongst themselves, three Cambridge plant breeders and geneticists interrupted this inertia by attempting to seize control of NIAB on the grounds of wartime expediency. Frank Engledow, Herbert Hunter (Figure 4.1), and Redcliffe Salaman proposed the creation of an Emergency War Committee, consisting solely of scientists and adopting all the powers of the Executive Committee over matters of principal and policy.¹⁸ While this reaction might seem a little drastic, their actions can be defended on the grounds that of those concerned with the Institute they were amongst the most proximate. Moreover, they had each either been directly involved with NIAB since its foundation or shortly thereafter. Their attempt is most significant for shedding light upon an

¹⁵ Engledow (1939).

¹⁶ NIAB, T92.6, Standing Joint Advisory Committee minutes, 4th meeting, 27/9/1938.

¹⁷ Wilt (2001) argues that "food and agriculture became linked to rearmament in the broad sense as early as 1935-6", p. 3. His book then charts pre-war preparations and war time results.

¹⁸ NIAB, E-6.13, Executive Sub-Committee minutes, 44th Meeting, London, 26/9/1939.

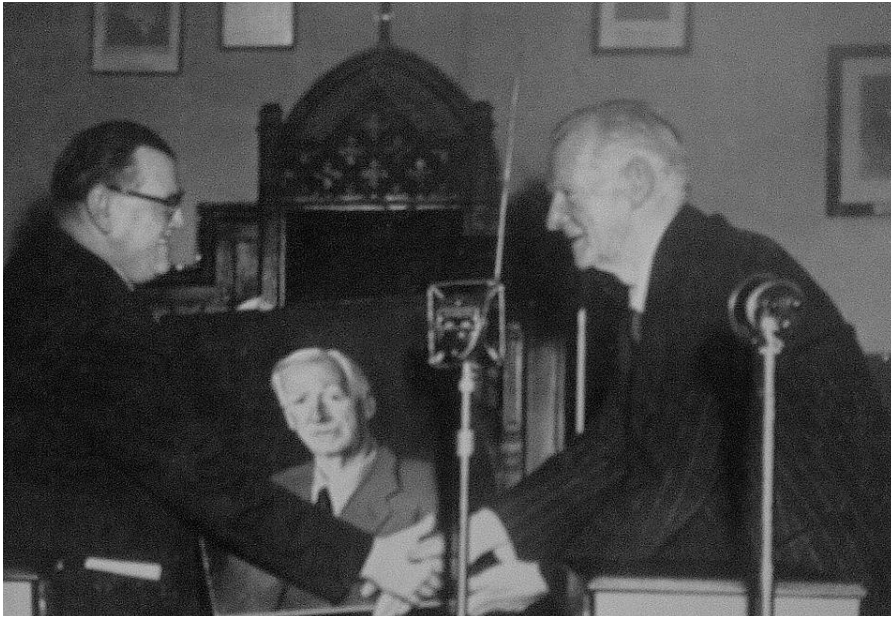


Figure 4.1: Herbert Hunter being presented with a portrait during the NIAB Crop Conference 1956. Image in *Journal of the National Institute of Agricultural Botany*.

important element of Cambridge politics. Despite the fact that all of the official agricultural laboratories and plant breeding institute's in Cambridge received substantial funding from MAF and the DC, this did not necessarily predominate in their self-identification as scientists. Attachment to the University kept them within another powerful circle of influence. For some years (it is not clear how many) these university based agricultural scientists had formed themselves into a Central Committee for Agricultural Research Organizations of Cambridge University. Perhaps unsurprisingly, Engeldow, Hunter and Salamans' plan failed, despite the authority they believed to possess. It would after all have required NIAB's Council to vote in favour of its own irrelevance during wartime.

The problem remained that NIAB had no Director and yet needed to make important decisions, the most urgent being how best to use the Institute's land.¹⁹ Some, such as S. F. Armstrong (NIAB's long-standing field trials manager) felt that the Institute should end the planned programme of trials immediately and instead begin rapid seed multiplication. Increased production of home seed was important for a number of reasons. Firstly, attacks on British shipping increased the likelihood that seed of high enough quality for sowing would be lost to the ocean floor. "All European

¹⁹ This was obviously a problem faced by any institution owning agriculturally valuable land, including the ARC. "The outbreak of war led to some consideration being given to the best use, under the circumstances, of the 1500 acres of farm land, a matter which sufficiently attracted the attention of the Lord President to request a report." Cooke (1981), p. 29.

supplies stopped, and shipping from other sources became more difficult as the U-boat campaign was intensified. Shipments of seeds from U.S.A. and Canada were very vulnerable, and indeed a lot of seed was lost through ships being torpedoed.”²⁰ Secondly, the need for economy in imports and exports to make room for military hardware and other more urgent goods, meant that reducing import tonnage of seed (along with everything else for that matter) was imperative. Thirdly, the mass food production campaign executed by the government was, it goes without saying, dependent upon a persistently large body of seed. It is some measure of NIAB’s confidence in the nation’s immediate seed production capacities and power of imports that they actually dismissed Armstrong’s suggestion. “It was agreed that as uniform seed was available cereal trials should be continued during the coming year.”²¹ A few weeks later, Hunter (by this time Director of the PBI) was eventually given the job of Acting Director of NIAB. In early 1940, the decision was finally taken to end cereals trialling and begin multiplying seed in the next harvest.²² This became NIAB’s primary responsibility, one which expanded all the more quickly after the creation of the Seed Production Committee. The Svalöf model of Chapter 1, which had only been nursed throughout the interwar period, now returned with a vengeance.

1941 witnessed some of the worst losses at sea, with 5 per cent of all food imports sunk.²³ Indeed it was at this time, in 1942, that a central intelligence bureau was established to tackle the expanding black market for rationed goods.²⁴ The facilities and expertise available at NIAB were now officially called upon by government. On the 17th of February 1942, Donald Fergusson – Permanent Secretary to MAF – wrote a letter on behalf of the Ministry to NIAB, asking that they form a Seed Production Committee (SPC).²⁵ NIAB duly obliged, and within only a few short years the SPC would overtake the Institute’s other branches to become its largest single institutional entity. Made up of representatives of farmers, the seed trade and agricultural science, the SPC was responsible for the domestic production of all seed (cereal, vegetable, grasses and fodder). It should also be stressed that though formed as part of NIAB, which was the centre of its operation, the SPC also extended beyond the bounds of the Institute, drawing upon experts and officials from across the UK. For now it is enough to have

²⁰ Cook (1946), p. 223.

²¹ NIAB, E-6.13, Executive Sub-Committee minutes, 44th Meeting, London, 26/9/1939.

²² NIAB, C-4, Council Minutes, 96th Meeting, London, 19/10/39.

²³ Edgerton (2011), p. 165.

²⁴ Zweiniger-Bargielowska (2000), p. 161.

²⁵ On Fergusson see Duke (2004).

brought attention to the origins and function of the SPC, which will receive greater scrutiny in Section II (A).

The inclusion of grass and clover seeds meant NIAB would have to work much more closely with the Welsh Plant Breeding Station (WPBS) than it had ever done before, as these were the crops the Aberystwyth station specialised in. It was only a few days prior to Fergusson's official letter, and under the pressure of war, that George Stapledon (whom we saw in Chapter 1) finally came to sit on NIAB's council for the first time. On at least one existing interpretation, this new union between cereal and grass breeding (between Aberystwyth and Cambridge) was part of a wider agricultural ambition. Edith Whetham, doyen of agricultural history and economics (whose father was the eugenically inclined William Cecil Dampier Whetham), wrote in her history of Second World War agriculture that "Following Sir George Stapledon and his apostles, the planners were all for ley farming, for taking the plough round the fields, for a judicious rotation of the new Aberystwyth grasses and the new Cambridge cereals."²⁶ The 'planners' and the extent to which NIAB and the WPBS drew power from one another will be returned to in Section II (B).

Before the close of hostilities, NIAB launched two other important initiatives. In 1944 the Institute published its very first Recommended List. Since 1931 NIAB had issued many hundreds of thousands of leaflets detailing the qualities of some of the best varieties in their trials, explaining their suitability or otherwise in given environmental conditions. These even bore on their covers – in authoritative and not at all patronising bold black lettering – the following statement:

Farmers should know

The RIGHT variety may do 20 per cent. better than the WRONG.

The RIGHT variety costs no more than the WRONG.

Many farmers still grow the WRONG variety.

The County Agricultural Organiser knows the RIGHT variety.

Some of these leaflets (distributed through networks of official and semi-official bodies), even presented themselves as a 'guide to farmers in their choice of varieties'. What was novel about the new Recommended List system, was that rather than strongly implying that the listed varieties were amongst the best, in the new Lists, farmers were *told* these were the best. A seemingly small difference, but for an

²⁶ Whetham (1952), p. 134.

institute with National in its name, this meant quite a lot.²⁷ By November 1944, 20, 000 copies of NIAB leaflet number 8, 'List of recommended varieties of winter wheat' had been circulated.²⁸ Recommended Lists were accompanied by a second innovation, that of Seed Certification. As of 1944, all NIAB seed would be certified before sale, a much stricter process than had been employed before now. Certification required a series of inspections throughout the growing season to monitor development, but most importantly, it required NIAB supervision during the harvesting and packaging of seed. Where the Institute had once relied on labelled and sealed seed sacks (Chapter 2), the elaborate procedure of certification was now considered the only way to ensure that NIAB's seeds were of the variety stated. In time this facility was opened up to seed multipliers located elsewhere who also wished to have their seed officially certified. It is worth highlighting that this system bears a striking resemblance to those employed in Francoist Spain and Nazi Germany, as seen in Chapter 3, though of course NIAB's was run on a voluntarist basis. Both the Recommended List and Seed Certification will be considered more thoroughly in Section II (C).

After the war in Europe had ended, British farmers continued to be enticed and exhorted to produce greater and greater amounts of food. Aside from those who balked at the 'new morality' of farming – in which farmers were seen to surrender the greater part of their autonomy in exchange for continued subsidies and price supports – politically and socially there was little descent from the continuation of these schemes in peacetime.²⁹ This consensus was codified by the passing of the 1947 Agriculture Act, the body of which had been pursued by a Tory minister though was eventually passed by a Labour government.

The Government urgently needed more food and was prepared to pay higher prices to achieve this end. A long term policy of high support for high production was firmly established by the 1947 Agriculture Act and the £100 million expansion programme.³⁰

²⁷ The only historian to have commented on the creation of the Recommended List has suggested that they were perhaps the most innovative aspect of plant breeding at this time, if compared to (what is believed to have been) a small number of new varieties being released at this time. Brassley (2006), p. 52.

²⁸ NIAB, C-4, Council Minutes, 109th Meeting, at NIAB, 30/11/1944.

²⁹ The phrase 'new morality' is taken from a publication produced by the Farmers' Rights Association, a group that worked to undermine and challenge the sanction powers of the War Aqs, the most conspicuous of which was the power to dispossess farmers of their land should they fail to either comply with cropping orders or maintain the necessary standard of farming. Farmer's Rights Association (1945).

³⁰ Smith (1990), p. 114.

The authority of agricultural scientists and the resources available to them benefitted greatly from this continued emphasis on agricultural output and productivity. In dairy farming, for instance, the technique of artificial insemination, long advocated by geneticists and agricultural scientists, only came to dominate the industry after the war and with the continued emphasis on productivism. “Bovine reproduction became a subject to be administered as experts advocated a new ‘biological responsibility’ with regard to the future of the national herd.”³¹ National scientists assumed a new responsibility, ensuring the wider public got a good return on the subsidisation of the industry through gains in efficiency. Another example, one which was designed to better integrate research work and farming practice, was the creation of the National Agricultural Advisory Service (NAAS).³² Since 1912 and the founding of the Provincial Advisory Service, County Councils had been obliged to provide farmers with access to experts. Throughout the interwar period this network had grown, though had remained narrow in expertise, understaffed and poorly funded.³³ NAAS was formed in 1946 in order to continue the advisory work of the county staff and the War Ags. NIAB came to work closely with NAAS, the latter taking over its field advisory and Seed Certification responsibilities.

Currently there is a growing body of work that wishes to place such post-war agricultural and industrial development programmes within a national security and geopolitical context.³⁴ John H. Perkins’ *Geopolitics and the Green Revolution* has been the most significant in this respect, and despite the substance of the book being dedicated to the history of twentieth century plant breeding, it has received surprisingly little attention from historians of science.³⁵ His argument focusses upon the United States, Mexico, India, and Great Britain, and in each case he interprets a rapid expansion of agricultural science funding (either immediately preceding or following

³¹ Wilmot (2007), p. 414. Bert Theunissen has told a chronologically similar story in the Dutch context, though does not relate changes in the position of agricultural scientists to changes in national support for productivity, though he perhaps assumes a familiarity with global food production needs at this time on behalf of his readers. How geneticists actually succeeded in securing their premier role within dairy breeding he leaves as an open question. “The story of how scientists eventually gained the upper hand and succeeded in reforming breeding practices along ‘rational’ lines has yet to be told.” Theunissen (2008), p. 671.

³² Rae (1955), p. 261.

³³ Holmes (1988), p. 80.

³⁴ Cullather (2010), Parmar (2012). For an engaging review of these works see Wolfe (2013). On the longer history to agriculture and geopolitics see Friedman (1982) and Friedmann and McMichael (1989).

³⁵ My thanks to Gregory Radick for bringing it to my attention.

the Second World War) as serving international political ends, rather than a more simple desire to improve the lot of farmers.

Put somewhat differently, after 1945, wheat breeding by American scientists became more than just an exercise in the modernization of agriculture. Old motivations for seeking new varieties did not disappear, but new motivations arose to justify expenditures. In addition, American scientists came to do their work not only in the United States for American farmers but overseas for foreign governments. Wheat breeding acquired an ideological dimension more elaborate than simply “the promotion of progress”. Instead, wheat breeding and other agricultural science became part of the “battle for freedom”.³⁶

While the Americans wished to prevent instability in nations that without rapid agricultural development (it was believed) would fall into the hands of Communism, for the British, the balance of payments problems following the war are cited (as is typical) for the emphasis placed on agricultural production at this time. On the whole this is an important perspective to have articulated, though Perkins’ account is not without its problems. The idea that agricultural science developed these significances only later in the twentieth century (whereas beforehand scientists had purely been focussing on improving domestic agricultural production as an end in itself) ignores the great deal of work within the history of science that demonstrates the development of these incentives and power structures from the early nineteenth century onwards. Agricultural scientists had been getting their political hands dirty for quite some time, as indeed we saw in Chapter 1 and Rowland Biffen’s research into ‘strength’ in wheat, work which puzzlingly is also emphasised by Perkins. Biffen was working on the quality of strength even before the First World War, precisely so as to redress an imbalance in economic and agricultural relations between Britain and its much larger wheat growing competitors. In addition, botanical experts had been familiar with the importance of agricultural development within the empire (to fuel industry back home in Britain and to further their own professional ambitions), many decades before the production programmes of the Second World War.³⁷ Needless to say, NIAB is hardly mentioned by Perkins, whose focus is upon the agricultural botanists and geneticists at the PBI. The national security perspective is certainly an important one, and much more attention must be paid to global food supply networks and their control, though at present how agricultural science plans and programmes developed within Britain itself still needs to be explained. Perkins is nevertheless right to stress that the Second World War and the

³⁶ Perkins (1997) pp. 140-141.

³⁷ Brockway (1979), Drayton (2000), Hodge (2007).

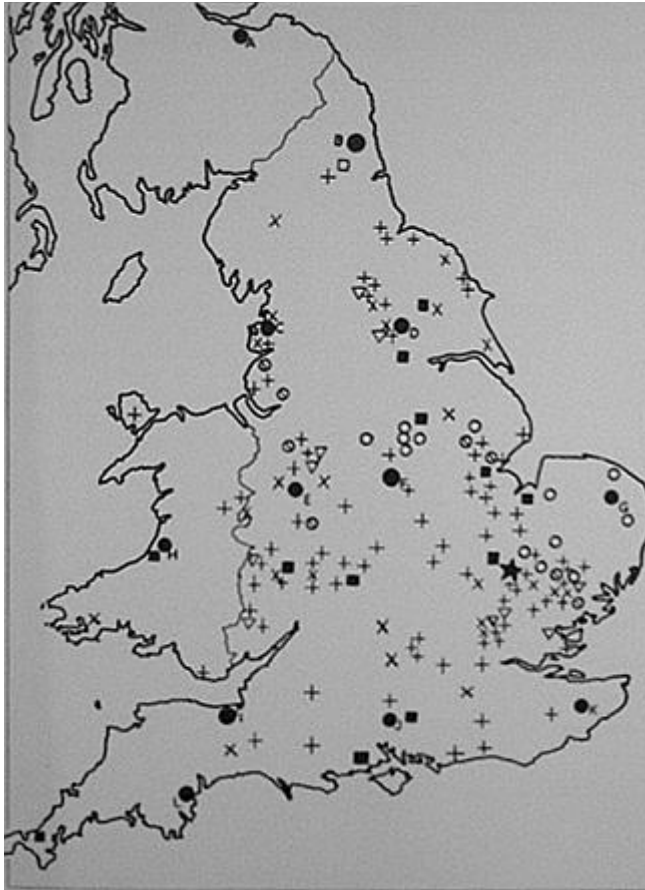


Figure 4.2: NIAB and NAAS trialling centres as of 1955. Black circles relate to NIAB Regional Trialling Stations, squares to NAAS Experimental Husbandry Farms, other symbols to trial locations for particular crops. From *Journal of the National Institute of Agricultural Botany*, 7 (1954-56), p. 465.

changed global relations it brought, prompted a good deal of rearrangement of, and reinvestment in, the *extant* agricultural science networks established within different countries.

In the early 1950s NIAB considered a change in its own circumstances, flirting with the idea of becoming a research station of the ARC. NIAB even began submitting reports to the latter, though the relationship remained tentative. The Chairman of NIAB's Council in 1951 believed that "It was a small beginning, but if the Institute could maintain the sympathy of the A.R.C. the work could very profitably be extended."³⁸ In the meantime NIAB continued to receive its funding directly from MAF. This was a period in which the organisation of British agricultural science was highly fluid. For instance, it was in 1950 that Cambridge University finally dropped all responsibilities toward the nationally funded research centres that had otherwise been twinned with

³⁸ NIAB, C-4, Council Minutes, 136th Meeting – 24/7/51.

Table 4.1: Key grants for expansion received, 1939-1955

Year of grant	Organisation granting funds	Project funded	Amount (£)
1943	MAF	Granary enlargement	8092
1946	MAF	Purchase of Hill Farm, Swavesey	13, 397
	NIAB contribution		1603
1948	MAF	Purchase of 47 acres from St Johns College, adjacent to HQ	10, 021
	NIAB contribution		5010
1948	MAF	New laboratory and office block	2926
1948	MAF	Staff cottages at HQ	3600
1948	MAF	Potato Virus-Testing Unit	6000
1955	MAF	HQ expansion	145, 000

its departments (as the PBI and the Cambridge School of Agriculture had been).³⁹ The same scholarly network that had inspired Engledow and his colleagues to attempt to take over NIAB at the outbreak of the Second World War was no longer a desirable feature of British agricultural science in the eyes of the Ministry. NIAB's situation would change further after the legislation of 1956, which granted ARC full control over research funding, (considered in Chapter 5). Even without the ARC, NIAB was well rewarded for its wartime service while under the patronage of MAF. Within ten years of the war's end, NIAB exceeded its original complement of trialling stations, acquiring 12 by 1955 including one station in Scotland and one in Wales (Figure 4.2). In addition, from 1943 onwards, the Institute came to receive substantial funding for an expansion of its grounds and headquarters, alongside a vast inflation of its annual grant. Table 4.1 provides an overview of some of the most important grants received for particular projects and expansion. Table 4.2 details all maintenance grants over this period. DC support ends abruptly in Table 4.2 as the Agriculture Act (1947) made all research funding purely a MAF concern.⁴⁰ The lengthy history of DC support for agricultural science, from 1909-1947, clearly marks it out as in urgent need of dedicated research. Control over agricultural science funding was highly contested. The initiatives begun by NIAB during the war had clearly also gained the Institute prestige, as further demonstrated by changes in the number of subscribed Fellows. In 1941 the number of Fellows stood at 249. By 1945 this had risen to 762, expanding to 1186 in 1950 and 2551 by 1955. It was the responsibility of NIAB's now permanent Director, Frank Horne

³⁹ Perkins (1997) p. 207.

⁴⁰ Palladino et al. (1997), p. 563.

Table 4.2: Maintenance grants from MAF and the DC, 1939-56. (Reports for the period 1940-43 are missing from the archive)

Financial Year	MAF (£)	DC (£)	Total (£)
1938-39	2482	6600	9082
1939-40	2124	6000	8124
1940-143	-	-	-
1943-44	5318	4700	10, 018
1944-45	6014	7550	13, 564
1945-46	8634	4900	13, 534
1946-47	10, 175	20, 600	30, 775
1947-48	8808	27, 300	36, 108
1948-49	40, 867		
1949-50	47, 003		
1950-51	55, 514		
1951-52	67, 746		
1952-53	73, 913		
1953-54	87, 960		
1954-55	97, 048		
1955-56	116, 863		

(who had taken on the position after Hunter had stepped down in 1945) to consolidate these gains and pursue others.⁴¹ That in 1955 MAF authorised £145,000 for a new building to be attached to the original headquarters might be considered a sufficient measure of his success, and – more to the point – of NIAB’s war.⁴²

Section II: National Security, Geography and Efficiency

Having given a shape to this period, Section II will analyse latent problems. Each arises in connection with a key aspect of NIAB’s national status, helping us appreciate what this status actually entailed. It begins in Section II (A) by examining the issue of national security and NIAB’s solution – the Seed Production Committee. In reemphasising seed multiplication, the Institute was revisiting the problem that had inspired its foundation. One might expect, therefore, to find the same trade resistance to NIAB’s commercial activity that we found in Chapters 1 and 2. However, thanks to the on-going atmosphere of conflict – which persisted well beyond the years of war themselves – and the new political consensus around state support for agriculture, agricultural scientists at NIAB did not feel forced to retreat from the marketplace as they had done after the Great War. On the strand of national security therefore, NIAB’s war story was

⁴¹ For more biographical detail, see Horne’s biography, written by his daughter. Sells (1978).

⁴² NIAB, C-8, Annual Reports, 57th Report - 1956.

certainly one of success. This is in contrast to the problem of national geography which will be investigated in Section II (B). On the terms of geography, NIAB fared far worse, and was even – for the third time in this thesis – made a candidate for closure. This story emerges from a conflict between NIAB and the Welsh PBS, as rationalisation of the national research effort was considered toward the end of the war. Finally, Section II (C) turns to consider the problem of national efficiency, and NIAB’s solutions – the Recommended List and Seed Certification.⁴³ In important and subtle ways, both innovations benefitted food producers and large seed firms as much, if not more, than they benefitted farmers.

(A): Security – The Seed Production Committee, 1939-1945

Though none of NIAB’s wartime multiplication programme can be found in the existing historiography, the work of the Institute and the official committees it worked through, constitute one of the more remarkable interventionist stories of Britain’s agricultural war. To be sure, the multiplication work overseen directly by NIAB itself was small in comparison to the entire UK effort (for which the SPC was still ultimately responsible).



Figure 4.3: Hill Farm, collectively 500 acres of land. Image held by NIAB archive.

⁴³ Though these schemes arguably fit within broader ideologies of ‘national efficiency’ as analysed by Geoffrey Searle (and those who have followed him) in the context of the early twentieth century, no effort is made in this Chapter to connect developments at NIAB with wider political and intellectual movements. This would be an excellent future research project. Searle (1971).

However, on the Institute's own terms, its wartime seed production was of a scale far greater than that which had been attempted before. The acreage under contract, as well as the amount of land actively farmed for multiplication purposes by the Institute itself, was increased greatly. NIAB's largest purchase – the 500 acre Hill Farm in Swavesey (Figure 4.3), a few more miles along Huntingdon Road – actually came just after the war, in 1946, a clear statement of intent on behalf of NIAB's new Director. Expansion was seen not only in quantity of seed produced, but also in the variety of species. Plants bred by the Cambridge Horticultural Research Station (HRS) – of which more shall follow – were grown to a commercial scale for the first time, alongside potato seed of varieties bred by Salaman, who had worked to have a Potato Virus Research Station established in Cambridge and who now sought further facilities (in particular a glasshouse for indoor virus detection work) at NIAB headquarters.⁴⁴ The aim of this subsection therefore is to redress this historiographical oversight, by showing that there was plenty of breeding work to be found in UK national institutes, and that the scientists involved sought to have their varieties multiplied and sold on a commercial scale. The most conspicuous element of this work was of course the SPC, established in 1942.

The SPC was Chaired by William Gavin (Figure 4.4), that figure of considerable significance introduced in Chapter 3 as the most desirable candidate for the Directorship of NIAB upon its foundation.⁴⁵ With the coming of the Second World War, Gavin was in greater demand than ever, and was accordingly offered the position of Chief Agricultural Adviser to the Ministry. He held this position at the same time as he remained an employee of Imperial Chemical Industries, a fact that today causes a minor disturbance in histories of organic farming.⁴⁶ Gavin's wartime duties as Chief Agricultural Adviser consisted largely of liaising between the War Aqs and central government, helping to ensure necessary supplies and assistance reached those Counties that needed it. His position on the SPC was therefore extremely important for prosecution of these duties. Nor was he a stranger to Cambridge (though many SPC meetings actually took place at his ICI offices). Gavin had been elected to the Institute's Council as its Fellows member in 1927, forming a bridge between the worlds of agricultural trade, farming and science. This status had been used by NIAB before, as it

⁴⁴ The Potato VRS had been founded in 1926 and later, in 1939, became the Plant VRS. Russell (1966), pp. 356-357. Cooke (1981), pp. 49-67.

⁴⁵ Limited biographical details can be found in his *Times* obituary. *Times*, 5th June (1968), p. 10.

⁴⁶ Harvey (1998), p. 13, Humphrys (2001), p.66, Cook (2003) and Conford (2011), p. 40.



Figure 4.4: Sir William Gavin (1886-1968), photograph taken in 1956. Image owned by the National Portrait Gallery.

was Gavin who had been asked to become Chairman of the Standing Joint Advisory Committee, that same Committee we saw created in Chapter 3 which was designed to improve NIAB-trade relations. Other members of the SPC included Frank Goldsmith (Suffolk Landowner, one time Conservative MP and father to radical environmentalist Edward Goldsmith), J.E. Hosking (organic farming advocate and member of the 'Kinship in Husbandry' group founded in 1941 by the fascist, Viscount Lymington), D.C. Hasler (son of William Hasler, owner of the seed traders in Dunmow and whom we saw in Chapter 1), Professors T.K. Jenkin and George Stapledon from the Welsh PBS, amongst numerous others.⁴⁷ Mr L. E. Cook from MAF, who would later author the brief official history of the SPC, was made Executive Officer and put on a salary of £750 pa, which was comparable with other top positions at NIAB.

⁴⁷ For more on Hosking's fascist associations – and indeed the extent to which Stapledon contributed to the shared intellectual milieu of the back-to-the-land movement, popular on the political left and right – see Stone (2004).

The most striking feature of the work of the SPC, in contrast to NIAB's pre-war history, was the central position of vegetable, herbage and root crops. Prior to the war, NIAB had from time to time investigated vegetables and roots on behalf of interested parties. However, with the passing of the Growing of Seed Crops (Control) Order in 1942 – requested by the SPC itself – British agricultural scientists virtually took over the horticultural seed industry. (NIAB's own particular horticultural work will be considered separately.) Under this new legislation, it became illegal for anyone to grow specified vegetable crops for seed without first having a contract for their future growing on with a registered trader. Species covered by this legislation included sugar beet, swede, parsnips, broccoli, broad beans, runner beans, and many more.⁴⁸ These crops, and the 'Dig for Victory' campaign that encouraged an expansion in home grown and allotment grown food, have since become synonymous with Britain's domestic agricultural war effort.⁴⁹ While some historians have highlighted that local seed associations were formed in order to disseminate vegetable seeds amongst their members, the SPC's role in such work has been overlooked.⁵⁰ These seed associations had emerged as a response to food production propaganda and the demands of the County War Agricultural Executive Committees, or 'War Ags' as they were known, who had the power to enact compulsory cropping orders.⁵¹ In turn, they had to cooperate with the SPC in order to access the supplies of seed they needed. Through this mechanism, the SPC could exert some control over the varietal market, encouraging or discouraging the breeding of varieties as it saw fit. Here it is worth emphasising again the broad spectrum of experts brought on to the SPC, which though arranged under NIAB, was dependent on the cooperation of scientists and traders from across the UK.

That the SPC became central to the supply of vegetable seed can easily be appreciated from Tables 4.4, 4.5 and 4.6. Respectively these demonstrate; (4.4) the acreage dedicated to root, vegetable and herbage seed growing; (4.5) the amount of seed in CWT of root, vegetable and herbage crops produced by home growers; and (4.6) the amount of seed produced purely from the Aberystwyth pasture strains (species including cocksfoot, sainfoin and clover). All figures are drawn from the ten published reports of the SPC, which can be found in *The Journal of the National Institute of Agricultural Botany*. Table 4.6 is particularly worthy of mention as these are

⁴⁸ Gavin (1945).

⁴⁹ Buchan (2013).

⁵⁰ Self and Storing (1962), p. 55 explain that these seed associations were eventually absorbed by the National Farmers' Union as the National Growers Association.

⁵¹ For a scandalous wartime case of potential War Ag abuse of powers, see Martin (2007).

Table 4.3: Key for estimating the potential impact of the SPC and NIAB's multiplication work

Crop	Acreage Grown in 1944 (from Ministry of Agriculture, 1947)	Average Seed Rate for sowing (from Robinson, 1955)	Average yield per acre (from Robinson, 1955)
Wheat	3, 062, 664	1.75 CWT per acre	19 CWT per acre
Barley	1, 721, 224	1.5 CWT per acre	18 CWT per acre
Oats	2, 225, 527	1.5 CWT per acre	15 CWT per acre
Clover and rotation grasses	2, 970, 978	30 lbs. per acre	Around 4 CWT per acre
Peas	62, 896	1.75 CWT per acre	17 CWT per acre

Table 4.4: Acreage of root and vegetable seeds GROWN, and herbage seeds HARVESTED, between 1943 and 1952. Blank entries reflect gaps in archive materials and should not be assumed to mean that the sum was zero.

Year	Acreage of root and vegetable seed GROWN	Acreage of herbage seed HARVESTED
1943	35, 562	-
1944	32, 386	-
1945	33, 286	103, 310
1946	38, 153	69, 820
1947	35, 800	115, 800
1948	36, 000	43, 150
1949	38, 200	153, 920
1950	25, 600	65, 386
1951	-	113, 058
1952	-	87, 061

Table 4.5: Intake from growers of vegetable and root seed, 1944-1953 in CWT.

Year	Root seed intake from growers in CWT	Vegetable seed intake from growers in CWT
1944	249, 892	161, 614
1945	118, 708	171, 946
1946	162, 882	203, 636
1947	175, 892	191, 683
1948	105, 571	138, 120
1949	150, 252	153, 101
1950	207, 093	195, 744
1951	115, 501	117, 213
1952	190, 136	75, 583
1953	173, 865	91, 341

Table 4.6: Acres of Aberystwyth strains grown under contract for the SPC, arranged by the Welsh Plant Breeding Station.

Year	Seed grown for nucleus stock/multiplication (in acres)	Seed inspected (in acres)
1941	2830	1497
1942	3704	3479
1943	9757	5383
1944	16, 047	12, 805
1945	22, 128	18, 629
1946	25, 522	30, 714
1947	13, 848	36, 268
1948	13, 812	22, 668
1949	16, 258	21, 040
1950	24, 974	21, 575
1951	21, 294	30, 100
1952	15, 275	32, 696
1953	13, 174	-

seeds directly controlled by the SPC, while Tables 4.4 and 4.5 reflect seed production across the UK. Again however, it was the responsibility of the SPC to direct all of this growth and the allocation of seed. On their own these figures (and those in future Tables) might mean very little. To provide some guide as to their significance, Table 4.3 includes figures for the national acreage in different key crops in 1944⁵², the suggested rates of seed sowing for each crop as given in the 13th edition of *Freams' Elements of Agriculture* (published in 1955), along with the average yield to be expected per acre from each crop, averages which are again taken from the 1955 edition of *Freams'*.⁵³ By using these figures, it is possible to get some sense of the SPC's contribution to agricultural seed supply.⁵⁴

NIAB itself – as a contributor to the programme of the SPC – also began producing horticultural seed on a large scale for the first time during the war. Around 1939 the Institute entered into negotiations with the Cambridge HRS to replicate the PBI's Svalöf arrangements. The HRS had been founded by the Development

⁵² Ministry of Agriculture and Fisheries (1947).

⁵³ Robinson (1955).

⁵⁴ This is by no means suggested as a comprehensive method. Rather Table 4.3 is offered in lieu of a much more dedicated investigation in to the amounts of seed distributed by the SPC (the records of which have not been kept systematically). In private correspondence, Paul Brassley suggested that a 'sensitivity analysis', in which a range of different seed rates from a number of sources are found (rather than just *Freams'*) which would be slightly more satisfactory. Different seed rates, running from the lowest to the highest, would expose the extent to which such differences influence the outcome of any calculation attempting to measure the potential value of SPC and NIAB stocks. This procedure would make the most sensible next step.

Table 4.7: Composite of select H.R.S. varieties and amounts harvested/sold/profit yielded, 1948-1952.

Year	Marathon Maple Peas	Brussels Sprout H.R.S. 1	Brussels Sprout H.R.S. 5	Cauliflower H.R.S. 5	Cauliflower H.R.S. 6	Cauliflower H.R.S. 7	Broccoli H.R.S. X.2	Broccoli H.R.S. X.5	Onion H.R.S. 2	Onion H.R.S. 10
1948	25 acres	0.75 acres harvested	0.25 acres harvested	0.33 acres harvested	0.0125 acres harvested	0.5 acres harvested	0.25 acres harvested	0.25 acres harvested	0.25 acres harvested	1 acre harvested
1949	43 acres provided 387.75 CWT.		2 acres produced 6.75 CWT. for sale	0.75 acres yielded 84.76 lbs. for sale	0.66 acres yielded 5 lbs. for sale	0.5 acres yielded 60.5 lbs. for sale	£555 from sale of seed produced during all broccoli trials	1 acre yielded 112 lbs. for sale	1 acre yielded 118.74 lbs. for sale	
1950	30 acres provided 133 CWT.	2 acres produced 36 lbs.	4 acres produced 3 CWT. 6 lbs. of seed	0.25 acres produced 3.5 lbs. of seed	0.25 acres produced 54 lbs. of seed	0.25 acres produced 1 CWT. 48 lbs.	£370 from seed sales (unspecified vars.)	1 acre produced 1 CWT. of seed	1 acre produced 90 lbs. of seed	
1951		13 CWT. 2 stone 1.5 lbs.		15.5 lbs. harvested		2.25 lbs.	£452 from seed sales (unspecified vars.)	1 CWT. 5 stone 10 lbs.		
1952	10 acres provided 155 CWT.	4 CWT. 2 stone 3 lbs. harvested	15 CWT. 6 stone harvested		49.5 lbs. harvested	10 ozs. harvested	£265 from seed sales (unspecified vars.)	21.5 lbs. harvested		

Commission in 1923.⁵⁵ The disappointing precedent set by Biffen and Yeoman II was apparently not enough to convince Cambridge University breeders of any need to enter into contractual arrangements with private firms. NIAB, as the official national seed multiplier, remained the only viable option, and one that they pursued energetically. New varieties of HRS pea, sprout, onion (highly prized during the war) and cauliflower were now all grown either on NIAB's own grounds or on contract to the Institute. Thanks to the nature of this horticultural plant material, NIAB could be much more firm with the trade than in the case of cereals. Not only did the Institute decide to sell seed to only one firm (to make use of its distribution network) it wouldn't even allow that firm to multiply the products.

The rapidity with which multiplication of many vegetable seeds could be effected would make it possible for the Institute to produce sufficient seed in any one season to satisfy the total demand. Therefore, although the seed would be offered to the seed trade, there would be no necessity for further multiplication by the trade before distributing to seed growers. For this reason the seed supplied to the trade would be sold in sealed packets for immediate resale.⁵⁶

As was seen with the example of the potato in Chapter 3, the biological peculiarities of different crops could make them more or less amenable to control.⁵⁷ The amount of horticultural seed actually produced by NIAB itself is difficult to ascertain. References in their annual reports are usually unspecific, while their record keeping – as will also be seen shortly with cereals – is unsystematic. What can be known for certain are the amounts grown (when mentioned) in the annual report, and the amount of money made from the sale of each variety (when specified) in the balance sheet that accompanied said reports. A composite of some of this information is contained in Table 4.7. It is by no means comprehensive, but gives an indication of NIAB's own horticultural multiplication work and the varieties being released by the HRS at this time. It should also be emphasised that these were cutting edge varieties from a horticultural breeding centre second only to the John Innes Institute.

NIAB was much more at home with cereals, and their increase in production levels reflects this (Tables 4.8 and 4.9). Prior to 1939, the only cereal variety to have been grown to a quantity larger than 25 CWT (the average crop yield harvested by NIAB

⁵⁵ The HRS is mentioned in Bell (1975), p. 13, and Cooke (1981), p. 60, but has otherwise escaped historical attention.

⁵⁶ NIAB, E-6.13, Executive Sub-Committee minutes, 42nd Meeting, London, 29/3/1939.

⁵⁷ See Leonelli (2007) for more on the material qualities of organisms constraining their capacities, particularly in research programmes.

Table 4.8: Select wheat varieties as sown, harvested and sold by NIAB, 1939-1953.

	Wheat			
Year	PBI Rampton Rivet	PBI Squarehead's Master 13/4	PBI Little Joss	PBI Holdfast
1939	124 qtrs. released, £422.2.1 profit, £554.17.6. sales			£173.16.3 profit
1940	20 acres sown	21 acres sown, 91 qtrs. sold	9 acres sown	28 acres sown
1941	20 acres sown	382.5 CWT., released, £220.9.2 profit	40 acres sown	162 CWT. released, £81.8.3 profit
1942	£222.2.0 profit	35 acres sown	£250.7.2 profit	34 acres sown
1943	5.5 acres sown	5.5 acres sown, 478 CWT., released, £345.3.9 profit	56 acres sown	603 CWT. released, £431.1 profit
1944		92 acres sown	1014 CWT., released, £816.6.5 profit	
1945		92 acres sown, 1338 CWT., 301 qtrs., released, £1305.15.2 profit	10 acres sown	
1946	25 acres sown, 373 CWT. released		30 acres sown, 646 CWT. released	
1947		5 acres sown		0.75 acres sown
1948	2.33 acres sown	42 acres sown	3 acres sown	8 acres sown
1949	33 acres sown, Only 58.5 CWT sold for seed, rest went to mills	1 acre sown	8 acres sown	63 acres sown, 1647 CWT. released
1950		47 acres sown	71 acres sown, 30 acres had to be discarded, 396 CWT sold	69 acres sown
1951	9 acres sown	52 acres sown, 883 CWT. released, about 100 CWT. to the mills	8 acres sown	59 acres sown, 1022 CWT. released, 627 CWT. sold, around 33 CWT. went to the mills
1952	6 acres sown, 27 CWT. sold	25 acres sown	8 acres sown, 101.25 CWT. released	25 acres sown
1953	25 acres sown, 350 CWT. released			27 acres sown, 390 CWT. released

Table 4.9: Select barley and oat varieties as sown, harvested and sold by NIAB, 1939-1953.

Year	Barley			Oats
	PBI Spratt Archer	PBI Pioneer	PBI Camton	PBI Picton
1939	22 acres sown			24 acres sown
1940	69 qtrs. released, £150.19.10 sales			43 acres sown, 75 qtrs. released
1941	28 acres sown			16 acres sown, 303 CWT. 101 qtrs. released, profit £576.7.9, including £241.12.6 from 1940
1942	26 acres sown, 280 CWT. released, £77.4.9 profit	29 acres sown	30 acres sown	15 acres sown
1943	25 acres sown, £92.4.4 profit	25 acres sown, 331 CWT, released, £309.0.9 profit	43 acres sown, £1132.15.9 profit	£635.18.0, total profit for 1940/41/42
1944	260 acres sown	438 CWT. released, £561.16.10 profit	34 acres sown, 394 CWT. released, £302.19.0 profit	50 acres sown
1945	25 acres sown, 3450 CWT., released, £1672.2.11 profit	14 acres sown	191 CWT. released, £195.10.5 profit	50 acres sown, 916 CWT., 307 qtrs. released, £1229.15.8 profit
1946		52 acres sown, 1001 CWT. released		
1947	10 acres sown		12 acres sown	5 acres sown
1948	129 acres sown	8 acres sown	10 acres sown	.75 acres sown
1949	8 acres sown		0.5 acres sown	8.5 acres sown
1950	70 acres sown			52 acres sown
1951				713 CWT. released, about 270 CWT. went to the mills
1952	5 acres sown	40 acres sown		
1953		40 acres sown, 302 CWT. released		

to sell as the nucleus of a variety) was Yeoman II. For one quick measure of the effects of the war, in 1939 – the last year in which only seed grown during peacetime was sold – NIAB marketed a total of 1173 CWT of seed. By 1944 this had risen to 6794 CWT.⁵⁸ One of the first varieties to be grown on a grander scale (either late in 1939 or very early in 1940) was a new PBI winter oat variety ‘87/1’, which came to be called Picton. The 24 acres dedicated to it represented a substantial investment on the part of the Institute, an investment which could be interpreted as demonstrating NIAB’s faith in its own trialling system (‘87/1’ had just successfully completed its first three years of trials), faith in the plant material, or indeed faith in its breeder – the Institute’s new Acting Director – Herbert Hunter. In wartime NIAB was finally able to replicate the Svalöf model. Indeed, it had perhaps exceeded those expectations what with Hunter being both Director of the PBI and NIAB simultaneously. The two institutions had never before been so well aligned. Let us not forget though, that NIAB was responsible for paying the PBI half of any profit yielded from the sale of the latter’s varieties. Wellington and Silvey find the arrangement unsavoury, stating that “the appointment of a renowned and practising cereal breeder had ignored Weaver’s precept that NIAB should not produce varieties.” On their view, it was only temporarily acceptable as “there was no conflict of interest over comparisons with cereal varieties from other breeders, as the Council had decided at the outbreak of war to stop all regional trials.”⁵⁹ This however was only true for a short while as NIAB resumed trials before the war ended. When national security was in question, national institutes could act all the more aggressively. In the new political climate, NIAB could be far more exacting in its dealings with the trade.

For one final example of the Institute’s changed relationship with the seed trade (prompted by the new emphasis on national security), consider the rapid growth in the number of Fellows seen in Section I. This does not simply correlate with a renewed patriotic interest in NIAB’s work. In 1941 the Institute found that it could not supply enough seed to meet demand from the trade. Rather than sell smaller and smaller packets of seed, which NIAB wished to avoid on the grounds that this would increase the likelihood of introducing impurities to seed stocks, the decision was taken that those who had purchased NIAB seed in the past would be preferred over new customers, while Fellows would be preferred ahead of either. Unfortunately the only

⁵⁸ NIAB, C-2, Council Papers, No. 216 ‘Sales in autumn 1943 and spring 1944’. CWT is a hundredweight. 1 CWT = 8 Stone.

⁵⁹ Wellington and Silvey (1997), pp. 34-35.

information recorded about Fellows (published at the end of each year in NIAB's annual report and accounts), is restricted to names, titles, and any relevant affiliations. It is nevertheless striking that prior to 1939 the few Fellows elected each year were often attached to scientific institutions or bureaucratic departments (though in truth the majority are unaffiliated), while after 1941 the list increases sharply, and is dominated by businesses and trade accounts (easily identifiable as they usually nominate an individual person who is then given in brackets). As there were no other changes in the terms of fellowship which could account for this rapid expansion in the number of Fellows, NIAB clearly used its new found strength, partly gained by carrying the national responsibility of the SPC, to deal with the trade increasingly on its own terms, enhancing the Institute's own seed production capacities as it did so.

(B): Geography – NIAB and the Welsh Plant Breeding Station, 1945-47

In Section I, the closer cooperation and coordination of work between NIAB and the WPBS as a result of the war was emphasised. George Stapledon – initially at the latter institution – was brought on to NIAB's Council. This perspective received further support in Section II (A) as both NIAB and the WPBS worked together within the SPC. There is however a more interesting story to be told, one that once again finds people suggesting the need for NIAB's closure. There was as much competition between the WPBS and NIAB as there was cooperation. The primary cause of these problems was geography, both in the sense of national boundaries and pride, and also that of differing climatic conditions. This subsection will concentrate upon a committee established by the Agricultural Improvement Council (AIC) in 1945. The AIC is another of these influential agricultural organisations of which we know hardly anything. It was described around the time of its formation by Donald Fergusson – whom we met in Section I as MAF Permanent Secretary, and who became the first Chairman of the AIC – as follows. (Incidentally, he was writing to the Chairman of the ARC, Sir Thomas Middleton, star of Chapters 1, 2 and 3. The upper echelons of British agricultural science remained exceptionally cosy throughout the twentieth century).⁶⁰

The work of the Agricultural Improvement Council should be supplementary to the work of the Agricultural Research Council as defined by its charter. The Agricultural Research Council will concentrate their energies on strengthening the efficiency of the research organisation, but will not be concerned to get the

⁶⁰ Olby (1991) pp. 523-524.

results applied in practice. This will be the job of the Agricultural Improvement Council.⁶¹

For present purposes, the AIC is only relevant as providing a context for the debate that follows. The AIC and NIAB joint Committee's terms of reference were to consider how the testing and distribution of new varieties undertaken at NIAB could be improved. After a few months, it was decided that as most of the planned reorganisation would have implications for all national testing stations, a working party should be created consisting of representatives from England, Wales, Scotland and Northern Ireland. It was now that representatives for the WPBS were brought in, alongside those for Scotland and Northern Ireland. During these discussions all parties were able to air grievances and opinions that are highly revealing. The result of these meetings and memoranda was a report to the AIC submitted in 1947. Ultimately – thanks to widespread and deep disagreements – nothing came of its recommendations, and trialling work continued (almost) as it had done before the war. In helping to understand the geographical strand of NIAB's national status, the committee's work is invaluable.

The introduction of the WPBS leads us again briefly back to the First World War. As will be remembered from Chapter 1, Stapledon had been the first Director of the Seed Testing Station upon its formation in London.⁶² At the end of the war he had returned to his work at the University College of Wales, Aberystwyth, eventually becoming the first Director of the WPBS upon its creation in 1919.⁶³ The parallel histories of NIAB and the WPBS therefore run exceedingly closely. Indeed, it was almost the case that NIAB's foundation could have prevented the founding of the WPBS. One of the people that Lawrence Weaver had originally approached when getting funding for NIAB was Laurence Phillips, who came very close to giving a £10, 000 donation to the Institute. In the event, Phillips decided instead to donate this money to Aberystwyth in order to create the WPBS. Phillips' family had deep roots in Pembrokeshire, Wales, while his love of horse racing (and that sports dependence on grass in the UK) was also believed to have influenced his decision. From the beginning then, national geographies had played a role in dividing the work conducted by staff in Aberystwyth and Cambridge. Palladino has already drawn our attention to differences

⁶¹ Quoted in Cooke (1981), p. 38.

⁶² It is doubtless this early association with NIAB that lead Seddon to incorrectly state Stapledon was once a Director of NIAB. Seddon (1989), p. 16.

⁶³ Russell (1961), p. 256. Greater biographical detail can be found in Waller (1962).

between the WPBS and PBI, emphasising how Stapledon was “critical of the institute at Cambridge for failing to produce seed varieties that were appropriate for the ecological conditions in which Welsh farmers worked.”⁶⁴ Considering how interesting and influential a figure Stapledon has been, it is unfortunate for this Chapter that by 1942 his relationship with the WPBS had changed. Midway through the year he resigned his Directorship in order to concentrate on managing the MAF Grassland Improvement Station in Dodwell.⁶⁵ Therefore, while he was still certainly an active figure in the industry and a member of NIAB’s SPC, this sub-section will instead be relying on others at the WPBS to make the Welsh case. Foremost amongst them is T.J. Jenkin, who was also on the SPC, and who took over the Directorship of the WPBS from Stapledon, having been a colleague of his almost since its inception.

On the 4th of May 1945, representatives of NIAB and the AIC held the first meeting of their new joint committee.⁶⁶ William Gavin took the chair and presided over a discussion that might sound more than a little familiar.

Sir Frank Engledow raised the question whether it was desirable that the same body should be responsible for plant breeding, testing and the multiplication of stocks. Dr. [Herbert] Hunter described the Swedish method whereby the same institution undertakes the breeding and testing of plant varieties but a separate seed company, linked with the breeding station, undertakes the multiplication and marketing of seeds.⁶⁷

Whatever moves toward increased multiplication NIAB might have made by the end of the war, or would achieve by 1955, in 1945 the Institute was clearly considered to have fallen far short of the Svalöf ideal and could not be guaranteed to reach it in the future. Even in terms of field trialling NIAB was thought not to have achieved all it might. In a memorandum Engledow had prepared earlier that year he had written that “The Institute, in spite of efforts to enlist the co-operation of County Organisers, has not become a national coordinating centre for yield trials: neither the United Kingdom nor any of its components has such a centre.” He continued by saying that the trialling

⁶⁴ Palladino (1990), p. 457.

⁶⁵ Anonymous (1942), p. 549. Moore-Colyer has written of Stapledon that “a careful reading of his works should be regarded as an essential point of departure for all contemporary scientists and scholars seeking to elucidate the problems of the modern countryside.” This claim reflects Stapledon’s current growing significance as a figurehead for critics of contemporary agribusiness who wish to see the industry arranged on more sustainable lines. Moore-Colyer (1999), p. 224.

⁶⁶ NA, MAF 113/26, ‘Joint Committee of the Agricultural Improvement Council and the National Institute of Agricultural Botany’, 1st meeting 4/5/1945.

⁶⁷ NA, MAF 113/26, ‘Joint Committee of the Agricultural Improvement Council and the National Institute of Agricultural Botany’, 1st meeting 4/5/1945.

arrangements available at NIAB “have rarely been accepted by seedsmen-breeders and only to a limited degree by official breeding stations.”⁶⁸ It was at this point he suggested that it might be best to bring NIAB – in its current incarnation – to a close, and instead launch a brand new facility, capable of working with fodder crops and those scientists needing to keep large groups of animals. This would allow all research strands to be integrated on a large, one might say ‘national’, farm.⁶⁹ With friends like Engledow at the PBI, NIAB could hardly need enemies, though it still had some.

From the beginning, Committee participants struggled to cooperate. That there were deep differences of opinion, between NIAB and the WPBS in particular, was clear from the first meeting. The WPBS representatives had prepared a memorandum in advance, presumably written by Jenkin. Compare the account of WPBS cooperation in the SPC given in Section I, with that given here by Jenkin.

...the new Aberystwyth Seeds Sub-Committee was a sub-committee of the Seed Production Committee, and the S.P.C. in its turn a committee of the N.I.A.B., the grass and clover strains produced by the Welsh Plant Breeding Station for the first time came to be, although only remotely, the concern of the Council of another Institution, the N.I.A.B.

He was keen to stress that once the SPC was wound up, the WPBS would be getting this distribution network back. Jenkin then went further and described the length of time it took to trial varieties in Aberystwyth and how this related to NIAB trials, writing that

It would be absurd...to consider that results obtained by the N.I.A.B. from a few trials at a very limited number of centres outside Wales could over-ride and nullify the significance of the results of many trials over many years within Wales in relation to the conditions under which these Welsh trials have been carried out. For this reason, trials with these varieties conducted by the N.I.A.B. outside Wales must be regarded as additional to those carried out by the Welsh Plant Breeding Station, rather than alternative to them.⁷⁰

Here were some clearly longstanding grievances about NIAB’s supposed national predominance. The very idea of a single ‘national’ trialling institute on these terms, was wrongheaded. There were instead clear geographic and climatic distinctions to be made between the Eastern, Northern and Western parts of the country. “With all the

⁶⁸ NA, MAF113/25, ‘Future arrangements for Testing and for the Provision of Seed or Stocks of Crop Varieties’, 20/1/1945.

⁶⁹ The model of the ‘national farm’ which some historians of agriculture have argued to have emerged at this time could therefore have been given flesh and blood form. Harvey and Riley (2009), Murdoch and Ward (1997).

⁷⁰ NA, MAF 113/25, ‘The Welsh Plant Breeding Station’, SSC 5.

variations that occur, it seems very doubtful whether trials at some twelve centres throughout England and Wales can give really significant results, except for each individual centre concerned.” The knife firmly in NIAB’s trialling programme, Jenkin twisted it, by reference to a WPBS oat variety (S.84) that had been trialled in Cambridge and found wanting. “When, therefore, the N.I.A.B. decided not to market S.84, the stocks available were transferred to the Hay-Talgarth Seed Growers’ Association for multiplication and distribution. Since that time, the variety has enjoyed very considerable popularity”.⁷¹

In return, Frank Horne (Figure 4.5) reemphasised that NIAB would like to have more trialling stations in Wales precisely so it could generate more relevant results for that part of the country, an argument that very much missed Jenkin’s point. More



Figure 4.5: Frank Horne, Director of NIAB 1945-1970. Image held by NIAB archive.

⁷¹ NA, MAF 113/25, ‘The Welsh Plant Breeding Station’, SSC 5. This line of argument was a common feature of national agricultural science discourse by this time, and could be wheeled out whenever the occasion demanded it. See Vernon (1997), p. 316.

persuasive was his attack on the rigour of the Welsh trials as reflected in their track record.

Even with the results of yield trials available, the decisions with regard to marketing are not easy to take and misjudgement may occur; it is, however, interesting to note what has happened to Aberystwyth products which were released without competitive trials: -

- 1: of 5 Han Gymro wheat selections (1931), only one, S.70 remains.
- 2: of 3 Aven strigosa selections “Both S.76 and S.78 seem to have disappeared completely”
- 3: of 2 Ceirch du bach selections one “S.79 has persisted”.

Thus, 3 selections are still grown out of the 9 originally placed on the market.⁷²

In comparison Horne showed that out of 54 wheat varieties, 23 oat varieties, and 31 barley varieties submitted to NIAB up to 1940, the Institute had only recommended or marketed 4, 2, and 4 of them respectively. That to Horne this proved a knock down argument – which, of course, from his perspective it was – elegantly captures further differences in ethos pervading Aberystwyth and Cambridge. Where Aberystwyth attempted to produce novelty rapidly, allowing it to sink or swim in the agricultural industry according to its uptake by farmers, NIAB had deliberately kept its output to a minimum (ostensibly on grounds of quality, though, as we saw in Chapter’s 2 and 3, deference to the trade was also an important motivation). Other members of the working group also challenged the WPBS, claiming that its dogmatic commitment to national boundaries was a form of bias. A draft of the report eventually submitted to the AIC attempted to make the point diplomatically – by speaking in terms that implicated both NIAB and the WPBS.

In some instances the seedsman and the plant breeders have places on the governing body responsible for passing judgment on the varieties tested; each might be said to have a vested interest in a new variety. To the plant breeder the variety is a child of his creation; if he is within the institute and in anyway responsible for the final assessment of its merits, there may be suspicion that he has not been entirely impartial in his judgment; if he is outside, the plant breeder may find it difficult, should his material be rejected, to believe that his rival within the institute has been unbiased. Equally the seedsmen might be suspected of suppressing a variety which might prove a serious rival to one in which he had a vested interest, or of supporting another from which he hopes to make a profit.

Jenkin however saw this passage as directly attacking the scientific credentials of his institution. In a letter responding to the draft report he wrote that “In the present

⁷² NA, MAF 113/25, ‘National Institute of Agricultural Botany (Crop Improvement Branch) – Comments on Aberystwyth Report, S.S.C.7.

paragraph it is suggested that even the plant breeder within an institute may fail to be entirely impartial in his judgment. This is not a view that is universally accepted. Appointments to scientific posts at plant breeding institutions necessarily imply that the plant breeder at such an institute is a scientist. Scientists seek the truth. Truth and bias are inconsistent.”⁷³

In the weeks leading up to submission of the report, the working party was in disarray. Eventually Engledow wrote to the chairman, asking that it be terminated. “Dissatisfaction in plant breeding and other agricultural circles is now widespread...I feel it would be wrong for me, knowing the trend and strength of interested feeling, to leave matters alone any longer...the charge entrusted to the Committee should be withdrawn, the Committee disbanded and a separate, specially constituted, committee set up to take over the investigation.”⁷⁴ All parties went back to their respective institutions and carried on as before. This episode over, both NIAB and the WPBS now faced a new national competitor. As mentioned in Section I, 1947 saw the creation of the National Agricultural Advisory Service (NAAS). This new body excised a significant chunk out of NIAB and WPBS work, by taking all responsibility for crop inspection, field demonstration, and advisory work. For NIAB in particular, there were two primary consequences. The first was that NAAS established its own regional farms across the country, which eventually came to exceed NIAB’s number of trialling centres. There emerged a new geographical division of labour, with NAAS taking on responsibility for demonstration work for farmers and regional trialling over a wider area (on smaller farms), while NIAB concentrated on making its own large regional trialling centres as sophisticated as possible. Returning briefly to the argument made in Chapter 2, it is significant that references to Beaven’s half-drill strip disappear from NIAB’s methods by the mid 1930s, while RCT’s become dominant. This new division of labour between NIAB and NAAS could be taken as evidence of how far the Institute had retreated from demonstration work by this time, having increased the statistical sophistication of its trials. This aspect of NIAB’s trialling programme will be attended to again in Chapter 5. It would be interesting to know what methods were adopted at NAAS trial grounds, and whether; (a) it remained the case that demonstration plots had to avoid randomisation if they were to prove persuasive to farmers; (b) NAAS was deaf to this possibility, or (c) farmers no longer viewed demonstration farms in the same way. The second important

⁷³ NA, MAF 113/29, ‘Scheme for Testing and Distribution of New Varieties, Comments on Dr. Slater’s Report by T.J. Jenkin, Welsh Plant Breeding Station, 16/6/1947.

⁷⁴ NA, MAF 113/29, Letter from Engledow to Slater, 12/5/1947.

consequence of the creation of NAAS for NIAB was that the Seed Certification schemes established by the latter during the war were taken over by the formers' new inspectors. Both Certification and the Recommended List are the subjects of the following subsection.

(C): Efficiency – The Recommended List and Seed Certification, 1944-55

On the straightforward account given in Section I, the Recommended List was designed to inform farmers of the best varieties suited to their environmental conditions, helping to make farming more efficient. However, precisely who gained from their introduction, and whose efficiency they actually improved, are not so obvious. Recommended Lists were actually begun for somewhat different reasons. At the very end of 1942, in the earliest part of this story, Hector Read wrote a letter on behalf of the National Association of Corn and Agricultural Merchants to the NIAB Council. "The chairman read a letter which he had received from Mr Hector Read suggesting that the number of varieties of wheat permitted to be sold in this country should be considerably reduced and that not more than say 15 varieties should be permitted to be sold in future."⁷⁵ Creation of the Recommended List was then further encouraged by the intervention/intrusion of the Ministry of Food early in 1944. "The Ministry of Food is anxious to secure more uniformity in the flour obtained from home-grown wheats and at the same time to secure better quality."⁷⁶ This Ministry not only supported the creation of such lists, but also proposed a differential scale of subsidy for those farmers who grew preferred varieties. This restrictive function of the Recommended Lists has already been mentioned by NIAB's official biographers, though they do so without exploring its full implications. Referring to the way in which the Lists would be amended over time, Silvey and Wellington write "This would prevent the List becoming too long to achieve the reduction in wheat varieties needed by millers, corn merchants and seedsmen as well as growers."⁷⁷ While it seems clear that this reduction was certainly needed by millers and corn merchants, and government departments ostensibly advocating on behalf of the consumer (though doing so by supporting food processors), there is less evidence to suggest it was desired by *all* seedsmen or necessarily *any* farmers, who have to deal with varietal performance in the peculiarities of their region.

⁷⁵ NIAB, C-4, Council Minutes, 105th Meeting, 14/1/1943.

⁷⁶ NIAB, E-6.14, Executive Sub-Committee Minutes, 63rd Meeting, London, 15/3/1944.

⁷⁷ Silvey and Wellington (1997), p. 43.

NIAB's emphasis on the needs of food processors points us in the direction of a well-recognised phenomenon, though one which has hitherto thought to have begun much later in the century. It has been argued that throughout the second half of the twentieth century, from around 1960 onwards, the nature of state agricultural research in Britain fundamentally changed. Spedding has stated this case most strongly, arguing that by the mid 1980s the ARC actually no longer supported 'agricultural research'. The ARC, he writes, "consists mainly of scientists and, although there are a few members from farming or the food industry, social scientists, medical doctors, economists, consumers and even agricultural scientists are rare. The ARC institutes are similarly staffed with scientists, as opposed to agriculturalists".⁷⁸ Instead – the argument goes – state funding was increasingly redirected along two dominant lines. Firstly, the greater part of the research in both public and private institutions was primarily geared towards the needs of food processors, rather than farmers. Secondly, and simultaneously, MAF's purview was increasingly restricted to basic research, supposedly so as to allow the private sector to take on more 'near market' research. At the same time, as Palladino et al. explain, MAF also came to instigate many more investigations into environmental concerns, or 'public interest' research.⁷⁹ In the background to these changes was increasing public scepticism about the closeness of the relationship between farmers and MAF, as the Ministry was seen to be acting in the interest of farmers rather than the consumer.⁸⁰ The case of the Recommended List lends support to these arguments while also pushing back the point at which these changes took place. From NIAB's foundation, much of the Institute's work had been concerned with improving the efficiency of food processors. As we saw in Chapter 1, millers and brewers were amongst the Institute's most active supporters. Prior to this, Biffen had been supported in his 'strength' research by the National Association of Corn and Agricultural Merchants. If "agriculture has ceased to be the separate economic entity it once was, and both the institutional organisation of research and allocation of resources within the organisation have changed accordingly, with the orientation of agricultural research being initially determined by the needs of food processors, and more recently by the needs of food retailers" then this is a process that has had a much

⁷⁸ Spedding (1984), p. 6.

⁷⁹ Palladino et al., (1997), p. 574.

⁸⁰ See Humphrys (2002), p. 66, for a particularly entertaining example.

longer history than has otherwise been recognised.⁸¹ Processors were not the only group to benefit from Recommended Lists, they were also a boon to large seed firms.

Seed houses possessing very large acreages could now dedicate a greater portion of their land to fewer varieties, producing much larger supplies and benefiting from economies of scale. Their recommended variety seed could subsequently be sold at a more competitive price. Meanwhile, those firms who made their money selling a greater number of varieties on smaller acreages would find it increasingly difficult to sell varieties that were not on the Recommended List, or at least not at comparable prices. If they switched to selling varieties that were, they would find themselves at a distinct disadvantage to the larger firms. Here then is a very neat explanation (or rather part of an explanation) for the rapid increase in the number of mergers and acquisitions that took place in the plant breeding industry in the second half of the twentieth century, not just in Britain but throughout the world.⁸² Aside from this however, the Recommended Lists also forms part of another trend running through British agriculture in the second half of the century, namely the shift towards contract farming. One of the earliest examples of this kind of financial arrangement – in which a firm pays a farmer to grow a certain acreage of the crop and the variety they desire – is found in the brewing industry. The Guinness firm grew virtually all of its barley and hops on contract from the turn of the century onward. E. S. Beaven's employment at that company, seen in Chapter 2, was to oversee these arrangements and ensure the subsequent crops were of a suitable standard.⁸³ As part of these arrangements, Guinness would provide farmers with the seed of the variety they wished to use. The greater the uniformity of the raw produce with which they began, the more efficient could be the brewing process. It was by producing such a remarkably good barley variety (Spratt Archer) while working in Ireland's Department of Agriculture, that NIAB's short-term Acting Director – Herbert Hunter – had established his plant breeding credentials. The creation of Recommended Lists (which could be appealed to much more legitimately in contractual negotiations), served to help firms advancing this approach, increasing the number likely to engage in contract farming.

Finally, the power of the Recommended List was used by NIAB in another way, one which amplified the changes described above. Around 1943 NIAB looked to expand

⁸¹ Palladino et al. (1997), p. 558.

⁸² Galushko and Gray (2012), Kinchy (2012) p. 7.

⁸³ Dennison and MacDonagh (1998), p. 205 explains that in 1920, 7000 barrels of Spratt Archer were distributed by Guinness's network of maltsters and breeders.

the number of species being inspected under Seed Certification Schemes. These had begun in pasture crops largely as a result of the initiative of local seed growers associations. The Institute now wished to begin certifying cereal seed. Seed certification was designed to tackle several problems that had emerged from NIAB's multiplication work, described in Section II (A). To state the problem briefly, NIAB's labelled seed sacks had been found an unreliable way of policing the identity of the Institute's seed. Often multipliers would grow these varieties in very close proximity to other varieties, leaving plenty of opportunity for cross pollination. This problem became all the more acute when demand for seed was high (as it was during the war), because individual sales had to be kept low, which increased the likelihood that a grower would have to fill half the field with one variety and the other half with another. Initially local cereal schemes were begun by Seed Growers Associations, which in turn looked to NIAB for guidance and inspection expertise. Only in situations that NIAB felt satisfied would the Institute give its seal of approval to these local projects, allowing them to sell their seed as officially certified. In time, the Institute formulated an official policy and inspection guidelines. From 1944 onward all NIAB seed was brought under its new Seed Certification scheme, as explained by Herbert Hunter. He wished to emphasise that Certified Seeds were not simply seed crops that had been inspected during growth. Inspection was not enough, especially considering the difficulties surrounding varietal identification, as seen in Chapter 3.

But it is of very great importance that it [inspection] should in no way be confused with certification. We cannot, as it were, enter seeds in the "herdbook" by inspection alone. Selected strains, as explained above, are indistinguishable by sight from one another, and so even are some varieties. For certification we must know not only the origin of the seed and that the crop we see is the authentic descendant, carefully controlled year by year to avoid both contamination and substitution – for mistakes are easily made. We must know that the seed which eventually comes on the market is in actual fact derived from the crop we are inspecting, and that it will not be threshed in a drum that has not been cleaned or contaminated with some other variety in the cleaning machine or on the barn floor.⁸⁴

Not all plant histories are equal.⁸⁵ This elaborate process sets important precedents for the history of intellectual property in plants which will be addressed in Chapter 5. Certified Seed was highly prized, purportedly offering a greater certainty of result to

⁸⁴ NA, MAF 113/25, 'Certification of Cereals' copy of an article written by Herbert Hunter, published in *Agriculture*, Vol LI, No. 6, Sept 1944.

⁸⁵ Berry (in press 2014).

Table 4.10: Development of the Cereal Seed Certification Scheme, 1947-1956. Data compiled from numerous sources. Blank boxes indicate missing data, not an absence of the scheme.

Year	Acreage inspected by approved traders (with NAAS oversight)	Acreage inspected by Seed Growing Organisations (with NAAS oversight)	Total acreage inspected	Total acreage approved	% Rejected
1947	26,808	9044	35,852	28,747	20
1948	27,831	10,074	37,905	24,024	36
1949	34,546	10,010	44,556	29,429	34
1950	43,010	10,264	53,274	37,511	29.5
1951	54,186	7910	62,096	43,417	30
1952	57,772	6101	63,873	45,343	29
1953	66,087	5548	71,635	47,402	33.8
1954	-	-	-	-	-
1955	82,296	7236	89,532	58,964	34.1
1956	85,243	6388	91,631	66,831	27.1

the farmer, while also increasing profits for those breeders that could have their seeds certified. Evidence of the growth of this scheme can be seen in Table 4.10.⁸⁶ Along with the new NAAS crop inspectors, traders and members of seed growing organisations could come to NIAB for training in crop inspection. Once proficient, they could then organise their own certification schemes, provided they adhered to the requirements outlined by Hunter. These were as follows:

- (a) that the original seed from which the stock has been grown is of known origin.
- (b) that it is true to name.
- (c) that it has been multiplied under conditions of strict control every year and at every stage from the field to the sealed sack.
- (d) that the seed in the sack is in fact the seed over which this care has been taken from the year the stock began as the produce of a single plant and not some other seed advertently or inadvertently substituted for it.⁸⁷

Importantly, the requirement that the original seed *stocks* must come from a known origin, was enough to prevent seed stocks held by smaller firms, from entry to the scheme. Only large seed houses and national plant breeding centres would carry

⁸⁶ Revealingly, when Hunter outlined his ideal pedigree seed multiplication process, 80,000 acres of seed was the amount he required grown each year in order to fulfil the needs of the entire country. The expansion of the Seed Certification scheme to a little over 80,000 acres by 1955 might therefore suggest that the vast majority of cereal seed sold by this time came from certified stocks. NA, MAF 113/25, 'Certification of Cereals' copy of an article written by Herbert Hunter, published in *Agriculture*, Vol LI, No. 6, Sept 1944.

⁸⁷ NA, MAF 113/25, 'Certification of Cereals' copy of an article written by Herbert Hunter, published in *Agriculture*, Vol LI, No. 6, Sept 1944.

credentials strong enough for their varieties to be recognised as unquestionably pure and original. A small seed firm would have to enter from the bottom, buying recognised seed from a certified trader and building up this stock according to the above conditions, provided, that is, that they wished to sell certified seed at all. An even more simple, though much more important, mechanism was also implemented, as NIAB would only allow the certification of varieties contained in their Recommended List. This was certainly one way to ensure British farming became more scientific.

Section III: Conclusion

In this Chapter, NIAB's national status has been addressed, focussing upon the aspects of security, geography and efficiency. In responding to the demands of national security, the Institute's rapid expansion of its own seed production capacities (which continued well into the post-war years) must surely be deemed a success. That NIAB was selected to house and direct the SPC was also of considerable import, considering that previously the value of the Institute and the expertise it represented had received little recognition. On the strand of national geography, NIAB fared considerably worse. The problems that emerged between NIAB and the WPBS following the creation of the joint AIC and NIAB committee must not be thought of as isolated to this period. Their different perspectives, and particular grievances, had clearly been building for some time prior to the war. While the demands of war forced NIAB and the WPBS into closer proximity, they also ensured a franker and fuller appraisal of one another's work. Ultimately little actually changed (in the short term) following this discussion, though both institutions would suffer an intrusion on its territory in the shape of NAAS. Finally, on the question of national efficiency, it has been argued that farming and farmers themselves benefitted little from the twin initiatives of the Recommended List and Seed Certification. At the very least this should remind us that the aims of agricultural science and agricultural scientists are subject to an inordinate number of influences, and can often require considerable assessment and reassessment before they are made clear. More than this however, it has been shown how one particular aspect of British farming – which is said to have been revolutionised in this period – was actually changed. Technical scientific improvements, or some natural drive to modernity, had little to do with it. Farming became more scientific through legislative change, committee diktat and institutional opportunism.

The war was good for agriculture and agricultural science. The further expansion in the size of NIAB's grant and headquarters, which continues over into Chapter 5, was accompanied by a considerable expansion of the Institute's scientific workforce. Throughout the interwar period, NIAB expertise had focussed almost entirely on the management of trials of farm crops. Immediately after the Second World War however, this situation began to change, with the addition of new laboratory facilities, and staff in chemistry, mycology and pathology. Indeed, NIAB did not even employ its own statistician until the 1950s. Provided these investigations were considered fundamental to the Institute's primary programme of work, NIAB's more basic scientific interests began to be treated with greater sympathy within Whitehall. Whether or not this brought with it a change in the extent to which NIAB was perceived as a scientific research institution, rather than a technical industrial regulator, is considered in the final Chapter.

NIAB's national status was therefore a source of strength as well as weakness, as it tied the Institute's fortunes to the political context of the day. Throughout the interwar period NIAB had kept its own seed production levels low, so as not to cause affront to the trade during a time when the agricultural industry (particularly its arable complement) was widely recognized as experiencing a period of deep depression. Government response to this problem had been a limited number of new marketing mechanisms and price guarantees, but largely non-interventionist. Accordingly, and in line with its own political leanings (after all, the Institute was not a hive of political radicalism) NIAB interpreted the problems of cereal farming as being resolvable through greater awareness of improved varieties, to be achieved through national trials and circulation of the results. With the arrival of agricultural support through subsidies, nationally funded agricultural scientists found themselves with new responsibilities and opportunities for action. Accordingly NIAB expanded its own seed multiplication work (ostensibly on the grounds that blockade had reduced national seed supplies to dangerous levels) while going on to build impressive new multiplication facilities immediately after the war. By 1955 the Institute had also dramatically increased the size of its headquarters and annual maintenance grant. Provided that there were no more substantial changes in the immediate political climate, NIAB had finally achieved something like a secure foundation upon which to build, and – thanks to the new growth in national investment – the likelihood that it might be closed at any point in the near future could be forgotten. How the Institute's position changed when a new

economic and political era did begin to emerge, shall be considered in the following Chapter.

It is worth reflecting on the ways in which the above themes of national security, geography and efficiency have actually been present throughout the thesis. As we saw in Chapter 1, it was the First World War and fears about food production and national security that provided much of the context for NIAB's foundation. Similarly, in Chapter 2, it was argued that NIAB's national terms of reference – to cooperate with farmers across as wide a geographical and climatic area as possible – were important obstacles to its adoption of randomised control trials. Finally, in Chapter 3, NIAB's efforts to increase the efficiency of British farming by controlling synonyms and the varietal market were only possible thanks to its national status, one which the Institute had to trade against its working relationship with private plant breeders. The present Chapter has therefore recapitulated the structure of the thesis thus far (in a way that might not be immediately obvious), while addressing problems that have been ever present (though until now only touched upon). Chapter 5 will take the job of synthesis much further, while bringing our history of NIAB up to 1969.

Some of the changes that took place in the present Chapter will form much of the context for Chapter 5. For instance, having now brought NIAB the closest it has come to fulfilling the Svalöf model, the following Chapter will necessarily pursue how this aspect of the Institute's work developed after 1955. Similarly, with the expansion of Britain's agricultural research network and the formation of NAAS, how this new landscape continued to constrain NIAB, or offer it new opportunities, will also be addressed in the following Chapter. Most importantly, the relationship between NIAB's seed certification programmes and future methods for control of the seed and varietal market will be considered in detail. The conceptual challenge that Chapter 5 takes on is the need to bring some synthesis to NIAB's four predicates as already explored in the thesis thus far, demonstrating how they relate and interact.

5. *Independent*: Reinventing NIAB in the productivist era, 1955-1970

“I do not think there is any real reason to fear” wrote E. John Russell in an address to NIAB during 1955, referring to contemporary agricultural trends and the potential for a return of the boom and bust of agricultural surplus and dearth. “In spite of the Iron Curtain – perhaps indeed because of it – there is far more international action than in the 1920s, and more readiness to spread local surplus.”¹ Such is the post-war context for the final Chapter of this thesis, which departs from the format thus far. Each preceding Chapter has focussed on a particular problem within a given period. In the first Chapter, NIAB’s importance as a *seed multiplier* was set alongside the numerous other potential purposes envisaged by the Institute’s founders. The second charted how NIAB became a *field trialler* within its first ten years of operation, and analysed the significance of its trialling methodology. NIAB’s role as *plant identifier* within the communities of publicly funded scientists, farmers, and private plant breeders took centre stage in the third Chapter, which focused upon the 1930s, while the previous Chapter scrutinised the Institute’s status as a *national institute* during and immediately after the Second World War. In contrast, while the present Chapter does focus on NIAB’s pretensions to being an *independent* institution, and the costs of maintaining this independence, it does not attempt to introduce this issue as yet another new problem. Independence is instead understood as a product – perhaps even the goal – of the four preceding predicates and their (often only partial and pragmatic) resolution. It is worth explaining what is meant by independence, as NIAB was by no means ‘independent’ of outside influences. Indeed in this Chapter the fact that a very great many groups (farmers and bureaucrats in particular), wished to exert control over NIAB drives at the very heart of the matter, fuelling the ‘struggle’ at the core of the argument. Rather, it is independence (in the eyes of each actor group) from overt control by any other individual actor group. One can immediately draw parallels and lines of causation with the story told in Chapter 1, in which upon founding the Institute, NIAB’s purposes were spread amongst a number of different interests, despite the internal incoherence that followed.

This Chapter makes two important contributions to the thesis as a whole. Firstly, it has been stressed that each of the four predicates discussed need not

¹ Russell (1955) pp. 376-387.

necessarily be confined to the particular periods assigned to them. Multiplication, trialling, identification, and national identity can be questioned at any point in the Institute's history, right up to the present day. It is the task of this fifth and final Chapter to deliver on that promise. Even a problem such as trialling methodology, which might be assumed to have been solved by the adoption of the RCT, continued to be a source of tension. The second contribution that this Chapter makes to the thesis as a whole, is that it helps to counteract a potential deficiency. Focussing upon these four predicates in isolated chapters might have given the false impression that they do not interact with one another. As we shall now see, this is far from the case. Bringing some synthesis to them under the broader issue of NIAB's *independence* is particularly appropriate, considering that throughout all of the preceding chapters, the Institute's autonomy has never been far from discussion.

Section I: Agricultural science after the Second World War

Few studies in the history of British agricultural science extend beyond the Second World War.² The majority of those that do, have suffered from the same deterministic tendencies highlighted by Abigail Woods. Changes in the agricultural industry are too often explained as part of some natural techno-economic progression. "Authors tend to regard intensive farming as an end point and set out to determine how it was reached. The resulting linear accounts either ignore key changes that do not fit into their general trajectory, or place them within the entirely separate sphere of organic farming."³ This criticism informed Chapter 4, but is particularly important in the present Chapter, which deals with some of NIAB's most visible and persistent legacies for the contemporary agricultural industry. Those few historians of science interested in British agriculture in this period have focussed mainly on the organisation of national funding, and the eventual privatization of British plant breeding.⁴ The question of national funding certainly looms large in this period, and shall be attended to accordingly.

² Only two of the histories mentioned in the introduction to Chapter 4 – Cooke's edited collection and John Martin's *The Development of Modern Agriculture* – give post-war developments significant attention. Both however suffer from the deterministic attitude described by Woods. Cooke (1981), Martin (2000). Philip Conford's *The Development of the Organic Network* also addresses the impact of post-war agricultural science and technology in Britain, interpreting their influence in no less deterministic (though much more negative) terms. Conford (2011).

³ Woods (2012), p. 166.

⁴ On the organisation of research see Read (1989), Thirtle et al. (1997). On the privatization of British plant breeding see Galushko et al. (2012), Pray (1996), Rangnekar (2000) and Webster (1989).

However, with regard to the latter question of privatization, it must be admitted that most of the important developments surrounding privatization take place outside of the period with which this Chapter is concerned. There has been only one major development of direct relevance to the history of NIAB (and which took place within the period 1955-1969) that has already commanded substantial interest. Academics working in a host of different disciplines have focussed upon the introduction of Plant Breeders' Rights (PBRs) in 1964, which gave a clear legal framework for the establishment of intellectual property rights over plants and the collection of royalties on the same.⁵ The years preceding the introduction of this legislation, and the results that followed, will necessarily provide much of the material for the present Chapter. However, the history of NIAB in this period is about much more than just the implementation of PBRs. The multiplication and certification programs begun during the Second World War continued to grow rapidly. The number of organisations looking to make use of NIAB's seed multiplication resources and expertise increased steadily. The Institute experienced significant expansion in resources and prestige, though, as was the pattern throughout the first fifty years of NIAB's history, this expansion came



Figure 5.1: NIAB headquarters in the early 1950s. Image held by NIAB archive.

⁵ Hayes et al. (2009), Laverton (1966), Srinivasan et al. (2003) There is also a vast literature that considers the introduction of this kind of legislation in different national contexts. On North America see Bugos et al. (1992), Evenson (1983), Kevles (2007). On Europe Llewelyn et al. (2006). On the international perspective see Dutfield (2000), Kloppenburg (2010).



Figure 5.2: NIAB headquarters, facing out from the rear of the Institute in the early 1950s. In the left of view can be seen the enlarged granary and seed cleaning facilities. Image held by NIAB archive.

with losses and contractions elsewhere. While PBRs and the ownership of plant varieties will therefore be central to this Chapter, and closely linked to the changes just briefly described, they will not be allowed to overshadow NIAB itself, which is – after all – the focus of the thesis (Figures 5.1 and 5.2).

The era of agricultural productivism and Harold Wilson's 'white heat' come together in this Chapter in ways that highlight more clearly than ever the need for more historians of science to attend to agricultural science and industry in this period.⁶ At present, international studies make helpful historiographical placeholders.⁷ Nevertheless, the political, economic and social peculiarities of Britain demand their own much deeper critical analysis. Increased production continued to be emphasised after 1955, but thanks to the return of world food supplies to pre-war levels, this policy became increasingly controversial, requiring negotiations between government, food processors, and the farming interest.⁸ These changes also lead to an apparent change in the public image of farming.⁹ Productivism is (unsurprisingly) the term given by historians of agriculture to the large state-sponsored expansion of agricultural production that took place throughout most of Europe following the Second World War.¹⁰ In comparison to earlier periods (and earlier Chapters in this thesis) agricultural

⁶ Vig (1968) has almost nothing to say of agricultural science and agricultural science policy.

⁷ Danbom (1979), Fitzgerald (2003), Harwood (2012), Hencke (2008).

⁸ Smith (199) pp. 117-147 provides a good overview of these issues. See also , Beresford (1975), Body (1982), McCrone (1962), Newby et al. (1978), Selly (1972), and Shoard (1982)

⁹ Lowe et al. (1986) p. 26.

¹⁰ Bowers (1985), Robinson and Sutherland (2002), Wilson (2001).

science and technology have by no means been ignored by the productivist historiography. On the contrary, science and technology are seen to be crucial driving forces behind bigger yields in everything arable and pastoral. It is believed that growth has in a large part “been achieved by plant and animal scientists, chemists, and geneticists simultaneously with a mechanical revolution, a management revolution, and now an electronic revolution.”¹¹ A small cottage industry of economists has attempted to quantify the contributions of agricultural science and technology to productivity.¹² Nevertheless the treatment of science and technology themselves has on the whole been relatively shallow. The ‘agricultural treadmill’ was a once popular explanatory model – technological determinism for a specifically agricultural context – but seems now to have gone out of favour.¹³ Paul Brassley has tempered the more exaggerated claims about the impact of science on agriculture by emphasising that much change was produced not by novel science and technology, but by a more rapid adoption of pre-existing technologies. He concludes that for all the work measuring production and productivism, we know hardly anything at all about how or why these changes came about; “having identified the importance of the 1945-65 period, and made a case for the output increases depending on existing technology, the obvious next stage of research should be on the reasons for adoption.”¹⁴ As for the wider political context, NIAB in this period fits very neatly into the revisionist history of British state support for science and technology advanced by David Edgerton.¹⁵ Support for agricultural science and technology, in the form of NIAB, had been greatly increased prior to the arrival of Wilson’s Labour government, and subsequent to its arrival (amid claims of technological revolution) agricultural science (NIAB) was increasingly expected to pay its way. This Chapter, as with the previous, will explain how at least one small part of state agricultural science infrastructure functioned at this time, the challenges it faced, and its contributions to changes in British agriculture.

¹¹ Howarth (1985) pp. 43-44.

¹² Barnes (2002), Doyle et al. (1985), Harvey (1988), Thirtle et al. (1989), (1996), Wise (1986).

¹³ Despite this, the treadmill notion does feature to a remarkable degree in Perkin (1997). For a rare critique of the term itself, and references to crucial texts in its history see Ward (1993), who nevertheless maintains that the treadmill notion can, once clarified, be a useful one. He takes an economic perspective and does not consider the assumptions about science and technology that the treadmill relies upon, assumptions that few historians of science and technology would sympathise with. See also Hausner and von Witzke (1997). My thanks to Abigail Woods for discussing this point with me.

¹⁴ Brassley (2000) p. 77.

¹⁵ Edgerton (1996).

The major changes that take place at NIAB during this period include the almost successful attempt by the Ministry of Agriculture and Fisheries (MAF) to subsume NIAB within the Ministry, the loss of NIAB's seed multiplication responsibilities to the newly created National Seed Development Organisation (NSDO), a doubling of its annual maintenance grant, and the implementation of PBR legislation. As regards to reinvention, a number of changes pattern NIAB in this period. Most clearly, the levels of funding required to maintain the Institute continue to grow, as does its Ministry grant, while simultaneously the amount of funding NIAB is expected to generate from its own services is greatly increased. In this respect NIAB quite literally pays to maintain its independence. In addition, the basis of the Institute's authority shifts further on to its statutory (rather than its voluntary and advisory) functions. In this respect NIAB's independence is gradually undermined, as the Institute goes on to take a more official and Ministerial appearance in the eyes of the farming community. Lastly, despite its longstanding (and increasingly successful) relationship with official plant breeding stations as a seed multiplier, in this period NIAB has the entirety of this responsibility taken from it and granted to a new body. Remarkably, this change occurs without any apparent sense of loss at the Institute. In this instance, NIAB's sense of its own independence (and conversely, its sympathies with the private seed trade) arguably does the Institute damage, as it was calls to protect its objective and independent nature that led to the (largely unnecessary) relinquishing of its multiplication work. In order to navigate all of this material, four key historical moments will be used as waypoints – providing a chronology and narrative for NIAB in this period – amounting to four Sections and a Conclusion. Section II concerns the beginnings of reinvention at the Institute in the years leading to NIAB's Joint Review Group report in 1955. These reports began to be commissioned on all nationally funded agricultural research centres by MAF after the Second World War, and were organised in cooperation with the Agricultural Research Council (ARC). They consisted of small groups of investigators, many of whom were practicing agricultural scientists, who would assess centres on a four yearly basis. Section III is dedicated to the 1955 report, the first waypoint, and its impact. The Joint Review Group Reports for 1961 and 1966 provide the second and third waypoints (considered in Section's IV and V respectively) not merely for the sake of simplicity but because genuinely significant developments follow from them. Both of these later reports were written after the point at which the ARC was given sole responsibility for the administration of national agricultural science funding. Yet, NIAB

remained the responsibility of MAF rather than the ARC. Not being taken on as a fundamentally scientific organization, NIAB's concomitant loss of prestige could explain some of MAF's changed attitude towards the Institute at this time. The fourth and final waypoint is that of the change to NIAB's Trust Deed in 1970, with which the Chapter will conclude. This was the first major change to the Trust Deed since its official confirmation in 1919. Throughout the Chapter, the aim will be to show how NIAB's roles as multiplier, trialler, identifier and national scientific institute, interacted with one another and together came to constitute (or detract from) its independent status.

Section II: MAF's challenge to NIAB's autonomy and the beginnings of reinvention

In 1951, NIAB made its first ever proposal to MAF for a change in its Trust Deed. The changes sought were modest, the most significant of which was an enlargement of the Council from 21 to a maximum of 28 members. This expansion would accommodate two more members from both MAF and the Fellows' vote, two 'Co-optative' members (persons invited to join the Council in respect of their expertise and active participation within the industry) alongside another new member nominated by the National Farmers' Union. Negotiations dragged on for a number of years and were interrupted by fallout from the Education (Miscellaneous Provisions) Act 1948. The Ministry of Education had been formed in 1944, and the provisions of the 1948 Act arrested responsibility for educational establishments previously under the purview of the Charity Commission (as NIAB was) to the new Ministry.¹⁶ In 1954 therefore, the responsibility for the oversight of NIAB's Trust Deed finally passed from the Charity Commission to the Ministry of Education. This was not the only cause of delay. MAF had taken the opportunity that these negotiations presented to try and increase the amount of direct control over NIAB wielded by the Minister. Proposed changes included that any and all expenditure on the Institute's buildings should require MAF consent, and that the Chairman of the Council should be appointed by the Minister rather than by vote of the Council, as had been the case up to that point. Sir William Gavin (that central and controversial figure who has appeared numerous times throughout this thesis and who became a Vice-President of NIAB in 1953), proffered the following opinion on these two suggestions.

With regard to (1) this proviso is merely superfluous. All new expenditure, even of the Institute's own funds, has to receive the Ministry's consent. The proposal

¹⁶ Fenwick (1985), Williams (1955).

(2) regarding the appointment of the Chairman is more serious and in my view profoundly disturbing as disclosing a Fabian and bureaucratic line of thought.¹⁷

Gavin's view won out, and in 1955 the small changes in the Trust Deed desired by NIAB went ahead without any concessions. Nevertheless, and as we shall see throughout the rest of this Chapter, NIAB's almost complete reliance on Ministry funding brought any supposed institutional independence into doubt and gave MAF strong grounds upon which to negotiate. Meanwhile, MAF's attempts to subsume NIAB further under its own control would meet with significant resistance, particularly from those attempting to protect the Institute's independence on behalf of the farming interest. Being a national institute could have serious implications.

The Ministry was increasing pressure on the Institute precisely at the same time as its services were becoming more popular than ever. For instance in trialling, NIAB now had to cope with more novel varieties than it had ever before been responsible for. This rapid increase in submissions began to push NIAB's resources (particularly that of land) to their limits, inspiring a complete overhaul of their trialling methods. These trialling developments will be discussed shortly. Beforehand it is important to point out that these changes went hand-in-hand with a creeping agreement amongst the scientists and administrators at the Institute that the time had come for some form of intellectual property protection over plants. Whereas in Chapter 3 we saw that the potential for such legislation was dismissed on the grounds that identification procedures were not sufficiently reliable and that stewardship over varietal identity could be a source of credit for breeders (regardless of that varieties origins), by the 1950s the potential for such legislation met no identifiable resistance at NIAB. At a meeting of the Cereal Trials Advisory Committee (CTAC) in July 1954, the Conservative peer Lord Gretton, spoke of "his long standing interest in the possibility of obtaining an official register of varietal names and asked whether the Institute would be willing to raise this matter with the Ministry of Agriculture." He continued in terms entirely befitting his stereotype.

It seemed to him that, just as a ship had to be named and the name registered, so varieties of crop plants should be named and registered, and the placing of the name on the official register would be a means of protecting that name and preserving its sole use in connexion with the variety in relation to which it was

¹⁷ NIAB, C-5.6, 'The N.I.A.B. Trust Deed' by Sir William Gavin, 17/6/1953.

originally registered. It was most important that the productions of plant breeders, whether official or private, should be protected in this way.¹⁸

The Council considered his proposal the following month and the MAF member of Council, R.J.E. Taylor, was only too happy to report that this very question was to be discussed by the new Committee on Transactions in Seeds (CTS), which had been established that same month.¹⁹ The CTS was tasked with considering the Seeds Act (1920) which was considered in need of revision (see Chapter 1). After only a few months of its formation, the CTS took the decision to submit not one but two reports. The first would be published as planned, having regard to the existing provisions of the 1920 Seeds Act and recommendations for change. The second report would then be dedicated entirely to the question of the intellectual property rights of plant breeders. This second report would eventually become the basis of Plant Breeders' Rights in 1964, but not before a number of sticky problems regarding the correct and systematic identification of plant varieties were pushed to the periphery of NIAB's view. How these problems were overcome will be considered at various points in the present Chapter. Before turning to consider changes in NIAB's trialling methods, one important observation (which connects field trialling and plant identification), needs to be made. Plant Breeders' Rights are today often defended on the grounds that before their introduction, the business of plant breeding languished as no breeder could afford to spend capital improving a variety only to have it sold by his competitors in the following years. Yet at the very same time that NIAB was finally coming to consider advocating such legislation, it was also having to seriously reconsider the nature of its trialling programmes due to an ever-increasing number of novel varieties being submitted for testing. Between 1946 and 1952 NIAB received 190 different varieties of wheat, 150 of oats and 80 different barley varieties.²⁰ Admittedly, many of these varieties were being produced by foreign breeders, and many did not pass the first stage of trialling, but the property rights of these breeders were no more protected in the UK than were the rights of any other breeders. Some pointed to the Second World War when accounting for this growth. "This expansion has been caused, in the main by the marked growth in variety trials during the post-war period, as a result of the loss of access to foreign varieties during the war, with consequent expansion in official breeding programmes in

¹⁸ NIAB, Cereal Trials Advisory Committee Minutes (in active rather than historical archive), 17th Meeting, 23/6/1954.

¹⁹ NIAB, C-4, 148th Council Meeting, 15/7/1954.

²⁰ NIAB, Cereal Trials Advisory Committee Papers (in active rather than historical archive), Paper No. 30 A.

this country together with the reintroduction of foreign varieties after the war.”²¹ The link between the growth in the number of varieties being submitted to the Institute following the Second World War, and the growth of sympathy with the need for IP protection over them, is surely not coincidental.

When faced with a greater number of novel submissions for testing, a national regulator can respond in one of two ways. Firstly, with infinite capital, they could decide to increase annual expenditure in order to ensure their research resources continue to match their trialling methods, expanding the size of the operation while still maintaining their present levels of rigour. In NIAB’s case, land constitutes the most significantly restricted resource, the amount and cost of which must increase in order to maintain its trialling programme. Alternatively, that same regulator could change its procedures in order to reduce pressure on its existing resources. Possible changes could include reducing the number of submissions eligible for testing each year, or changing trialling methods so that each submission consumes a smaller proportion of the total existing resources (thereby reducing the rigour of the trial). This second option therefore highlights a tension in trialling between the wishes of those submitting novelties (in NIAB’s case plant breeders) and those on whose behalf they are being tested (in NIAB’s case farmers and other purchasers of varieties). The way in which NIAB chose to respond to the increasing number of varieties submitted to its trials can therefore provide something of a measure of its sympathies with either or both of these two groups. In March 1953 NIAB approved the following changes to its trialling methods.²² Firstly, the number of years over which a variety was to be tested was dropped from four to three. This was achieved by removing the first years ‘observation’ plots grown solely at NIAB’s HQ. These very small plots had allowed for an initial screening of a small amount of all the varieties submitted for trialling that year, providing a check on obvious cases of synonymy, high levels of susceptibility to disease and so on. The removal of this immediate hurdle for plant breeders seems to clearly place NIAB’s sympathies with them. On the other hand, the stated aim of these proposals was to reduce the number of varieties eventually entered into ‘full trials’ across the country. On its own therefore, this decision does not appear to benefit either farmers or plant breeders too greatly. This ambiguity can also be found in NIAB’s

²¹ NIAB, K-16.48, Report of the Joint Review Group 1966/67, pp. 3-4

²² Key documents for this discussion include: NIAB, Cereal Trials Advisory Committee Papers (in active rather than historical archive), Paper No. 30 A; NIAB, Cereal Trials Advisory Committee Papers (in active rather than historical archive), Paper No. 61.

second major change to its trialling methods, regarding trial size. Since the adoption of randomized blocks, the standard size of a full trial plot was $1/48^{\text{th}}$ of an acre, from a strip 9 feet wide and 65 yards long, repeated eight times for each variety at each trial centre. A trial of six varieties, including a control, would therefore consume around 2 acres at each centre. In 1953 it was agreed to drastically reduce the size of these plots in the first year, which became known as Stage 1. 'Smaller trials', which had been used in the past simply as a transition phase from observation plots to full scale trials (helping to also multiply the seed necessary for eventual full trials) would now be used for all varieties, provided a breeder supplied enough seed. These would be conducted at only four centres; Cambridge, Boghall, Cannington and Sprowston. (See Chapter 4 Figure 4.2 for a map of NIAB's trial centres in 1955). The plot size for these smaller trials was only $1/96^{\text{th}}$ of an acre. Varieties that proved very worthy would then pass on to Stage 2, while those that performed very poorly would be dropped. Stage 2 trials took place at between 12 to 14 of the different regional centres across England and Scotland. These trials would last for a minimum of two years, and would retain the original plot size of $1/48^{\text{th}}$ of an acre. Again therefore, these decisions do not appear to favour either breeders or farmers unfairly. Instead NIAB adopts the first regulatory strategy described earlier; pursuing an increase in the amount of land under its control, and in the number of its trialling centres, to ensure that its larger trials continued at the same level of rigour as before. This precedent shall be borne in mind as NIAB's trialling methods continue to change over time.

There was a third and final major change in the Institute's trialling methods adopted prior to the Joint Review Group Report in 1955. This change unambiguously affected the value of the trials both for plant breeders and farmers. In March 1954 Mr R.A. Hamilton of Imperial Chemical Industries (ICI) came to NIAB to report on a recent visit he had made to Sweden.²³ The research that he was reporting on was aimed at uncovering the effect of increased nitrogen application on wheat, and its consequences for the remarkably persistent problem of 'strength'. Within a few months of this visit, CTAC came to propose a substantial change in NIAB's trialling methods. Rather than attempt to replicate the farming methods found in each region where a trialling centre was located (as had been the practice up to that point) CTAC recommended that all cereal trials should be made at three levels of nitrogen application; no nitrogen; the maximum amount of nitrogen that could be tolerated without causing the crop to

²³ NIAB, Cereal Trials Advisory Committee Minutes (in active rather than historical archive), Meeting 19/3/1954.

lodge; and one final application that was half of this maximum amount. The aim was to measure differential levels of nitrogen response between varieties, ultimately to help establish maximal possible levels of nitrogen use and crop output.²⁴ For an organisation supposedly dedicated to the trialling of plant varieties, this decision was exceptionally odd. Such was the strangeness of this proposal, that when the PBI's G.D.H. Bell was given an opportunity to comment on it he remarked that "he could not help wondering whether the Institute was considering husbandry trials rather than variety trials."²⁵ Nevertheless, these proposals were officially accepted and implemented before the end of 1955.²⁶ The decision obviously becomes less strange in the era of productivism. It is quite clear that NIAB's intention was to promote a rapid expansion of nitrogen use amongst farmers, one which numerous historians have documented did indeed take place. The argument of the thesis is not that the Institute was directly responsible for the redirection of farmers toward a greater use of nitrogen. After all, NIAB is also responding to calls from elsewhere. NIAB's activities in this instance are significant for a more important reason. While the environmental damage caused by excessive nitrogen use in agriculture has made the practice controversial in recent decades (leading to the creation of legal caps on the amount that a farmer might apply per acre), the extent to which nationally funded scientific institutions promoted these changes has yet to be explored. The effect of NIAB's decision on the varietal market is likely to have been important, as breeders were now materially led in the direction of stiffer straw and ultimately those celebrated (or damned) dwarf varieties of wheat, provided they wished their varieties to excel in the Recommended List trials. There is perhaps no clearer evidence of the role played by agricultural scientists in the rapid expansion of nitrogen use in the UK than NIAB's decision to skew its own trials in order to emphasise the effects of maximal N. Skew is no exaggeration, as when the results of these trials came to be published, the average result of all three levels of nitrogen application for each variety would be given, rather than the results at each level. The clear lines of influence found between ICI, CTAC's recommendations, and characters such as William Gavin, help us to appreciate precisely how closely entwined were nationally funded institutions such as NIAB and private agri-business interests. How trials for the

²⁴ NIAB, Cereal Trials Advisory Committee Papers (in active rather than historical archive), Paper No. 45 dated 23/6/1954.

²⁵ NIAB, C-4, 148th Council Meeting, 15/7/1954.

²⁶ NIAB, Cereal Trials Advisory Committee Minutes (in active rather than historical archive), 21st Meeting, 1/12/1955.



Figure 5.3: NIAB Fellows Day 1956. These sorts of plots became the primary way in which farmers and traders came to interact with novel varieties, rather than seeing their demonstration on a field scale. Image held by NIAB archive.

Recommended List have changed since, and whether or not they have retained NIAB's bias towards maximal N, is a question for future research.

The adoption of three levels of nitrogen application also allows us to continue the story begun in Chapter 2. There we saw that the RCT was initially rejected at NIAB because it might undermine the value of its trials as demonstrations of varietal activity for farmers. Farmers could best appreciate the properties of a variety if it was grown alongside a more familiar existing variety (as was the case with Beaven's half-drill strip), and over a large area. Over time, and particularly after the adoption of the RCT at NIAB, the value of trials as points of demonstration was increasingly eroded. This process took place over many decades, and was by no means completed by the adoption of the RCT. In the name of more efficient, or more comprehensive, or cheaper trials, NIAB increasingly marginalised the demonstration aspects of its trialling system. Farmers and seed traders, who had once looked upon the factory floor of varietal breeding and development, now looked upon shop windows (Figure 5.3). Evidence of this process only emerges at a few points within the archive, but is nevertheless convincing. For instance, during a meeting of the Council in January 1953, Mr Edward Cave, a well-respected Norfolk farmer (who had served on the Council since 1947 and who became the first Co-optive member under the 1955 Trust Deed²⁷) suggested that "the Institute's

²⁷ Cave, who had also been Chairman of the Potato Trials & Advisory Committee and Chairman of the NIAB Council in 1960, while also serving on the Potato Marketing Board, died in October 1963. NIAB, C-8.60, Forty-fourth Report and Accounts, 1963.

trials should be so designed that one variety should serve as a common denominator in relation to all the varieties undergoing trial, which had undergone trial in the past or would undergo trial in future.”²⁸ It is important to admit that Cave is likely not thinking of the *demonstration* value of such a common denominator. He is most likely instead arguing for the adoption of one single control, the results of which can be used by farmers on an annual basis to assess varieties ‘as published’ rather than ‘as grown’ in the field. In response one should say firstly that incorporating such a common denominator might perhaps also have given farmers some sort of helpful reference point in the field, though there is no evidence to support this interpretation of Cave’s motivations. Much more importantly and concretely, he is arguing for the adoption of a procedure that would protect *farmer* judgement (whether or not this judgement takes place while reading a NIAB publication or gazing upon a NIAB field). The common denominator proposed by Cave is valuable because it is a tool for judgement; the fewer such tools found in any publication, the more marginalised is the judgement of the intended audience. Much more direct evidence of the efforts by some farming members on NIAB’s Council to protect the demonstration value of its trials is provided by Mr Frank Rayns, longstanding Director of Norfolk Agricultural Experimental Station, CTAC member and the second new Co-optative member invited to join the Council after Cave. Early in the 1950s he asked CTAC how they planned on dealing with the ever expanding number of varieties submitted for trialling. Without increasing the acreage over which trials could be conducted he could not see how the Institute could continue to cope. More importantly, constantly increasing the number of varieties entered to trial, meant reducing the acreage allocated to each, with a detrimental impact for demonstration. “Mr Rayns asked whether it was likely that the present number of trials would be continued in the future. From the point of view of demonstration he thought that they were overloaded.”²⁹ Demonstration would be all the more greatly undermined with the arrival of NIAB’s new nitrogen priorities, argued Rayns:

if the Institute found itself committed to “confounded” lay-outs it would also find that it was necessary to consider very carefully the difficulties of demonstrating such lay-outs in the field. He regretted the general tendency to

²⁸ NIAB, C-4, 142nd Council Meeting, 23/1/1953.

²⁹ NIAB, Cereal Trials Advisory Committee Minutes (in active rather than historical archive), 8th Meeting, 5/6/1951.

make trials more complicated. It might suit the Statistician, but the trials had other purposes to fulfil.³⁰

These other purposes – demonstrating the value of certain varieties in the field – would be increasingly undermined, he feared, if a three level nitrogen application in all cereal trials was adopted. Once again, the reasoning behind those who proposed these changes was ostensibly statistical, though, as explained in Chapter 2, such reasoning is itself attractive as it helps to increase the prestige of statistical researchers to the exclusion of other experts, in a way that is seemingly without bias.

Regarding the design of the trials Mr. Thompson stated that it was a matter on which Rothamsted had offered assistance. Where only four varieties were concerned the trial would still be conducted in the form of randomized blocks, but where there were six varieties the trial would “confound” varieties and treatments of nitrogen. For more than six varieties a “split plot” arrangement would be most convenient.³¹

Ever in pursuit of more statistically sophisticated trials (regardless of the values attributed to these trials by external actors) Rothamsted advocated the use of the split-plot, the ‘confounded’ arrangements regretted by Rayns. In a split plot design it is virtually impossible to demonstrate the qualities of varieties to farmers in the field, as the block containing each variety is itself highly variable. One is viewing not only the performance of a variety, but also its response to various treatments, ‘confounding’ the two results. That 1/48th of an acre devoted to each variety is actually constituted by three lots of 1/144th of an acre for each treatment. This meant that any visiting farmer to the field would be viewing a smaller area of the ‘natural’ state of that variety than if they had visited NIAB’s self-styled ‘small-trials’ which, as was explained earlier, occupied only 1/96th an acre. If the RCT was a leap away from the easy field comparison a farmer might make under Beaven’s half-drill strip, the split plot eroded the capacity for field judgements even further, perhaps to nothingness. With an increase in the statistical sophistication of trials, the point at which one can legitimately pass judgement over the performance of a variety is further and further removed from the field and instead situated almost entirely within the offices of statisticians.

³⁰ NIAB, Cereal Trials Advisory Committee Minutes (in active rather than historical archive), 17th Meeting, 23/6/1954. In a letter to the Director that Rayns wrote around the same time (and which was reported on in the same CTAC minutes) he stated that “Personally he would deplore any incursion into existing arrangements which might tend to reduce the interest in the trials by visitors to the Station.”

³¹ NIAB, Cereal Trials Advisory Committee Minutes (in active rather than historical archive), 17th Meeting, 23/6/1954.

Finally, while field trialling, plant identification, and national status have been important throughout this Section, multiplication has hardly featured at all, though NIAB did continue to develop this aspect of its work. The most significant change was that in 1954 the Institute became the official multiplier and distributor of all Welsh Plant Breeding Station (WPBS) varieties, fulfilling the fears of their Welsh colleagues seen in Chapter 4. However, it appears as though this development came with the latter's blessing, due to changes in ARC funding policy that emphasised the extent to which stations such as the WPBS needed to concentrate on research rather than commercial work. The significance of NIAB's status as multiplier will become increasingly important as this Chapter develops.

Section III: The Joint Review Group Report, 1955

MAFF's Visiting Group inspected NIAB between the 6th and 8th of February. 'Food' was added to the Ministries purview in 1955 so throughout the rest of this Chapter the acronym MAFF will be used. Their report was published in April the following year.³² The report was largely positive, and focussed mainly on detailing the activities of the various branches and their staff. They did however make two significant recommendations. Firstly, that NIAB should be more assiduous in its selection of varieties for trialling. "The Group feel bound to express some concern at the large number of varieties coming forward for test, particularly from private breeders and especially those abroad." Between 1953 and 1955 NIAB had tested 225 different cereal varieties, 240 roots, 39 rapes and kales, 58 herbage crops, 173 'miscellaneous crops' (linseed oil, maize, etc.) and 133 vegetables. 101 of this total of 868 varieties had come from state funded UK breeders, 340 from UK private breeders, 423 coming from breeders abroad. (Here is therefore further evidence undermining the economic and innovation case for PBRs). No concrete solutions to this problem were offered, though it was heavily emphasised that the UK should be responsible for a greater proportion of the varieties actually tested by NIAB, or to put it in the terms of the Visiting Group "the Group hope that every effort will be made, difficult though it may be, to evolve a policy of very strict selection of material so as to eliminate, even from preliminary trials, all varieties which are likely to be of very little economic value in this country." The second significant recommendation was that NIAB pool all of its seed multiplication responsibilities – which had expanded considerably following the incorporation of

³² NIAB, K-21.63, National Institute of Agricultural Botany (Report of a Visiting Group), April 1956.

Year	Acreage Inspected	Acreage Passed
1954	86, 000	-
1955	89, 500	-
1956	90, 000	-
1957	96, 363	-
1958	129, 203	-
1959	141, 869	-
1960	162, 698	-
1961	191, 290	-
1962	196, 419	-
1963	191, 556	-
1964	-	-
1965	-	112, 871
1966	-	160, 754
1967	229, 800	183, 763
1968	226, 444	179, 611

Table 5.1: Total acreages for the Cereal Field Approval Scheme, compiled from NIAB's published annual reports.

WPBS varieties – into one section of the Institute. Up to this point cereal seed multiplication had been carried out under the Crop Improvement Branch, while the Aberystwyth varieties were the responsibility of Seed Production Branch (responsible for NIAB's seed certification and field inspection schemes). The Visiting Group's recommendation that all the seed multiplying and selling work of NIAB be brought under a new 'Seed Multiplication Branch', which NIAB established in 1956, would have important future consequences. Aside from these two recommendations, the Visiting Group also observed that the Cereals Field Approval Scheme (the certification process that we saw established in Chapter 4), had continued to expand, as had the number of trained field inspectors. Of particular interest is their observation that the 89, 500 acres inspected in 1955 would provide enough seed for approximately 10% of the cereal acreage of the country. This is an important claim as it allows a rare point of direct comparison for the argument made about the importance of NIAB's seed multiplication work during Chapter 4.

The expansion of the certification Cereal Field Approval Scheme is recorded in Table 5.1. 1955 saw further developments in this direction. While the Cereal Field Approval Scheme was meant to be an improvement on NIAB's seed sacks, (ensuring the purity and trueness-to-type of seeds by following them from the field to the seed house), the *Comprehensive* Certification Scheme begun in 1955 was meant to improve even upon that. In the existing Approval scheme, field inspectors from across the NAAS and the employees of private breeders or regional representatives, were trained in

inspection by NIAB. All such inspectors then contributed to the scheme, carrying out inspection according to the terms of their employment. However, this obviously left room for questions about the skill and consistency of effort to be found amongst all field inspectors, especially when one considers the area of land that was being inspected on an annual basis by the late 1950s was well over 100, 000 acres. The Comprehensive Scheme ran at a smaller scale and, without casting aspersions on the skills of inspectors elsewhere, was overseen entirely by NIAB employees. The aim in the Comprehensive Scheme was to produce what might be considered ‘gold standard’ seed stocks, available in good quantities for specialist growers, researchers, and plant breeders. The term NIAB adopted to refer to such stocks was ‘Foundation Seed’. It is important to appreciate the significance of both of these schemes for the history of the plant breeding industry. All those who purchased seed through NIAB from its multiplication work were expected to enrol these seeds in a Field Approval scheme for multiplication (if they wished to remain on good terms with the Institute that is). It continued to be the case that only varieties that had been entered into NIAB’s Recommended Lists would be eligible for inclusion in either the Field Approval or Comprehensive Certification programmes, while only stocks of those varieties which had been submitted by the *original breeder* could enter the process at all. The Institute’s system therefore traced seeds from their original breeders, through multiplication, and subsequently out into distribution (where they are lost from view and can be grown and multiplied by anyone who can get hold of them). Seed from unauthorised growers could not be entered into the system at all, while one breeder could not enter Foundation Seed of a variety produced by another breeder. This was therefore a system organised according to the logic of the ‘dehistoricized gene’ at a time when the plant breeding industry at large had yet to embrace such a notion.³³ Field Approval schemes acted as proof of concept for what the plant breeding industry might look like, if plant identities were owned by their originators, by achieving the kind of control of varieties that would be required should a system of plant breeders’ rights ever be introduced. Just as importantly, they also accustomed the agricultural industry to this new perspective on plant varieties and their ‘proper’ management. There appears to have been a growing consensus on this view and the need for PBRs at this time, as evidenced by NIAB’s dealings with trade and industry representatives.

³³ See Berry (in press 2014).

In early 1957 the National Association of Corn and Agricultural Merchants (NACAM) wrote to NIAB explaining that they wished to establish a voluntary breeders' royalties scheme all of their own, to begin in 1958. It was to build upon the Field Approval Scheme precisely as described, by asking distributors of seed from the Field Approval Scheme to charge a premium at the point of each sale, which would then go to the breeder of the variety in question. While they wished to now press ahead, they needed NIAB as a collaborator, as the Institute held all the information on growers and their acreages under the Field Approval Scheme. The minutes of this Council meeting record a brief discussion, which was largely positive.

The Chairman pointed out that as the N.A.C.A.M. scheme was a voluntary scheme which it was suggested should be linked with the Cereal Field Approval Schemes, it must of necessity be restricted to Cereals. It was hoped however that it would serve to encourage the establishment of similar schemes, and indeed might well set a pattern which could be followed in due course by other schemes.³⁴

Nevertheless, NIAB decided to err on the side of caution, lest support for this scheme scotch any potential for more stringent legislation. "The acceptance of a voluntary scheme such as the one suggested by N.A.C.A.M. might have the unfortunate effect of prejudicing any compulsory scheme which might follow". The Council therefore preferred to delay in order to allow the CTS to complete its report. NACAM however had other ideas. In order to build a stronger case, the Association wrote to the 179 seed traders responsible for handling the seed produced through the Field Approval scheme, canvassing their views on the payment of royalties to the breeders concerned; "about 74% approved the plan to remunerate plant breeders under a voluntary scheme, 9% opposed the plan, and 17% either abstained from comment or did not reply."³⁵ These results were reported to NIAB's Council in October that year, though caution prevailed. While the issue was still being discussed by the special sub-committee of the CTS, NIAB's Council chose to hold back from supporting NACAM, though with some regret. "Mr. [L.E.] Cook said it was unfortunate that whilst the Institute supported in principle the idea of paying royalties to breeders, yet at the present juncture it was impossible to put the idea into practice."³⁶ Pressure had also been building from elsewhere.

Some breeders had begun to take matters into their own hands by registering a trademark over their varieties. For instance in 1955 Weibull of Sweden trademarked

³⁴ NIAB, C-4, 15th Council meeting, 18/1/1957.

³⁵ NIAB, C-4, 161st Council meeting, 25/10/1957.

³⁶ NIAB, C-4, 161st Council meeting, 25/10/1957.

their variety 'Svenno'. This kind of activity caused concern at NIAB, as while the trademark might be sufficiently robust to prevent other breeders from using that name, there remained no legal bar from the sale of prized seeds under a different name. NIAB's Council therefore feared that because "at the present time, it was not illegal to sell such goods under other names" that "trade marks might therefore lead to an increase in synonyms."³⁷ Throughout 1956 and 1957 the Institute also received a number of letters from official bodies and interested plant breeders either lobbying for the introduction of some form of royalties payment on new varieties or establishing more stringent protocols for the protection of varietal identity. With regard to the former, the firm of Nickersons was amongst the most vocal. Joseph Nickersons' biography goes as far as to claim that he practically forced through the introduction of PBRs singlehandedly, including reference to a ten day open house that he organised at the Dorchester Hotel (London) and to which he invited any Members of Parliament, or others concerned with breeders' rights, to discuss the issue.³⁸ The firm was certainly active. Nickersons submitted a report on royalty payments to NIAB in April 1957, which again the Institute read in sympathy. It was at the same meeting of NIAB's Council in which they considered this report that they also decided to agree to write to the CTS, formally pledging their support to the idea of paying royalties to plant breeders.³⁹ However, Nickerson clearly should not be allowed to take all the credit for this proactive step. By this point even the National Farmers' Union had approached NIAB in sympathy with the idea.⁴⁰ This much consensus on an issue is troubling, particularly for a thesis that has thrived on dispute. It would be worth uncovering precisely where resistance lay, particularly within an organisation such as the NFU, which apparently was able to speak forcefully and with a united voice on an issue that nevertheless *must* have divided farming opinion. As far as this thesis can prove, it appears as though in the post-war context, some changed sense of fairness for plant breeders overtook the practical difficulties and biological signals of resistance exhibited by plants (which we saw in Chapter 3 and will return with force in Section IV) that had otherwise been sufficient to forestall legislative action up to this point. Practical difficulties were certainly being overcome more systematically in the years immediately before the creation of PBRs, as we saw with NIAB's Field Approval scheme. Further examples

³⁷ NIAB, C-4, 151st Council meeting, 29/4/1955.

³⁸ Whitlock (1987) pp. 104-109.

³⁹ NIAB, C-4, 159th Council meeting, 26/4/1957.

⁴⁰ NIAB, E-5.9, 120th Executive Committee Meeting, 7/2/1957.

would include the formation of the International Commission for the Nomenclature of Cultivated Plants, to which NIAB's Director, Frank Horne, was appointed in 1956. This body was responsible for the maintenance and updating of the *International Code of Nomenclature for Cultivated Plants* first published in 1953.⁴¹ Promoting greater uniformity in the language used by official stations and private breeders throughout the world, rationalising (and restricting) the way in which people regarded seeds and plants, helped to further prepare the ground for intellectual property legislation, especially as many countries had already taken that decision by this time. Greater uniformity in varietal identification was also promoted in 1959 by the creation of an official registration processes for plants in England and Wales, to which varieties could be submitted on a voluntary basis. This index had been recommended by the CTS in its first report, published in 1957.⁴² Such a recommendation gave a clear indication as to what its future conclusions about Plant Breeders' Rights might be. A draft of the CTS report on Plant Breeders' Rights was sent to NIAB in early 1960. MAFF sought the views of the Institute, especially as the report emphasised the extent to which existing trialling infrastructure would have to be used in the prosecution of any future legislation. NIAB's reply emphasised its agreement with the need to foster "greater output of improved varieties of British origin" including the "great importance...of the work of the grant-aided plant breeding stations."⁴³ It should not be forgotten of course that NIAB itself had a financial interest in these decisions, acting as it did as sales representative for PBI, HRS, WPBS, the National Vegetable Research Station (NVRS) and, by 1961, also the herbage varieties of the Scottish Society for Research in Plant Breeding. Throughout the 1950s NIAB looked to increase the amount of land under its possession and increase its granary facilities. A further addition to the granary was made in 1955, with an authorised expenditure of £14, 734, followed by a second instalment for the same a year later with a grant of £23, 024.⁴⁴ This kind of activity was both rational and irrational. In looking to expand its multiplication programme NIAB was acting as any rational agent would on behalf of its clients. The Institute was already producing much less seed than it felt it could comfortably sell, and with the promise of PBR's on the horizon, now was obviously the right time to expand. An internal report

⁴¹ Stearn (1952), Trehane (2004).

⁴² *Report of the Committee on Transactions in Seeds P.P.*, (1957-58), Cmnd. 300, (321-448) paragraphs 137-144.

⁴³ NIAB, C-2, Council Paper No. 452, Draft reply to Mr. R.J.E. Taylor's letter (M.A.F. & F.) of 19th August 1960. NIAB, E-5.9, 129th Executive Committee Meeting, 20/11/1958.

⁴⁴ NIAB, C-4, 156th Council meeting, 12/7/1956. For the first and second instalments see NIAB, C-8.60, 36th Report and Accounts, 1955 and 37th Report and Accounts 1956.



Figure 5.4: NIAB headquarters following the completion of its expansion in the late 1950s. Image held by NIAB archive.

Table 5.2: MAFF authorised expenditure for NIAB and OSTs as recorded in the Institute's published annual reports.

Year	NIAB (£)	Contingencies (£)	OSTS (£)	Total (£)
1954	83, 783	-	20, 984	104, 767
1955	107, 268	-	25, 898	133, 166
1956	127, 083	-	25, 898	152, 981
1957	212, 456	-	17, 330	229, 786
1958	182, 339	-	22, 179	204, 518
1959	214, 787	-	25, 624	240, 411
1960	230, 642	-	33, 485	264, 127
1961	188, 207	-	42, 434	230, 641
1962	277, 524	-	47, 000	324, 524
1963	307, 202	-	33, 620	340, 822
1964	294, 174	-	39, 552	333, 726
1965	302, 136	-	41, 981	344, 117
1966	289, 630	-	51, 447	341, 077
1967	215, 370	35, 000	50, 135	300, 505
1968	215, 088	33, 504	52, 408	301, 000
1969	266, 676	23, 700	57, 624	348, 000
1970	233, 920	27, 920	69, 356	331, 196

reviewing NIAB's distribution practices, written at some time around 1959, emphasised the extent to which in the past "The quantity of seed available when a new variety is publicised and issued for the first time has been inadequate."⁴⁵ It therefore recommended that "The Institute would issue seed of cereal varieties bred by the Official Institutes only to trader Fellows of the Institute who were satisfactorily participating in the Field Approval Scheme in England and Wales, or an appropriate official scheme elsewhere." This would end the practice of allowing all Fellows, not just traders, to apply for small quantities of seed, while ensuring virtually the entire stocks of a new variety would be multiplied under NIAB approved conditions. On the other hand this kind of activity might also be considered irrational, as many came to believe that the eventual implementation of PBRs would be incompatible with the functions of an institution such as NIAB, responsible for determining plant identity and conducting field trials. In supporting PBRs many have believed therefore that NIAB was actually undermining its own commercial capacities. This issue will be discussed more fully in Sections IV and V.

Finally, and as we saw at the end of Chapter 4, NIAB's wartime efforts were rewarded by a grant of over £150, 000 for an expansion of its headquarters. This building was eventually completed by 1960, with the OSTs able to move into their new

⁴⁵ NIAB, C-2, Council Paper No. 429, Distribution of Seed of Cereal Varieties.

offices in April 1959, (see Figure 5.4). The Institute found itself in a more secure and comfortable situation than it perhaps ever had, particularly when one considers the massive growth in its Ministerial grant (see Table 5.2 for details). Excellent evidence of this is provided in 1959, when NIAB is somewhat surprised at MAFF's decision to claw back £131, 000 that the Institute had accrued in surplus funding built up from its block grants over the previous four years. "It was apparently the view of the Ministry that so long as the annual grant was provided which met the Institute's estimated requirements, there was no necessity or justification for the retention of a large surplus which had been accumulated from grants provided by the Ministry in previous years."⁴⁶ This sense of security would begin to dramatically decline following the report of the 1961 Visiting Group.

Section IV: The Joint Review Group Report, 1961

Britain's changed scientific and political conditions were reflected in the 1961 report. Despite ARC takeover of agricultural science funding, NIAB was seemingly not deemed scientific enough to warrant the Council's full attention. Responsibility for NIAB remained with MAFF, which now began to attempt to consolidate control over the Institute. The report's general introduction explained that "the Department's policy in several fields recently has been to encourage the industry to assume responsibility for testing of the products that the farmer uses or produces."⁴⁷ They recommended that NIAB begin paying much more attention to the cost of its work and concentrate on "the recovery of the cost wherever practicable from those who benefit from the work." The Visiting Group therefore wished to see the Institute implement a full costings analysis, to attain what each element of its programme actually cost to complete, what amount of each part of this work was currently being fully paid for by the tax-payer, and what amount was currently being recovered by the beneficiaries of NIAB's services (breeders, traders and farmers). "A body as dependent on exchequer grants as the Institute is today is inevitably in a vulnerable position, and it will be definitely in the Institute's own interests for it to decrease its dependence on the taxpayer by increasing its income from other sources." It is at this point that the question of NIAB's proper relationship with the Ministry enters the report, though the authors attempted to emphasise their confidence that "the requirements of proper administration and sound

⁴⁶ NIAB, E-5.9, 136th Executive Committee Meeting, 30/12/1959.

⁴⁷ NIAB, C-6.43, Report of the 1961 Visiting Group.

financial control over the use of the taxpayer's money can be met under the present constitutional arrangement." While the report made no material suggestions for the immediate increase of Ministerial control over the Institute, the heavy emphasis placed on the Ministry having to be satisfied that the work that it sponsors is justifiable, gave NIAB's Council cause for concern. A Council paper drafted shortly after receipt of the report stated that they "consider it essential to preserve the independence of the Institute in order to ensure the integrity of its recommendations and advice."⁴⁸ Over time, Ministry pressure on NIAB increased, while the Institute was expected to generate an ever larger proportion of its own funds. In January 1962 MAFF wrote to NIAB asking that they make a saving of £20,000 for the coming financial year, to reduce the size of the annual grant.⁴⁹ The following year MAFF wrote again, to warn NIAB that the grant for 1963/64 was going to remain at the 1962 level, meaning that any money required for scheduled salary increases was going to have to come from the Institute's block grant (essentially reducing the Institute's programme of work unless other financial sources could be found.)⁵⁰

In such straitened times NIAB's largest expense, its trialling programme, was the first to suffer. Between 1960 and 1964 the Institute discussed and agreed a further change in its trialling procedure, though this time no amount of increased expenditure could be tolerated, meaning that levels of rigour (though not from the strictly statistical perspective) had to be dropped. At the same time as this funding squeeze began, it should not be forgotten that pressure continued to mount on the Institute's resources thanks to the growth in the number of varieties submitted for trial in the years building towards the introduction of PBRs. NIAB needed to reduce the amount of labour involved in trialling and the acreage required for each trial. "This is necessary because the range of crops, on which performance trials are made, has doubled in the last 15 years and in most crops there is a steady increase in the number of varieties coming forward for trial each year."⁵¹ The Institute enlisted the help of Dr. Boyd of Rothamsted, who considered the number of replications necessary to ensure a statistically sound trial. He recommended that they be reduced from 6 to 4 for each variety. Relaxing the acreage required for each trial would allow each variety to experience a greater

⁴⁸ NIAB, C-2, Draft Council Paper 'Preliminary observations on the Report of the 1961 Visiting Group', around Paper nos. 464-475.

⁴⁹ NIAB, E-5.9, 153RD Executive Committee Meeting, 11/1/1962.

⁵⁰ NIAB, E-5.9, 168th Executive Committee Meeting, 12/12/1963.

⁵¹ NIAB, Research Advisory Committee Minutes (in active rather than historical archive), 11th Meeting, 14/10/1964.

number of conditions, as more varieties could now be squeezed into each trialling centre. While these changes would decrease the accuracy for each individual trial of a variety, and make it more difficult to detect when a variety had a particular strength in a given region, NIAB took comfort from the fact that “the final [national] average will be no less accurate and, in fact, more soundly based since it derives from more trials more evenly distributed between years.”⁵² It is questionable to what extent farmers – who grow crops in their own fields and not on a national average farm – appreciated this distribution. Following the introduction of PBRs, NIAB’s trialling and recommendation procedures (alongside their multiplication work) would become all the more significant.

Aside from finance, the second problematic opinion expressed in the 1961 Joint Review Group Report focussed on NIAB’s status as seed multiplier and plant identifier. The 1961 Report stated that as “The Institute is not primarily a trading concern” the Visiting Group “were doubtful whether it was right for it to be required to take the commercial risks inherent in the carrying of large quantities of stock seed.”⁵³ For the time being the functions of multiplying and selling seed produced by the Official plant breeding stations was to remain with NIAB, but the 1961 report put the question of multiplication – examined in Chapters 1 and 4 – firmly back into view. In the foreground to the Joint Review Group’s opinion obviously stood the issue of PBRs, and therefore NIAB’s status as plant identifier. The CTS report dedicated to Plant Breeders’ Rights had been published in 1960.⁵⁴ This started the process of legislating for intellectual property rights over plants, which required no small amount of input from NIAB (see Section IV), and which were eventually put in place exceptionally quickly, passing into law in 1964.⁵⁵ NIAB now looked to secure its role within this legislation, which had always been implied in MAFF correspondence up to this point but had yet to be finalised. The sub-committee that NIAB established to discuss the CTS publication, reported their findings to Council that October. Mr. Herbert Lea, Council representative for NACAM, and Mr. T. Duke, elected to the Council by NIAB’s Fellows, made key contributions to the discussion.

The Committee felt that the expansion of Official Plant Breeding Institutes almost inevitably meant that a considerable part of the income derived from

⁵² NIAB, Cereal Trials Advisory Committee Papers (in active rather than historical archive), Paper No. 91.

⁵³ NIAB, C-6.43, Report of the 1961 Visiting Group.

⁵⁴ *Plant breeders’ rights: Report of the Committee on Transactions in Seeds* P.P., (1959-60), Cmnd. 1092, (467-587).

⁵⁵ For a fuller account of the legislative process and results see Rangnekar (2000).

Plant Breeders' Rights would gravitate to those stations and would in consequence be taken by the Agricultural Research Council in reduction of their grant requirement. Mr. Lea expressed the hope that nothing would be done as a result of the report of the Committee on Transactions in Seeds which would detract from the present value of the Institute's recommended lists. Mr. Duke thought that this was the crux of the matter. For 40 years the Institute had been undertaking trials of new varieties, and he thought that Council should come out quite clearly with a definite statement to the effect that it thought it should be the body responsible for trials.⁵⁶

NIAB's programme of work was therefore initially threatened by the arrival of PBRs in three key ways. Firstly, it interacted with the problems of NIAB's finances and trialling programme, as discussed earlier in this Section. If NIAB was now expected to increasingly pay its own way, then expanding its multiplication work – eminently profitable even if conducted at the less than satisfactory scale so far pursued by the Institute – was the most sensible course of action. Indeed in 1960, precisely as financial times were becoming tighter, the Institute was granted £8, 000 by MAFF (with an additional £4000 coming from NIAB's own funds) to purchase more land at its headquarters trial grounds, helping to relieve its multiplication centre – Hill Farm – of the additional trialling work it had been undertaking in recent years.⁵⁷ In addition, in 1962 MAFF authorised a £39, 500 grant “for extending the storage capacity and processing machinery of the cereal granary.”⁵⁸ Moreover, with regard to finance and trialling, we can see that at precisely the same time as NIAB was having to reduce the size of its trialling programme in order to save money, the Institute was also expected to increase its multiplication work, in order to make money. Here the demands of multiplication and trialling can be seen to interact quite directly. The second way that Plant Breeders' Rights seemed to threaten NIAB's programme of work is intimated by Mr. Duke in the above quote. The fear was that if a new statutory authority was to be created (the Plant Variety Rights Office suggested by the CTS) then its trialling programme for assessing a varieties suitability for PBRs might undermine and compete with NIAB's, while the granting of rights over a variety might come to undermine the badge of excellence once leant to a variety by its being in the RL.⁵⁹ In helping to implement this legislation over the coming years, NIAB would to some extent further increase (and decrease) its independent status, by building itself into statutory

⁵⁶ NIAB, C-4, 173rd Council meeting, 27/10/1960.

⁵⁷ NIAB, C-8.60, 41st Report and Accounts, 1960.

⁵⁸ NIAB, C-2, Council Paper No. 478, Director's Quarterly Report April to June 1962.

⁵⁹ NIAB, Cereal Trials Advisory Committee Papers (in active rather than historical archive), Paper No. 81.

requirements. The third threat to NIAB's programme of work presented by PBRs returns us to the opinion of the 1961 Joint Review Group, that NIAB might not be the most suitable organ for multiplying and selling seed of nationally funded varieties. This third problem and its proposed solutions will be considered in Section V.

Before moving beyond the introduction of PBRs, it is important to consider how we shift from the world outlined in Chapter 3, to a world of legally protected varietal identities. There is not room in this Chapter to be comprehensive, and indeed a recent publication highlights a number of possible changes that occurred in the middle of the twentieth century, including changes in genetics pedagogy, changes in the recruitment practices of plant breeding firms, a contraction of the number of independent plant breeding firms and even the modern synthesis in biology, all of which potentially contributed.⁶⁰ Chapter 3 of this thesis however made some very particular claims about NIAB and its difficulties in policing synonyms. The world of variable, ever changing varieties (which by their biological nature allowed room for claims as to skill in varietal stewardship and thus claims to distinctness) described in that Chapter did not simply evaporate over time as breeding got more 'scientific'. As late as 1956 NIAB's head of the newly formed Seed Multiplication Branch, A. F. Kelly, would investigate the amount of variation demonstrated by varieties in the field and the extent to which this undermined their stability (and therefore identity). The variety chosen in his investigations was Yeoman, a significant choice in light of the material covered in Chapters 1, 2 and 3. He found that it was not possible to dismiss all off-types or rogue elements as being either due to admixture with foreign seed or even cross-pollination. As he then wrote:

The practical implication of this observation is that any wheat variety should not be regarded as homogenous, but rather as a population within which minor variants may be expected to occur. The breeder, or his agent responsible for the production of original seed, must ensure that seed of reasonably high genetic purity is available, but minor variations in type must be expected even at this level.⁶¹

⁶⁰ Berry (in press 2014). On genetics pedagogy see Skopek (2008) and (2011), in which – amongst other things – he shows that genetics pedagogy went through many significant changes, including a creeping marginalization of laboratory based teaching in favour of text-book exercises that constituted a 'virtual historical environment'. By the 1940s "Textbooks had replaced fly rooms and crop fields." (2008) p. 102. Importantly, genetics had also grown sufficiently independent from botany by this time.

⁶¹ Kelly (1956) p. 484.

When PBRs were introduced in 1964, Kelly became the head of NIAB's Systematic Botany Branch, established that same year to determine the Distinctness, Uniformity and Stability of plants on behalf of the Plant Variety Rights Office. The perspective on plant breeding found in Chapter 3, and shown to have persisted in the post-war world by Kelly's quotation above, had to be systematically, bureaucratically and legislatively eliminated were PBRs to function as intended. This can be demonstrated most persuasively by introducing one last wheat variety to this thesis; Rothwell Perdix.

Rothwell Perdix was a new variety brought for trial at NIAB in the early 1960s by the firm of Nickersons. It was a trouble maker. "The Director explained that this variety, formerly known as Heines 653, had been selected on an unusually broad basis which resulted in a certain range of types. If it was accepted that plant breeding is moving into a new phase, then Rothwell Perdix might be the first of many varieties so bred."⁶² The biography of Nickersons makes no mention of a new breeding method in relation to Rothwell Perdix, other than hybridisation, so it seems most likely that the Director Frank Horne was thinking of the status of such a variety as being deliberately variable in this 'new phase' of plant breeding. This is precisely what G.D.H. Bell subsequently focussed on.

Dr. Bell thought that if Rothwell Perdix was accepted for inclusion in the Recommended List it would introduce a new concept into the Inspection Schemes. It was impossible to define this variety by one set of characters, but only by the characters of its component lines. It was, therefore, a variety which is a population of different forms of true ['true' deleted in pencil and replaced with 'in'] breeding lines. He did not know how this variety would be dealt with in relation to plant breeders' rights.⁶³

The variety was causing the Council trouble, as it had now completed its three years of trialling at NIAB and, having performed exceedingly well, CTAC had recommended it for inclusion in the RL. MAFF representative L.J. Smith pointed out that "the Recommended List would not be of much value if varieties of equivalent value to Rothwell Perdix were excluded." Following further discussion it was indeed agreed to include the highly variable variety Rothwell Perdix in the RL. The new generation of agricultural and genetical Professors now hove into view. Professor T.L. Bywater, Professor of Agriculture at the University of Leeds, and Professor Sir Joseph Hutchinson, successor to the Drapers Chair of Agriculture at Cambridge after Frank Engledow, made the following statement.

⁶² NIAB, C-4, 186th Council meeting, 27/11/1963.

⁶³ NIAB, C-4, 186th Council meeting, 27/11/1963.

Professor Bywater said the multi-line varieties certainly presented problems. It would be necessary to define such varieties by the individual components, and the proportions in which the several components were present. Sir Joseph Hutchinson thought that the Institute should not consider varieties which contained so many impurities. True multi-line varieties could only be authenticated in the way indicated by Professor Bywater and...this might become too onerous in terms of cost. He suggested that as there was as yet no evidence that so-called multi-line varieties were superior in performance to some of the individual lines which they contained, and until this was proven the Institute should ignore them. It might state that it was not prepared to certify them because it could not guarantee that the resulting crops would be identical; if there was a possibility that the stock would change from year to year, it should not be included in the Scheme.⁶⁴

It was through such encounters and discussions that the 'dehistoricized gene' came to the UK.⁶⁵ Not only were aspersions cast upon 'so-called' multi-line varieties, simply because they did not conform to the ideal of a single distinct varietal identity, but because of this it was also held that they should de facto be ignored by NIAB's protocols. To put these changes in broader terms, varieties were now made 'legible' or 'addressable', not merely in the sense of defining a fixed point of correspondence for any given variety, but in redefining their biological nature in the terms of this non-variable fixed point.⁶⁶ Moreover, consider Hutchinson's last complaint, that if varieties are going to change year by year, they should not be included in NIAB's schemes. A.F. Kelly had admitted only ten years prior to this, that all stocks of varieties demonstrate variability over time. This is a phenomenon that Hutchinson himself would surely have admitted. What is essential, is that by 1965 Hutchinson considered this variability a sign of weakness, not to be used as a selling point in the way that Nickersons were attempting. Yes, a variety might show variability if grown for a number of years away from the original stock. But, for Hutchinson, any multiplication beyond the first years subsequent to certification (a seed stock 'leaving the grid' as it were) radically undermined any claim to purity and even its claim to being a variety in the first place. (For another example, revisit Herbert Hunter's conditions for the Cereal Seed Certification scheme, explained at the end of Chapter 4, in which control over varietal history was just as important as any new genetical understanding). Indeed, when Hutchinson came to make recommendations on how to tackle the problems presented by Rothwell Perdix in January 1966, he suggested the following. "Perhaps the seed

⁶⁴ NIAB, C-4, 195th Council meeting, 23/11/1965.

⁶⁵ Berry (in press 2014).

⁶⁶ Scott (1998) p.82, Joyce (2013) p. 90.

should be labelled to indicate the year of release from the breeder: perhaps the Committee would advise the Council as to the number of generations which should be tolerated in the case of mixed varieties.”⁶⁷ When members of the Council spoke out on behalf of such varieties, and their inclusion in NIAB schemes, Hutchinson replied that “A relaxation of standards was proposed, and he suggested that if we had never had Rothwell Perdix we should not have had these problems. The problem had to be taken seriously and the Council would have to make up its mind as to the standards which should be adopted, and should take its stand that there are varieties which do not meet these standards.”⁶⁸ Smith, responsible for representing the good British public, evaluated the situation quite rightly.

Mr. Smith said that the whole concept of what is a variety was fundamental to Plant Breeders’ Rights and also to the [varietal] Index. The question of the degree of impurity which could be accepted would have to be resolved in relation to the varieties which are being submitted for Plant Breeders’ Rights. It was perhaps unfortunate that at the present time there were certain multi-line varieties which appealed to farmers, but caused difficulties in Field Approval.⁶⁹

In 1966, Rothwell Perdix was removed from the Recommended List.⁷⁰ Unfortunately this is where the present thesis must leave this story, it would be a job of work for future historians to follow these discussions out into the 1970s, to establish how and when NIAB’s policy decisions began to transform the industry at large. To end this Chapter, we now turn to examine how NIAB survived MAFF’s attempted takeover of the Institute in the late 1960s.

Section V: The Joint Review Group Report, 1966

As this history of NIAB draws to a close, there is time for one final dramatic twist. The 1966 Joint Review Group Report proposed radical changes at NIAB that were aimed squarely at its independence. While in 1956 William Gavin had reacted strongly against the suggestion that the Ministry increase its control over NIAB by appointing the Chairman of the Council directly, the latest proposal was far more extreme, as it was argued that the entire Institute needed to be subsumed within MAFF. “The Director and staff of the Institute would be integrated with the Civil Service and become part of

⁶⁷ NIAB, C-4, 196th Council Meeting, 12/1/1966.

⁶⁸ NIAB, C-4, 196th Council Meeting, 12/1/1966.

⁶⁹ NIAB, C-4, 195th Council meeting, 23/11/1965.

⁷⁰ NIAB, C-2, Council Paper No. 545, Director’s Quarterly Report Nov-Dec 1966. The decision appears to have been made after it was discovered that certain stocks of Rothwell Perdix were highly susceptible to disease.

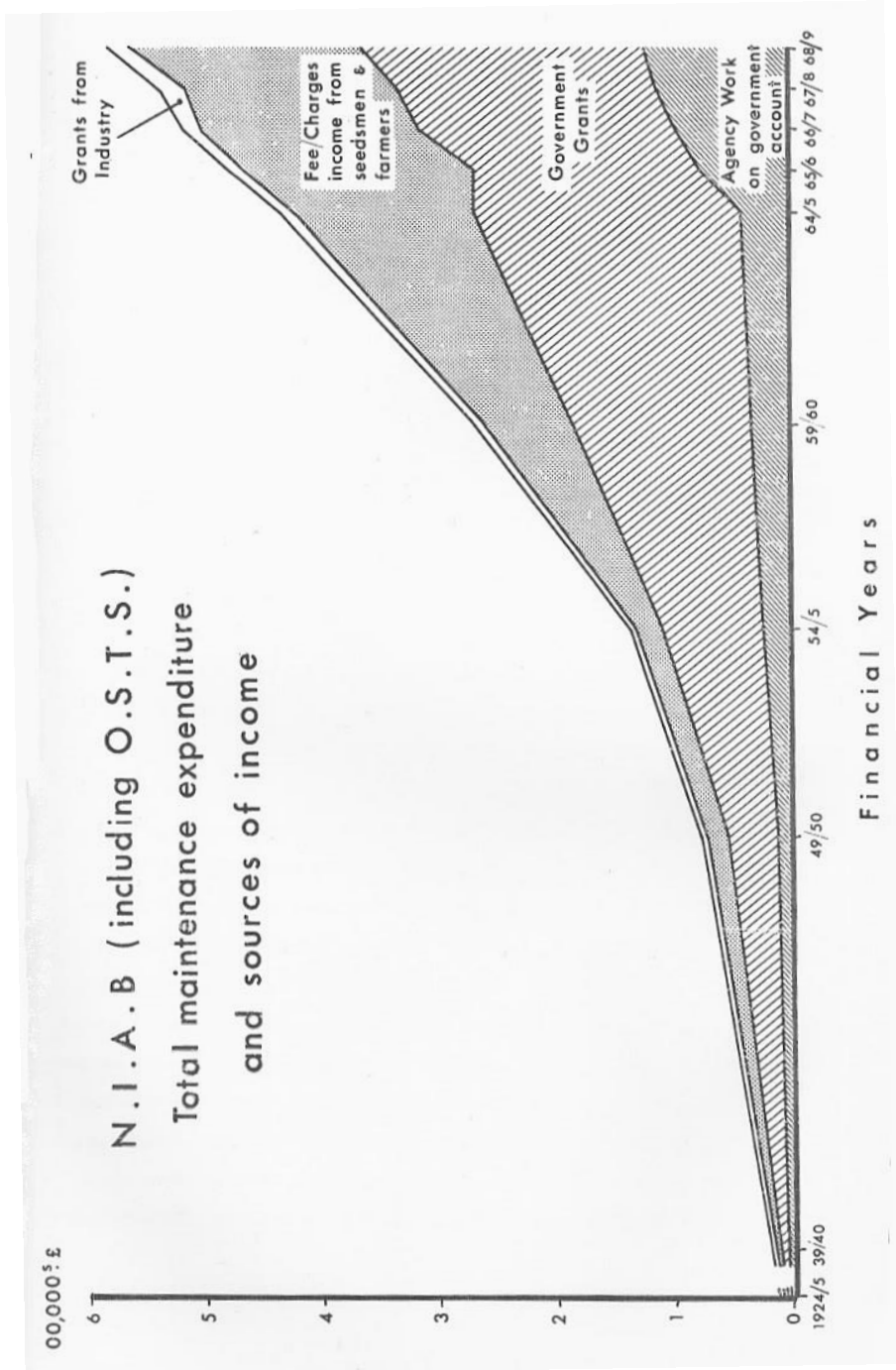


Figure 5.5: Graph from 1966/67 Joint Review Group Report.

the staff of the Ministry”.⁷¹ Their reasoning was quite straightforward. Not only had the size of the Ministerial grant more than doubled since the end of the Second World War, but the work of the Institute was taking on an increasingly statutory nature, making it directly responsible to the Ministry (with the implication that the Council was increasingly becoming just a body for oversight rather than a decision maker, as was stated in the Trust Deed). At the same time the decision had been taken to hive off the commercial multiplication work, which had been neatly collected together under the Seed Multiplication Branch following the 1956 Joint Review Group Report. Remarkably, this suggestion had come from NIAB itself, and there is little evidence of disagreement. More on the formation of the National Seed Development Organisation (NSDO), which became responsible for the multiplication and sale of nationally funded varieties, will follow shortly. Figure 5.5 is taken from the 1966 report and shows quite clearly the extent to which NIAB had indeed come to depend upon Ministerial funds for support. While the Report recognised that “the Institute increased its income from £17, 000 in 1945/6 to £112, 000 in 1961/62 and to an estimated £275, 000 in 1967/68, this development has only been made possible by the injection of large amounts of public money.”⁷² As part of this incorporation into the civil service, NIAB’s Council would be split down the middle, with half the representatives coming from MAFF and the other half from various interested quarters of the agricultural industry. The Report also attempted to argue that the proposed changes would make little difference to NIAB’s complement of scientific staff. There would be “suitable safeguards designed to protect the scientific integrity of their work” while it was also argued that those conducting statutory work (particularly in the Systematic Botany Branch) already “have to work virtually as civil servants, acting as required as advisers to the Controller [of Plant Varieties] or the Minister.”⁷³ Needless to say, these proposals amounted to a considerable reinvention of NIAB and an almost complete removal of its independence as it had been understood thus far (though it would continue to run in parallel to the NAAS rather than as another part of the Advisory service).

It took almost two years to compile this report, which was eventually published in December 1967. Its contents came as no surprise to a select few of the Council. In contrast to previous Joint Review Groups that had been made up entirely of MAFF and ARC staff, three NIAB Council members had been invited to join in their deliberations

⁷¹ NIAB, K-16.48, Report of the Joint Review Group 1966/1967, p. 11.

⁷² NIAB, K-16.48, Report of the Joint Review Group 1966/1967, p. 4.

⁷³ NIAB, K-16.48, Report of the Joint Review Group 1966/1967, pp. 34-41.

from the beginning. In addition, the Heads of Branches at the Institute had been invited early in 1966 to submit a statement on the potential future changes. They had suggested either 1) the status quo (which they considered unsatisfactory); 2) that the Institute remain independent but with an amended constitution (which failed to place NIAB scientific staff at a status comparable to the agricultural botany staff working for Ministries in Scotland and Northern Ireland, but was still considered a good option); or 3) full integration with the civil service (which, while they submitted no determined preference, was clearly highly desirable). However, they had not been allowed to share this statement with the Council as a whole, as it was an official submission to the Joint Review Group. Therefore, while some amount of intercommunication was perhaps inevitable, many members of the Council could not have expected such radical proposals when the Report was introduced to them at a special meeting on the 21st March 1968.⁷⁴ This introduction was clearly managed remarkably well, so well in fact that at that very same meeting the Council voted to give general approval to the Report, while it was agreed that a Committee should be established to consider outstanding problems. As we shall soon see, the delivery of this report to the public (and more importantly, to the organisations and individuals directly involved with NIAB) would be handled far less well. Only one member of Council observed that “when the farmers became aware of the Institute being the Ministry’s responsibility, their interest and support might cease. The Council would become an advisory body and farmers would tend to lose interest in the Institute: at present they looked upon it as their Institute – a farmers’ Institute.” For now, the Council and its Chairman urged secrecy. “It was important that the Press Should not be aware of the contents of the Report until there had been agreement on policy with the Minister.”⁷⁵ The ARC and MAFF had already been implicated in a recent brawl over the identity of the John Innes Centre, whose independence appeared to be threatened when the ARC had forced it to move to Norwich in 1967.⁷⁶ Moreover, 1967 had already seen MAFF take over an important cornerstone of NIAB’s work, through the creation of the NSDO.

The NSDO was constituted in 1967 and explicitly modelled on the National Research Development Corporation (NRDC). The NRDC had been established in 1949,

⁷⁴ NIAB, C-4, 205th Council meeting, 21/3/1968.

⁷⁵ NIAB, C-4, 205th Council meeting, 21/3/1968.

⁷⁶ See the detailed timeline compiled by Sarah Wilmot, accessible online , www.jic.ac.uk/centenary/timeline/index.htm. Considering the importance of the John Innes Centre, and the richness of its archival material, it is remarkable that no published history of the Centre exists, while it is mentioned but little in the existing agricultural and horticultural historiography.

with the intention of better exploiting research produced by government funded institutes.⁷⁷ The latter was itself initially approached as to whether it could take over the multiplication of novel varieties produced by Official breeders, but declined, leading to the formation of the NSDO.⁷⁸ There is a puzzle at the core of these developments though, as NIAB seems to have pushed for the creation of the NSDO itself. Considering that multiplication work had inspired the creation of NIAB, and had formed part of the bedrock of its constitution, it seems strange that they were quite so keen to throw this baby out while holding firmly onto the bathwater. The official story, as recorded in NIAB's existing biography, is that as an official varietal trialler, the Institute could not be in a position to profit from the sale of certain varieties, as claims of bias would surely follow. This argument certainly seems logical and yet it can only be considered half of the story. NIAB had been multiplying seed on behalf of national stations and selling it to the trade via traders since the release of Yeoman II in 1924. It had been trialling varieties and publishing on their performances since the 1920s. Moreover, since the mid 1940s the Institute had been doing both while also publishing Recommended Lists. The most material change that had occurred since, and which seems to offer the best explanation for why NIAB was now keen to lose its multiplication work, was the introduction of Plant Breeders' Rights. It was not NIAB field trialling varieties while also multiplying and selling state funded varieties that was the problem. Rather, it was the level of profit the was now expected to be possible under PBRs, and the expectation placed on any national seed multiplier to secure this profit. In a meeting with MAFF on the potential for the creation of the NSDO, NIAB's representatives practically admitted as much when they suggested "if the Institute abandoned the publication of recommended lists, the reason for setting up a separate Seed Development Organisation would disappear."⁷⁹ The recommended lists were considered highly influential when it came to varietal choice, and thus the potential for profit, in a way that simply trialling and publishing on varieties was not. At the NSDO "to ensure that the important financial considerations are not neglected by the body" MAFF wish to "provide for adequate representation on the Board of persons fully qualified, experienced and competent in finance and commerce." The clear implication being that

⁷⁷ Hendry (1989) pp. 7-22. My thanks to James Sumner for this reference.

⁷⁸ On the NRDC offer see NIAB, C-6.47, JRG/8.

⁷⁹ NIAB, E-5.9, Executive Committee Paper No. 263. Meeting between Seeds Division of the Ministry and members of Council of the N.I.A.B. at St. Andres Place, 8/1/1965.

NIAB had failed in these efforts until now. So clear was this implication, that MAFF correspondent C.H.M. Wilcox continued by adding

In deciding that a change such as this is necessary, Winnifrith [Permanent Secretary at MAFF] has asked me to take the opportunity of expressing our very real thanks to the N.I.A.B. for the work that they have done over the past years in the multiplying up of seed of new varieties produced at the state plant breeding institutes, including in recent years the Welsh Plant Breeding Institute. The Harwood Visiting Group of 1961 had of course drawn attention to the fact that the Institute is not primarily a trading concern and had expressed doubts whether it was right for it to be required to take the commercial risks inherent in the carrying large quantities of stock seed but decided that it was better to leave the work with the Institute for the present subject to the question being kept under review. The Institution of a system of plant breeders rights (much more speedily incidentally I think than anyone could have reasonably anticipated at the time of the Harwood report) has ofcourse now created an entirely new situation which, for the reasons I have mentioned above, has led Winnifrith to the conclusion that a new Organisation is required to deal with it.⁸⁰

NIAB as an organisation had always kept its multiplication programme at a scale that would not cause any affront to the trade. With the introduction of Plant Breeders' Rights, the presiding government now wished to see a full and proper exploitation of state bred varieties. At a time when NIAB was expected to raise increasing amounts of funding from its own activities, dropping its seed multiplication responsibilities was, bizarrely, attractive twice over. By not pursuing multiplication work, the Institute could continue to legitimately draw the majority of its funding from the exchequer while also continuing to keep its commercial friends on the Council and in industry. In the late 1960s, NIAB needed all the friends it could get.

The public response to the Joint Review Group proposals, particularly from NIAB's farmer Fellows, was of a scale and intensity that nobody had predicted. To some extent this was due to the way in which the announcement was made. Two days before the Minister was expected to announce the proposals in Parliament, NIAB held a general staff meeting. Horne spoke to this audience, explaining that he, the Heads of Branches and the Deputy Director had all agreed that "the recommendations are workable and our general opinion is that they provide a framework within which the present good work can go forward with confidence as developing conditions unfold."⁸¹ The same day as the Minister announced to Parliament that NIAB was to become part of the Ministry, NIAB held the Annual General Meeting of its Fellows. Chairman of the

⁸⁰ NIAB, C-2, Council Paper No. 523, letter dated 14/6/1965.

⁸¹ NIAB, C-6.41, General Staff Meeting held 26/6/68.

Council, Sir Harold Sanders, spoke to this audience in terms that suggest he expected little outcry. "The N.I.A.B. is entering on its 50th year. It has a proud record and enjoys a high reputation among farmers and seedsmen. Why, then, change at all? The trouble is that times change and we must keep in step with the march of events."⁸² The only potential complaint that he attempted to address in substance, was that of the changing status of NIAB's scientific staff.

There is a sentence in the Report about safeguarding the scientific integrity of the officers under the new dispensation. I am sure the Council will be vigilant over this but do not think they will have cause to worry. Of course, an officer of the Institute will always be free to express his opinion in scientific or technical matters entirely untrammelled by pressure of any sort. In all the work of variety comparison he will, as now, seek the honest truth and no thought as to whether a variety is from an official station or a private breeder will affect his judgement. I very much doubt whether our officers will find the change has appreciable effect on their activities, their freedom of action, or, most certainly, on the scientific conclusions they reach and publish, and the advice they give to Council on such matters as the Recommended Lists.⁸³

A report of the discussion that followed this meeting reveals how poorly NIAB's Council had judged the reception of the Report.⁸⁴ Col. Brookes stated that the Fellows "wanted the Institute to go on serving agriculture, the agricultural trades and seed trades, in the great independent spirit with which it had done in the past. But if the Fellows felt they were being steam rolled they would lose a great deal of faith in that independence." Mr. Hall "thought that many Fellows who relied on the work of the Institute would view with considerable disquiet any change in the N.I.A.B. which suggested government paternalism. They had put great faith in the work because they thought it was completely impartial." This ill feeling towards Ministerial take-over, and the way in which these decisions had been made public, almost immediately began to have an effect. By August Frank Horne was already reporting that on seeing the Minister at a function in July, the latter had been "obviously rather concerned at what he had heard of the reaction of the Fellows and others to the proposals."⁸⁵

This outcry, which continued to build momentum once the agricultural press got hold of the story (see Figure 5.6), was not the only reason MAFF takeover of NIAB

⁸² NIAB, C-6.41, AGM of Fellows 28/6/1968.

⁸³ NIAB, C-6.41, AGM of Fellows 28/6/1968.

⁸⁴ NIAB, C-6.45, Report of the discussion at the Annual General Meeting of Fellows on the address by the Chairman of Council, 19/7/68.

⁸⁵ NIAB, C-6.41, Letter to Wellington from Horne, 29/8/68.

appeared to be unlikely from the very moment of its announcement.⁸⁶ At a meeting of the Joint Review Group that took place only four days before the Parliamentary announcement on NIAB's future, "It was rumoured that Minister's were contemplating a complete embargo on the taking over of any further fringe bodies."⁸⁷ Before the end of that year this had become MAFF's official position on the matter. As NIAB reported "It is now understood that the Minister as a result of further discussions would not in any case be able to agree to alternative 3 [NIAB joining Civil Service] during the next two or three years." Before the end of November 1968, only six months after the Parliamentary announcement that NIAB was to join the Ministry, Basil Engholm, who



Figure 5.6: Full page from *Farmer and Stockbreeder*, 17/2/1968 reporting on the Extraordinary Meeting of Fellows at NIAB that month.

⁸⁶ An entire folder of newspaper responses can be accessed in NIAB, C-6.46.

⁸⁷ NIAB, C-6.41, JRG Working Party Meeting 24/6/1968.

succeeded to the position of MAFF Permanent Secretary after Winnifrith at this time, was writing to NIAB asking for fresh proposals on the future arrangements between the Institute and MAFF.⁸⁸ The new proposals, assembled in NIAB Council Paper 566, only gave MAFF a greater amount of representation on the Council.⁸⁹ NIAB's independent status was to remain, and its funding to continue as a grant-in-aid. This was officially accepted by Engholm in April 1969.⁹⁰

Conclusion: The new Trust Deed, 1970

NIAB was able to celebrate its 50th anniversary, which came complete with a Royal visit (Figures 5.7 and 5.8), still as an independent Institution, though it did not do so unchanged. The new Trust Deed placed a greater emphasis on NIAB's statutory rather than voluntary trialling work, and yoked the Council more tightly to the Ministry. The intervention of the NIAB Fellows, and the Extraordinary Meeting that they had arranged in early December 1968, were widely regarded as having been decisive.



Figure 5.7: Queen Elizabeth II being shown the OSTs in 1969. Image held by NIAB archive.

⁸⁸ NIAB, C-6.45, letter from Engholm dated 25/11/1968.

⁸⁹ NIAB, C-3, Papers on Trust Deed Presented at meeting of Council on 15th Jan 1970.

⁹⁰ NIAB, C-6.45, letter from Engholm, April 1969.



Figure 5.8: Queen Elizabeth II being shown NIAB's glasshouses by Frank Horne in 1969. Image held by NIAB archive.

When the Ministry tried, in the summer, to stage a coup d'état and turn a private research station into yet another State rest home for ill-directed pseudo-agricultural scientists, the Fellows whose subscriptions help to maintain it rebelled."⁹¹ That Whitehall was also facing an oppositional veto on the creation of any further Civil Servants at this time was overlooked as much too dull. NIAB had changed in another important respect, in that it had lost its responsibilities for multiplying and selling varieties of plants produced by state sponsored breeders. With the National Seed Development Organization, the Svalöf model was replaced by that of the NRDC. The Executive Committees response to the government's newfound enthusiasm for money making through seed multiplication ("The Committee were strongly against the use of the term "exploitation") provides a glimpse as to how this work had been regarded at

⁹¹ From *Farmer and Stockbreeder*, 17/12/1968 and written by none other than Robert Trow Smith, who has made a number of significant contributions to British agricultural historiography. Article accessible in NIAB, C-6.46.

NIAB during the earlier fifty years and how it was to be approached by the NSDO.⁹² With NIAB's new Trust Deed and position with MAFF settled, the Director Frank Horne chose to retire. The implications that these developments might have for any broader conclusions we might wish to draw from the thesis as a whole will be confined to the final Chapter.

In Chapter 5 we have seen how NIAB's responsibilities as multiplier, trialler, arbiter and national institute all interacted with one another. In Section II, the Institute's dependence upon government funds as a *national* institute began to see an increase in pressure upon its efficiency. This called for a change in its *triallying* methods and a saving of costs by the reduction of the number of years a typical variety might remain in the Institute's trials. It was this mission, to find those few varieties best able to produce maximal output, which also led NIAB to begin testing all cereal varieties at three levels of nitrogen fertilization. In turn this had implications for the demonstration value of trials for farmers. The Institute was not just looking for the best varieties, but attempted an even more fine-grained search, for the best varieties under what were the (then agreed) best conditions. To complete the circle, such a paternalistic perspective was clearly due to its *national* remit. In Section III these problems were compounded by the introduction of Plant Breeders' Rights. Pressure on NIAB's trials from the proliferation of novel varieties in the PBR age (which preceded the arrival of PBRs in the UK, but seems to have gone hand-in-hand with their growing likelihood) was increased thanks to the financial importance attached to the Institute's Recommended Lists. NIAB's status as a field trialler and plant identifier increasingly competed with one another, and that of *seed multiplier*. The rise of PBRs had dramatic implications for the latter. Though the motivations that lay behind the eventual creation of the NSDO require further research before definite conclusions can be drawn, it was certainly the case that the introduction of PBRs made it much more difficult for the same institution that judged varieties to also benefit financially from the sale of a certain few, especially when that Institute had been judged commercially placid.

As we saw in Section IV, in order to implement PBRs NIAB needed to navigate its way around a number of biological difficulties. These were explored via the variety Rothwell Perdix. In this section NIAB's status as *plant identifier* was even more thoroughly questioned, as the Institute was left to decide not only what varieties

⁹² NIAB, E-5.9, 176th Meeting of the Executive Committee, 17/12/1964.

existed but how 'variety' was to be defined. At the same time, MAFF continued to increase pressure on NIAB's finances, though it is important to point out that the size of NIAB's grant does not appear to have been affected particularly greatly. MAFF instead used its financial power over the Institute to attempt to take it over, as seen in Section V. In this final Section it was possible to see how NIAB's failures and successes in defending its multiplication, trialling, arbitration and national responsibilities together constituted the extent to which it might be considered independent. This being said, unpicking the precise ways in which NIAB's status as a national institute influenced and interacted with changes in its trialling methods, plant identification procedures, and multiplication responsibilities, is perhaps less fruitful than simply acknowledging the interconnected and emergent phenomenon that was NIAB at work.

Conclusion

This thesis has not been the first attempt to write the history of NIAB from foundation to Golden Jubilee. In the late 1960s, as plans for the latter celebration began to take shape, D.S. Kimber (Technical Liaison Officer) suggested that NIAB might publish a biography, which he would be happy to author. He got at least as far as deciding upon Chapter headings.

1. Origin of N.I.A.B. – Ormskirk, Weaver, O.S.T.S. foundation, buildings.
2. Pre-war development – Hiam Farm, Stock feed, early trials, first regional centres.
3. Variety testing – Recommended Lists, Advisory Committees, Regional Centres, liason with N.A.A.S.
4. Quality – link with consumer industries, development in potatoes (blackening, crisping, canning), cereals (Holdfast to M. Widgeon), vegetables (canning, freezing), herbage (digestibility).
5. Disease testing – virus testing in potatoes, loose smut, yellow rust, etc.
6. Multiplication – Hill Farm, basic seed offers.
7. Seed Production – Field Approval and Certification, O.E.C.D.
8. Seed Testing – Development of Services, I.S.T.A.
9. International role of N.I.A.B. – E.B.C., O.E.C.D., F.A.O., I.S.T.A.
10. A look at the future¹

Kimber also began researching the origins of the Institute, reporting back to Horne in November 1968 on precisely the same point of NIAB's ambiguous purpose to which Chapter 1 was dedicated.

As far as the original objects of the Institute are concerned, there are many references to the Institute functioning as a multiplication and distribution agency for the P.B.I. and other breeders. As late as June 1920, the Minister moving the second reading of the Seeds Bill in the House of Lords said "the N.I.A.B., founded in order to work with Biffen with a view to distribution new varieties, will carry out a function similar to Svalof". Yet in July 1918 the Minister had approved notes for Weaver's speech to the Seed Trade Association, in which he stated "despite the natural restlessness on the subject of official control, I believe that the trade would generally welcome some official action in the direction of registering new varieties and controlling the present orgy of synonyms. Such a duty might well be entrusted to the new Institute."²

The present thesis has been sympathetic to both Kimber's proposed Chapters, along with his recognition of the confusion that surrounded NIAB's purpose as a seed

¹ NIAB, K-17.51, Kimber to Horne 13/2/1968.

² NIAB, K-17.51, Kimber to Horne 13/11/1968.

multiplier. Some of Kimber's colleagues however, were much more sanguine in their assessment of the role, worth and purpose of institutional histories.

This is a good idea to mark the 50th anniversary and as a propaganda effort. But it all hinges on cost – both £.s.d. for publication, and in time compiling such a record... I should have thought that if anything more than a base recital of facts is envisaged then you [Horne] are about the only one who could make a good readable history of the Institute.³

Perhaps neither Kimber nor the author of the present thesis were the right people for the job, but this sanguine assessment of the role, worth, and purpose of institutional biographies (for those within the Institute) is worth remembering. In many ways, the present thesis has been written with the audience of NIAB's staff (past, present, and future), firmly in mind.

By way of bringing this thesis to a close, the conclusion will address three questions. First, what, in retrospect, are the strengths and limitations of the approach to NIAB's history adopted here? Second, bearing in mind the limitations, what are the wider lessons for historians of science? And third, what are the wider themes of interest for those who currently work at NIAB and in related institutions at the intersection of plant science and agribusiness?

Section I: Strengths and limitations of the approach taken in this thesis

The job of uncovering, organizing and interpreting the history of a scientific institute such as NIAB is one of compromise and pragmatism. Compromise, in that one cannot hope to say all that need be said, and pragmatism, in choosing what to include and what to set aside. There are a good number of Chapters that were very nearly written, many on topics of almost equivalent importance to those that have been included here. The work of the Official Seed Testing Station, for instance, has been ignored, though its internal and international workings are profoundly important for understanding how management of the global seed industry came to adopt the shape it has today. Similarly, changes in NIAB's staff and internal organization have only been glimpsed, despite the rich variety of individuals who have worked with or for the Institute promising a prosopography of significant value. Lastly, and strangely for a thesis in the history and philosophy of science, very little of the scientific research work conducted by NIAB (whether that be the results of its trialling system or the work of its later

³ NIAB, K-17.51, Letter to Horne 30/6/1968.

scientific staff, mentioned at the end of Chapter 4) has been discussed directly, aside from the ground covered in Chapter 3. The five preceding Chapters were nevertheless selected ahead of these alternatives, because they were the most efficient way to achieve two aims; 1) to take NIAB from 1919 to 1969 in a way that was sufficiently entertaining; 2) to take NIAB to the history and philosophy of science. If the thesis proves interesting enough that future researchers are inspired to take on these latent questions, so much the better.

Be that as it may, five key predicates that are typically attached to NIAB have been interrogated; *Seed Multiplier*, *Field Trialler*, *Plant Identifier*, *National Institute* and *Independent*. Each of the first four distinct predicates, and the fifth synthetic one, could have been traced throughout the entire five decades with which we are concerned, rather than remain consigned to the period in which they were discussed. Brief outlines of what such histories might look like are given below. An outline of the fifth synthetic predicate is not attempted, as this would no doubt require a concluding Chapter all of its own. It might also be said that Chapter 5 discusses the relationships between the four distinct predicates in terms sufficiently abstract to make clear the potential procedure for an investigation of *Independence* outside of the period in which that Chapter took place.

A history of NIAB as *Seed Multiplier* would begin with the Food Production Department programmes of the First World War, resulting in the eventual establishment of NIAB and the release of Yeoman II. It would then see the Institute keep a cap on the scale of these activities throughout the interwar period (in deference to the trade during economically hazardous agricultural times), before eventually unleashing its multiplication capacities during the Second World War. For a decade or so, NIAB's Svalöf capacities would expand, as the number of official institutions looking to make use of the Institute's facilities steadily grew. This new security would then be interrupted, as the Institute's multiplication capacities are excised (because of the projected profitability of varietal development following Plant Breeders' Rights, and the same suspicion that NIAB was not operating at full commercial capacity due to its relations with the seed trade). This work would now be hived off to the new National Seed Development Organisation. This history would not necessarily have to end here. In some respects NIAB today may have rediscovered its origins, by beginning to generate and release new germ lines (the much discussed 'super wheats') which are meant to form the basis of the future cereals market. Multiplication of such germ lines,

and multiplication of cutting-edge varieties (such as Biffen's) mirror one another in ways that are both intriguing, and potentially instructive, provided the publicly funded setting in which this past work took place is remembered. Claims about continuity can be deceptive. NIAB's contemporary activities, and economic and political contexts, are by no means equivalent with those of its origins.

A history of NIAB as *Field Trialler* would emphasise the long history of field trialling activities from the nineteenth century onwards, perhaps with a focus on those conducted at Britain's premier agricultural science centre, Rothamsted Experimental Station. The social dimensions of trialling and demonstration work, not just in Britain but across the empire, would be kept within view, so as to make the eventual arrival of the RCT appear precisely as alien as it was. NIAB would enter this scene as an institution dedicated to discerning the differences between plant varieties under a wide variety of given conditions and, most importantly (due to its difficult early financial situation), it would have to set about constructing this programme of work in a highly collaborative way, so as to make use of the expertise and resources found elsewhere. Convincing farmers of the worth of different varieties was fundamental to the Institute. Over time however, a new division of labour between trialling, on the one hand, and demonstration, on the other, would see the shape of NIAB's trials transform radically. This division of labour was prompted by increasing trust in the power of RCTs to ensure significant results and financial stringency. Many more trials could be conducted on far less land provided a randomized technique was used. Following the Second World War, and the arrival of productivism, NIAB would go so far as to skew its own variety trials in exchange for trials that were devoted to demonstrating the results of maximal nitrogen use. The social meaning of trials had by this time almost completely switched from meeting farmers on (relatively) equal terms in the field, demonstrating to them the value of certain varieties as they actually underwent trial, in ways that farmers could appreciate – to demonstrating the power of chemically synthesized fertilisers and (on vastly smaller plots of land), allowing a farmer only a peak at select varieties pre-chosen as worthy of their attention. (The switch from factory floor to shop window described in Chapter 5).

A history of NIAB as *Plant Identifier* could equally trace its origins to the late nineteenth century and the foundations of the market in novel cereal varieties. Private plant breeders – often working individually and with competing theories of heredity – clamoured for recognition and a larger proportion of the varietal market. As this

community began to assume the shape of an industry, it also attracted the attention of governments around the world interested in expanding and exploiting domestic and colonial agricultural and horticultural production. The new science of genetics offered them an attractive solution (even if this solution was, as described by a number of historians in the Introductory Chapter, merely an alternative to more controversial political decisions such as tariff reform), thereby granting biologists a new tool with which to extract patronage from the State. NIAB was but one beneficiary of a larger agitation for scientific support, which was promoted by a whole host of different social groups, not least amongst them of course, scientists themselves. Over time, as Mendel-Morganism permeated society, those with financial or social interests in particular varieties (rather than an investment in the wider social process of farming and breeding) came to redefine plant varieties in terms apparently inspired by this new science. Despite decades of social resistance, and also persistent biological problems surrounding plant identification and varietal identity, sufficient sympathy for the notion that a plant breeder should own their varieties in perpetuity eventually built up, resulting in their legal constitution in the form of Plant Breeders' Rights. NIAB's role as *Plant Identifier* now took on a statutory nature, as the Institute became responsible for conducting the Distinctness, Uniformity and Stability tests upon which this legislation depends, a responsibility that it continues to hold today. Those who have strongly defended intellectual property rights in plants would have to face difficult truths, such as the apparently buoyant varietal market on the eve of their introduction. Consider also the argument sometimes advanced by strong supporters of plant patents, that "farmers have increasingly abandoned the responsibility for seed selection to professional researchers".⁴ This would be a very perverse way to characterise the persistent accretion of control over, and access to, stocks of seed and novel varieties which we have seen by agricultural scientists and influential trade members.

Lastly, a history of NIAB as *National Institute* would begin with the significance of such organisations as distinct from philanthropic, university based, or commercial scientific centres. It would follow the relationship between NIAB's fortunes and the changing political context much more closely than was necessary in Chapter 4, which discussed NIAB's national status at a time of hardened political consensus. Consider again the Institute's apparently unique status upon its establishment in Chapter 1; government funded, yet independent; charitable, yet aimed at profit-making; scientific,

⁴ Lipton and Longhurst (1989) p. 35.

and yet also deeply embedded within industrial problems. In Chapter 1, attention had to be paid to the nuts and bolts of how NIAB actually came about. The extent to which its apparent uniqueness was actually evidence that NIAB bore the stamp of its historical context had to be set aside. We can now return, armed with Patrick Joyce's description of another British institution, one that was also a "completely characteristic creation and reflection of the liberal state." Established in 1922, only a year after NIAB's headquarters were completed, the BBC can now be understood as NIAB's twin.

It is as Lord Reith put it "a public service, not only in performance but in constitution – but certainly not as a department of state". This delicate positioning involved being in the state and drawing its authority from it as a state monopoly, but yet not being of the state as a government department because it was a public corporation. However it had been given its constitution by the state, which could change or revoke it at any time. As a state monopoly it was charged by the state with representing the (multi-) nation state. It was forever precariously balanced between dependence and independence because it shared the perennial problem of the liberal state itself, which was supposed to embody the nation and yet stand above as its supposedly neutral regulator.⁵

Aside from switching 'public corporation' for 'charity', this description of the BBC could just as easily be a description of NIAB. Our outline history of NIAB the *National Institute*, would then continue from this observation, demonstrating over and over again how the Institute was a product of, an influencer upon, and reflection of, the state, just as the security, geography and efficiency of that body was subjected to new stresses and underwent further change, eventually aiming squarely for Edgerton's late twentieth-century landscape. These are histories that might have been and may still be.

Section II: NIAB and agricultural science in the twentieth century

The most obvious point to make in this historiographical context is to highlight precisely how much more there is left for historians of science to uncover. Any number of important organisations, government departments, and scientific institutions, have been mentioned in passing within this thesis, all of which require a great deal more attention and systematic investigation. The most important candidates include the Development Commission, the Agricultural Research Council, the Agricultural Improvement Council, the John Innes Centre, the Horticultural Research Station, the Potato (later Plant) Virus Research Station, Ormskirk Testing Station, the Norfolk

⁵ Joyce (2013) p. 316.

Agricultural Station, and the list goes on. That Russell's *A History of Agricultural Science in Great Britain* (1966), is still the most authoritative account of the subject is deeply troubling. Building upon the work of those such as Paul Brassley and Abigail Woods, the beginnings of a revisionist account are firmly underway, a project to which this thesis is a contribution.

We have also seen that control over agricultural science funding was exceptionally highly contested throughout the twentieth century. Barely ten years would pass before some new organisation or government body would attempt to assume control over the allocation of state funds for the agricultural sciences. These changes continued well into the later twentieth century, while today agricultural science funding is allocated by the Biotechnology and Biological Sciences Research Council (an organisation which, as is often noted, does not even have 'agriculture' in its name.) Often changes in department and centres of control turn out to be expensive bureaucratic exercises in ensuring that everything remains the same. This may well have been the case in agricultural science, considering that on the whole NIAB often benefited from these changes, perhaps because of the Institute's tight identification with the Board and later Ministry of Agriculture. However, it would be an important future job of work to attend to the ideologies and working practices of the Development Commission and its successors, in order to discern precisely what, if anything, caused or resulted from this turbulence. Meanwhile, this thesis can also be interpreted as an important further expansion of (and to some extent problem for) Edgerton's 'warfare state' thesis.⁶ It expands Edgerton's account, by uncovering and emphasising the state sponsored work of a body of experts, whose effectiveness and influence on Britain's economic and national security have otherwise been overlooked. British agricultural policy therefore comes to look much more technocratic as a result. At the same time however, this thesis also calls into question the apparent tension that Edgerton wishes to establish between a 'welfarist' and 'warfarist' interpretation of Britain in the twentieth century. Emphasising the agricultural – which in some respects can be seen as both (or neither) welfarist and warfarist – undermines Edgerton's more stringent revisionist claims. There is more to be gained by integrating these competing historiographies, rather than labelling a large proportion of one 'anti-history' while pursuing military industries in isolation.

⁶ Edgerton (2006).

Perhaps the most important conclusion to be drawn from this investigation of NIAB for agricultural science in the twentieth century, is that this truly was the period in which the contemporary agricultural industry was forged – and it was forged with a great deal of intervention from agricultural scientists. Whether through the management and control of seed through the creation of the Official Seed Testing Station and the Seeds Act (1920), the eventual introduction of mechanisms for the proliferation and sale of certified seed (capable of being tracked and differentiated from the general population of seed), the waxing and waning of agricultural demonstration work, important commercial evaluative tools such as the Recommended List, and last but by no means least, the intellectual property regimes that now preside over what has become very much a global industry, all of these developments can be traced precisely to this period. That these changes have been causally linked to agricultural scientists, rather than some amorphous agricultural science, is exceptionally important. More often than not, the figure of the agricultural scientist in this thesis was significant not as the voice of a dispassionate and firmly established scientific discipline which supposedly held the key to improving agricultural output, but as a diplomat; they were the most sensible, neutral, and well informed man (and on very few occasions woman) in the room. This same identity ironically also thereby made them more vulnerable than most to the vast number of competing interests engaged in the agricultural industry, as it was an identity with real power. If the motivations that lay behind such people, and the decisions they made, can eventually be traced to cultural changes, changes in agricultural education, biological pedagogies, or international political developments, and if the disagreements had amongst themselves can be more clearly brought into focus, it is possible that points of direct relevance to contemporary policy makers will emerge.

With regard to the latter, two examples immediately suggest themselves. Firstly, today there exists in the UK no dedicated national staff for the provision of agricultural advice to, and coordination amongst, farmers. Private companies and agronomists can be called upon for the right fee, but the general and relatively comprehensive oversight of farming practices within Britain that was once pursued by NIAB and then NAAS, no longer takes place. It is pure arrogance to assume that only farmers in developing countries require this sort of attention, or similarly, that farmers in the developed world ought to be allowed to get on with it. Farmers are an important and powerful political body. Regardless of the way in which their businesses are funded

(i.e. regardless of the subsidised basis of their work in Europe and North America) there is much more to agriculture than the successful extraction of profit, which therefore ought to involve greater national oversight. Those historians (and historians of science in particular) who have often dismissed agriculture on the grounds that it is not a proper industry, are quite right; agriculture is a great deal more than just an industry. While this thesis is not necessarily arguing for the reintroduction of an advisory system, it certainly calls for an investigation of the potential consequences that a loss of this form of interaction, and particularly the loss of the demonstration farm, has had for British farming and the countryside. The second insight that emerges from this thesis which may be of interest to public policy makers is directly related to the first. As we saw in Chapter 2, NIAB valued the social and interactive elements of field trialling so highly, that they rejected the RCT in their favour. Today the RCT is often proposed as the most efficient, most reliable, and most scientific method for the conducting of trials, on everything from education, to potato breeding, to medical care. Agriculture, as an important early location in which randomization was pioneered, therefore deserves the equivalent attention already given to the rise of randomization in medical experimentation. This thesis rejects the apparent obvious superiority of the RCT. All trials are conducted with finite resources. If the adoption of the RCT limits the uses to which those resources might be put, then the decision to adopt the RCT is precisely that – a decision. Those who choose not to adopt the RCT, are no less scientific for it.

Section III: NIAB and plant breeding

It is an exciting time in which to work on the history of plant breeding. Any number of research programmes have begun to place plant breeders, their methods, and their products, at their core. Seeds can be investigated as commodities, plants as important experimental models, agricultural plants as reflections of socio-economic conditions, and plant breeding geneticists as biopower-brokers. In this historiographical context, the primary aim of this thesis has been to demonstrate that historians of science need to attend to agricultural plants within all the various different contexts in which they existed. This was not restricted to fields attached to avowedly pure research stations. Regulatory bodies such as NIAB deserve much greater attention. This is all the more so when one remembers the Institute's close work with farmers in their own localities. This thesis has found new evidence for the role of farmers as active experts in the production of scientific knowledge. This thesis has thereby also emphasised that our

gaze should not be too narrowly focussed on the seed. The seed has often dominated our attention, either because of its slippery nature (as explained in the Introductory Chapter), or because of its fecund promises of potential. If a plant is a mirror to society, the seed is a veritable glitter ball. One truly important conclusion to be drawn from this thesis therefore is that seeds have no power in and of themselves, even if produced in brightly-lit laboratories by genetic modification. Power can certainly be invested in given stocks of seed, but only when the necessary legislative, commercial and economic infrastructure has first been built.

Including NIAB and the OSTs in this picture results in a number of gains. It is, for instance, now beyond doubt that agricultural and horticultural geneticists at the University of Cambridge were alive to the commercial value of their varieties, and pursued a realisation of this potential most vigorously. National funding acted as something of a fig-leaf. The fact that potential profits from the sale of varieties were piped back into their institutions (and not directly into their own pockets) was enough to spare the blushes of nationally funded breeders who accrued a good deal of social credit thanks to their status as public-spirited innovators.⁷ This conclusion is not made so as to cast aspersions on the motivations of past breeders, but because without this guiding principle, the contemporary agricultural industry might look much too dissimilar to that which existed in the past. If we fail to recognise these similarities, the results of this historical investigation cannot even begin to hope to impress themselves upon contemporary scientists and policy makers.

In this respect, the most important conclusion from this thesis as a whole is clearly that regarding intellectual property rights over plants. There has been an exceptionally long history to the eventual creation of Plant Breeders' Rights, one that is continually being added to by scholars in various different disciplines. This thesis has shown that prior to the arrival of PBRs, agriculturalists first had to make inroads into the control of the flow of seed. Typically this began on voluntaristic terms, such as the pre-war use of European seed testing stations by those traders and farmers who sought a guarantee of quality that might influence the price of seed stocks. From these voluntary beginnings, legislative compulsion could often grow, as we saw with the introduction of the Seed Testing Station by the Food Production Department and the eventual Seeds Act (1920) making the testing of seed a legal requirement at point of sale. At every step in this process, the identity of plant varieties, and those seeds that

⁷ Charnley (2013a).

could be officially traced to possessing this identity, increasingly came to be stitched together. This was a slow and faltering process, as the fluidity between seeds and their varietal identities had been essential to the functioning of that industry until the entry of the state and its regulators, who wished to see it 'rationalised' and made legible.⁸ Scientists played a key role in this process, determining the limits of plant identity, the limits of variability, and – through NIAB – establishing mechanisms for the multiplication, certification and sale of seed that solved practical problems, and paved the way for plant patents. The public policy implications of this historical research have been most clearly outlined elsewhere.⁹

Finally, what of potential future research directions? The NIAB story is already in the process of being continued, as another PhD student tackles the Institute's history from 1970 to the present, and a third its contemporary working practices. The deep connections between bureaucratic and government decisions, scientific and expert opinions, the wider agricultural context (and farmer concerns in particular) and changes in the plant breeding industry – as have been described in this thesis – will go on to inform this research. Beyond the UK, historians of science investigating plant breeding around the world must begin to consider the perspective that institutions such as NIAB (often with a heavy emphasis on regulation and only limited pretensions toward basic science) can lend to our understanding of the changes in this industry. There is at present a sense of urgency leant to research in the history of agricultural science, one which will hopefully make it increasingly attractive. It is an urgency generated both by the subjects' current marginalization, and its crucial importance in discussions of the environment, climate change, food security, industrialisation, and development. NIAB, as a mechanism for change within this global picture, and a historical lens through which to view it (and, moreover, as an institution that is uncharacteristically friendly towards historians of science and invested in learning from its past), shall continue to excite interest for some time to come.

⁸ Scott (1997).

⁹ Berry (2014).

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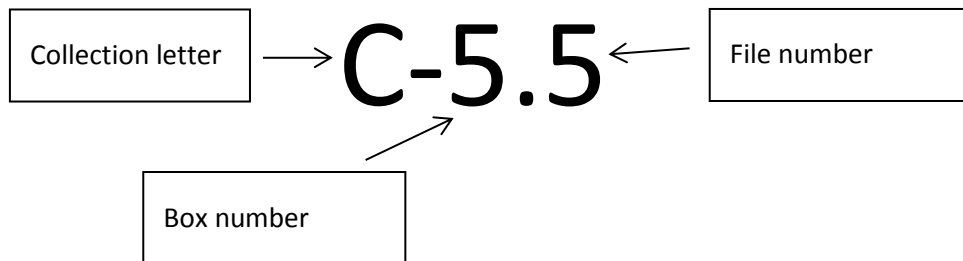
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Appendix 1: NIAB Archive Handlist

There are 10 collections in the NIAB archive, the photographic archive making an 11th. Access to the photographic archive can be arranged for those looking to consult the other archive materials. It is separated purely for cataloguing purposes.

<u>Collection</u>	<u>Page Number</u>
C ouncil	3-15
T rialling and Multiplication	16-28
D irector and Deputy Director	29-36
K elly	37-62
O fficial Seed Testing Station (OSTS)	63-69
G overnmental and Royally Appointed Bodies	70-71
S ecretary	72-76
E xecutive Committee and Sub-Executive Committee	77-80
B uildings, Farms and Sub-Station	81-89
F inance	90-95

The identity of each file in these collections is made up of three different components.



When exploring the handlist you will notice that some files only have a Collection letter and a Box number. For instance 'C-1'. In these instances, it means the files in question have occupied an entire box all on their own, and have not been separated out into further sub-divisions.

To search the handlist, use the Ctrl-F function (Cmd-F on Mac computers) to open a search box. There you can then enter any key words you would like to search for. However, as this is a relatively short handlist, it is recommended that a thorough reading of it in its entirety would probably yield the best results. Important documents can be found within each collection.

When consulting the archive, you will be asked to remove no more than two boxes from the shelves at any one time. This will help to prevent admixture amongst the files. You are also kindly asked to return any files in the boxes in the numerical order that you found them.

When you have identified the files you would like to consult, you will find them in boxes arranged on two sets of shelves. To help you find the various Collections more quickly, each corresponds to a different colour sticker attached to the label on the front of the box.

Front shelves

C-1	C-2	T-5	T-6	D-7	D-8	K-11	K-12
C-3	C-4	T-7	T-8	K-1	K-2	K-13	K-14
C-5	C-6	T-9	T-10 T-11 T-12	K-3	K-4	K-15	K-16
C-7	C-8	D-1	D-2	K-5	K-6	K-17	K-18
T-1	T-2	D-3	D-4	K-7	K-8	K-19	K-20
T-3	T-4	D-5	D-6	K-9	K-10	K-21	K-22

Back shelves

O-1	O-2	E-1	E-2	Material not yet catalogued	Material not yet catalogued	F-1	F-2
O-3	O-4	E-3	E-4			F-3	F-4
O-5	O-6	E-5	E-6	Material not yet catalogued	Material not yet catalogued	Finance books	Finance books
O-7	G-1	E-7				Finance books	Finance books
S-1	S-2	B-1	B-2				
S-3		B-3	B-4				

Title: Council Collection

References: C

Covering Dates: 1917-2000

Extent and Medium: 8 boxes.

Description: These are papers and correspondence relating to the Council, the most senior arm of NIAB management. Members of the Council were elected by various interest groups, such as the Agricultural Seed Trade Association, the National Farmers' Union, and the National Association of Corn and Agricultural Merchants, while various universities over the years were asked to elect members from amongst their agricultural science staff (Oxford and Cambridge were the most common, but Leeds, Liverpool and others were approached at various times). The Council would meet 3-4 times a year to discuss the business of the Institute and approve reports submitted to it. As NIAB grew, the amount of work that had to be delegated to committees within the Institute itself, rather than within the Council, significantly diminished the amount of discussion that took place at the Council level. Members of NIAB's various committees (the papers of which can be found in the Trial Collection, the Executive Committee Collection and some papers in the Kelly Collection) were often organised to include the most relevant Council members. The most significant items in this collection are the Council Minutes and Council Papers, while the collection is peppered with important founding documents and significant reports on the business of the Institute.

Title: 1 – Council Papers 1-205

References: C-1

Covering Dates: 1919-1944

Extent and Medium: 3 large red books, indexed, with papers numbered and affixed inside, all within 1 box.

Description: First book - Council Papers 1-81. Second book – Council Papers 81-139. Third book – Council Papers – 140-205. Considerable care should be taken not to damage the spines, as the red material comes off very easily. Together with C-2 and C-3 these comprise an almost full series of papers (missing Council Papers 257-356).

Title: 2 – Council Papers 206-256, 357-499

References: C-2

Covering Dates: 1943-1963 (missing 1948-1953)

Extent and Medium: 1 red book (1943-1948) indexed, with papers affixed inside, and 2 green and red box files, all within 1 box.

Description: Red book – Council Papers 206-256. Considerable care should be taken not to damage the spine, as the red material comes off very easily. First green and red box file – Council Papers 357-433. Second green and red box file – Council Papers 434-499. Together with C-1 and C-3 these comprise an almost full series of papers (missing Council Papers 257-356).

Title: 3 – Council Papers 500-770

References: C-3

Covering Dates: 1964-1983

Extent and Medium: 3 green and red box files, 1 black and grey box file, all within 1 box.

Description: First green and red box file – Council Papers 500-589. Second green and red box file – Council Papers 590-671. Third green and red box file – Council Papers 672-752. Black and grey box file – Council Papers 753-770. Together with C-1 and C-2 these comprise an almost full series of papers (missing Council Papers 257-356).

Title: 4 – Council Minutes 1938-1966

References: C-4

Covering Dates: 1938-1982

Extent and Medium: 2 handwritten minutes books, 2 green and red box files, 2 files, all in 1 box.

Description: The first handwritten minute book is titled 'Council 3' and covers 14/2/1938 to 21/5/1946. The second handwritten minute book is titled 'Council 4' and covers 16/7/1946 to 20/4/1951. The first green and red box file is titled 'Council Minutes Jan.1943 to Oct.1959'. The second green and red box file is titled 'Council Minutes Jan. 1960 to' and ends in September 1982. The first file is titled 'Council Minutes January 1961 to' and ends in November 1966. The second file is titled 'Council Minutes 1952, 1953, 1954, 1955, 1956, 1957, 1958, 1959, 1960, 1961'.

Title: 5 – Trust Deed

References: C-5.5

Covering Dates: 1918-1920

Extent and Medium: 1 file of less than 50 pages.

Description: Letters and draft copies of NIAB's original Trust Deed. Includes detailed correspondence with Stafford Cripps.

Title: 6 – Revision of Trust Deed 1950-1954

References: C-5.6

Covering Dates: 1950-1954

Extent and Medium: 1 file of less than 100 pages.

Description: Council minutes and papers relating to the proposed revision of the Trust Deed.

Title: 7 – Notes by Mr Lawrence Weaver on visit to Denmark and Sweden in July, 1919

References: C-5.7

Covering Dates: 1919-1920

Extent and Medium: 1 file of less than 50 pages.

Description: Reports from Lawrence Weaver, Mr G.P. Miln and Mr S.F. Armstrong on what they found when touring plant breeding and seed testing stations in Sweden and Denmark in preparation for building NIAB.

Title: 8 - Constitution

References: C-5.8

Covering Dates: 1921-1923

Extent and Medium: 1 file of less than 100 pages.

Description: Contains memoranda and reports on the founding of NIAB. These papers appear to have been collected together from various parts of the organisation. Contains lists of fellows and statutes relating to their election.

Title: 9 – NIAB Miscellaneous Memos No. 1 Description of Institute, 10/10/1921.

References: C-5.9

Covering Dates: 1921

Extent and Medium: 1 file less than 50 pages.

Description: Draft memorandum on the objects and constitution of NIAB.

Title: 10 – Donations and Subscriptions 1917-1921

References: C-5.10

Covering Dates: 1914-1921

Extent and Medium: 1 folder of less than 150 pages.

Description: Correspondence relating to the donations and subscriptions taken up with NIAB. Also some discussion of its tax status as a charitable institution.

Title: 11 – Correspondence 1918-1920

References: C-5.11

Covering Dates: 1918-1920

Extent and Medium: 1 folder of less than 150 pages.

Description: Correspondence relating to the establishment of NIAB. Much from Lawrence Weaver.

Title: 12 – NIAB Crest

References: C-5.12

Covering Dates: 1919-1920

Extent and Medium: 1 envelope inside 1 file.

Description: Original mock-ups of NIAB's crest.

Title: 13 – Records – NIAB visit to Denmark and Sweden 1919

References: C-5.13

Covering Dates: 1919-1920

Extent and Medium: 1 small notebook and 1 card-bound report all in 1 folder.

Description: Mr A.E.K. Wherry kept a personal journal when travelling with the NIAB party to Denmark and Sweden in 1919. It is full of photographs, autographs and clippings from the journey. Includes a letter from E.K. Wherry, the former's son, who sent this journal into NIAB to be kept in the archive, and a photograph of A.E.K. Wherry to help with identification. The card-bound report was made some time later, and attempts to supplement the information in the original journal, with some indications of those in the photographs.

Title: 14 – Letter from David Lloyd George

References: C-5.14

Covering Dates: 1921

Extent and Medium: 1 letter in a file.

Description: Letter signed by David Lloyd George, asking to be enrolled amongst the first of the Institute's Fellows. File also includes a copy of NIAB's seal-stamp which was found near the letter.

Title: 15 – N.I.A.B. Capital and Maintenance Accounts Rothamsted

References: C-5.15

Covering Dates: 1912-1918

Extent and Medium: 1 file of less than 50 pages.

Description: Correspondence and reports exchanged between NIAB and Rothamsted Experimental Station. When founding the Institute, Lawrence Weaver contacted E.J. Russell of Rothamsted for copies of their latest accounts, to provide a basis for the proposed activities at NIAB.

Title: 16 – Relations with Camb. Plant Breeding Institute

References: C-5.16

Covering Dates: 1918

Extent and Medium: 1 file of less than 50 pages.

Description: Correspondence relating to the founding of NIAB and its relationship with the Cambridge Plant Breeding Institute.

Title: 17 – Record of Members of Council

References: C-5.17

Covering Dates: 1919-1984

Extent and Medium: 1 large notebook inside 1 folder.

Description: Alphabetised records of those who had been made members of Council, who they represented and when they ceased to remain on the Council. Includes numerous cuttings from newspaper obituaries when Council members had died.

Title: 18 – Funeral of King George VI

References: C-5.18

Covering Dates: 1952

Extent and Medium: 1 page inside a file.

Description: This loose memo records arrangements for the day of the funeral of King George VI.

Title: 19 – Verinder Correspondence

References: C-5.19

Covering Dates: 1926

Extent and Medium: 1 file of less than 20 pages.

Description: Correspondence regarding the dismissal of Miss Verinder, an OSTS analyst, after she failed to prevent possible hanky panky at a NIAB/OSTS dance.

Title: 20 – Appointment of Deputy Director

References: C-5.20

Covering Dates: 1959

Extent and Medium: 1 file of less than 20 pages.

Description: Multiple copies of the advertisement for the position and its description.

Title: 21 – Council Paper No. 443

References: C-5.21

Covering Dates: 1959

Extent and Medium: 1 file of less than 20 pages.

Description: Council paper for Council meeting 29/10/1959 with list of fellows.

Title: 22 – Notes taken at a meeting following the Council Meeting held on the 23rd April, 1959

References: C-5.22

Covering Dates: 1959

Extent and Medium: 1 file of less than 20 pages.

Description: Minutes as described.

Title: 23 – Drawing and Photograph of field implement

References: C-5.23

Covering Dates: c.1950

Extent and Medium: 1 drawing and 2 photographs inside 1 file.

Description: Design and photographs of a field weighing device (sometimes referred to as the dinosaur) for the efficient and repeated weighing of plant matter.

Title: 24 – Order for seed despatch from Hasler to NIAB

References: C-5.24

Covering Dates: 1925

Extent and Medium: 1 small postal order inside a file.

Description: Postal order for stocks of Yeoman II from Hasler and Company to NIAB.

Title: 25 – Death of the Director

References: C-5.25

Covering Dates: 1938

Extent and Medium: 1 memo inside 1 file.

Description: Short memo recording the death of W.H. Parker and arrangements for the funeral.

Title: 26 – Victory Celebrations

References: C-5.26

Covering Dates: 1945

Extent and Medium: 1 memo inside 1 file.

Description: Short memo recording arrangements for the two day national holiday given over to celebrate the end of the Second World War.

Title: 27 – Misc. internal office notices

References: C-5.27

Covering Dates: 1932-1957

Extent and Medium: 9 short memos in 1 file.

Description: Collection of office memos relating to internal requests and notifications of decisions regarding events, including those of the funeral of King George V in 1936.

Title: 28 – Agreements for Growing

References: C-5.28

Covering Dates: 1940-1941

Extent and Medium: Fewer than 10 pages inside 1 file.

Description: Agreements and contracts between NIAB and their growers for a number of crops.

Title: 29 – Inventory of Trial Ground Equipment

References: C-5.29

Covering Dates: 1938

Extent and Medium: 1 page inside 1 file.

Description: Inventory as described for the year 1938.

Title: 30 – N.I.A.B. 387 Agricultural Trade Associations

References: C-5.30

Covering Dates: 1924

Extent and Medium: 1 file of less than 50 pages.

Description: Lists of the members of the Agricultural Seed Trade Associations whom NIAB might be able to contact to become Fellows.

Title: 31 – Royal Visit to Cambridge

References: C-5.31

Covering Dates: 1921

Extent and Medium: 1 folder of less than 100 pages.

Description: Letters, press cuttings, and photographs relating to the official Royal opening of NIAB in 1921.

Title: 32 – Royal Visit 1969

References: C-5.32

Covering Dates: 1968-1969

Extent and Medium: 1 file of less than 50 pages.

Description: Internal letters and reports relating to the visit of Queen Elizabeth II to NIAB upon its fiftieth anniversary.

Title: 33 – Royal Visit (1969)

References: C-5.33

Covering Dates: 1969

Extent and Medium: 1 folder of fewer than 150 pages.

Description: Arrangements for the royal visit, colour proofs of photographs, letters relating to the same, press notices and associated material.

Title: 34 – Organisation Committee

References: C-5.34

Covering Dates: 1923

Extent and Medium: 1 file of fewer than 50 pages.

Description: Letters and reports relating to the 'Organisation Committee' – established to discuss the best ways to arrange NIAB Council business, its methods and conduct, and the work of the Institute's committees.

Title: 35 – The Work and Organization of the N.I.A.B.

References: C-5.35

Covering Dates: 1932

Extent and Medium: 1 file of less than 50 pages.

Description: 1 annotated copy of the report 'The Work and Organization of the N.I.A.B.' sent to the Ministry of Agriculture in April 1932.

Title: 36 – Special Meeting of Council et al.

References: C-6.36

Covering Dates: 1928-1966

Extent and Medium: 1 file of between 150-200 pages.

Description: 6 sets of papers.

- The first relates to the Special Meeting of Council – Certification Standards (1966).
- The second relates to Variability of Cereal Varieties (1966)
- The third relates to Minutes of the Executive Committee (48-54)
- The fourth relates to Minutes of Executive Sub-Committee (1-3)
- The fifth relates to Report of Executive Committee (1928-1930)
- The sixth relates to Minutes of Council (54-62)

Title: 37 – Publications Working Party

References: C-6.37

Covering Dates: 1976

Extent and Medium: 1 file of less than 50 pages.

Description: Minutes of the working party assembled to discuss how best to disseminate NIAB results and the best way to publish NIAB work in general.

Title: 38 – Seeds Advisory Conference

References: C-6.38

Covering Dates: 1940-1941

Extent and Medium: 1 file of fewer than 50 pages.

Description: Reports and correspondence relating to the meetings held across this period. They were arranged in accordance with the Ministry of Agriculture.

Title: 39 – Report on a meeting of the Special Committee Appointed by the Council to consider the Visiting Group Report

References: C-6.39

Covering Dates: 1964

Extent and Medium: 1 file of fewer than 50 pages.

Description: As described in the title.

Title: 40 – Visiting Group Special Committee

References: C-6.40

Covering Dates: 1963-1964

Extent and Medium: 1 file of between 50-100 pages.

Description: Reports and correspondence between NIAB and the Ministry of Agriculture referring to the report of the Visiting Group that inspected NIAB in 1961.

Title: 41 – J.R.G. Working Party on Staff

References: C-6.41

Covering Dates: 1968

Extent and Medium: 1 file of fewer than 50 pages.

Description: Letters and reports of this working party. Draft press notices regarding proposed changes to NIAB after the report of the Joint Review Group.

Title: 42 – Special Committee

References: C-6.42

Covering Dates: 1964-1966

Extent and Medium: 1 file of between 50-100 pages.

Description: Reports and minutes of Special Committee on costings, brought together to discuss the report of the Joint Review Group that inspected the Institute in 1961.

Title: 43 – 1956 Visiting Group Report et al.

References: C-6.43

Covering Dates: 1956-1961

Extent and Medium: 1 file of between 50-100 pages.

Description: There are 3 sets of papers.

- 1956 Visiting Group Report.
- Brief for 1961 Visiting Group.
- 1961 Visiting Group Report.

Title: 44 – Visiting Group Report and 1970 Trust Deed

References: C-6.44

Covering Dates: 1961-1967

Extent and Medium: 2 full reports (both bound), some loose sheets, all in 1 folder.

Description: Contains a copy of the report of the 1961 Visiting Group, Report on the Joint Review Group 1966/1967 and the agreement between NIAB and the Controller of Plant Variety Rights, alongside some loose copies of early NIAB Council meetings.

Title: 45 – Reactions to the Special Meet. Of Fellows Dec 1969

References: C-6.45

Covering Dates: 1968-1969

Extent and Medium: 1 file between 100-150 pages.

Description: Reports and correspondence relating to the arrangement of this special meeting.

Title: 46 – Press References to JRG Report

References: C-6.46

Covering Dates: 1966-1969

Extent and Medium: 1 file of fewer than 50 pages.

Description: Cuttings from newspaper and magazine articles relating to the proposed changes following the report of the Joint Review Group.

Title: 47 – JRG 1966

References: C-6.47

Covering Dates: 1966-1967

Extent and Medium: 1 file of between 150-200 pages.

Description: Papers relating to the Joint Review Group (1966). Index includes:

- History and constitution.
- Method of Government Support.
- N.I.A.B. Staff. Terms and Conditions of Service.
- Functions and work of the technical branches of the Institute.
- Costings.
- Land Buildings.
- The effect of the Plant Varieties and Seeds Act 1964 on the work of the Institute.
- The National Seed Development Organisation.
- Relations between N.I.A.B. and other organisations in the United Kingdom.
- The principal recommendations of the 1961 Visiting Group and the action take or proposed in connection with them.
- Present arrangements and future developments – Official Seed Testing Station.
- The work of N.I.A.B. in relation to International Organisations.
- Proposals for the future of the National Institute of Agricultural Botany.
- Integration of N.I.A.B. staff with the Ministry.
- Future scope of plant pathology at the National Institute of Agricultural Botany.
- Future scope of work involving statistical analysis and the use of computers at the National Institute of Agricultural Botany.
- Future glasshouse requirements of the Institute.

Title: 48 – JRG Future Status

References: C-6.48

Covering Dates: 1966-1969

Extent and Medium: 1 file of between 150-200 pages.

Description: Detailed proposals from heads of branches regarding NIAB's future in light of the report of the Joint Review Group. Correspondence relating to the same.

Title: 49 – JRG General Correspondence

References: C-6.49

Covering Dates: 1968-1969

Extent and Medium: 1 file of between 150-200 pages.

Description: Correspondence from all interested parties relating to the report of the Joint Review Group and the proposed future changes to NIAB.

Title: 50 – Crop Conference 1968

References: C-6.50

Covering Dates: 1968

Extent and Medium: 1 file of fewer than 20 pages.

Description: Summaries of that morning's papers.

Title: 51 – Committee on Transactions in Seeds

References: C-7.51

Covering Dates: 1955-c1960

Extent and Medium: 1 report of between 100-150 pages alongside a collection of fewer than 50 loose papers.

Description: Draft report of the Committee on Transactions in Seeds, which had been formed by the government in 1954. Also contains correspondence and reports with NIAB about the same.

Title: 52 – Staff Inspection Reports

References: C-7.52

Covering Dates: 1971-1982

Extent and Medium: 9 reports all in 1 folder.

Description: Various reports of inspections conducted by the Ministry of Agriculture into the staff across the branches of NIAB during this period.

Title: 53 – Plant Varieties and Seeds Journal Correspondence

References: C-7.53

Covering Dates: 1992-1995

Extent and Medium: 1 file of between 100-150 pages.

Description: Correspondence between NIAB and publishers of the journal *Plant Varieties and Seeds* (formally the *Journal of the National Institute of Agricultural Botany*), regarding possible publications and arrangements for the inclusion of figures.

Title: 54 – NIAB Journal – Commercial Publication

References: C-7.54

Covering Dates: 1984-1987

Extent and Medium: 1 file of between 150-200 pages.

Description: Correspondence between NIAB and the publishers of the journal *Plant Varieties and Seeds* (formally the *Journal of the National Institute of Agricultural Botany*).

Title: 55 – Journal of Plant Varieties and Seeds Editorial and Advisory Boards

References: C-7.55

Covering Dates: 1987-1988

Extent and Medium: 1 file of between 100-150 pages.

Description: Correspondence as titled.

Title: 56 – Publications – Plant Varieties and Seeds; Policy/subscriptions/costs etc.

References: C-7.56

Covering Dates: 1989-1993

Extent and Medium: 1 file of between 150-200 pages.

Description: Correspondence as titled.

Title: 57 – The Harvest Thresher: Report of National College of Agricultural Engineering

References: C-7.57

Covering Dates: 1966

Extent and Medium: 1 bound report of around 100 pages and a letter all in 1 file.

Description: This report was prepared by E.S.B. Southcombe and contains extensive photographs of various designs of this machine. The envelope of the attached letter is dated 29/11/1972, while the letter explains that the report had been found by a Mr E.A. Sollars (retired photographer) who decided to send it to NIAB as perhaps the best place to keep it, as it was concerned with agricultural matters.

Title: 58 – A Report of Conference on Herbage Seed Production (1959)

References: C-7.58

Covering Dates: 1959

Extent and Medium: 1 reprint of a report published in the *Journal of the National Institute of Agricultural Botany*.

Description: Report of conference that took place in 1958 at the Cambridge Guildhall in conjunction between NIAB and the British Seeds Council.

Title: 59 – Scrap Book 1975-1986

References: C-7.59

Covering Dates: 1975-1979

Extent and Medium: 1 bound notebook with inserts, around 200 pages.

Description: A scrap book of newspaper and magazine cuttings relating to the work of NIAB (in particular its work with vegetable crops) donated to the archive by an unknown employee.

Title: 60 – Annual Reports and Accounts

References: C-8.60

Covering Dates: 1920-1971

Extent and Medium: 45 annual report booklets (2 copies of each equating to 90 booklets) all in 1 box.

Description: These are the published annual reports and accounts of the Institute, giving an overview of that year's works and development. Certain volumes are missing. These include: 16, 17, 18, 19 and 22.

Title: 61 – Veg Section Press Cuttings

References: C-8.61

Covering Dates: 1990-2000

Extent and Medium: 1 red ring binder folder.

Description: Press Cuttings donated to the NIAB archive by Mike Day, former NIAB Vegetable expert.

Title: 62 – Scrapbook 1

References: C-8.62

Covering Dates: 1986-1989

Extent and Medium: 1 blue ring binder folder.

Description: Press Cuttings donated to the NIAB archive by an unknown donor.

Title: 63 – Scrapbook 2

References: C-8.63

Covering Dates: 1999-2000

Extent and Medium: 1 green ring binder folder.

Description: Press Cuttings donated to the NIAB archive by an unknown donor.

Title: 64 – Joint Review Group 1966-67

References: C-8.64

Covering Dates: 1966-1968

Extent and Medium: 1 file of around 200 pages.

Description:

Title: 65 – Joint Review Group Draft Papers Returned by MAFF

References: C-8.65

Covering Dates: 1966

Extent and Medium: 1 folder of around 100-150 pages.

Description: Folder as described.

Title: 66 – Papers Relating to the NIAB archive

References: C-8.66

Covering Dates: C1980

Extent and Medium: 1 folder of around 30 pages.

Description: Folder as described.

Title: 67 – Enquiry about the history of a NIAB Landover

References: C-8.67

Covering Dates: 2009

Extent and Medium: 1 envelope.

Description: As described.

Title: 68 – Poster for a NIAB football match against delegates from Moldova.

References: C-8.68

Covering Dates: ?

Extent and Medium: 1 page inside 1 folder.

Description: As described.

Title: Trialling and Multiplication Collection

References: T

Covering Dates: 1915-2011

Extent and Medium: 9 Boxes, 1 cardboard tube and 4 oversized notebooks not able to fit inside a box.

Description: These files relate to the scientific activity pursued by NIAB, which is best summarised as Trialling and Multiplication. In this collection there can be found trial books, plant museum entry books, results of trialling, papers relating to the scientific committees of the Institute and other items related to the commercial/scientific world in which NIAB operated. Of particular interest are the almost complete set of Ormskirk Trialling and Note Books from between 1919 and 1940 (See T5, T6, T7).

Title: 1 – Crop Improvement Committee Papers

References: T-1

Covering Dates: 1921-1929

Extent and Medium: 92 files, the majority of 10 pages or fewer, all in 1 box.

Description: The Crop Improvement Committee was the primary committee for NIAB's trialling work (other than potatoes). These papers (Nos. 2-93) relate to the work of that committee throughout this period and should be read in conjunction with the Crop Improvement Committee Minutes (T-1.2).

Title: 2 – Crop Improvement Committee Minutes

References: T-1.2

Covering Dates: 1921-1929

Extent and Medium: 3 folders, each of around 100 pages.

Description: The Crop Improvement Committee was the primary committee for NIAB's trialling work (other than potatoes). The first folder relates to meetings from between November 1921 and September 1924. The second folder relates to meetings from between September 1924 and December 1929. The third folder includes the handwritten copies of minutes for Nov 1921-Sep 1929 copied from a book that had been stolen. These should be read in conjunction with Crop Improvement Committee Papers (T-1).

Title: 3 – Seed Production Committee Minutes

References: T-2.3

Covering Dates: 1942-1960

Extent and Medium: 1 notebook and some loose papers, inside 1 folder.

Description: These minutes relate to the Seed Production Committee, established according to a request by the Ministry of Agriculture during the Second World War. The notebook includes minutes of both the Seed Production Committee and its specialist subcommittees (i.e. Root and Vegetable Seed etc.) The period it covers includes February 1942 to March 1943. The loose sheets are minutes for the same committee across the period of September 1954 to October 1960.

Title: 4 – Seed Production Committee Herbage Section Minutes and Seed Prices Sub-Committee Minutes

References: T-2.4

Covering Dates: 1942-1950

Extent and Medium: 2 notebooks inside 1 file.

Description: These two notebooks are as described, and relate to Committees organised under the oversight of the Seed Production Committee (see T-2.3).

Title: 5 – Cereal Synonym Committee Minutes and Papers

References: T-2.5

Covering Dates: 1930-1958

Extent and Medium: 1 notebook and some loose papers, inside 1 folder.

Description: The Cereal Synonym Committee was formed in 1930 and met regularly up to 1937. Afterward, some meetings were convened to discuss the problem but only on occasion. The notebook in this folder contains the handwritten copies of these minutes, while the loose sheets of paper include the surviving paper copies and committee papers.

Title: 6 – Standing Joint Advisory Committee Minutes

References: T-2.6

Covering Dates: 1937-1943

Extent and Medium: 1 notebook inside 1 folder.

Description: The full name of this Committee 'The Standing Joint Advisory Committee on Relations with the Seed Trade' provides a better context for its formation in 1937. In order to discuss problems that the agricultural seed trade had with NIAB's practices, this Committee was formed and met on occasion throughout this period. This notebook contains the handwritten minutes of those meetings.

Title: 7 – CTAC Minutes 1959-1989

References: T-2.7

Covering Dates: 1959-1988

Extent and Medium: 1 file of around 200 pages.

Description: The Cereal Trials Advisory Committee was formed to discuss developments in NIAB's trialling methodology and the dissemination of these results in relation to cereals crops in particular. These are the paper copies of the minutes of that Committee. This Committee also made decisions regarding varieties on the Recommended Lists.

Title: 8 – CTAC Minutes June 82 to Nov 2001 (the end!)

References: T-2.8

Covering Dates: 1982-2001

Extent and Medium: 1 file of around 200 pages.

Description: The Cereal Trials Advisory Committee was formed to discuss developments in NIAB's trialling methodology and the dissemination of these results in

relation to cereals crops in particular. These are the paper copies of the minutes of that Committee. This Committee also made decisions regarding varieties on the Recommended Lists.

Title: 9 – Vegetable Trials Advisory Committee Minutes

References: T-2.9

Covering Dates: 1935-1953

Extent and Medium: 1 notebook of around 60 pages (used) inside 1 folder.

Description: The Vegetable Trials Advisory Committee was formed to discuss developments in NIAB's trialling methodology and the dissemination of these results in relation to vegetable crops in particular. This notebook contains the handwritten minutes of this committee. This Committee also made decisions regarding varieties on the Recommended Lists.

Title: 10 – Minutes of Trials Sub-Station Sub-Committee (Dissolved) and Root Trials Advisory Committee. P. 30.

References: T-2.10

Covering Dates: 1924-1941

Extent and Medium: 1 notebook of around 40 pages (used) in 1 folder.

Description: The Trials Sub-Station Sub-Committee was convened between 1924 and 1926, the first 25 pages of this notebook contain the handwritten minutes of its meetings. From page 30 onwards this notebook contains the minutes of the Root Trials Advisory Committee, from between 1933 and 1941.

Title: 11 – Miscellaneous Papers of the Cereals and Yield Trials Committee

References: T-3.11

Covering Dates: 1921-192?

Extent and Medium: 7 files of no more than 20 pages each, all in 1 file.

Description: Papers 1-7 of the Cereals and Yield Trials Committee.

Title: 12 – Potato Trials Policy

References: T-3.12

Covering Dates: 1953-1955

Extent and Medium: 1 file of less than 50 pages.

Description: Internal reports and correspondence relating to the conduct of potato trials.

Title: 13 – Root and Fodder Trials Advisory Committee

References: T-3.13

Covering Dates: 1953-1977

Extent and Medium: 1 file of fewer than 200 pages.

Description: These are the minutes of the described committee across this period, interspersed with relevant correspondence and papers.

Title: 14 – A.R.C. Technical Committee on Cereal Research- Working Party on Cereal Diseases

References: T-3.14

Covering Dates: 1969-1972

Extent and Medium: 1 file of 100-150 pages.

Description: Minutes and papers on this Agricultural Research Council working party.

Title: 15 – NI/14 Cereal Working Party Minutes

References: T-3.15

Covering Dates: 1977-1979

Extent and Medium: 1 file of around 100-150 pages.

Description: Minutes of this Working party, internal to NIAB, between its 39th and 45th meetings.

Title: 16 – Lord Derby Gold Medal Committee Minutes

References: T-3.16

Covering Dates: 1926-1949

Extent and Medium: 1 notebook (water damaged) inside 1 folder.

Description: The Lord Derby Gold Medal Committee issued this award annually to the breeders of potato varieties believed to be worthy of high recommendation. These are the handwritten (and some typed) minutes for that committee.

Title: 17 – Minutes – Lord Derby Gold Medal Committee

References: T-3.17

Covering Dates: 1925-1956

Extent and Medium: 1 notebook inside 1 folder.

Description: The Lord Derby Gold Medal Committee issued this award annually to the breeders of potato varieties believed to be worthy of high recommendation. These are the handwritten (and some typed) minutes for that committee. While many of the entries therefore duplicate those to be found in T-3.16, this notebook contains minutes over a longer period and is interleaved with relevant correspondence.

Title: 18 – Costs of Trials at ADAS Centres

References: T-3.18

Covering Dates: 1973-1979

Extent and Medium: 1 file of around 200 pages.

Description: NIAB came to work in conjunction with the Agricultural Development Advisory Service when planning its national trials. ADAS was initially formed as the National Agricultural Advisory Service in 1946, and its staff were employed to consult with farmers across Britain, attempting to change their methods and understand the kinds of assistance they need. It became ADAS in 1971. File contents relate to changes in arrangements between NIAB and this organisation, how trials are funded, etc.

Title: 19 – Potato Committee Papers and Ormskirk Committee Papers

References: T-3.19

Covering Dates: 1921-1929

Extent and Medium: 1 large red-spine book.

Description: Both of these committees were responsible for NIAB's potato trialling and virus testing work. Ormskirk was the location for NIAB's potato testing station, which it had inherited from the Ministry of Agriculture upon the Institute's foundation. The inside of the book's cover provides an index to the contents.

Title: 20 – Potato Committee Minutes

References: T-3.20

Covering Dates: 1919-1921

Extent and Medium: 1 notebook inside 1 folder.

Description: Partial records of minutes and papers of this committee across this period.

Title: 21 – Sainfoin Trials 1934-1959

References: T-4.21

Covering Dates: 1934-1959

Extent and Medium: 9 trial books (and some loose sheets) all inside 1 box file.

Description: Trial books for Sainfoin across the dates described.

Title: 22 – Lucerne Trials

References: T-4.22

Covering Dates: 1938-1959

Extent and Medium: less than 50 pages inside 1 box file.

Description: Results of Lucerne trials and some graphs analysing the results.

Title: 23 – Primary Spring Wheat 1949-1955

References: T-4.23

Covering Dates: 1948-1955

Extent and Medium: 1 box file holding around 200 pages.

Description: Analysis sheets for Spring Wheat varieties, arranged according to year and kept in chronological order.

Title: 24 – Spring Wheats Primary Results From 1945

References: T-4.24

Covering Dates: 1945-1988

Extent and Medium: 1 file of around 150 pages.

Description: Analysis sheets for Spring Wheat varieties, organised chronologically.

Title: 25 – Potato Trials at Ormskirk 1915

References: T-5.25

Covering Dates: 1915

Extent and Medium: 1 notebook inside 1 folder.

Description: Original trial book from Ormskirk prior to its being taken over by NIAB, inscribed by John Snell.

Title: 26 – Minutes of Potato Committee

References: T-5.26

Covering Dates: 1921-1928

Extent and Medium: 1 notebook (90 pages used) inside 1 folder.

Description: Notebook containing the handwritten minutes of this committee throughout the period.

Title: 27 – Potato Advisory Committee

References: T-5.27

Covering Dates: 1949

Extent and Medium: 1 notebook (about 6 pages used) inside 1 folder.

Description: Contains only the minutes to the first meeting of this committee.

Title: 28 – Ormskirk account book

References: T-5.28

Covering Dates: 1920-1940

Extent and Medium: 1 notebook inside 1 folder.

Description: Account book detailing inputs into the Ormskirk station.

Title: 29 – Potato Trials Books – Maincrop Varieties (1976)

References: T-5.29

Covering Dates: 1976

Extent and Medium: 4 notebooks inside 1 folder.

Description: Each notebook corresponds to a different trial site; Kent, Cornwall, Yorkshire East Riding and Rickwood.

Title: 30 – Main Crop Trial 1981 H. Adams

References: T-5.30

Covering Dates: 1981

Extent and Medium: 1 notebook inside 1 folder.

Description: Trial book for Harper Adams potato trial in 1981.

Title: 31 – Ormskirk Trialling and Note Books

References: T-5.31

Covering Dates: 1915-1918

Extent and Medium: 4 notebooks inside 1 folder

Description: These small notebooks were maintained by organisers at Ormskirk (the earliest being John Snell before his death in 1920), and give some details as to the work conducted at Ormskirk during the periods indicated.

Title: 32 – Ormskirk Trialling and Note Books

References: T-5.32

Covering Dates: 1919

Extent and Medium: 4 notebooks inside 1 folder.

Description: These small notebooks were maintained by organisers at Ormskirk (the earliest being John Snell before his death in 1920), and give some details as to the work conducted at Ormskirk during the periods indicated.

Title: 33 – Ormskirk Trialling and Note Books

References: T-5.33

Covering Dates: 1921

Extent and Medium: 4 notebooks inside 1 folder.

Description: These small notebooks were maintained by organisers at Ormskirk (the earliest being John Snell before his death in 1920), and give some details as to the work conducted at Ormskirk during the periods indicated.

Title: 34 – Ormskirk Trialling and Note Books

References: T-6.34

Covering Dates: 1922-1923

Extent and Medium: 5 notebooks inside 1 folder.

Description: These small notebooks were maintained by organisers at Ormskirk (the earliest being John Snell before his death in 1920), and give some details as to the work conducted at Ormskirk during the periods indicated.

Title: 35 – Ormskirk Trialling and Note Books

References: T-6.35

Covering Dates: 1924

Extent and Medium: 5 notebooks inside 1 folder.

Description: These small notebooks were maintained by organisers at Ormskirk (the earliest being John Snell before his death in 1920), and give some details as to the work conducted at Ormskirk during the periods indicated.

Title: 36 – Ormskirk Trialling and Note Books

References: T-6.36

Covering Dates: 1925

Extent and Medium: 4 notebooks inside 1 folder.

Description: These small notebooks were maintained by organisers at Ormskirk (the earliest being John Snell before his death in 1920), and give some details as to the work conducted at Ormskirk during the periods indicated.

Title: 37 – Ormskirk Trialling and Note Books

References: T-6.37

Covering Dates: 1926

Extent and Medium: 3 notebooks inside 1 folder.

Description: These small notebooks were maintained by organisers at Ormskirk (the earliest being John Snell before his death in 1920), and give some details as to the work conducted at Ormskirk during the periods indicated.

Title: 38 – Ormskirk Trialling and Note Books

References: T-6.38

Covering Dates: 1927-1928

Extent and Medium: 4 notebooks inside 1 folder.

Description: These small notebooks were maintained by organisers at Ormskirk (the earliest being John Snell before his death in 1920), and give some details as to the work conducted at Ormskirk during the periods indicated.

Title: 39 – Ormskirk Trialling and Note Books

References: T-6.39

Covering Dates: 1929-1930

Extent and Medium: 4 notebooks inside 1 folder.

Description: These small notebooks were maintained by organisers at Ormskirk (the earliest being John Snell before his death in 1920), and give some details as to the work conducted at Ormskirk during the periods indicated.

Title: 40 – Ormskirk Trialling and Note Books

References: T-7.40

Covering Dates: 1931-1932

Extent and Medium: 4 notebooks inside 1 folder.

Description: These small notebooks were maintained by organisers at Ormskirk (the earliest being John Snell before his death in 1920), and give some details as to the work conducted at Ormskirk during the periods indicated.

Title: 41 – Ormskirk Trialling and Note Books

References: T-7.41

Covering Dates: 1933

Extent and Medium: 2 notebooks inside 1 folder.

Description: These small notebooks were maintained by organisers at Ormskirk (the earliest being John Snell before his death in 1920), and give some details as to the work conducted at Ormskirk during the periods indicated.

Title: 42 – Ormskirk Trialling and Note Books

References: T-7.42

Covering Dates: 1934

Extent and Medium: 2 notebooks inside 1 folder.

Description: These small notebooks were maintained by organisers at Ormskirk (the earliest being John Snell before his death in 1920), and give some details as to the work conducted at Ormskirk during the periods indicated.

Title: 43 – Ormskirk Trialling and Note Books

References: T-7.43

Covering Dates: 1935-1937

Extent and Medium: 4 notebooks inside 1 folder.

Description: These small notebooks were maintained by organisers at Ormskirk (the earliest being John Snell before his death in 1920), and give some details as to the work conducted at Ormskirk during the periods indicated.

Title: 44 – Ormskirk Trialling and Note Books

References: T-7.44

Covering Dates: 1938

Extent and Medium: 3 notebooks inside 1 folder.

Description: These small notebooks were maintained by organisers at Ormskirk (the earliest being John Snell before his death in 1920), and give some details as to the work conducted at Ormskirk during the periods indicated.

Title: 45 – Ormskirk Trialling and Note Books

References: T-7.45

Covering Dates: 1939-1940

Extent and Medium: 5 notebooks inside 1 folder.

Description: These small notebooks were maintained by organisers at Ormskirk (the earliest being John Snell before his death in 1920), and give some details as to the work conducted at Ormskirk during the periods indicated.

Title: 46 – Previous Recorders Conferences

References: T-7.46

Covering Dates: 1926-1939

Extent and Medium: 1 file of between 50-100 pages.

Description: Reports on the annual Crop Recorder's Conferences, including notes for speeches and some papers relating to trialling technique. Also some trial plot layout information.

Title: 47 – Crop Recorders Conferences

References: T-7.47

Covering Dates: 1946-1959

Extent and Medium: 1 file of fewer than 50 pages.

Description: Reports on the annual Crop Recorder's Conferences, including notes for speeches and some papers relating to trialling technique. Also some trial plot layout information.

Title: 48 – Soil Series 1951-1955

References: T-7.48

Covering Dates: 1948-1955

Extent and Medium: 1 file of around 50 pages.

Description: Contains maps and details of surveys conducted on NIAB trialling land. Analytic data of chemical tests conducted on soil throughout.

Title: 49 – Letter to Dr. F. Earnshaw (Economic Botanist at NIAB)

References: T-7.49

Covering Dates: 1947

Extent and Medium: 1 file of less than 10 pages.

Description: Correspondence between Earnshaw and Mr Rose about a recent article written by the former, and an incidence of the disease in question experienced by the latter.

Title: 50 – Bagging samples for certification purposes

References: T-7.50

Covering Dates: 1966

Extent and Medium: 1 file of fewer than 10 pages.

Description: Short report describing the difficulties and problems arising from the bagging of small samples of seeds.

Title: 51 – Population studies with Majestic Potatoes in rows and in beds

References: T-7.51

Covering Dates: 1968

Extent and Medium: 1 file containing a journal article reprint.

Description: Reprint of an article written by R.H.Jarvis and F.E.Shotton in *Experimental Husbandry* no.16 (1968)

Title: Variety museum books

References: T-8

Covering Dates: 1919-1970

Extent and Medium:

Description: This box contains all the surviving arrivals books for varieties as they were submitted or sent to NIAB. There are 11 books.

- The first is titled 'N.I.A.B. Reference Book of Manager of Field Plots. It covers entries between 1918 and 1966 with their reference number, source of seed and remarks about their appearance or where they will be sent next (museum, trial, etc.)
- The second is blank, with a brown (flaking) spine and dark green cover. On the inside cover it is titled 'Register recording the receipt of seeds by the Manager of Field Plots. Commenced:-1922.' Records up to 1936.
- The third is titled 'H Book No.2' and contains entries for varieties of Herbage plants brought to NIAB between 1957 and 1963.
- The fourth is titled 'Peas OFW 1953' and contains varieties of peas submitted to NIAB between 1952 and 1953. Has descriptions of each and drawings of important features.
- Fifth and sixth are two small red notebooks titled 'Museum Barleys'. One covers A-I and the other J-Z. These give details as to varietal pedigrees and origins.
- The seventh is a small notebook titled 'Museum Oats 1968-1969' and is as described.
- The eighth is titled 'Museum Barley 1969-1970' and is as described.
- The ninth is titled 'Cage Book Oats 1966' and is as described.

- The tenth is a small green notebook with no title or inscription. It contains information on varieties of Barley, Beans, Flax, Grass, Linseed, Maize, Oats, Peas, Wheat, Rye and Veches. Dates seem to range from between 1924 and 1955.
- The eleventh is inscribed Cereal Section and covers the period 1968-1971. An extensive list of museum wheats is also inserted amongst the pages.

Title: 52 – Contracts for growing

References: T-9.52

Covering Dates: 1940-1947

Extent and Medium: 6 envelopes inside 1 folder

Description: These envelopes include copies of the contracts made with private farmers to multiply stocks of NIAB seed during this period. They include details as to location, varietal type and acreage.

Title: 53 – Varieties of Potatoes with their Synonyms

References: T-9.53

Covering Dates: 1933

Extent and Medium: 1 booklet inside 1 file.

Description: This booklet was published by NIAB and is as described.

Title: 54 – Archive – Variety Descriptions Miscellaneous

References: T-9.54

Covering Dates:

Extent and Medium: 1 file of around 150 pages.

Description: Includes details of some descriptions for the Plant Varieties Rights Office c.1969.

Title: 55 – Equipment Trials Branch 1959-1966

References: T-9.55

Covering Dates: 1959-1966

Extent and Medium: 1 file of fewer than 50 pages.

Description: Correspondence and reports relating to equipment needed by Trials Branch during this period.

Title: 56 – Spring Wheats Secondary Results from 1949

References: T-9.56

Covering Dates: 1949-1984.

Extent and Medium: 1 file of less than 100 pages.

Description: Is as described.

Title: 57 – Winter Wheats Primary Results from 1945-1973

References: T-9.57

Covering Dates: 1945-1973

Extent and Medium: 1 file of between 50 – 100 pages.

Description: Is as described.

Title: 58 – Letter from K.J. Coghill re Oat Trial

References: T-9.58

Covering Dates: 2011

Extent and Medium: 1 envelope inside 1 file.

Description: Coghill, a former NAAS/ADAS employee donated this photograph of a NIAB oat variety trial, that took place in Co. Durham in 1951.

Title: 59 – Notes and Reports on Crop Inspection

References: T-9.59

Covering Dates: 1963-2012

Extent and Medium: 1 folder containing booklets and loose papers.

Description: These materials were kindly donated to the archive by Tony Crofton on 21/3/2013. They include his explanation of cereal seed inspection schemes, written in 2013. Booklets include 'The British Cereal Seed Scheme', 'The Cereal Field Approval Scheme' and the 1972 edition of 'The British Cereal Seed Scheme'. Also includes some notes for Field Inspectors.

Title: 60 – Potato Crop Inspection

References: T-9.60

Covering Dates: 1957-1967

Extent and Medium: 2 notebooks and 4 booklets all inside 1 folder.

Description: These materials were kindly donated to the archive by Tony Crofton. They include two of his own personal NIAB notebooks, one on potato identification and the other regarding the 'Rosemaund Demonstration Plots 1963-1964'. The booklets include 'Key to the Demonstration and Training Collections' (1966), 'Key for the Identification of Potato Varieties in the Field' (1957), 'Guide to the Identification of Potato Varieties' and 'Key to Potato Trials and Collections at East Craigs (1967).

Title: 61 – Field Note Books

References: T-9.61

Covering Dates: 1923-1939

Extent and Medium: 3 notebooks inside 1 folder.

Description: These three Field books are some of the only surviving examples from this very early period. The 1930 Field Book that had once belonged to D. Boyes of the Cambridge School of Agriculture was kindly donated to the archive by Valerie Silvey in 2011. The other two field books were maintained by the manager of field plots at NIAB, one is on wheat in 1923-1924 and the other on Sweet Corn Observations in 1939.

Title: 62 – Letter from John Jemmett

References: T-9.62

Covering Dates: 1971-?

Extent and Medium: 1 envelope inside a file.

Description: This personal collection of journal articles and photographs were kindly donated to the NIAB archive by John Jemmett, a retired NIAB employee, in 2011.

Title: 63 – Letter from G. Finch

References: T-9.63

Covering Dates: c1960

Extent and Medium: 1 letter and envelope inside a file.

Description: In 2006 George Finch kindly donated to NIAB an example of the labels used by the National Certifying Authority for Herbage Seeds.

Title: 64 – Pea Scales for Photos May 1953

References: T-9.64

Covering Dates: 1953

Extent and Medium: 1 box of around 50-100 photographs.

Description: Numerous photographs of peas and samples of plant matter .

Title: Eel Worm Infestation Map

References: T-10

Covering Dates: ?

Extent and Medium: 1 large map inside a cardboard tube.

Description: This map of a section of Cambridgeshire was donated to the NIAB archive by Tony Crofton.

Title: Gramineae 139 30 Avena

References: T-11

Covering Dates: ?

Extent and Medium: 1 file of fewer than 50 pages.

Description: This file includes examples of Avena (Gramineae) plants affixed to paper.

Title: Variety record books

References: T-12

Covering Dates: 1951-1967

Extent and Medium: 4 large notebooks, too large to go inside a box, and which are therefore kept on the shelf.

Description: These four large notebooks contain descriptions of herbage and grass varieties under observation.

Title: Director and Deputy Director Collection

References: D

Covering Dates: 1918-1992

Extent and Medium: 8 boxes.

Description: These documents emanated from the office of either the Director or Deputy Director of NIAB. They include the monthly reports that (aside from a period after 1930) were published by the Director explaining progress in all NIAB's efforts.

Title: 1 – Director’s Monthly Reports

References: D-1

Covering Dates: 1921-1930

Extent and Medium: Individual files for each month, all in 1 box.

Description: Written by NIAB’s first Director, Wilfred H. Parker, these monthly reports record the development of the Institute and its associated trialling stations.

Title: 2 – Director’s Monthly Reports and Unpublished Reports

References: D-2

Covering Dates: 1920-1934

Extent and Medium: 3 large red spine books, all in 1 box.

Description: These three books contain printed copies of the Director’s monthly reports. The first covers the period May 1920 to June 1926. The second covers July 1926 to February 1930. The third contains unpublished reports between 1930 and 1934. All three are quite badly water damaged, making it impossible to read some entries, while all require care.

Title: 3 – Finance Policy 1923-1937

References: D-3.3

Covering Dates: 1923-1937

Extent and Medium: 1 file between 150-200 pages.

Description: Correspondence between NIAB, various committee members, the Development Commission and the Ministry of Agriculture regarding NIAB’s funding.

Title: 4 – NSDO 1969-1973

References: D-3.4

Covering Dates: 1969-1973

Extent and Medium: 1 file between 150-200 pages.

Description: Correspondence between NIAB and the National Seed Development Organisation. Discussion of charges, inventories of equipment to be shared between the two and details of receipts from sale of seeds.

Title: 5 – RTO Conferences Reports

References: D-3.5

Covering Dates: 1970-1984

Extent and Medium: 1 file of around 200 pages.

Description: Reports of the Regional Trials Officers Conferences across this period.

Title: 6 – Joint Review Group 1968/69

References: D-3.6

Covering Dates: 1968-1969

Extent and Medium: 1 folder of around 100 pages.

Description: Reports and Correspondence relating to the report of the Joint Review Group.

Title: 7 – Joint Review Group 1966

References: D-3.7

Covering Dates: 1966

Extent and Medium: 1 folder of around 100 pages.

Description: Reports relating to the findings of the Joint Review Group, including information about the way NIAB is funded by government, staff conditions of service, functions of the Institute, etc. Some correspondence.

Title: 8 – VCU Working Party Papers

References: D-3.8

Covering Dates: 1978-1983

Extent and Medium: 1 file of around 100 pages.

Description: Papers and correspondence relating to the Value for Cultivation and Use trials working party.

Title: 9 - VCU

References: D-3.9

Covering Dates: 1978-1981

Extent and Medium: 1 file of around 50 pages.

Description: Minutes of the Value for Cultivation and Use Working Party.

Title: 10 – DUS Working Party

References: D-3.10

Covering Dates: 1978-1981

Extent and Medium: 1 file of around 50 pages.

Description: Minutes of the Distinctness, Uniformity and Stability Working Party.

Title: 11 – Visitors 1981-1983

References: D-3.11

Covering Dates: 1981-1985

Extent and Medium: 1 file of around 150 pages.

Description: Correspondence relating to those persons and organizations visiting NIAB throughout this period.

Title: 12 – ASTMS Negotiating Cttee Correspondence 1972-1982

References: D-4.12

Covering Dates: 1972-1982

Extent and Medium: 1 file of around 100 pages.

Description: Correspondence and reports of meetings between NIAB and the Association of Scientific, Technical and Managerial Staffs.

Title: 13 – UK Seed Cert Cttee Corres 1982-1985

References: D-4.13

Covering Dates: 1982-1985

Extent and Medium: 1 file of around 100 pages.

Description: Reports and correspondence relating to the work of the UK Seed Certification Committee.

Title: 14 – Correspondence – UK Seed Certification and Seed Testing Committee 10
April 1979 – June 1982

References: D-4.14

Covering Dates: 1979-1982

Extent and Medium: 1 file of around 200 pages.

Description: File is as described, though includes minutes of meetings and reports alongside correspondence.

Title: 15 – E.E.C. Seed Directives

References: D-4.15

Covering Dates: 1971-1985

Extent and Medium: 1 file of around 200 pages.

Description: Details of these European Economic Community directives and potential for UK involvement with them. Discussion of integration of national lists with a common catalogue.

Title: 16 – Science Advisory Committee

References: D-4.16

Covering Dates: 1970-1981

Extent and Medium: 1 file of around 100 pages.

Description: Minutes and correspondence of NIAB involvement with the Cambridgeshire College of Arts and Technology Scientific Advisory Committee throughout this period.

Title: 17 – N.G.D. Advisory Committee

References: D-4.17

Covering Dates: 1975-1984

Extent and Medium: 1 file of around 200 pages.

Description: Correspondence and reports relating to the National Grassland Demonstration, which NIAB worked with in an advisory capacity.

Title: 18 – Heads of Branches

References: D-4.18

Covering Dates: 1980-1983

Extent and Medium: 1 file of around 200 pages.

Description: Minutes and Agendas of the Heads of Branches meetings throughout this period.

Title: 19 – Staff - In Confidence Feb 78 – Mar 80

References: D-5.19

Covering Dates: 1978-1980

Extent and Medium: 1 file of around 150 pages.

Description: Internal communications relating to the staff, their appointments and so on.

Title: 20 – Staff - In Confidence April 1980-April 1981

References: D-5.20

Covering Dates: 1980-1981

Extent and Medium: 1 file of around 150 pages.

Description: Internal communications relating to the staff, their appointments and so on.

Title: 21 – Staff - In Confidence May 1981-Mar 82

References: D-5.21

Covering Dates: 1981-1982

Extent and Medium: 1 file of around 150 pages.

Description: Internal communications relating to the staff, their appointments and so on.

Title: 22 – Staff - In Confidence April 1982 - June 1983

References: D-5.22

Covering Dates: 1982-1983

Extent and Medium: 1 file of around 200 pages.

Description: Internal communications relating to the staff, their appointments and so on.

Title: 23 – Staff Club 1979-1985

References: D-5.23

Covering Dates: 1979-1985

Extent and Medium: 1 file of around 50 pages.

Description: Minutes of the Staff Club General Committee meetings. Reports and correspondence also relating to the Annual General Meetings and the NIAB staff newsletter.

Title: 24 – Staff Inspections Admin 1978/79

References: D-5.24

Covering Dates: 1978-1979

Extent and Medium: 1 file of around 250 pages, with an envelope of reports and some booklets interleaved.

Description: Papers and correspondence relating to the staff of the Administration Branch of the Institute.

Title: 25 – Staff Review Trials Branch

References: D-6.25

Covering Dates: 1975-1977

Extent and Medium: 1 file of less than 50 pages.

Description: File is as described.

Title: 26 – Staff Relations Sub-Committee on Restructuring

References: D-6.26

Covering Dates: 1975

Extent and Medium: 1 file of less than 50 pages.

Description: File is as described.

Title: 27 – Staff Inspections – Regional Trials Branch

References: D-6.27

Covering Dates: 1979-1983

Extent and Medium: 1 file of less than 50 pages.

Description: File is as described.

Title: 28 – Staff Appointments/Promotion (1)

References: D-6.28

Covering Dates: 1971-1978

Extent and Medium: 1 file of around 150 pages.

Description: File is as described. Includes details of meetings for appointments.

Title: 29 – Staff Appointments/Promotion (2)

References: D-6.29

Covering Dates: 1978-1984

Extent and Medium: 1 file of around 100 pages.

Description: File is as described. Includes details of meetings for appointments.

Title: 30 – F.A.O. Seed Campaigns

References: D-6.30

Covering Dates: 1982-1983

Extent and Medium: 1 file of fewer than 50 pages.

Description: Correspondence and reports relating to NIAB's involvement with the Food and Agriculture Organization.

Title: 31 – Reports of FAO Working Party

References: D-6.31

Covering Dates: 1951-1957

Extent and Medium: 1 file of around 200 pages, largely made up of bound copies of reports.

Description: File is as described.

Title: 32 – NIAB Journal 1982-1983

References: D-6.32

Covering Dates: 1982-1983

Extent and Medium: 1 folder of around 100 pages.

Description: Internal correspondence regarding the contents, editing and publication of NIAB's journal.

Title: 33 – NIAB Journal 1983-1985

References: D-6.33

Covering Dates: 1983-1985

Extent and Medium: 1 file of around 100 pages.

Description: Internal correspondence regarding the contents, editing and publication of NIAB's journal.

Title: 34 – Miscellaneous Correspondence with Director 1953-1967

References: D-6.34

Covering Dates: 1953-1967

Extent and Medium: 1 file of around 50 pages.

Description: This file brought together all the loose sheets of paper associated with the office of Director and Deputy-Director. Of particular interest are the reports and correspondence to do with the proposed costing of the Institute's activities in the 1960s.

Title: 35 – Miscellaneous correspondence regarding staff and salaries

References: D-6.35

Covering Dates: 1953-1992

Extent and Medium: 1 file of around 50 pages.

Description: This file brought together all the loose sheets of paper of relevance to the office of Director and Deputy-Director, with particular regard to staff and salaries.

Title: 36 – Ministry of Agriculture guides for Joint Departmental Whitley Council procedures

References: D-6.36

Covering Dates: 1968-1974

Extent and Medium: 3 bound reports inside 1 folder.

Description: These documents were written and published by the Ministry of Agriculture and are as described.

Title: 37 – Farming – Correspondence re: Chapter

References: D-7.37

Covering Dates: 1957

Extent and Medium: 1 file of fewer than 50 pages.

Description: Agreement and correspondence between F.R. Horne and the publishers of 'Farming' for a chapter on 'Grain Crops'.

Title: 38 – NIAB Information

References: D-7.38

Covering Dates: 1918-1968

Extent and Medium: 1 file of around 100 pages.

Description: Including a copy of the Institute's first memorandum, this file collects together some important attempts to record the Institute's history over the first 50

years, explaining its functions and role within agriculture as seen by the Director Frank Horne.

Title: 39 – Regional Centre Inspections

References: D-7.39

Covering Dates: 1973

Extent and Medium: 1 file of fewer than 50 pages.

Description: Includes a report on the Functions of the Regional Trials Officers in Wales, other papers relate to staff inspections within this period.

Title: 40 – A Report on a Visit to the United States of America under the auspices of the Mutual Security Agency 2th June to 17th August 1953.

References: D-7.40

Covering Dates: 1953

Extent and Medium: 1 file of around 50 pages.

Description: File is as described.

Title: 41 – Report of Visit to Centres of Mutation Research in Norway, Sweden, Denmark, Holland, Belgium, France, East and West Germany by P.S. Hudson and R.N.H. Whitehouse

References: D-7.41

Covering Dates: 1957-1960

Extent and Medium: 1 folder of fewer than 50 pages.

Description: File is as described, with some correspondence.

Title: 42 – F.A.O. Anderson's paper

References: D-7.42

Covering Dates: 1979-1981

Extent and Medium: 1 folder of fewer than 50 pages with a booklet.

Description: Correspondence and copies of reports relating to Plant Breeder's Rights and R.G. Anderson's paper 'Plant Breeder's Rights – Promise or Problem'.

Title: 43 - C.T.I.S. Prevention of Cross Pollination Seed Crops

References: D-7.43

Covering Dates: 1955

Extent and Medium: 1 file of around 100 pages

Description: Minutes and reports of meetings of the Committee on Transactions in Seeds, working on zoning schemes are methods for the prevention of cross-pollination.

Title: 44 – Prof Hanley's Book – Typed Copies – altered copy sent to Prof Hanley Oct 21st/48

References: D-7.44

Covering Dates: 1946-1948

Extent and Medium: 1 folder of around 150 pages.

Description: Draft copies of F.R. Horne's chapters 'Improvement of Crops'.

Title: 45 – Miscellaneous reports

References: D-7.45

Covering Dates: 1938-1956

Extent and Medium: series of files loose in box D-7

Description: These reports were loose amongst the archive material. None being sufficient enough to warrant a reference of its own, they are instead listed here, with an indication of the dates when possible.

- CTS Committee Director's Miscellaneous Notes – c1953
- Injurious Weeds Germination etc. – 1956
- Seed-Borne Diseases – c1954
- Reports on visits to sub-stations – c1944
- Confidential – Report on visit by Dr. Hudson to Messrs. Holmberg's Breeding Establishment (Sweden) 1948
- Proposals for Fruit Trials N.A.A.S. – 1948
- Forward to 'Seed Production of European Vegetables in the Tropics' by A.G.G. Hill – 1947-1948
- Warminster Barley Research Station - ?
- Visit to France – 1926-1938

Title: 46 - A.E.B. M. Harnes[?] Exhibit

References: D-7.46

Covering Dates: 1957

Extent and Medium: 1 file of fewer than 50 pages, with oversized material affixed to card.

Description: Miscellaneous papers, including map of the UK mounted on card showing locations of trials grounds for various herbage species and photographs of plant experiments with radioactive substances.

Title: 47 – Correspondence from the office of the Deputy Director.

References: D-8

Covering Dates: 1978-1982

Extent and Medium: 5 files, each around 200 pages. These are on pink paper and are carbon copies of the original.

Description: There are five files:

- Pinks Sep 1979-April 1982.
- Internal Pinks Jan 1981-May 1982.
- External Pinks Jan 78 – Aug 79.
- Internal Pinks September 1979-December 1980.
- NIAB Staff Pinks Jan 78-Aug 79.

Title: Kelly Collection

Reference: K

Covering Dates: 1919-1981

Extent and Medium: Originally 62 box files (now stored as 62 box files, with the addition of more files related to A.F. Kelly all within 22 boxes)

Description: This collection was brought together by Arthur Fenwick Kelly (1920-2009) during his time as an employee at NIAB. The archivists decided to leave the collection as an artefact in itself, rather than return the various items it contains to their points of origin (if these could even be discovered). Kelly joined NIAB in June 1945 and from the beginning was involved with the Institute's seed multiplication work. In 1954 he was seconded to the Organization for European Economic Co-operation, to work on international agreements for seed certification. When NIAB established a Systematic Botany Branch in 1964 (a move that came in response to the formation of Plant Breeder's Rights) Kelly was made the Branch's first Head, leaving his position as Head of Seed Production Branch. The Systematic Botany Branch was responsible for varietal identification and prosecution of the new legislation regarding varietal ownership. In 1970 Kelly was made Deputy Director of NIAB, a position in which he remained until his retirement in 1983. The Kelly Collection contains a very wide range of materials, from important founding documents, to Joint Review Group reports in the early 1980s. A card index was begun by Kelly and can be found in K-21. The files contained in K-22 'Kelly Papers', while not part of the original Kelly series, were nevertheless maintained by him. It was therefore felt that they ought to be included in the Kelly Collection.

For more see:

Nature July 24 1965, p. 354.

Nature July 18 1970, p. 318.

Title: 1

References: K-1.1

Covering Dates: 1919-1941

Extent and Medium: 8 files, each between 10 and 50 A4 pages in length, all inside 1 Box file.

Description: Titles on the Spine of the box file- 'History and Constitution of NIAB. Wheat Act 1932. Trademark Patents Office 191/38. Lord Derby Gold Medal Committee. Royal Visit 1921'. There are 8 files.

- The first bears no title, but has an attached note reading "This file shd. be retained for record purposes" and dated 8/9/60. It contains correspondence regarding NIAB's status as an approved merchant, able to issue wheat certificates (a problem that arose with the passing of the Wheat Act, 1932).
- The second is dated 15/9/1920 and titled 'Trade mark – "National"'. It includes correspondence between Lawrence Weaver, the Patent Office and the Ministry of Agriculture regarding making the word 'National' a trademark only available to NIAB and the varieties it releases, and the possibility of disbaring other traders from selling a variety with the word 'National' attached. NIAB was for a time (c.1919) drawn into a disagreement with the firm of Messrs James Carter

& Co. regarding the trademarking of this word, correspondence about which is also included.

- The third is titled 'History & Constitution of N.I.A.B.' and bears the names W.C. Tame and F.R.Horne. It includes a copy of the first meeting of the Joint Committee of the Agricultural Research Council and the Ministry of Agriculture and Fisheries appointed to review the work and finance of NIAB, from c.1937. There are also reports on the historical background to NIAB, its relations with other institutions, diagrams explaining the Institute's organisational structure, and descriptions of its functions up till this point. The early drafts of these papers are heavily annotated.
- The fourth has an attached note dated 9/2/1959 reading "This is a valuable file and should be retained". It contains copies of the Trade Marks Act 1905 and 1919. The bulk of the file is taken up with NIAB's original trademark application in 1924 and 1925. There is also correspondence from the NIAB secretary M.G. Tozer to the Patent Office, regarding the renewal of the NIAB trademark in 1938.
- The fifth is titled 'N.I.A.B. 204 – Arrangements for Royal Visit'. It contains letters from Lawrence Weaver and Wilfred Parker about preparations for the visit, the programme for the day, and thanking people for their involvement with the royal opening in 1921. Stress is also put on the display of cereals (ancient and modern) and the best way to display the work of the Ormskirk Potato Testing Station.
- The sixth is titled 'N.I.A.B. 211 Invitations for Royal Visit'. Inside are letters to and from those that the NIAB council wished to invite to the Royal opening.
- The seventh is titled 'N.I.A.B. 210 Press Arrangements for Royal Visit'. It includes a lengthy list of those attending the 1921 opening and the programme for the day in detail. There is also correspondence between F.C. Hawkes (the NIAB secretary) and the photographers that attended the event, and early drafts of an article about the Institute submitted to *Nature*.
- The eighth is title 'Lord Derby Gold Medal Committee'. It contains the blank certificates that NIAB would award to potato growers that won this prize.

Title: 2

References: K-1.2

Covering Dates: 1920-1921

Extent and Medium: 7 files, each between 20 and 100 A4 pages in length, all inside 1 Box file.

Description: Titles on the spine of the box file – 'NIAB Papers 1920/21. Appt Director. 1st Annual Report. Howes Close Leases. Estab. Committee Jun 1921. Council Incorporation 1920. Finance Committee Dec 1919-Feb 1921.' There are 7 files.

- The first is titled 'Establishment Committee' and dated 14/6/1921. It pertains to the formation of this committee, proposals regarding the organisation of staff at the Institute, arrangements for furnishing the Institute and the domestic parts of the building. A letter from January 1922 explains that the Committee is now to be disbanded.

- The second is title 'Organisation of NIAB 1921'. It contains a file of correspondence between Rowland Prothero at the Ministry of Agriculture, Lawrence Weaver and Mr S.W. Farmer, the latter a large land owner and farmer who felt that NIAB was being created in far too close an alignment with the agricultural seed trade. Outside of that file are drafts of NIAB's memorandum and much correspondence about necessary alterations to the Institute's Trust Deed.
- The third is titled 'Council – Incorporation'. These refer to the appointment and official incorporation of the first Council and trustees with the Charity Commission.
- The fourth is titled 'Howes Close – Leases to Housing Association for Officers Families' and dated 15/11/1920. Aside from the terms of agreement upon which the houses at NIAB might be leased, it also includes plans of the building layout and early arrangements for the building of further cottages on the NIAB site. It includes letters written up to c.1928.
- The fifth is titled 'Appointment of Director' and dated 28/7/1920. This includes a good number of letters from applicants for the post, and letters between Lawrence Weaver, Prof. Thomas Wood and Thomas Middleton regarding suitable applicants. Early contenders included O.T. Faulkner and William Gavin.
- The sixth is titled 'Finance Committee' and dates indicate Dec 1919 to Feb 1921. It contains letters and estimates regarding the finance committee.
- The seventh is titled '1st Annual Report' and dated 2/10/1920. Inside are some of the original mock-ups of the first published annual report. There are substantial revisions in the early stages that are heavily annotated. This file also includes the second report of the Housing Association for Officers Families.

Title: 3**References:** K-1.3**Covering Dates:** 1969**Extent and Medium:** Two stacks of letter paper, each around 200 pages.

Description: Titles on the spine of the original box file - 'Letters relating to the Queens visit 13 March 1969'. Box file contains multiple copies of two letters. One a NIAB letterhead, significant for its bearing the patronage of the queen. The other, a letter sent from Buckingham Palace on behalf of the queen following her visit to the Institute, dated 13th March 1969.

Title: 4**References:** K-2.4**Covering Dates:** 1926-1956

Extent and Medium: 3 files, each holding between 20 and 100 pages, all within 1 box file.

Description: Titles on the spine of the box file – N.I.A.B. Correspondence. Rates Dec 1919-Apr 1949. Jan 1915-Dec 1956. There are three files.

- The first is titled 'Rates- July to Dec 1926'. This relates to the protracted discussion with the County Council over the rates which NIAB was expected to

pay. The Institute attempted to argue that it ought to be classed as a scientific institute, giving them a special reduced rate to pay. Members of the Council did not agree. File contains correspondence and newspaper articles relating to the decision and its appeal.

- The second is titled 'Rates Exemption- Feb'27 to Apr. '49'. File relates to the appeal following the 1926 decision and efforts to change NIAB rates in the 1940s.
- The third has no title and simply collects together the loose papers left in the box file. It includes further material to do with the 1926 rating and correspondence from the mid-1950s suggesting that following the creation of new buildings at the Institute, it might now be time to attempt another change in the rating.

Title: 5

References: K-2.5

Covering Dates: 1924-1949

Extent and Medium: 6 files, each holding between 20 and 150 pages, all within 1 box file.

Description: Titles on spine of the box file – 'N.I.A.B. Misc. Leases Feb 1924 to Jan 1949'. There are 6 files.

- The first is titled 'H.Q. Buildings 1925'. It includes detailed information about new premises built at NIAB, and much correspondence with Percy Richard Morley Horder, NIAB's architect and Wilfred Parker, the Director of NIAB. There is also correspondence from Lawrence Weaver regarding the purchase and use of land on the opposite side of the road to NIAB.
- The second is titled 'N.I.A.B. 21 (4) Howes Place – Buildings. Oct 24 to Mar 25'. Contains correspondence between Percy Richard Morley Horder and various members of NIAB staff in relation to the building of new cottages at the site.
- The third is titled '8th Jan 1949-Feb20th 1924. 5/2/2. Miscellaneous Leases'. Correspondence largely to do with the 'White House' cottage built at NIAB HQ.
- The fourth is blank and simply collects together the loose items in the box file. Includes a map of Bretagne and various leaflets to do with the area.
- The fifth is titled '16th August 1948 – 14th May 1937. 5/2/1. Headquarters' Buildings Leases of'. Correspondence largely from NIAB secretary M.G. Tozer dealing with various aspects of the HQ buildings. Focus is on changes in leases for flats and houses at the HQ. Includes Post Office use of NIAB buildings during wartime.
- The sixth is titled 'HQ buildings Jan 1929 to Oct 1931'. Correspondence largely regarding maintaining and repainting the HQ, problems with Doloment flooring. Also letters between F.C. Hawkes and Percy Richard Morley
- on how NIAB should be painted, and how the land opposite the Institute should be used (for ploughing or to lie fallow).

Title: 6**References:** K-2.6**Covering Dates:** 1928-1948**Extent and Medium:** 6 files, each containing between 30 and 100 pages, all within 1 Box file.**Description:** Titles on spine of Box File – ‘Correspondence. Granary and Seed Cleaning Plant, March ’28 to Oct’ 48’. There are 6 files.

- The first is titled ‘N.I.A.B. Granary Correspondence Etc. March to July 1928’. Contains letters and architectural plans for the building of a new granary, including information about the machinery to be installed. Letters largely contain discussions between the Ministry of Agriculture, the Treasury and the Director about the funding of the building and about the architects to be used.
- The second is titled ‘N.I.A.B. Granary Aug to Oct 1928’. Correspondence regarding the design of the granary and seed cleaning plant as the plans change. Percy Richard Morley Horder took a direct interest in the construction.
- The third is titled ‘Granary. July 1929 to Dec 1930’. This correspondence is largely concerned with problems that arose in the immediate period after completion of the granary and seed cleaning plant. There are also details as to how all the equipment was tested.
- The fourth is titled ‘Granary and Drying Plant. Jan 31 to July 32’. Further testing of the granary and drying equipment is discussed. Problems with the final construction and the asphalt roof are considered at length. Also problems with the firm of Thompsons. Further parts and bits of equipment are ordered from Robert Boby Ltd.
- The fifth is titled ‘Granary and Seed Cleaning Plant Aug 32 to Nov 38’. The granary roof continued to be the subject of discussion. Secretary M.G. Tozer took care of much of the correspondence.
- The sixth is titled ‘Granary and Seed Cleaning Plant Oct 39 to Oct 48’. Letters relating to the installation of a ‘Hummeller’ device. Plans for a dehydration unit. Correspondence with the Ministry of Agriculture regarding the expansion of the granary in 1942. Herbert Hunter, Director of the Institute during this time, was closely involved in the discussion. Later letters relate to the storage and drying facilities in 1947. Around the same time a further granary extension was contemplated. Includes architectural plans for the inclusion of conveyor belts.

Title: 7**References:** K-3.7**Covering Dates:** 1920-1931**Extent and Medium:** 7 files each between 20 and 80 pages in length, all within 1 box file.**Description:** Titles on spine of the box file – ‘NIAB buildings. Howes Place- March 1920 to March 1925. HQ- 1925, 1929-1931’. There are seven files.

- The first is titled ‘Howes Close – Fitting of Council Room’ and is dated 15/2/1920. Correspondence from Lawrence Weaver regarding the furniture and fittings in the Council Room.

- The second is titled 'N.I.A.B. 264. Tenancy agreement of Hostel'. Letters discussing the appropriate rent to be paid by hostel tenants from 1921. Correspondence from the Housing Association for Officer's Families. Some letters refer to the need to arrange for repairs around 1924.
- The third is blank and collects together loose sheets from the box file. It includes the invoice from painters and decorators for the headquarters building in 1927.
- The fourth is titled 'NIAB Howes Close Farm'. Letters from 1918 between Rowland Biffen and Lawrence Weaver regarding the purchase of necessary land. Weaver wrote to various parties to put together estimates as to the running costs of the HQ site before making an application to the Development Commission. William Hasler supplied information regarding seed storage requirements. Letters pertaining to the purchase of the Howes Close site and those relating to the building of the Headquarters in 1920. Also correspondence with The Poulsen Wireless Telegraph Company Ltd. regarding the lease of land at this site used as a wireless telegraph station. Letters from 1946 refer to the purchase of further farm land at Swavesey (Hill Farm).
- The fifth is titled 'South Hinksey'. Correspondence between Lawrence Weaver and Professor Adams of All Souls College, Oxford, regarding the purchase of land at South Hinksey c.1919-1920. Possible location for a seed farm. Includes draft report by Fred Hiam on the state of that land. Cyril Dampier Whetham offering opinion as to whether or not NIAB ought to spread itself so thinly. Also details as to the future of that land outside of NIAB's use.
- The sixth is titled 'N.I.A.B. Plans & Buildings'. Letters from 1919 regarding the new site in Cambridge. Lawrence Weaver gathered information from seed testing authorities around the world as to the facilities required for this work. Correspondence also about the form the new Cambridge headquarters should take.
- The seventh is titled 'Houghton Hill Farm St Ives'. Correspondence between 1918 and 1920 regarding the purchase of Houghton Hill Farm. Fred Hiam was closely involved. Also correspondence from Hiam in March 1920 saying he will not be able to look after Houghton Hill farm any longer. Also resigns seat on Council.

Title: 8

References: K-3.8

Covering Dates: 1935-1947

Extent and Medium: 2 files, 1 in an envelope, the other consisting of around 200-250 pages, all in 1 box file.

Description: Titles on spine of the box file – 'Correspondence Re: - Land purchased by NIAB. Feb 1935 - Jul 1947. There are 2 files.

- The first is an envelope with 'Nature of Enclosure' on its cover. Contains agreement for building of new cottage and offices at Dark Lane Farm Ormskirk.
- The second is blank on its cover but dated 4/2/13. Contains letters and agreements for tenancy and ownership of land throughout the 1930s and 40s.

Detailed drawings of the land at Boxworth. Two sets of papers deal with the extension of the headquarters grounds in the early 1950s and the purchase of land on Windsor Road.

Title: 9

References: K-3.9

Covering Dates: 1957-1968

Extent and Medium: 5 files and 1 envelope, each containing between 50-100 pages, all in 1 box file.

Description: Titles on the box file – ‘NIAB ‘Building Schemes’. HQ premises extension. Cycle Shed. Glasshouse.’ There are 5 folders and 1 envelope.

- The first folder is titled ‘Headquarters premises extension Volume III as from 16th April, ’56.’ Includes estimates for prices for alterations and extensions to the headquarters in 1956. Progress reports give some information as to the development of the building. Engineering drafts for the Chemical Sampling Room. Architectural plans for the extension.
- The second is titled ‘Headquarters premises extension Volume IV as from 1st March, 1957. Architectural plans for the new extension. Layouts for the organisation of work within the new building. Summary of works of alterations and additions required in the Existing Building.
- The third is titled ‘Headquarters Extension. From February 1958’. Architectural plans for the extension. Correspondence attending to changes are problems with the build as they arise.
- The fourth is titled ‘Headquarters Extension. From May 1959’. Correspondence relating to the furnishing and finishing of the new building and laboratories of the OSTs.
- The fifth is titled ‘Cycle Shed’. Correspondence dating from between 1956 and 1963 regarding the building and altering of cycle sheds. Includes architectural plans and drawings.
- The sixth item is an envelope titled ‘Glasshouse. Bills of Quantities and Plans.’ Extensive architectural plans for the propose glasshouse c.1968.

Title: 10

References: K-4.10

Covering Dates: 1952-1959

Extent and Medium: 7 files, each between 20 and 100 pages in length, all in 1 box file.

Description: Titles on the spine of the box file – ‘NIAB HQ premises extension correspondence March ’52 to April ’59.’ There are 7 files.

- The first is titled ‘Vol I. Headquarters Extensions 5/3/52-11/2/55’. Reports on changes in the needs of the OSTs and measures taken to achieve them. Includes reports explaining the need for an extension of the headquarters. Estimates of the accommodation needed by the various branches of NIAB. Discussion of draft plans of the extension. Architectural plans of the proposed extension.

- The second is titled 'Headquarters premises extension as from 1st March 1955, Vol. II.' Extensive architectural plans. Notes on various aspects of the building and layout. Architects are J.B.F. Cowper and Poole. Tenders for the building are listed.
- The third is titled 'Headquarters Extension Equipment'. Estimates from 1958-59 for headquarters furniture.
- The fourth is titled 'Headquarters Premises Extension- Furniture and Equipment'. Notes from 1956 on the requirements of laboratories and the OSTs. Arrangements for furnishings and storage throughout 1958-59.
- The fifth is titled 'Headquarters Extension. Equipment.' A few pages explaining the new building's capital equipment needs.
- The sixth is titled 'Finance for H.Q. Building Extension'. Correspondence from as early as 1956 regarding the glasshouse and main extension. Lists of estimates for costs. Statement of final account with the architects.
- The seventh is blank and collects together loose architectural plans for the new extension.

Title: 11**References:** K-4.11**Covering Dates:** 1955-1972**Extent and Medium:** 4 files, 1 of less than 50 pages, the rest between 50 and 100, all in 1 box file.**Description:** Titles on Box file – 'Confidential. File: Hill Farm correspondence Oct 1970 to July 1972. County of Cambridge. Town and Country Planning Act 1947. Dev Plan. Town Map No.2. Hill and College Farm Sales Etc. 1943-1971. There are 4 files.

- The first is titled 'County of Cambridge Town and Country Planning Act of 1947'. Contains extensive and detailed maps of the area surrounding NIAB headquarters and elsewhere in Cambridge.
- The second is titled 'Hill Farm Documents'. Contains delicate notebook detailing NIAB's bank balance in the main account and at Hill Farm from 2/12/1950-19/9/1967. Auction materials for sale of Hill Farm in 1971. Details of cattle and machinery there.
- The third is titled 'Inventory and Valuation of the live and dead farming stock, Hay, Straws, Stores, Manures, Crops and Cultivations on Hill and Noon Folly Farms'. Inventory and valuation carried out by Messers. Bidwell & Sons in 1968.
- The fourth is titled 'Hill Farm HQ 24'. Contains information labelled confidential regarding the Hill Farm staff. Most from c.1971. Report on Hill Farm Cattle and Machinery.

Title: 12**References:** K-4.12**Covering Dates:** 1951-1971**Extent and Medium:** 7 files, each containing between 50 and 100 pages, all within 1 box file.

Description: Titles on the spine of the box file – ‘Hill Farm. Work at above. Sewerage New Cott. Damage by Sparrows’. There are 7 files.

- The first is blank. Contains correspondence regarding Hill Farm and its cottages. Also agreements for tenancy of Noon Folly farm (Longstanton All Saints).
- The second is titled ‘New Cottages for Hill Farm’. Correspondence from 1955-58 regarding the accommodation at Hill Farm, the repair of old cottages and the building of some new.
- The third is titled ‘Hill Farm/Drainage’. Correspondence between 1960-68 regarding problems of drainage at Hill Farm. Amount of assistance to be expected from government land drainage schemes. Contracts for this work. Dates for drainage.
- The fourth is titled ‘Sewage. Hill Farm. Closed 1965’. Contains report by Frank Horne protesting against the erection of a new village at Dry Drayton, Bar Hill, near NIAB’s Hill Farm that he believes will interfere with the Institute’s work. Letters concerning the creation of a sewage plant on Huntingdon Road in 1965, as part of the new village.
- The fifth is titled ‘Hill Farm Valuation’. Valuation that took place in 1961 and 1968.
- The sixth is titled ‘Damage by Sparrows to H/Q trial ground & Hill Farm’. Correspondence between 1960-70 on the damage done by sparrows and their efforts to control them. Damage to trials the main concern. Cooperation with the Ministry’s Infestation Control Laboratory. Plans to use narcotics. Various other possible solutions considered.
- The seventh is titled ‘Sewage Disposal Farm – Hill Farm’. Correspondence between 1965-68 regarding the new development at Bar Hill and the sewerage system they are planning. General review of Hill Farm, Council Paper No. 529.

Title: 13

References: K-5.13

Covering Dates: 1965-66

Extent and Medium: 3 files, 1 less than 50 pages, both others between 100-250 pages, all within 1 box file.

Description: Titles on spine of the box file – ‘NIAB. Dry Drayton Development’. There are 3 files.

- The first is titled ‘Dry Drayton Development Sewage Scheme to December 1965. It contains some newspaper cuttings relating to the Bar Hill development and its effects upon NIAB’s Hill Farm. Largely correspondence between Chesterton Rural District Council and NIAB relating to the decision to build a sewage disposal works alongside the farm.
- The second is titled ‘Dry Drayton Sewage 1st January 1966’. Contains detailed and extensive plans of the proposed Bar Hill Development. Plans of the sewage works. Discussion on how the sewage plant could be made less destructive to NIAB’s activities.

- The third is titled 'Dry Drayton Development'. Correspondence regarding the location for a fly over as part of the Bar Hill development.

Title: 14**References:** K-5.14**Covering Dates:** 1953-1967**Extent and Medium:** 4 files, each between 100-150 pages, all in 1 box file.**Description:** Titles on side of the box file – 'NIAB trial Ground Extension. Glasshouse Plans & Correspondence 1953/56.' There are 4 files.

- The first is titled 'Glasshouses'. Contains plans for the new glasshouse c.1956. Correspondence from 1953 onwards referring to their creation, efforts to have them funded and built. Detailed plans of the proposed building. Reports on discussions with Ministry officials. Agreements with the architects.
- The second is titled 'TRIAL GROUND: Further Extensions'. Correspondence from 1954-59 about reserving land around NIAB for future potential expansion. Efforts to purchase some such land.
- The third is titled 'Trial Ground Extension'. Contains report on headquarters trial ground from 1964. Maps of the trial grounds and colour coded map of the layout around headquarters and who owns the land. Report on the land requirements of NIAB.
- The fourth is titled 'Trial Ground Extension. Howes Close'. Discussion of purchasing further property around the headquarters. Much to do with the sale of Howes Close. Freemasons may have been purchasers. Newspaper clipping from 1967 with picture of Howes Close. Further correspondence from 1967 as the Director attempts to find more land nearby for NIAB.

Title: 15**References:** K-5.15**Covering Dates:** 1921-1938**Extent and Medium:** 4 files, 1 less than 50 pages, the 3 others between 100-150 pages, all in 1 box file.**Description:** Titles on spine of the box file – 'Correspondence with H.A.O.F. 1921 to 1938'. There are 4 files.

- The first is titled 'Housing Association for Officer's families 1921-1922'. Correspondence from 1921 between Wilfred Park and Captain Bennet of the Housing Association for Officers Families. Correspondence regarding the caretaker at Howes Place and his duties. Some letters annotated by Lawrence Weaver, who was also Honorary Treasurer of the HAOF. Other letters deal with problems with Howes Place as they arise.
- The second is titled 'Housing Association for Officers families 1922-1926.' Letters regarding the ordering of trees and shrubs for the Housing Association in 1922. Some reports dealing with the rent expected from tenants. Most correspondence to do with general upkeep of the buildings 1922-1926.
- The thirs is blank and collects together some loose papers from the box file. Letters from 1931-1932 between Percy Richard Morley Horder and F.C. Hawkes

regarding the use of the land opposite NIAB on Huntingdon Road, which, had been bought by Lawrence Weaver, and which since his death is being managed by the Weaver Trustees.

- The fourth is titled '1927-1931'. Correspondence between the Housing Association and F.C. Hawkes dealing with matters arising from the Howes Place properties, restoration, upkeep of the road etc. Some details c.1931 regarding possible sale of some of the houses.

Title: 16

References: K-6.16

Covering Dates: 1939-1959

Extent and Medium: 3 files, each between 100-200 pages, all within 1 box file.

Description: Titles on spine of the box file – 'Correspondence with H.A.O.F. 1939 to 1946. 1954 to 1959.' There are 3 files.

- The first is titled '1932-1938'. Continuance of correspondence between NIAB and the Housing Association for Officers Families.
- The second is titled '1939'. Continuance of correspondence between NIAB and the Housing Association for Officers Families.
- The third is titled 1940-1946. Continuance of correspondence between NIAB and the Housing Association for Officers Families. Some discussion of air raid shelters and their use by residents of Howes Place.

Title: 17

References: K-6.17

Covering Dates:1952-1963

Extent and Medium: 1 file of around 200-300 pages, all in 1 box file.

Description: Titles on spine of the box file – 'Correspondence F.S.S.U. Aug 1952 – Dec 1963'. There is 1 file.

- It is titled 'Superannuation 9/5/1'. Includes memorandum on the Supplementation of the Federated Superannuation System for Universities - Staff Paper No. 63. Other committee papers association with this scheme. Envelope contains standard form of agreement with staff. Includes papers relating to changes in the law and how they impinge upon NIAB staff.

Title: 18

References: K-6.18

Covering Dates: 1969-1976

Extent and Medium: 4 files, each between 50-150 pages each, all within 1 box file.

Description: Titles on the spine of the box file – 'FILE: STF/10 (8). Report of Staff Inspection. 28.10.69. File : STF/20. Negotiations Committee (ASTSM & NIAB Reps of Council) May 69 – Mar 75. File: STF/34. Education and Training for NIAB staff Jan 71-76. File: STF /44. Staff Assn. Jan 65-74.' There are 4 files.

- The first is titled 'Report of Staff Inspection – Review of Proposed Posts & Allowances on 28/10/69'. Visit from the Establishment Division of the Ministry

of Agriculture, Fisheries and Food. Report is concerned with new requested posts. John Maslen the reporting MAF representative.

- The second is titled 'Negotiations Committee'. Correspondence with the Association of Scientific, Technical and Managerial Staffs from 1969-1970. Also confidential memorandum on NIAB salaries and also on the structure of the Institute. Minutes of meetings with the ASTMS in 1971. Diagrammatic representations of the institutional structure. Report of a further meeting in 1974 and another in 1975.
- The third is titled 'Education & Training of NIAB staff'. Correspondence from 1970 with various educational organisations regarding the further training of NIAB staff. Records of staff who attended special training programmes in the 1970s.
- The fourth is titled 'Staff Association'. Correspondence c.1966 regarding the formation of a Staff Consultative Committee. The latter's draft constitution. Meetings and dealings with said committee.

Title: 19

References: K-7.19

Covering Dates: 1954-1962

Extent and Medium: 1 file of around 50-100 pages, all in 1 box file.

Description: Titles on spine of the box file – 'Correspondence with the Assn of Scientific Workers, May 1954 – Dec 1962'. There is 1 file.

- It is dated 3/4/13. Attached to inside front cover, letter from the Director marked confidential from 1961 regarding the Association of Scientific Workers. Rest of the folder correspondence between 1954-1962. Decisions as to the allowance of annual leave. Reports on salary and structure. Contemplation of revisions following the 1961 Visiting Group. September 1962 edition of the Association of Scientific Workers Journal. Superannuation schemes for laboratory assistants, clerical and typing staff.

Title: 20

References: K-7.20

Covering Dates: 1965-1974

Extent and Medium: 6 files, each between 50 and 150 pages long, all in 1 box file.

Description: Titles on spine of the box file – 'File: STF/6. Rates of Pay and Allowances Feb 1965 to Dec 74. Salary Scales. OSTs Analysts. NIAB staff. Farm Manager. Files: - NPS 1A. NPS 1C. NPS 2A. 1969-70.' There are 6 files.

- The first is titled 'Staff January 1969-Dec 69'. Various staff appointments and assessments throughout this period. Some discussions with staff and about staffing matters.
- The second is titled 'Farm Managers Salary'. Papers dating between 1968 and 1971. Discussions with the Ministry of Agriculture, Fisheries and Food and the Association of Scientific Workers regarding the salary scales of farm managers. Council Paper No. 596 provides something of a summary.

- The third is titled 'Rates of pay & Allowances 1965-1964'. Lists of employees, their Grades and rates of pay. Settlements with the Ministry of Agriculture on renewed rates of pay.
- The fourth is titled 'Salary Scales'. Various arrangements for the salary scales of Institute employees. Comparisons with some national rates. Some information about the rates of pay at the National Agricultural Advisory Service.
- The fifth is titled 'Salary Scales OSTs Analysts'. Papers and letters from between 1954-63.
- The sixth is titled 'Jan 1970-Dec 1970'. Begins with report of staff inspection 1969. Some papers relating to the salaries of trial ground, granaries and glasshouse staff.

Title: 21**References:** K-7.21**Covering Dates:** 1964-1975**Extent and Medium:** 4 files, each between 50 and 100 pages, all within 1 box file.

Description: Titles on spine of the box file – 'File STF/2. Staff appointments policy Sept '65-Dec '70. File STF/3. Conditions of service 1964-1975. File STF 3(B). Substitution Claim. Resignation of Dr. Chamberlain o/t Mrs Smith, Mr Meadway. Accident to PHS inspector on potato course'. There are 4 files.

- The first is titled '1971 onwards on Registry Files'. Earliest letter from 1965, between the Ministry of Agriculture and M.G. Tozer regarding staff pay increases. Records of appointments of staff throughout the late 1960s. Advertisements describing vacancies. Lists of those interviewed for posts. Some papers relating to changes in pay scales.
- The second is titled 'Conditions of Service 1964-1975'. Papers describing the conditions agreed to by NIAB staff upon employment. Sick pay, maternity pay, holiday, etc.
- The third is titled 'Substitution Claim (Resignation of Dr. N. Chamberlain) (o/Time Mrs Smith & Mr Meadway). Disagreement over the amount of overtime pay to go to Smith and Meadway following the resignation of Chamberlain c.1974.
- The fourth is titled 'Accident to PHS inspector on potato course (A.J.Tuton)'. 1973 incident in which a Tuton's car was damaged during a potato refresher course. Drove into a concrete post that was hidden.

Title: 22**References:** K-8.22**Covering Dates:** 1969-1973**Extent and Medium:** 1 file of less than 50 pages all in 1 box file.

Description: Titles on spine of box file – 'Staff Club Building. Correspondence etc.' There is 1 file.

- It is titled 'Staff Club Building'. Includes drawings of the building and layout. Also the lyrics and notation for a song dedicated to 'The NIAB Code'.

Title: 23**References:** K-8.23**Covering Dates:** 1927-1970**Extent and Medium:** 5 files, each between 50 and 100 pages, all in 1 box file.**Description:** Titles on spine of the box file – 'NSDO/NIAB Files/Variou. Staff Arrangements. Building. Hiam Farm Sale 1927'. There are 5 files.

- The first is blank, and contains papers relating to the sale of Hiam Farm in 1927 to Hiam Estates Ltd. Disagreement between Hiam and NIAB over the amount he should pay, considering the upkeep that he has put into the property and that he made a loss when running the farm on behalf of NIAB.
- The second is titled 'Correspondence with Mr J. Nickerson & Chairman of Council Etc. – 1968'. Correspondence takes place in 1968. Concerned about the creation of the National Seed Development Organisation and its relationship with NIAB. Reply from Frank Horne. The N.S.D.O. was established to take over NIAB's multiplication responsibilities upon the creation of Plant Breeder's Rights.
- The third is titled 'N.S.D.O. Building'. Arrangements for the building of the National Seed Development Organisation in 1967. Some discussion of those members of the NIAB Multiplication Branch who might be suitable candidates for NSDO positions. Further papers relate to the purchase of NIAB land to house the NSDO.
- The fourth is titled 'N.S.D.O./N.I.A.B. Staff Arrangements'. Reports and correspondence from 1967 relating to the changeover in responsibilities between NIAB and the National Seed Development Organization, and the staff needed throughout this transition. Considerable thought given to the seconding of H.N. Greenwood, head of NIAB's Multiplication Branch. Also reports relating to the use of NIAB facilities by the NSDO.
- The fifth is titled 'N.S.D.O. Building'. Correspondence and reports between 1969-1970 relating to the facilities of the NSDO. Letters from Douglas Collins of Suttons Seeds, who is involved in an official capacity with the NSDO. Confidential reports on NIAB/NSDO relations. Plans to move the NSDO to R.A.F. Duxford.

Title: 24**References:** K-8.24**Covering Dates:** 1948-1971**Extent and Medium:** 3 files, each between 100-150 pages, all in 1 box file.**Description:** Titles on spine of the box file – 'Particulars of posts held by members of the Institute staff Oct '48-Apr 1961. Staff Appts Policy – Jan '66-Oct '71.' There are 3 files.

- The first is titled 'Staff Appointments Policy (1)'. Reports from 1964 discussing a rationalisation of current staff payment scales. Papers relating to appointments of candidates throughout the 1960s. Some Civil Service papers on scientific officers.

- The second is titled 'Particulars of posts held by members of the Institute's staff'. Contains lists of staff members and their positions. Detailed advertisements for various positions as they became available during the 1950s-60s, often with name of successful candidate attached.
- The third is titled 'Particulars of posts held by members of the Institute's staff' and can be differentiated from the former file by the letters 'M.G.T.' on the label. Detailed advertisements for various positions as they became available during the 1950s often with name of successful candidate attached.

Title: 25**References:** K-9.25**Covering Dates:** 1931-1959**Extent and Medium:** 2 files, each less than 50 pages in length, all in 1 box file.**Description:** Titles on the spine of the box file – 'N.I.A.B. Executive Committee Jan 1931 to Dec 1957'. There are 2 files, both are dated 2/2/3.

- The first is titled '11th Dec 1950-13th Jan 1931. 2/2/3 Executive Committee'. Letters to The Secretary M.G. Tozer regarding meetings of the Executive Committee. Many are apologies for inability to attend, or thanks for reception of minutes. Also description of powers of the Executive Committee.
- The second is titled '2/2/3 Executive Committee 7th Feb: 1951. To 10th Dec: 1957'. Letters to The Secretary M.G. Tozer regarding meetings of the Executive Committee. Many are apologies for inability to attend, or thanks for reception of minutes. Also description of powers of the Executive Committee.

Title: 26**References:** K-9.26**Covering Dates:** 1918-1927**Extent and Medium:** 1 file, less than 100 pages, all in 1 box file.**Description:** Titles on spine of the box file – 'N.I.A.B. Council 1918 to 1927'. There is 1 file.

- It is titled 'Representation on Council – Appointments' and is dated 24/7/1920. Letters relating to the appointment of persons to the Council throughout 1918-1927, many nominated by the official institutions entitled to appoint persons as set out in NIAB's Trust Deed.

Title: 27**References:** K-9.27**Covering Dates:** 1919-1950**Extent and Medium:** 3 files, each between 50 and 150 pages, all in 1 box file.**Description:** Titles on spine of the box file – 'Charity Commissioners Correspondence Jan 1919 – Jun 1923. Mar '46 – Apr '50.' There are 3 files.

- The first is titled 'N.I.A.B. 19. Charity Commissioners. Order for Treasury Approval of sales of property'. Correspondence relating to the creation of a Trust Deed through the Charity Commission. Publicity given to this Order. Draft copies of the Deed. Some Council minutes from 1923.

- The second is titled 'N.I.A.B. 528. Trust funds – Charity Commission'. Correspondence between 1919-1923. Letters relating to a substantial purchase of stock on the part of NIAB, and the subsequent realisation of part of it during the building of NIAB's headquarters. Further investments made in the early 1920s are also included.
- The third is titled 'April 4th 1950 – March 8th 1946. 3/13/9 Charity Commission General Corres'. Correspondence relating to potential changes in NIAB's Trust Deed. Other papers dealing with matters as they arise.

Title: 28

References: K-10.28

Covering Dates: 1956-1970

Extent and Medium: 2 files, both of less than 50 pages, all in 1 box file.

Description: Titles on spine of the box file – 'RTO Conferences Etc. 1956/67. 1969/70'. There are 2 files.

- The first is titled 'RTO, 1956-67 Incomplete'. Papers and reports relating to Regional Trials Officers and the annual conferences.
- The second is titled 'Regional Trials Officers Conference 1969-Dec 1970'. Monthly reports for certain trial centres and papers relating to Regional Trials Officers Conference 1969.

Title: 29

References: K-10.29

Covering Dates: 1927-1930

Extent and Medium: 15 files, each containing 1 committee paper (usually less than 10 pages), all in 1 box file.

Description: Titles on spine of the box file – 'Crop Improvement Committee Papers: No. 94-108 1927/29/30'. Despite the title on the box file, the run of papers actually goes to Committee Paper No. 109. Many of the folders include the original drafts of these papers.

Title: 30

References: K-10.30

Covering Dates: 1955-1969

Extent and Medium: 2 files, each between 150 and 200 pages, all in 1 box file.

Description: Titles on spine of the box file – 'National Certifying Authority for Herbage Seeds Papers 1-147 Jan 55-May 65. Papers 148-219 May 65 – May 69'. Both files are precisely as stated on the spine of the box file, and separated accordingly. The aims of the scheme were to ensure that all herbage crops grown and sold under the scheme could be guaranteed as to identity and purity, and to encourage farmers to grow only certified seed.

Title: 31

References: K-11.31

Covering Dates: 1955-1976

Extent and Medium: 1 file of between 100-150 pages all in 1 box file.

Description: Titles on spine of the box file – ‘National Certifying Authority for Herbage Seeds Jan 55-Nov 76. Nos. 1-60’. The file consists of minutes of the associated committee throughout this period. Minutes missing are 11-18, 30, 31, 39.

Title: 32

References: K-11.32

Covering Dates: 1927-1956

Extent and Medium: 1 file of less than 20 pages and 1 book of around 300 pages, all in 1 box file.

Description: Titles on spine of the box file – ‘Buildings estimates 1927. 1956.’

- The file is titled ‘Sub-committee for report on the Institute’s finances – Nov 1927’. Details the financial assets of the Institute at this time and its future prospects over the next five years.
- The second item is a report compiled as a book, titled ‘Estimate for Proposed Alterations and additions to existing building at Huntingdon Road, Cambridge for the National Institute of Agricultural Botany’ and is dated January 1956. Contains extensive and detailed accounts of the changes envisaged by the grant for an expansion granted by the Ministry of Agriculture that same year.

Title: 33

References: K-11.33

Covering Dates: 1953-1970

Extent and Medium: 4 files, each less than 50 pages in length, all within 1 box file.

Description: Titles on spine of the box file – ‘Stats section. NPS /2, 1969/70. Temp. Office Accommodation. Accounts, presentation of 1961-70. Howard Gregory Memorial.’ There are 4 files.

- The first is titled ‘NP.a.1. Accounts’ and covers years 1961-1970. Contains correspondence between NIAB and the Ministry of Agriculture regarding the Institute’s maintenance grant and various applications for new machinery and expansion of facilities. Some negotiations relating to the grant in aid and letters referring to changes in accounting following the creation of the National Seed Development Organisation.
- The second is titled ‘Temporary Office Accommodation’ and covers years 1965-1970. Includes details of staff accommodation at present and future requirements. A detailed and numbered layout of the headquarters building is included and referred back to in a number of places.
- The third is titled ‘Machine Operators’ and covers years 1969-1970. Refers to the status of machine operators employed by NIAB and their representation by the Association of Scientific Workers. Machine operators in this context are those operating the calculating machines in the statistical section of the Institute.
- The fourth is titled ‘Howard Gregory Memorial’. Upon the death of Howard Gregory (who had been a key figure in the work of the Seed Production Committee since its inception in 1942) in 1953, this memorial fund was established. Details of the memorial and its costs are included here. Some

details of the committee established to prosecute the building of this fund and the memorial to follow, placed at NIAB in the courtyard.

Title: 34

References: K-12.34

Covering Dates: 1930

Extent and Medium: 1 file, less than 20 pages, all in 1 box file.

Description: Titles on spine of the box file – ‘Correspondence Lawrence Weaver Memorial May 1930’. There is 1 file titled ‘Proposed Lawrence Weaver Memorial – May 1930’. Correspondence relating to the memorial which was organised largely by Stafford Cripps.

Title: 35

References: K-12.35

Covering Dates: 1980-1981

Extent and Medium: 2 files, each between 100-150 pages, all in 1 box file.

Description: Titles on spine of the box file – ‘Fellows Days 1980 and 1981. Correspondence sale of tickets etc.’ There are 2 files.

- The first is titled ‘Fellows Day 1980’. Contains copies of the tickets issued to those in attendance, including those offered to the press.
- The second is titled ‘1981 Fellows Day’. Contains copies of the tickets issued to those in attendance, including those offered to the press.

Title: 36

References: K-12.36

Covering Dates: 1954-1970

Extent and Medium: 7 files, each between 50 and 100 pages, all in 1 box file.

Description: Titles on spine of the box file – ‘NIAB Building Schemes. Seed store, Implement shed, Granary Extn. Potato Store Nthn Ireland’. There are 7 files.

- The first is titled ‘Granary – 1st Instalment’. Contains architectural plans for the proposed new granary in 1955. Contains papers relating to the Ministry of Agriculture’s grant for its erection. Primary impetus being that NIAB is to take over the multiplication of varieties produced by the Welsh Plant Breeding Station. Also letters relating to the required seed cleaning plant.
- The second is titled ‘Granary Cereal etc.’ Reports and letters covering 1958-1961 relating to the proposed extension of the cereal granary. Philip Lea is consultant expert who writes a report for NIAB on its requirements. Records of discussions with Ministry of Agriculture representatives. Reports of the architect.
- The third is titled ‘Potato Store Northern Ireland 1962’. Includes architectural plans of NIAB’s potato store in Northern Ireland. Records of meetings with Northern Ireland staff to discuss requirements. NIAB had been operating out of NI in this fashion since 1940.
- The fourth is titled ‘C.P. 5 Vol III 11-10-61-’. Papers relating to 1959-1964 relating to the extension of NIAB’s cereal granary. Lengthy reports of meetings

held to discuss the implementation of these plans. Estimates of agreed expenditure from the Ministry of Agriculture.

- The fifth is titled 'Seed & Sample Store'. Records from between 1967 and 1968, relating to difficulties with the seed store and a proposed new herbarium building.
- The sixth is titled 'Potato Store'. Records from between 1959 and 1963 relating to the creation of a potato storage shed.
- The seventh is titled 'Trial Ground Implement Shed'. Contains architectural plans and correspondence relating to a proposed implement shed, covering years 1957-1960.

Title: 37

References: K-13.37

Covering Dates: 1953-1970

Extent and Medium: 4 files, each between 50 and 100 pages, all in 1 box file.

Description: Titles on spine of the box file – 'File. P33 Multiplication in Northern Ireland Dec 68 to 70. DSTS Program NP. ST.1. Feb 53 to Jun 70. File: NPT/SH Rosewarne Han 67 to Sept 70.' There are 4 files.

- The first is titled 'O.S.T.S. Programme'. Records from between 1958 and 1970 relating to the programme of the Official Seed Testing Station. Current investigations. Correspondence regarding fees. Report on a world tour to attend the congress of the International Seed Testing Association by D.B. MacKay. Report on the International Symposium '100 years of Seed Testing' held at Wurzburg 26th Sept 1969.
- The second is titled 'NPT/S.H.' and dated Jan 1967 – Aug 1969. Correspondence and reports related to Rosewarne Experimental Horticultural Station in Cornwall. Largely about vegetable crops. Records of pollination of foundation plants. Report on visit to Rosewarne 1969.
- The third is titled 'Multiplication in Northern Ireland' and dated December 1968-1970. Papers relating to the multiplication of seed potatoes at the Northern Ireland site. Reports on the production of virus tested seed potatoes. Changes in policy following the creation of the National Seed Development Organisation. Report of joint committee of Agricultural Improvement Council and NIAB Aug 1947.
- The fourth is titled 'Rosewarne' and dated 1969-70. Reports and correspondence regarding work conducted at the Rosewarne Experimental Horticultural Station in Cornwall.

Title: 38

References: K-13.38

Covering Dates: 1943-1975

Extent and Medium: 2 files, each between 150 and 200 pages, all in 1 box file.

Description: Titles on side of the box file – 'Cereal Seeds sub-committee (1943-59) Minutes 1-45. Cereal Seeds Committee (1959-75). Papers 1-200, missing (112/114) minutes (59-75) 1-47.' There are 2 files.

- The first is titled 'Cereal Seed Sub-Committee Minutes 1-45 (1943-1959)'. Contains the minutes of this committee, which reported up to the Seed Production Committee.
- The second is titled 'Cereal Seeds Committee (1959-75)'. File proclaims that it includes the association papers alongside the minutes to this committee, but the papers are not included (see K13.39 for the papers). The Cereal Seed Committee was created in 1959 to follow on from the Cereal Seeds Sub-Committee, after it was decided that it was more appropriate for this work to be reported directly to the Council rather than via the Seed Production Committee (the work load of the latter having been largely dispersed through other committees).

Title: 39

References: K-13.39

Covering Dates: 1959-1976

Extent and Medium: 198 committee papers loose in 1 box file.

Description: Titles on spine of the box file – 'Cereal Seeds Committee Nov 59 – May 76 Nos 1-200'. Contains the Committee papers of the Cereal Seeds Committee (missing 112/114).

Title: 40

References: K-14.40

Covering Dates: 1953-1976

Extent and Medium: 3 files, each between 100-150 pages, all within 1 box file.

Description: Titles on spine of the box file – 'O.S.T.S. Committee March 53 to March 76 Nos: 1-67. Seed Mult Committee June 61 to June 67 Nos: 1-45 and mins 1-8.' There are 3 files.

- The first is titled 'OSTS Committee Papers 1-67 (1953-1967)' and are as described.
- The second is titled 'Seed Multiplication Committee, Minutes 1-8, Papers 1-45' and are as described.
- The third is titled 'OSTS Committee Minutes 1-33 (1953-1976)' and are as described. Also includes some council papers relating to the Official Seed Testing Station.

Title: 41

References: K-14.41

Covering Dates: 1980-1981

Extent and Medium: 1 notebook and several hundred ticket receipts all in 1 box file.

Description: Titles on the spine of the box file – 'Crop Conference 1980. Fellows Day 1981. Ticket Sales Book.' Includes ticket receipts to both events and an extensive list of attendees.

Title: 42

References: K-14.42

Covering Dates: 1978-1979

Extent and Medium: 3 files, 1 of around 300 pages and two of between 50 and 100, all in 1 box file.

Description: Titles on spine of the box file – ‘Vacational Students 1978/79. Papers and Correspondence’. There are 3 files.

- The first is titled ‘1978/79 Vacational students Correspondence’. Letters from students requesting employment at NIAB and the replies they received. Organised alphabetically.
- The second is titled ‘Correspondence re. sandwich course students with college tutors, esp. those unable to help and with students not placed, with thru withdrawal or refusal etc.’ Covers 1978-79.
- The third is titled ‘1979 Vacational Students’. Letters and reports regarding students the visited during 1979, often including an assessment of their performance. Arranged alphabetically.

Title: 43

References: K-15.43

Covering Dates: 1979

Extent and Medium: 7 files, each between 50 and 150 pages, all in 1 box file.

Description: titles on spine of the box file – ‘Vacational Students. Sandwich course students 1979. Papers Correspondence’. There are 7 files.

- The first is titled ‘Vacation employment 1979 applications’. Contains alphabetised letters from students seeking employment with NIAB.
- The second is titled ‘Sandwich course students 1979 applications and correspondence’ and is as described. The applications are alphabetised.
- The third is titled ‘1979 Student Requirements Etc.’ Describes the student labour required by various sections of NIAB activity in 1979.
- The fourth is blank and collects together loose documents from the box file. Lists wages for students according to age.
- The fifth is titled ‘Vacation Employment 1979 General Correspondence’ and is as described.
- The sixth is titled ‘1978/79 Vacational students, official secrets act, pay & hours worked’. Signatures of those students who signed the Official Secrets Act in order to work at NIAB during 1978/79. Includes details of hours worked and their pay.
- The seventh is titled ‘Sandwich Course students 1979’. Contains applications from students on the sandwich course, and their assessments. Some general correspondence relating to individual students.

Title: 44

References: K-15.44

Covering Dates: 1980-1981

Extent and Medium: 2 files, between 150-200 pages in length, all in 1 box file.

Description: Titles on spine of the box file – ‘Sandwich course students 1980. Vacation Students Apr 80 to Mar 81’. There are 2 files.

- The first is titled ‘Sandwich course students 1980’. Contains alphabetised information pertaining to the students that attended at this time and their assessments’. Some general correspondence relating to individual students and job offers. Includes wages information.
- The second is titled ‘Vacation Students 1980’. Contains alphabetised information pertaining to the students that attended at this time and their assessments’. Some general correspondence relating to individual students and job offers. Includes wages information.

Title: 45

References: K-15.45

Covering Dates: 1980

Extent and Medium: 4 files, between 50 and 100 pages in length, all in 1 box file.

Description: Titles on spine of the box file – ‘Sandwich course and vacation employment 1980’. There are 4 files.

- The first is titled ‘Sandwich Course and Vacation Employment 1980 Requirements etc.’ Describes the student labour required by various sections of NIAB activity in 1980.
- The second is blank and collects together loose sheets from the box file. Contains information about wages. Some applications for work and NIAB job offers.
- The third is titled ‘Sandwich Course and Vacation Employment 1980 General and Unsuccessful Correspondence.’ Correspondence relating to open positions for sandwich course and vacation students, applications and refusals.
- The fourth is titled ‘Vacation Employment 1980 Applications’ and is as described. Contains alphabetised information pertaining to the students that attended at this time and their assessments’. Some general correspondence relating to individual students and job offers. Includes wages information.

Title: 46

References: K-16.46

Covering Dates: 1966

Extent and Medium: 13 files, all fewer than 50 pages, all within 1 box file.

Description: Titles on spine of the box file – ‘Joint Review Group 1966’ Files 1-13 on JRG Papers. Listed inside’. There are 13 files, labelled as:

- History and Constitution
- NIAB Staff terms and conditions of service
- Costing
- Land and Glasshouses
- Effects of 1964 Seeds Act
- NSDO
- Relations with MAFF/NAAS

- Future Status of NIAB
- Integration of NIAB staff with the Ministry
- Plant Pathology
- Statistics and computerisation
- Glasshouse crop variety testing
- Miscellaneous papers on Joint Review Group method of government support

Title: 47

References: K-16.47

Covering Dates: 1966-1967

Extent and Medium: 2 files, each between 50 and 100 pages, all within 1 box file.

Description: Titles on spine of the box file – ‘Joint Review Group 1966. JRG Papers 1-22 1967 Corres’. There are 2 files.

- The first is titled ‘Joint Review Group Papers 1-22’ contains drafts of eventual reports.
- The second is titled ‘F.R. Horne. Confidential’. Contains correspondence between Frank Horne and various representatives of the Ministry of Agriculture throughout 1967, regarding the future of NIAB and the findings of the Joint Review Group.

Title: 48

References: K-16.48

Covering Dates: 1966-1967

Extent and Medium: 2 files and 2 book-length reports (duplicates of one another), each between 150 and 250 pages, all in 1 box file.

Description: Titles on spine of the box file – ‘Joint Review Group 1966. 1. Summary of Report. 2. Report. 3. Press cuttings on Report.’ There are 2 files and 2 book-length reports.

- The first file is titled ‘Joint Review Group Report Summarised Version’ and is as described. Some annotations and correspondence inserted throughout.
- The second file is titled ‘J.R.G. Press Cuttings’. A substantial number of press cuttings are collected throughout 1968-69 relating to the publication of the report and views on its implications. Proposals contained in the review have been rejected by NIAB fellows.
- Both books are copies of the Joint Review Group Report, published December 1967.

Title: 49

References: K-17.49

Covering Dates: 1968

Extent and Medium: 2 files, between 50 and 100 pages, both within 1 box file.

Description: Titles on spine of the box file – ‘Joint Review Group 1966. 1. Corres. 1-1-68 - 28-6-68 Fellows AGM. 2. Corres 28-6-68 – 11-12-68 Fellows Special Meeting’. There are 2 files.

- The first is titled 'JRG 1966 Correspondence 1/1/68 – 28/6/68'. Inside cover explains it contains correspondence for the period after the Report was available and following the Chairman of the Council's address on it at the Fellows AGM 28 June "when Fellows expressed their disapproval".
- The second is titled 'JRG 1966 Correspondence 28/6/68 – 11/12/68'. Inside cover explains that this correspondence relates to the period after the Fellows had requested (and had) a Special Meeting to discuss the Joint Review Group Report. Special meeting was held 11/12/68. Also includes consultations with other bodies.

Title: 50

References: K-17.50

Covering Dates: 1968-1970

Extent and Medium: 3 files each between 50-100 pages, all within 1 box file.

Description: Titles on the spine of the box file – 'Joint Review Group 1966. 1. Corres 11-12-68 – 21-5-69 including alternative proposals for the future. 2. Special Com of Council papers and reports 21-3-68 – 22-1-69. 3. Trust Deed amendments following the 1966 JRG'. There are 3 files.

- The first is titled 'JRG 1966 Correspondence 11/12/68 – 21/5/69'. The inside cover explains that this file contains correspondence related in particular to the discussions that followed the special AGM of the Fellows and the alternative proposals for NIAB's future put forward.
- The second is titled '1966 JRG Special Committee of Council 21/3/68 – 22/1/69'. The inside cover explains that a Special Committee of the Council was appointed to deal with the Joint Review Group Report and this file contains the papers, minutes and correspondence on it for the period specified.
- The third is titled 'JRG 1966 Amendments to Trust Deed following 1966 JRG Report'. Contains correspondence and reports on the matter described up to 1970, and notifications to the press.

Title: 51

References: K-17.51

Covering Dates: 1950-1970

Extent and Medium: 4 files, each between 50 and 100 pages, all within 1 box file.

Description: Titles on spine of the box file – 'Joint Review Group 1966. 1. Staff. 2. Fellowship. 3. 1950/51 Special Com. – Trust Deed. 4. 1969 50th Anniversary. Queen's visit.' There are 4 files.

- The first is titled '1966 JRG Staff Consulting Committee' and contains correspondence on staff matters in connection with the same.
- The second is titled 'JRG 1966 Fellowship Working Party' and contains correspondence and papers on Fellowship following the JRG 1966 report, including promotion and statutes.
- The third is titled 'Special Committee appointed to consider the revision of the Institute's Trust Deed and the Statutes of Fellowship'. Includes minutes for the 1st, 2nd, and 3rd meetings of this committee between 1950 and 1951.

- The fourth is titled '1969- 50th Anniversary. Visit of H.M. The Queen 12/3/69' and is as described.

Title: 52**References:** K-18.52**Covering Dates:** 1975**Extent and Medium:** 1 file of around 400 pages all in 1 box file.**Description:** Titles on the spine of the box file – 'Code Memorandums. Civil Service pay and conditions of service code: - From 1-130'. Official Civil Service document. The file is as described.**Title:** 53**References:** K-18.53**Covering Dates:** 1975**Extent and Medium:** 1 file of around 400 pages all in 1 box file.**Description:** Titles on the spine of the box file – 'Code Memorandums. Civil Service pay and conditions of service code - 131-239'. Official Civil Service document. The file is as described.**Title:** 54**References:** K-18.54**Covering Dates:** 1975**Extent and Medium:** 1 file of around 400 pages all in 1 box file.**Description:** Titles on the spine of the box file – 'Code Memorandums. Civil Service pay and conditions of service code - From 240 to 336'. Official Civil Service document. The file is as described.**Title:** 55**References:** K-19.55**Covering Dates:** 1975**Extent and Medium:** 1 file of around 400 pages all in 1 box file.**Description:** Titles on the spine of the box file – 'Code Memorandums. Civil Service pay and conditions of service code: - From 337 - 427'. Official Civil Service document. The file is as described.**Title:** 56**References:** K-19.56**Covering Dates:** 1975**Extent and Medium:** 1 file of around 400 pages all in 1 box file.**Description:** Titles on the spine of the box file – 'Code Memorandums. Civil Service pay and conditions of service code: - From 428 to 495'. Official Civil Service document. The file is as described.**Title:** 57**References:** K-19.57

Covering Dates: 1970s

Extent and Medium: 1 file of around 400 pages all in 1 box file.

Description: Titles on spine of the box file – ‘Guide Memorandums. Establishment Officers’ Guide. From:- GM/1 to GM/179’. Official Civil Service document. The file is as described.

Title: 58

References: K-20.58

Covering Dates: 1969-1976

Extent and Medium: 154 committee papers, each less than 10 pages, all in 1 box file.

Description: Titles on spine of the box file – ‘National Certifying Authority for Herbage Seeds. May ’69-Nov 1976. Nos: 220-380’. The certifying scheme was established much earlier by NIAB, with origins in the Second World War. This file contains the papers of the Committee, though is missing 208, 244, 267, 282, 332 and 349-373.

Title: 59

References: K-20.59

Covering Dates: 1942-1971

Extent and Medium: 3 files, each between 50 and 100 pages, all in 1 box file.

Description: Titles on spine of the box file – ‘Aberystwyth Seeds Committee Minutes 1959-1971. A.S.C. Sub-Committee Nos. 1-64 (1942-1959).’ There are 3 files.

- The first is titled ‘Aberystwyth Seeds Sub-Committee Minutes 1-64 (1942-59)’ and is as described.
- The second is titled ‘Minutes Aberyst. Seeds Comm. 1959-1971’. With the reorganisation of the Seed Production Committee, the Aberystwyth Seeds Sub-Committee changed its name and began reporting directly to the Council.
- The third is titled ‘Aberystwyth Seeds Comm. Papers 1-61 (1959-1971)’ and is as described.

Title: 60

References: K-20.60

Covering Dates: 1959-1970

Extent and Medium: 5 files, each between 50 and 100 pages, all in 1 box file.

Description: Titles on spine of the box file – ‘Private Plant Breeders Assn 1961/68. Plant Breeders Rights Jan 59 – Dec 61. Dec 63 – Nov 69. NIAB statutory tests & trials 1970 correspondence. F.A.O. (file 28b). Tech meeting on plant Exploration and introduction 1960/62’. There are 5 files.

- The first is titled ‘Private Plant Breeders Association’ and is dated 1961-1968. Papers and correspondence relating to the formation of the Private Plant Breeders’ Association in 1960m and their interest in Plant Breeders’ Rights legislation.
- The second is titled ‘Plant Breeders Rights’ and covers 1964-1969. Correspondence regarding the formation of plant breeders rights by the Plant Varieties and Seeds Bill, some with private breeders, the National Vegetable Research Station and the Ministry of Agriculture.

- The third is titled 'Correspondence – L.J.Smith (1970) Technical Trials Advisory Committee etc.' Correspondence regarding the Ministry of Agriculture bodies the 'Technical Trials Advisory Group' and the 'Variety Classification Unit' (both of which are governed by representatives from England, Wales, Northern Ireland and Scotland) and how they will be constituted following Frank Horne's retirement. Includes proposals for a 'Statutory Trials Unit'.
- The fourth is titled 'F.A.O. Technical Meeting on Plant Exploration & Introduction'. Papers from between 1960 and 1962 relating to work of the Food and Agriculture Organization of the United Nations. Includes papers relating to the 'World Seed Campaign' in 1961. Largely to do with the meeting on plant exploration and introduction, arranged for 10-20th July 1961 in Rome. Proposals for a plant exploration expedition. Plans for the extension of activities for crop improvement work in the UK.
- The fifth is titled 'C.T.I.S. Plant Breeders Rights' and contains papers from between 1959-1961. Early correspondence with the Cambridge Plant Breeding Institute on this topic. Reports on methods for collecting the royalty potentially owed to breeders. Discussion of European Convention on Plant Breeders' Rights c.1959. Reports of the Committee on Transactions in Seeds c.1960. NIAB reply to Ministry of Agriculture regarding the latter.

Title: Index Nos of Archive Files

References: K-21

Covering Dates:

Extent and Medium: 1 grey plastic index card box with index cards.

Description: Box details 'Index Nos – Archive Files (Mr A.F. Kelly 1-37) N.I.A.B. 1-62'. Contains partial information as to the location of materials found throughout the 62 boxes of the Kelly collection.

Title: 61

References: K-21.61

Covering Dates: 1972-1981

Extent and Medium: 2 files, 1 very small the other between 150 and 200 pages, all in 1 box file.

Description: Titles on spine of the box file – 'Secretary NIAB Misc Correspondence Files: Gen 35 Jan 72 to Dec 81. NIAB Combined Insurance Policy. No: R.05CE.1770 Ref: 163590 (1975-1976)'. There are 2 files.

- The first is titled 'Miscellaneous' and contains correspondence to and from NIAB's Secretary and also the Institute's Director 1972-1981.
- The second is titled 'Combined Insurances Policy' and contains this policy.

Title: 62

References: K-21.62

Covering Dates: 1961-1976

Extent and Medium: 1 large combined file of around 400-500 pages, all in 1 box file.

Description: Titles on spine of the box file 'Particulars of Posts Nos 1-250. March 1961-January 1976'. The file gives extensive details of the roles assumed by staff throughout this period.

Title: 63

References:

Covering Dates: 1956-1969

Extent and Medium: 1 folder of between 150-200 pages, including some booklets.

Description: This folder of material belonging to A.F. Kelly was found elsewhere amongst the archive materials. It includes reports on, and copies of, the Visiting Groups that attended to NIAB between 1956-1967. Much is annotated, there is also considerable internal correspondence.

Title: Kelly Papers

References: K-22

Covering Dates: 1976-1983

Extent and Medium: 12 files, each between 100-200 pages, all within 1 archive box.

Description: These files were maintained by A.F. Kelly during his time as Deputy Director of NIAB. While not part of the original Kelly Collection, they are nevertheless included here, this location being the most appropriate. There are 12 files.

- The first is titled 'Library Sub-Committee of Council' and covers 1981-1983. Contains architectural plans of the new proposed library.
- The second is titled 'RASE C.D.I.U' and contains papers relating to the Royal Agricultural Society of England and the Cereal Demonstration and Information Unit of the National Agricultural Centre. Covering 1976-1983.
- The third is titled 'NIAB Conferences Feb 1979-May 1983' and is as described.
- The fourth is titled 'Recommended Lists 1970-1980' and is as described.
- The fifth is titled 'Executive Committee 1977' and contains information relating to the organisation and changing membership of the same, alongside extensive correspondence.
- The sixth is titled 'Publications 1981-1983' and contains information relating to materials published by NIAB during this period.
- The seventh is titled 'ISTA – General Jan 1979-June 1983' and contains papers and correspondence relating to the International Seed Testing Association, and the Official Seed Testing Station, throughout this period.
- The eighth is titled 'Executive – Council Trials Committee Meetings 1981/1982' and contains claims for travelling expenses for those attending Council and Trials Committee meetings.
- The ninth is titled 'Staff Movements Folder' and includes a template form to be used when staff move into different branches of the Institute.
- The tenth is titled 'Interviews (Panel) 1981/1982, 1982/1983, 1983/1984' and lists panel members and interviewees during job interviews in these years.

- The eleventh is titled 'Executive – Council – Trials Committee Meetings Paid 1982/1983' and contains claims for travelling expenses for those attending Council and Trials Committee meetings.
- The twelfth is titled 'Executive – Council – Trials Committee Meetings Paid 1983/1984' and contains claims for travelling expenses for those attending Council and Trials Committee meetings.

Title: OSTS Collection

References: O

Covering Dates: 1917-2007

Extent and Medium: 7 boxes.

Description: The Official Seed Testing Station for England and Wales began life in 1917 as simply the Seed Testing Station, and initially operated out of rooms of the Food Production Department (a department setup to increase food production in the UK during the First World War). These files relate to the founding and operation of the OSTS throughout this period. For a long time it was the only statutory element to NIAB, prosecuting the Seeds Act (1920) which required that measurements of seed purity and health be made as part of a sale of seed stocks. This collection includes papers relating to the staff of the OSTS, it's organising committee, examples of results of analysis carried out by the station, and correspondence with the International Seed Testing Association (a body officially founded in 1924 following an international conference at NIAB headquarters).

Title: 1 – Committee Papers of the OSTS

References: O-1

Covering Dates: 1921-1957

Extent and Medium: 64 files each of around 10 pages, and 2 books of between 100-200 pages, all within 1 box.

Description: These are the papers of the OSTS committee. The loose files relate to papers 1-64 (1921-1938). The beige book duplicates these, covering 1-44 (1921-1926). The red book further duplicates the loose files, covering 45-62 (1926-1935). However, there are included within the red book a new series of OSTS Committee papers numbered 1-15, dating from 1953-1957.

Title: 2 – Modern Seed Testing

References: O-2.2

Covering Dates: 1903

Extent and Medium: 9 page article in 1 file.

Description: A reprint of an article in *The Magazine of Commerce* from October 1903 on 'Modern Seed Testing'. Includes photographs of the Aynsome Seed Testing Station.

Title: 3 – 1st and 2nd Annual Reports of the OSTS

References: O-2.3

Covering Dates: 1918-1919

Extent and Medium: 2 pamphlets in 1 file.

Description: The annual reports of the OSTS, reprinted from the *Journal of the Board of Agriculture*.

Title: 4 – Seeds Act, 1920

References: O-2.4

Covering Dates: 1920

Extent and Medium: 1 pamphlet in 1 file.

Description: A copy of the Seeds Act (1920).

Title: 5 – Forest Trees Seeds Book 1921-1923

References: O-2.5

Covering Dates: 1921-1923

Extent and Medium: 1 notebook within 1 folder.

Description: Includes results of analysis conducted on seeds of forest trees and details of the source of the seed.

Title: 6 – Minutes of the OSTS Committee

References: O-2.6

Covering Dates: 1921-1931

Extent and Medium: 1 book of around 100 (used) pages in 1 folder.

Description: Handwritten minutes of the OSTS Committee for the period described.

Title: 7 – Diary of Alfred Burlton

References: O-2.7

Covering Dates: 1921-1934

Extent and Medium: 1 fragile notebook of less than 100 pages, within a folder.

Description: Found by Paul Thompson (employee of the OSTS) in 2005, this is a very fragile diary that belonged to an OSTS laboratory attendant, Alfred Attwood Burlton. Aside from capturing some of the more mundane tasks associated with his position, the diary also includes mentions of contemporary events and changes at NIAB headquarters. Paul Thompson conducted an investigation into his life, his report and findings are included in the file folder.

Title: 8 – Equipment and Technical Drawings 1927-1988

References: O-2.8

Covering Dates: 1927-1988

Extent and Medium: 1 file of around 100 pages, in pamphlets and binder form.

Description: Miscellaneous leaflets, receipts, manuals and drawings of instruments purchased by the OSTS throughout the stated period.

Title: 9 – Equipment and Technical Drawings 1988-2007

References: O-2.9

Covering Dates: 1988-2007

Extent and Medium: 1 file of around 100 pages, in pamphlets and binder form.

Description: Miscellaneous leaflets, receipts, manuals and drawings of instruments purchased by the OSTS throughout the stated period.

Title: 10 – Cereals Attendance 1958-1961

References: O-2.10

Covering Dates: 1958-1961

Extent and Medium: 3 register books inside 1 folder.

Description: Register books detailing the attendance of staff in the Cereal Seed section of the OSTs.

Title: 11 – Cereals Attendance 1962-1967

References: O-2.11

Covering Dates: 1962-1967

Extent and Medium: 2 register books inside 1 folder.

Description: Register books detailing the attendance of staff in the Cereal Seed section of the OSTs.

Title: 12 – Cereals Attendance 1994-2003

References: O-2.12

Covering Dates: 1994-2003

Extent and Medium: 100-150 pages of attendance record sheet, in one file.

Description: Register books detailing the attendance of staff in the Cereal, Pulses and Linseed section of the OSTs.

Title: 13 – Review of the Organisation and Procedures of the OSTs

References: O-2.13

Covering Dates: 1960

Extent and Medium: 1 report of 100 pages in 1 file.

Description: Ministry of Agriculture report on the organisation and procedures of the OSTs.

Title: 14 – MacKay – Internal Referee Testing in England and Wales 1951-1961

References: O-2.14

Covering Dates: 1962

Extent and Medium: 1 pamphlet in 1 file.

Description: A reprint of an article by D.B. MacKay in *Proceedings of the International Seed Testing Association* – 'Internal Referee Testing in England and Wales 1951-1961'.

Title: 15 – Pelleted Seeds Workshop 1972

References: O-3.15

Covering Dates: 1970-1972

Extent and Medium: 1 file of less than 100 pages.

Description: Contains draft timetable for the workshop, correspondence regarding the same, reports on problems associated with pelleted seed. Some papers relate to the International Seed Testing Association.

Title: 16 – H Miscellaneous

References: O-3.16

Covering Dates: 1974-1982

Extent and Medium: 1 folder of correspondence.

Description: Miscellaneous correspondence between the OSTs and others, some official state bodies, others private interest.

Title: 17 – MA/32 Miscellaneous

References: O-3.17

Covering Dates: 1968-1976

Extent and Medium: 2 folders of correspondence (was originally 1 overlarge file).

Description: Miscellaneous correspondence between the OSTs and others, some official state bodies, others private interest. Original folder was too damaged to be kept, so all information on the cover is recorded in the title.

Title: 18 – Staff Papers

References: O-3.18

Covering Dates: 1972-1979

Extent and Medium: 1 file of less than 150 pages.

Description: Papers and correspondence relating to notifications of new vacancies at NIAB kept by D.B. Mackay of the OSTs.

Title: 19 – International Seed Testing Association Rules Committee

References: O-3.19

Covering Dates: 1973-1974

Extent and Medium: 1 file of less than 150 pages.

Description: Report and correspondence relating to the rules committee of the International Seed Testing Association and the OSTs.

Title: 20 – Fees for Seed Testing and Courses MA/9

References: O-3.20

Covering Dates: 1975-1979

Extent and Medium: 1 folder of less than 150 pages.

Description: Correspondence relating to the fees paid to the OSTs as a result of its seed testing, and training, activities. Original folder was too damaged to be kept, so all information on the cover is recorded in the title.

Title: 21 – NI/3 Administration Branch

References: O-3.21

Covering Dates: 1976-1980

Extent and Medium: 2 folders of less than 100 pages each (was originally 1 overlarge file).

Description: Internal correspondence relating to the management of the OSTs. Arrangements for particular events, movements of staff, records of deaths of employees, some papers relating to the seed analysts course. Appears to have been kept by D.B. MacKay of the OSTs. Original folder was too damaged to be kept, so all information on the cover is recorded in the title.

Title: 22 – Seed Testing Station Northern Ireland

References: O-4.22

Covering Dates: 1963-1976

Extent and Medium: 1 file of less than 150 pages.

Description: Correspondence and reports exchanged between the OSTs and the Northern Ireland Seed Testing Station. Includes sharing of information, arrangements for meetings, plans for the future and so on.

Title: 23 – IS/23 Executive Committee May 76 – March 77

References: O-4.23

Covering Dates: 1976-1977

Extent and Medium: 1 folder of less than 150 pages.

Description: Papers and reports relating to the Executive Committee of the International Seed Testing Association. Includes arrangements for meetings and discussion of future protocol. Draft of 'Report on Seed Science and Technology 1974-77' by D.B. MacKay. Original folder was too damaged to be kept, so all information on the cover is recorded in the title.

Title: 24 – ISTA Newsletter

References: O-4.24

Covering Dates: 1977-1980

Extent and Medium: 11 issues of the newsletter with some interspersed papers, all in 1 file.

Description: Issues of the International Seed Testing Association Bulletin during this period, with a few papers interspersed in places throughout.

Title: 25 – Annual Figures

References: O-4.25

Covering Dates: 1972-1974

Extent and Medium: 1 file of less than 100 pages.

Description: Details of number of samples received and processed, of various different species and their annual totals.

Title: 26 – Cereals Section

References: O-4.26

Covering Dates: 1980-1990

Extent and Medium: 2 notebook of less than 150 pages each.

Description: The first is a register of individual staff members and their leave throughout September 1980 and March 1986. The second is the same for April 1986-September 1990.

Title: 27 – 1,000 Seed Weight Determination

References: O-4.27

Covering Dates: 1970

Extent and Medium: 1 file of less than 100 pages.

Description: Records of 1000 seed weight determinations, a procedure in which the weight of 1000 pure seeds of a species are calculated, to be used in calibration of results and checking against other stations. Also used to calculate seed rates for sowing.

Title: 28 – OSTS Sand Room

References: O-4.28

Covering Dates: 1995-1999

Extent and Medium: 1 notebook of less than 200 pages in 1 file.

Description: Records the entry and progress of various samples as they are grown in the sand room for germination testing.

Title: 29 – Laboratory Management: A Training Manual

References: O-4.29

Covering Dates: 1993

Extent and Medium: 1 ring-binder of less than 100 pages.

Description: A training manual written by T.J. Arthur, G.F.M. Bryant, R.M. Coster, R.J. Flood, M.J. Smith and J.H.B. Tonkin on how to manage a seed testing laboratory.

Title: 30 – 125 Years of Seed Testing – What Next?

References: O-4.30

Covering Dates: ?

Extent and Medium: 1 short report inside 1 file.

Description: A short report written by J.H.B. Tonkin (Chief Officer in the OSTS) on the history and possible future of seed testing. It is undated.

Title: 31 – Training for Seed Analysts 1986

References: O-4.31

Covering Dates: 1986

Extent and Medium: 1 pamphlet inside 1 file.

Description: A short pamphlet as described.

Title: 32 – Seed Analysis: A Training Manual

References: O-4.32

Covering Dates: 1995

Extent and Medium: 4 ring-binders with plastic covers.

Description: A 4 volume training manual for seed analysts. Each volume is in the region of 100-150 pages in length.

Title: 33 – Diaries of Sand and Soil Analysis Results

References: O-5

Covering Dates: 1955-1977

Extent and Medium: 19 Diaries inside 1 box.

Description: 19 diaries covering the above years (missing 1956, 1968 and 1975).

Title: 34 – Records of Analysis

References: O-6

Covering Dates: 1960-1992

Extent and Medium: 14 files (of between 100-200 pages each), all in 1 box.

Description: This box contains records of analysis from the OSTs. They are a testament to the working practices of the station. This box includes 14 files, each of analyses as recorded on a daily basis. This series of 14 files (when combined with O-7) offer an almost complete record of work from 1953-1992. Years missing include 7/1988-6/1989, 1976-1983.

Title: 35 – Records of Analysis

References: O-7

Covering Dates: 1927-1960

Extent and Medium: 2 ring-bound folders, 1 notebook (inside folder) and 10 files (of between 100-200 pages each), all in 1 box.

Description: This box contains records of analysis from the OSTs. They are a testament to the working practices of the station. They include; 2 black ring-bound folder containing records of number of weed seeds found in samples between 1927 and 1954, and alphabetised correspondence regarding results of tests between c2003 ; 1 notebook (inside a folder) recording the results of samples (and those who sent them to the OSTs) after initial germination testing and staining from 8/2/1950 to 24/11/1960; 10 files of analysis as recorded on a daily basis. This series of 10 files (when combined with O-6) offer an almost complete record of work from 1953-1992. Years missing include 7/1988-6/1989, 1976-1983. When accessioned these files were slightly out of order, so they have been returned to something like a chronology. Errors should be expected and apparent changes in working practice (particularly relating to the collation of data according to certain periods in the year) might be an artefact of the archiving process.

Title: 36 – ISTS Broad and Field Beans Papers from H. Higgins

References: O-4.36

Covering Dates: 1974

Extent and Medium: 1 file of around 50-100 pages.

Description: File is as described and regards the International Seed Testing Association.

Title: 37 – MAF Seed Analysts' Bulletin

References: O-4.37

Covering Dates: 1938

Extent and Medium: 1 200 page report.

Description: Copy of Ministry of Agriculture sponsored publication 'Seed Analysts' Bulletin' No. 31.

Title: 38 – Fourth Annual Report of the OSTs

References: O-4.38

Covering Dates: 1920-1921

Extent and Medium: 1 booklet inside a file.

Description: File as described.

Title: Governmental and Royally Appointed Bodies Collection

References: G

Covering Dates: 1918-1991

Extent and Medium: 1 box.

Description: NIAB was constituted by, and cooperated with, a number of important external bodies. This collection brings together NIAB's materials relating to the Ministry of Agriculture, the Development Commission, the Charity Commission and the Royal Agricultural Society of England.

Title: 1 – Grants from the Development Commission 1919

References: G-1.1

Covering Dates:1918-1928

Extent and Medium: 1 file of fewer than 100 pages.

Description: Right up until 1948, the Development Commission (founded in 1909) was the primary source of funding for NIAB. This file is concerned with correspondence and reports relating to those funds.

Title: 2 – M. of A. Financial Relations with

References: G-1.2

Covering Dates: 1920-1921

Extent and Medium: 1 file of fewer than 20 pages.

Description: A small collection of letters between NIAB and the Ministry of Agriculture regarding finances.

Title: 3 – Correspondence with the Charity Commissioners

References: G-1.3

Covering Dates:1929-1958

Extent and Medium: 1 file of around 50 pages.

Description: As a registered Charity, NIAB was responsible to the Charity Commission in the prosecution of the terms of its Trust Deed. This file is a described.

Title: 4 – Correspondence with Development Commissioners

References: G-1.4

Covering Dates: 1920-1931

Extent and Medium: 2 files each around 100 pages.

Description: Right up until 1948, the Development Commission (founded in 1909) was the primary source of funding for NIAB. This file is concerned with correspondence and reports relating to those funds. This file is significant for its containing many letters from members of the Development Commission itself, rather than just the organization.

Title: 5 – Charity Commission

References: G-1.5

Covering Dates: 1920-1978

Extent and Medium: 1 folder of less than 100 pages.

Description: Photocopies of the various agreements into which NIAB entered with the Charity Commission.

Title: 6 – RASE Pre 1972

References: G-1.6

Covering Dates: 1965-1972

Extent and Medium: 1 file of around 200 pages.

Description: Correspondence and reports shared between NIAB and the Royal Agricultural Society of England.

Title: 7 – Correspondence with MAF

References: G-1.7

Covering Dates: 1921-1968

Extent and Medium: 4 files, each between 100-150 pages.

Description: Correspondence between NIAB and the Ministry of Agriculture.

Title: 8 – Ministry Correspondence 1969 onward

References: G-1.8

Covering Dates: 1969-1986

Extent and Medium: 1 file of around 150 pages.

Description: Correspondence between NIAB and the Ministry of Agriculture.

Title: 9 – Ministry of Agriculture, Fisheries and Food Report on a Staff Inspection of the National Institute of Agricultural Botany

References: G-1.9

Covering Dates: 1991

Extent and Medium: 1 comb-bound report inside 1 file.

Description: A report published by the Ministry of Agriculture after an inspection of NIAB in 1991.

Title: 10 – Miscellaneous Leaflets distributed by MAF

References: G-1.10

Covering Dates: 1917-1976

Extent and Medium: 1 file holding around 50-100 individual leaflets.

Description: The Ministry of Agriculture published leaflets containing information considered valuable for farmers. This files contains some of those in NIAB's possession.

Title: Secretary Collection

References: S

Covering Dates: 1919-1990

Extent and Medium: 11 items, all within 1 box.

Description: Papers belonging to the office of the Secretary of NIAB. This position was occupied by Maurice G. Tozer from 1933-1967 (though he worked at the Institution in other capacities previously). The papers relate to a wide range of topics, including correspondence with NIAB's solicitors, reports on the work of the Institute and contracts with the Horticultural Research Station. Some papers relating directly to the Fellows of NIAB are also kept here.

Title: 1 – Correspondence with Knapp-Fisher and Wartnaby 1919-1939

References: S- 1.1

Covering Dates: 1919-1939

Extent and Medium: 1 file of under 50 pages.

Description: Letters to and from NIAB's solicitors, Knapp-Fisher & Sons (later & Wartnaby) whose offices were in The Sanctuary, Westminster Abbey. They regard changes to NIAB's Trust Deed, the seal of the Institute, changes in the ownership of NIAB property and title deeds, and so on.

Title: 2 – Memoranda on work of the Institute 6/1/3

References: S-1.2

Covering Dates: 1925-1929

Extent and Medium: 1 file of less than 100 pages.

Description: Contains reports written for the benefit of the Development Commission and for other external groups explaining the progress of the work of the Institute. There are numerous drafts, often heavily annotated.

Title: 3 – Method of Payment for Statistical Work

References: S-1.3

Covering Dates: 1924-1932

Extent and Medium: 1 file of less than 50 pages.

Description: During this period NIAB relied on students of Cambridge University to complete its statistical work. These files indicate the type of work conducted and the costs.

Title: 4 – Papers for Ag Research Council (and miscellaneous)...

References: S-1.4

Covering Dates: 1956-1961

Extent and Medium: 1 file envelope with 3 items inside; 2 files and (x2 copies) of the 1961 report.

Description: Titles on spine of the envelope file – 'Papers for AG Research Council 1937. FIS Conference 1954. Visiting Group 1961'. Despite these titles all of the material is actually related to visiting group reports of 1956 and 1961. There are 2 files and 2 copies.

- The first is titled 'National Institute of Agricultural botany (Report of a Visiting Group) April, 1956'. Contains a copy of the report of the Ministry of Agriculture visiting group in unpublished form.
- The second is titled 'Visiting Group 1961'. Contains copies of the draft report, minutes of meetings responding to the draft report and correspondence relating to the same.
- The third item is titled 'National Institute of Agricultural Botany Report of the 1961 visiting group'. There are two copies of this report.

Title: 5 – H.R.S. Contracts and Financial Statements

References: S-1.5

Covering Dates: 1940-1949

Extent and Medium: 1 file of around 100 pages.

Description: Correspondence and reports relating to the release of varieties and sale of seed of those varieties from the Cambridge Horticultural Research Station, as organised by NIAB. Includes examples of official certified seed sacks. Statements of account. Correspondence with Messrs Cooper Taber & Co., the private firm made responsible for dissemination.

Title: 6 – Snell Medal Award (and miscellaneous)...

References: S-1.6

Covering Dates: 1920-1975

Extent and Medium: 1 file envelope, containing 8 files, each between 50 and 150 pages long.

Description: Titles on spine of the file envelope – 'Snell Medal Award 1952. Capital projects – General Jan 1973-Feb 1981. Conversion of N.I.A.B. Cereal Granary. Proposed Motorway 1963-1970. Map of Cambridge + Institute 1970. Land + Buildings 1969-1970. Trial Ground Extension L+B 1971-1983. Drainage – Trial Ground Lease of Atkins Land 1971-1985.' There are 8 files.

- The first is titled 'Snell Medal Award 1952-'. Correspondence from between 1952 and 1961 relating to who is and isn't going to receive the Snell Medal Award for services to the potato industry.
- The second is titled 'Capital Projects – General Jan 1973-'. Relating to 1973-1981. Small amount of correspondence relating to land and buildings.
- The third is titled 'Conversion of NIAB Cereal Granary'. Papers from 1971-1974 relating to the possible conversion of the granary into additional office and laboratory space after the removal of the National Seed Development Organisation to another location.
- The fourth is titled 'Proposed Motorway'. Papers from between 1963-1970 relating to proposed bypass which crosses NIAB land. Includes maps.
- The fifth is titled 'Map of Cambridge and Institute 1970'. Map designed to aid visitors to the Institute with plan of the premises.

- The sixth is titled 'Trial Ground Extension/Land + Buildings 1971-'. Covers 1971-1983 and relates to the headquarters trial ground and surrounding area. Sale of land due to by-pass.
- The seventh is titled 'Drainage – Trial Ground/Lease of Atkins Land 1971-'. Covers 1971-1985 and relates to problems associated with drainage on this area of NIAB land.
- The eighth is titled 'Sugar Beet Trials (1971-75). Correspondence and reports relating to the same.

Title: 7 – Internal NIAB reports and correspondence for Secretary

References: S-2.7

Covering Dates: 1958-67

Extent and Medium: 1 file of less than 50 pages.

Description: Miscellaneous correspondence to and from the Secretary. Some issues include estimates of costs, new buildings, appointments to Council and Committees etc.

Title: 8 – Correspondence between NIAB secretary and MAFF

References: S-2.8

Covering Dates: 1962-1964

Extent and Medium: 1 file of less than 20 pages.

Description: Miscellaneous correspondence between NIAB and the Ministry of Agriculture Fisheries and Food.

Title: 9 – Fellows Subscriptions

References: S-2.9

Covering Dates: 1967-1990

Extent and Medium: 1 green book.

Description: Gives details of the amounts of money donated by individual Fellows for three different fund raising schemes. The first, the Retirement of the Secretary (March 1967). The Second the Retirement of the Director (1970). The third the Retirement of the Director (1990).

Title: 10 – Conditions of Service 1974

References: S-2.10

Covering Dates: 1974-1976

Extent and Medium: 1 file of 150-200 pages.

Description: Details the conditions of service to which various members of NIAB's staff were held.

Title: 11 – Restructuring 1973-1976

References: S-2.11

Covering Dates: 1973-1976

Extent and Medium: 1 file between 150 and 200 pages.

Description: Has extensive details on the structure of NIAB prior to this planned rearrangement, and staff positions relating to the same.

Title: 12 – Letter from former fellow of NIAB, Geoffrey A Oswald

References: S-3.12

Covering Dates: 1995

Extent and Medium: - 1 letter and a newspaper cutting inside a folder.

Description: Letter from Oswald with attached newspaper clipping from his father's collection of papers. Clipping is from 1910 and regards an investigation into 'Mummy wheat' found inside an Egyptian tomb and then apparently regrown.

Title: 13 – Statistics Course for NIAB Fellows

References: S-3.13

Covering Dates: 1978

Extent and Medium: 1 folder of around 150 pages.

Description: File is as described.

Title: 14 – 1972 Stats Course at Kings

References: S-3.14

Covering Dates: 1972

Extent and Medium: 1 file of around 100 pages.

Description: Papers of another statistics course for NIAB Fellows.

Title: 15 – Ten year fellows, June 1969

References: S-3.15

Covering Dates: 1969-1975

Extent and Medium: 1 file of around 50 pages.

Description: Correspondence between NIAB and various Ten Year Fellows (those who had paid membership for ten years in advance).

Title: 16 – Fellowship General, July 1969

References: S-3.16

Covering Dates: 1969-1979

Extent and Medium: 1 file of around 200 pages.

Description: Correspondence as described.

Title: 17 – Fellows + Open Days, 1971-

References: S-3.17

Covering Dates: 1971-1978

Extent and Medium: 1 file of around 150 pages.

Description: Correspondence as described.

Title: 18 – Associate Fellows, Sept 1971-

References: S-3.18

Covering Dates: 1971-1973

Extent and Medium: 1 file of around 100 pages.

Description: Correspondence as described.

Title: 19 – Honorary Fellows in Great Britain, Oct 1952-

References: S-3.19

Covering Dates: 1952-1977

Extent and Medium: 1 file of around 50 pages.

Description: Correspondence as described.

Title: 20 – Howard Gregory Memorial, Oct 1953-

References: S-3.20

Covering Dates: 1953-1971

Extent and Medium: 1 file of around 50 pages.

Description: Correspondence as described.

Title: Executive and Sub-Executive Committee Collection

References: E

Covering Dates: 1922-1983

Extent and Medium: 7 boxes.

Description: The Executive and Sub-Executive Committees were constituted by a select group of Council members, elected on an annual basis. While the Council only met quarterly, these Committees met far more often, and were tasked with making important decisions about the Institute's activities in concert with the Director. They could commission reports, to be submitted to the Council, and also arrange to have reports written for themselves. It is impressive that the NIAB archive contains a complete run of the Executive Committee's papers between 1922 and 1983, while the minutes for both this Committee and the Sub-Executive Committee have also survived in good number.

Title: 1 – Executive Committee Papers

References: E-1

Covering Dates: 1922-1958

Extent and Medium: 2 large red spined books and 1 green and red box file.

Description: There are three items in this box:

- The first is a red spined book with affixed Executive Committee Papers 1-74 (1922-1927).
- The second is a red spined book with affixed Executive Committee Papers 75-135 (1927-1956)
- The third is a green and red box file containing Executive Committee Papers 107-180 (1955-1958)

Title: 2 – Executive Committee Papers

References: E-2

Covering Dates: 1958-1970

Extent and Medium: 3 green and red box files.

Description: There are three items in this box:

- The first is a green and red box file containing Executive Committee Papers 181-234 (1958-1962).
- The second is a green and red box file containing Executive Committee Papers 235-286 (1962-1966).
- The third is a green and red box file containing Executive Committee Papers 287-353 (1966-1970).

Title: 3 – Executive Committee Papers

References: E-3

Covering Dates: 1970-1978

Extent and Medium: 3 green and red box files.

Description: There are three items in this box:

- The first is a green and red box file containing Executive Committee Papers 354-436 (1970-1973).

- The second is a green and red box file containing Executive Committee Papers 437-549 (1973-1976).
- The third is a green and red box file containing Executive Committee Papers 550-647 (1976-1978).

Title: 4 – Executive Committee Papers

References: E-4

Covering Dates: 1978-1983

Extent and Medium: 2 green and red box files and 1 grey and green box file.

Description: There are three items in this box:

- The first is a green and red box file containing Executive Committee Papers 648-722 (1978-1979).
- The second is a green and red box file containing Executive Committee Papers 723-807 (1980-1982).
- The third is a grey and green box file containing Executive Committee Papers 808-855 (1982-1983).

Title: 5 – Executive Committee Papers (with annotations)

References: E-5.5

Covering Dates: 1966-1967

Extent and Medium: 1 file of around 150 pages.

Description: These copies of Executive Committee Papers 267-298 appear to have been collected by one member of NIAB staff, and contain their annotations. (See also E-5.6 and E-5.7).

Title: 6 – Executive Committee Papers (with annotations)

References: E-5.6

Covering Dates: 1968-1969

Extent and Medium: 1 file of around 150 pages.

Description: These copies of Executive Committee Papers 299-330 appear to have been collected by one member of NIAB staff, and contain their annotations. (See also E-5.5 and E-5.7).

Title: 7 – Executive Committee Papers (with annotations)

References: E-5.7

Covering Dates: 1970-1971

Extent and Medium: 1 file of around 200 pages.

Description: These copies of Executive Committee Papers 331-394 appear to have been collected by one member of NIAB staff, and contain their annotations. (See also E-5.5 and E-5.7).

Title: 8 – Executive Committee Minutes

References: E-5.8

Covering Dates: 1928-1950

Extent and Medium: 1 notebook with handwritten minutes.

Description: Minutes of the 43rd – 87th meetings of the Executive Committee.

Title: 9 – Executive Committee Minutes

References: E-5.9

Covering Dates: 1950-1968

Extent and Medium: 1 green and red box file.

Description: Minutes of the 87th - 210th meetings of the Executive Committee.

Title: 10 – Executive Committee Minutes

References: E-5.10

Covering Dates: 1955-1966

Extent and Medium: 1 file of around 150 pages.

Description: Minutes of the 108th - 194th meetings of the Executive Committee.

Title: 11 – Executive Committee Minutes

References: E-6.11

Covering Dates: 1961-1967

Extent and Medium: 1 file of around 100 pages.

Description: Minutes of the 147th - 200th meetings of the Executive Committee.

Title: 12 – Executive Committee Minutes

References: E-6.12

Covering Dates: 1969-1983

Extent and Medium: 1 green and red box file.

Description: Minutes of the 211th – 295th meetings of the Executive Committee.

Title: 13 – Minutes of the Executive Sub-Committee (1)

References: E-6.13

Covering Dates: 1930-1942

Extent and Medium: 1 notebook of around 300 pages.

Description: Minutes of the 1st-54th meetings of the Executive Sub-Committee.

Title: 14 – Minutes of the Executive Sub-Committee (2)

References: E-6.14

Covering Dates: 1942-1946

Extent and Medium: 1 notebook of around 200 pages.

Description: Minutes of the 55th – 73rd meetings of the Executive Sub-Committee.

Title: 15 – Minutes of the Executive Sub-Committee (3)

References: E-6.15

Covering Dates: 1946-1948

Extent and Medium: 1 notebook of around 200 pages.

Description: Minutes of the 74th – 88th meetings of the Executive Sub-Committee.

Title: 16 – Minutes of the Executive Sub-Committee (4)

References: E-6.16

Covering Dates: 1949-1950

Extent and Medium: 1 notebook of around 200 pages.

Description: Minutes of the 89th – 96th meetings of the Executive Sub-Committee.

Title: 17 – Minutes of N.I.A.B. Executive Sub-Cttee

References: E-6.17

Covering Dates: 1937-1939

Extent and Medium: 1 file of around 50 pages.

Description: Minutes of the 29th – 43rd meetings of the Executive Sub-Committee.

Title: 18 – Papers for meetings of Executive Sub-Cttee

References: E-6.18

Covering Dates: 1939

Extent and Medium: 1 file of around 50 pages.

Description: Some miscellaneous papers associated with meetings of the Executive Sub-Committee.

Title: 19 – Minutes of the Executive Sub-Committee

References: E-6.19

Covering Dates: 1930-1955

Extent and Medium: 1 green and red box file.

Description: Minutes of the 1st – 126th meetings of the Executive Sub-Committee. Missing 45, 71 and 93.

Title: 20 – Executive Sub-Committee Papers

References: E-7

Covering Dates: 1931-1955

Extent and Medium: 1 red spined book with copies of committee papers affixed inside and 2 green and red box files.

Description: There are three items inside this box.

- The first is a red spined book containing papers 1-32 of the Executive Sub-Committee (1931-1937).
- The second is a green and red box file containing papers 1-38 of the Executive Sub-Committee (1930-1938).
- The third is a green and red box file containing papers 39-118 of the Executive Sub-Committee (1939-1955).

Title: Buildings, Farms and Sub-Stations Collection

References: B

Covering Dates: 1918-1994

Extent and Medium: 4 boxes.

Description: These archive materials relate to NIAB's buildings, land, farms and substations. Some of the most important items include the Headquarters visitor's books and files relating to the Housing Association for Officer's Families, who oversaw the houses in Howes Place.

Title: 1 – Visitor's Book

References: B-1.1

Covering Dates: 1921-1971

Extent and Medium: 1 leather-bound book of around 300 pages inside a file.

Description: This book holds the signatures of all those who visited the institute between its official Royal Opening in 1921 and 1971. A number of notable people can be found in its pages.

Title: 2 – Visitor's Book

References: B-1.2

Covering Dates: 1961-1994

Extent and Medium: 1 black covered visitor's book inside 1 folder.

Description: This book holds the signatures of all those who visited the institute between 1961 and 1994. A number of notable people can be found in its pages.

Title: 3 – Notice for flat to let at NIAB

References: B-1.3

Covering Dates: 1938

Extent and Medium: 1 piece of paper inside a file.

Description: File is as described.

Title: 4 – Plan for Proposed New NIAB Building Seale-Hayne Agric. College, Jan 1954

References: B-1.4

Covering Dates: 1954

Extent and Medium: 1 file of less than 20 pages.

Description: Detailed drawings and architectural plans for NIAB's suggested new buildings at Seale-Hayne Agricultural College.

Title: 5 – Undated 'New Building Allocation of cost of general services'

References: B-1.5

Covering Dates: c1950

Extent and Medium: 1 file of 2 pages.

Description: These handwritten notes describe how the areas of a new building will be allocated amongst NIAB branches, and the % cost thereby shared.

Title: 6 – Analysis of Repairs to:- Main Buildings (General) Main Buildings (OSTS) Main Buildings (Admin & Crop Improvement Branches). Flat No. 5. Housekeeper's Cottage. The Potato Testing Station. The Mount – Ormskirk.

References: B-1.6

Covering Dates: 1923-1940

Extent and Medium: 1 file of around 150 pages.

Description: Histories of repairs conducted on various parts of the NIAB Headquarters and other NIAB buildings, including cost.

Title: 7 – Trial Ground Buildings

References: B-1.7

Covering Dates: 1956-1960

Extent and Medium: 1 file of fewer than 50 pages.

Description: Correspondence regarding repairs and changes to various parts of NIAB owned trial ground buildings.

Title: 8 – Inventory Book

References: B-1.8

Covering Dates: 1921-1944

Extent and Medium: 1 large green record book, around 300 pages.

Description: This inventory book includes details of items acquired by NIAB throughout this period. The contents are not in any obvious order, and throughout various loose bits of paper have been interleaved.

Title: 9 – Trial Ground Building

References: B-1.9

Covering Dates: 1966-1970

Extent and Medium: 1 file of around 150 pages.

Description: Architectural and ground plans of proposed new trial ground buildings. Includes relevant correspondence.

Title: 10 – Central Heating 1970-1974

References: B-1.10

Covering Dates: 1970-1974

Extent and Medium: 1 file of around 100 pages.

Description: Correspondence and receipts for the installation of central heating units within NIAB and its sub-stations.

Title: 11 – Conversion of Granary 1972-1975

References: B-1.11

Covering Dates: 1972-1975

Extent and Medium: 1 file of around 150 pages.

Description: Details the process of converting NIAB's existing granary into offices, laboratories and extended storage space. Correspondence, architectural and other plans of the building layout.

Title: 12 – Contractor for Granary Conversion

References: B-1.12

Covering Dates: 1973-1977

Extent and Medium: 1 file of around 100 pages.

Description: Receipts and orders of payment with the Contractor for the conversion of NIAB's granary.

Title: 13 - Architect

References: B-1.13

Covering Dates: 1972-1976

Extent and Medium: 1 file of fewer than 50 pages.

Description: Contractual arrangements with NIAB's architect for the conversion of the granary.

Title: 14 – Consulting Engineering Services

References: B-1.14

Covering Dates: 1973-1976

Extent and Medium: 1 file of fewer than 50 pages.

Description: Contractual arrangements with the consulting engineering services for the conversion of NIAB's granary.

Title: 15 – Minutes of the Establishment Committee of the National Institute of Agricultural Botany

References: B-2.15

Covering Dates: 1921

Extent and Medium: 1 large notebook, only around 10 pages used.

Description: File is as described, though only 3 meetings are minuted.

Title: 16 – Correspondence RE: Land 1918

References: B-2.16

Covering Dates: 1918

Extent and Medium: 1 file of fewer than 50 pages.

Description: File is as described. Includes some correspondence with staff of Country Life, and Weaver's involvement with a commemoration service for the first British soldier to be killed in the First World War, plans for setting returning serviceman on the land. Also correspondence with Stafford Cripps. Plans to have land donated for use of NIAB and operated by servicemen. Also Weaver on Swedish design of the Institute.

Title: 17 – Atkin's Land

References: B-2.17

Covering Dates: 1957

Extent and Medium: 1 file of fewer than 100 pages.

Description: Correspondence, maps and reports regarding this land adjoining the headquarters in Cambridge.

Title: 18 – Lease of Mr Atkin's Land

References: B-2.18

Covering Dates: 1957-1965

Extent and Medium: 1 file of fewer than 50 pages.

Description: Correspondence, maps and reports regarding this land adjoining the headquarters in Cambridge. Became an extension to the headquarters trial ground.

Title: 19 – Soil Surveys- Trial Ground and Hill Farm

References: B-2.19

Covering Dates: 1958-1968

Extent and Medium: 1 file of fewer than 50 pages.

Description: File is as described.

Title: 20 – Trial Ground Roads

References: B-2.20

Covering Dates: 1957-1963

Extent and Medium: 1 file of around 50 pages.

Description: Correspondence, reports and maps as described.

Title: 21 – Trial Ground Roads

References: B-2.21

Covering Dates: 1964-1969

Extent and Medium: 1 file of around 100 pages.

Description: Correspondence, reports and maps as described.

Title: 22 – Trial Ground Fences and Right of Way including Footpath Appeal Volume II

References: B-2.22

Covering Dates: 1958-1960

Extent and Medium: 1 file of less than 50 pages.

Description: Correspondence and maps as described.

Title: 23 – Trial Ground Irrigation Vol III

References: B-2.23

Covering Dates: 1959-1963

Extent and Medium: 1 file of less than 50 pages, envelopes of contracts inserted inside.

Description: Correspondence, reports and contracts as described.

Title: 24 – Trial Ground Extensions Volume II

References: B-2.24

Covering Dates: 1959-1962

Extent and Medium: 1 file of around 50 pages.

Description: Correspondence, reports and maps as described.

Title: 25 – Trial Ground Fences & Right of Way

References: B-2.25

Covering Dates: 1955-1958

Extent and Medium: 1 file of around 50 pages.

Description: Correspondence as described.

Title: 26 – Extension of H.Q. Trial Ground

References: B-2.26

Covering Dates: 1956-1969

Extent and Medium: file of around 20 pages.

Description: Correspondence as described.

Title: 27 –An Archaeological Desk-Based Assessment of land at the National Institute of Agricultural Botany, Huntingdon Road, Cambridge

References: B-2.27

Covering Dates: 2006

Extent and Medium: 1 bound report inside 1 blue folder.

Description: File is as described. Report was conducted by John Samuels Archaeological Consultants.

Title: 28 – H.A.O.F. Tennis Courts

References: B-3.28

Covering Dates: 1923-1936

Extent and Medium: 1 file of fewer than 50 pages.

Description: Maps and correspondence regarding the Housing Association for Officers' Families tennis courts.

Title: 29 – Correspondence with H.O.A. 2 From JAN 1947

References: B-3.29

Covering Dates: 1947-1953

Extent and Medium: 1 file of around 100 pages.

Description: Correspondence between NIAB and the Housing Association for Officers' Families.

Title: 30 – H.A.O.F. March 1954 to December 1959

References: B-3.30

Covering Dates: 1954-1959

Extent and Medium: 1 folder of around 100 pages.

Description: Correspondence between NIAB and the Housing Association for Officers' Families.

Title: 31 – Housing Association for Officers' Families

References: B-3.31

Covering Dates: 1960-1965

Extent and Medium: 1 file of around 100 pages.

Description: Correspondence between NIAB and the Housing Association for Officers' Families.

Title: 32 – Copies of Sub-Stations' Accounts supplied by the Ministry of Agriculture and Fisheries

References: B-3.32

Covering Dates: 1926-1932

Extent and Medium: 1 file of fewer than 50 pages.

Description: File is as described.

Title: 33 – Sub-Stations' Finance

References: B-3.33

Covering Dates: 1933-1937

Extent and Medium: 4 files (1933-1934, 1934-1935, 1935-1936, 1936-1937) inside 1 file.

Description: File is as described.

Title: 34 – Sub-Stations' Finances

References: B-3.34

Covering Dates: 1937-1940

Extent and Medium: 3 files (1937-1938, 1938-1939, 1939-1940) inside 1 file.

Description: File is as described.

Title: 35 – Sub-Stations' Finances

References: B-3.35

Covering Dates: 1940-1943

Extent and Medium: 3 files (1940-1941, 1941-1942, 1942-1943) inside 1 file.

Description: File is as described.

Title: 36 – Sub-Stations' Finances

References: B-3.36

Covering Dates: 1943-1946

Extent and Medium: 3 files (1943-1944, 1944-1945, 1945-1946) inside 1 file.

Description: File is as described.

Title: 37 – Sub-Stations' Equipment and Miscellaneous Sales

References: B-3.37

Covering Dates: 1937-1942

Extent and Medium: 6 files (1936-1937, 1937-1938, 1938-1939, 1939-1940, 1940-1941, 1941-1942) inside 1 file.

Description: File is as described.

Title: 38 – Crop Testing Stations Income and Expenditure Account for the year ended 31st March 1948

References: B-3.38

Covering Dates: 1948

Extent and Medium: 1 file of fewer than 20 pages.

Description: File is as described.

Title: 39 – Ormskirk 1918-1920

References: B-3.39

Covering Dates: 1918-1920

Extent and Medium: 1 folder of around 100 pages.

Description: Correspondence and reports relating to the Ministry of Agriculture's Ormskirk Potato Testing Station and its coming under the responsibility of NIAB. Inside of old folder recorded "Other Papers are in the Ministry's File CB 12/20".

Title: 40 – Property Schedule

References: B-4.40

Covering Dates: 1921-1966

Extent and Medium: 1 file of around 50 pages, containing file for 1921-1931.

Description: Detailed schedule of NIAB property and money expended on the same. Letters from Purcell Weaver, son of Sir Lawrence.

Title: 41 – Hiam Farm 1927

References: B-4.41

Covering Dates: 1920-1927

Extent and Medium: 1 file of around 150 pages.

Description: Valuations and reports on the farm, correspondence regarding the farm. Letters and reports regarding the sale of the farm. Sale guide.

Title: 42 – Hill Farm Purchase Of

References: B-4.42

Covering Dates: 1951-1967

Extent and Medium: 1 file of around 50 pages.

Description: Correspondence regarding Hill Farm and possible land nearby that might be acquired.

Title: 43 – Hill Farm Reports

References: B-4.43

Covering Dates: 1952-1959

Extent and Medium: 4 folders, each of about 100 pages.

Description: Folders are as described.

Title: 44 – Hill Farm Bailiff's House

References: B-4.44

Covering Dates: 1957-1959

Extent and Medium: 1 file of fewer than 50 pages.

Description: Includes plans and correspondence.

Title: 45 – Hill & Noon Farms: Field Drainage

References: B-4.45

Covering Dates: 1954-1959

Extent and Medium: 1 file of around 20 pages.

Description: Includes maps and correspondence.

Title: 46 – Electricity Swavesey College Farm

References: B-4.46

Covering Dates: 1960-1966

Extent and Medium: 1 file of around 20 pages.

Description: Correspondence regarding the same.

Title: 47 – Hill Farm – Noon Folly Farm & King William

References: B-4.47

Covering Dates: 1960-1969

Extent and Medium: 1 file of around 50 pages.

Description: Correspondence and maps regarding the same.

Title: 48 – Hill Farm, King William IV Land & Noon Folly

References: B-4.48

Covering Dates: 1958-1968

Extent and Medium: 1 file of around 20 pages.

Description: Correspondence regarding the same.

Title: 49 – Hill Farm Capital Grants

References: B-4.49

Covering Dates: 1949-1972

Extent and Medium: 1 file of around 200 pages.

Description: Correspondence and reports regarding the same. Floor plans of Hill Farm House.

Title: 50 – Hill Farm & Noon Folly Farm Cottage Buildings

References: B-4.50

Covering Dates: 1950-1959

Extent and Medium: 1 file of around 50 pages.

Description: Plans and layouts of these buildings, correspondence and reports regarding the same.

Title: 51 – Inventory of Hill Farm Machinery

References: B-4.51

Covering Dates: 1970

Extent and Medium: 1 file of around 10 pages.

Description: File is as described, with some correspondence.

Title: 52 – Hill Farm 1969-1972

References: B-4.52

Covering Dates: 1969-1972

Extent and Medium: 1 file of around 100 pages.

Description: Maps and correspondence regarding the same, including compulsory purchase of land for the building of a fly-over.

Title: 53 – Hill Farm 1970

References: B-4.53

Covering Dates: 1969-1970

Extent and Medium: 1 file of around 50 pages.

Description: Inventory of machinery at Hill Farm and Headquarters trial ground in preparation for the sale of Hill Farm. Correspondence regarding the same.

Title: 54 – Special Council 12/10/70 Sale of Hill Farm

References: B-4.54

Covering Dates: 1970-1971

Extent and Medium: 1 file of around 100 pages, including sale pamphlet.

Description: Correspondence as described. Includes auction booklet.

Title: 55 – Administration Files - Directorate

References: B-4.55

Covering Dates: None

Extent and Medium: 1 file, no pages.

Description: This file was kept in the archive as its cover provides a list of 'Administration Files' which might be useful as an inventory of sorts for research purposes.

Title: 56 – Hill Farm

References: B-4.56

Covering Dates: 1971-1975

Extent and Medium: 1 file of around 100 pages.

Description: After the sale of Hill Farm, NIAB retained the rights to a number of properties on the estate, and access via the farm road. This correspondence, and the maps, relate to the farm in this capacity.

Title: 57 – Land and Buildings (1968-1970)

References: B-4.57

Covering Dates: 1968-1970

Extent and Medium: 1 file of around 100 pages.

Description: Correspondence regarding the same.

Title: 58 – Farm Committee (1970-1971)

References: B-4.58

Covering Dates: 1970-1971

Extent and Medium: 1 file of around 50 pages.

Description: Correspondence and reports of the farm committee, including explanation of its functions. Some minutes and agendas.

Title: Finance Collection

References: F

Covering Dates: 1920-1979

Extent and Medium: 4 boxes.

Description: This collection brings together all NIAB archive material of direct relevance to the financial side of NIAB. Outside of this hand list, the archive also has a large collection of Cash Books and Ledgers, not suitable for boxing, which nevertheless can be consulted in the archive reading room. These were found in cupboards in the Council Room and had presumably been left there for many years. The larger part of this collection is made up of records of annual Maintenance Grants (from 1921-1932) and the Institute's yearly estimates.

Title: 1 – Minutes of Finance Committee

References: F-1.1

Covering Dates: 1920-1921

Extent and Medium: Large notebook only around 20 pages used inside 1 file.

Description: Handwritten minutes of the 1st – 6th meetings of the Finance Committee.

Title: 2 – Finance Committee Minutes and Papers 1920-1921

References: F-1.2

Covering Dates: 1920-1921

Extent and Medium: 1 file of around 50 pages.

Description: Paper copies of minutes of the 1st-6th meetings of this committee, including some reports on financial issues.

Title: 3 – Investments 1922-1951 + 1967

References: F-1.3

Covering Dates: 1922-1967

Extent and Medium: 1 file of around 150-200 pages.

Description: File is as described.

Title: 4 – Institute's Financial Position March 1923

References: F-1.4

Covering Dates: 1923

Extent and Medium: 1 file of around 50 pages.

Description: Report as described.

Title: 5 – Finance – Special Applications & Statements of Financial Position

References: F-1.5

Covering Dates: 1923-1928

Extent and Medium: 1 file of around 50-100 pages.

Description: Deputations to the Development Commission, proposals for new acquisitions, reports on the policy and finance of the Institute, capital expenditure.

Title: 6 – Notes on Finance of N.I.A.B. 1932 onwards

References: F-1.6

Covering Dates: 1928-1932

Extent and Medium: 1 file of around 50 pages, including copy of 12th Annual report for 1930-1931.

Description: Includes handwritten notes on the same, report on proposals from the Ministry for a reduction in NIAB's grant, costs of various aspects of the Headquarters.

Title: 7 – Claims for Payment of a Special Grant King's College Newcastle-upon-Tyne 1945/46

References: F-1.7

Covering Dates: 1945-1946

Extent and Medium: 1 envelope of around 20 pages inside 1 file.

Description: File is as described.

Title: 8 – Trustees Savings Bank

References: F-1.8

Covering Dates: 1939-1972

Extent and Medium: 1 file of around 20 pages.

Description: Correspondence as described.

Title: 9 – National Westminster Bank Ltd (1965-1968)

References: F-1.9

Covering Dates: 1965-1969

Extent and Medium: 1 file of around 100 pages.

Description: File of correspondence as described.

Title: 10 – Superannuation 1961-1969

References: F-1.10

Covering Dates: 1956-1969

Extent and Medium: 1 file of around 200 pages.

Description: File as described.

Title: 11 – Insurances (1966-1968)

References: F-1.11

Covering Dates: 1966-1968

Extent and Medium: 1 file of around 50-100 pages.

Description: File as described.

Title: 12 – Costings (1964)

References: F-1.12

Covering Dates: 1964

Extent and Medium: 1 file of around 150 pages.

Description: Minutes and papers of Committee on Costings.

Title: 13 – Costings (1966-1967)

References: F-1.13

Covering Dates: 1966-1967

Extent and Medium: 1 file of around 200 pages.

Description: Results of the Costing's exercises for these years.

Title: 14 – Capital Finance (1969-1970)

References: F-1.14

Covering Dates: 1969-1970

Extent and Medium: 1 file of around 100 pages.

Description: File as described.

Title: 15 – Maintenance Grants

References: F-2.15

Covering Dates: 1921-1932

Extent and Medium: 6 files inside 1 file.

Description: There are 5 files:

- NIAB Maintenance Grants 1920/21.
- NIAB Maintenance Grants 1921/22.
- OSTs Maintenance Grants 1921/22.
- NIAB Maintenance Grants 1922/23.
- OSTs Maintenance Grants 1922/23.
- NIAB Maintenance Grants 1922/23.

Title: 16 – Maintenance Grants

References: F-2.16

Covering Dates: 1923-1926

Extent and Medium: 4 files inside 1 file.

Description: There are 4 files:

- NIAB Maintenance Grants 1923/24.
- NIAB Maintenance Grants 1923/24.
- Maintenance Grants 1924/25.
- Maintenance Grants 1925/26.

Title: 17 – Maintenance Grants

References: F-2.17

Covering Dates: 1926-1928

Extent and Medium: 2 files inside 1 file.

Description: There are 2 files.

- Maintenance Grants 1926/27.
- Maintenance Grants 1927/28.

Title: 18 – Maintenance Grants

References: F-2.18

Covering Dates: 1928-1932

Extent and Medium: 2 files inside 1 file.

Description: There are 2 files:

- Maintenance Grants 1928/29.
- Maintenance Grants January 1929-April 1932.

Title: 19 – Income Tax 1921-1938

References: F-2.19

Covering Dates: 1921-1938

Extent and Medium: 1 file of around 400-500 pages.

Description: File as described.

Title: 20 – Income Tax 1939-1974

References: F-2.20

Covering Dates: 1939-1974

Extent and Medium: 1 file of around 150 pages.

Description: File as described.

Title: 21 – Growth Chambers 1969-1970

References: F-3.21

Covering Dates: 1969-1970

Extent and Medium: 1 file of around 20 pages.

Description: Expenditure on growth chambers.

Title: 22 – Salary Scales 1978/9

References: F-3.22

Covering Dates: 1978-1979

Extent and Medium: 1 file of around 100 pages.

Description: File as described.

Title: 23 – Capital Grants (1946-1962)

References: F-3.23

Covering Dates: 1946-1962

Extent and Medium: 1 file of around 300 pages.

Description: Correspondence as described.

Title: 24 – Capital Grants (1962-1970)

References: F-3.24

Covering Dates: 1962-1970

Extent and Medium: 1 file of around 200 pages.

Description: Correspondence as described.

Title: 25 - Estimates

References: F-3.25

Covering Dates: 1935-1936

Extent and Medium: 1 file of 50-100 pages.

Description: Provisional estimates for the financial year.

Title: 26 – Estimates

References: F-3.26

Covering Dates: 1964-1965

Extent and Medium: 1 file of around 100 pages.

Description: Provisional estimates for the financial year.

Title: 27 – Estimates

References: F-3.27

Covering Dates: 1965-1966

Extent and Medium: 1 file of around 150-200 pages.

Description: Provisional estimates for the financial year.

Title: 28 – Estimates

References: F-4.28

Covering Dates: 1966-1967

Extent and Medium: 1 file of around 200 pages.

Description: Provisional estimates for the financial year.

Title: 29 – Estimates

References: F-4.29

Covering Dates: 1967-1968

Extent and Medium: 1 file of around 200 pages.

Description: Provisional estimates for the financial year.

Title: 30 – Estimates

References: F-4.30

Covering Dates: 1968-1969

Extent and Medium: 1 file of around 250 pages.

Description: Provisional estimates for the financial year.

Title: 31 – Estimates

References: F-4.31

Covering Dates: 1969-1970

Extent and Medium: 1 file of around 300 pages.

Description: Provisional estimates for the financial year.

Title: 32 – Estimates

References: F-4.32

Covering Dates: 1970-1971

Extent and Medium: 1 file of around 300 pages.

Description: Provisional estimates for the financial year.

Title: 33 – Estimates

References: F-4.33

Covering Dates: 1971-1972

Extent and Medium: 1 file of around 300 pages.

Description: Provisional estimates for the financial year.

Title: 34 – Estimates

References: F-4.34

Covering Dates: 1972-1973

Extent and Medium: 1 file of around 200 pages.

Description: Provisional estimates for the financial year.

Appendix 2: Trial centres that cooperated with NIAB's county oat trials. From Brandreth (1935a)

Northern Section			
Cumberland	Newton Rigg, Penrith	Cumberland and Westmorland Farm School	1931,1932,1933
Durham	Bishop Auckland	W. Birkitt	1931
	Chester-le-Street	J.R. Spraggon	1931
	Tantoble	J. Wallison	1931
	Houghall	J. Wilson	1931, 1932, 1933
	Heighton	A. Simpson	1933
Northumberland	Ford Hill, Berwick-on-Tweed	Major the Hon. J.A. Jolcey	1931, 1932, 1933
	Ancroft, Berwick-on-Tweed	J.G.G. Rea	1931, 1932, 1933
	Morpeth	Messrs. J & J. W. Frater	1931, 1932
	Cockle Park Experimental Farm	Northumberland County Council	1931, 1932, 1933
Yorkshire	Thornton Watlass	M. Hammond	1931
	Askham Bryan	C. M. Knight	1931
	Northallerton	W.T. Kirby	1931
	Selby	J. Tate	1931
	Wykeham	W. Robinson	1931
Lancs.	Ormskirk	Potato Testing Station	1932, 1933
	County Connell Farm, Hutton	Lancs. County Council	1931, 1932, 1933
Midland Section			
Derby	Shirebrook	H. Clayton	1931
	Marston Montgomery	H. Prince	1931
Leicester	Sutton Bonington	Midland Agricultural College	1931, 1932, 1933
Northampton	Country Farm Institute	Northamptonshire County Council	1931
Bucks.	Preston Bissett	A.E. Bryant	1931
	Haversham	F. Massey	1931
	Marlow	H. Darvill	1931
Gloucester	Cirencester	Royal Agricultural College	1931, 1932, 1933

	Upper Slaughter	Col. E. P. Brassey	1931, 1932, 1933
	Andoversford	J. C. Meikle	1931
	Andoversford	T. C. Hyatt	1932, 1933
Salop	Shifnal	J. Bowen	1931
	Lydbury North	S. Norton	1931
	Montford Bridge	G. Warner	1931
	Bridgnorth		1932
	Bridgnorth	E. Turner	1933
	Aston-on-Clue		1932
	Oswestry		1932
	Hadnall	J. Fairhurst	1933
	Shrewsbury	R. J. H. Edwards	1933
Staffs.	The Farm Institute, Penkridge	Staffordshire County Council	1931, 1932, 1933
	Pattingham	P.L. Oliver	1931
Warwick	Studley	Studley College	1931, 1932, 1933
	Heathcote	R. G. Richmond	1932, 1933
	Wellesbourne	Major A.D. Clarke	1932
	Stratford-on-Avon	Capt. A.R. West	1933
Cheshire	Reaseheath School of Agriculture	Cheshire County Council	1931, 1933
Eastern Section			
Bedford	Cople	W. L. Porter	1931, 1932, 1933
	Woburn	E.B. Watson	1931, 1932, 1933
	Harrold	Messrs. Northern & Son	1931, 1932, 1933
Cambridge	Trumpington	R. J. Cornwell	1931
	Steeple Moren	S. Kirby	1931
	Soham	W. Smith & Son	1931
Essex	Nazeing, Wlatham Cross	G. Chapman	1931
	West Hanningfield, Chelmsford	T. H. Sochon	1931
Herts.	Herts. Institute of Agriculture, St. Albans	Herts. County Council	1931, 1932, 1933
	Hemel Hempstead	F. J. Elworthy	1931
	St. Albans	F. W. Dean	1931
	Harpenden	Rothamsted Experimental Station	1931
Lincs. (Lindsey)	Panton, Wragby	A. W. Noble	1931
	Ulceby	H. Mollet	1932

	Snitterby	J. W. Cottingham	1933
Lincs. (Kesteven)	Billinghay	F. Toulson	1931
	Stragglethorpe	L.E. Allbones	1931
	Eagle	A. Harley	1932
	North Kyme	J.R. Wright	1932
	Thurlby	Griffin & Sons	1933
	Swinderby	G.H. Newton	1933
Norfolk	Nordelph	W. Proctor	1931
	Boughton	E. Marks	1931
	Bridgham	J. R. Ware	1931
	Catfield	H.P.E. Neave	1931
Suffolk, East	Tunstall	G. Thurston	1931, 1932
	Chelmondiston	S. Cordle	1933
Suffolk, West	Gt. Barton	West Suffolk County Council	1931
	Fornham St. Martin	Lt.-Col. G.H. Long	1933
	Cockfield	West Suffolk County Council	1933
South Eastern Section			
Kent	Tunstall, Sittingbourne	Kent County Council	1931
Sussex, West	Chichester	West Sussex County Council	1931
Berks.	Shinfield	Reading University Farm	1931, 1932, 1933
	Newbury	H. C. Sutton	1931
	Moulsford	Berks. Mental Hospital	1931
	Shinfield	National Institute for Research in Dairying	1931, 1932
	Swallowfield	G. Dance	1932
	Streatley	O. J. Bishop	1933
Hampshire	Sparsholt	Farm Institute	1931, 1933
	Andover	C. S. Lovelock	1931
	Petersfield	Col. R.F.N. Baxendale	1931
Isle of Wight	Shorwell	J. Attrill	1931
	Newchurch	C. Allen	1931
	Thorley	E.G. Heal	1932, 1933
Middlesex	Napsbury Mental Hospital	Middlesex County Council	1932, 1932, 1933
Wilts.	Teffont	Messrs. Crouch & Sons	1931, 1932, 1933

	Wylve	Capt. F. N. Jeans	1931, 1932, 1933
South Western Section			
Dorset	Forston Grange, Dorchester	A. P. Goddard	1931
	Cheselbourne	R. E. Bennett	1931
Cornwall	Gorran	Mr. Mitchell	1931
	Kirkhampton	Mr. Timms	1931
	Millbrook	Mr. Rundle	1931
	St. Buryan	F. Hosking	1931
	St. Tudy	Mr. Button	1931
Devon	Newton Abbot	Seale Hayne Agricultural College	1931, 1932, 1933
	Stoke Canon	H.L.L. Horrell	1931
	Stoke Fleming	J.E. Forster	1931
	Ottery St. Mary	J. Peek	1931
	Bideford	T. Trewing	1931
	Tavistock	J. Willcock	1931
	Copplestone	H. Parr	1932
	Yelverston	S. Ward	1932
	Barnstable	J. D. Andrew	1932
	Ivybridge	A. J. Abbot	1932
	Slapton	J. Honeywill	1933
	Payhembury	H. Daniels	1933
	Buckland	S. M. Ward	1933
	Filleigh	W. F. J. Pidler	1933
Wales and Monmouth Section			
Anglesey	Parciau, Marianglas	Col. L. Williams	1931
	Plashewydd, Llanfair P.G.	The Marquis of Anglesey	1931
Caernarvon	Madryn Farm School, Bodfean	Caernarvonshire County Council	1931, 1932
	Bangor School of Agriculture	University College of North Wales	1931, 1932, 1933
Cardiganshire	Glynarthan, Henllan	J.J. Owen	1931
	Beulah	T. Thomas	1931
	Llandyssul	Mr. Davies	1931, 1932
	Beilicardarn, Llanwren	J. Evans	1931
	Aberystwyth	University College of Wales	1931, 1932, 1933
	Maesycrugiau	Mr. Lloyd	1932
	Capel Seion	W. G. Rattray	1932
	Llangeitho, Tregaron	Mr. Jones	1932
Denbigh	Llysfasi Farm Institute,	Denbighshire County	1931, 1932, 1933

	Ruthin	Council	
Flints	Loc, Holywell	J. Hughes	1931, 1932, 1933
	Liscwarm	G. Kendrick	1931, 1932
	Bryncoch	D. T. Pierce	1933
Carmarthen	Pibwrlwyd Farm Institute	Carmarthen County Council	1931
	Gwynefe, Llangadock	G. Jones	1931
	Llanfihangel-yr-arth	J. I. Davies	1931
Glamorgan	Demonstration Farm, Pencoed	Glamorgan County Council	1931, 1933
Merioneth	Dolgelley	J. Price	1931, 1932
	Towyn	W. Jones	1931, 1932, 1933
	Llanfihangel-y-Pennant	H. Vaughan	1931
	Bala	D. M. Davies	1931, 1932
	Mallwyd	J. Jones	1931
	Maenturog	W. Pierce	1932
	Maenturog	W. Owen	1933
	Corwen	T. Roberts	1933
	Dyffryn	M. Griffith	1933
Montgomery	Llanidloes	Mr. Owen	1931
	Cefnoch	E. Jones	1931
	Llanfair	Mr. Jones	1931
	Llanbrymair	Mr. Rowlands	1931
	Berriew	J. Bowen	1932
	Churchstoke	E. Rees	1932
	Llanfair	Messrs. Jones	1932
	Sarn, Newtown	Mr. Jandrell	1932
Pembroke	Cilwendeg, Boncath	W. Bowen	1931, 1932, 1933
Monmouth	Monmouth Agricultural Institute, Usk	Monmouthshire County Council	1931, 1932, 1933