UNDERSTANDING HUMAN PREFERENCES FOR NATURALISTIC TROPICAL URBAN PLANTING IN KUALA LUMPUR, MALAYSIA

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DECLARATION

I declare that this thesis entitled **"Understanding Human Preferences for Naturalistic, Tropical Urban Planting in Kuala Lumpur, Malaysia**" is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in the candidature of any other degree.

Signature	**:**	**..**
Name	**:**	**SARAH BINTI BAHARUDIN**
Date	**:**	**February 2020**

DEDICATION

Specially dedicated to

The love of my life, Nazrul Hilmi Mohammad,
my supportive Bapak, Baharudin
and
my loving & inspiring Allayarhamah (Late) Mak, Rohaya.

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ABSTRACT

This PhD study investigates the selection of plant species to create multi-species plant communities in Malaysian urban spaces, to develop a research tool to investigate public responses to spatial disorder and complexity in those planting communities. Eighteen species of mainly Malaysian tropical herbaceous perennial forbs have been selected on the basis of ecological, horticultural and aesthetic traits. These were used to create a gradient of communities with different levels of plant diversity. The work's overall purpose is to explore whether using these naturalistic plant communities as a contemporary, potentially more sustainable form of planting design is suitable in tropical climates involving a twelve-month growing season and very high growth and change rates. A preliminary assessment of the extent to which the tropical species in the communities are increasing, stable or decreasing in response to the management regime in operation is explained. Key species factors that underpin these behaviours were reviewed. Assessment through survey methods on the response of the maintenance staff involved and the general public to these communities are also provided. The study is in 2 parts. Part 1 involves vegetation types planted in three different spatial arrangements at two sites across social class, income, and educational gradients in an urban setting in Kuala Lumpur, Malaysia. Responses and feedback were obtained from questionnaires through a survey conducted at two selected public parks in Malaysia were presented to answer the research questions. Part 2 is another round of responses and feedback through the questionnaire survey, 12 months after planting. The respondents' response to the plots in both parks depicted that they perceived these three variable combinations as designs that they preferred and should widely be planted all around Malaysia. Low diversity vegetation is arranged in a random design and planted in three layers of different heights: base, low emergent, and tall emergent layers. Factors influencing this analysis include how nature connected or knowledgeable they are about nature, how nature-loving or eco-centric they are, and whether they have the anthropocentric view (controlled-nature).

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B40	-	Lower class income 40%
KLCH	-	Kuala Lumpur City Hall
m.a.p.	-	months after planting
M40	-	Middle-class income 40%
P1	-	Phase 1
P2	-	Phase 2
PCA	-	Principal Component Analysis
PNS	-	personal need for structure
PS	-	Perceived safety
U20	-	Upper-Class income

CHAPTER 1

INTRODUCTION

Out of the 7 billion humans alive today, 3.9 billion live in urban areas (United Nations Population Division, 2011). The majority of future human population growth will occur in cities (United Nations Population Division, 2011). Urbanisation has caused challenges that could also directly affected mental health, causing fatigue and depressed state among urban residents through the noise, air and water and soil pollutions. (Kaplan and Kaplan, 1989; Velarde, Fry and Tveit, 2007; Foo, 2016a). Studies on restorative environments have revealed urban nature to be increasingly preferred overbuilt urban settings (Staats, Kieviet and Hartig, 2003; Hartig and Staats, 2006; Hansmann, Hug and Seeland, 2007). It was suggested that this preference for urban nature is because of the restorative qualities of those environments (Purcell et al., 2001; Staats, Kieviet and Hartig, 2003). More parts of 'nature' and 'natural environment' needs to be incorporated in everyday life.

The benefits of being in nature and at the same time in the urban setting are a growing reality in many cities. More and more urbanites choose to be amongst nature where they find it therapeutic and relaxing, thus positively affecting their mental health. Perceptions of the terms 'natural' and 'naturalness' share a high varying degree of 'naturalness' along the urban-to-rural gradient. (McKinney, 2002; Foo, 2016a). Naturalism has been highlighted in many aspects of urban life. The rising trend in landscape design stresses natural processes that shape landscapes and the roles of landscapes in these processes. The essence is to preserve nature, keep disturbance to nature to a minimum, and restore, create, or emulate nature where it does not exist. This approach could help to sustain or enhance character in urban areas and contribute to sustainable development in the long run (Jim and Chen, 2006).

A recent study by (Foo, 2016b) argued that Malaysia is a tropical country rich with evergreen vegetation, people might subconsciously interpret 'how natural a place is' as 'how green that place is'. Although a 'greener' place is more likely to be considered a 'more natural' position, assessing a place's naturalness is far more than that. Terms such as 'non-man made', 'undisturbed by human activity', 'unsystematic'. The interviewees' explanation was frequently presented, indicating the different nature between a natural landscape and human-shaped landscape.

Changing perceptions of nature through history have influenced landscape design styles between 'formality' and 'naturalism' as the two concepts in landscape design and landscape management. Alienation between people and the natural world has increased (Özgüner and

Kendle, 2006) since the industrial revolutions of the 19th century and the growth of urban areas-decline nature throughout the 20th century, the. This alienation together with some other contributing factors has led to new perceptions of nature within urban people, and ways of protecting the natural environment are by the creation of more natural landscapes (Kendle and Forbes, 2013)

These changes in the perception of nature stimulated interest among professionals in styles of a landscape where control over the form and content of the plant communities has been relinquished to some degree. In the last few decades, an increasing amount of landscape development in urban areas has involved ‘naturalistic’ or ‘ecological’ styles. Hough (1995) played seminal roles in applying ecological landscape design theories and principles to urban areas. This has led many landscape professionals throughout northern Europe to create more natural landscapes where ecological criteria are taken into account and encourage wildlife within the urban fabric (Kendle and Forbes, 2013). These styles are favoured by many modern designers and landscape managers who value the spontaneous, unplanned or uncontrolled in the landscape. This had mainly happened in post-industrial societies when people separated from nature begin to feel nostalgia for it. Despite these design trends, many researchers have pointed out (Ulrich, 1986; Parsons, 1995; Özgüner, Kendle and Bisgrove, 2007), that people do not feel safe, naturalistic landscapes and prefer well-manicured formal landscapes in terms of safety. Positive attitudes to urban nature appear scarce in the tropics and Asian countries in general and particularly in Malaysia.

Although ecological approaches initially focused on the use of native plants, increasing interest has also been shown by landscape professionals in naturalistic plantings of exotic species to incorporate ecological processes in urban landscapes. Nevertheless, still connecting with publics who still have preferences for more familiar horticultural species. (Hitchmough, 2000; Hitchmough *et al.*, 2004; Jorgensen, Hitchmough and Dunnett, 2007b) have used non-native species to maximise flower colour, flowering season and visual diversity in ways that are not always possible using just native species themselves (Özgüner and Kendle, 2006). In combination with this work on aesthetic aspects of planting, ecological work has also been on how such vegetation functions over time, mainly how competition within these designed communities influences long-term survival and performance (Hitchmough and Wagner, 2013). Such an evolution in thinking involves changes in the conception of naturalistic landscapes that may not be accepted by everyone.

Few studies have been undertaken on these issues in tropical naturalistic planting design in the Tropics or the South East Asian region. Using actual vegetation planting as a stimulant to investigate the human response to naturalistic planting has not been undertaken to date in these regions. Incorporating ecological and horticultural positive traits in species selection is not common in Malaysian urban landscapes in Kuala Lumpur where planting design is often very formalised. More often than not, the maintenance of landscape areas (parks, roadsides) becomes burdensome due to the high maintenance model underpinning this type of traditional planting. This study looks at Malaysian public park users' response to naturalistic spatial planting arrangements that appear more disordered and ‘messy’ foreign to what they are used to in Malaysia.

1.1 Aim

This research investigates the human response to multi-species designed plantings of herbaceous species at the small scale from ground level to 2m tall in Malaysian urban greenspace as a contemporary, potentially more sustainable and low maintenance planting design.

1.2 Objectives:

1. To design a gradient of multi-species, 3-layered plant communities as research cues in three Malaysian urban spaces with contrasting visitor demographics.
2. To investigate the public response to spatial disorder and complexity plus aesthetic factors such as flowering and leaf colour within these communities.
3. To use these understandings to assess naturalistic plant communities' potential as a contemporary, potentially more sustainable and low maintenance planting design in Malaysian cities.

1.3 Research Questions:

1. How do different 2-D spatial and 3-D layer arrangements, density and diversity, and species traits and morphologies affect public park users' environmental psychology?
2. Are designed plant communities that look similar to semi-natural plant communities more preferred than vegetation which looks dissimilar to semi-natural plant communities?
3. Is public perception and preference of these vegetation types related to participants' background factors such as gender, ethnicity, social class, income and education?
4. Can colour, and other aesthetic properties override intrinsic hostility to disorder in tropical environments?
5. Does the belief that plants are native species make them more attractive to green space users in a Malaysian context?

1.4 Research Hypothesis

1. Designed plant communities that look similar to semi-natural plant communities prefer vegetation that looks dissimilar to semi-natural plant communities.

2. People value native plants more than non-native species in designed plant communities.

3. Public perception and preference are related to participants' background factors such as social class, income and education

4. Increasing density and diversity significantly increases the likelihood of mortality under tropical conditions within the lowest layer of herbaceous plant communities

The next chapter is Chapter 2, which will review literature from precedent works and publications relevant to the naturalistic style planting and the public park users' in the tropics region. The Malaysian context specifically thinks about or their perception of this type of vegetation thus far. This chapter will also further elucidate the current vegetation selections in Malaysian public parks, particularly in Kuala Lumpur.

CHAPTER 2

LITERATURE REVIEW

2. Introduction

2.1. Defining nature, natural environment, naturalness and semi-natural.

When it comes to the natural environment, many definitions appear in the social science literature and are usually associated with environments which have no evidence of human intrusion (Kaplan, Kaplan and Wendt, 1972; Zube, 1976; Mausner, 1996). Naturalness is defined as environmental dimensions (Kaplan, Kaplan and Wendt, 1972; Zube, 1976; Nasar, 1987; Mausner, 1996; Foo, 2016a). The concept of naturalness often defined as the perceived nearness to a natural stage of vegetation (Ode Sang *et al.*, 2016). It has been shown that naturalness has a strong relationship with landscape preference (Ode *et al.*, 2009; van der Jagt *et al.*, 2014; Junge *et al.*, 2015; Foo, 2016a).

According to Angermeier (2000) “naturalness” is the degree to which a thing is natural and represented by a continuous gradient between entirely natural and entirely artificial extremes. It is referred to as ‘relatively more natural’ if less human inputs such as facilities, technology for maintenance are involved. Different degree of naturalness may affect people’s experiential connection to nature, and eventually leading to other ways, nature contributes to these functions. (Kaplan and Herbert, 1987; Zheng, Zhang and Chen, 2011a). What seems to be a common theme for all the definitions is the non-involvement of human and our technology. An almost raw and ‘ready-made’ condition of the world is considered as natural or related to naturalness.

Semi-natural, however, can be defined as when natural and non-natural elements ‘coexist’. When built structures are predominant, however, a commitment to maintaining some naturalness can often be discerned. Human notions usually take precedence in semi-natural environments, in that people control whatever elements of naturalness remain (Mausner, 1996). This semi-natural feature will be further discussed in the discussion chapter on how eco-centricity or anthropo-centric views of the public park users would affect how they perceived plantings.

Casual observation also suggested that people are selective about what they see as ‘natural’, and ‘nature’ means different things. For example, Lamb and Purcell (1990) argue that ecological naturalness and perceived naturalness are related but not equivalent. For some people, nature is reserved for wilder places and does not exist in the urban context (Kaplan, 1992). The study intends to gauge the level of naturalness behind these respondents’ choice, whether or not they see the vegetation as ecological naturalness or perceived naturalness.

2.1.1. Why is there interest in naturalistic planting design?

Within the Asia region, particularly in China, interest in the natural landscape has been increasingly highlighted in urban areas to preserve biodiversity and restore, create, or emulate nature where it no longer exists. In recent years, these trends have been given further weight in China by President Xi Jinping's pronouncements. This approach could also help to sustain or enhance nature in urban areas and contribute to sustainable development in the long run (Jim and Chen, 2006).

Naturalistic style landscape has consistently deemed in much literature to have a positive impact on health and well-being. Several attempts gauge the relative importance of the degree of naturalness or content of a natural setting and its beneficial effect on health (Velarde, Fry and Tveit, 2007).

Some literature suggests that interaction with nature, including viewing wildlife, gives a good quality of calm, relaxation and a sense of pleasure (Kaplan and Kaplan, 1989). Furthermore, the possible benefits that we may have when in contact with nature for urban people have begun to be explored by environmental psychologists, and it has been generally accepted that such contact is fundamental for human health and well-being (Rohde and Kendle, 1994).

Several research projects have investigated people's attitudes to natural areas in urban regions. A study in the UK (Mostyn, 1979) investigated why contact with nature is beneficial to urban people and found that people benefit from nature emotionally, intellectually, socially and physically.

2.1.2. Ecological approach

Studies on landscape ecology indicated that planting design primarily influences green spaces' success (Rosli, 2004; Walker, 1991). Three broad categories of ornamental plants comprise native, naturalistic and exotic plants (Cook, 2002; Mel, 2006). The selection of ornamental plants comprises various plant types (ground covers, vine tangles, low plants, small shrubs or canopy trees) also help the space to utilise fully; either to provide food resources or shelter in order to offer biodiversity for the sustainable urban community.

Practitioners, especially landscape architects, could incorporate the ecological approach to conserve wildlife habitat and encourage biodiversity in urban forest parks. In urban park design, ecological planning that integrates the native plant data is crucial to maintain and balance the biodiversity. This is not the case for vegetations in the Malaysia urban park settings. There is a lack of native plant data, and it is not considered a crucial aspect in upholding the biodiversity.

According to Kemp (2004), the new approach for the conservation of urban biodiversity needs to be more holistic, addressing the urban community's societal needs for recreation and nature appreciation, including wildlife, instead of preserving a few selected species. The distinction is more pronounced in an urban environment where habitats' importance depends on their value to the urban residents. The Town and Country Planning Association of the United Kingdom (2004) noted that supporting a richness of biodiversity is one way to building more sustainable urban community.

2.2. Perception and preference of naturalistic planting around the world

The last 30 years have seen a rapid change in attitudes towards nature in the urban environment. This change has led to an increased interest in, and a greater appreciation of, the value of nature in cities. Such changes reflect greater awareness of nature amongst the general public and the professions responsible for planning and managing urban green space (Kendle and Forbes, 2013). However, where nature like vegetation might be used and how this might influence perception has to be addressed. For example, the edges of big parks with rural character might be perceived entirely differently to a city centre vegetation situation. This is where demographic factors play an essential role in determining they perceive the planting style mostly naturalistic style.

(Hitchmough *et al.*, 2004) have used exotic species to maximise flower colour, flowering season and visual diversity in ways that are not possible using just native species themselves (Özgüner and Kendle, 2006). In combination with this work on aesthetic aspects of planting, ecological work has also been on how such vegetation functions over time, mainly how competition within these designed communities influences long-term survival and performance (Hitchmough and Wagner, 2013). Such an evolution in thinking involves changes in the conception of naturalistic landscapes that may not be accepted by everyone just yet.

Recently, efforts have been made to understand human-nature relationships in a more scientific way. These ideas have now been demonstrated by authors from both the social and natural sciences who have demonstrated several different theoretical perspectives (e.g. Altman and Wohlwill, 1983; Kaplan and Kaplan, 1989; Francis and Hester, 1990) that are relevant to explaining why people may derive enhanced well-being from contact with nature.

2.2.1. *Growing evidence that exposure to nature might be useful for well-being*

Simonic (2003) mentioned in a study on visual landscape perception, differences in preference not only arise between those general landscape categories (urban vs nature) but also within the more specific naturalistic landscape type (e.g. picturesque, wild garden, biotope). To put it simply, people's well-being gained through natural experience may vary in association with the degree of nature in a place due to the change in the subtle human-nature interaction in response to their different preferences for the degree of naturalness.

Kjellgren, Buhrkall and Norlander (2011), and Martens, Gutscher and Bauer (2011) also pointed out that perceived well-being varies with different natural conditions. Given that naturalness is an influential factor in (Kaplan, Kaplan and Wendt, 1972; Lamb and Purcell, 1990; Purcell and Lamb, 1998; Hunziker *et al.*, 2008; Ode *et al.*, 2009; Zheng, Zhang and Chen, 2011a), studies that strive to explore the relationship between the degree of naturalness and its associated effects on human well-being are potentially valuable to understanding urban dwellers' well-being.

Many studies have been made about the impact of exposure of nature to human well-being. Studies of physiological responses to the visual environment have also suggested that the restorative effects of natural, in contrast to urban scenes, involve positive emotional states (Ulrich *et al.*, 1991; Ulrich, 2013). Environmental psychologist Roger Ulrich carried out a series of experiments and concluded that viewing nature is psychologically healthful (Ulrich, 1979, 1981; (Ulrich *et al.*, 1991). Hartig et al. (1991) also provided relatively strong evidence that natural settings experiences may facilitate recovery from mental fatigue. Several studies have also indicated that a window's view can influence health outcomes (Moore, 1982; Ulrich, 1984; Kaplan et al., 1988; Tennessen and Cimprich, 1995).

The relationship between people and the natural environment is too complicated, and the particular reasons why nature is believed to have this stress-reducing and therefore, health-promoting qualities are not evident. However, the process is often linked to psycho-evolutionary human development theories (Rohde and Kendle, 1997).

Apart from that, Attention Restoration Theory (ART); (Kaplan and Kaplan, 1989), also states that natural environment can reduce stress and promote recovery of mental fatigue (Kaplan and Kaplan, 1989; Kaplan, 1995). Studies on restorative environments have revealed urban nature's role in increasing restorative potential of urban settings and the preference for natural overbuilt urban settings (Staats, Kieviet and Hartig, 2003; Hartig and Staats, 2006; Hansmann, Hug and Seeland, 2007). It has been suggested that urban nature preference is due to the restorative qualities of those environments (Purcell and

Lamb, 1998; Staats, Kieviet and Hartig, 2003; Hartig and Staats, 2006). Restorative qualities of natural style planting are what differ from the manicured planting and naturalistic planting style.

2.3. How the structure and spatial organization of planting is perceived

Kaplan's Information-processing Theory proposed that visual preference for a landscape is derived from two primary human responses to an environment: the need to understand and a desire to explore by Kaplan and Kaplan (1989). Gobster (2001) identified four significant ``visions of nature'' that people expressed in analysing these materials. He based these constructions on implicit criteria regarding (1) *function* - how people view the ``purpose'' of nature; (2) *structure* - how vegetation as the primary structural element defines the character and appearance of the landscape; (3) *values* - what aspects of the natural and cultural landscape have meaning and significance to people; (4) *use* - how the landscape should be used and by whom, reflecting the balance between people and nature-as-defined; and (5) *icons* - symbolic natural or cultural features in the landscape that are critical in defining the unique character of the place for a particular vision of nature.

In other studies in the field of environmental psychology have identified six dimensions concerning how nature is perceived and link an individual's perceptions of nature to the degree of responsibility he/she feels towards conservation (Schultz 2000; Clayton 2003; Frantz et al. 2005; Fischer and Young 2007; Schroeder 2007; Bruni and Schultz 2010). Furthermore, these dimensions are recognized to be collapsible into two higher-order factors: nature preservation and utilization (Milfont and Duckitt 2004; Fischer and Young 2007; Schultz 2000)

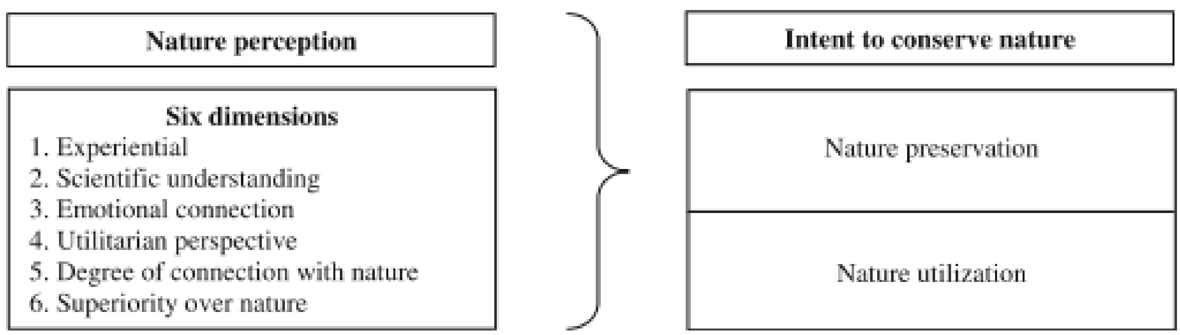


Figure 1. 1. Six dimensions used to measure nature perception and the two higher-order factors, measuring biodiversity conservation intent, within which scores for the six nature perception dimensions can fall under (Adapted from Milfont and Duckitt 2004; 2010; Fischer and Young 2007; Schultz 2000)

Therefore, the current naturalistic planting style must be dictated by the professionals' interests and reflect the general public's needs. For example, although there is an increasing interest in urban natural landscapes, it is also evident that some people do respond negatively to natural landscapes and find them untidy, ugly, or in some way a compromise of civilised aesthetic values, and even sometimes frightening (Burgess, Harrison and Limb, 1988; Parsons, 1995; Harrison and Burgess, 1988; Burgess, 1993;).

Despite the decline in the provision of formal, ornamental landscapes due to the adverse effects of the economic constraints, skill deficits and the increasing importance of biodiversity as a philosophy and practice on cultivated vegetation, public interest in formal, ornamental landscapes has always been high (Hitchmough and Woudstra, 1999).

Similarly, Hayward and Weitzer (1984) found that residents living near parks in three New England cities were attracted to parks for various reasons, including for physical activity, enjoyment of nature, social activity, and a sense of relief and escape from an urban setting. Another positive impact study in the UK by Burgess et al., (1988a) revealed that all sections of the British community enjoy contact with the natural world in people's everyday lives and there is a desire for social interaction in the open spaces.

2.3.1. 'Fear of Natural Area'

In previous studies in the late '80s towards the landscape, preferences demonstrated that natural areas are highly valued and preferred. However, there is also evidence that people recognise that natural areas are scary, disgusting and uncomfortable (Bixler and Floyd, 1997), often associated with fears of physical danger (Talbot and Kaplan, 1984) and sometimes frightening places to visit (Hayward and Weitzer, 1984; Burgess et al., 1988b; Harrison and Burgess, 1988).

However, a more recent study (Jorgensen, Hitchmough and Calvert, 2002a) examined the interaction between spatial arrangement and vegetation structure in an urban park in the UK and found that spatial arrangement was the most critical factor in determining a sense of safety but not preference. They suggested that more naturalistic vegetation be introduced into parks and green spaces without necessarily making the parks appear unsafe.

In terms of the urban public housing area, residents might prefer more formal settings with built features and well-maintained vegetation over more natural and densely wooded areas (Talbot and Kaplan, 1984). Research also showed that disorderliness in a scene was the most frequently mentioned concern among the participants (Kaplan and Talbot, 1988). The presence of unmaintained, natural vegetation may have the opposite effect on security perceptions as well. Grass maintenance, for example, increased both preference and sense of safety in inner-city neighbourhoods (Kuo et al., 1998)

Hoyle *et al.*, (2018) mentioned that people's reactions might have been related more to the structural attributes or spatial arrangement of planting, which impacted aesthetics, making it appear 'wild' than biodiversity per se. Indeed, urban people's preference for more manicured, tidy landscapes has been documented (Gobster et al., 2007; Jorgensen, Hitchmough and Calvert, 2002a; Jorgensen, Hitchmough and Dunnett, 2007a; Nassauer, 2011).

2.3.2. 'Natural Is Untidy'

Despite the potential benefits of contact with nature, problems still exist between people's aesthetic preferences and naturalistic landscapes in cities. For example, people see wildflower areas as particularly beautiful in one season and may find them untidy and unmanaged for much of the year (Rohde and Kendle, 1997). Moreover, preferences and benefits do not always have to go together as people sometimes tend not to do what is right for them but preferably those that appeal to them for other reasons (Rohde and Kendle, 1994). It can be hard to appreciate a new kind of a different kind of landscape style when people are familiar with another kind of landscape (Kendal *et al.*, 2019)

People who value formal ornamental landscapes will often see wild areas as untidy, unmaintained or in some other way degraded. For others, the degradation is associated with too much human influence, when an area becomes 'manicured', 'over-formal' or loses its 'naturalness' (Kendle and Forbes, 2013).

Previous studies also suggested that naturalistic landscapes are sometimes perceived as 'threatening' or 'frightening' particularly by women (Harrison and Burgess, 1988; Burgess et al., 1988b; Burgess, 1993). This study will further investigate the correlations between gender, age and education background with the way they perceive naturalistic landscape.

2.3.3. Aesthetic Values & Human Nature

Much of the support for, and against, naturalistic urban landscape rests on considerations of aesthetics, and aesthetic appreciation can differ from person to person. Research in environmental psychology suggests that people generally find natural surroundings more calming and very pleasing because of their balance of continuity and complexity, sensory stimulation, and cultural and symbolic significance (Kaplan and Kaplan, 1989).

A recent study by (Chiesura, 2004; Jorgensen, 2004; Ozguner and Kendle, 2006), suggested that people prefer landscapes that they see as natural. However, there are also studies showing that although the great majority of the people enjoyed the diversity in the appearance of naturalistic settings, they also wanted to see proof of stewardship (Kaplan, 1984; Schroeder and Anderson, 1984; Burgess, Harrison and Limb, 1988; Hands and Brown, 2002; Özgüner and Kendle, 2006). Nassauer (1995) highlights that people perceive landscapes that exhibit biodiversity as messy, weedy and unkempt. Similarly, Gobster (2001) discusses how to minimise visual conflict and perceptual conflicts associated with natural areas and suggested design cues that equate human care and stewardship activities. This is where a carefully designed landscape plays its role in enhancing people's experience with naturalistic planting and perceiving them positively.

2.4. The Malaysian Context in Relation to Naturalistic Planting

2.4.1. Current Landscape scenario in Kuala Lumpur, Malaysia

Ibrahim (2016) reported that during the colonial period, urban park development in Kuala Lumpur was designed and managed by the British government, which brought the landscape style from the European countries and altering the local landscape according to colonial knowledge and preferences. They introduced urban greening and city beautification to Kuala Lumpur to enhance Kuala Lumpur's urban landscape, following trends and landscape fashion from developed countries, mainly the UK and North America.

Post-independence from Britain in 1957, Malaysia experienced rapid urbanization of Kuala Lumpur that led to the diminishing of green areas, and adverse changes to the local climate of the urban areas in terms of temperature, precipitation, climate-air pollution relations (Ahmad, 1981; Sani, 1987; Yaakup et al., 2000 and Ahmad, 2005). These have put pressure on the existing vegetation, which needs to be conserved or retain.

In Malaysia generally and Kuala Lumpur (KL), the gradients of plants within the parks mainly shade trees, shrubs and well-manicured turf grasses. The public parks around KL are maintained by Kuala Lumpur City Hall (KLCH). They are majorly planted with similar species repeatedly, and they are not much different from one another. Although various biodiversity can build a multi-layer herbaceous plant, these are yet to be fully utilized in the landscape. The ones that are easily obtained are not domesticated or used due to lack of knowledge.

Kuala Lumpur City Hall (KLCH) however moving forward, was convinced that the naturalistic style concept was appropriate for ameliorating the rapid urbanization, by bringing the forest back into the city (Zakariya and Ainuddin, 1989), cited in Webb (1998). This would work well with the natural topographic character of Kuala Lumpur (Webb, 1998), besides providing strong naturalistic appearance throughout the city, as suggested by Justice (1986). Furthermore, KLCH would also want to use that approach because these changes would be used as a tool to manage the costs of maintaining public spaces.

As a result of this greening efforts, more semi-natural woodland was established in the margins of parks, while a picturesque style landscape was maintained within, with green lawns, colourful trees and shrubs and annual flower beds remaining as the park's main components (Department of Agriculture, 2009).

To adapt to the "Garden Nation" to the Malaysian context, the government has to emphasise that this idea needs to blend with the country's own unique identity (Tahir, 2005). Karbodarahangi et al. (2012) suggested that this identity should strongly reflect Malaysia's natural and climatic character. Also, people's attitudes and culture significantly influence each other, as suggested by Nassauer (1995); and each culture has different interpretations of nature and the environment (James *et al.*, 2009).

Changes made towards ecologically sustainable practice in Kuala Lumpur urban parks may result in different perceptions of this landscape's ecological appearance. People are used to manicured, British influenced Victorian-age style of horticultural appearance, quite different from typical ecological design involving messier naturalistic form. Thus, Malaysia's aspiration to be both beautiful and environmentally sustainable by the year 2020 presents a significant challenge to local authorities in creating a balance between these two goals. However, without knowledge and exposure to natural type of plantings, people may misinterpret the appearance of ecological landscapes as unkempt, which could lead to a perception that the urban park management is not performing their maintenance as suggested by Nassauer (1995).

One of the most influential tropical garden designers globally to many landscape architects and garden designers was Roberto Burle Marx. His protégé Raymond Jungles, who is based in Southern Florida, is currently one of the famous landscape architects in the USA, known for his sensitivity to the environment, and creativity in working with tropical and the sub-tropical plants (Qiu et al., 2007). Incorporating his 'messy' designs in urban park planting communities might create a new positive perspective of naturalistic tropical planting from the public park user's perspective. As a tropical region, the idea of adopting Marx's and Jungles' style of planting as an inspiration for public parks is something that KLCH should consider and

2.5 Attitudes to Nature-Like Vegetation In Malaysia

2.5.1 *Perceived Malaysian public anxiety about naturalistic landscape appearance*

The research findings from Ibrahim, (2016) also revealed that park management across the case studies was very concerned over the public's negative perceptions of ecological design as a poorly managed landscape ut and unsafe for public use. This very closely relates to the pre-determined idea that urban parks should be beautiful, clean and tidy.

Safety and security is another critical aspect of design and management of Kuala Lumpur's urban parks, mainly because of the prevalence of crimes such as snatch theft and stealing landscape furniture from the park and public misbehaviour, such as damage to the landscapes and littering. Additional threats to public safety derive from public proximity to dangerous wildlife.

While all these issues may be similar to those faced in developed countries, they are more critical in Kuala Lumpur's context due to the negative perceptions of safety among the public. In temperate climates, the landscape is naturally more dynamic because of the changing seasons, and therefore the public will accept a certain degree of messiness. However, in a tropical climate, naturalistic landscape imposes a more intense and messy look. Due to the long-established preference for beautiful, clean and tidy landscape, the public would perceive such an intense and messy landscape as a severe threat to their safety, particularly as they fear being too close to urban wildlife.

Consequently, they may express their disapproval by complaining to the relevant local authorities, resulting in delays or discontinuation of this naturalistic landscape approach.

2.5.2 Nativeness and national identity on plant community selection in Malaysia

Native plants are often suggested because they are seen as requiring less soil preparation, irrigation, fertilizers, or pruning. Native plants are also seen as bringing native fauna to the planting community and contributing to an increase in urban biodiversity (Luckett, 2009). It is known that native species have evolved to survive and grow in their regional meteorological conditions, diseases and pests (Dewey, Johnson and Kjelgren, 2004; White & Snodgrass, 2003).

There is much disagreement about the role of native and non-native plant selections. Some believe native plants are more appropriate than a non-native plant (Calkins, 2005; Simmons, Venhaus and Windhager, 2007). Others, like Hitchmough (2011) mentioned that non-native species could also support ecological processes and natives. These differences are based on differing philosophical perspectives and interpretation of the research literature, such as invertebrate specificity. There is a discernible growth of interest in Malaysian landscape architecture and horticulture in native species, but it is unclear how widespread this movement is and what lies behind its growth. The Malaysian public's general knowledge on native species of Malaysia is still scarce as majority of public park users.

2.5.3 Attitudes of Malaysians towards nature and the natural world

A recent study by Chee (2015) argued that given that Malaysia is a tropical country which is rich with evergreen vegetation, people might subconsciously interpret 'how natural a place is' as 'how green that place is'. Although a 'greener' place is more likely to be considered a 'more natural' place, assessing a place's naturalness is far more than that. Terms such as 'non-man made', 'undisturbed by human activity', 'unsystematic'. The interviewees' explanation was frequently presented, indicating the contrasting nature between a natural landscape and human-shaped landscape.

In the neighbouring country Singapore, which have similar climates and weather, a survey was conducted, and the results indicated that landscape preference tended towards manicured landscapes despite an overall tendency towards nature conservation, which is best achieved in naturalistic habitats. Reasons driving landscape choice were found to be aesthetic, focusing on visual hues present in a landscape. Specific education in ecology/conservation as well as increased opportunities to experience first-hand natural areas abroad were factors that may influence landscape choice to encompass more naturalistic habitats.

Sakip (2015) found that subjects' characteristics and personal attributes such as education, age, and occupation correlate with environmental concerns. Individuals who express the most concern tend to be young and well-educated (Tognacci, Marvin and Rnon, 1971; Buttel and Flinn, 1978). A study by Baharudin *et al.* (2014) supported this view regarding the Malaysian landscape scenario context. Darmstadt *et al*. (2006) also found that different groups of people (e.g., students' vs locals) would often have very different landscape preferences and argued that the differences underlined the need for care when interpreting values.

2.5.4 Perception of safety in naturalistic urban landscapes in Kuala Lumpur, Malaysia.

(Ulrich, 1986; Schroeder, 1989; Michael and Hull, 1994; Parsons, 1995; Forsyth, 2003; Özgüner, Kendle and Bisgrove, 2007), report that typically people feel less safe in naturalistic landscapes (i.e. village natural landscape with tall grasses and roadside natural standings vegetation) and prefer well-manicured formal landscapes in terms of safety. In contrast to this, in the Malaysian context, (Farbod, Kamal and Maulan, 2015) indicated that people do feel safe in naturalistic landscapes in urban parks. (Farbod, Kamal and Maulan,2015) showed color photographs of landscape scenes in urban parks in Kuala Lumpur, Shah Alam and Putrajaya. Seven landscape professionals/academicians at Universiti Putra Malaysia rated the coloured photographs based on the extent to which they represented naturalistic landscapes, that is, 'designed landscapes, but made to look more natural than formal landscapes'. The responses were provided on a five-point Likert-like scale (1 =Not naturalistic at all to 5= Extremely naturalistic). Photographs that were rated 3 (moderately naturalistic) or lower on the naturalistic scale were removed. Finally, from the remaining images, five were selected randomly by the authors for the questionnaire.

The mean score for perceived safety based on the questionnaire was 3.413. There was no mention of how diverse, how disordered or how elaborate the plantings are.

These safe feelings in the parks shown to them may be attributed to the fact that compared to North Americans and Europeans users of Malaysian parks (and Asian park users in general) tend to spend more time with friends and family members than they spend alone (Maulan, 2006; Tinsley et al., 2002).

The findings indicated that Malaysians generally felt safe in naturalistic settings in urban parks. This is contrary to the findings of studies with other populations done elsewhere. The study also found that social-related threats were better predictors of perceived safety than wildlife threats in these parks. This is consistent with other studies' findings, such as the study conducted by Andrews and Gatersleben (2010).

Farbod's finding is a stark contrast and contradictory to study by Ibrahim (2016) which stated that colonial ideas on the beautiful landscape had been part of the local culture for over a century, and the public has been sold the idea of beautification as the ideal image for public parks in Kuala Lumpur. In Ibrahim's finding, there are negative perceptions of safety among the public and park managers. Ibrahim involved the managers and stakeholders to see whether they accepted the idea of a naturalistic style planting. She used actual site photographs to assess the adaptation of ecological landscape design in the urban park, digital manipulation technique. Digital manipulation helped to represent various types of ecological treatment in images used to support interviews with respondents regarding this different and sustainable approach. This approach showed the respondents how it could look like when proper natural style planting is applied on site. That might have made the respondents perceive the plantings in the pictures negatively considering that it is new, unfamiliar, and not challenging their comfort and norm.

In temperate climates, the landscape is naturally more dynamic because of the changing seasons, and therefore the public will accept a certain degree of messiness. In an equatorial rainforest climate, the naturalistic landscape might grow too fast and invasively. It might also give an unkempt and messy look. Consequently, they may express their disapproval by complaining to the relevant local authorities, resulting in delays or discontinuation of this naturalistic landscape approach (Ibrahim, 2016).

Although much emphasis has been put on urban nature from different perspectives and preferences of urban natural areas than built-up areas, studies focusing on perception and preferences of different forms of nature are relatively scarce. This has prompted the present study to test the theories about public perception and preferences of urban naturalistic landscapes in contrast to formal green spaces in the context of two urban green spaces of Kuala Lumpur, Malaysia

Past researches have reported a positive correlation between environmental preferences and perceived naturalness (Fenton,1988). Theories on human–nature interaction were usually based on the developed countries context, which may be a different case for Malaysia. Thus, this study associated with the public park's users of Kuala Lumpur’s views on naturalistic style plantings can contribute to studying the human-nature interaction.

CHAPTER 3

MATERIALS AND METHOD

3.1. Phase 1: Developing Planting Communities for Use as “Cues” in the Research

Three plant communities at two different plant diversity levels (9 and 18 species per treatment), to form the cues for exploring human preference in Kuala Lumpur (KL) were developed. The designed plant communities consisted of three layers. There were 1-layer which is base only and consists of 9 species, 2-layer forbs which are base and lower emergent, consisting of 6 species and 3-layer communities, which are base, lower emergent and tall emergent of 3 species. The base layer includes species below 600 mm in height; the low emergent layer 600-1000mm and the tall emergent layer 1000-2000 mm (Table 3.1). To provide different visual complexity levels, plants were arranged as either block, small groups or randomly placed individuals on a grid, at two diversities to further create more complex or less intricate looking communities. The three-layer treatment created the possibility to create a range of flowering durations and also flowering events with more or fewer species in flower at a point in time.

In the final design selection, the variety of species was selected to provide maximum flowering impact over as much of the season as is realistically possible. The number of species included, however, must achieve a balance between impact and variety. Too great a variety of species provides a long flowering display yet may not have enough single impact at any one time. Too few species created good visual impact yet limits the extent of the flowering period. These trials included two planting diversities: low at ten species across the three layers, and high at 18 species across the three layers. A greater planting density can create more significant flowering impact, particularly in an immature planting. However, a higher planting density is more expensive to establish and may result in plant deaths due to over-competitiveness between neighbours. To incorporate the variations in plant diversity and planting layers described above, the design includes eighteen plant communities for trial, combinations of 3 designs, three planting layers and two plant diversities (number of different species) (Refer to Table 3.3).

A plant trait database for tropical species was developed as part of the study to assist the research plant's design. The first stage in selecting plants was a binary selection/rejection split and was applied to 130 potential species. Only those plants with known potential were included in the spreadsheet. Each deciding characteristic was allocated a nominal score, based on a subjective assessment of the characteristic's value to the design strategy. This analysis is through a process called nominal rating.

The next stage was plants included in the spreadsheet were then be evaluated according to a range of characteristics, differentiating between descriptors and deciders. “Decider” factors were listed as light and water tolerance, good flowering display, quick to first flowering, length of flowering and long-time untidiness. The “descriptors” were essential design criteria based on flower colour, growth habit and natural habitat. Another aspect that affected the scoring of each species was the invasiveness character of the plant. A minus point was given to plants with a particular trait.

This plant trait database methodology developed by Gerber (2016) was used to eliminate and structure the plant selection process to limit subjectivity, thereby reducing risk through increased confidence in the selection process. By the end of the elimination process, the list of 130 species had decreased to 30 species and discussion were then held with the experts (researcher’s supervisor and the horticulture unit of Kuala Lumpur City Council) to select the final 18 species. The final selection was based on the suitability of the plants to the research sites climate and the plant’s robustness and ability to survive in direct sunlight.

3.1.1. Procurement of the Planting Materials

The selected plants were obtained from Tan Kok Leyong Nursery P.L.C. in Muar, Johor, Malaysia. In total, 2000 plants of the 18 species were procured.

Table 3.1: Species finally selected for the study

Layer type	Genus	Species	Number of plants procured
Base layer (<600 mm)	*Peperomia*	*obtusifolia*	200
	Cuphea	*hyssopifolia*	200
	Anthurium	*andraeanum*	200
	Begonia	*masoniana*	80
	Calathea	*makoyana*	80
	Ophiopogon	*jaburan*	200
	Tradescantia	*spathacea*	200
	Vriesea	*splendens*	80
	Calathea	*loeseneri*	80
Lower emergent (600mm-1000mm)	*Hymenocallis*	*litoralis*	200
	Hippeastrum	*reticulatum*	100
	Spathoglottis	*plicata*	100

	Neomarica	*caerulea*	100
	Vrisea	*imperialis*	40
	Costus	*woodsonii*	40
Taller emergent (1000mm-2000mm)	*Canna*	*glauca*	20
	Heliconia	*psittacorum*	60
	Alpinia	*purpurata*	20
		TOTAL	2000

Table 3.2: Origins of the selected species

Genus	Species	Origin
Peperomia	*obtusifolia*	Florida, Mexico and The Caribbean
Cuphea	*hyssopifolia*	Mexico, Guatemala and Honduras
Anthurium	*andraeanum*	Colombia and Ecuador
Begonia	*masoniana*	Southern China and Northern Vietnam.
Calathea	*makoyana*	Eastern Brazil
Ophiopogon	*jaburan*	Tropical East, Southeast Asia, and South Asia
Tradescantia	*spathacea*	Belize, Guatemala, and Southern Mexico(Chiapas, Tabasco, and The Yucatán Peninsula
Vriesea	*splendens*	Trinidad, Eastern Venezuela
Calathea	*loeseneri*	Peru, Brazil, Colombia, Ecuador and Bolivia
Hymenocallis	*litoralis*	Latin America naturalized in many tropical countries
Hippeastrum	*reticulatum*	South America
Spathoglottis	*plicata*	Subtropical Asia to Australia and The Western Pacific , including Tonga and Samoa.
Neomarica	*caerulea*	Brazil
Vrisea	*imperialis*	Brazil
Costus	*woodsonii*	Caribbean(Including Dominica, Guadeloupe, Hispaniola, Martinique, And Puerto Rico).
Canna	*glauca*	Wetlands Of Tropical America Naturalized In Sri Lanka, Thailand, Malaysia, Vietnam, Java And The Philippines
Heliconia	*psittacorum*	The Caribbean And South America.
Alpinia	*purpurata*	Malaysian

* Highlighted are native species to Malaysia

Figure 3. 1: Images of the final selected species

Base Layer (<600 mm)

Peperomia obtusifolia

Cuphea hyssopifolia

Anthurium andraeanum

Begonia masoniana

Calathea makoyana

Opiophogon jaburan

Tradescantia spathacea

Vriesea splendens

Calathea loeseneri

Lower Emergent Layer (600mm-1000mm)

Hymenocallis littoralis

Hippeastrum reticulatum

Spathoglottis plicata


Neomarica caerulea


Vriesea imperialis


Costus woodsoni

Tall Emergent Layer (1000mm – 2000mm)


Alpinia purpurata


Canna glauca


Heliconia psitacorrum

3.1.2 Developing the research communities/plot layout

Three variables were combined between each other to create different complexity of vegetation in each plot. They are listed as below;

Variable 1: Design

- Structured design (S)
- Intermediate design (I)
- Random design (R)

Variable 2: Diversity

- Low diversity
- High diversity

Variable 3: Layer

- 1-Layer (base layer only)
- 2-Layer (base + lower emergent)
- 3-layer (base + lower emergent + tall emergent)

Based on the 3 designs, 2 diversity levels and 3 layers, all 18 plots have different combinations and are summarized in table 3.2 below, i.e. each plot was unique. The combinations were randomized, and plot numbers were given to assist the researcher in managing the data. The respondents would not be able to see any clear pattern between the designs, layers and diversity.

Table 3.3: Characteristics of the 18 experimental plots

PLOT	CODE	PROPERTIES
1	**IH2**	Intermediate Design + High Diversity + Base & Low Emergent (2)
2	**RL1**	Random Design + Low Diversity + Base (1)
3	**SH2**	Structured Design + High Diversity + Base & Low Emergent (2)
4	**IL1**	Intermediate Design + Low Diversity + Base (1)
5	**RH2**	Random Design + High Diversity + Base & Low Emergent (2)
6	**RL3**	Random Design + Low Diversity + Base & Low Emergent + Tall Emergent (3)
7	**IH1**	Intermediate Design + High Diversity + Base (1)
8	**SH3**	Structured Design + High Diversity + Base & Low Emergent + Tall Emergent (3)
9	**SL3**	Structured Design + Low Diversity + Base & Low Emergent + Tall Emergent (3)
10	**RH1**	Random Design + High Diversity + Base (1)
11	**IL3**	Intermediate Design + Low Diversity + Base & Low Emergent + Tall Emergent (3)
12	**RL2**	Random Design + Low Diversity + Base & Low Emergent (2)
13	**SH1**	Structured Design + High Diversity + Base (1)
14	**IH3**	Intermediate Design + High Diversity + Base & Low Emergent + Tall Emergent (3)
15	**IL2**	Intermediate Design + Low Diversity + Base & Low Emergent (2)
16	**SL1**	Structured Design + Low Diversity + Base (1)
17	**SL2**	Structured Design + Low Diversity + Base & Low Emergent (2)
18	**RH3**	Random Design + High Diversity + Base & Low Emergent + Tall Emergent (3)

3.1.3 Experimental design

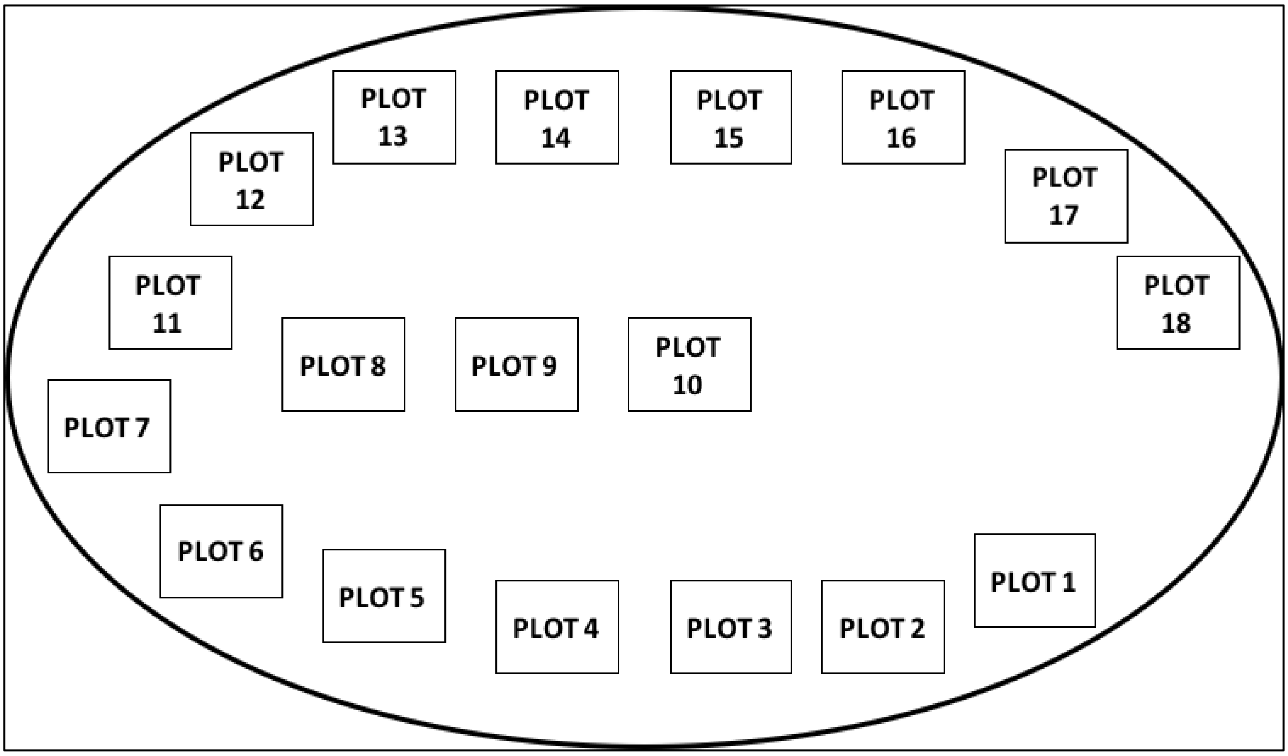


Figure 3.2: Plots arrangement in the research site in a completely randomized design (CRD)

Spatial arrangement treatment

The low and high diversity treatments plants were arranged to form a gradient of the disorder, as shown in Figure 3.3-3.5. In the "random" community plants were placed randomly with no apparent human pattern discernible. In the "structured" community, plants were arranged in groups in line with the tradition of "block" planting to give obvious cues of human patterns. In the "Intermediate" design, each species' block size was smaller and more akin to the individual repeating patterns in the "random". Hence there was a transparent gradient of complexity (intermingling species), and evidence of "design" across the research communities. The most complex-disordered was the high diversity random model, the least complex-disordered the low diversity structured model.

Combinations of diversity (2) x spatial distribution (design)(3) x canopy layer combination (3) gave rise to 18 plot types. One plot of each of these 18 plots was placed in the landscape at each of the two experimental sites, leading to 36 plots in total. Each plot was 2.4 m x 2.4 m. Each plot was different and was randomized to allow the respondents to see and evaluate each plot independently and would not be biased by the other plots around them. Plots were given a sequence number 1-18, as shown in Figure 3.2, but plot type is randomised within this sequence, so there are no clear patterns from plot to plot.

Table 3.4: Distribution of species numbers across the two plant diversity treatments

Planting Diversity			
High (18 species)		Low (10 species)	
Layers	**No. of Species**	**Layers**	**No. of Species**
Base layer	9 species	Base layer	6 species
Low Emergent layer	6 species	Low Emergent layer	3 species
Tall Emergent layer	3 species	Tall Emergent layer	2 species

Below is the visualisation of how the spatial arrangements of the designs are being arranged. There are structured, intermediate and random designs. Each of the species in the particular designs was carefully placed according to the plan (refer Figure 3.6 – figure 3.22).

Figure 3.3: Structured design section elevation

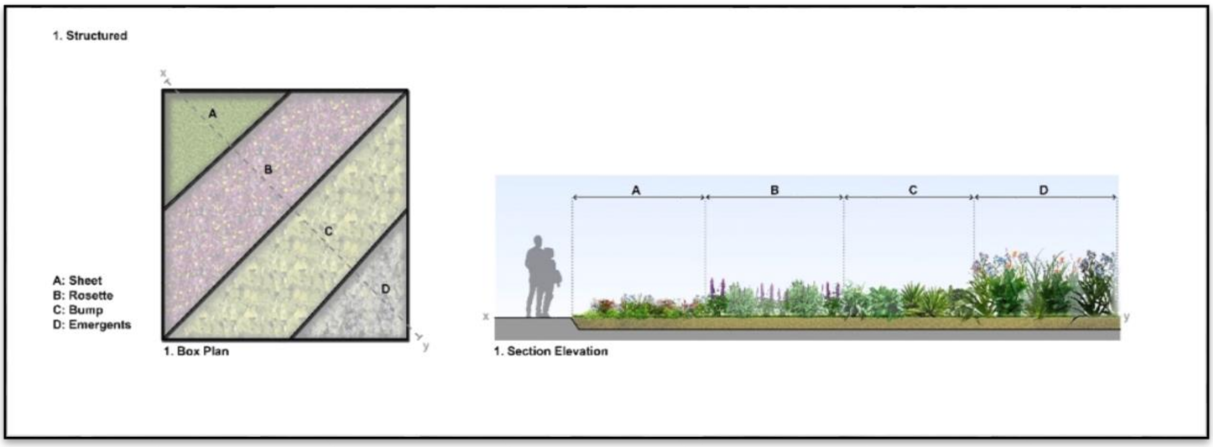


Figure 3.4: Intermediate design section elevation

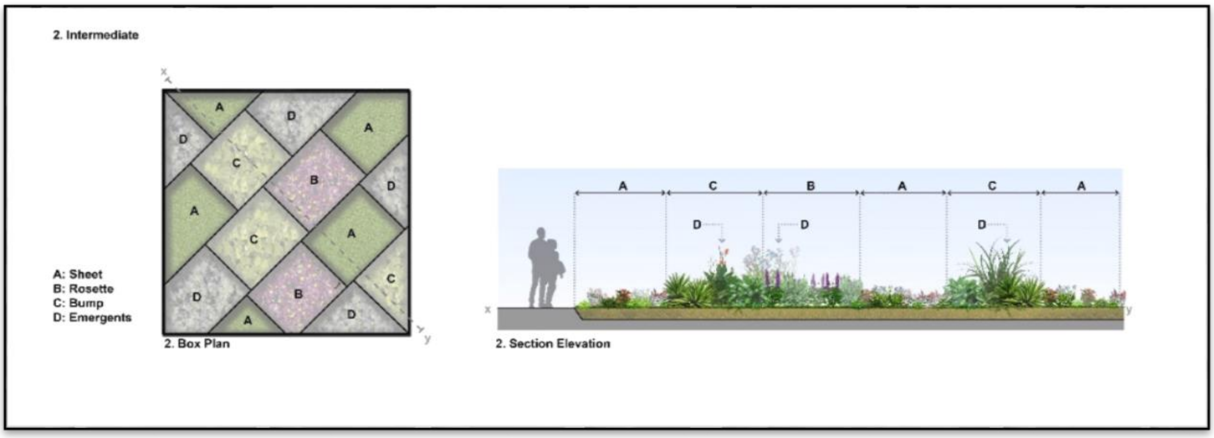


Figure 3.5: Random design section elevation

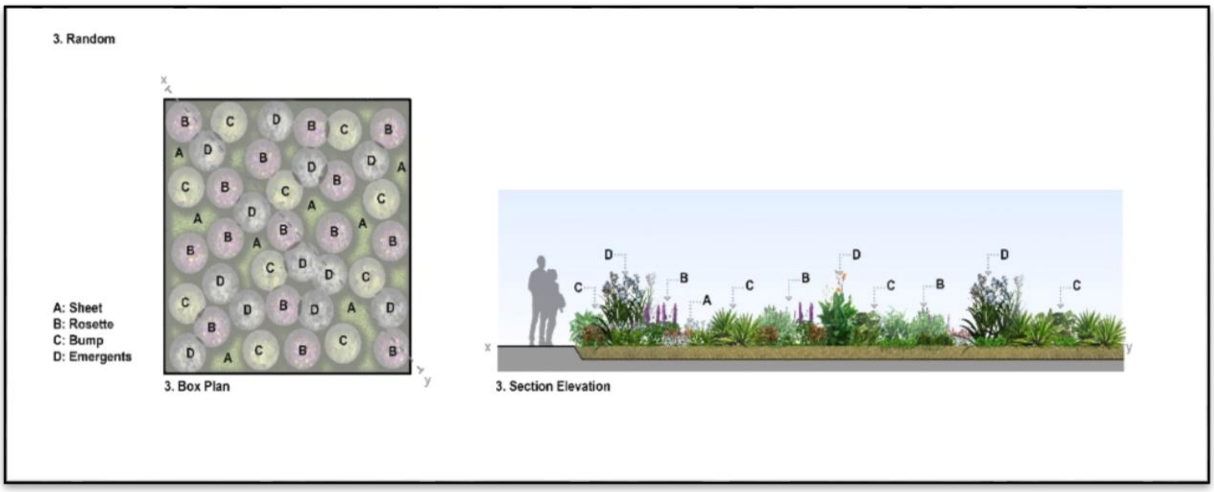
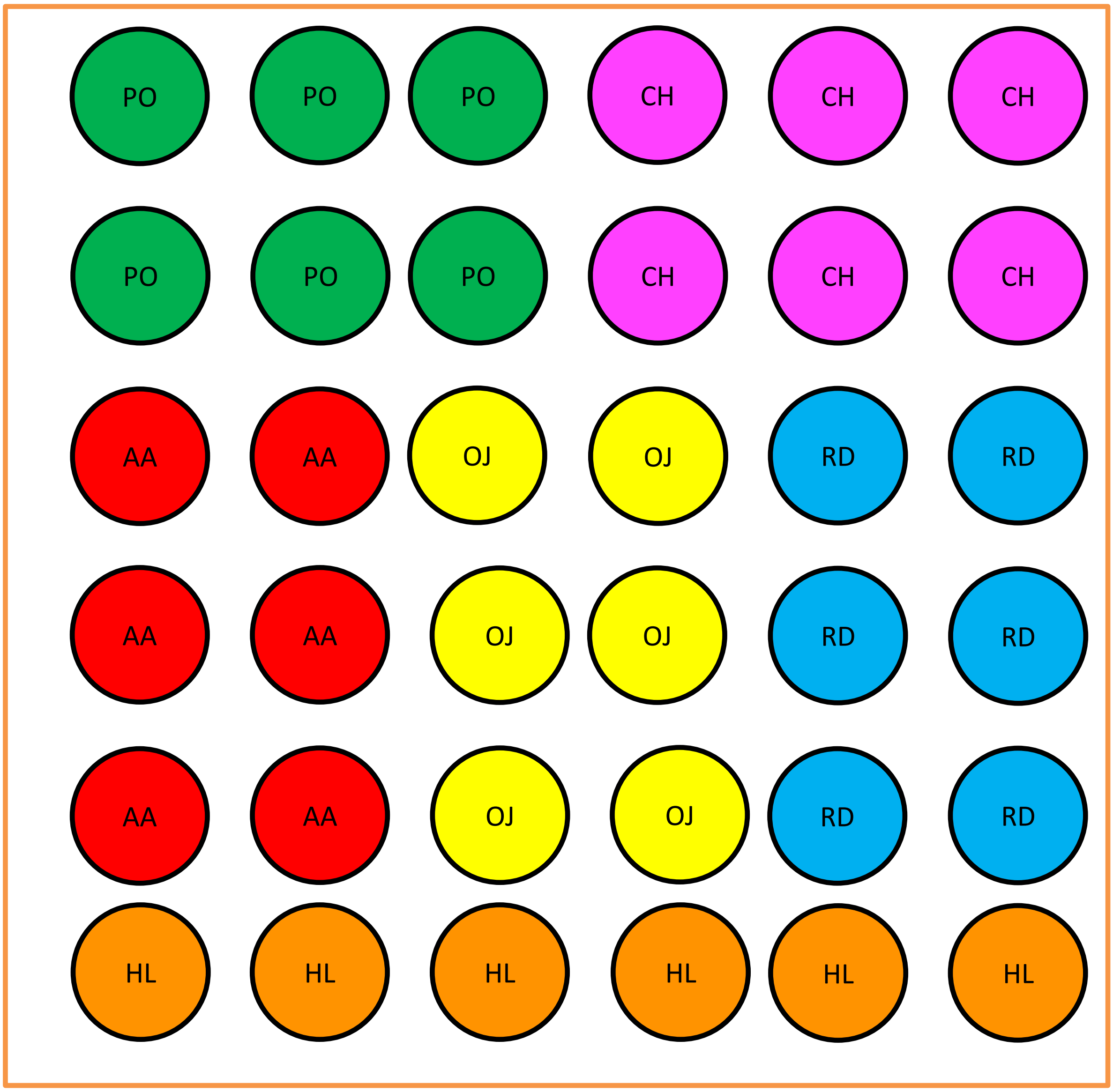


Figure 3.6: Plot 1– Structured Design + Low Diversity + Base (1) (SL1)



LEGENDS:

PO – *Peperomia obtusifolia (6 plant)*

CH – *Cuphea hyssopifolia(6 plants)*

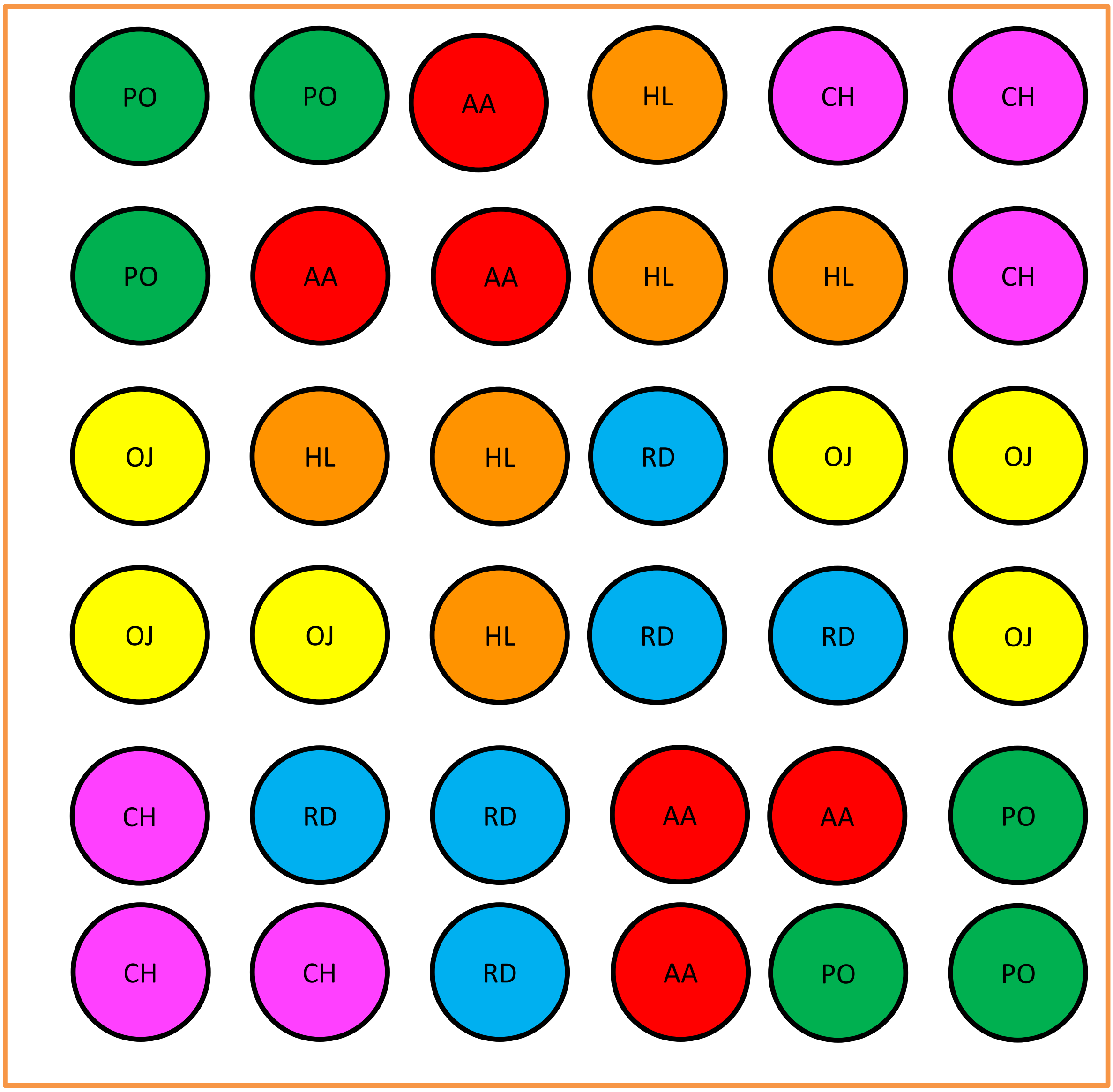
AA – *Anthurium andraeanum (6 plants)*

OJ – *Ophiopogon jaburan (6 plants)*

RD – *Rheo discolor (6 plants)*

HL – *Hymenocallis litoralis (6 plants)*

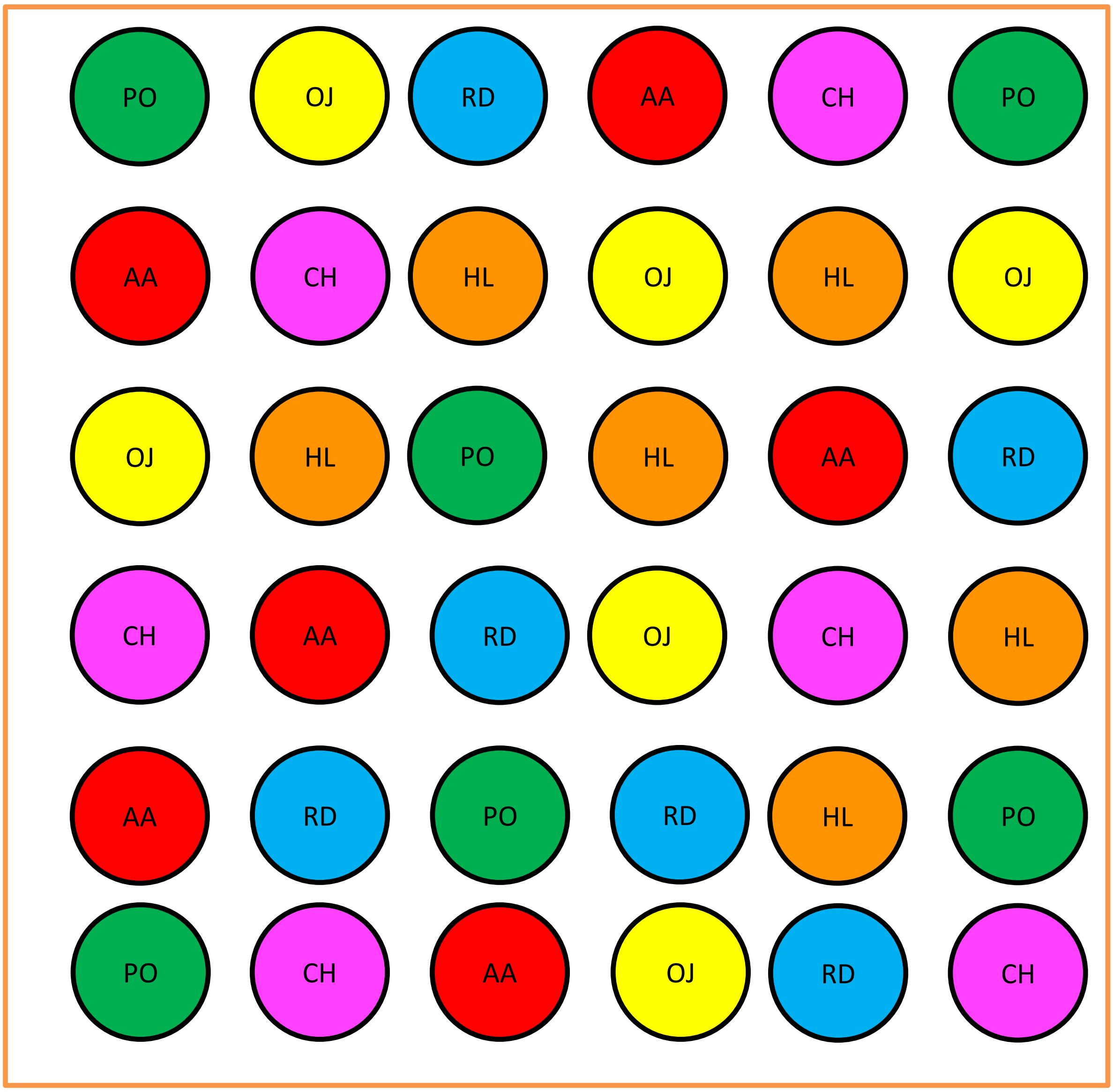
Figure 3.7: Plot 2 : IL1 – Intermediate Design + Low Diversity + Base (1)



LEGENDS:

1. PO – *Peperomia obtusifolia (6 plants)*
2. CH – *Cuphea hyssopifolia(6 plants)*
3. AA – *Anthurium andraeanum (6 plants)*
4. OJ – *Ophiopogon jaburan (6 plants)*
5. RD – *Rheo discolor (6 plants)*
6. HL – *Hymenocallis litoralis (6 plants)*

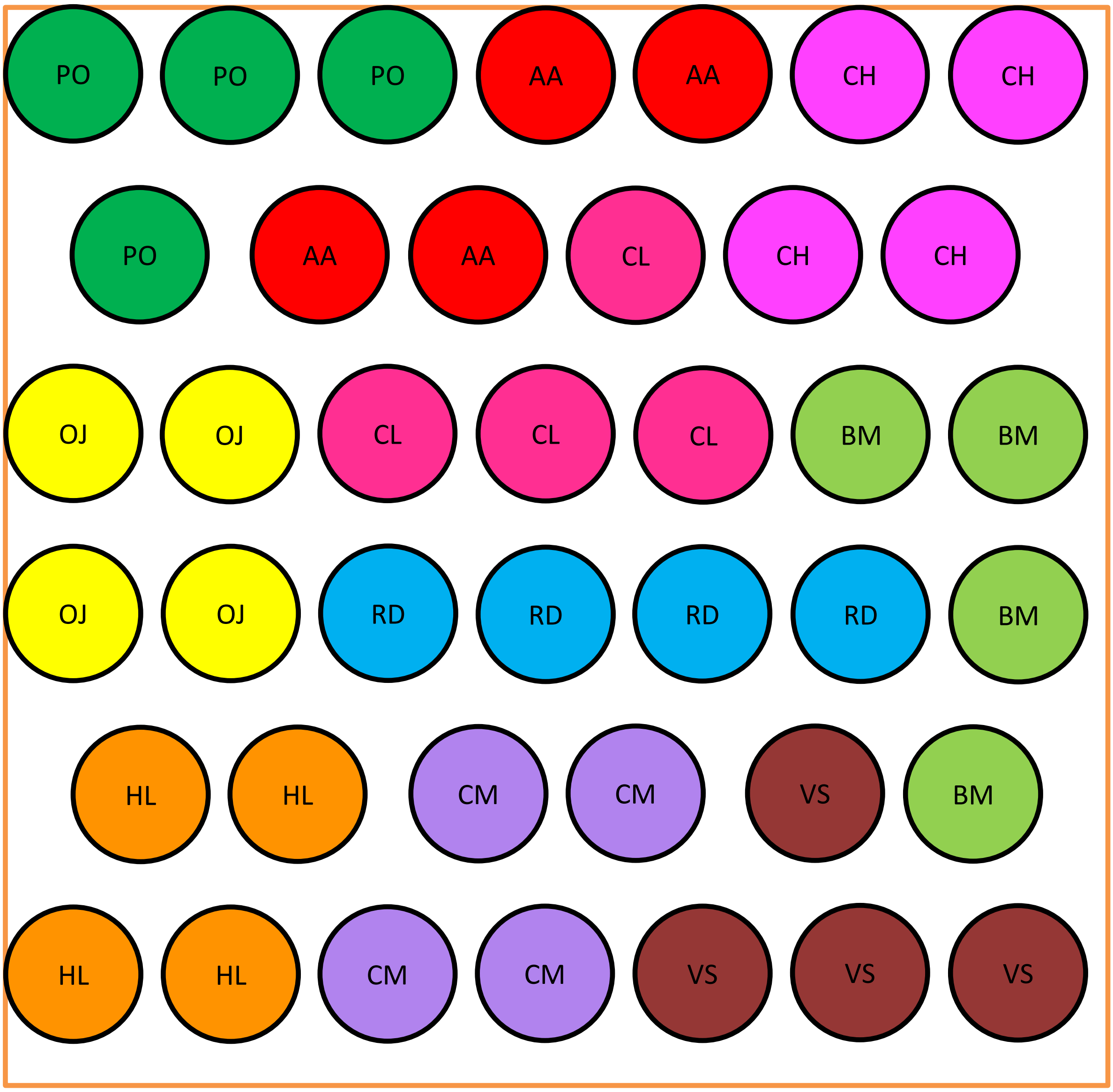
Figure 3.8: Plot 3 : RL1 – Random Design + Low Diversity + Base (1)



LEGENDS:

1. PO – *Peperomia obtusifolia (6 plants)*
2. CH – *Cuphea hyssopifolia(6 plants)*
3. AA – *Anthurium andraeanum (6 plants)*
4. OJ – *Ophiopogon jaburan (6 plants)*
5. RD – *Rheo discolor (6 plants)*
6. HL – *Hymenocallis litoralis (6 plants)*

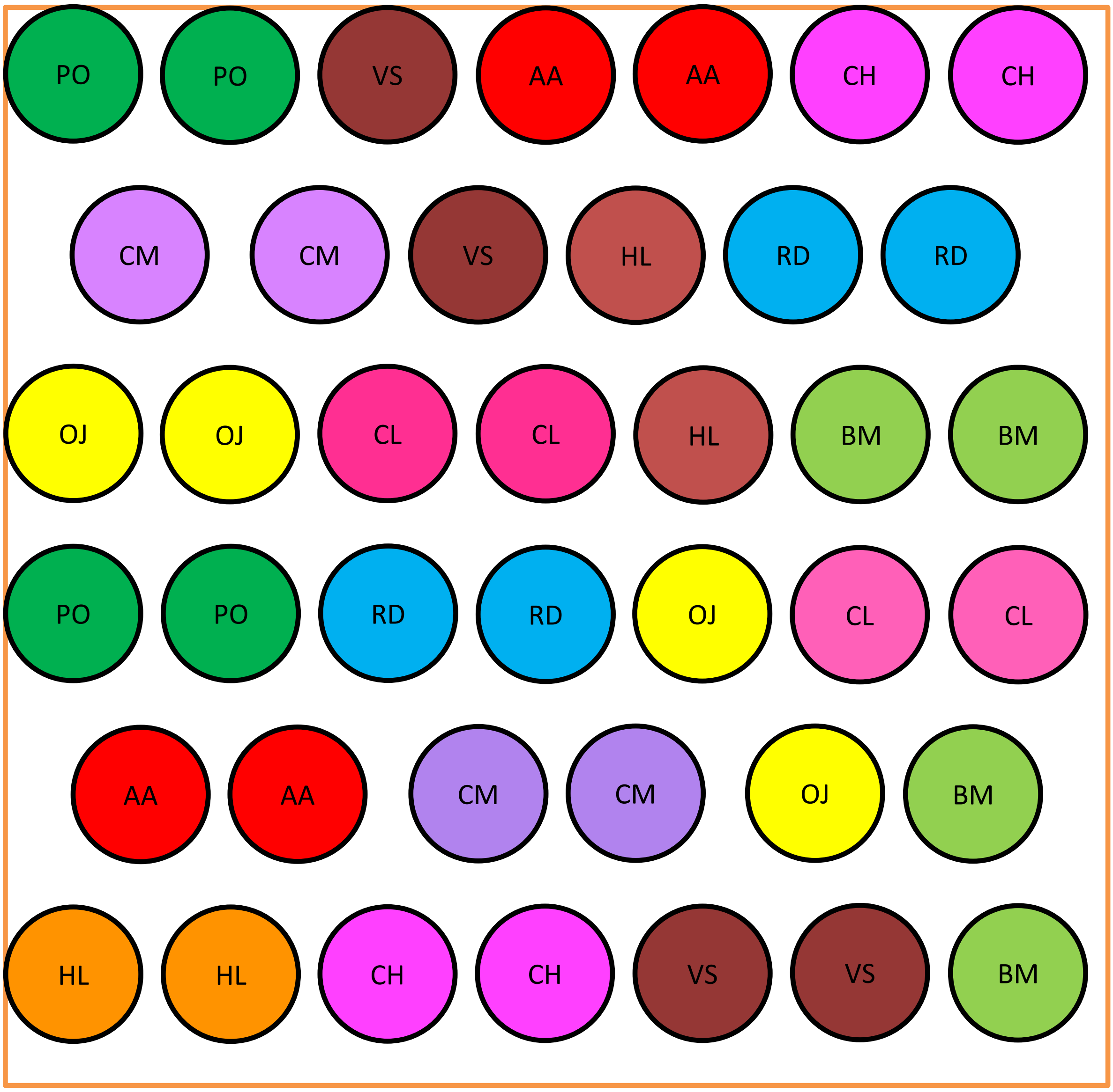
Figure 3.9: Plot 4 : SH1 – Structured Design + High Diversity + Base (1)



LEGENDS:

1. PO – *Peperomia obtusifolia (4 plants)*
2. CH – *Cuphea hyssopifolia(4 plants)*
3. AA – *Anthurium andraeanum (4 plants)*
4. OJ – *Ophiopogon jaburan (4 plants)*
5. RD – *Rheo discolor (4 plants)*
6. HL – *Hymenocallis litoralis (4 plants)*
7. BM – *Begonia masoniana (4 plants)*
8. CM – *Calathea makoyana (4 plants)*
9. VS – *Vriesea splendens (4 plants)*
10. CL – *Calathea loeseneri (4 plants)*

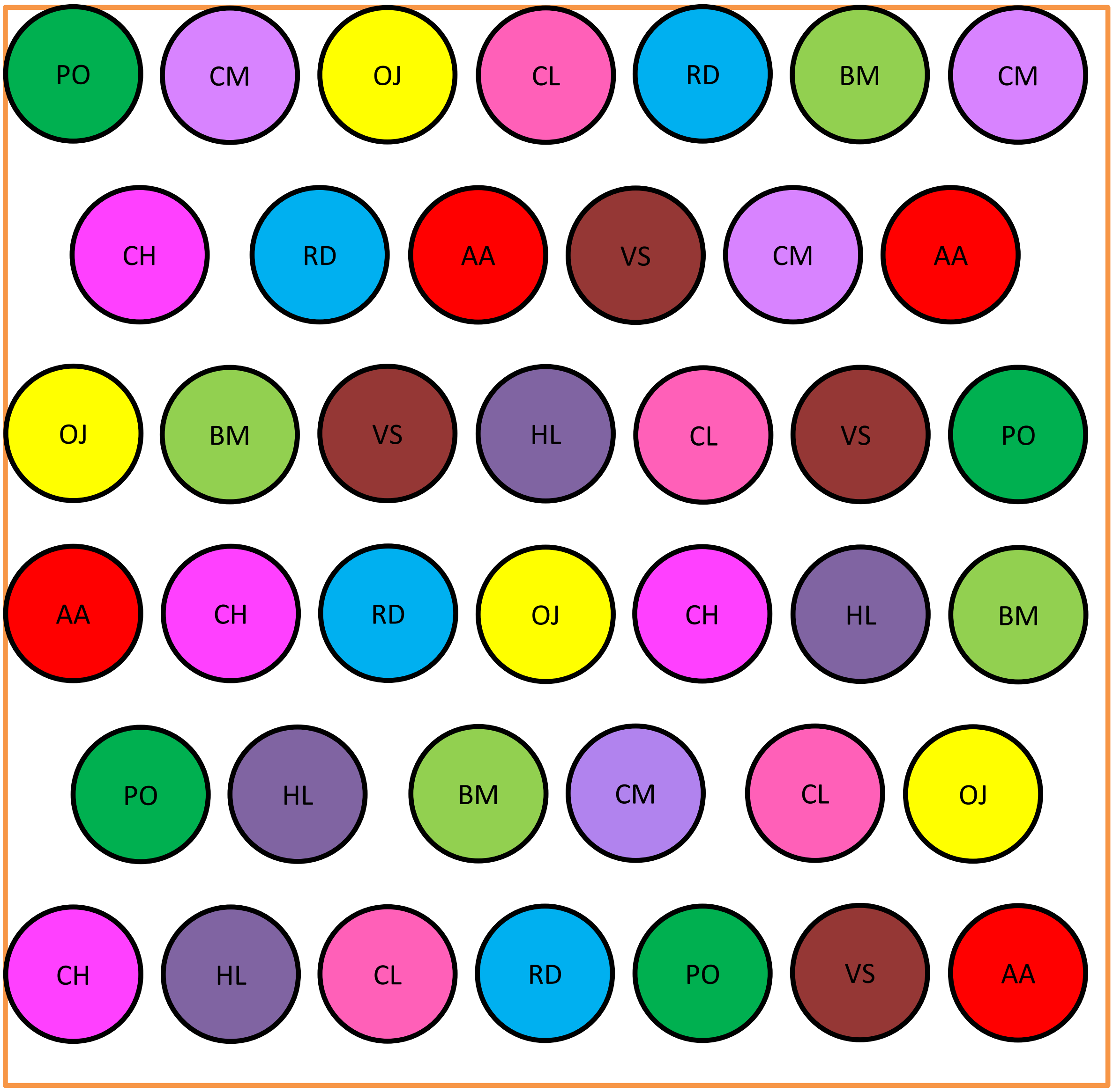
Figure 3.10: Plot 5 : IH1 – Intermediate Design + High Diversity + Base (1)



LEGENDS:

1. PO – *Peperomia obtusifolia (4 plants)*
2. CH – *Cuphea hyssopifolia(4 plants)*
3. AA – *Anthurium andraeanum (4 plants)*
4. OJ – *Ophiopogon jaburan (4 plants)*
5. RD – *Rheo discolor (4 plants)*
6. HL – *Hymenocallis litoralis (4 plants)*
7. BM – *Begonia masoniana (4 plants)*
8. CM – *Calathea makoyana (4 plants)*
9. VS – *Vriesea splendens (4 plants)*
10. CL – *Calathea loeseneri (4 plants)*

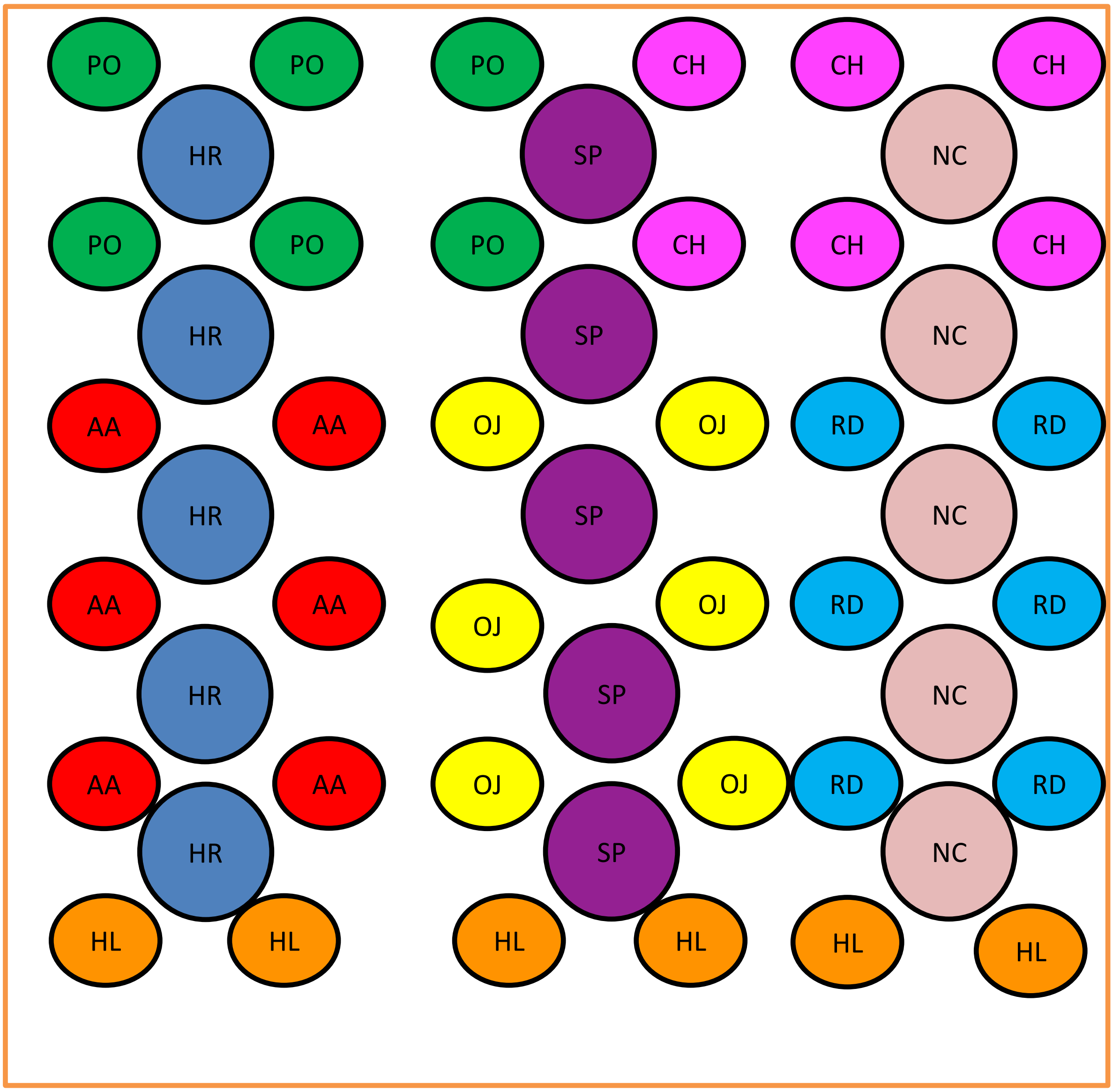
Figure 3.11: Plot 6 : RH1 – Random Design + High Diversity + Base (1)



LEGENDS:

1. PO – *Peperomia obtusifolia (4 plants)*
2. CH – *Cuphea hyssopifolia(4 plants)*
3. AA – *Anthurium andraeanum (4 plants)*
4. OJ – *Ophiopogon jaburan (4 plants)*
5. RD – *Rheo discolor (4 plants)*
6. HL – *Hymenocallis litoralis (4 plants)*
7. BM – *Begonia masoniana (4 plants)*
8. CM – *Calathea makoyana (4 plants)*
9. VS – *Vriesea splendens (4 plants)*
10. CL – *Calathea loeseneri (4 plants)*

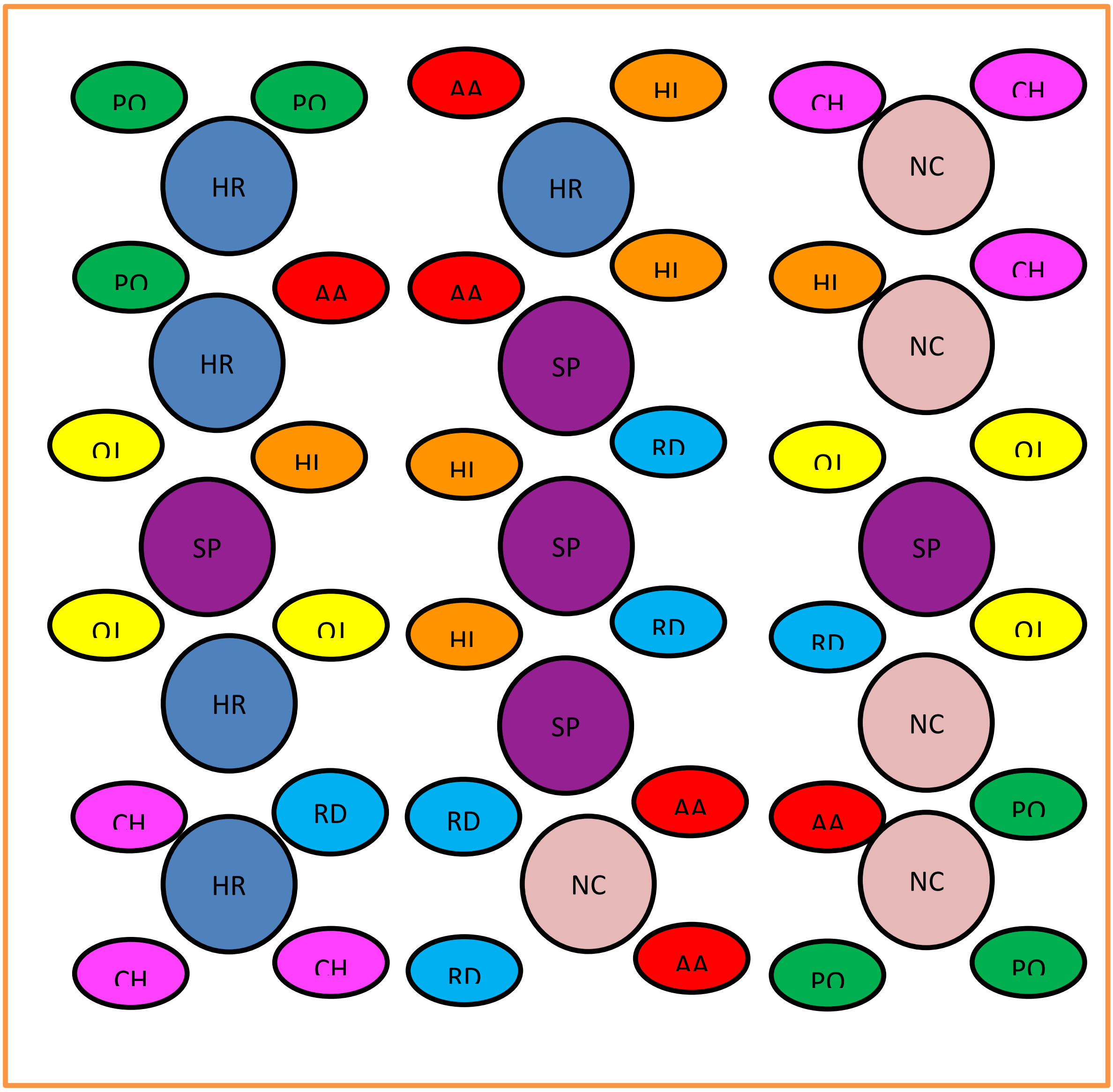
Figure 3.12: Plot 7 : SL2 – Structured Design + Low Diversity + Base & Low Emergent (2)



LEGENDS:

1. PO – *Peperomia obtusifolia (6 plants)*
2. CH – *Cuphea hyssopifolia(6 plants)*
3. AA – *Anthurium andraeanum (6 plants)*
4. OJ – *Ophiopogon jaburan (6 plants)*
5. RD – *Rheo discolor (6 plants)*
6. HL – *Hymenocallis litoralis (6 plants)*
7. HR – *Hippeastrum reticulatum(5 plants)*
8. SP – *Spathoglottis plicata (5 plants)*
9. NC – *Neomarica caerulea (5 plants)*

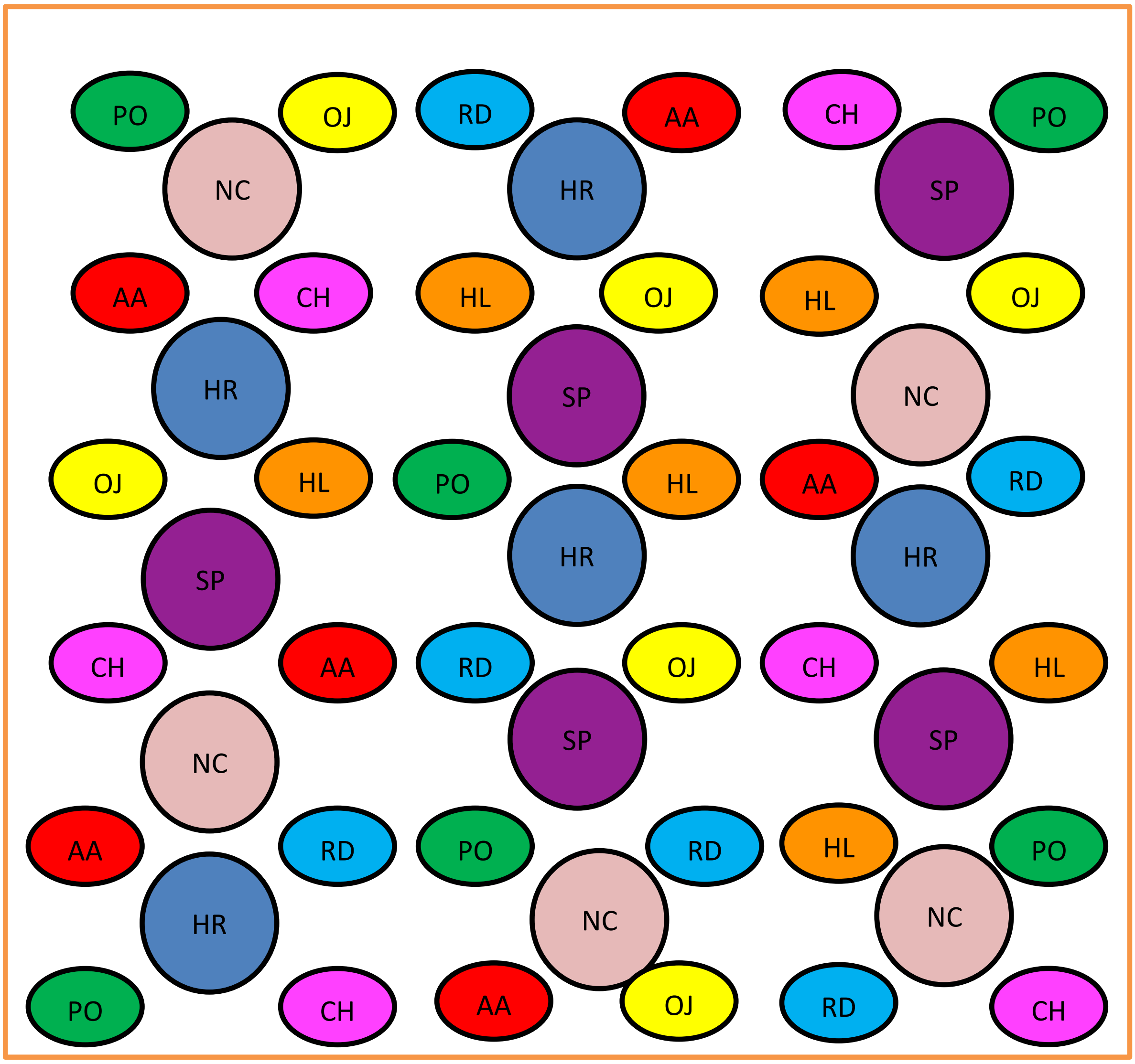
Figure 3.13: Plot 8 : IL2 – Intermediate Design + Low Diversity + Base & Low Emergent (2)



LEGENDS:

1. PO – *Peperomia obtusifolia (6 plants)*
2. CH – *Cuphea hyssopifolia(6 plants)*
3. AA – *Anthurium andraeanum (6 plants)*
4. OJ – *Ophiopogon jaburan (6 plants)*
5. RD – *Rheo discolor (6 plants)*
6. HL – *Hymenocallis litoralis (6 plants)*
7. HR – *Hippeastrum reticulatum(5 plants)*
8. SP – *Spathoglottis plicata (5 plants)*
9. NC – *Neomarica caerulea (5 plants)*

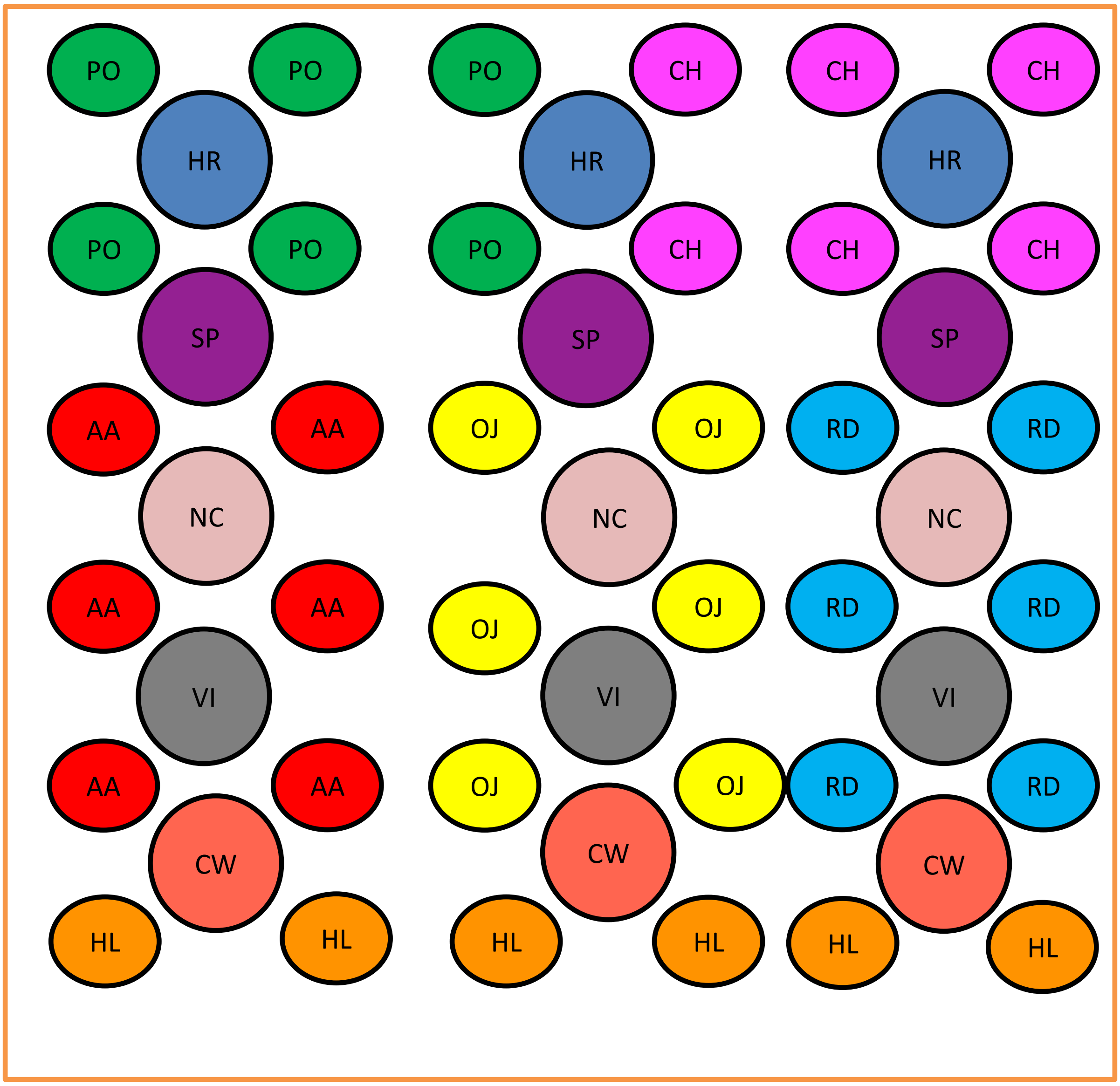
Figure 3.14: Plot 9 : RL2 – Random Design + Low Diversity + Base & Low Emergent (2)



LEGENDS:

1. PO – *Peperomia obtusifolia (6 plants)*
2. CH – *Cuphea hyssopifolia(6 plants)*
3. AA – *Anthurium andraeanum (6 plants)*
4. OJ – *Ophiopogon jaburan (6 plants)*
5. RD – *Rheo discolor (6 plants)*
6. HL – *Hymenocallis litoralis (6 plants)*
7. HR – *Hippeastrum reticulatum(5 plants)*
8. SP – *Spathoglottis plicata (5 plants)*
9. NC – *Neomarica caerulea (5 plants)*

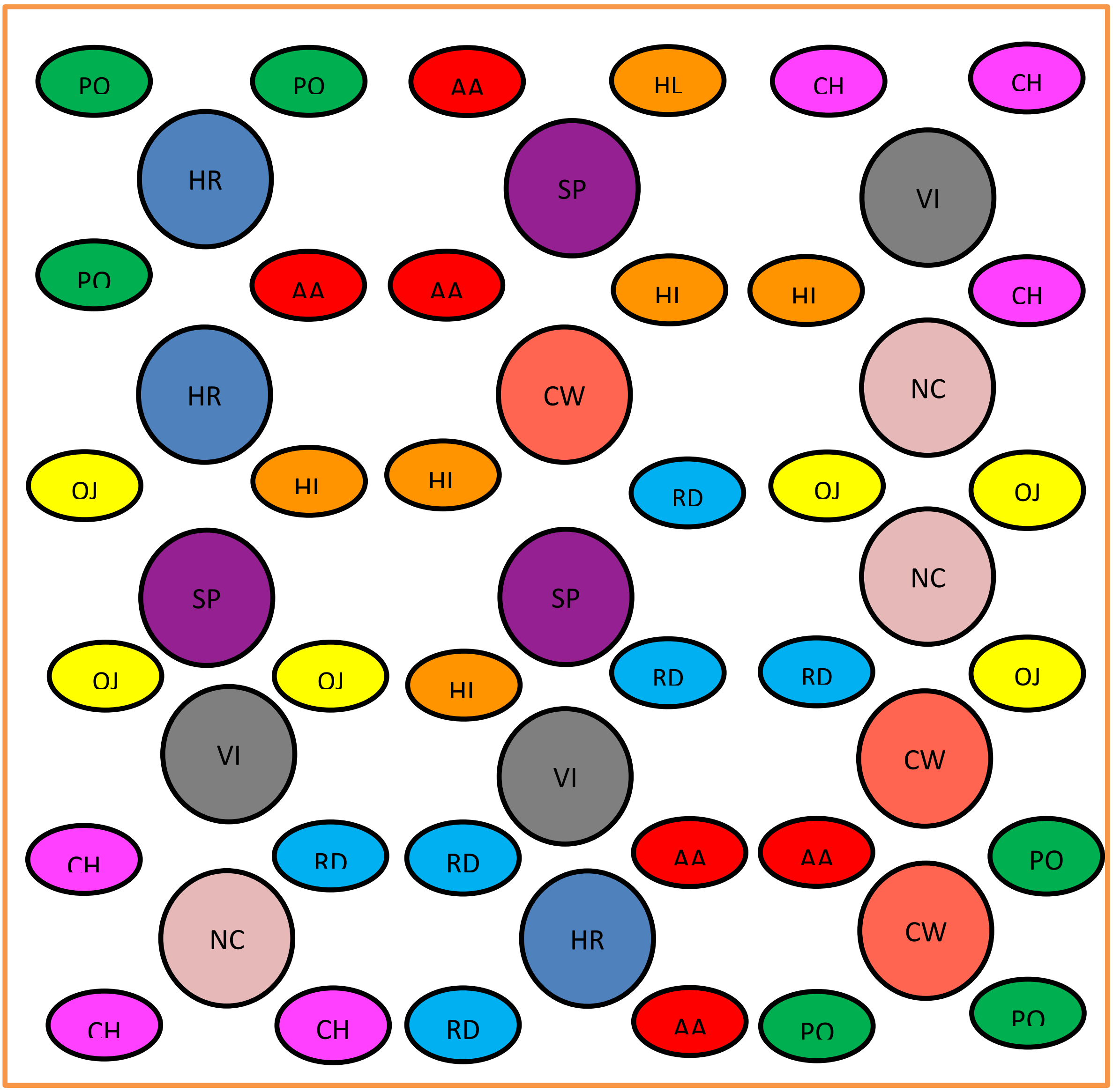
Figure 3.15: Plot 10 : SH2 – Structured Design + High Diversity + Base & Low Emergent (2)



LEGENDS:

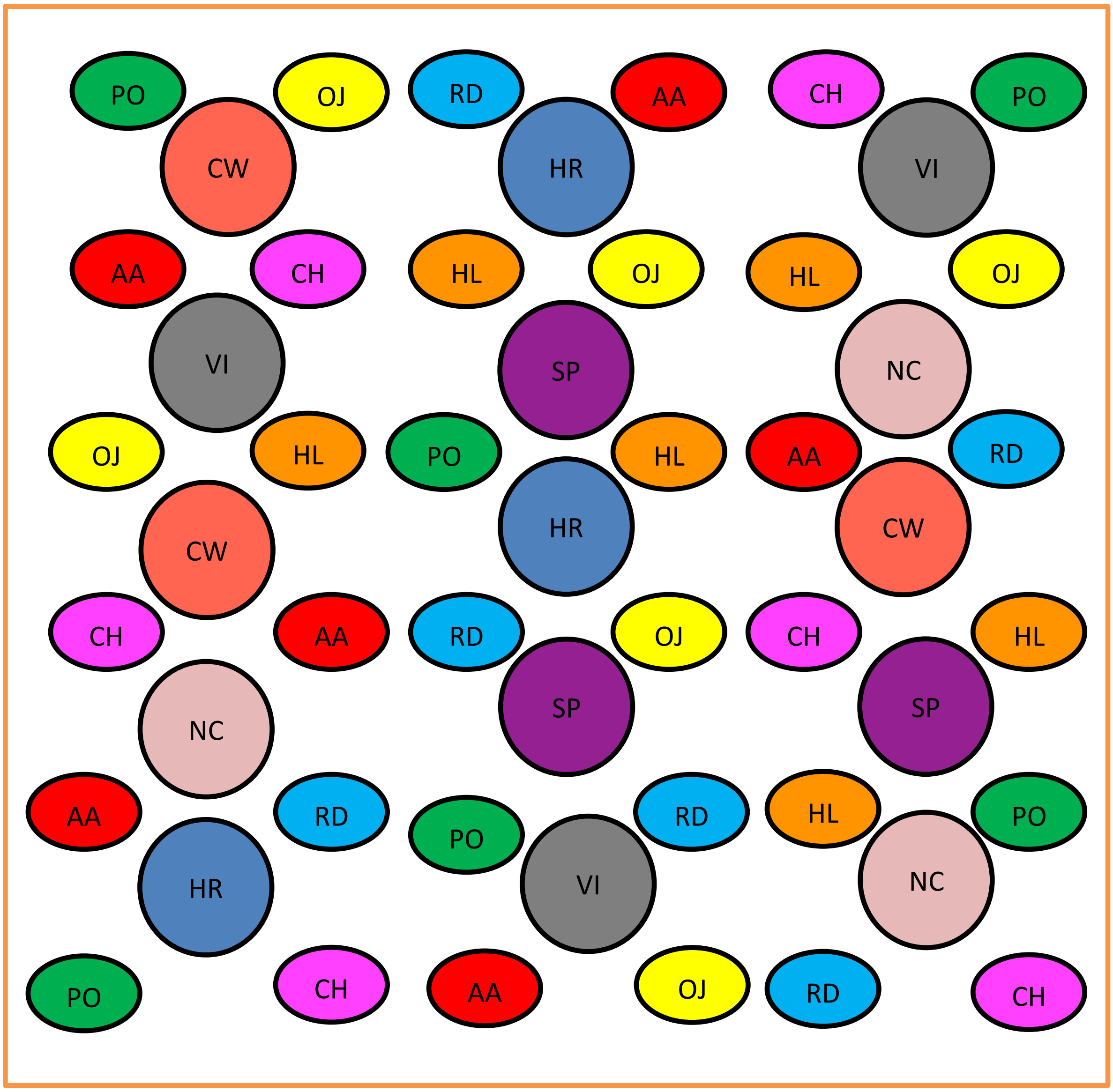
1. PO – *Peperomia obtusifolia (4 plants)*
2. CH – *Cuphea hyssopifolia(4 plants)*
3. AA – *Anthurium andraeanum (4 plants)*
4. OJ – *Ophiopogon jaburan (4 plants)*
5. RD – *Rheo discolor (4 plants)*
6. HL – *Hymenocallis litoralis (4 plants)*
7. HR – *Hippeastrum reticulatum(3 plants)*
8. SP – *Spathoglottis plicata (3 plants)*
9. NC – *Neomarica caerulea (3 plants)*
10. *BM – Begonia masoniana (4 plants)*
11. *CM – Calathea makoyana (4 plants)*
12. *VS – Vriesea splendens (4 plants)*
13. *VI – Vrisea imperialis (3plants)*
14. *CW – Costus woodsonii (3plants)*
15. *CL – Calathea Loesenerii (4 plants)*

Figure 3.16: Plot 11 : IH2 – Intermediate Design + High Diversity + Base & Low Emergent (2)



1. PO – *Peperomia obtusifolia (4 plants)*
2. CH – *Cuphea hyssopifolia(4 plants)*
3. AA – *Anthurium andraeanum (4 plants)*
4. OJ – *Ophiopogon jaburan (4 plants)*
5. RD – *Rheo discolor (4 plants)*
6. HL – *Hymenocallis litoralis (4 plants)*
7. HR – *Hippeastrum reticulatum(3 plants)*
8. SP – *Spathoglottis plicata (3 plants)*
9. NC – *Neomarica caerulea (3 plants)*
10. *BM – Begonia masoniana (4 plants)*
11. *CM – Calathea makoyana (4 plants)*
12. *VS – Vriesea splendens (4 plants)*
13. *VI – Vrisea imperialis (3plants)*
14. *CW – Costus woodsonii (3plants)*
15. *CL – Calathea Loesenerii (4 plants)*

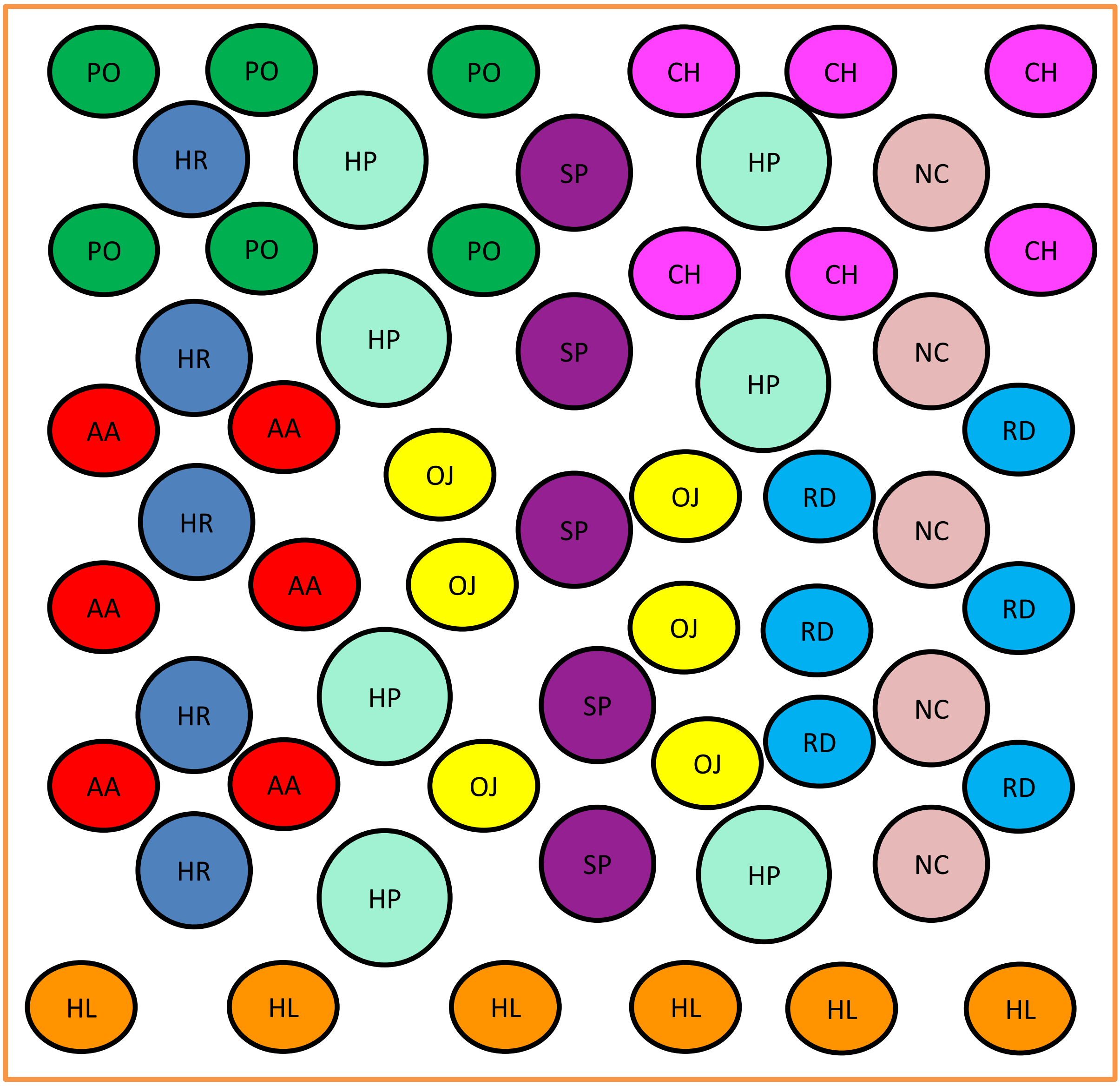
Figure 3.17: Plot 12 : RH2 – Random Design + High Diversity + Base & Low Emergent (2)



LEGENDS

1. PO – *Peperomia obtusifolia (4 plants)*
2. CH – *Cuphea hyssopifolia(4 plants)*
3. AA – *Anthurium andraeanum (4 plants)*
4. OJ – *Ophiopogon jaburan (4 plants)*
5. RD – *Rheo discolor (4 plants)*
6. HL – *Hymenocallis litoralis (4 plants)*
7. HR – *Hippeastrum reticulatum(3 plants)*
8. SP – *Spathoglottis plicata (3 plants)*
9. NC – *Neomarica caerulea (3 plants)*
10. BM – *Begonia masoniana (4 plants)*
11. CM – *Calathea makoyana (4 plants)*
12. VS – *Vriesea splendens (4 plants)*
13. VI – *Vrisea imperialis (3plants)*
14. CW – *Costus woodsonii (3plants)*
15. CL – *Calathea Loesenerii (4 plants)*

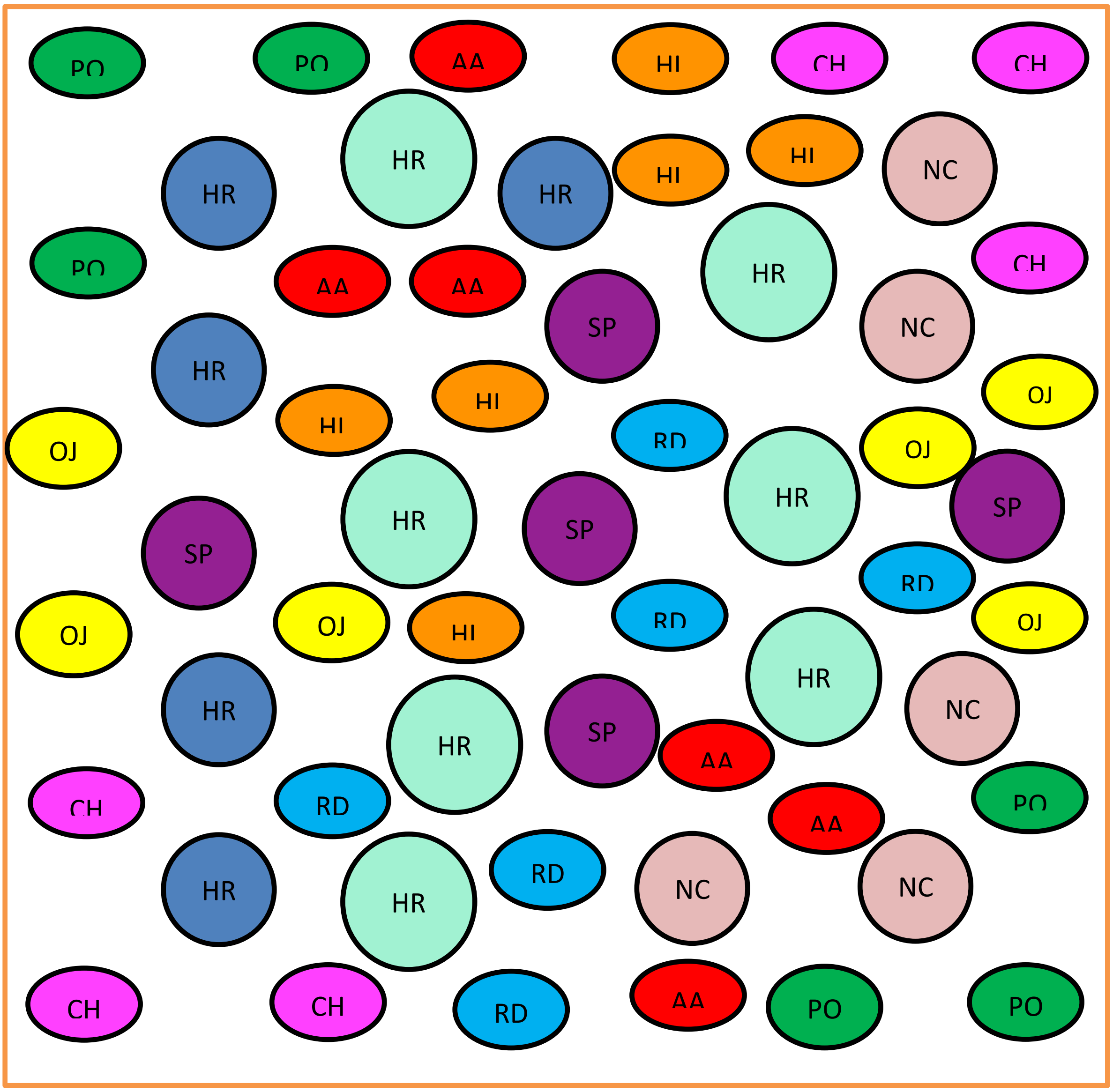
Figure 3.18: Plot 13 : SL3 – Structured Design + Low Diversity + Base & Low Emergent + Tall Emergent (3)



LEGENDS

1. PO – *Peperomia obtusifolia (6 plants)*
2. CH – *Cuphea hyssopifolia(6 plants)*
3. AA – *Anthurium andraeanum (6 plants)*
4. OJ – *Ophiopogon jaburan (6 plants)*
5. RD – *Rheo discolor (6 plants)*
6. HL – *Hymenocallis litoralis (6 plants)*
7. HR – *Hippeastrum reticulatum(5 plants)*
8. SP – *Spathoglottis plicata (5 plants)*
9. NC – *Neomarica caerulea (5 plants)*
10. *HP – Heliconia psittacorum (7 plants)*

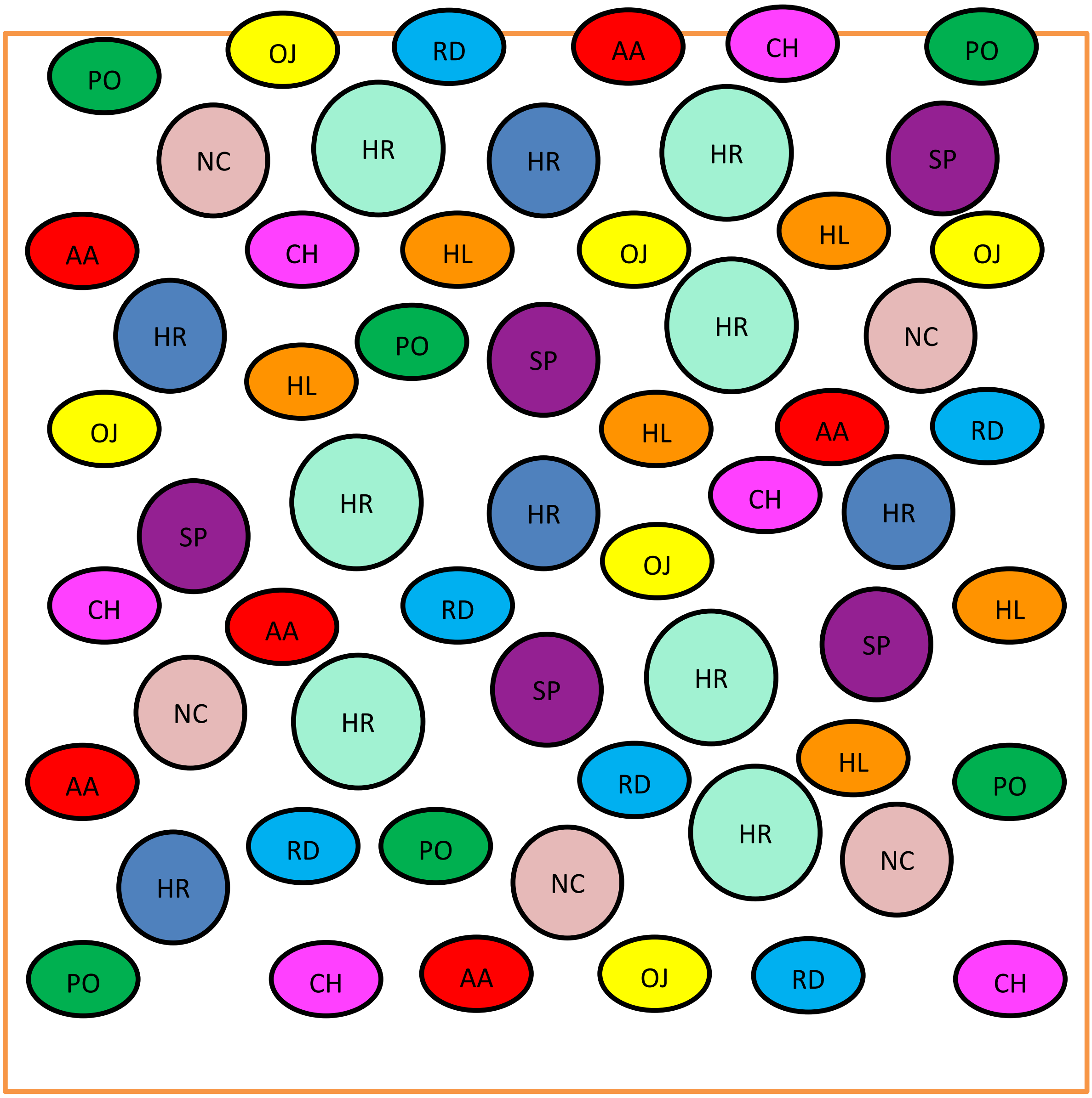
Figure 3.19: Plot 14 : IL3 – Intermediate Design + Low Diversity + Base & Low Emergent + Tall Emergent (3)



LEGENDS

1. PO – *Peperomia obtusifolia (6 plants)*
2. CH – *Cuphea hyssopifolia(6 plants)*
3. AA – *Anthurium andraeanum (6 plants)*
4. OJ – *Ophiopogon jaburan (6 plants)*
5. RD – *Rheo discolor (6 plants)*
6. HL – *Hymenocallis litoralis (6 plants)*
7. HR – *Hippeastrum reticulatum(5 plants)*
8. SP – *Spathoglottis plicata (5 plants)*
9. NC – *Neomarica caerulea (5 plants)*
10. *HP – Heliconia psittacorum (7 plants)*

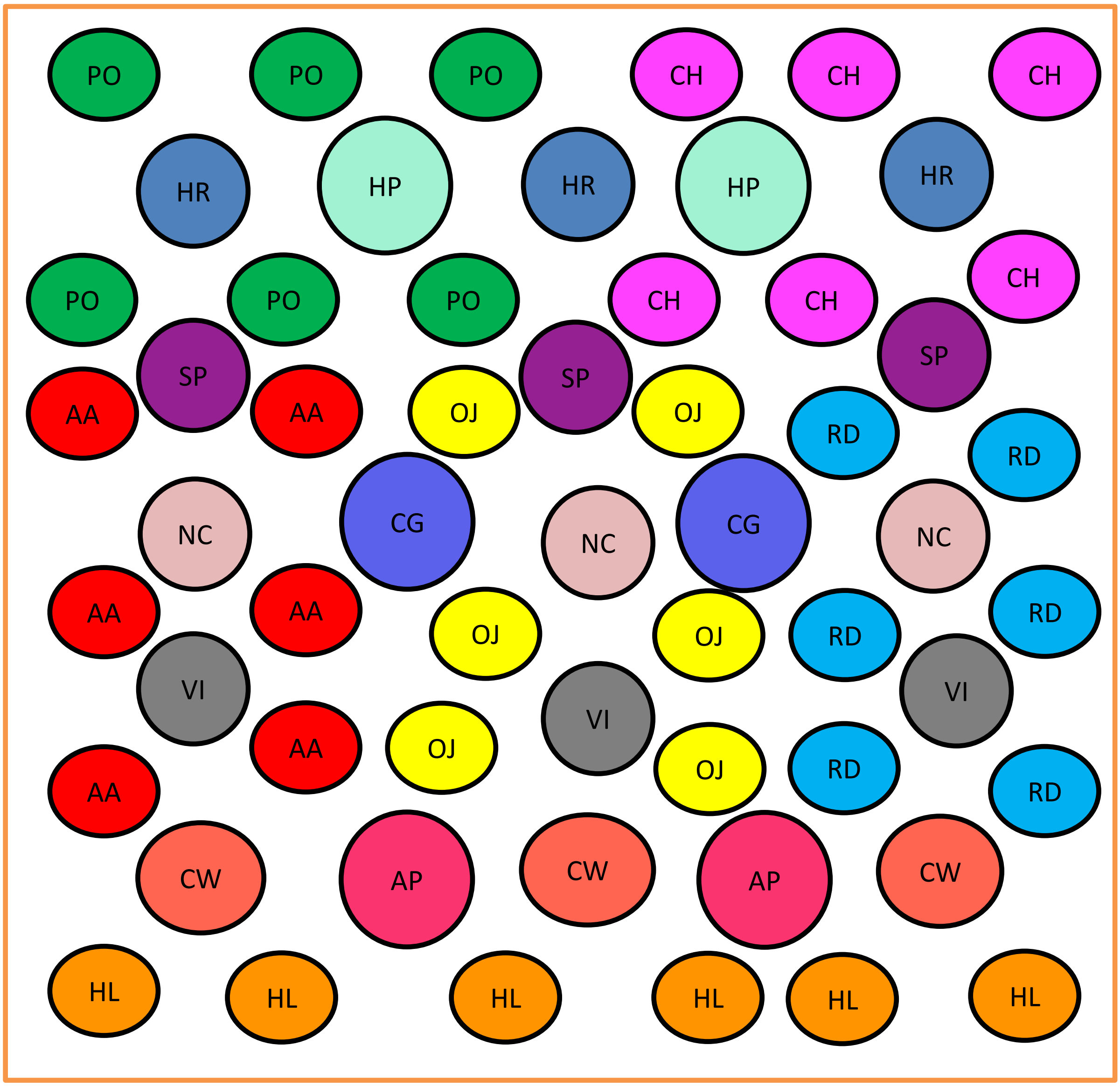
Figure 3.20: Plot 15 : RL3 – Random Design + Low Diversity + Base & Low Emergent + Tall Emergent (3)



LEGENDS

1. PO – *Peperomia obtusifolia (6 plants)*
2. CH – *Cuphea hyssopifolia(6 plants)*
3. AA – *Anthurium andraeanum (6 plants)*
4. OJ – *Ophiopogon jaburan (6 plants)*
5. RD – *Rheo discolor (6 plants)*
6. HL – *Hymenocallis litoralis (6 plants)*
7. HR – *Hippeastrum reticulatum(5 plants)*
8. SP – *Spathoglottis plicata (5 plants)*
9. NC – *Neomarica caerulea (5 plants)*
10. *HP – Heliconia psittacorum (7 plants)*

Figure 3.21: Plot 16 : SH3 – Structured Design + High Diversity + Base & Low Emergent + Tall

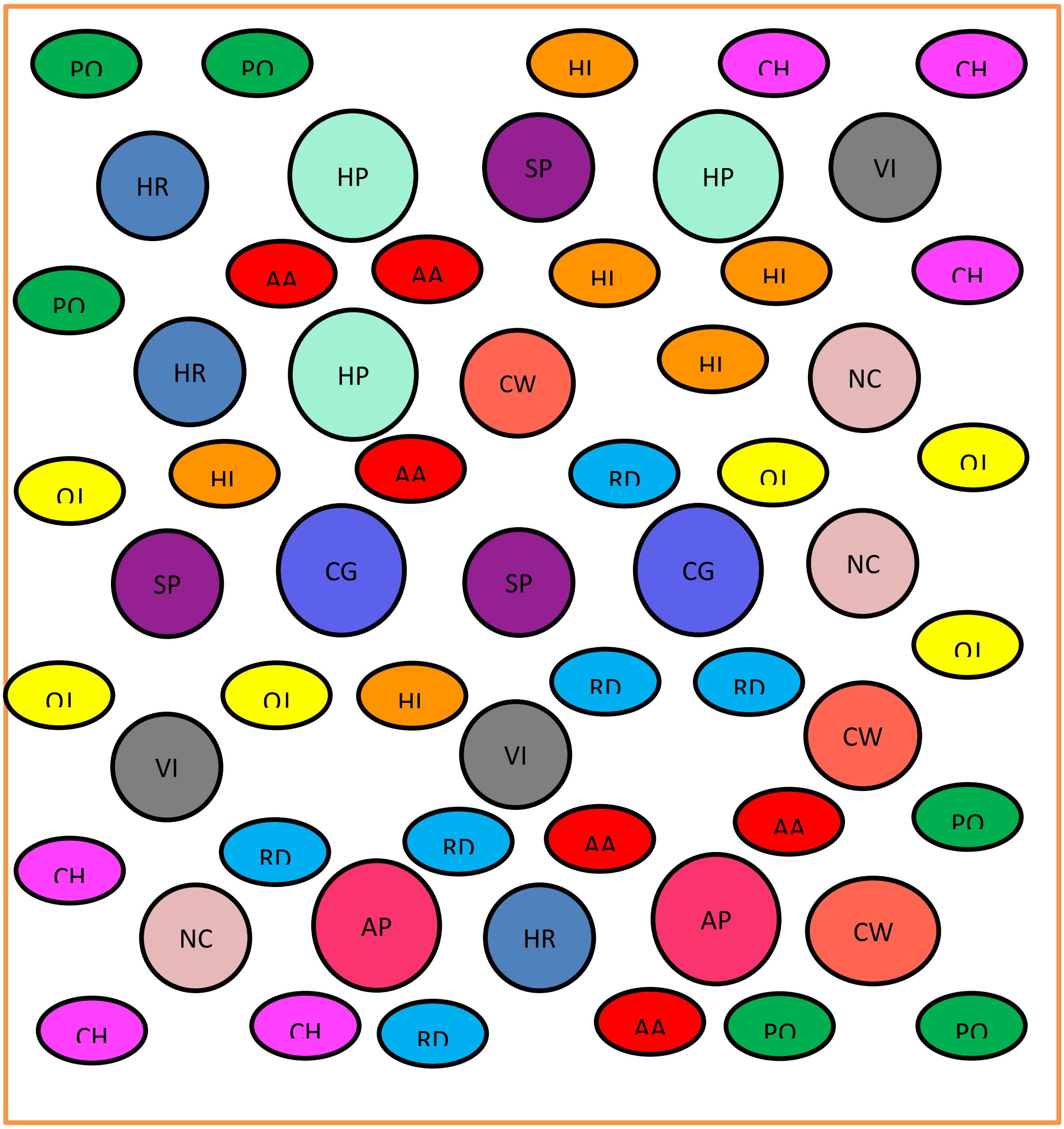


Emergent (3)

LEGENDS

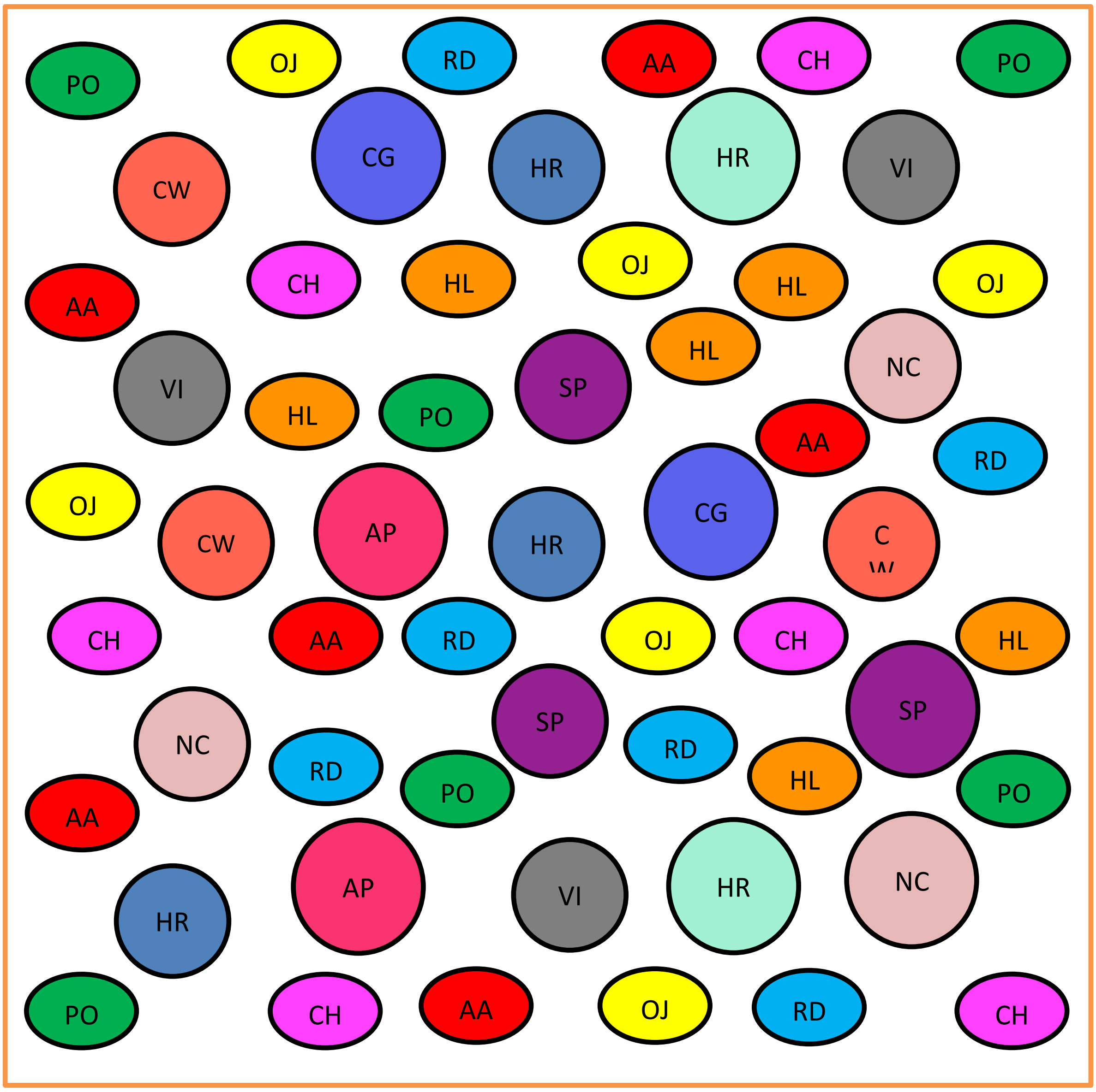
1. PO – *Peperomia obtusifolia (4 plants)*
2. CH – *Cuphea hyssopifolia(4 plants)*
3. AA – *Anthurium andraeanum (4 plants)*
4. OJ – *Ophiopogon jaburan (4 plants)*
5. RD – *Rheo discolor (4 plants)*
6. HL – *Hymenocallis litoralis (4 plants)*
7. HR – *Hippeastrum reticulatum(3 plants)*
8. SP – *Spathoglottis plicata (3 plants)*
9. NC – *Neomarica caerulea (3 plants)*
10. *BM – Begonia masoniana (4 plants)*
11. *CM – Calathea makoyana (4 plants)*
12. *VS – Vriesea splendens (4 plants)*
13. *VI – Vrisea imperialis (3plants)*
14. *CW – Costus woodsonii (3plants)*
15. *CL – Calathea Loesenerii (4 plants)*
16. *CG – Canna glauca (2 plants)*
17. *HP – Heliconia psittacorum (2 plants)*
18. *AP – Alpinia purpurata (2 plants)*

Figure 3.22: Plot 17 : IH3 – Intermediate Design + High Diversity + Base & Low Emergent + Tall Emergent (3)



1. PO – *Peperomia obtusifolia (4 plants)*
2. CH – *Cuphea hyssopifolia(4 plants)*
3. AA – *Anthurium andraeanum (4 plants)*
4. OJ – *Ophiopogon jaburan (4 plants)*
5. RD – *Rheo discolor (4 plants)*
6. HL – *Hymenocallis litoralis (4 plants)*
7. HR – *Hippeastrum reticulatum(3 plants)*
8. SP – *Spathoglottis plicata (3 plants)*
9. NC – *Neomarica caerulea (3 plants)*
10. *BM – Begonia masoniana (4 plants*
11. *CM – Calathea makoyana (4 plants*
12. *VS – Vriesea splendens (4 plants)*
13. *VI – Vrisea imperialis (3plants)*
14. *CW – Costus woodsonii (3plants)*
15. *CL – Calathea Loesenerii (4 plants)*
16. *CG – Canna glauca (2 plants)*
17. *HP – Heliconia psittacorum (2 plants)*
18. *AP – Alpinia purpurata (2 plants)*

Figure 3.23: Plot 18 : RH3 – Random Design + High Diversity + Base & Low Emergent + Tall



Emergent (3)

1. PO – *Peperomia obtusifolia (4 plants)*
2. CH – *Cuphea hyssopifolia(4 plants)*
3. AA – *Anthurium andraeanum (4 plants)*
4. OJ – *Ophiopogon jaburan (4 plants)*
5. RD – *Rheo discolor (4 plants)*
6. HL – *Hymenocallis litoralis (4 plants)*
7. HR – *Hippeastrum reticulatum(3 plants)*
8. SP – *Spathoglottis plicata (3 plants)*
9. NC – *Neomarica caerulea (3 plants)*
10. *BM – Begonia masoniana (4 plants*
11. *CM – Calathea makoyana (4 plants*
12. *VS – Vriesea splendens (4 plants)*
13. *VI – Vrisea imperialis (3plants)*
14. *CW – Costus woodsonii (3plants)*
15. *CL – Calathea Loesenerii (4 plants)*
16. *CG – Canna glauca (2 plants)*
17. *HP – Heliconia psittacorum (2 plants)*
18. *AP – Alpinia purpurata (2 plants)*

3.2. Phase 2: Setting Up the Research Communities in Kuala Lumpur

3.2.1 Selection of Survey Sites

In this study, the parks selected to host the research planting design communities were situated in the heart of Kuala Lumpur City Centre, Malaysia.

Kuala Lumpur was chosen as the most urban part of Malaysia, the centre of power, and the urban development model for the rest of the country. Kuala Lumpur (Latitude 3°8´N; Longitude 101°44´E) is situated in the Federal Territory of Kuala Lumpur, in the west Peninsular Malaysia (Figure 1). The total population of Kuala Lumpur (in 2019) it was estimated 1.78 million people (Department of Statistics Malaysia, 2019). The ethnicity compositions were Malays (40%), Chinese (36.7%), Indians (8.5%), others (1.09%) and a foreign nationality population of 13.44%.

Malaysia has a tropical climate (Köppen climate classification *Af*), with high temperatures and high humidity throughout the year. Daytime temperatures rise above 30°C (86°F) year-round and night-time temperatures rarely drop below 20°C (68°F). Discussions and presentations were made with the Malaysian collaborator (Kuala Lumpur City Hall) in selecting the most appropriate sites to meet the social-demographic characteristic. After shortlisting ten parks around Kuala Lumpur, two parks were selected: Tasik Permaisuri Park and Pudu Ulu Park. Both parks are located in Cheras, a sub-district of Kuala Lumpur. These parks are mainly selected based on differences in their physical composition, characteristics, their location and as well as their demographic factors particularly socio-economics and affluence. In order to measure the influence of the planting designs on preferences, sites were selected to reflect social class, income, and educational gradients in an urban setting

3.2.2 Selected Research Site

Park 1: Permaisuri Lake Garden

The first selected park was Tasik Permaisuri Park. It is an urban park in the Bandar Tun Razak district of Kuala Lumpur, about 6 km from the city centre. Kuala Lumpur City Hall manages it. The park covers 40 hectares with a scenic lake at its centre, enlivened by several fountains. Parts of the lake are covered with pink lotus flowers and lilies. There are shady picnic spots around the lake with concrete tables and stools provided. The park is attractively landscaped on naturally hilly terrain. There is a park-within-a-park section with a terraced amphitheatre planted with colourful species. There are four seating gazebos in this area which enjoy a view over the lake

Activities and facilities here include a football pitch, a futsal court, children's playground and cycle hire (although cycling is not permitted in some parts of the park). Jogging/walking trails extended into the more jungle-like southern section of the park left in a natural state. Elsewhere is a hard-landscaped space with brick pillars that no doubt is intended for multi-purpose use but instead looks somewhat decayed and unused. On the eastern border of the park is a large football stadium and a public swimming pool, part of Bandar Tun Razak Sports Complex.

Park 2: Pudu Ulu Park

The second selected park was Pudu Ulu Park, also located in Cheras, Kuala Lumpur. It is 3km apart from Tasik Permaisuri park. It is also part of the Pudu Ulu Recreational Park located between Taman Shamelin Perkasa and Jalan Pudu Ulu in Cheras. The park was developed in two stages over almost a decade, covering a vast 25.9ha in its entirety and is filled with trees and foliage. However, a large area of mature trees had recently been cleared for a recreational building. In addition to the children playground, there is a jogging track, wading pool for kids, a boardwalk, benches and a stage. Popular with folks around the area, it provides a much needed green lung for the city. The first phase was opened to the public in December 2007 by then Federal Territories minister of Malaysia.

Table 3.5: Site characteristics comparison between Permaisuri Lake Garden (Park 1) and Pudu Ulu Park (Park 2) (Source: Department of Statistics Malaysia, 2019 & DBKL 10 year-plan, 2017)

	PERMAISURI LAKE GARDEN	**PUDU ULU PARK**
Year Opened	1989	2007
Size	49.4 hectare	25.9 hectare
Amount Of Tree Cover	60%	45%
Vegetation Structure	Trees, Palm oil trees, coconut trees, shrubs, large grass area	Large grass area, trees, and shrubs
Characteristics	15km from the city centre	10km from the city centre
Landscape Features	• Originated from old tin mining • Human-made lake • Jogging trails and cycling track • Shooting fountains • Outdoor gym • Canopy walk • Flower garden terrace • Playground • Gazebos for picnics/ events / meditation • Hilly terrains	• It was built on a water recreation and leisure concept. • First wading pool in a public park in Malaysia. • Has a metropolitan park characteristic. • This park was built in line with the country's landscape policy to create more green spaces in Kuala Lumpur. • Jogging trails and cycling track • Gazebos for picnics/ events / meditation • Playground • Amphitheatre • Large grass carpet areas all over the park • Flatter terrains
Nature Of Users	• Jogging • Walking (morning/evening stroll) • Cycling	• Jogging • Walking (morning/evening stroll) • Cycling

	• Picnic • Events • Outdoor yoga / tai chi classes • Appreciating nature • Exercising	• Picnic • Events • Outdoor yoga / tai chi classes • Appreciating nature • Exercising
Affluence	Lower to middle-class income (B40 – M40)	Middle class to upper-class income (M40 – U20)
Average Gross Household Income	RM5530 – RM10,823	RM10,823 – RM26,306
Population Projection	70,000 people	38,000 people
Contextual Study Of Research Area	• 10 residential + 7 commercial parcels • 11 schools • 1 government hospital & rehab centre • 1 shopping mall	• 4 schools • Private clinics • 1 shopping mall • Train station
Concentration	• Malay • Indian	• Chinese • Indian • Malay

3.2.2.1 Research site pictures: Site 1: Permaisuri Lake Garden

Figure 3.24: Overview of Permaisuri Lake Garden (Inside red line). (Source: Google Maps, 2019)(top)

Figure 3.25: Highlighted Permaisuri Lake Garden (Inside red line). Green area is the research site. (Source: Google Maps, 2019)(below)

Figure 3.26: Permaisuri Lake Garden's research site zoomed-in. (Source: Google Maps, 2019)

Figure 3. 28: Angle 2 of research site at Permaisuri Lake Garden

Figure 3.29: Jogging trail beside the research site at Permaisuri Lake Garden

3.2.2.2 Research site pictures: Site 2: Pudu Ulu Park

Figure 3.30: Overview of Pudu Ulu Park (Inside red line). (Source: Google Maps, 2019)

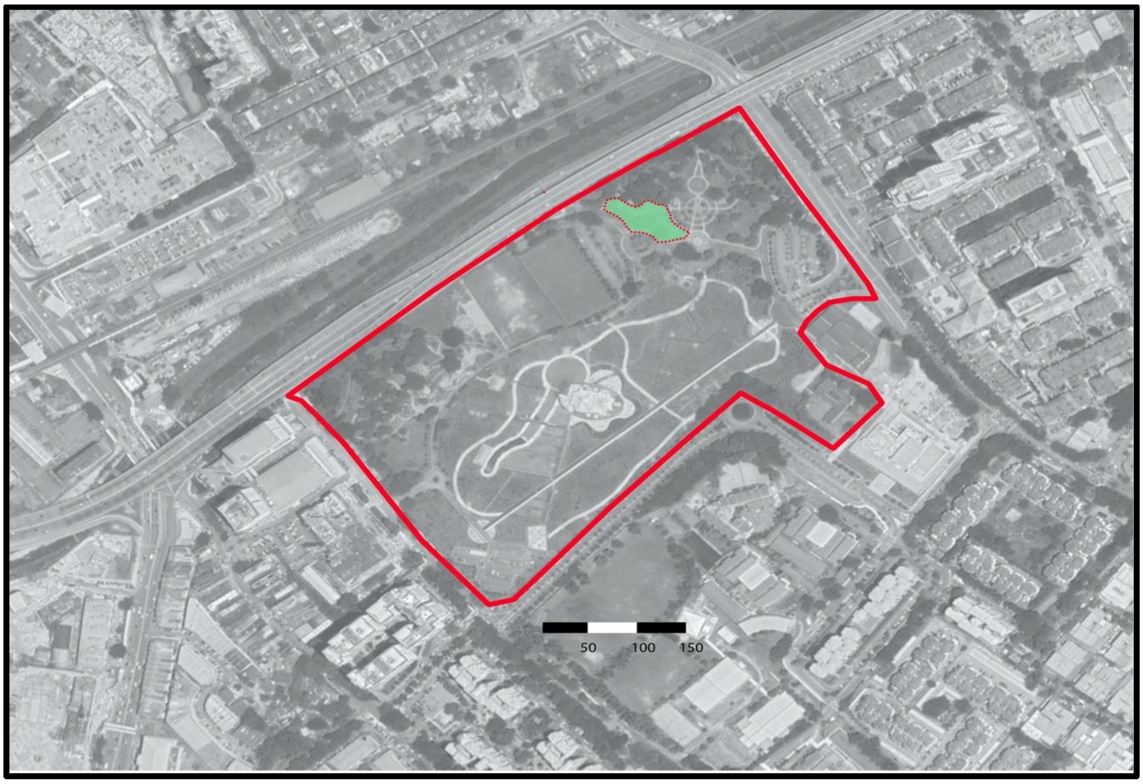


Figure 3.31: Highlighted Pudu Ulu Park (Inside red line). Green area is the research site. (Source: Google Maps, 2019)

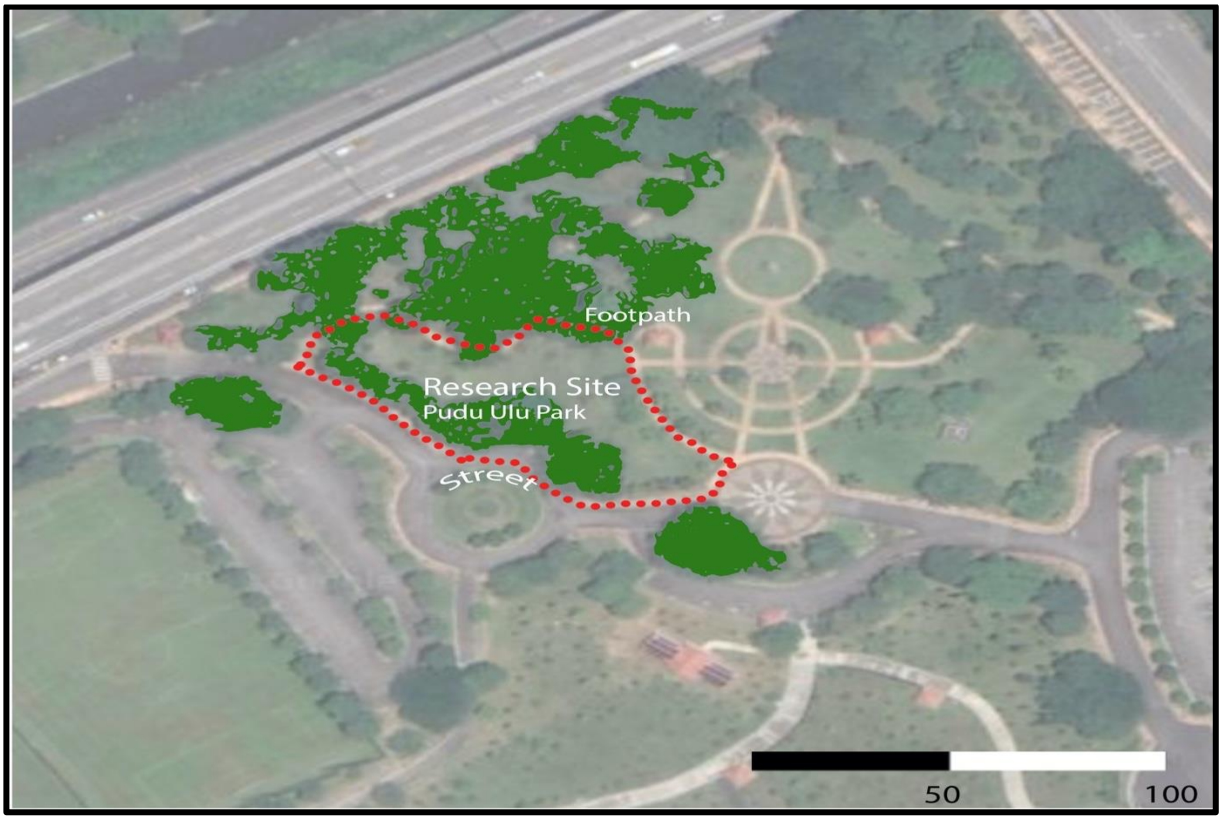


Figure 3.32: Pudu Ulu Park's research site zoomed-in. (Source: Google Maps, 2019)

Figure 3.33: Angle 1 of research site at Pudu Ulu Park

Figure 3.34: Angle 2 of research site at Pudu Ulu Park

Figure 3.35: Sitting area beside the research site at Pudu Ulu Park

3.2.3 Trial Plots Setup

The plots were placed in cutouts in the parks' mown grass surface in a relatively open area within 20m of the main path. Each block was separated from the next by a 2m wide mown grass path (Table 3.2 and Figure 3.2). Each of the 18 trial plots was 3m x 3m in each of the two parks. Plots were arranged in a completely randomized design (CRD). The plots were not replicated as the goal was not to collect ecological data, but merely to use these as cues to the human preference of the 18 different planting typologies. Each plant in the plot was planted at 300mm centres, i.e. approximately 9.5 per m^2 and approximately 60 plants per plot.

Figure 3.36: Visualisation of trial setup plan at the research site at Pudu Ulu Park

Figure 3.37: Actual setup of the plots at the research site at Pudu Ulu Park

Figure 3.38: Actual setup of the plots at the research site at Pudu Ulu Park

3.2.4 Collaborators

Throughout the research, the researcher (University of Sheffield) collaborated with three organisations actively involved in the landscape design and management research and development in Malaysia. The collaborators and their contributions are as follows (Please refer Table 3.5);

Table 3.6: Collaborators and contributions to the research

Organization	Contribution
Department of Landscape, Kuala Lumpur City Hall (KLCH)	• Provide research site • Assisted with planting and maintenance of research plots
Universiti Putra Malaysia (UPM)	• Provide postgraduate student (research assistants) • Publication collaborations • Local expertise advice
Malaysian Agriculture Research & Development Institute (MARDI)	• Local expertise advice • Publication collaborations

The plots were maintained for 15 months. Responses to the vegetation were collected at two dates which are during Phase 1 (1 month after sowing of seedlings – May 2017) and one year (12 months) after that, which is Phase 2 (flowering period – April 2018) after planting of seedlings

3.3. Phase 3: Respondent Response to The Plantings in Kuala Lumpur

3.2.1 Questionnaire Design

A questionnaire survey was based on similar studies ((Garrod and Willis, 1999; Lorenzo *et al.*, 2000; Lewan and Söderqvist, 2002) Tyrvainen 2000) designed to investigate public reaction to the 18 research vegetation types. The questionnaire takes the form of open-ended and closed questions and attitudinal statements, following established methodology, for example, Ives and Kendal (2013). Responses were analysed quantitatively using SPSS Ver. 25 statistical package. The questionnaire survey was designed to assess overall patterns concerning public perception and preference for designed planting with specific structures and characters. Then, part of the questionnaire gathered demographic information of respondents, including gender, age group, educational level, place of residence, and monthly income to assess whether the sample was representative of the general population (Bateman and others 2002; (Garrod and Willis, 1999) and also assess the relationships between respondent's demography and perceptions and preference for planting design. The first part of the questionnaire looks at general attitudes to nature and planting. The second part focuses on specific attitudes to the 18 plots, and the third part of the study looks at the demographics of the respondents

The questionnaire was refined, followed by revision after the questionnaire is piloting with thirty post-graduates and under-graduates from Malaysia studying at the University of Sheffield. A sample copy of the questionnaire is shown in the appendix and simplified below:

Research theme	**Questionnaire Measures (Individual attitudinal statements & questions)**
Park visit patterns	Is this your first visit to this park? How often do you visit this park? Which other open spaces do you visit regularly? Reasons for coming to the park Who are you visiting the park with? I often visit gardens that are open to the public.
Familiarity and preference of nature-like planting	What was your familiarity with nature-like planting before seeing this planting? Where did you see this type of planting? Do you think nature-like planting is appropriate in the park? Do you like this nature-like vegetation more than the traditional horticultural type of planting in the park?
Perceived diversity values	How many species of plants do you think there are in THIS plot? Do you know what "native plant" means? What percentage (%) of plants in the plot do you think are NATIVE SPECIES? How well does THIS plot support wildlife?
Aesthetic qualities	How attractive are the colour combinations of THIS plot? How attractive is the foliage? How disordered or messy is it? Does it look cared for? Does it look tidy? Does it look natural? Does THIS plot look crowded? I prefer planting with lots of different species. I prefer planting with only a few species. Planting is about the colour of the flowers

Research theme	Questionnaire Measures (Individual attitudinal statements & questions)
Restorative effect	Do you find the planting in the plot inappropriate? How does this plot make you feel? Do you like the design of THIS plot? I like formal, ordered planting in a park I like informal and natural-looking planting in a park I know what naturalistic planting is I like nature-like vegetation. I like to see cultivated soil in between plants Mixing plants species makes it look messy. Disorder/messiness in planting design makes me closer to nature Disorder/messiness in planting design makes me happy/comfortable
Importance of native species	Planting is better when it contains native Malaysian species. Natural native planting is about a modern independent Malaysia The plots contribute to the character of the local area. I can recognise many Malaysian plants
Knowledge and exposure on landscape and ecology	I regularly garden. I choose to spend a lot of time outdoors. I can design a garden I am passionate about the natural environment. I regularly read about the environment.

3.3.2 Methodological protocols used in carrying out the study

The plots were grouped into six sets (Set A-F) of six plots each, and respondents only assessed one set of these six sets. This approach is widely used in epidemiological research and is referred to as a balanced incomplete design. Each plot appears twice, and no two plots appear together twice in different blocks. Each set was formed by considering all the counterparts of the variables available in each set, and the respondents get to visit all of the plots that contain the variable counterparts. The combinations within each set areas listed below:

3.3.2.1 Incomplete balanced block design set and plot combinations

Set A: Plot number – 1, 4, 9, 12, 13, 18
Set B: Plot number – 2,5,7,8,11,17
Set C: Plot number – 3, 6, 10, 14, 15, 16
Set D: Plot number – 4,5,6,13,14,17
Set E: Plot number – 1, 8, 10, 11, 12, 16
Set F: Plot number – 2,3,7,9,15,18

This method is mixing two highly connected ideas. Randomized incomplete design and random block allocation because these were blocked in different ways. If all respondents saw all blocks, then that is complete block allocation. The sets are designed to see a subset of six plots which also means that the respondent sees an incomplete block. Evaluating six plots allows all factors are balanced within them. There are, in fact, 18 ways that this can be done. 6 of the ways would mean that people saw the same combinations that look like

H:S:1; H:I:2; H:R:3; L:S:1; L:I:2; L:R:3
(H: High diversity; L: Low diversity; S: Structured design; I: Intermediate design; R: Random design; 1: 1-Layer (Base layer only); 2: 2-layer (Base + lower emergent); 3: 3-layer (Base + lower emergent + tall emergent)

The second principle of blocking comes from random block allocation, which is widely used in medical trials. It uses the fact that if we take a respondent to see 6 plots, we can take the next to see 6 plots that are different, leaving us with 6 for the third respondent. If we have one pattern of six given the balancing, then two other six patterns are balanced and will cover the other twelve plots. The pattern of 12 leaves 4 subsets of three patterns. The importance of making sure that we have this sort of rotation means that some plots do not get visited a lot more than others. The six sets give more balance arrangements and allow the measuring of more interactions.

Table 3.7: Combinations of 6 sets of plot numbers between all variables.

SET	PLOT NUMBER	COMBINATIONS
A	1,4,9,12,13,18	
	1	Intermediate Design + High Diversity + Base & Low Emergent (2)
	4	Intermediate Design + Low Diversity + Base (1)
	9	Structured Design + Low Diversity + Base & Low Emergent + Tall Emergent (3)
	12	Random Design + Low Diversity + Base & Low Emergent (2)
	13	Structured Design + High Diversity + Base (1)
	18	Random Design + High Diversity + Base & Low Emergent + Tall Emergent (3)
B	2,5,7,8,11,17	
	2	Random Design + Low Diversity + Base (1)
	5	Random Design + High Diversity + Base & Low Emergent (2)
	7	Intermediate Design + High Diversity + Base (1)
	8	Structured Design + High Diversity + Base & Low Emergent + Tall Emergent (3)
	11	Intermediate Design + Low Diversity + Base & Low Emergent + Tall Emergent (3)
	17	Structured Design + Low Diversity + Base & Low Emergent (2)
C	3,6,10,14,15,16	
	3	Structured Design + High Diversity + Base & Low Emergent (2)
	6	Random Design + Low Diversity + Base & Low Emergent + Tall Emergent (3)
	10	Random Design + High Diversity + Base (1)
	14	Intermediate Design + High Diversity + Base & Low Emergent + Tall Emergent (3)
	15	Intermediate Design + Low Diversity + Base & Low Emergent (2)
	16	Structured Design + Low Diversity + Base (1)
D	4,5,6,13,14,17	
	4	Intermediate Design + Low Diversity + Base (1)
	5	Random Design + High Diversity + Base & Low Emergent (2)
	6	Random Design + Low Diversity + Base & Low Emergent + Tall Emergent (3)
	13	Structured Design + High Diversity + Base (1)

SET	PLOT NUMBER	COMBINATIONS
	14	Intermediate Design + High Diversity + Base & Low Emergent + Tall Emergent (3)
	17	Structured Design + Low Diversity + Base & Low Emergent (2)
E	1,8,10,11,12,16	
	1	Intermediate Design + High Diversity + Base & Low Emergent (2)
	8	Structured Design + High Diversity + Base & Low Emergent + Tall Emergent (3)
	10	Random Design + High Diversity + Base (1)
	11	Intermediate Design + Low Diversity + Base & Low Emergent + Tall Emergent (3)
	12	Random Design + Low Diversity + Base & Low Emergent (2)
	16	Structured Design + Low Diversity + Base (1)
F	2,3,7,9,15,18	
	2	Random Design + Low Diversity + Base (1)
	3	Structured Design + High Diversity + Base & Low Emergent (2)
	7	Intermediate Design + High Diversity + Base (1)
	9	Structured Design + Low Diversity + Base & Low Emergent + Tall Emergent (3)
	15	Intermediate Design + Low Diversity + Base & Low Emergent (2)
	18	Random Design + High Diversity + Base & Low Emergent + Tall Emergent (3)

In previous studies, even though several researchers have evaluated in-situ (De La Fuente de Val and Mühlhauser, 2014; Sevenant and Antrop, 2009; Bulut and Yilmaz, 2008) the relationship between a landscape's scenic beauty and socio-demographic factors, planning, doing, and analysing face to face surveys is an expensive and time-consuming process which requires more specialist skills (Lothian, 1999). We chose this method because of the accuracy and the experience of being in front of the planting plots.

On the other hand, some papers (Bishop, 1997; Roth, 2006; Wherrett, 1999) have shown that the Internet is a valid substitute for conducting studies of perception with similar results to face-to-face surveys (Lindhjem and Navrud, 2011). However, even though the Internet is an appropriate medium to undertake visual preference surveys, and one which has improved over time (Roth, 2006), there are still several issues which should be considered: (i) effects of monitor resolution, and colour resolution can distort the image quality (Wherrett, 1999), (ii) the sample profile is more related to Internet users than the general public (Roth, 2006; Wherrett, 1999), (iii) people who score landscape images after having visited them probably overestimate their scores because they remembered their on-site experiences instead of judging the photographs (Roth, 2006). According to Tahvanainen et al. (2001), when a survey is carried out, it is better to use visual presentations than verbal questions, because the image shown can be different to the respondent's mental composition and, by extension, can condition their visual preference.

3.3.3 Pilot Study

A pilot study was conducted in Sheffield before the actual data collection in Kuala Lumpur. The pilot study aims to test the research instruments and protocols to be used in the data collection. This pilot, however, was done using digital pictures stimulation in the laptop and tablets. The pilot test helped the researcher modify the research instruments and practice and improve the procedure for conducting the questionnaire study. Thirty post-graduates and under-graduates from Malaysia studying at the University of Sheffield were asked to fill out the questionnaire based on the 18 contrasting landscape designs pictures seen on a tablet/laptop. The participant's comments were taken into account, and questions were modified.

Issues arising from the pilot test:

1. The survey took too long. Majority of the respondents in the pilot study took more than 20-30 minutes to finish answering the questionnaire.
2. Questions can be repetitive.
3. Questions were in English. This made the respondents sometimes confused or unsure due to language barriers and different English language command levels in Kuala Lumpur, Malaysia.
4. Some of the terms were not fully understood by laypersons.

Based on the feedback, changes were made to the questionnaires:

1. The questionnaire design was simplified to be too taxing on the respondents by using the preliminary but balanced block design. This enabled the respondents to see all combinations but within a shorter time to answer the questionnaire.
2. Made it bilingual so that the questions' idea was conveyed better, and the respondents can answer more effectively. It was in English only initially, but by having it in bilingual (English and Malays language), the respondents would better understand the context of the questions.
3. The number of plots that any one individual rated was reduced to 6 plots, and a statistical sampling methodology used to provide reliable estimates for all the plots. This required 6 versions of the questionnaire with different plot numbers on (see table 3.7 above).

3.3.4 Survey procedure

Six postgraduate students trained in the procedures and etiquette of conducting the survey served as enumerators / research assistants. During training, they conducted the survey together as a group under the supervision and coaching to ensure consistency in approach. The simple random sample method was used, and respondents were selected from those walking along main routes of the sites or entrance. The survey was conducted on a face-to-face basis. It was conducted two times in the fifteen-month of planting. The first phase of data taking was during the vegetative stage 1 month after planting (Phase 1), and the second data taking was twelve months after planting, the flowering stage (Phase 2). Phase 1 was in May 2017 and phase 2 in April 2018.

Surveys were conducted for each park simultaneously, i.e. at each time. Three enumerators were stationed in both parks. In total, there were six enumerators, including the researcher, responsible for doing the survey process. Researcher and research enumerators conducted the survey every day within the same duration within two-time windows; 7.30-10.30 am and 4.30-7.00 pm. According to the Department of Landscape, these were considered ‘peak hours’ for visitors, Kuala Lumpur City Hall staff. The whole process took about 30 days to finish each phase. On average, every day, there were 8-10 respondents who took part in the survey. They are the public park users who used the jogging trail and voluntarily joined in the process.

Respondents were approached individually, and those who wished to do the survey were invited to participate. This started with a briefing given individually or in a group (if more than 3 participants at one time) by the researcher/ research enumerators. Participants were given questionnaires on clipboards to answer as truthfully as possible according to their research plot observations. Whenever necessary and asked for, the enumerators would provide information (when asked) without influencing the respondent’s opinion or creating biases in the respondents’ answers; otherwise, the respondents completed the questionnaires independently and without any influence from the researcher or research enumerators. After completing the survey, each respondent received a small gift as a token of appreciation. In total, in Permaisuri Lake Garden during phase 1, 210 respondents took part in the survey process and phase 2, there were 207. While in Pudu Ulu Park, in phase 1, 207 respondents joined, and 205 respondents answered the survey in phase 2. In total, in phase 1, there were 417 respondents, and in phase 2, there were 412 respondents in total for both parks.

3.3.5 Statistical Analysis

All statistical analysis was performed using IBM SPSS Statistics Version 24 (2016). The specific analysis used to analyse was Mixed Model Analysis based on the balanced incomplete block design. The data distribution was tested to ensure they met the assumption of normality and heterogeneity of variance for parametric statistical tests using Levene's Test. This was followed by determining the correlation between design factors, the number of layers and diversity of vegetation, and how they influence public park users' response and perception using the Factorial analysis using Principle Component Analysis (PCA) and expressed in eigenvalue.

CHAPTER 4

RESPONDENTS' KNOWLEDGE ON NATURALISTIC-STYLE PLANTING AND VISITING PATTERNS BASED ON DEMOGRAPHIC FACTORS

4. Introduction

As mentioned previously in Chapter 3, experimental plantings were undertaken in two parks in Kuala Lumpur with the same layout at both sites. Data collection was conducted in 2 phases, which are Phase 1 (1 month after planting), and Phase 2 (12 months after planting). Results will be presented and further discussed in depth in Chapter 4, 5 and 6. Chapter 4 will mainly discuss respondents' pattern in visiting the research site and their familiarity with naturalistic style planting in response to demographic factors, namely; age, gender, ethnicity and educational backgrounds.

This chapter is divided into two main parts; visitors' characteristics in relation to visiting the park and visitor characteristics in relation to the planting. These factors have different effects on the respondent's behaviour in relation to visiting patterns and their knowledge on naturalistic style vegetation. The chapter will report in detail on all significant factors and what and how it affected the respondents.

Graphs are only provided where results showed statistical significance at p-value ≤ 0.05. However, the commentary is made when necessary, for example, when there was a marked difference between Phase 1 & Phase 2 results.

Table 4. 1: Summary of the effect of demographic factors on respondents' visitation patterns and their familiarity of nature-like planting

<table>
<tr><th></th><th colspan="5">PARK VISIT PATTERNS</th><th colspan="3">FAMILIARITY AND PREFERENCE OF NATURE-LIKE PLANTING</th></tr>
<tr><th></th><th>Is this your first visit to this park?</th><th>How often do you visit this park?</th><th>Which other open spaces do you visit regularly?</th><th>Who are you visiting the park with?</th><th>What was your familiarity with nature-like planting before seeing this planting?</th><th>Where did you see this type of planting?</th><th>Do you think nature-like planting is appropriate in the park?</th><th>Do you like this nature-like vegetation more than the traditional horticultural type of planting in the park?</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Age (Years old)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>18-25</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>26-40</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>41-55</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>56-65</td><td></td><td></td><td></td><td></td><td></td><td bgcolor="orange"></td><td></td><td></td></tr>
<tr><td>Over 65</td><td bgcolor="orange"></td><td></td><td bgcolor="orange"></td><td></td><td bgcolor="orange"></td><td></td><td></td><td></td></tr>
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<tr><td>Gender</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Male</td><td></td><td bgcolor="orange"></td><td bgcolor="orange"></td><td></td><td></td><td bgcolor="orange"></td><td></td><td></td></tr>
<tr><td>Female</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td bgcolor="orange"></td></tr>
<tr><td>Prefer not to say</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
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<tr><td>Ethnicity</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Malay</td><td></td><td></td><td></td><td></td><td></td><td bgcolor="orange"></td><td></td><td></td></tr>
<tr><td>Chinese</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Indian</td><td></td><td bgcolor="orange"></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Sabah & Sarawak (Borneo origins)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Educational background</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Primary School up to age 12</td><td></td><td bgcolor="orange"></td><td bgcolor="orange"></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Secondary School up to age 17</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Sixth Form / Diploma / Matriculation / A-Level / Vocational Training</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Bachelors degree</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td bgcolor="orange"></td></tr>
<tr><td>Higher Degree (Masters or Doctorate)</td><td></td><td></td><td></td><td></td><td bgcolor="orange"></td><td bgcolor="orange"></td><td bgcolor="orange"></td><td></td></tr>
</table>

4.1. Respondents characteristics in relation to visiting patterns

The demographic factors were as follows; gender (male, female, and prefer not to say). As mentioned in Chapter 3 (3.4) in Malaysia, the three categories of gender are the standard practice of categorisations in official forms.

Age was divided into five categories; 18-25, 26-40, 41-55, 56-65 and over 65 years old. Park users below the age of 18 were not included in the survey to ensure a certain level of maturity in evaluating and expressing opinions and choices. Ethnicity was categorised into five categories; Malay, Chinese, Indian, Sabahan and Sarawakian origins (Borneo origin). Educational background was categorised into; primary school and secondary school leavers, diploma holders and equivalent, bachelor degree holders and higher degree (postgraduate) holders.

Table 4.2: Summary of the effect of demographic factors on respondents' characteristics. Significant results (P<0.01) indicates the difference between categories within demographic factors (e.g. Gender – Male vs female) (Phase 1: n=417; Phase 2: Phase 1: n=417; Phase 2: n=412).

QUESTIONS	**Effect of Age**		**Effect of Gender**		**Effect of Ethnicity**		**Effect of Educational Back Ground**	
	PHASE 1	**PHASE 2**	**PHASE 1**	**PHASE 2**	**PHASE 1**	**PHASE 2**	**PHASE 1**	**PHASE 2**
	P-Value							
Is this your first visit?	ns	**0.009**	ns	ns	ns	0.013	0.014	0.028
How often do you visit this park**?**	0.020	**0.001**	ns	0.033	0.040	**ns**	**0.010**	**ns**
Other open spaces you visit regularly. : Other urban parks	ns	0.015	ns	ns	ns	ns	0.030	**0.001**
Other open spaces you visit regularly?: National Parks	ns	ns	0.013	ns	ns	ns	ns	ns
Other open spaces you visit regularly?: Village	0.048	0.012	ns	ns	ns	ns	ns	**0.001**
Reason for coming to the park (Ward Method[1])	0.021	ns	ns	ns	0.024	ns	**0.001**	ns
With whom did you visit the park? : Myself	ns	ns	ns	ns	0.041	**0.001**	ns	ns
With whom did you visit the park? : Family	ns	ns	ns	ns	ns	ns	ns	0.05
With whom did you visit the park?: Friends	**0.001**	**0.002**	ns	0.029	ns	ns	0.03	ns

With whom did you visit the park?: Work Colleague	**0.003**	ns	ns	ns	ns	ns	ns	ns

[1] Ward method: hierarchical clustering method, used to create groups, where the groups' variance is minimized. (Eszergár-Kiss and Caesar, 2017)

Bold =P value <0.01; Non-bold =P Value <0.05; ns = Not Significant (P Value > 0.05)

4.1.1. Age distribution characteristics of respondents

Table 4.2 showed the overall percentage distribution of respondents across the age group for both Phase 1 and Phase 2. Most of the respondents, in both phase 1 and 2, were under forty years of age.

Table 4.3: Overall demographic distribution of respondents based on age for Phase 1 (1 month after planting) & Phase 2 (12 months after planting) (Phase 1: n=417; Phase 2: n=412).

Age (Years old)	PHASE 1 (1 Month After Planting)	PHASE 2 (12 Month After Planting)
18-25	32.9%	45.2%
26-40	28.3%	31.8%
41-55	17.7%	13.8%
56-65	16.8%	6.5%
Over 65	4.3%	2.7%

4.1.1.1. How does this factor affect behaviour?

In reference to Table 4.1, the effect of age towards the respondent's characteristics in relation to visiting the park shows significance for five out of ten overall questions. In comparison with the other three demographic factors (gender, ethnicity and educational background), age can be considered to have a medium effect on visitors' characteristics in relation to visiting the park containing the experimental plots.

In Phase 1, there was no significant difference between the first time visit patterns. There is, however, a highly significant difference between the age group during Phase 2. The first timer in the 18-25 years-old category, and the least first timer are from the over 65 years-old category.

There is an apparent change between the age groups' first visit to the park. In Phase 1, there was no significant difference between the age groups (graph not shown for Phase 1). However, in the second phase, there was a highly significant difference between the Age factor with a greater number in 18-25 years-old group as first time visitor (*p=0.009*). Respondents in the age group >65 years old are the least numerous of the parks' first-timer.

This is most likely because the total number of respondents from this age category is the lowest, and this did not change dramatically between phase 1 and 2.

Figure 4.1 shows that during phase 2, the 'yes' on the bar chart's right side means that they are the first-timers and mainly from 18-40 years old. So they could be looking at the park and the research plot for the first time, unlike the 56 to over 65 years old who are the more constant visitors to the park. They could see the difference between how green and plain it was usually and how it changed after experimental plots were added. Their input on the plots is somewhat different from the first-timers.

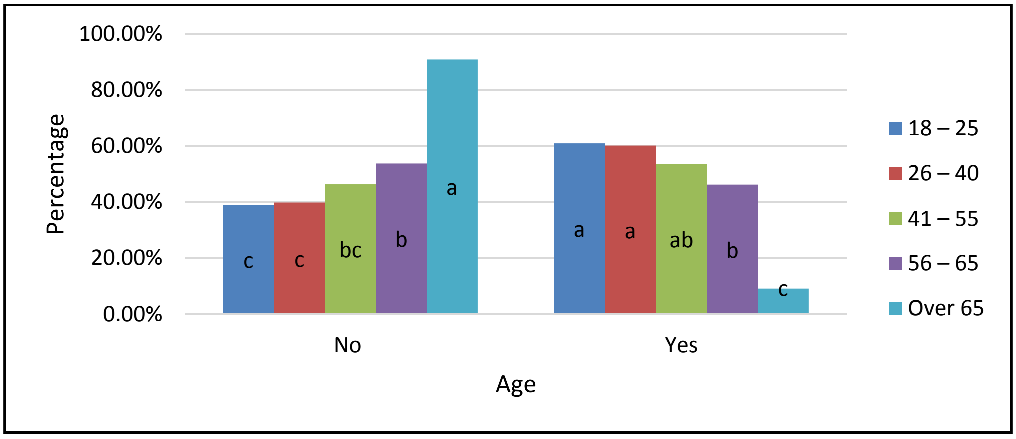


*Figure4.1: Effect of **age** on **first-time visitors** to the research sites in **Phase 2** (12 months after planting) (p=0.009**). Different letters denote significant differences between bars at the 0.05 level. (Phase 2: n=412).*

In figure 4.2, in Phase 2, there are more respondents > 65 years-old that visited other urban parks regularly compared to other age groups. The 26-40 years-old and 41-55 years old or a group that can be classified as still actively working in their respective professions are the least number of age categories in visiting other urban parks. This working group arguably might have less allocated time to go and visit other urban parks. The graph for Phase 1 for age on visits to other urban parks is not shown due to its insignificant difference between age.

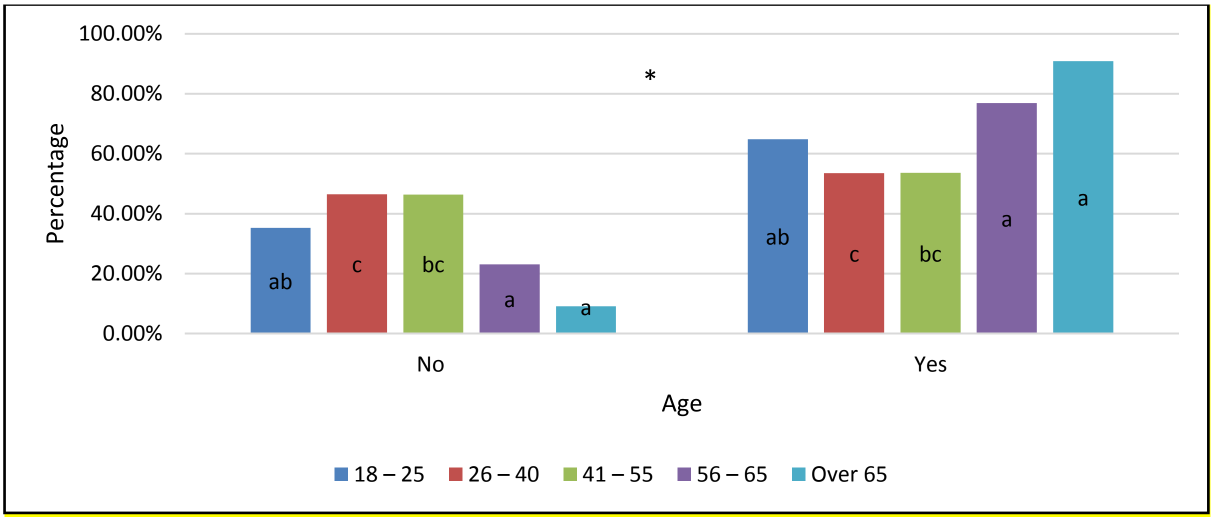
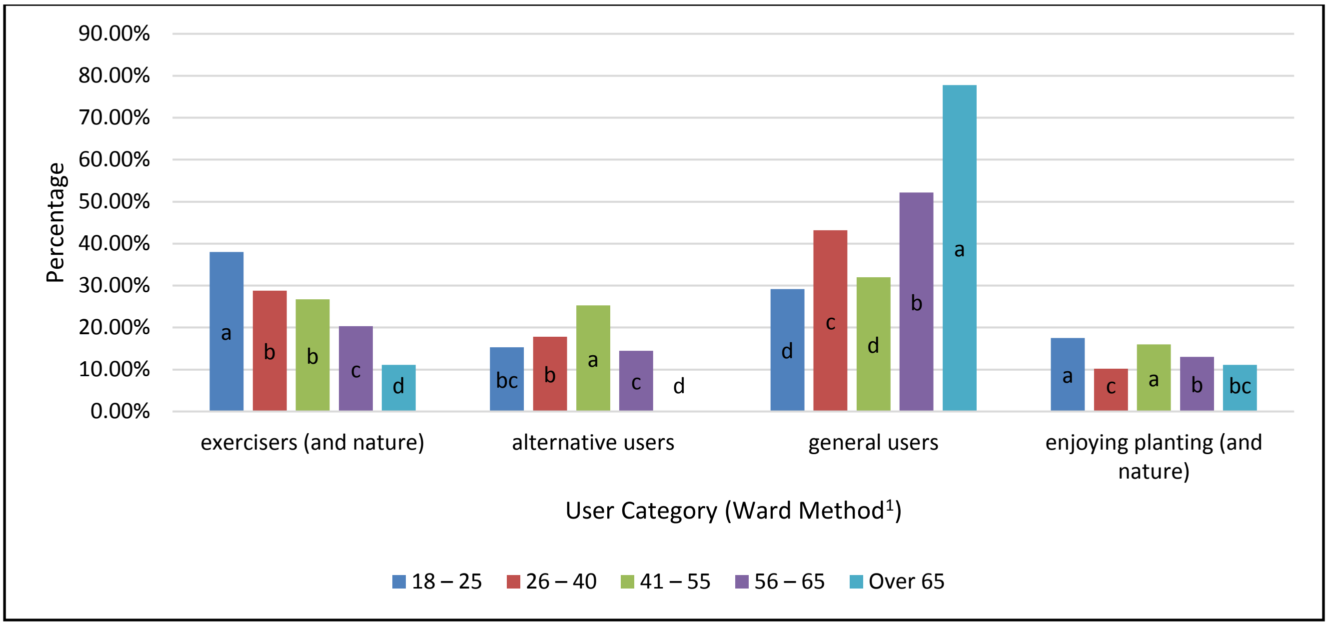


Figure 4.2: Effect of ***age*** *on the other* ***open spaces they regularly visit****: other* ***urban parks*** *in* ***Phase 2*** *(12 months after planting) (p=0.015*) Different letters denote significant differences between bars at 0.05 level. (Phase 2: n=412).*

Using the ward Method[1] categorisation (Figure 4.3), the respondents were divided into four types of users. Firstly, the users are exercisers, enjoy planting and nature type of users, general users, and alternative users (doing both exercises and enjoying the planting/nature). In Phase 1, the exercisers are dominated by 18-25-year-old category. Alternative users are mainly 41-55 year old, and general park users are over 65-year-old. They mainly use parks for various functions and reasons. E.g. for exercise, recreation, enjoying the planting and so on. Age category 18-25 and 41-55 are similar in using the park to enjoy planting and nature only. However, there was no significant difference between age categories affecting the types of park users according to the Ward Method[1] in Phase 2, and no graph is presented for this.



[1]Ward method: hierarchical clustering method, used to create groups, where the variance within the groups is minimized. (Eszergár-Kiss and Caesar, 2017)

*Figure 4.3: Effect of age on the reason for coming to the research sites according to the park users' category ([1]Ward Method) in Phase 1 (1 month after planting). (p =0.021**). Different letters denote significant differences between bars at the 0.05 level. (Phase 1: n=417).*

4.1.2. The gender breakdown of respondents

Table 4.3 shows that there were more female respondents than male respondents for both phases visiting the park. There is an increase in percentage for Phase 2 for female respondents and a decrease for male respondents.

Table 4.4: Overall respondent's demographic distribution based on gender for Phase 1 (1 month after planting) & Phase 2 (12 months after planting) (Phase 1: n=417; Phase 2: n=412).

Gender	PHASE 1 (1 Month After Planting)	PHASE 2 (12 Month After Planting)
Male	47.4%	39.2%
Female	52.6%	60.8%
Prefer not to say	0%	0%

Gender can be considered to have a low effect on visitors' characteristics in relation to visiting the park. There are only three out of ten circumstances (refer Table 4.1) where gender had a statistical effect between the 2 phases. Namely on the questions like; 'How often do they visit this park?', 'Other open spaces that you visit regularly? National Park' and 'Who do you visit the park with? : Friends'.

According to figure 4.4, in Phase 2, a larger number of infrequent visitors are more likely to be women. They visited the parks less frequently than their male counterpart did. There is a significant difference between the gender in the ‘Once a month or less’ category. It can be concluded that the overall percentage of male visitors to the parks are less than the female visitors, but the ones that do come to the park, do so more frequently.

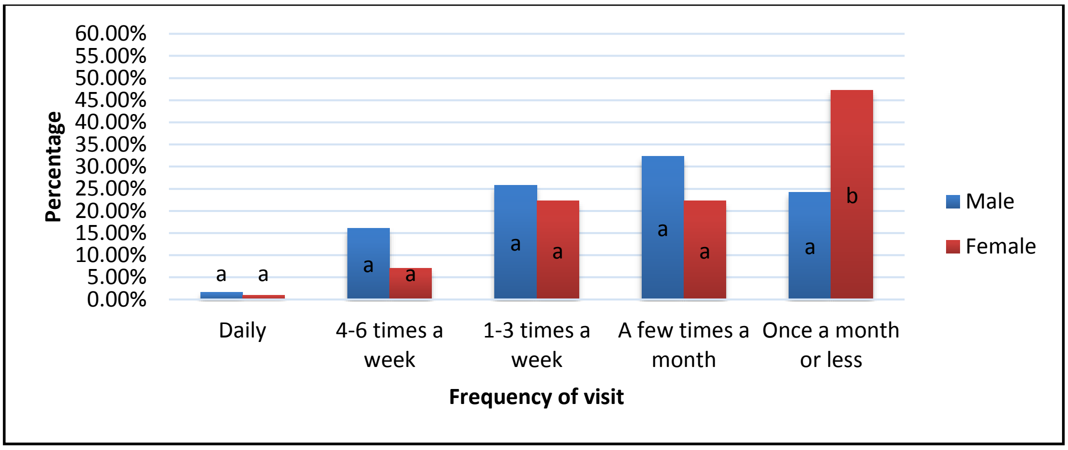


*Figure 4.4: Effect of **gender** on **how often the respondents visited** the research sites in **Phase 2** (12 months after planting) (p=0.033*). Different letters denote significant differences between bars at the 0.05 level. (Phase 2: n=412)*

What can be seen from figure 4.5 is that 32.3% of the male respondents visit other open spaces, in this option; National Parks compared to only 21.6% of the female respondents. This is however only significant for Phase 1. There was no effect of gender in visiting National Park in Phase 2; therefore it shows that the male respondents might have more empathy with nature than the female, or perhaps have more opportunity to do this.

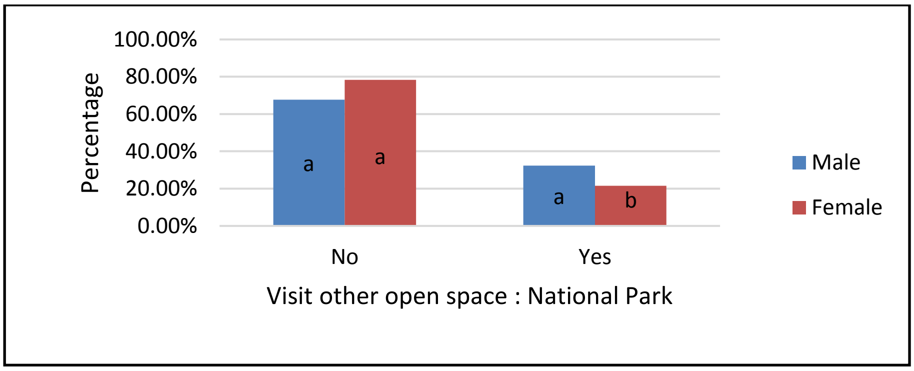


*Figure 4.5: **Other open space (National parks)** that the respondents visit regularly based on their **gender** in **Phase 1** (1 month after planting) (p=0.013*) Different letters denote significant differences between bars at 0.05 level. (Phase 1: n=417)*

4.1.3. Ethnicity of respondents

Table 4.4 showed that Malays dominates the respondents, followed by Chinese, Indian and Sabahan & Sarawakian. This is in-line with typical ethnic make-up of Malaysian populations. The ethnicity compositions were Malays (40%), Chinese (36.7%), Indians (8.5%), others (1.09%). Ethnicity is also a low effect on visitors' characteristics in relation to visiting the park with only 4 out of 10 significant effects on respondents' behaviour towards the park visiting pattern.

Table 4.5: Overall respondent's demographic distribution based on ethnicity for Phase 1 (1 month after planting) & Phase 2 (12 months after planting) (Phase 1: n=417; Phase 2: n=412).

Ethnicity	**PHASE 1 (1 Month After Planting)**	**PHASE 2 (12 Month After Planting)**
Malay	56.2%	60.2%
Chinese	30.9%	27.3%
Indian	11.5%	11.0%
Sabah & Sarawak (Borneo origins)	1.4%	1.5%

In Phase 1, the frequency of visits to the parks was significantly affected by ethnicity (figure 4.6); the average respondents' frequency of visit is around 1-3 time a week. However, 80% of Sabahan & Sarawakian and 48.7% of Chinese would come to the park 1-3 times per week. 35% of Indians would come to the parks 4-6 time per week. Indian also showed the highest daily visits to the park (10%), more frequent and highly regular than any other ethnicity. Malays (28.9%) would only visit the parks a few times a month, making it the lowest percentage amongst ethnicity and less regular.

Indians visit the park more regularly than other ethnicities scoring high on the higher frequency of visits. Malays oppositely differ from the Indian. Malays visited the parks in less number of times per month. Chinese are steady visitors whereby their visitation frequency was represented within all categories.

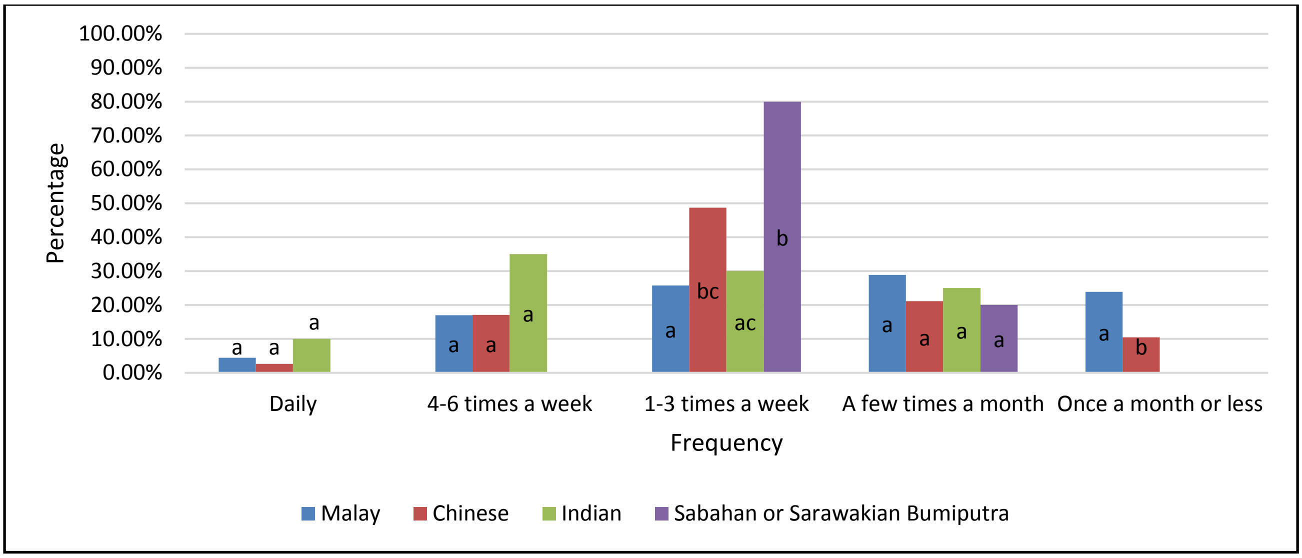
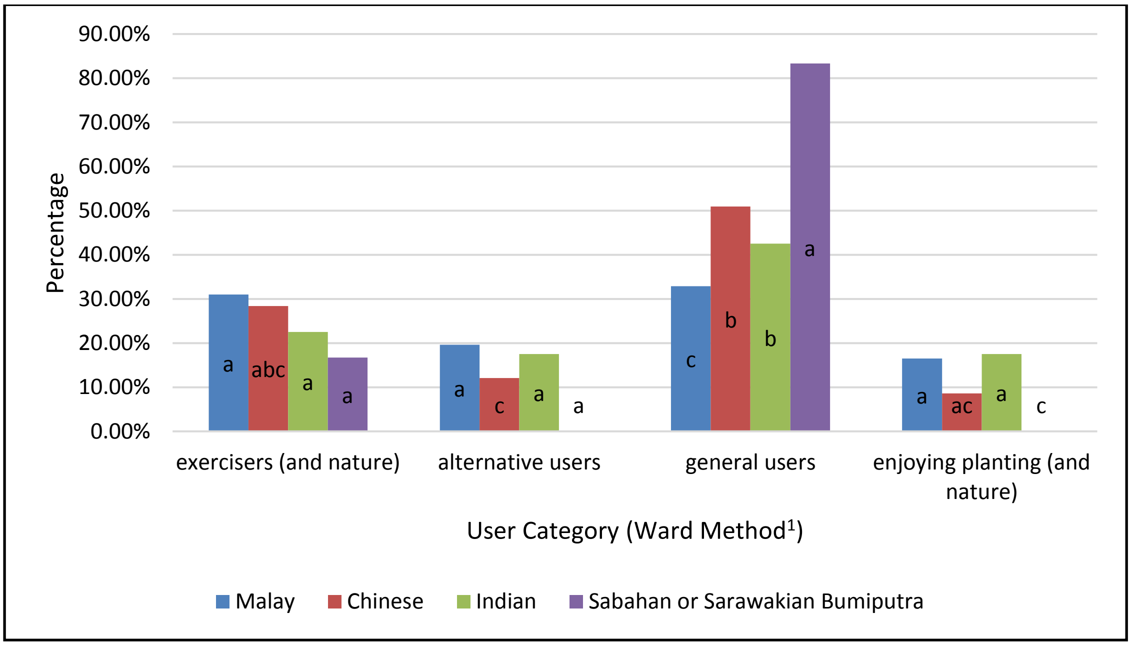


*Figure 4.6: Effect of **ethnicity** on the **frequency of visits** to the research site. **Phase 1** (1 month after planting) (p=0.04*) (n=417). Different letters denote significant differences between bars at the 0.05 level. (Phase 1: n=417).*

From the graph below (refer Figure 4.7) we can see that ethnicity-wise, Malay are mainly the exercisers and come to the park to enjoy nature (31%). However, they are alternative park users (doing both exercises and enjoying the planting/nature) like the Indians (17.50%). Indians also come to the park to enjoy plantings and nature (17.5%). Chinese are mainly exercisers (28.4%) and general users similarly to Sabahan and Sarawakian ethnics. There is no significant impact of ethnicity on park users based on [1]Ward Method in Phase 2. Respondents were visiting the site for various reasons with no differences between ethnicities.



[1] *Ward method: hierarchical clustering method, used to create groups, where the variance within the groups is minimized. (Eszergár-Kiss and Caesar, 2017).*

*Figure 4.7: Effect of **ethnicit**y on the **reason for coming to the park** according to the park users categories using Ward Method[1] in **Phase 1** (1 month after planting) (p=0.024*). Different letters denote significant differences between bars at the 0.05 level. (Phase 1: n=417).*

4.1.4. Effect of Educational background on reasons for visiting the research site

In Table 4.1, the educational background significantly affects the respondent's behaviour pattern in seven out of ten overall questions. It is considered as having an impactful effect on the behaviour of respondents' concerning park visits. Bachelor degree graduates followed by Diploma holders and equivalent were the most common educational backgrounds in respondents.

There are increases from Phase 1 to Phase 2 for all categories of educational background (refer table 4.5) except for respondents who had left education at secondary school (termed "secondary school leavers", and higher degree holders. The percentage of Bachelor degree holders are higher than the others. This is most likely due to the location of the parks. Both parks are situated in Cheras, right in Kuala Lumpur, where many residents are either professional or semi-professional. Thus, these categories have minimal qualifications of at least a diploma and onwards.

Table 4.6: Overall respondent's demographic distribution in terms of respondents' education background for Phase 1 (1 month after planting) & Phase 2 (12 months after planting) (Phase 1: n=417; Phase 2: n=412).

Educational background	**PHASE 1 (1 Month After Planting)**	**PHASE 2 (12 Month After Planting)**
Primary School up to age 12	6.5%	7.3%
Secondary School up to age 17	18.8%	15.2%
Sixth Form / Diploma / Matriculation / A-Level / Vocational Training	29.0%	30.3%
Bachelors degree	32.4%	40.5%
Higher Degree (Masters or Doctorate)	13.3%	6.7%

According to figure 4.8, 50% of secondary school leavers came to the park where the research site was located daily. 25% every 1-3 times a week and the rest once a month or less. So there are two extreme ends for this category, they come either regularly or very sporadically. The peak frequency of visits for all education background is 1-3 times a week with post-doctorate holders topping the chart (29.4%). Degree holders visited less number of times per month on average. The most frequent for Bachelor's degree holder is 1-3 times a week with 38.7%. Secondary school leavers are generally scattered evenly at every category of frequency. The less affluent or, the lower education categories (primary and secondary school leavers) may have more time on their hands to visit the parks more often than the more affluent / further educated ones. They may also visit more because they cannot afford other alternative recreational activities.

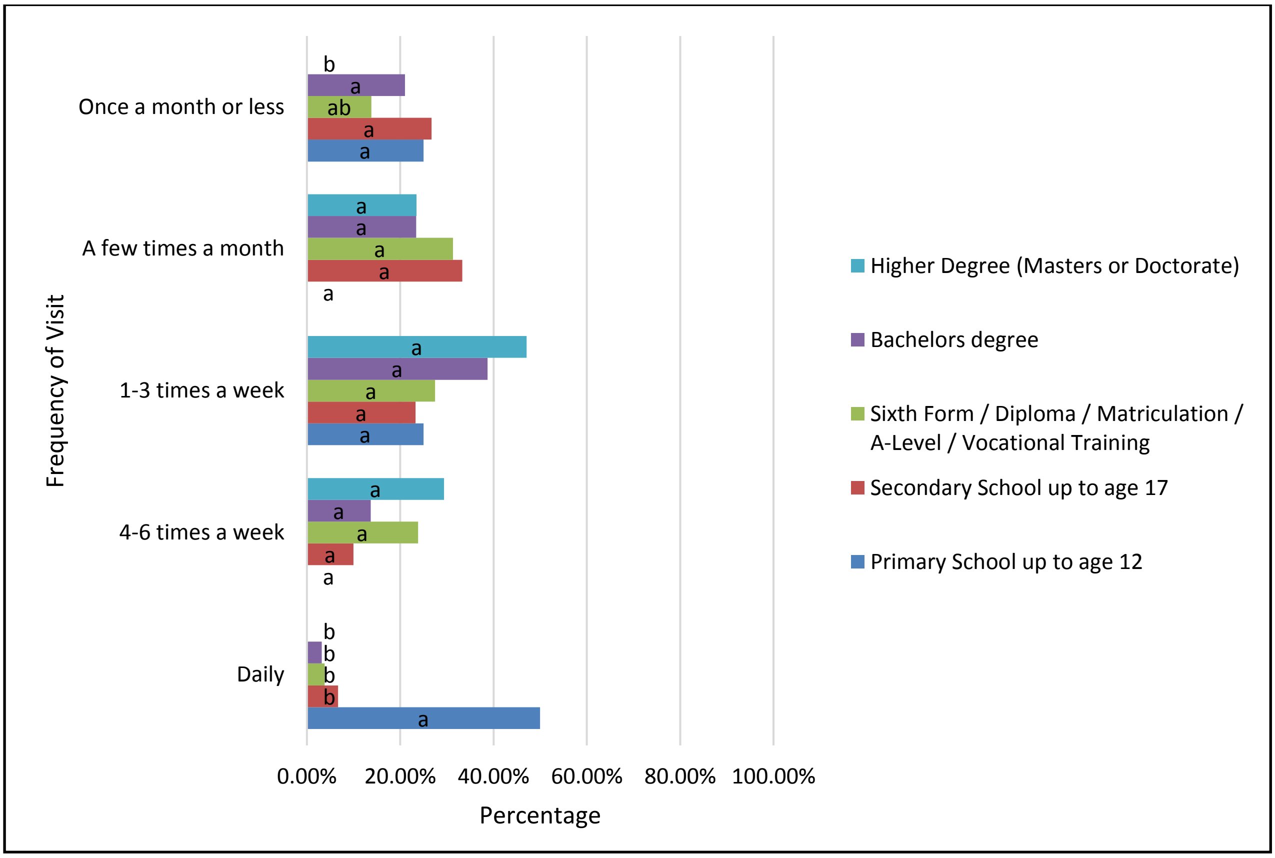


*Figure 4.8: Effect of **educational backgrounds** on the **frequency of visits** to research sites (research sites) in **Phase 1** (1 month after planting)(p=0.01**) Different letters denote significant differences between bars at 0.05 level. (Phase 1: n=417).*

Figure 4.9 shows that in the 2nd phase, education background impacts other open spaces the respondents visited, and specifically on visiting villages. Primary (69.2%) and secondary school leavers (62.3%) spent significantly more of their time in the village more than other groups. Higher degree holders spent the least time in the village, suggesting that the latter might be least familiar with rural landscapes.

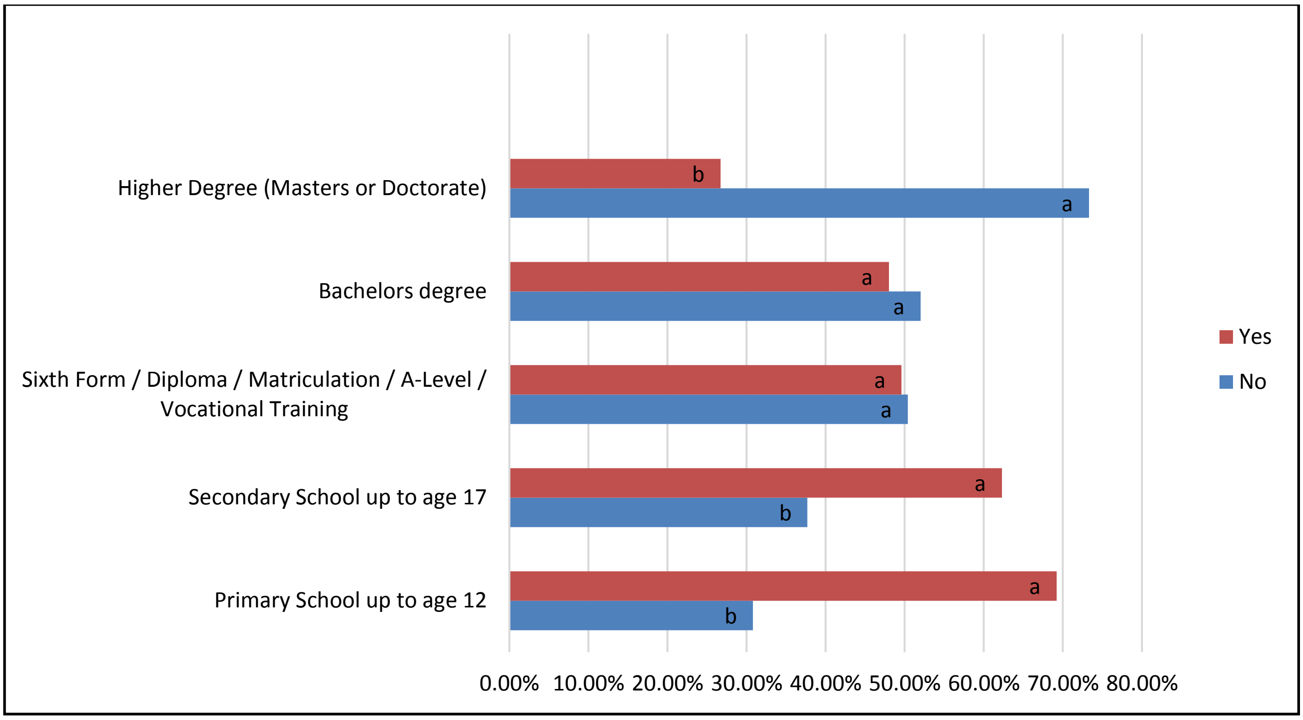


*Figure 4.9: Effect of **educational background** on **other open space**s that respondents visit regularly**; village** in **Phase 2** (12 months after planting) (p=0.001**) Different letters denote significant differences between bars at 0.05 level. (Phase 2: n=412).*

In Phase 1 (Figure 4.10), general park users are mainly postgraduates (59.3%) followed by undergraduates (43.9%). Diploma or equivalent holders were mostly into exercising while appreciating nature (44.9%). The secondary school leavers were mainly in the park to enjoy the plantings and nature. However, their percentage across all the other type of users are relatively evenly distributed and can be said that they are using the parks for all of its different uses. It can be observed that this category is the highest for using the park to enjoy the plantings and nature. This suggests that they might be more exposed to city nature than any other educational backgrounds. Primary school leavers are majorly alternative Park users with 50% of the respondents use it to socialize and attend other organized activities mainly. Also, what is interesting, none of the Primary school leavers was using the park to connect or enjoy nature and plantings.

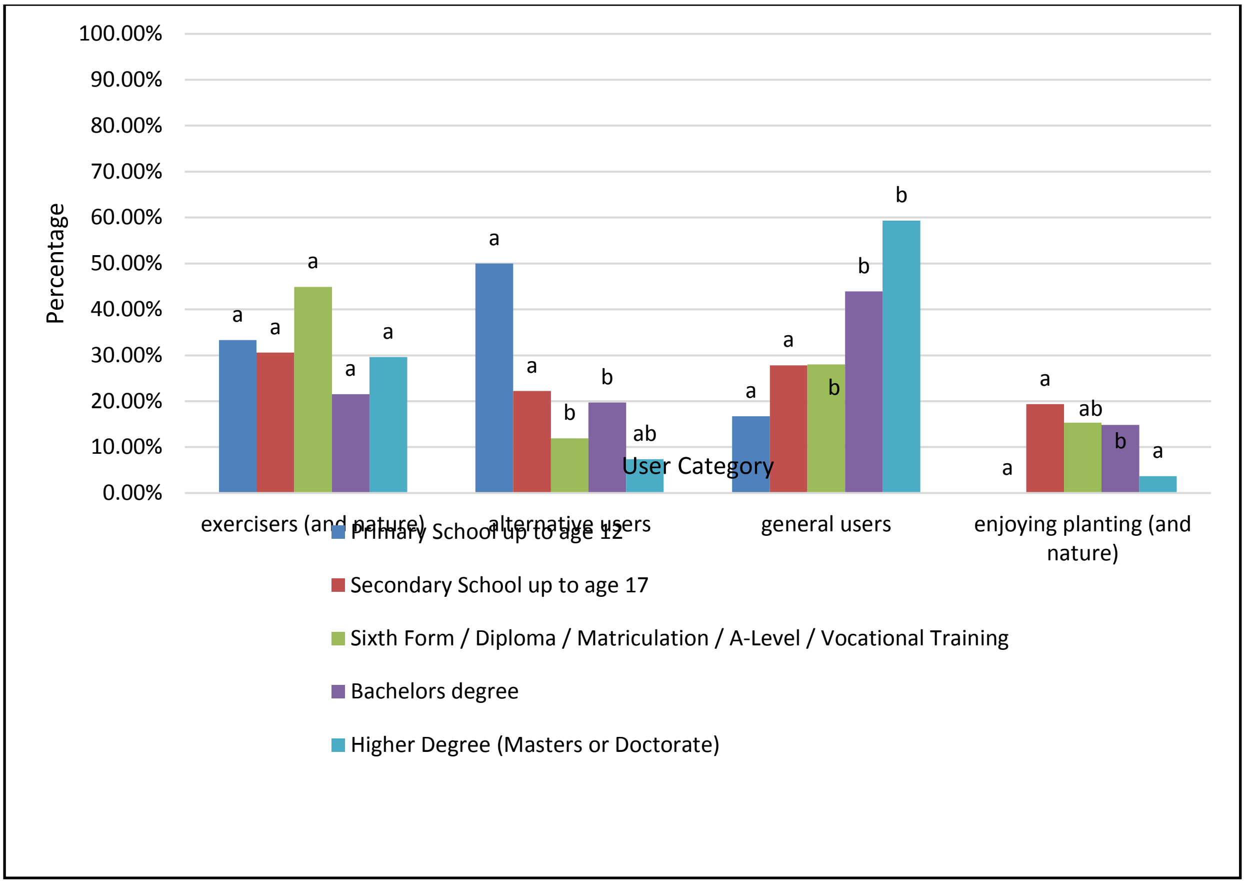


*Figure 4.10: Effect of **educational background** on the **reason for coming to the park** according to the park users categories in **Phase 1** (1 month after planting) (p=0.001**) Different letters denote significant differences between bars at 0.05 level. (Phase 1: n=417).*

4.2. Visitor characteristics in relation to the planting.

In this section, an analysis of the effect of demographics on visitor understanding of the experiment planting is presented. Age has a medium effect, gender and ethnicity, minimal effects. Educational background generally had a more pronounced effect on familiarity with nature-like planting style (Table 4.7). Significant responses between familiarity and demographic factors were only rarely consistent between the two phases, presumably due to the two different respondent populations' characteristics.

Table 4.7: Summary of the effect of demographic factors on respondents' familiarity-understanding of the planting. Significant results (P<0.01) indicates the difference between categories within demographic factors (e.g. Gender – Male vs female) (Phase 1: n=417; Phase 2: n=412).

	Effect of Age		**Effect of Gender**		**Effect of Ethnicity**		**Effect of Educational Background**	
	PHASE 1	**PHASE 2**	**PHASE 1**	**PHASE 2**	**PHASE 1**	**PHASE 2**	**PHASE 1**	**PHASE 2**
Questions	*P-Value*							
What is your familiarity with nature-like planting?	ns	**0.001**	ns	ns	ns	ns	ns	0.017
Where did you see this type of planting? - Pictures in books	ns	ns	ns	ns	0.032	ns	ns	0.04
Where did you see this type of planting? - Pictures in Newspapers	ns	0.016	**0.001**	ns	ns	ns	ns	ns
Where did you see this type of planting? - Pictures in internet	**0.001**	ns	ns	ns	ns	ns	0.05	ns
Where did you see this type of planting? – In other parks	ns	**0.001**	ns	ns	ns	ns	0.021	**0.002**
Do you think nature-like planting appropriate in the park**?**	ns	ns	ns	ns	**0.001**	0.024	**0.008**	ns
Do you like nature-like vegetation more than traditional planting style?	ns	ns	0.047	ns	**0.001**	0.038	ns	**0.003**
Do you know what 'native plant' means?	ns	ns	ns	ns	ns	ns	**0.001**	ns

Bold =P value <0.01; Non-bold =P Value <0.05; ns = Not Significant (P Value > 0.05)

4.2.1. Effect of age on respondent understandings of the plantings.

There is a significant difference in terms of understanding the plantings between the age categories of respondents. From the graph (refer Figure 4.11), we can see that over 90% of over 65 years-old profess to be very familiar with nature-like planting. This is followed by 56-65 years-old. As respondents get younger, the familiarity of nature-like plantings percentage becomes less and less. It is quite apparent that the older the respondents are, the more they recognize or claim to recognise the naturalistic style of planting. Age factor is an essential aspect of the respondents' exposure to this style of planting

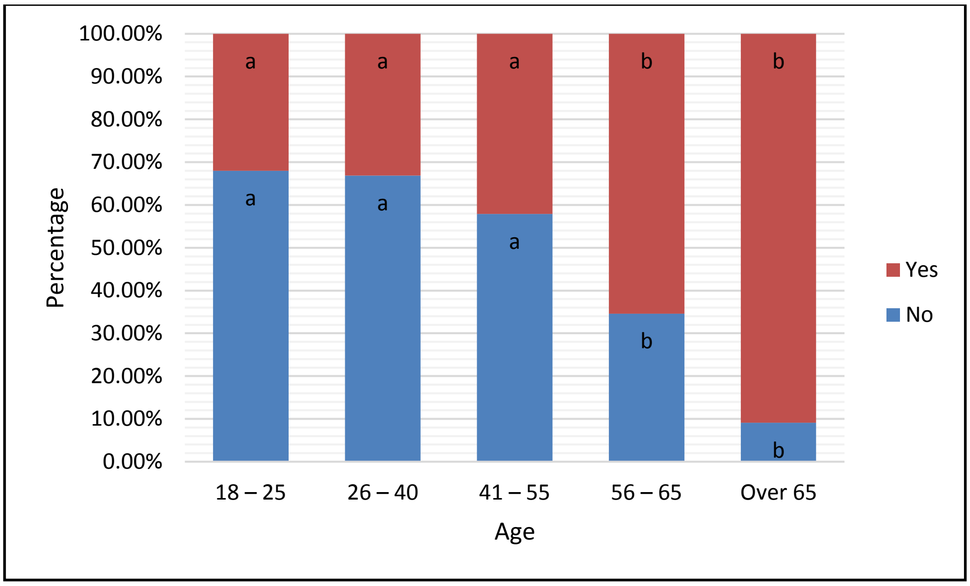


*Figure 4.11: Effect of age on respondents familiarity with nature-like planting in Phase 2 (12 months after planting) (p=0.001**). Different letters denote significant differences between bars at the 0.05 level. (Phase 2: n=412).*

Figure 4.12 shows that in common with the pattern discussed in the previous paragraph, the two oldest age group state they have seen this style of planting style in the print media (magazines and other visual media) much more than the younger generations. Only a small percentage of the three other younger age groups have seen this type of plantings in the print media. Currently, younger generations are reading news and current affairs on their computers, tablets and phones. They are often very selective and depending on their interest. Google, Instagram, Twitter and Facebook are the current go-to place (apps or software) when searching-for or having any possibilities of exposure to nature-like plantings. Thus, making the print media a rarer place to have seen these kinds of image for 55 years old and below.

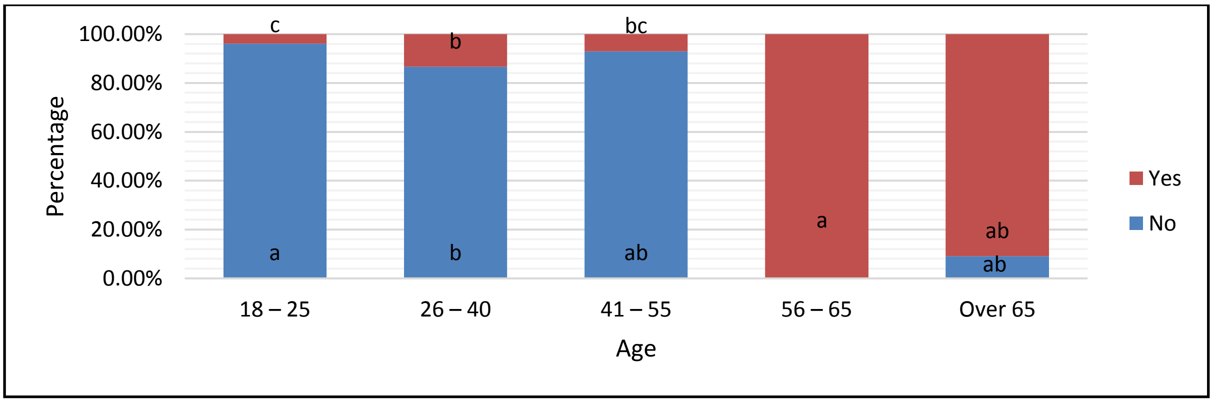


Figure 4.12: Effect of ***age*** *on whether respondents* ***have seen images of this type of planting in the print media*** *in Phase 2 of the study (12 months after planting) (p=0.016) Different letters denote significant differences between bars at 0.05 level. (Phase 2: n=412).*

In relation to familiarity with naturalistic planting images on the internet (refer Figure 4.13), the pattern is the other way round to the figure shown in Figure 4.12. The youngest age group (18-25 years old) is the most familiar with naturalistic images of planting on the internet, because of their high internet use frequency. As mentioned above, the social media platforms online played an influential role in providing naturalistic style plantings to the younger generations.

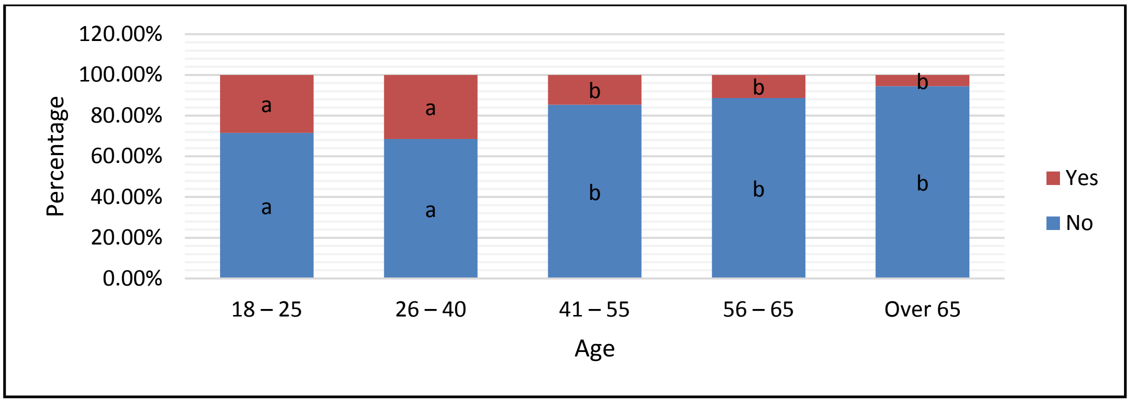


*Figure 4. 13: Effect of **age on whether respondents have seen images of this planting on the internet in Phase 1** (1 month after planting) (p=0.001**) Different letters denote significant differences between bars at 0.05 level. (Phase 1: n=417).*

In figure 4.14, age had a significant effect on whether the respondents had seen this type of planting in other urban parks. Over 81.8% of Over 65 years old age group claim to have seen it in other urban parks, the next highest percentages being for respondents in the 56-65 years old category. The lowest percentage was for 26-40 years old. It has been shown in figure 4.2, the number of Malaysian visiting the urban parks on a more frequent and daily basis are mainly the older generations hence its more likely that they would have had more exposure and more opportunity to observe these types of vegetation.

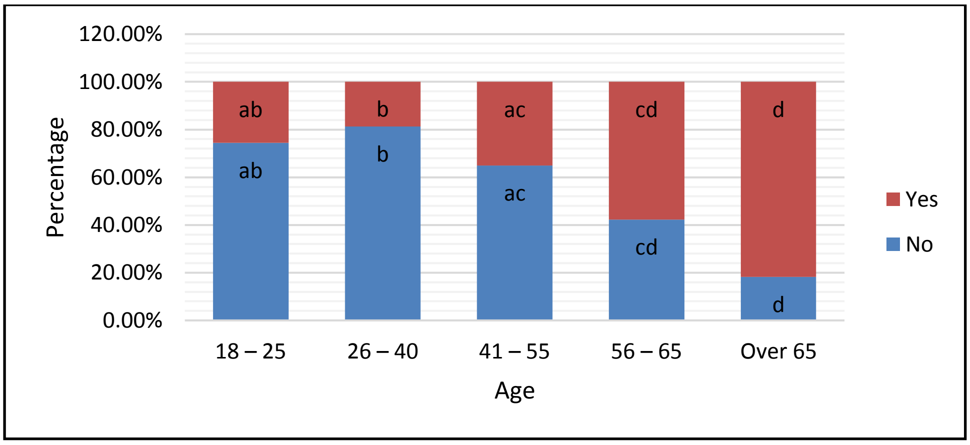


*Figure 4.14: Effect of **age on whether respondents have seen this type of planting in other parks in Phase 2** (12 months after planting) (p=0.001**) Different letters denote significant differences between bars at 0.05 level. (Phase 2: n=412).*

4.2.2. Effect of gender on respondent understandings of the plantings

As shown in Table 4.3, the gender of the respondents at, 47.4% male and 52.6% female was relatively balanced in Phase 1.

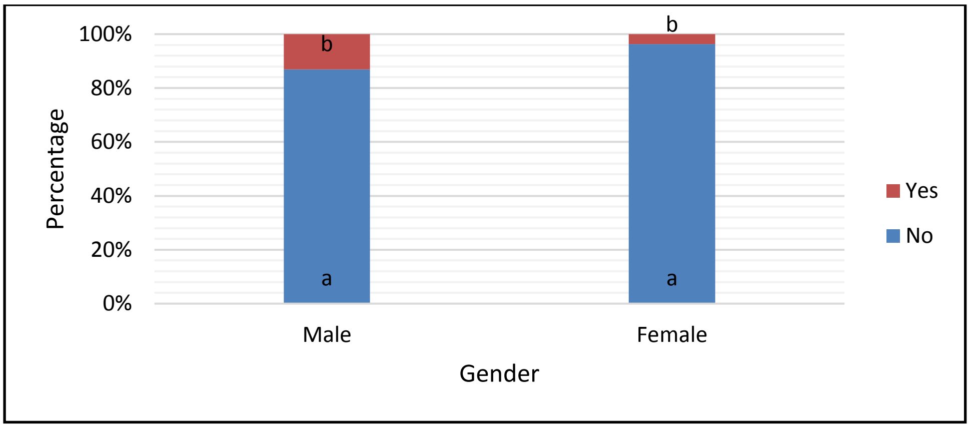


*Figure 4.15: Effect of **gender on whether respondents have seen images of this type of planting in the print media in Phase 1** (1 month after planting) (p=0.001**) Different letters denote significant differences between bars at 0.05 level. (Phase 1: n=417).*

Both genders claimed to like nature-like planting style more than traditional planting style in at least some situations (Figure 4.16). What is interesting is both genders professed to be optimistic about this style of planting. Much more significant percentages are inclined towards Yes; they like this planting style in most situations.

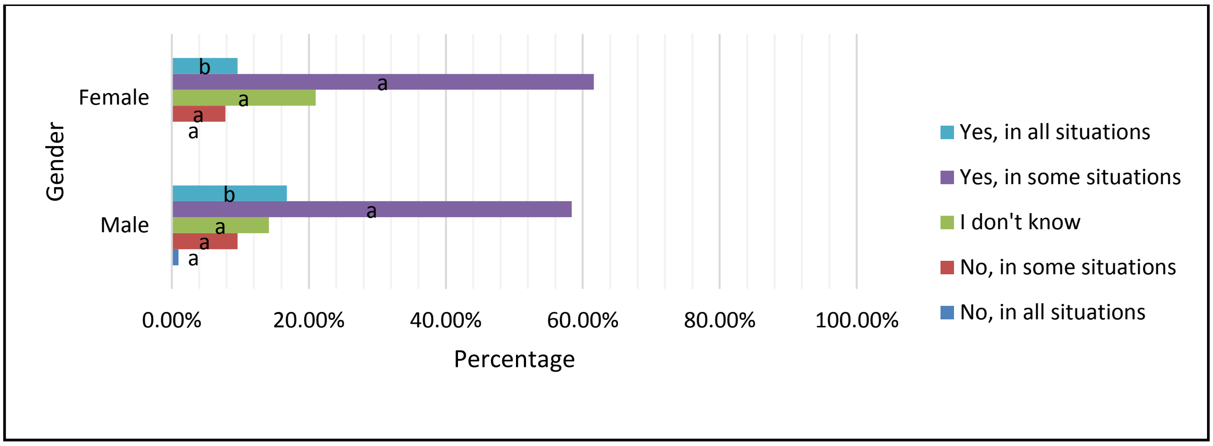


*Figure 4.16: Effect of **gender on whether respondents preferred nature-like planting style more than traditional planting style in Phase 1** (1 month after planting)(p=0.047*). Different letters denote significant differences between bars at the 0.05 level. (Phase 1: n=417).*

4.2.3. Effect of ethnicity on visitor characteristics in relation to the planting.

In Phase 1, only Malay (11.40%) and Chinese (5.4%) respondents had seen this type of planting in books, and the print media (Figure 4.17). The other ethnicities had not seen this style of planting in the print media. The only educational background has shown a significant effect on seeing this planting in books about other demographic factors, which is in Phase 2. These results indicated that there is a lack of knowledge on nature-like type of plantings amongst the respondents through reading books. Respondents' background of knowledge on naturalistic style planting, landscape and ecology will be explored further in the next chapter.

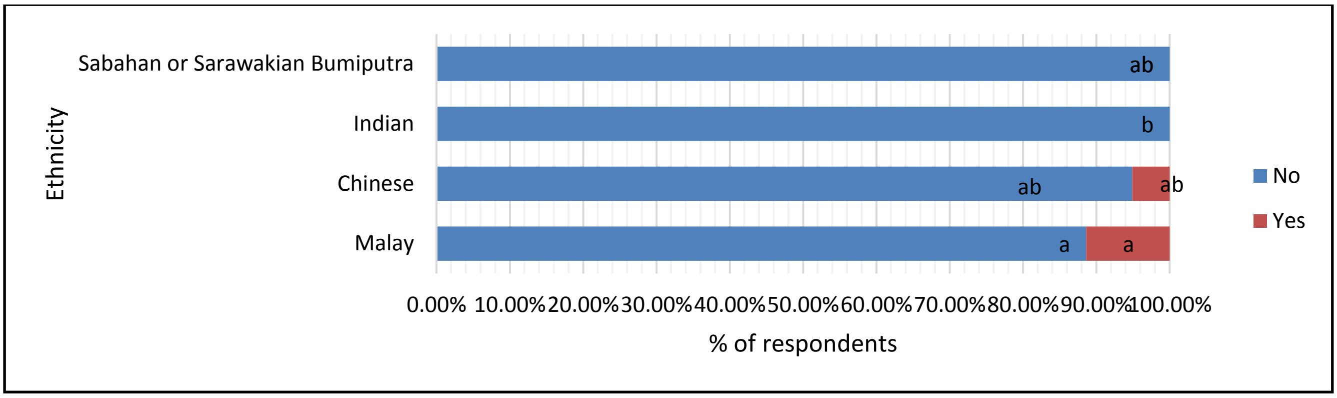


Figure 4.17: Effect of ***ethnicity on whether respondents had seen this images of the planting in print media in Phase 1*** *(1 month after planting) (p=0.001**) Different letters denote significant differences between bars at 0.05 level. (Phase 1: n=417).*

4.2.4. Effect of educational background on respondent understandings of the plantings

There is a significant educational background on respondents' familiarity with nature-like planting in Phase 2 (12 months after planting). Figure 4.18 reveals that there has been a steady rise in percentage familiarity as education progresses to a higher level. The highest percentage is by higher degree holders with 53.3% respondents professing familiarity with the vegetation. The lowest familiarity is within respondents with the lowest educational background (primary school leavers, 15.4%).

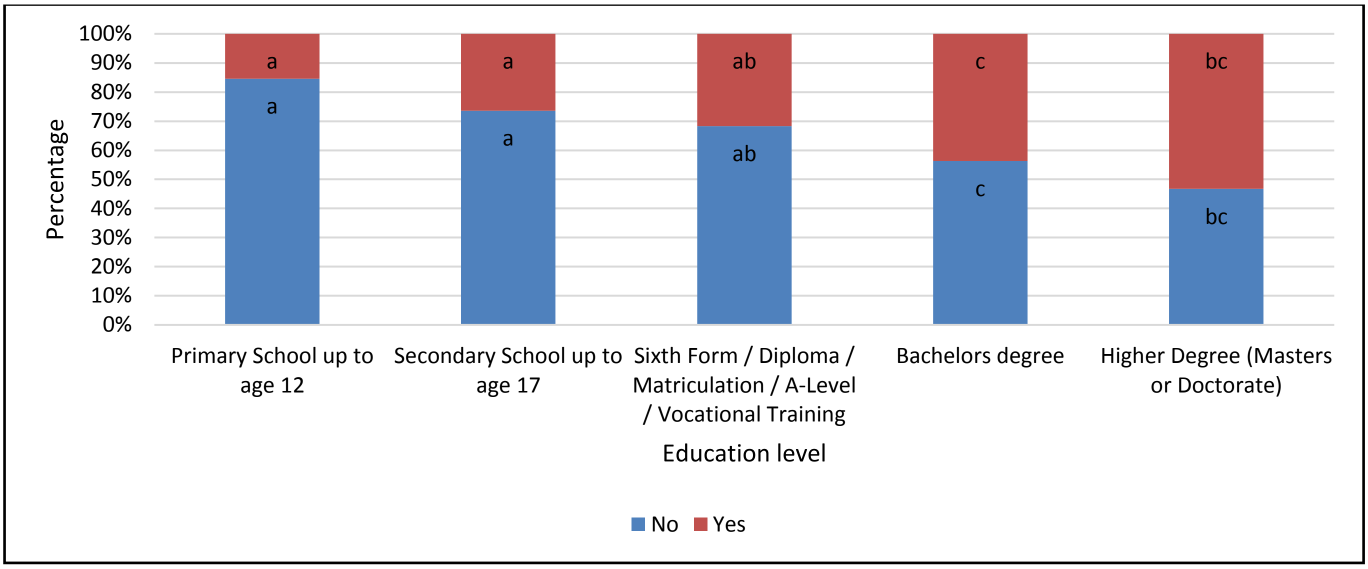


*Figure 4.18: Effect of **educational background on respondents familiarity with nature-like planting in Phase 2** (12 months after planting) (p=0.017*). Different letters denote significant differences between bars at the 0.05 level. (Phase 2: n=412)*

Respondents' educational background had a significant effect on whether or not they have seen images of nature-like planting styles in the print media. Higher degree holders (13.30%) and Primary school leavers (15.4%) had relatively high levels of having seen this type of planting in the print media (figure 4.19). The three other education levels showed a low percentage. It is reasonable to assume that primary school leavers are mainly the older generations respondents who went through education during the pre-independence era. This group are less comfortable with digital media, and they often rely on print media. It is almost expected that the more educated respondents (Bachelor degree and higher degrees holder) with greater access to media of all sorts also score relatively highly.

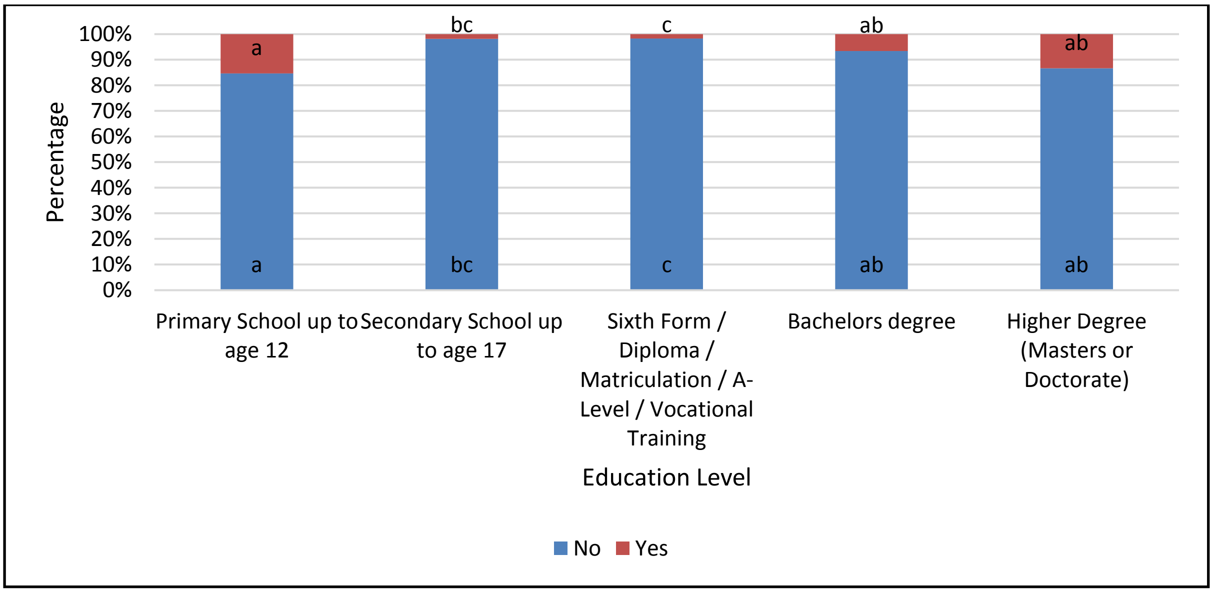


Figure 4.19: Effect of ***educational background on whether respondents have seen images of this planting in the print media in Phase 2*** *(12 months after planting) (p=0.04*). Different letters denote significant differences between bars at the 0.05 level. (Phase 2: n=412).*

Figure 4.20 shows a progressive increase in familiarity with naturalistic planting images on the internet with an educational background. More Diploma, Bachelor and higher degree holders have seen this style of planting compared to school leavers. The higher the education level is, the more exposure the respondents have to seem images that they consider to represent naturalistic planting on the internet.

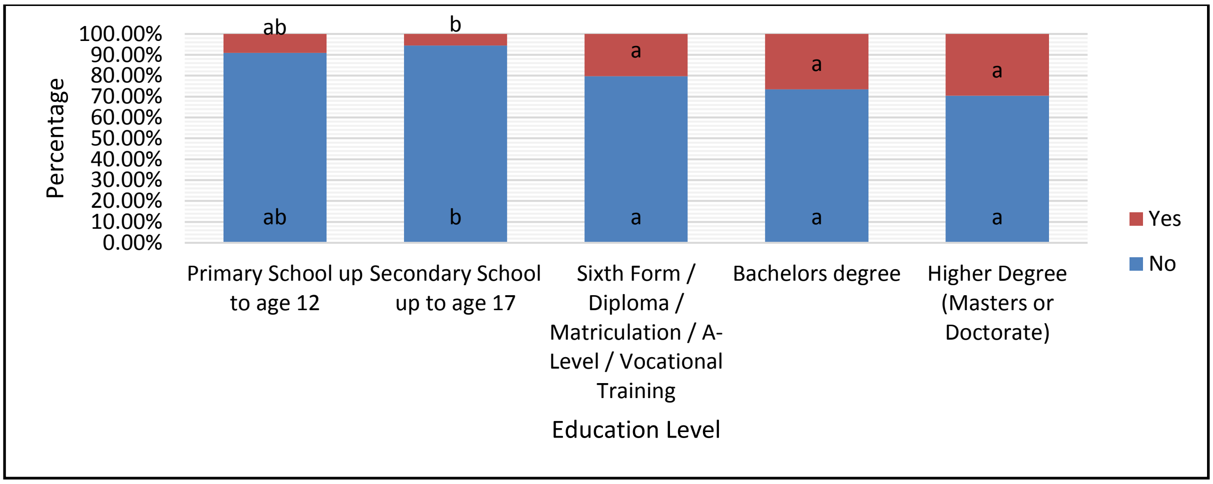


Figure 4.20: Effect of ***educational background on whether respondents have seen images of this type of planting on the internet in Phase 1*** *(1 month after planting) (p=0.001**). Different letters denote significant differences between bars at the 0.05 level. (Phase 1: n=417).*

In figure 4.21, the educational level had a significant effect on whether naturalistic planting was seen as appropriate or inappropriate for use in parks, but only at the poles; i.e. least educated to most educated. Overall, all respondents on every education level think it is entirely appropriate for this type of planting style to be planted in a park except for primary school leavers. 50% of primary school leavers had no opinion on this, although it is followed by 33.3% of the respondents in this category who think it is entirely appropriate. Looking at figure 4.30 as a whole, respondents are perhaps surprisingly optimistic about the appropriateness of this style of planting for research sites.

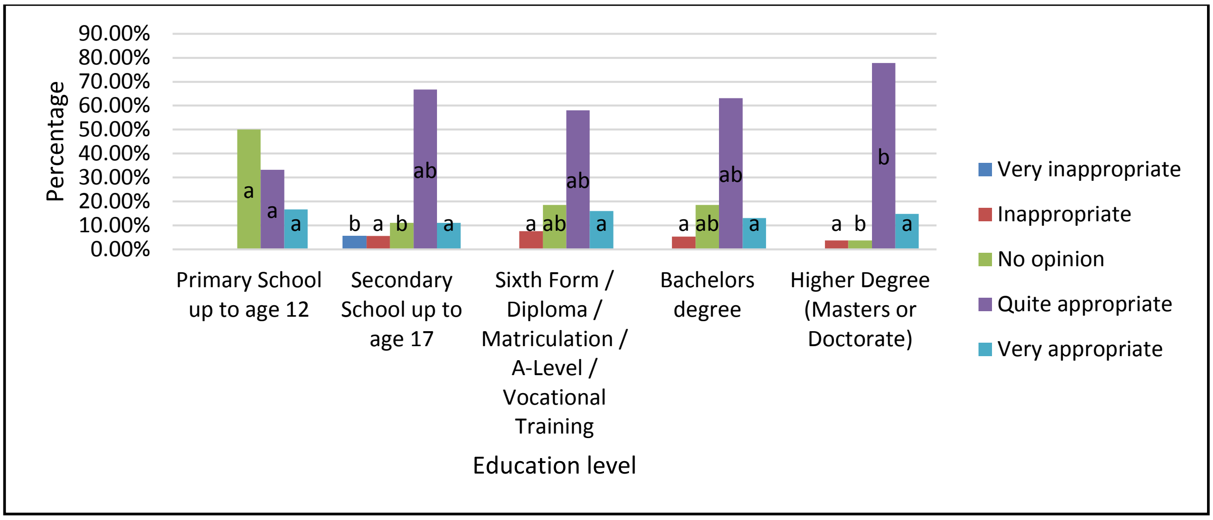


Figure 4.21: Effect of ***educational background on whether respondents think nature-like planting style is appropriate in a park in Phase 1*** *(1 month after planting)(p=0.008**) Different letters denote significant differences between bars at 0.05 level. (Phase 1: n=417).*

It is apparent in the graph (figure 4.22) that a high proportion of secondary school leaver, diploma and Bachelor degree holders preferred natural style planting to traditional style planting. Interestingly, higher degree holders' opinion is generally non-significant between each other within the same education level. This suggests that although they are generally optimistic about naturalistic planting, they recognised that it might not be suitable in all situations. Hostility to the use of naturalistic vegetation is mainly restricted to the least educated respondents.

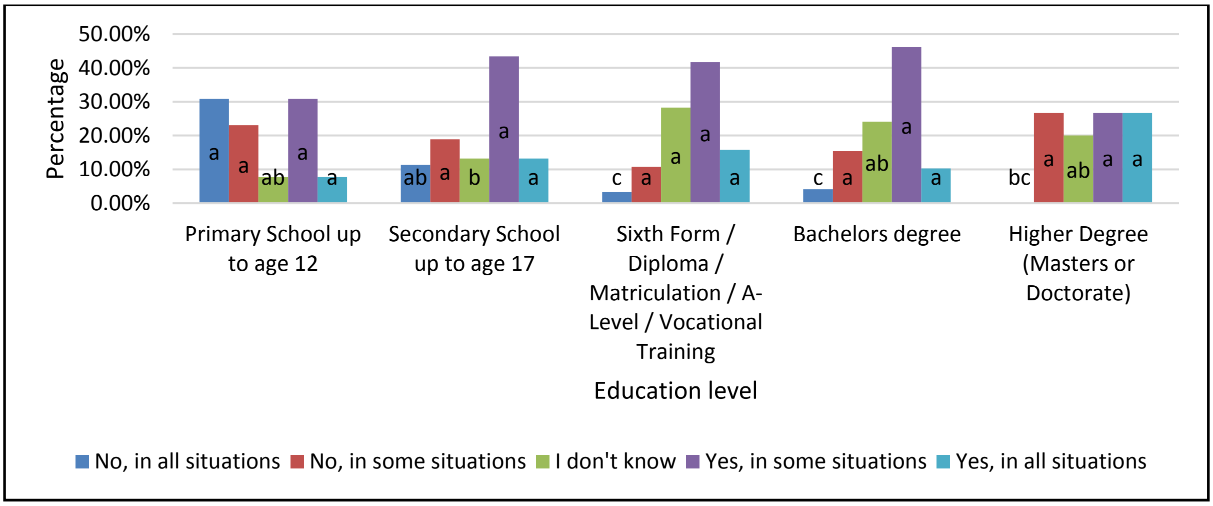


Figure 4.22: Effect of ***educational background on whether respondents like nature-like planting style more than traditional planting style in Phase 2*** *(12 months after planting)(p=0.003**) Different letters denote significant differences between bars at 0.05 level. (Phase 2: n=412).*

Respondents were asked whether they knew what a native plant is. According to figure 4.23, there is a steady increase in the percentage as educational levels progress. It is surprising that even amongst the best-informed respondents (diploma, bachelor and higher degree), more than 70% did not know what native plants are. This jumped to around 90% in school leavers. Overall, only 13% of 53 out of 412 people in phase 2 knew what native plants are.

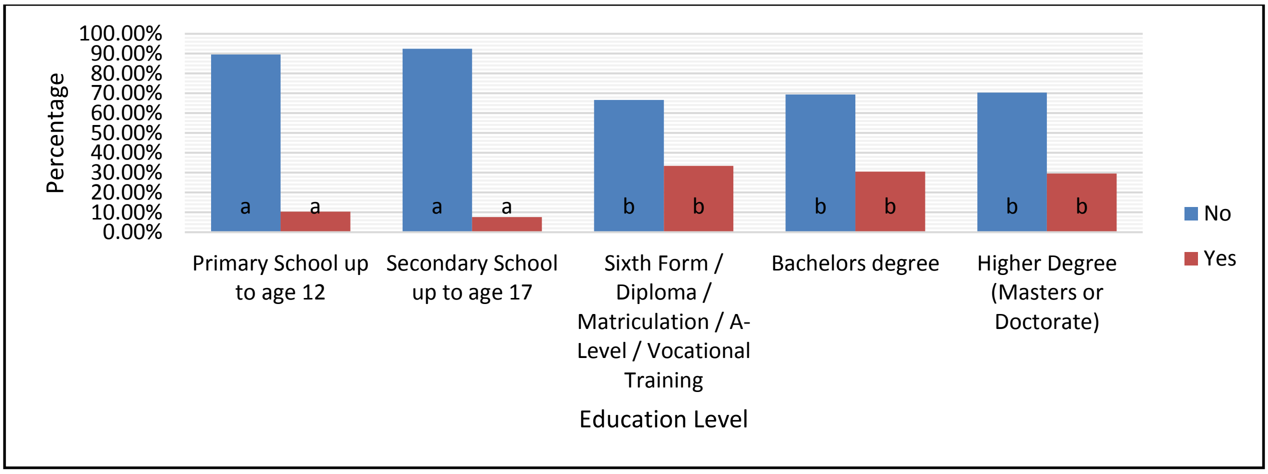


Figure 4.23: Effect of ***educational background on whether respondents know what a native plant is in Phase 1*** *(1 month after planting) (p=0.008**). Different letters denote significant differences between bars at the 0.05 level. (Phase 1: n=417).*

4.3 Conclusions

This study determined whether there are significant impacts between the four demographic factors on respondents' visiting patterns and knowledge and familiarity of naturalistic style-planting. The demographic factors are namely age factor, gender factor, ethnicity factor and educational background factor. It can be concluded that;

1. Effect of the educational background has the most impact on respondents' characteristics, behaviour and knowledge towards the park and naturalistic style planting. The more educated the respondents are, the more they are familiar and receptive to naturalistic style planting. The educated ones (diploma and onwards) are exposed more to a different planting style outside the usual style planted all around Kuala Lumpur, Malaysia. With better education, affluence and the affordability to travel further to other types of climates and countries. This would affect the way they percept the landscape style of planting.
2. Age is another demographic factor that showed a significant difference between the respondents. In almost every question, the age factor has differences between the answers. This showed that classifications of age are very much impactful on how they observe the planting style. The older the age is, the more familiar the respondents are to the natural-style planting.

3. The older generations, notably the age 56 - ≥65 years old, were more familiar with this type of plantings. They are exposed to the print media more than any other visual media. These age groups are the baby-boomers generation (born 1946 -1964), and they are not too exposed to digital screens as the other existing younger generations (Gen X, Millenials and Gen Z). They also have seen these in other parks that they have visited in their life, before (in or out of the country).
4. The age group of 55 years old and below, visited the park less frequently than 56 years old and above. The frequency of coming to the parks would also hypothetically affect how the respondents looked at the vegetation, which will be further discussed in Chapter 5 and Chapter 6.

In the next chapter (Chapter 5), we will explore the results for respondents' response to the research plots, particularly on aesthetic values, environmental, psychological effect (restorative effect) and its ability to support wildlife.

CHAPTER 5

RESPONDENT ATTITUDES TO THE DESIGNED VEGETATION PLOTS

5. Introduction

Chapter 5 revolves around the response of respondents 1 and 12 months after planting. At the first questionnaire survey (Phase 1), virtually none of the plants were flowering. It was hoped that repeating the questionnaire survey eleven months later would shed light on how establishment and flowering might influence perception. The first species to flower started doing so from the 3rd month after planting, but for the eighteen species chosen, flowering time differed from one species to another. Data were taken on the 12th month after planting (subsequently abbreviated to m.a.p) this timeline was chosen to make sure every species has had at least one cycle of flowering or was still blooming during the data collection phase. Responses in this chapter are based on 417 respondents in phase 1 and 412 respondents in Phase 2.

The respondents were asked 13 questions about their thoughts on the planting in the plots (refer Appendix i) via a five-point scale, from strongly agree, agree, no opinion, disagree, strongly disagree. As mentioned in Chapter 3, Table 3.3, there are six sets of the questionnaire (Set A, B, C, D, E and F) (Refer Table 3.7 for detailed sets) and each set involves looking at different combinations of plots. In total, there were 18, 2.4m x 2.4m planted research plots. However, there are only six plots in each set that each respondent needs to look at and evaluate. Each set looks at combinations that are a complete set of the three variables that we were testing. Using this methodology (balanced incomplete block design (BIMD), the survey process was cut to less than 20 minutes per respondents instead of 45 minutes per respondents if they looked at all 18 plots. Statistically, the plots are analysed using the mixed model analysis to show the respondents' preference towards any particular design (spatial arrangements), layer, and diversity combination of the plots' vegetation.

The questions were divided into three sections: i) impressions of the composition and capacity of the plots to support wildlife, ii) how attractive respondents found the plots and iii) the effect of the plots on their feelings. The questions were;

i) Impressions of the composition of, and capacity of the plots to support wildlife

1. How many species of plants do you think there are in the plot?
2. What percentage (%) of plants in the plot do you think are native species?
3. How well does THIS plot support wildlife?

ii) How attractive respondents found the plots

4. How attractive are the colour combinations of the plot?

5. How attractive is the foliage?
6. How disordered or messy is it?
7. Does it look cared for?
8. Does it look tidy?
9. Does it look natural?
10. Does the plot look crowded?

iii) Effect of the plots on the respondents' feelings.

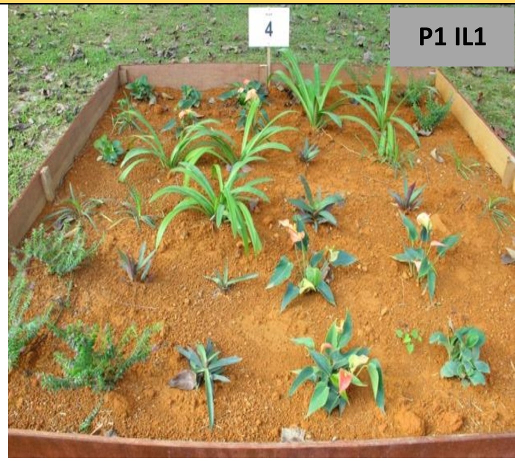
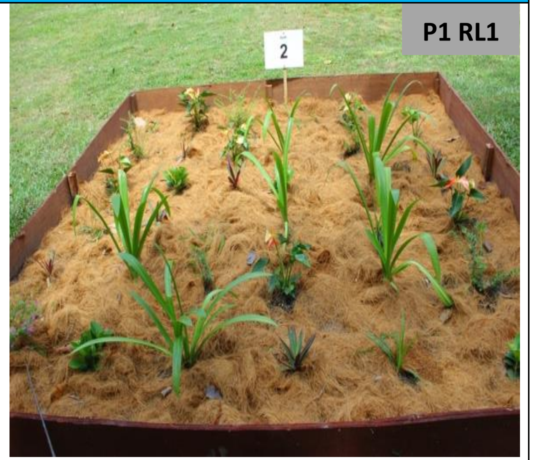
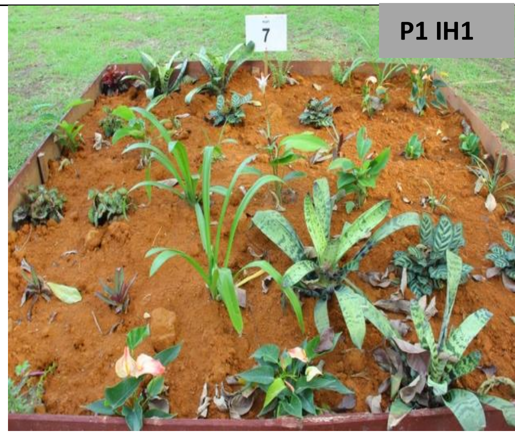
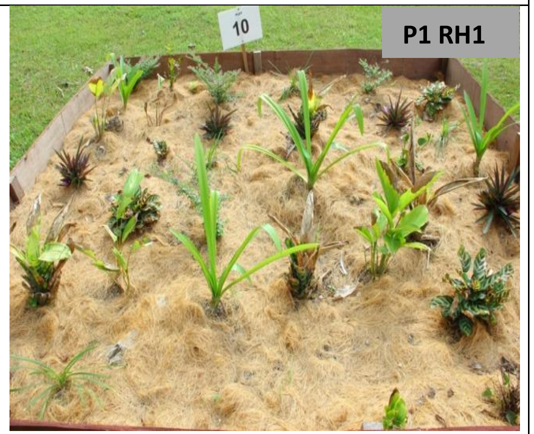
11. Do you find the planting in the plots appropriate?
12. How does the plot make you feel?
13. Do you like the design of the plots?

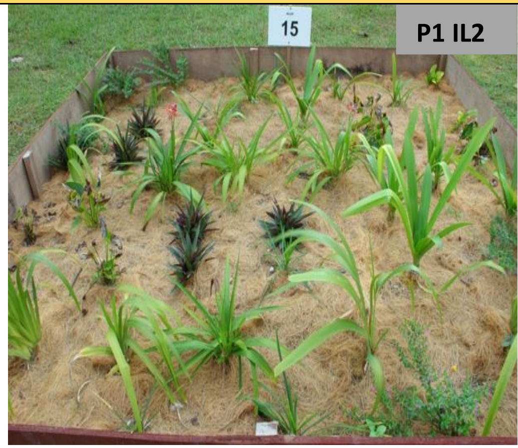
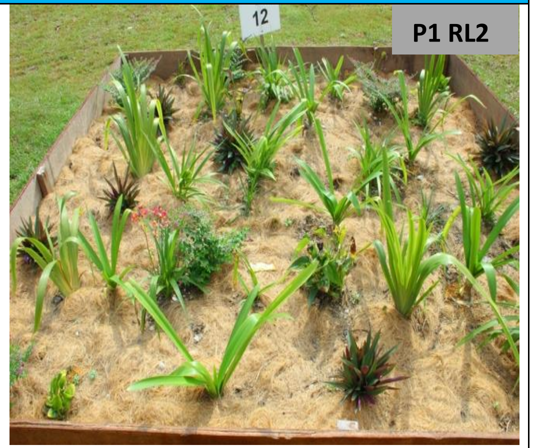
These questions were intended to capture first impressions of the respondents. Respondents in Phase 1 / P1 (1 m.a.p) and Phase 2 / P2 (12 m.a.p) were looking at vegetation types of different age and maturity. The different variables are name; design, diversity, layers, design within layers, design within layers, and diversity.

In question 10 (a-m), under 'The Plots' section of the questionnaire, the respondents ticked one of the boxes from 5 options. They are ranked 1 to 5 (negative statement to positive statement). The answers vary according to questions (Please refer full version of the questionnaire in Appendix i). The mean of all graphs in the next sections will have five as the maximum. Answers for each question (from question 1 to question 13) will be mentioned in the graph section.

5.1. Images of the 18 plots in the research sites for Phase 1 and Phase 2 according to 3 variables (design, diversity and layers)

Table 5.1: Phase 1 (1 Month After Planting)

Layers	Diversity	Structured (S)	Intermediate (I)	Random (R)
Base (1-layer) (8 species) (1)	Low diversity (9 species) (L)			
	High diversity (18 species) (H)			

<table>
<tr><th>Layers</th><th>Diversity</th><th>Structured (S)</th><th>Intermediate (I)</th><th>Random (R)</th></tr>
<tr><td rowspan="2">Base & Low Emergents (2-layer)
(12 species)
(2)</td><td>Low diversity (9 species)
(L)</td><td>
</td><td>
</td><td>
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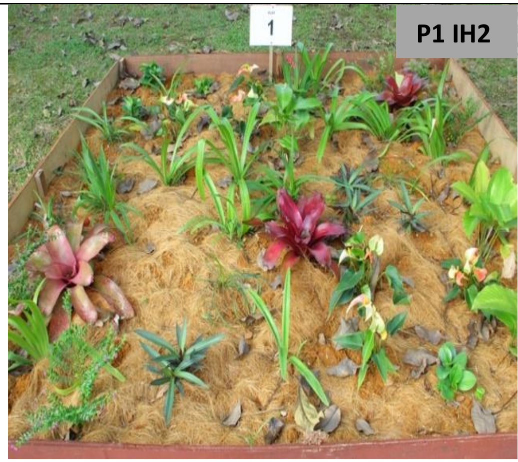
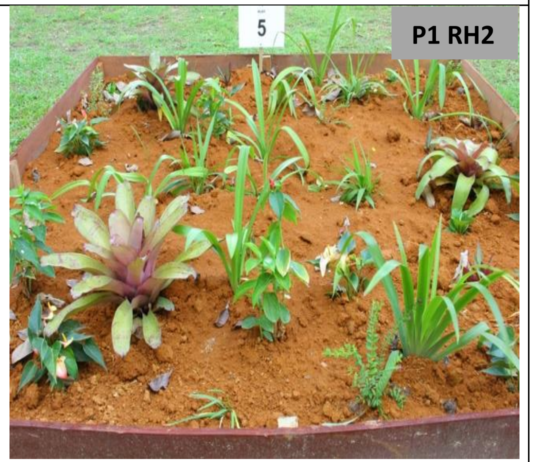
<tr><td>High diversity (18 species)
(H)</td><td>
</td><td>
</td><td>
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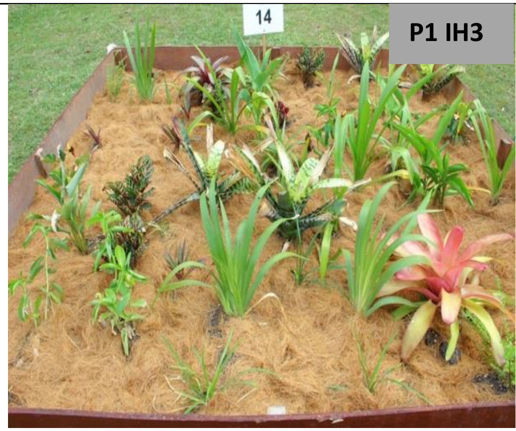
Layers	Diversity	Structured (S)	Intermediate (I)	Random (R)
Base & Low Emergents + Tall Emergents (3-layer) (18 species) (3)	Low diversity (9 species) (L)			
	High diversity (18 species) (H)			

Table 5.2: Phase 2 (12 Months After Planting)

Layer	Diversity	Structured (S)	Intermediate (I)	Random (R)
Base (1-layer) (1)	Low diversity (9 species) (L)			
	High diversity (18 species) (H)			

Layers	Diversity	Structured (S)	Intermediate (I)	Random (R)
Base & Low Emergents (2-layer) (2)	Low diversity (9 species) (L)			
	High diversity (18 species) (H)			

<table>
<tr><th>Layers</th><th>Diversity</th><th>Structured (S)</th><th>Intermediate (I)</th><th>Random (R)</th></tr>
<tr><td rowspan="2">Base & Low Emergents + Tall Emergents (3-layer)

(3)</td><td>Low diversity (9 species)

(L)</td><td></td><td></td><td></td></tr>
<tr><td>High diversity (18 species)

(H)</td><td></td><td></td><td></td></tr>
</table>

Table 5.3: Braun-Blanquet cover-abundance scale for vegetation analysis.

No.	*Species*	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11	Plot 12	Plot 13	Plot 14	Plot 15	Plot 16	Plot 17	Plot 18	**Total**
	Code (Abbv.)	IH2	RL1	SH2	IL1	RH2	RL3	IH1	SH3	SL3	RH1	IL3	RL2	SH1	IH3	IL2	SL1	SL2	RH3	
1.	*Peperomia obtusifolia*																			**0**
2.	*Cuphea hyssopifolia*	2	3	2	3	3	2	2	2	1	2	3	5	4	2	2	4	4	2	**48**
3.	*Anthurium andraeanum*	+																		**1(+)**
4.	*Ophiopogon jaburan*	1	1	1	+	+		+	1		+	1	+	1	2	1	2	1	+	**12+6(+)**
5.	*Tradescantia spathacea*	1	2	1	2	1		+	2		1		2	2	1	2	3	2		**22+1(+)**
6.	*Hymenocallis litoralis*	2	4	3	2	2		1		1	2	1	3	2		3	2	3	2	**33**
7.	*Hippeastrum reticulatum*	1		1		1		+					1	1		1				**6(+)**
8.	*Spathoglottis plicata*						1									3		2		**6**
9.	*Neomarica caerulea*	1					+													**1+1(+)**
10.	*Begonia masoniana*																			**0**
11.	*Calathea makoyana*							+									1			**1+1(+)**

12.	*Vriesea splendens*							1									1			**2**
13.	*Vrisea imperialis*	+		+					+										+	**3(+)**
14.	*Costus woodsonii*			3		3			5						4				3	**18**
15.	*Calathea Loesenerii*	+					+													**1(+)**
16.	*Canna glauca*								3						3		+			**6+1(+)**
17.	*Heliconia psittacorum*						5		4	5		5			4		4			**27**
18.	*Alpinia purpurata*								2						2				2	**6**

Table 5.4: Braun-Blanquet cover-abundance scale (Wikum and Shanholtzer, 1978)

Braun Blanquet Scale:	**Range of Cover (%)**
5	75 – 100
4	50 – 75
3	25 – 50
2	5-25
1	<5 ; numerous individuals
+	<5 ; few individuals

Table 5.5: Conversion of Braun-Blanquet cover-abundance scale to the midpoint of cover range (Wikum and Shanholtzer, 1978)

Braun- Blanquet scale	**Range of cover (%)**	**The midpoint of cover range (%)**
5	75 – 100	87.5
4	50 – 75	62.5
3	25 – 50	37.5
2	5-25	15.0
1	<5	2.5
+	<5	0.1

Table 5.6: Summary of vegetation analysis for 18 plots; 2.44 m x 2.44 m quadrats sampled in research sites, Kuala Lumpur, Malaysia.

No	*Species*	Plots of occurrence	Percent frequency	Total cover (%)	Average cover (%)	colour of leaves	colour of flowers
1.	*Peperomia obtusifolia*	0/18	0	0	0	green	-
2.	*Cuphea hyssopifolia*	18/18	100	562.5	31.25	green	purple
3.	*Anthurium andraeanum*	1/18	5.56	0.1	0.006	green	pink
4.	*Ophiopogon jaburan*	16/18	88.90	50.6	2.81	green	-
5.	*Tradescantia spathacea*	14/18	77.78	155.1	8.62	purple green	white
6.	*Hymenocallis litoralis*	15/18	83.33	325	8.06	green	white
7.	*Hippeastrum reticulatum*	7/12	58.33	15.1	0.84	green	pink
8.	*Spathoglottis plicata*	3/12	25	55	3.06	green	Purplish pink
9.	*Neomarica caerulea*	2/12	16.67	2.6	0.14	green	purple
10.	*Begonia masoniana*	0/8	0	0	0	green purple	-
11.	*Calathea makoyana*	2/8	25	2.6	0.14	green yellow	
12.	*Vriesea splendens*	2/8	25	5	0.28	green yellow	
13.	*Vrisea imperialis*	3/6	50	0.3	0.02	green pink	
14.	*Costus woodsonii*	5/6	83.33	262.5	14.58	green	red
15.	*Calathea Loesenerii*	1/8	12.5	0.1	0.006	green	purple white
16.	*Canna glauca*	3/3	100	75.1	4.17	green	yellow
17.	*Heliconia psittacorum*	6/6	100	450	25	green	orange
18.	*Alpinia purpurata*	3/3	100	45	2.5	green	red

5.2. Braun-Blanquet cover scale

Based on table 5.5 (Braun-Blanquet cover scale), it can be observed that there are a few species that were dominating the majority of the 36 plots. Species like *Cuphea hyssopifolia, Ophiopogon jaburan, Tradescantia spathacea, Hymenocallis litoralis, Canna glauca* and *Heliconia psittacorum* filled the plots to create a very aesthetically attractive outlook for each plot. Species with the highest average cover percentage were a base layer species, Cuphea hyssopifolia (31.25%) across all the plots with *this species.* This species is very robust, and they thrived in all plots. *Cuphea* also has attractive purple flowers that grew horizontally and gave the plots a fuller look. This species is a sun-loving type of plant but at the same time can thrive in the shade.

Heliconia psittacorum was the second species amongst the 18 species with the highest cover percentage (25%). This species belonged to the lower emergent category and dominated the 2-layer and 3-layer vegetation structure.

In the Braun-Blanquet ecological quadrat sampling, there were only seven species with the best coverage percentage and thrive well under the high solar irradiance and shady area, especially for the lowest layer (base layer) that grew under the broader leaves low and tall emergent. By having the right amount of layers and coverage percentage, weeding will potentially be reduced. There is less space for the weeds to grow due to the natural 'mulching' effect created by choosing suitable base layer species. In terms of pruning and trimmings, the naturalistic style planting does not need to be edited as often as the structured design as they are looking more natural and the modest amount of 'messiness' would have a higher threshold to park users. They would still have to be maintained, but the frequency of it is minimalized.

Table 5.7: Summary of vegetation characteristics against perceived diversity values, aesthetic qualities and restorative effects.

	PERCEIVED DIVERSITY VALUES			AESTHETIC QUALITIES						
CHARACTERISTICS	Species of plants in this plot?	percentage (%) of plants that are NATIVE SPECIES?	Support wildlife?	How attractive are the colour combinations of THIS plot?	How attractive are the foliage?	How disordered or messy is it?	Does it look cared for?	Does it look tidy?	Does it look natural?	Does THIS plot look crowded?
DESIGN										
Structured										
Intermediate										
Random										
DIVERSITY										
Low										
High										
LAYERS										
1-Layer										
2-Layers										
3-Layers										
COMBINATIONS										
DESIGN X DIVERSITY										
Structured x Low										
Structured x High										
Intermediate x low										
Intermediate x High										
Random x Low										
Random x High										
LAYER X DIVERSITY										
1-Layer x Low										
1-Layer x High										
2-Layers x Low										
2-Layers x High										
3-Layers X Low										
3-Layers X High										
DESIGN X LAYERS										
Structured x 1-Layer										
Structured x 2-Layer										
Structured x 3-Layer										
Intermediate x 1-Layer										
Intermediate x 2-Layer										
Intermediate x 3-Layer										
Random x 1-Layer										
Random x 2-Layer										
Random x 3-Layer										

	RESTORATIVE EFFECTS		
	Do you find the planting in the plot inappropriate?	How does this plot make you feel?	Do you like the design of THIS plot?
DESIGN			
Structured			
Intermediate			
Random			
DIVERSITY			
Low			
High			
LAYERS			
1-Layer			
2-Layers			
3-Layers			
COMBINATIONS			
DESIGN X DIVERSITY			
Structured x Low			
Structured x High			
Intermediate x low			
Intermediate x High			
Random x Low			
Random x High			
LAYER X DIVERSITY			
1-Layer x Low			
1-Layer x High			
2-Layers x Low			
2-Layers x High			
3-Layers X Low			
3-Layers X High			
DESIGN X LAYERS			
Structured x 1-Layer			
Structured x 2-Layer			
Structured x 3-Layer			
Intermediate x 1-Layer			
Intermediate x 2-Layer			
Intermediate x 3-Layer			
Random x 1-Layer			
Random x 2-Layer			
Random x 3-Layer			

Selected

5.3. Respondent impressions of plot composition and capacity of the plots to support wildlife

5.3.1. Question 1: How many species of plants do you think there are in this plot?

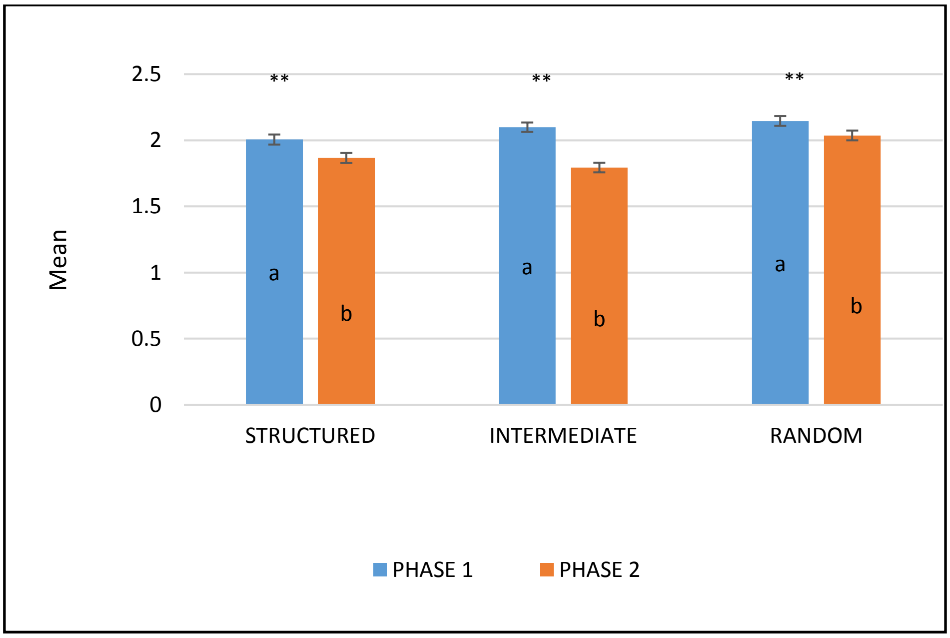


Figure 5. 1: Effects of design (structured; intermediate; random) on respondent's perception of the number of plant species in each plot (Phase 1 [P1]: n=417; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i) *Differences within each of the three design types*

There are differences based on time of growth within each design and spatial arrangement when the survey was conducted and the whole plot's outlook between the 12 months duration. There was a decrease in estimated plants present for all types of designs between Phase 1 and 2. In structured and intermediate design, the drop between the phases was quite significant. This is not the case for random design. The perception of declining numbers in phase 2 was also slighter.

The respondents believed that the number of plants within all the plots are a lot less in Phase 2. This is because of the decrease between both phases across all designs. Intermediate design plots showed the least number of species in the plots in phase 2. Table 5.2 shows that the number of intermediate design species was much less in phase 2 compared to phase 1 despite diversity levels. The number of dominant species taken over all the plots in phase 2 is significantly less than phase 1. Respondents' reaction to the number of plants in the plots according to the design showed that they correctly guess the number of species in both phases.

ii) *Patterns between the three design types*

As observed in figure 5.1, there is a significant difference between all the three design spatial arrangements in phase 1 and 2. The respondents thought that more plant species were present in random design arrangements in both phases than the other two designs, which are in line with the pictures in table 5.1. The respondents perceived the random design has the most number of species per plots in both phases. This is despite diversity or layers of difference. This spatial arrangement was giving the impression of having more species than the other designs. For example, if we look at between P1 SH3, P1 IH3, and P1 RH3. They have the same number of species but arranged in different ways which makes all the difference.

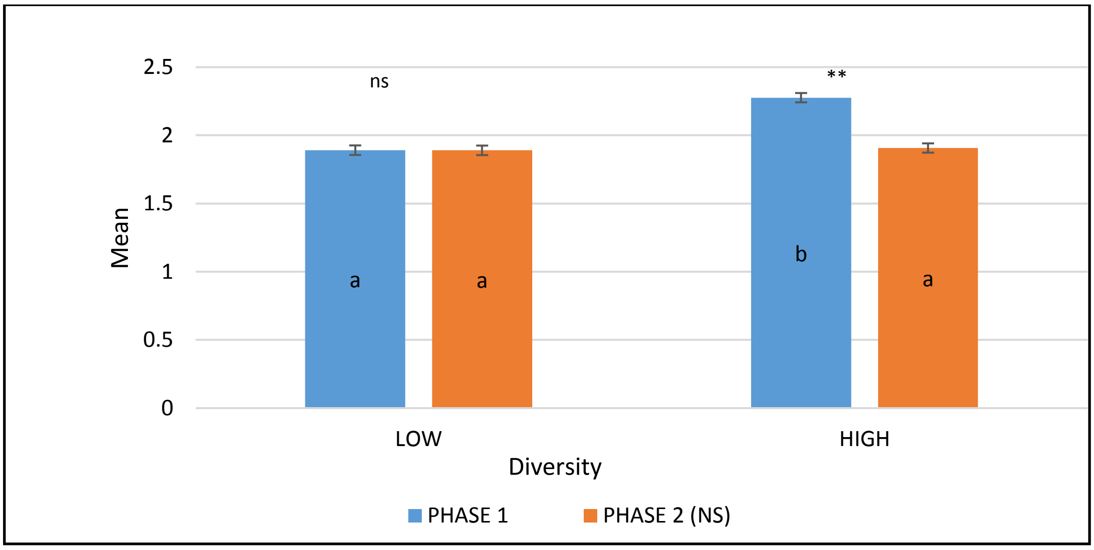


Figure 5. 2: Effects of diversity (low =9 species; high =18 species) on respondent's perception of number of plant species in the plots (Phase 1 [P1]: n=417 ; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each of the two plant diversity*

Figure 5.2 shows that in Phase 1, the respondents can distinguish that the higher diversity treatment contains more species than the lower diversity treatment. In Phase 2, the respondents cannot differentiate between low and high diversity treatments in terms of the number of species in the plots. In low diversity, there was no significant difference between the phases. The respondents clearly can distinguish the number of species in the plots despite the growth between the 12 months difference. Low diversity was perceived as having around 5-10 species per plot, which is not far from the actual number of 9 species per plot—this the same with phase 2 for low diversity.

High diversity shows significant differences between phase 1 and 2. In phase 1, the respondents perceived the plots to have between 6-15 species per plots. However, the circumstances changed in phase 2 when it reduced dramatically to 5-10 species per plot. This is not surprising due to the actual look of the plots. The issue with high diversity plots is not the species' distinguishability once they had grown together within 12 months, but more of the problem is fewer plants in the high diversity plots (because of competition and plant failures to survive). Dominant species have taken over the plots. So, the respondents' perception of the number of species in phase 2 of high diversity plots is correct and close to the actual number of species that existed by the end of the study.

ii. *Patterns between the two plant diversities*

High and low diversity was different initially (P1) with obviously more high diversity species and less in lower diversity. The respondents spotted that. These circumstances changed for high diversity 12 months later due to a few species dominating the plots, particularly on the number of species per plot changed. Despite design and layers, the diversity does play a role in the plots' outlook and directly affected respondents' impressions of the plots. They answered 'how many species are there in the plots?' solely based on what is perceived by them at a particular period (Refer to table 5.1 and 5.2).

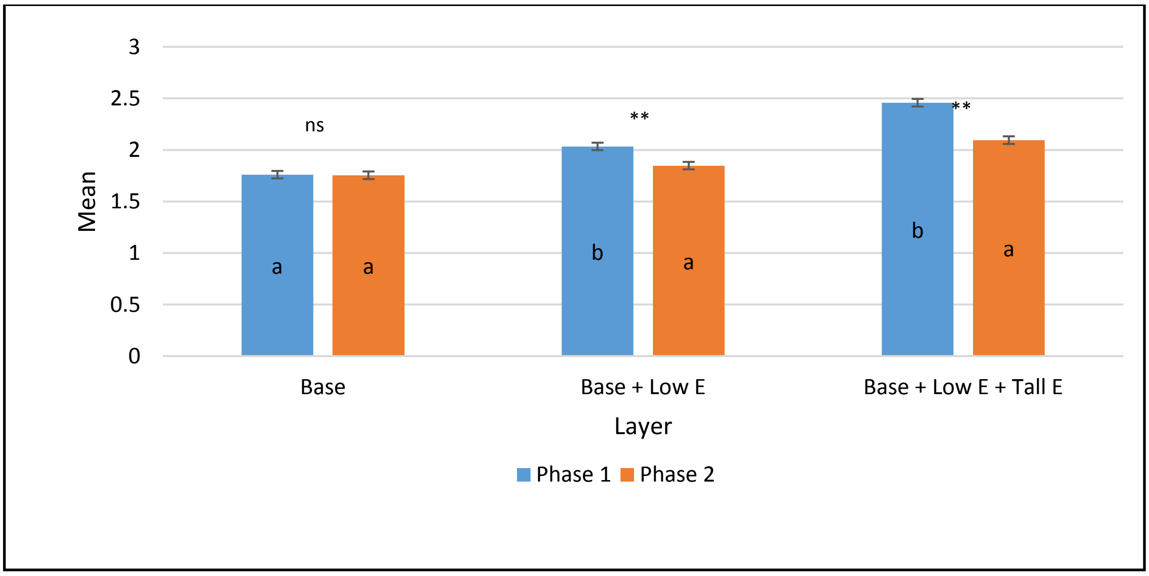


Figure 5. 3: Effects of vegetation layers (base (8 spp.); base and low emergent (14 spp); base, low emergent and tall emergent (18 spp.) on respondent's perception of the number of plant species in the plots (Phase 1 [P1]: n=417; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each of the three layers*

In the base layer (1-layer) which contained only eight species, there was no significant difference in perception of how many species were present between 1 month after planting and 12 months after planting. In the base layer plus low emergent (14 spp.), there is a slight, but significant decrease in the perception of numbers present between phase 1 and 2. There is a marked decrease in the three-layered treatment (18 spp.) in the perception of species present in phase 2. In terms of the number of species present in the plots, the respondents perceived them differently in both phases. The respondents assessed the number of species correctly at different layers and growth stage.

In base layer, the number of species per plot was precise and even after 12 months; it can be observed, that the number of species can be counted apart from the species that did not survive the competition between species. No significant change was present in this layer.

2-layer or base plus low emergent had a significant difference between the two phases. The respondents seem to think fewer species in the plots after 12 months of growth, as in P1 SL2 and P2 SL2 (Table 5.1 & 5.2). There was a clear difference between the numbers of species between the two phases. For example, there were more species in P1 SL2 then P2 SL2. In phase 2, as the vegetation grew, the dominant species took over the plots and gave a different appearance. The more robust species survived and causing the weaker species to 'disappear' from the plot.

This is the same situation for 3-layer or base, low emergent and tall emergent and even more so for the differences between the phases. There are 18 species in the 3-layer vegetation, and the reason for the stark difference from phase 1 and 2 can be seen clearly in table 5.1 and 5.2. The contrast between the two phases is due to the same reason as the 2-layer vegetation is. The more robust species took over the plots and gave the respondents fewer species than before. In phase 1, the respondents thought that there were 10-15 species per plots on average, but this has reduced to 6-10 species in phase 2. However, within the 3-layer category, more species survived than the other two types of layers. However, due to the dominant ones' sheer size, respondents might not see or count the under-storey species during phase 2.

ii. *Patterns between the three layers*

Hypothetically, we expected that the 3-layer (base, low emergent and tall emergent) would score the highest mean number of species per plot. With the 3-layer having the most number of species and multi-layering, respondents correctly estimated the number of species despite the diversity and spatial arrangement design. It is relatively easy to detect the number of species present with different heights and variety within the layers. However, it is a bit harder to assess in phase 2 due to as mentioned above the over-powering growth of a few dominant species making it harder to distinguish correctly. The difference between all layer types in the plots diminished as the experiment proceeded; by the end of the experiment, the plots looked almost the same. Although two and 3-layer decreased significantly in phase 2, the 1-layer or base only layer did not show any changes in how the respondents perceived the number of species in the plots in phase 2. Table 5.1 and 5.2, P1 and P2 for the base shows patches of bare soil between the species even in phase 2. However, although 1-2 species did not survive the 12 months, the respondents still can tell what the species were present in the plots.

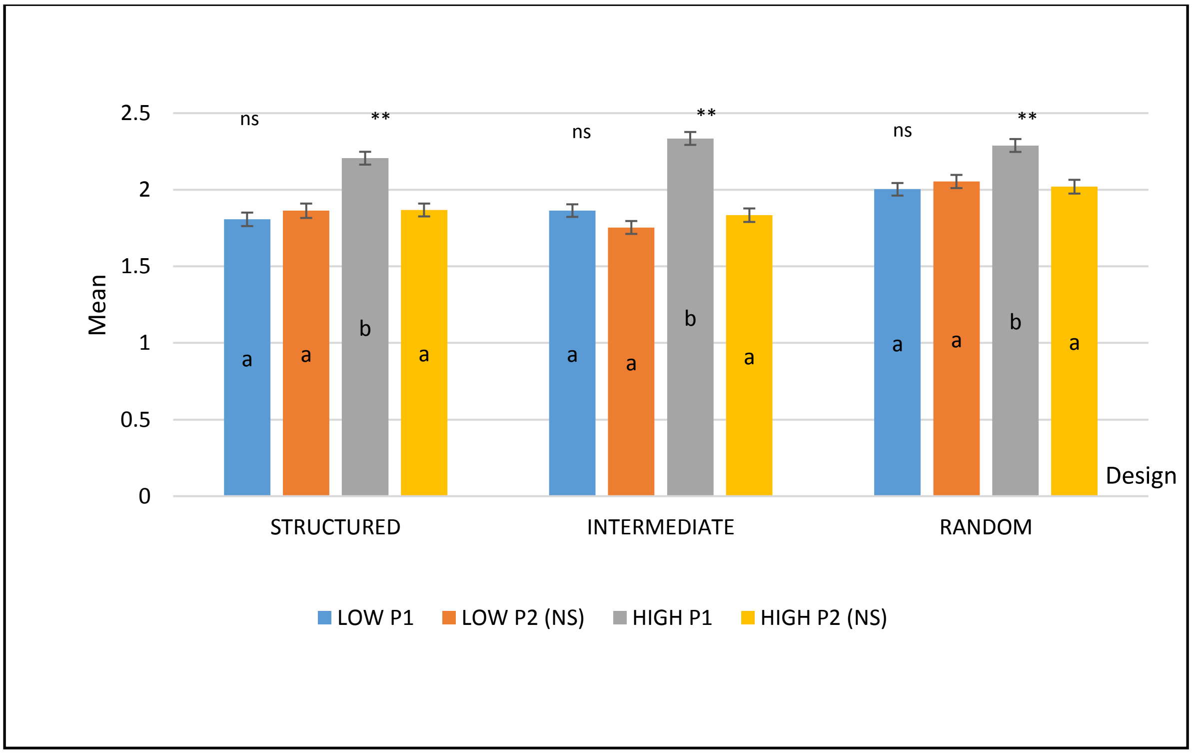


Figure 5. 4: Effects of diversity (low= 9 species; high= 18 species) within designs (structured; intermediate; random) on respondent's perception of number of plant species in the plots (Phase 1 [P1]: n=417; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

Figure 5.4 showed the effect of the diversity variable within the design. There are 18 species in high diversity plots and nine species in low diversity plots to recap. Each type of diversity has shown different effects on respective designs.

i) *Differences within each design*

In the structured design, the low and high diversity was looked at differently, especially in phase 1. This is, however, not the case in phase 2. The respondents could not tell the difference between low and high diversity once they have matured after 12 months. This can be seen in Table 5.2 (P2 SL1 and P2 SH1).

This is the same pattern with diversity within the intermediate and random design. The diversity is noticeably different between low and high diversity in phase 1, become insignificant, and are perceived as an almost similar number of species in the low diversity plots in phase 2. (Refer Table 5.2: P2 IL3, P2 IH3, P2 RL3 and P2 RH3). In phase 2, respondents identified the plots as having 5-10 species only for both diversity levels. In phase 1, as mentioned previously, high diversity has 18 species in each plot.

ii) *Patterns between designs*

In Phase 1, high diversity was always significantly higher than low diversity regardless of designs between the three designs. However, this difference was significantly smaller in the intermediate, at low diversity and more prominent in the intermediate, at high diversity than the other two groups ($f_{(2,1)}$=5.068, p=0.006). In Phase 2, the perception of diversity within all design showed decreased, except for an increase in low diversity within the random design / spatial arrangement and low diversity within the structured design. Maturity seems to be adding to the complexity and gave a fuller outlook to the lower diversity in these two designs. Nonetheless, both diversity within a random design is the highest amongst all designs in terms of having the most number of plants per plot.

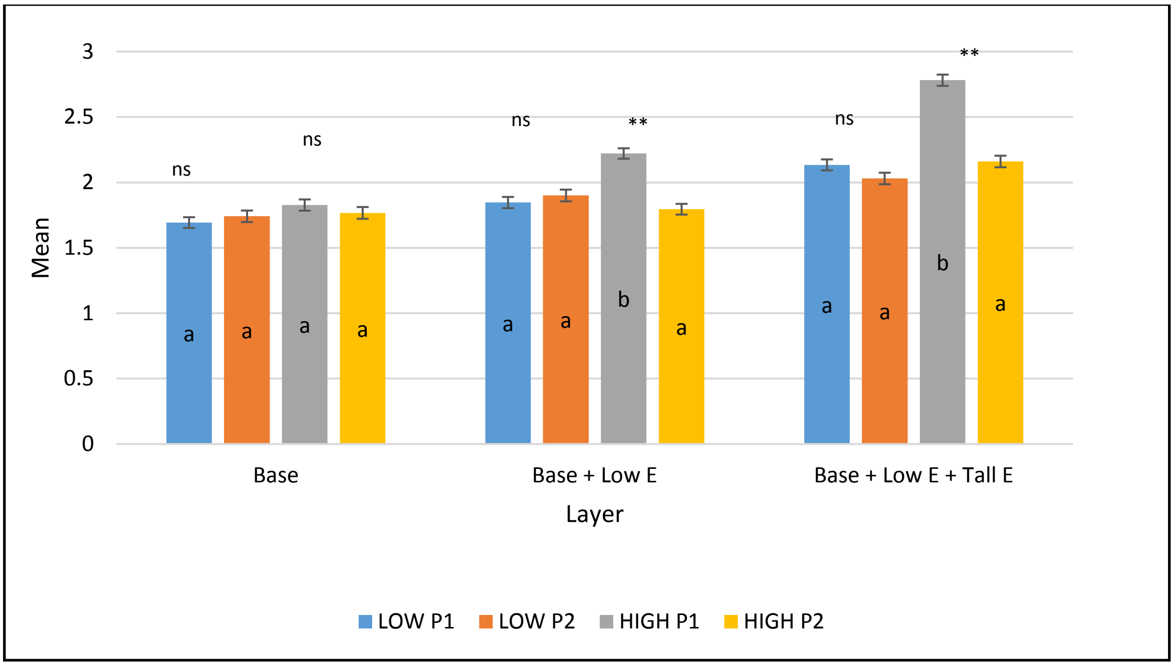


Figure 5.5: Effects of diversity (low; high) within vegetation layers (base; base and low emergent; base, low emergent and tall emergent) on respondent's perception of the number of plant species in the plots (Phase 1 [P1]: n=417; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

There are three-layer types in figure 5.5 that show the different effect of diversity on how the respondents think of the number of species in the plots.

i) *Differences within each layer*

In base only layer (1-layer), there was no significant difference between phase 1 and phase 2. The respondents in both time frame made similar judgements on how many species there are in the plots. On average, the respondents seems to think there are only 5-6 species in this type of layer, and the perception does not change over time.

In 2-layer or base and lower emergent, there is no significant difference between lower diversity at phase 1 and 2, but there is a significant reduction in high diversity in phase 2. In phase 1, the respondents' thoughts were the high diversity plots have around 7-11 species in one plot, but in phase 2, it dramatically changed to only 5-6 species only. If we refer to table 5.1 due to a few species' losses through competitions and individual plant characteristics, in phase 2, the number of species has declined, and the respondents correctly assessed this.

The same pattern was observed in 3-layer (base, lower emergent and tall emergent). Very clearly, we can see the dramatic fall in phase 2. Table 5.2 (P1 RH3 and P2 RH3) shows physical changes in the number of species between the 3-layer vegetation, with the plots becoming dominated by five more robust species. The respondents' perceptions were relatively accurate.

ii) *Patterns between layers*

Hypothetically, the respondents should differentiate between the three-layer types, base only, base and lower emergent and base, low emergent and tall emergent. However, it is intriguing to know whether the respondents can see the diversity levels within the layers. The respondents could see the difference in phase 1, but the diversities gap has become more blurry as time progresses.

Overall, the layers difference were seen by the respondents with the addition of each layer. The more layers, the more species that were perceived by them. This confirms that the public was able to see the multilayer structures as designed. The Base had no significant difference, but high diversity in 2 and 3-layer was significant between each other. The number of species in 3-layer was way more than the other two-layer type ($f_{(2,1)}$=36.81, p=0.001). It is also noted that between 1 and 2 -layer, there was not much difference in the number of species in the plots perceived by the respondents.

5.3.2. Question 2: What percentage of plants in the plot do you think are native species?

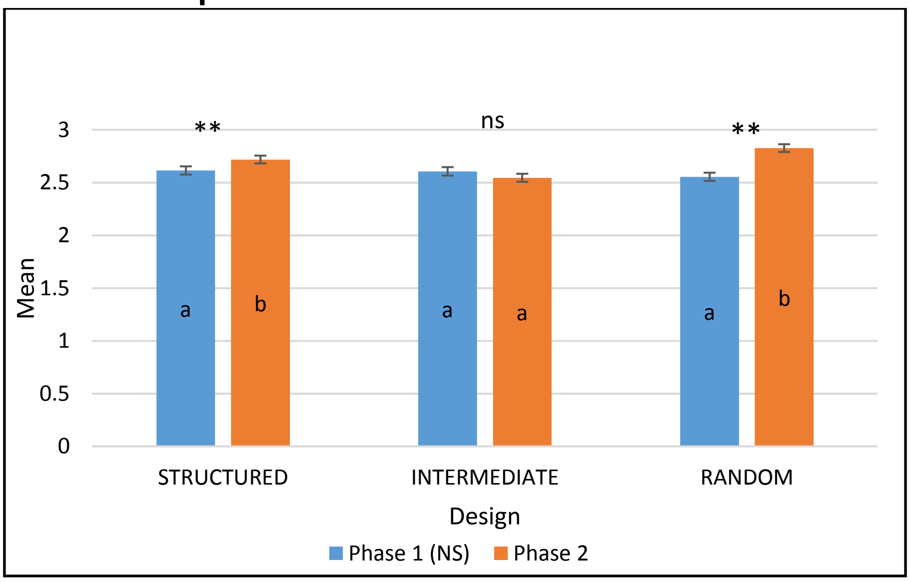


Figure 5.6: Effects of design on respondents' perception of the plots' percentage of native plant species. (Phase 1 [P1]: n=417 ; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. Differences within each design

According to figure 5.6, structured design shows a significant difference between phase 1 and 2. This is also the case for a random design wherein both designs, and phase 2 showed a rise in the respondents' perspective of the plots' percentage of native plants. If we refer to table 5.2 in P2 (SL1, SH1, RL2, RH2), the fuller looking plots might have influenced the possibility of the respondents' judgement on the percentage of native species there are in the plots. This is also most likely due to the complexity of the design for random design category. The intermediate design, however, showed no significant difference between the two phases.

ii. Patterns between designs

Comparing the three designs, all design started in phase 1 as almost the same percentage between the designs, which are between 25-30% are native plants—no significant difference between the designs in the first phase.

However, the random design showed profound changes from the perception of 25-30% to 35-40% of native species existed in the plots. The perception of native species in structured design also risen to 30-35%. Slightly less than random design. Relating the result on the perception on the percentage of native species with question 9 in the questionnaire, the respondents who know the actual definition of 'native plant' and answered what it means were, only 13% of overall respondents. This statistics causes us not to inclusively consider the respondents' answer to this question due to lack of knowledge and correct information on 'native plant' itself.

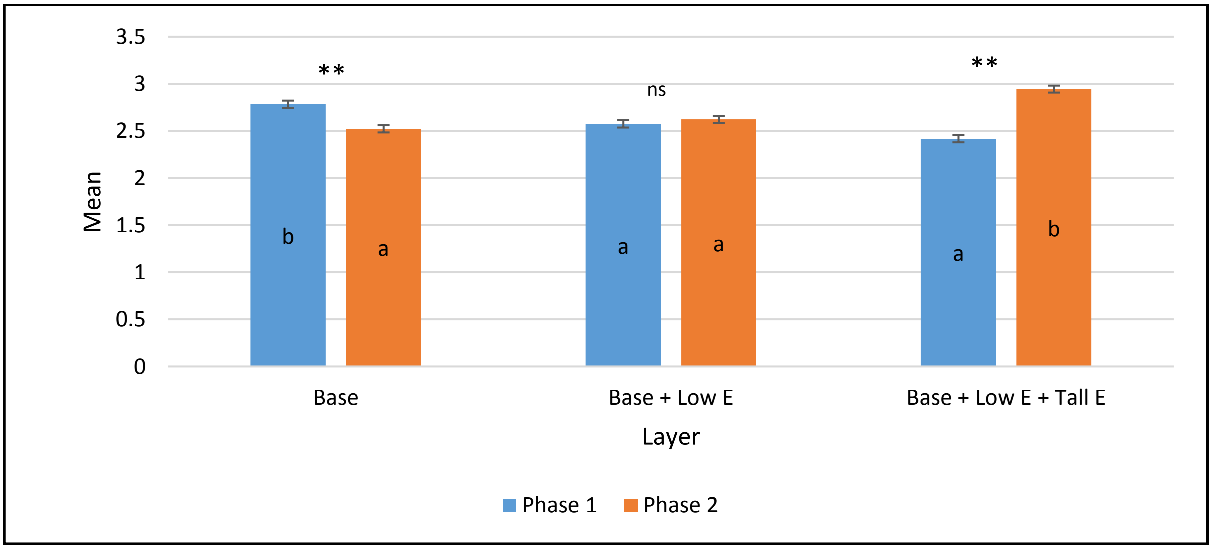


Figure 5.7: Effects of vegetation layers (base; base and low emergent; base, low emergent and tall emergent) on the respondent's perception of the percentage of native plant species

in the plots. (Phase 1 [P1]: n=417 ; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each layer*

Interestingly in figure 5.7, the three layers showed different results between phase 1 and phase 2. Base only or 1-layer was perceived as having between 30-35% of native species in phase 1. They were reduced to 25-30% of native species.

In 2-layer or base and lower emergent, however, showed no significant difference between the phases. As can be observed in table 5.1 – P1 (SL2, SH2, IL2, IH2, RL2, RH2) and table 5.2 – P2 (SL2, SH2, IL2, IH2, RL2, RH2). The respondents' response between both the phases stayed between 28-32% of native plants. The outlook given by these layers and the impression of native species in the plots did not differ due to minor changes amongst the species that survived in the plots. What they see in month one and month 12 (despite maturity level and height of vegetation) were giving the same impressions.

For 3-layer or base, low emergent and tall emergent, however, is a different story. Plots in phase 1 gave the impression that there was only less than 25% of native species, although it contains the most complex multi-layer vegetation. This however changed drastically in phase 2 where it rose to 35-38% of native species in the plots as it matures and becomes fully grown. Referring to table 5.2 figure P2 (SL3, SH3, IL3, IH3, RL3, RH3), we can see that the plots are growing massively, and the foliage touches each other. This most likely makes the respondents believe there are more native species in those six plots. It is a complete opposite of the same plots in phase 1.

ii. *Patterns between layers*

Overall the respondents' perception of the percentage of native species in the plots is in a way not too far off from each type of layer. The range is between 25-38% only. This could be related to the fact that the respondents' understanding of what is native plants itself is minimal and the lack of knowledge on the species that are native. There is also a possibility that the respondents gave a good guess on what seems to be familiar to them, and they have seen a few particular species around them before making them think it is native species.

3-layer, in the end, showed the highest percentage of native species in their plots in phase 2. However, the intermediate design started steadily in month one but did not change 12 months after. According to the respondents, the base layer only has the lowest native plants in phase 2. It is correct that the base layer only has the least number of native species and vice versa with 3-layer, which is the most complex layer amongst the three layers. Once again, the impression of the layers' plots is correctly assessed by the respondents, although not necessarily correct in terms of the percentage of the native species, which is less than 20%.

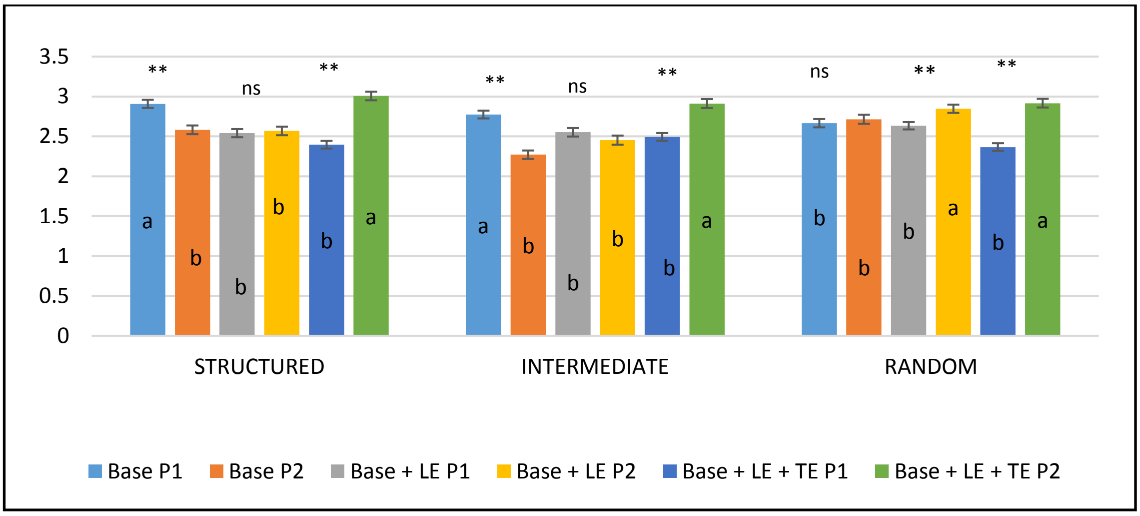


Figure 5.8: Effects of designs (structured; intermediate; random) within vegetation layers (base; base and low emergent; base, low emergent and tall emergent) on respondent's perception of the percentage of native plant species in the plots. (Phase 1 [P1]: n=417 ; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each design*

Within the structured design, base only layer and 3-layer was significantly different between the phases. It is a similar pattern to figure 5.8 where 1-layer (base) is worse off in second phase and vice versa to 3-layer, which turned out to be better off in the second phase. 2-layer also remained non-significant between phases.

This pattern is precisely similar to intermediate design. The only difference is for base only layer in phase 2, which reduced lower than the others. In the intermediate design, the 2-layer vegetation was perceived as having the least number of native species. If we were to refer table 5.2 P2 IL2 and IH2, it is observed that IL2 is very dense, but only four species dominate the number of species that have grown in the plots. It also did not look like it has two layers of growth and become more homogenous. This possibly might affect the perception of native species in this plot. IH2, on the other hand, has a big sparse bare soil area due to failure of growth and competition between species. This also would influence the thoughts on the overall percentage of native plants in the plots.

3-layer within structured design shot to the highest mean in phase 2. It is very much due to the spatial arrangement structured with rigid and precise borders between species within the plots that would influence the respondents to think that there are more native species. (refer table 5.2 P2 SL3 and P2 SH3).

However, the random design showed a different pattern whereby all the bars in phase 2 rose, particularly for 2-layer and 3-layer. There was no significant difference for 1-layer in a random design. The respondents assessed two and 3-layer to have almost 40% of native species in the plots. Although the spatial arrangement is randomised, the dense outlook for both layer categories still gave the impression of the multi-species present in the plots, significantly when they matured and grown. This also positively correlates to the number of native species in the plots as the more species existed in the plots, the more native species there are.

ii. *Patterns between designs*

Among the designs, random design exhibited the highest percentage of native species present in the plots due to the aforementioned reasons. The combination of 2 and 3layer of vegetation and the random design that makes the whole plots look varied and colourful would give the impression of having more species and native species.

The explanation behind this result is in phase 1, the 1 -layer, especially within the structured and intermediate design, is significantly apart, and respondents can see each species. The impression by this is that they are confident that what they perceive very clearly are native plants. Unlike 3-layer, that is a lot more dense and touching each other. So the percentage of native plants perceived by respondents are somewhat less because distinguishing them is a lot harder with much more complex design and 3-layers of different height. 3-layers in Phase 2 are so much bigger and more apparent that it gives the most impressive native species in the plots.

5.3.3. Question 3: How well does this plot support wildlife?

Question 3 focuses on the ability of the plots to support wildlife. The choices are between very well, well, average, badly and very severely. Between the three variables, namely design, layers and diversity, the respondents assessed all the 18 plots to judge based on their perceptions of the plots they are looking at.

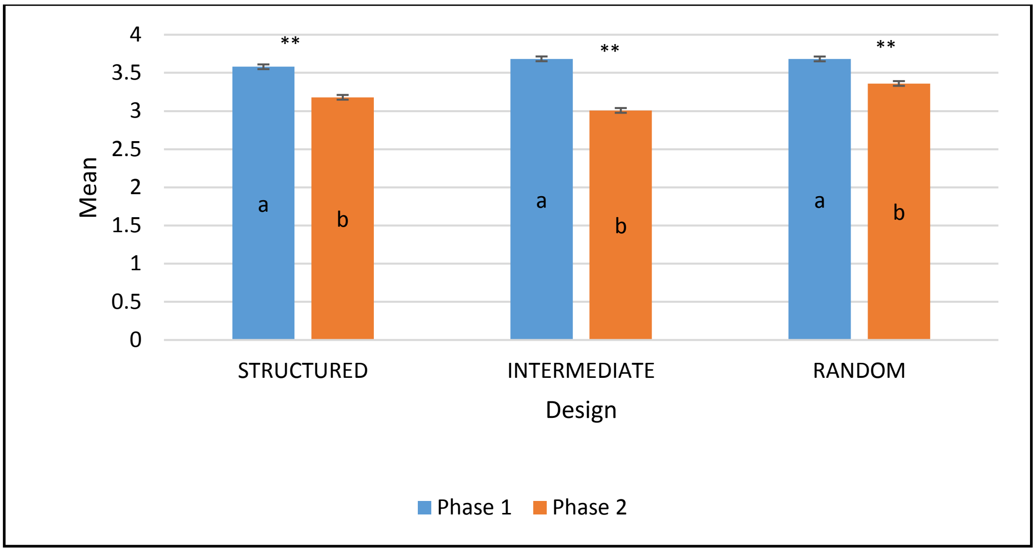


Figure 5.9: Effects of design (structured; intermediate; random) on respondent's perception of how well the plots support wildlife (Phase 1 [P1]: n=417; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. Differences within each design

As observed in figure 5.9, within each design type, bar graphs showed a similar pattern between phase 1 and phase 2. All designs started higher in phase 1 and came down significantly in phase 2.

In structured design, phase 1, the mean was marked at 3.5, categorized as average. In phase 2, the mean of ability to support wildlife was reduced to 3.1. This is the same for intermediate design, but in the second phase, this design was reduced more dramatically amongst the three design, from the average (3.6) ability to support wildlife to badly category (2.9). Intermediate design is the lowest in phase 2. If we refer to table 5.2 and compare all designs in phase 2, we can see that the intermediate design vegetation is a bit more sparse between each other. There was more bare soil in the plots. This most likely influenced the respondents to assess intermediate as the least type of design that could support wildlife due to the plants' lack of density.

The random design, however, exhibited the highest mean in phase 2 with 3.4. However, it is still in the same category, which is the average ability to support wildlife. Hypothetically the more dense and close to each other the designs are, the better it can support wildlife. The random design in phase 2 gives the impression of being denser and having more species and layers in the plots.

ii. Patterns between designs

There was a significant difference between phases within every design; however, between designs, there was no significant difference between each other. There was no difference between phase 1, and phase 2 of structured, intermediate and random as they are not significantly different in both phases. Overall, according to figure 5.10, all the plots are average to support wildlife as the bar graph is between 3.0 and 3.6 maximum. This is still under the average category due to the small range. This can be explained most likely by the nature of spatial arrangement in the design. The structured are much tidier and clumped together, so it becomes a lot harder for wildlife to be supported by such a human-made looking design.

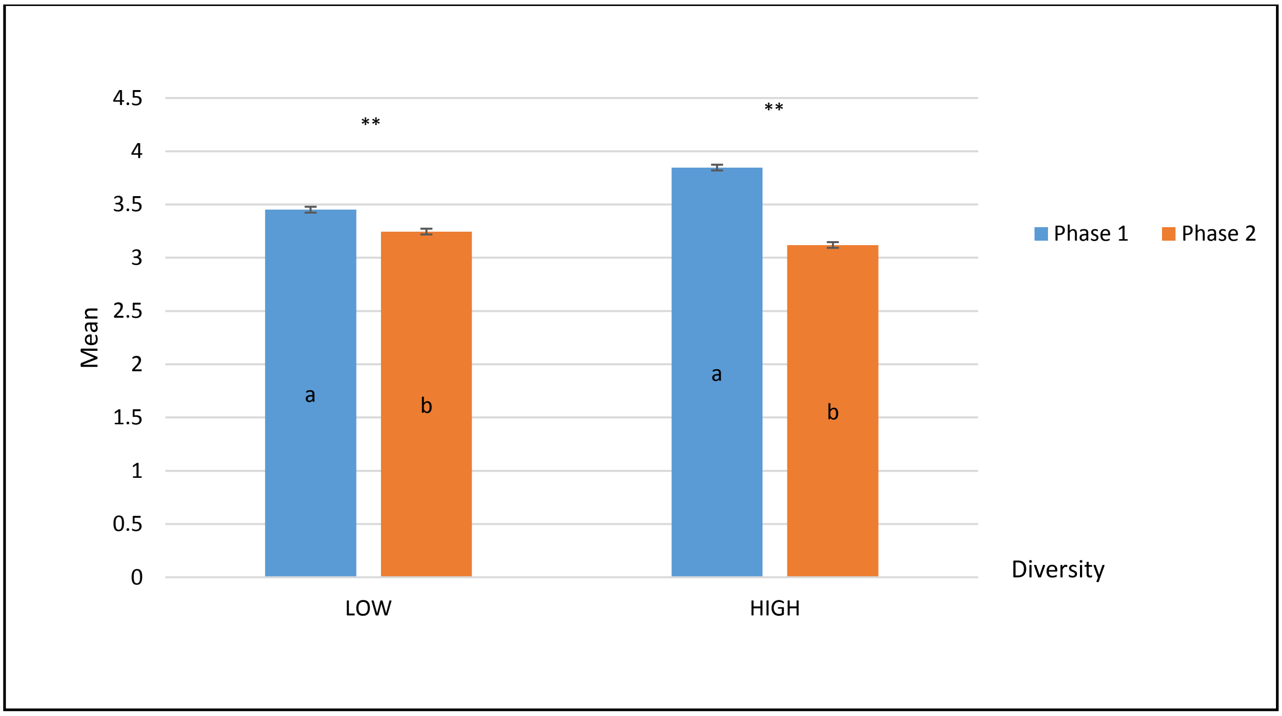


Figure 5.10: Effects of diversity (low =9 species; high =18 species) on respondent's perception of how well do the plots support wildlife (Phase 1 [P1]: n=417 ; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each design*

Low diversity only consists of 9 species in total. Therefore it is understandable why the respondents think it will support the wildlife less than the high diversity plots. In phase 1, the mean was 3.45 and 12 months after that, and it reduced to 3.3. Table 5.2 shows that all the plots in Phase 1 (P1) look scarce and few and far between each other. Unlike the higher diversity, there is more number of plant species even in phase 1. With 18 species, the density and the less amount of soil that can be seen make the respondents a lot more sure about this type of plots harbouring more wildlife than the low diversity.

In phase 2, however, the difference between the low and the high diversity has lessened whereby the high diversity goes from a mean of 3.8 to 3.1. Low diversity is scored at 3.3 in phase 2. This means, the low diversity had fewer changes in 12 months in terms of their ability to support wildlife unlike the high diversity, where the reduction was very dramatic and significant.

ii. Patterns between designs

Generally, respondents do not think that there is much difference between the two diversity in supporting wildlife, particularly when both are more matured and denser. However, the changes between the two diversities are very different. The lower diversity was perceived as more supportive of wildlife than high density in phase 2, which is quite bizarre considering hypothetically. One would think the more dense and diverse a vegetation is, it would be perceived as more able to support wildlife. This result is against the hypothesis, and this is most likely due to the outlook of the second phase for these two diversity levels.

Although the low diversity has fewer species than high diversity, their maturity and growth went very well, and they filled up the plots quite nicely with species touching each other and less amount of bare soul seen. (Refer Table 5.2 P2(SL1, RL1, SL2, IL2 and RL2) as compared to P2 (SH1, RH1, SH2, IH2 and RH2). Low diversity also means less competition between the species, resulting in better survival rates and better overall look in the plots. Overall, despite changes between the phases, both diversity means of the ability to support wildlife was ranging between 3 and 4, which is between 'average' and 'well'.

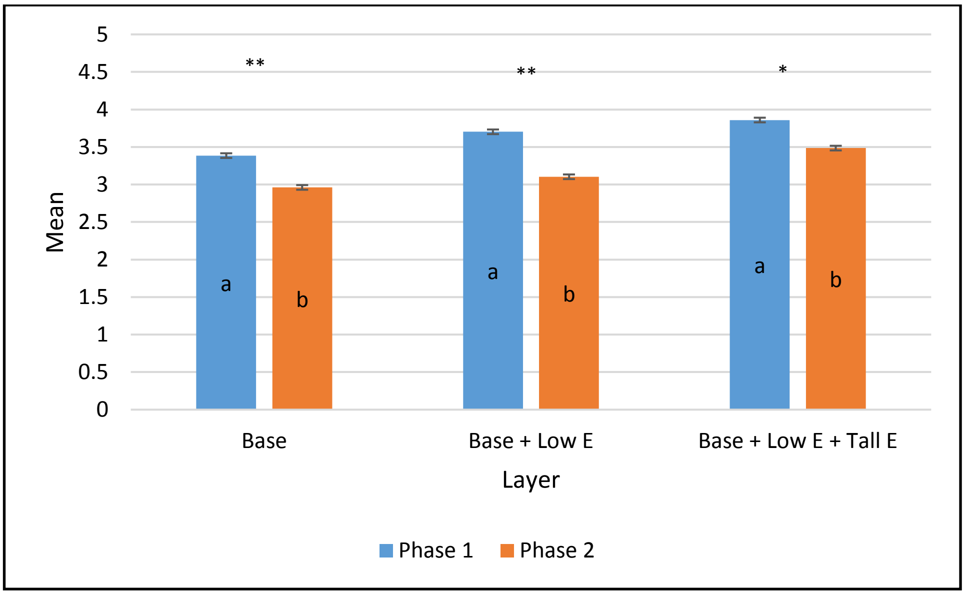


Figure 5.11: Effects of vegetation layers (base; base and low emergent; base, low emergent and tall emergent) on respondent's perception of how well does the plots support wildlife (Phase 1 [P1]: n=417; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. Differences within each layer

Figure 5.11 exhibited the effect of vegetation layers on respondents' perception of the plots ability to support wildlife. Generally, the mean for all layers decreased in phase 2. The differences lie in the level that it was reduced too.

Base only or 1-layer was 3.4 in phase 1 and was reduced to 2.9, which is the lowest amongst all layers in phase 2. The difference between the score is 0.5. It is significantly different, and the category also changed from average to badly support wildlife. This is most likely due to the single layer of the vegetation. The lack of layers influenced the respondents' assessment, and the complexity in the form of height for all the base layer is less than 500mm tall only. This hinders their ability to support wildlife.

2-layer or base plus lower emergent scored 3.7 in phase 1 and went down to 3.1 in phase 2. Difference between them is 0.6. The difference in phase 1 and 2 is the biggest between all layers. This indicated that the perception of the respondents reversed significantly. 2-layer vegetation, particularly in high diversity was more sparse from each other, and the impression that the plots give is if they have bare soil area, it will not be able to do the supporting wildlife function. (refer Table 5.2, figure P2(SH2, IH2, RH2)

3-layer or base, lower emergent and tall emergent started at 3.8 and 12 months after that it decreased to 3.5, which is only 0.3 point difference. The smallest difference amongst all three layers. It also showed a small sign of change between the phases. Looking at table 5.2, figure P2(SL3, SH3, IL3, IH3, RL3, RH3) displayed significant complexity of triple layer of vegetations with species that grew up to 1 metre tall. This very obviously would give the impression of being the best layer that could support wildlife.

ii. Patterns between designs

It can be observed in figure 5.11, that there is a steady drop or each category of layers. The 1-layer is the least able to support wildlife, followed by 2-layer and 3-layer has been repeatedly shown that respondents are perceived to have the most number of species between the plots and the best in supporting wildlife. Between all layers, they are scored within a range that is between a minimum of 2.9 to a maximum of 3.8. they are still on the scale of it being 'average' in the ability to support wildlife.

5.4. How attractive did the respondents find the plots?

Overall outlook (aesthetic values) of the plots

This subsection will discuss the aesthetic values of the vegetation in the plots. In this part, the questions asked focus on the overall outlook of the vegetation and how they perceived the colours and shape in the plots.

5.4.1. Question 4: How attractive are the colour combinations of this plot?

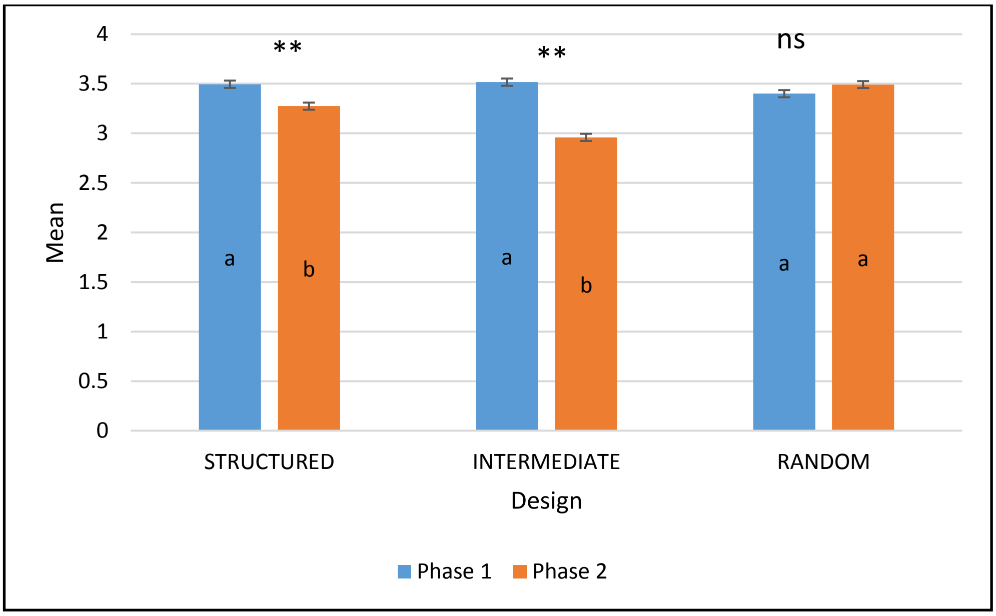


Figure 5.12: Effects of designs (structured; intermediate; random) on respondent's perception of how attractive are the colour combinations of the plots (Phase 1 [P1]: n=417; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each design*

Between designs, there were differences between phase 1 and 2 for structured and intermediate design. The random design shows no significant difference between the scores in both phases.

The structured design was scored higher in phase 1 with a mean of 3.5 and went down to 3.3 in phase 2, which is only 0.2 point difference. There is still however a depreciation after 12 months later. It is also important to point out that this design is still in the same category despite the reduction, which means the colour combination for this design is slightly attractive to the respondents.

This is the same for intermediate design. There is a stark decline from phase 1 to phase 2. This design was scored the same as structured design in phase 1, a mean of 3.5. In phase 2, this design only manages to score 2.9. This indicated that the first impression of the attractiveness of intermediate design's colour combination in month one is slightly attractive. However, in month 12, this design's colour combination has fallen into the slightly unattractive category. This can be seen in Table 5.2; Fig. P2 (IL1, IH1, IL2, IH2, IL3 and IH3).

The random design depicted no difference between both phases. It was scored 3.4 in phase 1 and went to 3.5 in phase 2. The score did not significantly drop. This illustrated that the random design was perceived as having the most attractive colour combination among the three design phases. Looking at figure P2 (RL1, RL2, RH2, RL3 and RH3) we can see across all diversity levels and layers, the random design would always be assessed by the respondents as having the most attractive colour combinations, and this is most likely due to its spatial arrangement and the complexity of it.

ii. Patterns between designs

Figure 5.12 shows that the respondents initially (phase 1) think the best colour combination goes to intermediate design followed by the structured design and the least attractive colour combination is the random design. However, this is not the case in phase 2. 12 months on, the most attractive design is the random design followed by structured and the least attractive is intermediate design. This is interesting considering that it is a 180 degrees turn. The random design had a slight increment proving that it is perceived as attractive even with a taller and fuller look, particularly in the colour combination.

The species in random design plots are precisely similar to the other two designs. One of the different factors is the diversity level within each design which is not in question. Another difference is how the plants were arranged. In phase 1, colours did not play a substantial role, yet it is still young and relatively small. The only colours are between different species, and it is a different foliage colour. As the vegetation grows and become more mature, more flowers came out, and this further enhances the colour combinations for this already intricate design making it more attractive than two other designs.

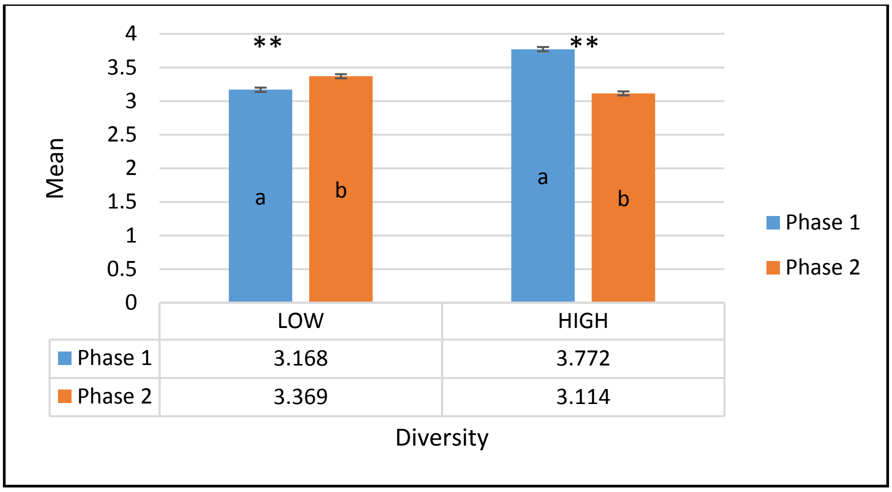


Figure 5.13: Effects of diversity (low; high) on respondent's perception of how attractive are the colour combinations of the plots (Phase 1 [P1]: n=417; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each diversity*

Figure 5.13 showed the difference of pattern between both diversity levels. The lower diversity averaged at 3.2 in phase 1. It went up significantly in phase 2 to 3.4. There are only 0.2 points much better from phase 1. This indicated that in phase 1, lower diversity's colour combination is less attractive than the other one and becomes more and more attractive as they grow mature and filled up the plot boxes.

However, high diversity started relatively high in phase 1 with 3.8 and went down drastically to 3.1 in phase 2. The difference between score is 0.7 points worse off between the phases. In phase 1, the variety of species across all spatial arrangement style makes the vegetation look attractive, and in these circumstances, the colour combination looks very colourful and consists of more than one foliage colour. In phase 2, although the flowers have bloomed and filled the plots, high diversity plots were mainly dominated by only 3-4 species that are most robust. Therefore, there is a lack of difference between the number species between the two diversities level. This caused the high diversity to look almost the same in the 12th month, and they score the colour combination across layers and spatial arrangement design. As shown in table 5.2, Fig. P2 SH1, IH1, RH1, SH2, IH2 and RH2, there is lack of colours and density and to make the score worse, the respondents can see bare soil in these plots when the lower diversity looked lush and dense. This causes the score to be less than what is expected.

ii. *Patterns between diversity*

However, if we average the diversity level between P1 and P2, the high diversity would significantly have a more attractive colour combination between the diversity levels.

Low diversity would score the average of 3.26, and high diversity would score 3.44 points. The more colour paints the scores there are in the plots, the more attractive the colour combinations are. Although lower diversity has fewer species, the species, grew well and filled up the plots. They were colourful and looked lush. The high diversity should be more densely lush hypothetically, but due to competition and invasiveness of certain dominant species, the colours and variety have lessened. Overall, diversity plays a role in having more attractive colours and better combinations of vegetation as long as all the species survive and fill up the space they were planted in. It is also important to note that despite the diversities' fluctuations, the respondents frequently scored the question between 3-3.99, which is slightly attractive and slightly unattractive.

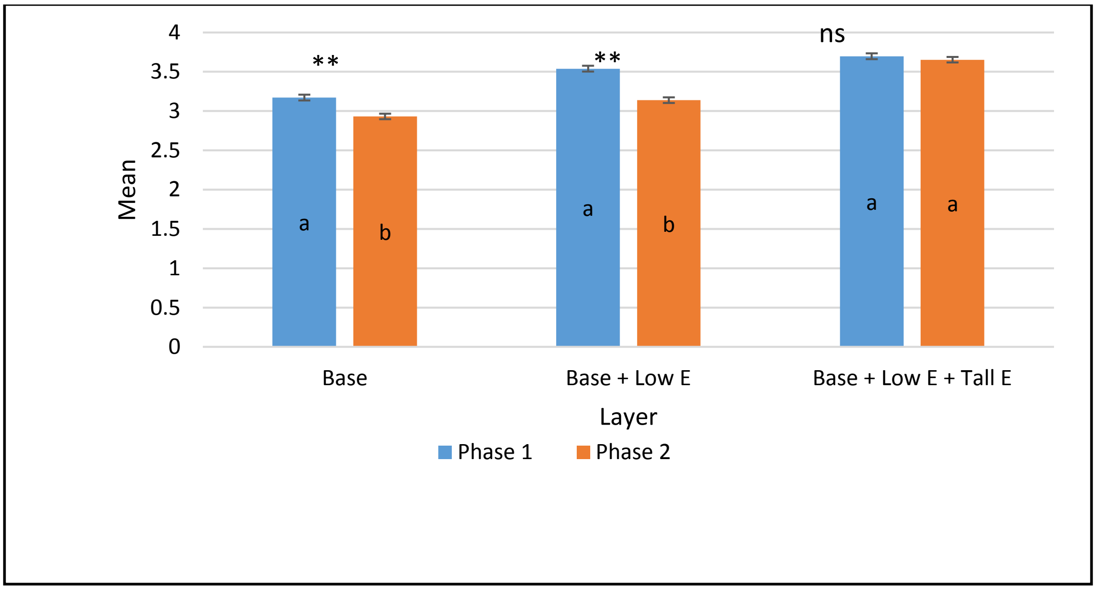


Figure 5.14: Effects of vegetation layers (base; base and low emergent; base, low emergent and tall emergent) on respondent's perception of how attractive are the colour combinations of the plots (Phase 1 [P1]: n=417; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

1-layer (random P1)

2-layer (random P1)

3-layer (random P1)

1-layer (random P2) **2-layer (random P2)** **3-layer (random P2)**

i. *Differences within each layer*

As depicted by figure 5.14, 1- and 2-layer was significantly different between phase 1 and phase 2. 3-layer showed no significant difference between the phases.

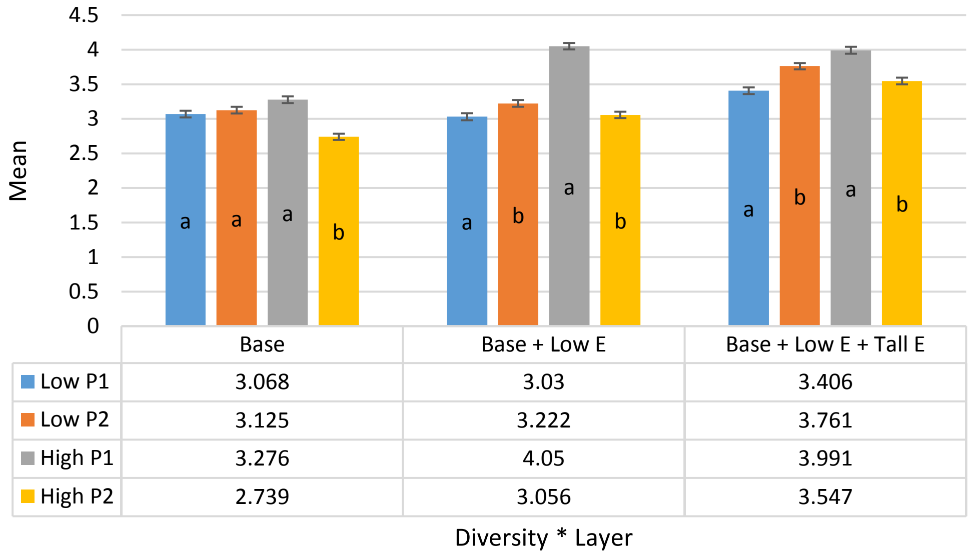
1-layer started at 3.2 in phase 1 and was significantly reduced to 2.93 (0.27 point difference). This indicated that 1-layer's colour combination was far more attractive in phase 1 than phase 2. It went from slightly attractive to slightly unattractive.

2-layer started at 3.5 and decreased dramatically to 3.14 (0.4 point difference) between phase 1 and 2. This shows a big difference between the mean scores. Although the 2-layer for random design is lush and dense as shown above, overall, 2-layer plots did not all performed well horticulturally, and some plots even have bare soil that spoiled the aesthetic value of the whole outlook of the vegetation in this layer category. This caused the score for the attractiveness of colour combinations of 2-layer went down quite a lot in phase 2.

3-layer showed no significant difference between both phases. It scored the highest in phase 1 (3.69) and stayed the highest in phase 2 (3.65). The respondents perceived the highest number of the layer as the most attractive in terms of the vegetation's colour combinations.

ii. *Patterns between layer*

As it can be seen from figure 5.14, the most layer (3-layer or base, low emergent and tall emergent) scored the highest between the three types of layers. The score went up from 1-layer, followed by 2-layer and 3-layer. This indicated increment of the score as the layer is added. The layer with the most number of species and multiple layers has the most attractive colour combinations. 3-layer is also the most colourful between the three-layer types. The more species, the more colours there are and the more variety there will be in the plots. However, it should be noted here that the 3-layer vegetation in phase 2 has been dominated by 4-5 species only—however the species producing colourful flowers and foliage. Although there are reductions in the number of species present in the plots, the score was maintained, which is very much due to the colours produced by the 3-layer plots.



	Base	Base + Low E	Base + Low E + Tall E
Low P1	3.068	3.03	3.406
Low P2	3.125	3.222	3.761
High P1	3.276	4.05	3.991
High P2	2.739	3.056	3.547

Figure 5.15: Effects of diversity (low; high) within vegetation layers (base; base and low emergent; base, low emergent and tall emergent) on respondent's perception of how attractive are the colour combinations of the plots (Phase 1 [P1]: n=417; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each layer*

Figure 5.15 showed the effect of diversity level within different layers on the respondents' opinion on the most attractive colour combinations. Within the base layer only (1-layer), there is no difference between phase 1 and 2 for low diversity, but there is a significant difference between phase 1 and 2. Low diversity in phase 1 starts with the mean score of 3.1 and remains with 3.1 in the second phase, which is in the category of the colour combination of these plots looking slightly attractive. However, it started at a 3.3 score in high diversity and went down steeply to 2.7 in the second phase, from slightly attractive to slightly unattractive category.

2-layer (base and lower emergent) depicted a more dramatic difference between diversity levels and between phases. Lower diversity had increment from phase 1 and phase 2, while high diversity decreased from phase 1 to phase 2 and dramatically. Low diversity at phase 1 was scored 3.03 and rose to 3.2 points in phase 2. High diversity was scored at a high 4.05 in phase 1 and went down to 3.05 in phase 2. This indicated that in phase 1, the colour combination in high diversity within 2-layer was more attractive than the lower diversity. The number of species is less in low diversity. With more species in high diversity plots, the respondents tend to score the more denser-looking plots consisting of multiple species and less amount of bare soil higher.

3-layer (base, lower emergent and tall emergent) however scored relatively, quite low for the low diversity (3.4) in phase 1 and a higher score (3.99) for high diversity in phase 1. The score changed the other way for both of them when the low diversity rose to a mean score of 3.8 points, and high diversity was reduced to 3.6. This means the colour combination between low and high diversity in phase 2 are not significantly different from each other as they move closer to each other. The 3-layer in low diversity was initially (phase 1) scored low because of the vegetation's density while the higher diversity is much denser and tighter, looking with less amount of bare soil. However, in phase 2, it is a different story when the plots with high and low diversity in 3-layer have grown. Both the diversity levels have a smaller difference between them in terms of the number of species and overall outlook. This is why the respondents scored the lower diversity’s colour combination higher and high diversity’s combination lower because they almost give a similar overall outlook. This is believed to be due to the overpowering growth and invasion of three to four species only in both types of diversity. (Refer Table 5.2; Fig. P2 (SL3, SH3, IL3, IH3, RL3 and RH3).

ii. Patterns between layer

As an overview between the three types of layer, the lowest score was base only or 1-layer only, and the highest overall score was for 3-layer vegetation plots. This can be said because each level of diversities' score is higher than the bars in the other two layers.

The combination between diversity levels and the number of layers is shown to justify why the respondents scored more on 3-layer than 1-layer (as shown in layer variable only (Fig. 5.15) and the different levels of diversity exhibit this at different phases within those layers. It has a complicated factor of combinations that pushed the respondents to choose their preference (in this circumstances the best colour combination) on which was more specific and the plots were carefully designed having all three variables in each one. The respondents did not know the combinations, and they judged it solely on what they are looking at. The scores are not different when it is single variable only as compared to 2 variables interacting with one another but rather a more detailed data representation of what is happening within the layers where there are also factors of design and diversity variations in it and made it perceived like that for each of them.

The most complex plots with high diversity and 3-layer plots are more colourful than the most straightforward combination, which is only 1-layer and low diversity. This proves that the respondents reacted positively to the cheerful-looking plots' colours and drama, which is also why phase 2 results show less gap between the two diversity levels. The flowers and colours shown in both high and low diversity plots are the same kinds and due to its complexity. As a result, the plots are seen as very attractive and colourful despite diversities. Also, it must be noted that the significant factor to the closings of the gaps in phase 2 is the number of species in both diversities that has an almost similar number of species that were still present and survived.

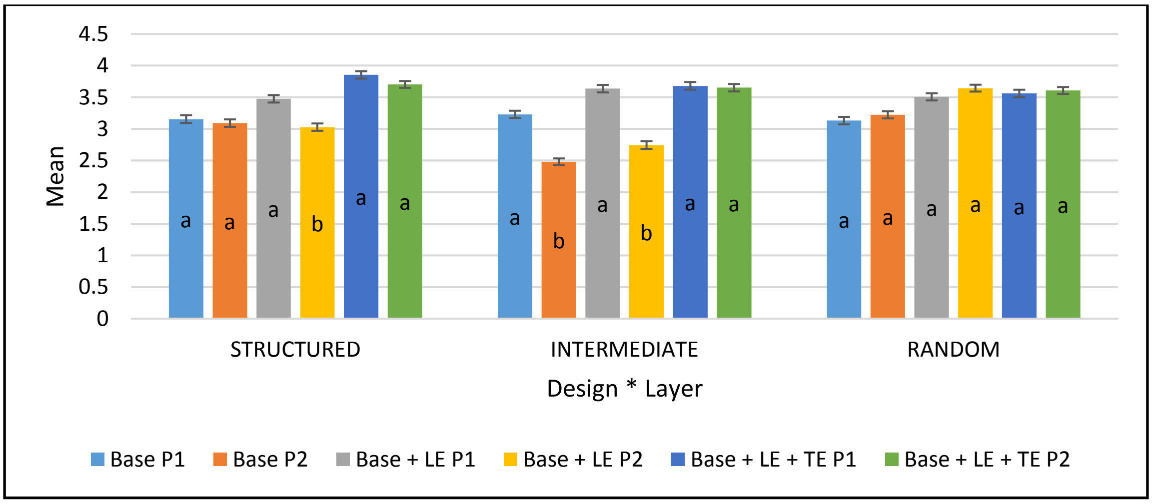


Figure 5.16: Effects of designs (structured; intermediate; random) within vegetation layers (base; base and low emergent; base, low emergent and tall emergent) on respondent's perception of how attractive are the colour combinations of the plots (Phase 1 [P1]: n=417; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each design*

Figure 5.16 showed the effect of design within vegetation layers on the respondents' perception of attractive colour combination. Within the structured design, it can be observed that all layer types are more attractive in phase 1 but decreased in phase 2 with 3-layer being the most attractive between all layer types. The only significant difference between phases is 2-layer. Phase 1 was scored 3.5 points, and the second phase was much less to only 3.0. Although the 3-layer was not significantly different between phases, it was perceived as the most colourful and had the most attractive colour combination in structured design plots. This design also stayed within the 3.0-3.9 range of score, which means the plots' colour combinations are slightly attractive.

The intermediate design, however, depicted a dramatic fall within phase 1 and 2. In phase 1, 1- and 2- layer within the intermediate designs started with a similar score with a structured design. They were perceived as having slightly attractive colour combinations as well. However, in phase 2, things took a different turn when these two-layer types were significantly reduced to only 2.5 for 1-layer and 2.7 for 2-layer. This has brought them out of the 3.0-3.9 range and was perceived as being slightly unattractive colour combination. This is evident when there was less number of species and more bare soil. This changes the dynamics of the plots dramatically. 3-layer stayed as the most attractive layer within the intermediate design and was no difference between phase 1 and 2. Once again, the most complex was seen as the most attractive colour combination amongst all.

The random design showed the best pattern whereby all the layers within this design were not significantly different between phase 1 and 2. 1-layer was scored lowest amongst the three layers. However, it rose from 3.1 to 3.2 in phase 2 when all the 1-layer across designs has been reduced; this layer rise to a slightly better score. Even in 2-layer and 3-layer the score are pretty high and both 2- and 3-layer were perceived as having the most attractive colour combinations between all layers within the random design. They are also in the same range across all type of designs.

ii. Patterns between designs

To compare the designs, random design scored the best for all three layers within the design. When all layers within designs were scored lower in phase 2 compared to phase 1, layers within random design all stayed the same between the phases. This means that just how they perceived the attractiveness of colour combinations in phase 1, the respondents still perceived the same plots in phase 2 as attractive as when it was younger and smaller. The colour combinations of all the plots in the random design of phase 2 were more attractive than plots in structured and intermediate design.

It is also interesting to note that the most complex layer, 3-layer vegetation (base, lower emergent and tall emergent) scored the highest across all the designs. They also were not significantly different between phase 1 and 2. This again means that the respondents' perception of the colour combination of 3-layer plots is always the most attractive than other layers despite the spatial arrangement or designs.
The most attractive treatment combination in terms of colour combination is 3-layer within the structured design. Nonetheless, all 3-layer (most complex) were scored almost the same and within the same range, between 3.5 to 3.9 and classified as slightly attractive.

5.4.2. Question 5: How attractive is the foliage?

Foliage played an essential role in any ornamental planting design. It adds to the aesthetic value in terms of the foliage's shape and could give variations to the colours and enhanced the overall outlook of the vegetation.

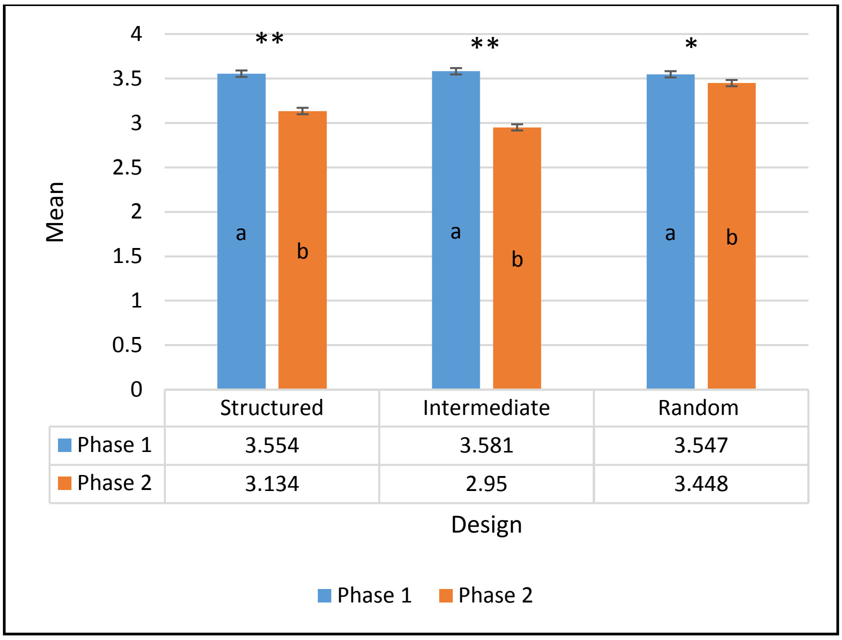


Figure 5.17: Effects of designs (structured; intermediate; random) on respondent's perception of how attractive are the foliage (Phase 1 [P1]: n=417 ; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each design*

In terms of design, the attractiveness of the foliage differs from phase to phase. In phase 1, the structured design was scored 3.5 and decreased to 3.1 in the second phase. The reduction means the respondents think the foliage is much more attractive (phase 1) as it has a clear difference between colours and was structurally arranged in clumps and according to colour. Although they were far apart from each other, the respondents still scored them similar to other designs. In phase 2, the structured design plots have grown to fill up the boxes. However, some species did not survive and left some bare soil space that could tarnish the score, thus reducing the score. Refer Table 5.1; Fig. P1 (SL1, SH1, SL2, SH2, SL3 and SH3) and Table 5.2; Fig. P2 (SL1, SH1, SL2, SH2, SL3 and SH3).

However, the intermediate design started with a similar score to structured design in Phase 1 but decreased even lower than structured design in phase 2. Phase 1 was scored 3.5, and in phase 2, the mean score went down to 2.95 only. This indicated that in phase 2, the respondents did not think that the foliage is beautiful. The score was out of the usual (3.0-3.9) range which categorized the intermediate design phase 2, from slightly attractive to slightly unattractive. At this stage (12 months after planting), the intermediate design grew to be patchier, and some plots are looking less attractive, mainly the foliage. This happens because of the way the vegetation is being arranged. In intermediate plots, the species that did not survive in phase 2 can be in a few spots, resulting in the 'patchy' look. This gave a wrong impression to respondents, particularly regarding the foliage's attractiveness and lowered the design score. Refer Table 5.2; Fig. P2 (IL1, IH1, IL2, IH2, IL3 and IH3).

The random design, however, depicted only a small significant difference between phase 1 and 2. Phase 1 foliage was scored a 3.5 and decreased to only 3.4 after 12 months later (phase 2). There is only 0.1 point difference between the phases. If we refer to Table 5.2; Fig. P2 RL1, RL2, RH2, RL3 and RH3, we can see most of the plots are looking fuller and denser. Even from phase 1, the foliage variety is seen through the colour and the arrangement. It gets even better looking once the vegetation matures, and the colour and shape of the leaves are much more distinct. With the random design, respondents find it more attractive and give the illusion of fuller-looking plots. This is very much reflected in the score.

ii. *Patterns between designs*

The first phase shows that all the scores for phase 1 for all designs were 3.5 points. The respondents could not distinguish foliage attractiveness between the designs. They were insignificant. However, in phase 2, they preferred random design better than the others. What differs random design than the other designs are the spatial arrangements. The selected species were arranged randomly in the plots. This makes the variety of foliage looks much more colourful and attractive. Even when species that did not survive, the other species would almost 'cover' the lost species because they were not clumped or categorize in a specific corner because of the plants' placement's randomness. The species that survived and grew took over space for the non-surviving species and kept the plot looking full. This is why the foliage in random design is the most attractive and was a more preferred design in a longer run.

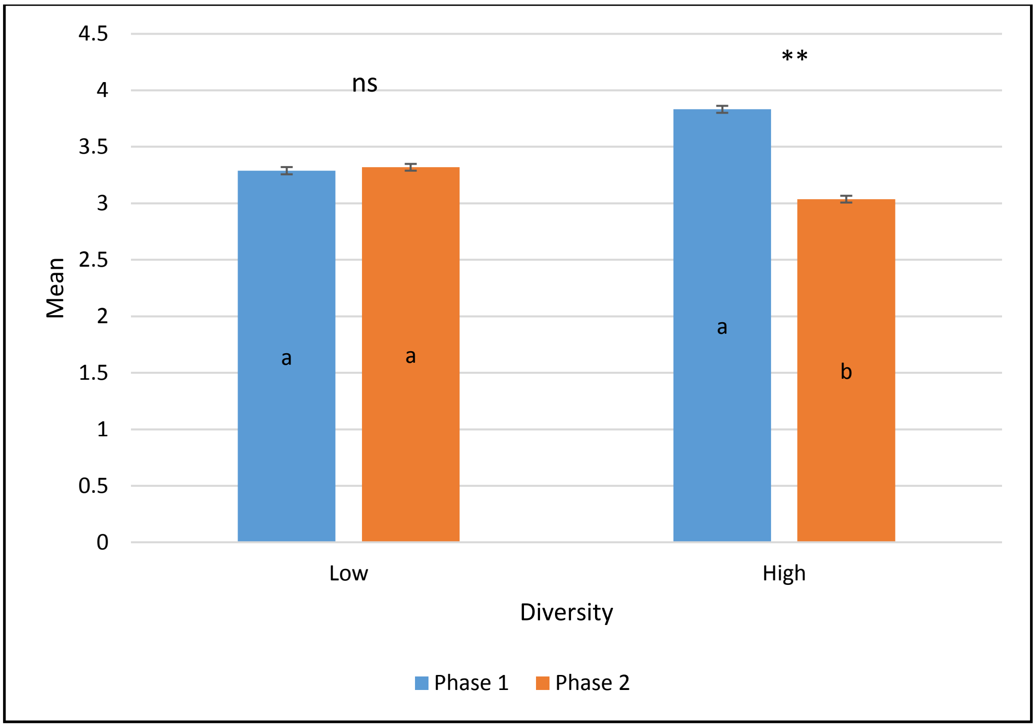


Figure 5.18: Effects of diversity (low; high) on respondent's perception of how attractive are the foliage (Phase 1 [P1]: n=417 ; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. Differences within each diversity

In figure 5.18, there was no significant difference between phase 1 and phase 2 in low diversity. Respondents perceived the attractiveness of the foliage in both phases as the same. Lower diversity has fewer species but the equivalent amount of the number of plants in 1 each plot. In phase 1, the vegetation in the low diversity plots was scored at 3.3 in the beginning. In phase 2 after 12 months, the score stayed at 3.3, which means that despite the plants' maturity level, the respondents still think the plants' foliage is as attractive as they perceive them when they were smaller and younger (phase 1). The number of species did not deteriorate badly but was dominated by an individual 3 to 4 species. In high diversity, however, it is shown that there is a significant difference between phase 1 and phase 2. The respondents seem to think the foliage in phase 1 is far more attractive than the foliage of high diversity plots in phase 2. Phase 1 was scored a good 3.8, and in phase 2 it had a major downfall to only a mere 3.0 points. If we refer to Table 5.1; Fig. P1 (SL1, IL1, RL1, SH1, IH1, RH1) and Table 5.2; Fig. P2 (SL1, IL1, RL1, SH1, IH1, RH1), we can see that the lower diversity filled the plots and can maintain the number of species after 12 months of growth. The high diversity plots, however, was dominated by the four species that overpowered the other species. This made the plots look less attractive due to the same species' repetition that won the survival competition.

ii. Patterns between diversity

Overall, the lower diversity is seen as having, the more attractive foliage. It might not be the case in phase 1, but it is steady and scored more in phase 2. The foliage of the higher diversity was less attractive in phase 2. This significant difference indicated that the respondents perceived the foliage and lower diversity leaves when they are mature as more attractive than higher diversity. Due to 3 to 4 species' dominance only in high diversity, the number of species in both types of diversity is almost identical.

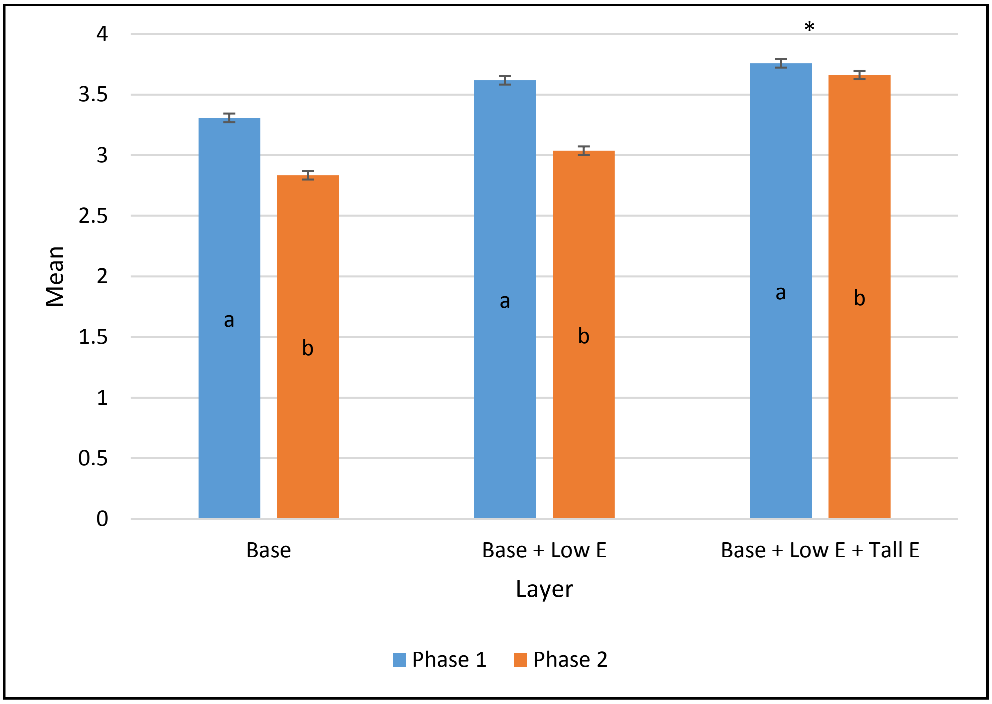


Figure 5.19: Effects of vegetation layers (base; base and low emergent; base, low emergent and tall emergent) on the respondent's perception of how attractive are the foliage. (Phase 1 [P1]: n=417 ; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

Table 5.8: Summary of frequency, percentage of total cover and average vegetation cover of eighteen 2.44 meter x 2.44 meter plots.

Layer Category	Species	Frequency (%)	Total cover (%)	Average cover (%)
Base	*Peperomia obtusifolia*	0	0	0
	Cuphea hyssopifolia	100	562.5	31.25
	Anthurium andraeanum	5.56	0.1	0.06
	Ophiopogon jaburan	88.90	50.6	2.81
	Tradescantia spathacea	77.78	155.1	8.62
	Begonia masoniana	0	0	0
	Calathea makoyana	25	2.6	0.14
	Vriesea splendens	25	5	0.28
	Calathea Loesenerii	12.5	0.1	0.06
Lower Emergent	*Hymenocallis litoralis*	83.33	325	8.06
	Hippeastrum reticulatum	58.33	15.1	0.84
	Spathoglottis plicata	25	55	3.06
	Neomarica caerulea	16.67	2.6	0.14
	Vrisea imperialis	50	0.3	0.02
	Costus woodsonii	83.33	262.5	14.58
Tall Emergent	*Canna glauca*	100	75.1	4.17
	Heliconia psittacorum	100	450	25
	Alpinia purpurata	100	45	2.5

i) *Differences within each of the three-layer*

In 1-layer (Base layer only), there is a difference between phase 1 and phase 2. The respondents preferred the foliage in a base layer less in phase 2 than in phase 1. This is the exact similar pattern for 2-layer planting, which consists of base forbs and lower emergent. Both layer styles decrease across time, much less in phase 2. In 3-layer planting, however, although there is a difference between the phases, the most complex layer has proven to have the most attractive foliage in both. The average cover percentage across the three layers are the highest and much denser than the other two as can be seen in table 5.8, combinations of more number of species in 3-layer made the foliage more attractive in phase 2.

ii) *Patterns between the three-layer types*

The 3-layers were perceived as the layer type that has the most attractive foliage in both phases. The change between phases for one layer (base) and 2-layer (base + lower emergent) was drastic and were highly significant. 3-layer (base + lower emergent + tall emergent) showed changes from phase 1 to phase 2 but rather a small difference. This means the respondents felt that the coverage percentage of the 3-layer was much higher and more complex. This made the foliage more attractive combinations between a higher number of species in the 3-layer plots. This might suggest that as when the planting looks more complex, it looks better, or it may just be that it just had more cover.

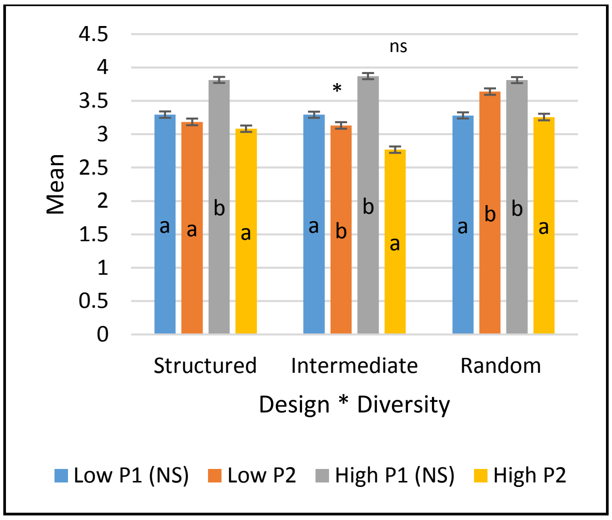


Figure 5.20: Effects of diversity (low; high) within designs (structured; intermediate; random) on respondent's perception of how attractive are the foliage (Phase 1 [P1]: n=417 ; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

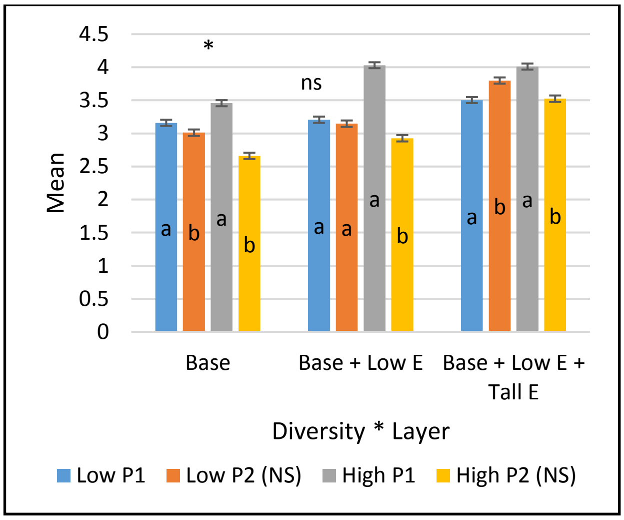


Figure 5.21: Effects of diversity (low; high) within vegetation layers (base; base and low emergent; base, low emergent and tall emergent) on respondent's perception of how attractive are the foliage (Phase 1 [P1]: n=417; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each design*diversity and layer*diversity types*

Figure 5.20 and 5.21 have similarities in terms of patterns of behaviour between phase 1 and phase 2 for each design and layer individually. Every diversity across design or layers displayed a consistent drop between the phases. They had less attractive foliage after 12 months of planting except for two low diversity combinations within the random design and low diversity within 3-layer. What is clear here is the combinations of low diversity, and the most complex within the variables (design and layer) were perceived as having the most attractive foliage. The spatial arrangement of the random design looked most natural and at the same time appeared to have more variety of different foliage colour. Even more attractive when it is combined with another variable which is 3-layer of plantings.

ii. Patterns between designs and layers

The pattern between designs and layers when combined with diversity, is behaving very similar between each other. Within the design, all low and high diversity in phase 1 is not significantly different. This means, during the vegetative phase, the respondents did not particularly see any difference in terms of attractiveness of the foliage for all three designs and two different diversities. The respondents felt that the plantings were still very young within the designs and did not have any clear preference. In figure 5.20, the respondents were indifferent with either low or high diversity within any type of layers in phase 2. This also would mean that in terms of foliage attractiveness in phase 2, despite the layers or how many species there are, the respondents still do not see any difference between the foliage's attractiveness (flowering season). Random design, planted in 3-layer at low diversity would be the best combination between all the combinations.

Hypothetically, we would expect the higher diversity to show a better chance at preferences as the most attractive foliage plots. However, lower diversity has proven to be a constant favourite between the two. In phase 2, the respondents find lower diversity because most of the lower diversity plots had better coverage percentages. From figure 5.21, we can see that plots in the lower diversity section have more plant cover despite layers. Low diversity plots in P1 did not portray a full look. However, this changed in P2. Higher diversity had more number of species in its plots so as the plants grew, and there were higher rates of competition between them. Species that survived the competition in high diversity plots were the kind of forbs that were not filling the plots fast enough or took more time because of their slow growth compared to low diversity plants that have less number of species in the plots but less competition and filled the whole plot giving it a more attractive outlook. Where the planting is intricate, they typically like it less when it is at P2. This raises the big question on why do they generally find it less attractive at P2. This is presumably because it has lost the neatness and order it had at P1.

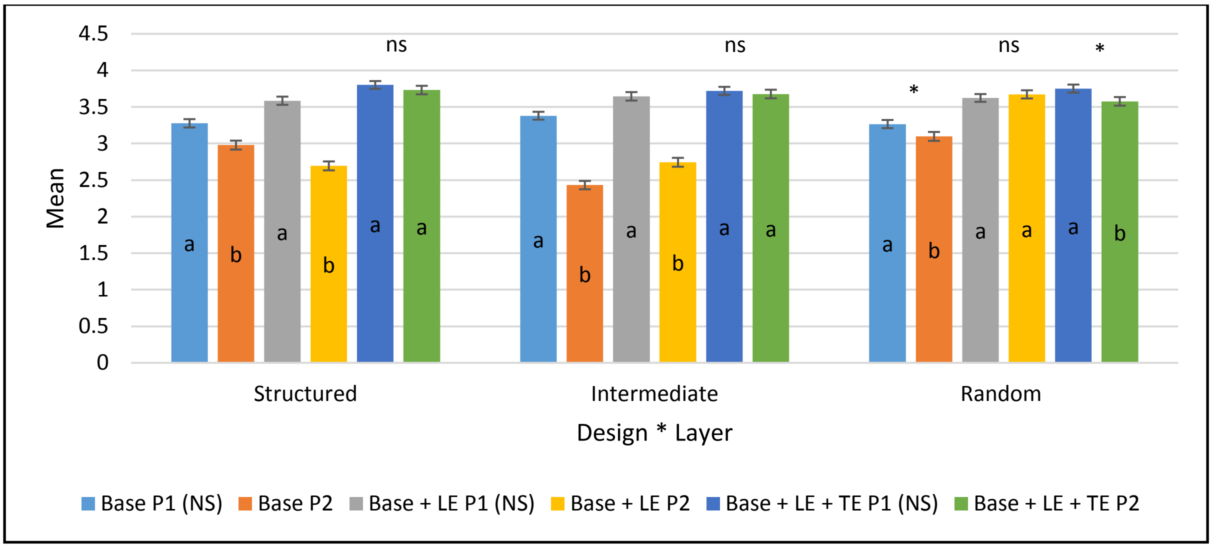


Figure 5.22: Effects of design (structured; intermediate; random) and vegetation layers (base; base and low emergent; base, low emergent and tall emergent) on respondent's perception of how attractive is the foliage. (Phase 1 [P1]: n=417 ; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each design*layer*

Figure 5.22 gave the impression of steadiness coming from random designs across all layers. However, random design within 1-layer showed a significant decrease in Phase 2. The combination between 2-layer and 3-layer planting with random design has also been depicted repeatedly that the impression it gives to both phases, especially phase 2, is almost unchanged if not better. The multilevel planting and density of the vegetation in random design plots helped produce the impression towards better-looking foliage.

ii. *Patterns between designs*layer*

3-layer across all design displayed no significant difference between phases. 1-layer and 2-layer between structured and intermediate design all showed a decrease in phase 2 in foliage attractiveness. This is similar to Figure 5.20 and figure 5.21, where the less number of layers and a more clumped design would give a patchy look in the plots. Mostly if any species did not survive and grew very slowly. Random design lessens the patchy look effect because the surviving and non-surviving species were planted next to each other and the surviving species would cover space due to no growth. The plots would still look full and has a variety of colours in it. All the most complex ones are the most preferred in terms of foliage attractiveness

5.4.3. Question 6: How disorderly or messy is it?

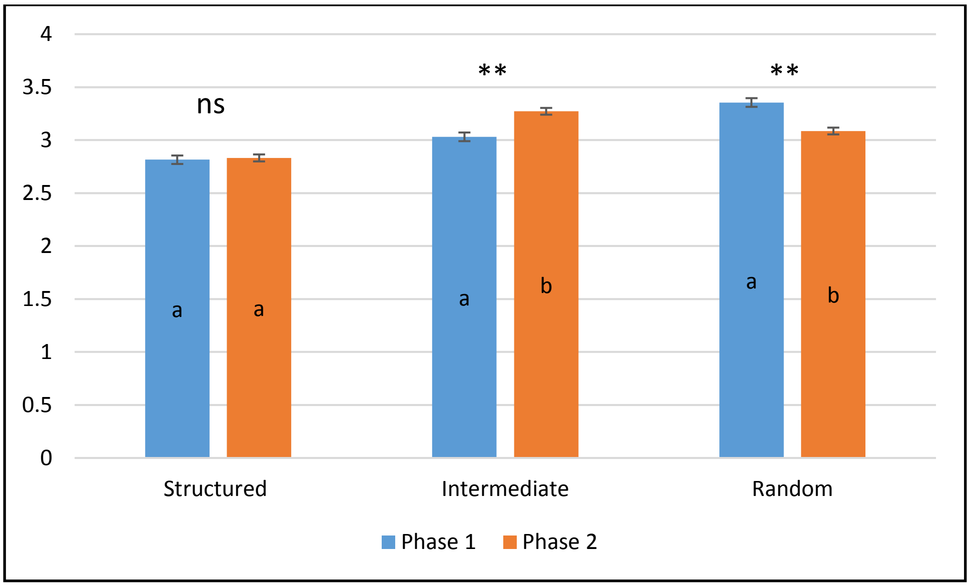


Figure 5.23: Effects of designs (structured; intermediate; random) on the respondent's perception of how disordered or messy it is in the plots. (Phase 1 [P1]: n=417 ; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each design*

Figure 5.23 depicted a difference between phase 1 and 2 except for structured design in each design. The respondents looked at the level of messiness and disorderliness of structured design as the same at any time. It did not change through time progression. However, the intermediate design was less messy in phase 1 but was perceived as more disordered and messier in phase 2. As the plantings in the plots grew mature, the level of messiness in the respondents' eyes was higher. However, the random design was perceived as messy in phase 1 however was less messy as the time progressed and made the respondents felt that it is not as messy as it was when the plantings were smaller and younger.

ii. *Patterns between designs*

In between designs, we can observe that structured design is the least disordered and messy in both phases. Random was seen as the messiest in phase 1, but in phase 2, intermediate design rose as the messiest and most disordered after 12 months of planting. This means that the respondents did not think that intermediate design was growing to be the nicest looking plots because of the unevenness of the growth, it caused the outlook of the plots to be messy and unattractive.

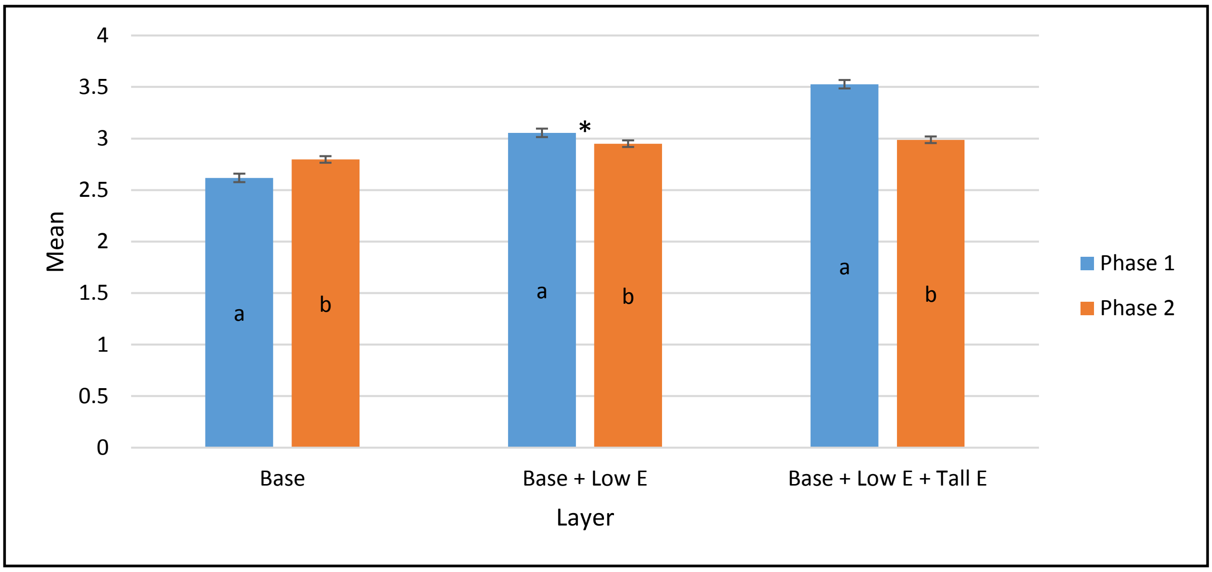


Figure 5.24: Effects of vegetation layers (base; base and low emergent; base, low emergent and tall emergent on the respondent's perception of how disordered or messy it is in the plots. Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each layer*

Base only layer (1-layer) in figure 5.24 showed that in phase 1, the base layer was perceived as less messy but as the time progresses, the plots with base only layer looked messy and disordered. However, it is still considered the least messy if we compare it with other layers.

2-layer (base + Lower emergent) showed a small difference in phase 2 when the respondents felt less messy in phase 2. With two different heights, the layers looked better when they are matured and taller. There is clear segregation between the layers that made them slightly less messy.

3-layer (base + Lower emergent + tall emergent) was perceived as the messiest in phase 1, in phase 2, upon a flowering time the respondents thought of them as so much less messy. They are also perceived as almost similar to 2-layer. The decrease from phase 1 to phase 2 was very dramatic. 3-layer vegetations were growing to be more colourful and attractive, making them look less messy although the number of layers is more complex and denser.

ii. *Patterns between layer*

It can be seen that the less the number of layers, the less messy and disordered it is. The base is the least messy and also because of this. It gave the less crowded look to the respondents. 3-layer plantings, however, remained as the messiest and disordered amongst all three layers. The complexity of the 3-layer dynamics causes messy looking plants. However, despite perceiving them as messy at the beginning of the study, the respondents felt less messy and more attractive as it fused.

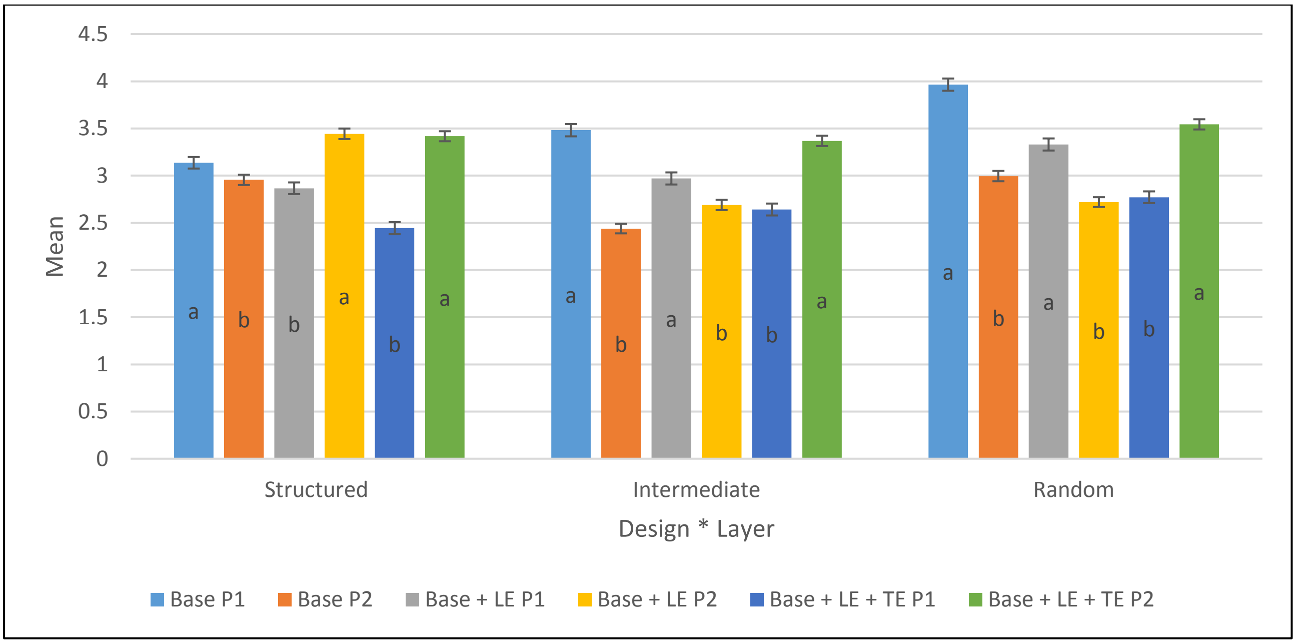


Figure 5.25: Effects of vegetation layer (base; base and low emergent; base, low emergent and tall emergent) within the design (structured; intermediate; random) on respondent's perception of how disordered messy it is in the plots. Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each design*

The difference between the designs lies in how much they rose, or they fell. In the structured design, when there is more than 1-layer in the plots, 2-layer and 3-layer, the respondents felt that in phase 1 were less messy and messier as they grew older.

The Intermediate design showed a tremendous difference in 1-layer and 2-layer. Phase 1 showed that they were perceived as messier, and at phase 2, the viewpoint changed to less messy, especially for 1-layer. 3-layer within this design showed that the more complex the layer and design is, as a combination, it looks messier.

The same thing happened to random design plantings were by the same pattern occurred. 1- layer and 2-layer in phase 1 were high but in phase 2 decreased tremendously. The 3-layer within the random design, however, showed an increment. The most complex design was hypothetically thought to be the most disordered and messy. Indeed that is what the respondents felt with this combination. Plantings at three different height arranged in a random design gave the messiest outlook.

ii. Patterns between designs

For design across layers in figure 5.25, all layers experienced steep decrease except for three layers within all designs. It can be seen that 3-layers for all design have a significant increment between phase 1 and Phase 2. This means the more number of layers the respondents perceive the messier and disordered them.

5.4.4. Question 7: Does it look cared for?

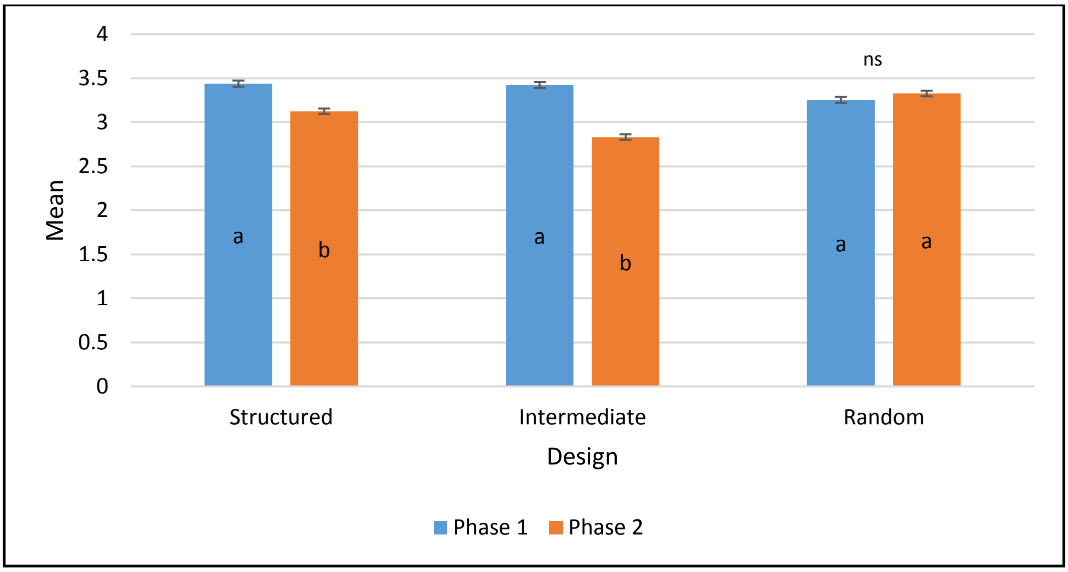


Figure 5.26: Effects of design (structured; intermediate; random) on respondent's perception of whether the plots looked cared for (Phase 1 [P1]: n=417; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. Differences within each design

Figure 5.26 shows that structured and intermediate design exhibited the same pattern. In phase 1, they both scored higher than the random design. The respondents felt that structured and intermediate design looked much cared for compared to random design. However, in phase 2, both designs drastically decreased, with intermediate more than structured. The random design, however, did not change between the phase. The respondents felt the same about random design, and they perceived it as being cared for even 12 months after planting.

ii. Patterns between designs

Although the random design was the least design that looked cared for in phase 1, in phase 2 the respondents maintained their perception of random design, whereas the other two designs were perceived as less cared for. This was most likely because, in phase 2, most structured and intermediate plots have patches of bare soil due to species that did not survive or grew well. This would give the impression that those plots were not taken-cared of. Unlike random design that has many species at every meter square and has no particular pattern in terms of spatial arrangement, the plots would always look full and has a lesser amount of bare soil that can be seen.

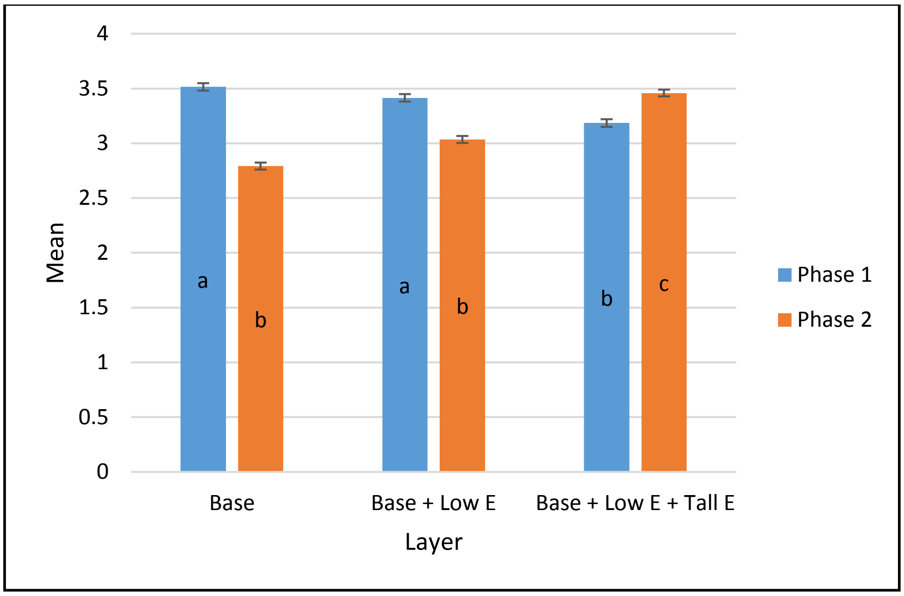


Figure 5.27: Effects of vegetation layers (base; base and low emergent; base, low emergent and tall emergent) on respondents' perception of whether the plots looked well cared for. (Phase 1 [P1]: n=417 ; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i) *Differences within each of the three-layer types*

Based on figure 5.27, in phase 1, the base layer only (1-layer) were perceived as the most cared for, followed by 2-layer plantings and the least cared-for is the 3-layer. In phase 2, this pattern turned the other way around. 3-layer plantings were the most cared for. Base layer only showed the most dramatic decline between the three types of layers. 2-layer also declined in phase 2 but much less than 1-layer only plots. The respondents felt that 3-layer were much looked after for in phase 2. Especially with understorey and mid-level layering that filled the whole plot with a variety of colours.

ii) *Patterns between the three-layer types*

The only layer that showed a positive response toward the plantings is the 3-layer plantings. As the number of layers increases, the more attractive the plots are looking, especially when combined with complex variables. As the 3-layer grew, more and more flowers bloomed and gave a much colourful and pretty look at the plots.

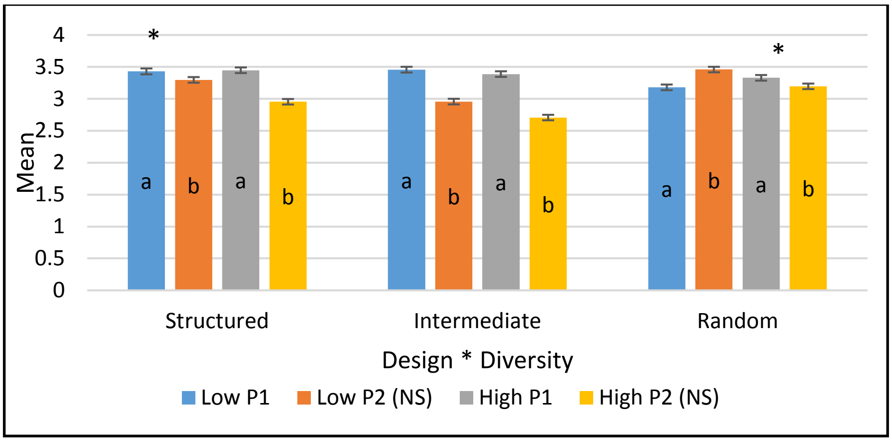


Figure 5.28: Effects of diversity (low; high) within vegetation layers (base; base and low emergent; base, low emergent and tall emergent) on respondent's perception of whether the plots looked like it is taken care of (Phase 1 [P1]: n=417; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each design*

What is clear in figure 5.28 is that low and high diversity within random design behaves differently between phase 1 and phase 2. In Phase 2, the only combination that showed an increase in preference is low diversity in a random design.

There is also a highly significant difference between phase 1 and phase 2 (comparison) at both high and low diversity within the intermediate design. The declining of both diversity means that the respondents felt that despite diversity levels, the intermediate design looked to lack stewardship, and this was mentioned in individual variable results of intermediate design (Figure 5.25).

ii. *Patterns between designs*

Across designs, in phase 2, both low and high diversity showed no significant difference between each other. This means that after the flowering phase, the diversity level effect had somehow faded and less distinguishable. There is a difference within the unique design itself, but there is no difference between the designs on which one looked more cared for between the two diversities.

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5.4.5. Question 8: Does it look tidy?

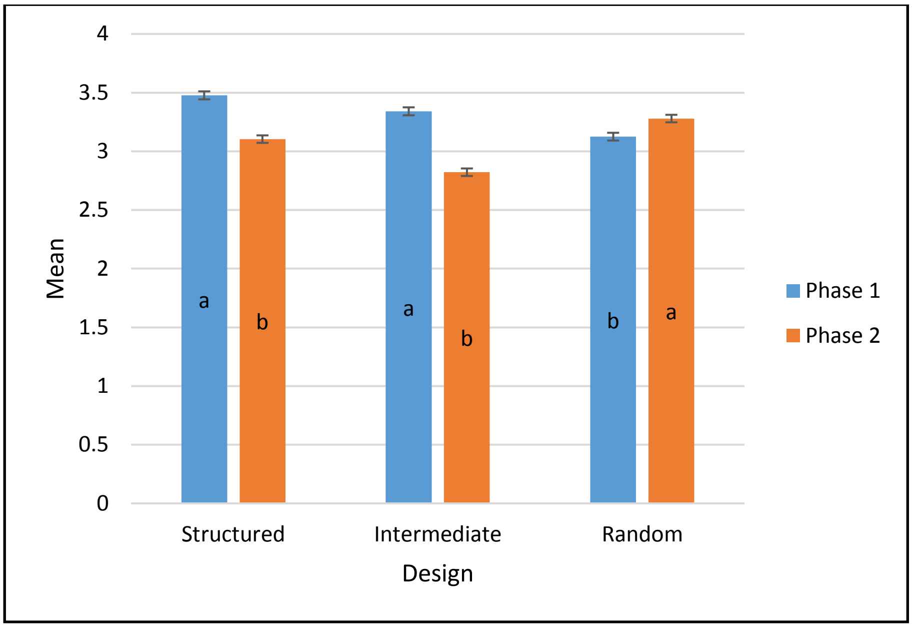


Figure 5.29: Effects of designs (structured; intermediate; random) on the respondent's perception of the plots' tidiness. (Phase 1 [P1]: n=417 ; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each design*

According to figure 5.29, the structured design started strong in phase 1. It However decreased in phase 2 alongside with intermediate design. The random design was the other way around were in phase 2; it rose better than during phase 1. This indicated that in phase 1, the structured design was perceived as the tidiest and hypothetically we would expect the same for structured design in phase 2. This is not the case when the respondents actually felt in phase 2, the random design was much tidier than structured and the least clean design which is intermediate.

ii. *Patterns between designs*

Between all designs, the random design is the steadier design in both phases. At younger and vegetative phase, the random design although deemed as the least tidy, it wasn't that far off from the other two but because of the dramatic decrease with structured and intermediate design at phase 2, and the random design increased a little showed that the fluctuation in random design has a smaller amplitude and proven to be more stable. During the flowering season, the random plots, although having multiple layers or diversity, would be perceived as very tidy due to the spatial arrangements and the impact it gives to tidiness impressions.

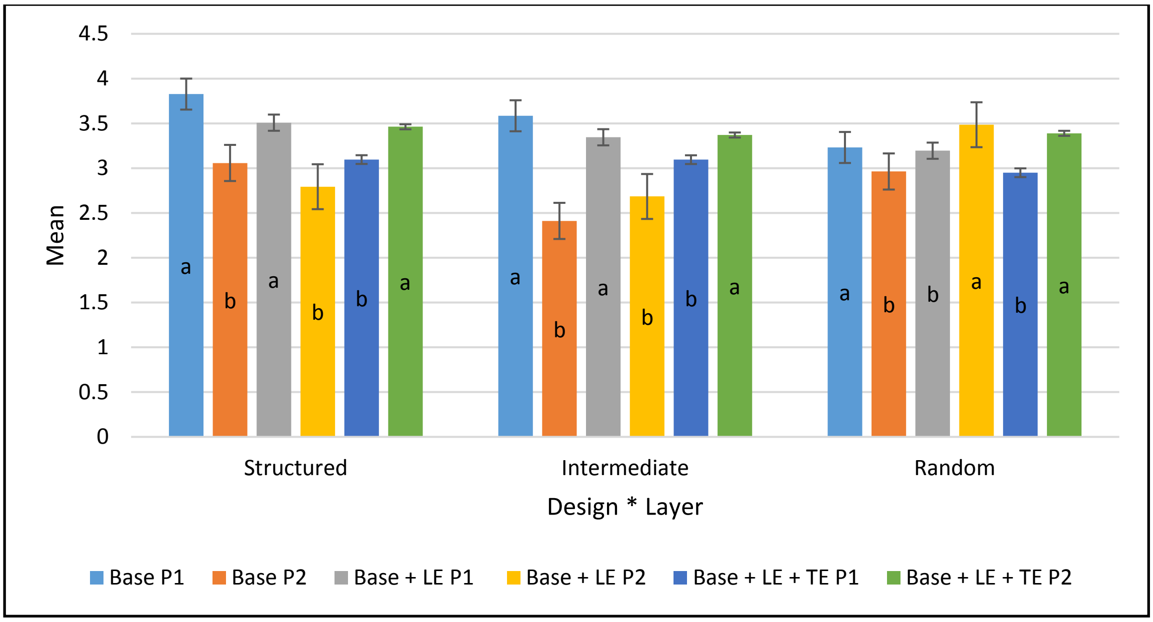


Figure 5.30: Effects of designs (structured; intermediate; random) within vegetation layers (base; base and low emergent; base, low emergent and tall emergent) on respondent's perception of tidiness of the plots (Phase 1 [P1]: n=417 ; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each design*

When we looked at combinations between design and layers (figure 5.30), we observed in the structured design, 1-layer and 2-layer both declined in phase 2. 1-layer was perceived as the tidiest in phase 1 3-layer the least. However, in phase 2, 2-layer was seen as the least tidy and 3-layer rose as the tidiest. This pattern was repeated similarly within the intermediate design. In random design, only 1-layer decreased over time. 2- and 3-layer both showed an incline as time progresses. The more complex the layers are in phase 2, the more it will stand out as the tidiest looking plots.

ii. *Patterns between designs*

The probability of intermediate being the least tidy in phase 2 is because the respondents could not distinguish the intermediate design. The intermediate design was designed as a combination of structured and random design. In the respondents' eyes, the intermediate would have more patchy parts of the plots that have more bare soil area and consist of a variety of species placed here and there. This confusion causes untidiness that was not seen earlier in phase 1. All designs mainly showed a positive effect when combined with all 3-layers planting. When all other layers decreased over time, the 3-layers was frequently perceived as tidy looking plots. 3-layers individually and when combined with any designs would have a positive impact on respondents.

5.4.6. Question 9: Does it look natural?

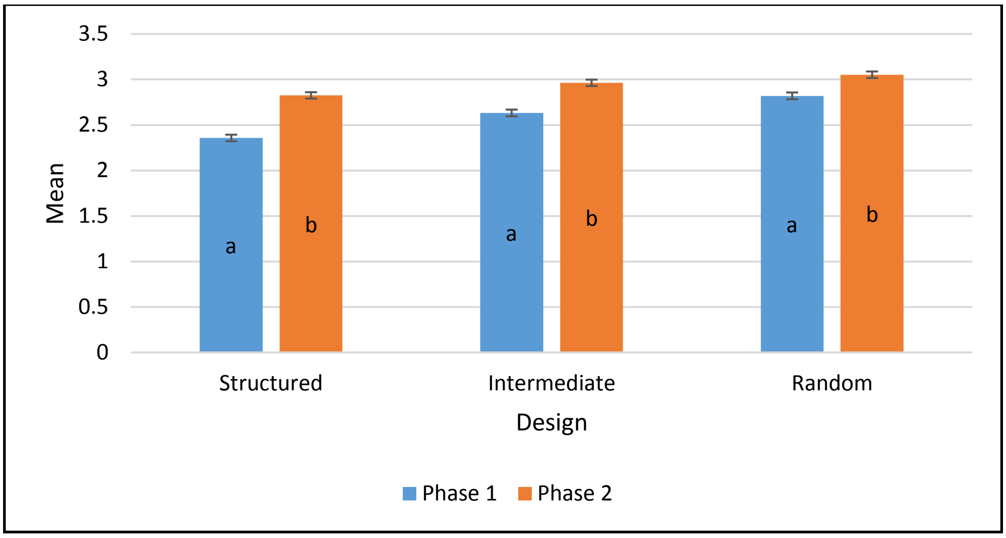


Figure 5.31: Effects of designs (structured; intermediate; random) on the respondent's perception of the plots' naturalness. (Phase 1 [P1]: n=417 ; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each design*

All designs across the board in figure 5.31 had the same pattern with the highest score for the most natural-looking plots. The least natural-looking plots are structured design, and the most natural-looking is random design as has been hypothesized. The random designs were plots that do not have any apparent pattern or apparent repetitions, and this very much resembles the natural standing plants that are commonly found in secondary jungles or the rural areas in Malaysia.

ii. *Patterns between designs*

The random design had the least difference between both phases. What this interprets is random design plots were seen as natural-looking at this did not change much. Nevertheless, as time progresses, the random design was filled with many species, and these arrangements seem to give the best rate of growth for the plants. Being randomized and all jumbled up, this design would make the small understorey forbs to flourish thanks to multi-layered planting and multi-coloured plots that came out looking very natural.

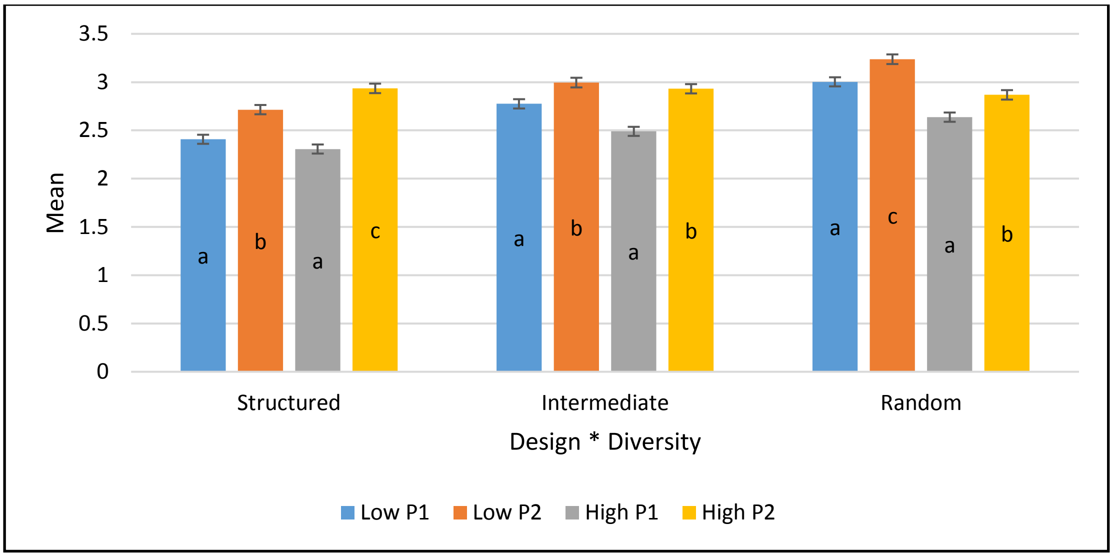


Figure 5.32: Effects of diversity (low; high) within vegetation layers (base; base and low emergent; base, low emergent and tall emergent) on respondent's perception of naturalness of the plots (Phase 1 [P1]: n=417; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each design*

In Figure 5.32, the structured design showed the changes between low and high diversity in phase 1 and phase 2. In phase 1, there was no significant difference between the diversity. However, it becomes apparent that high diversity in phase 2 was the most natural-looking plots amongst structured design. Intermediate, however, had no significant difference between the diversity levels. Phase 2 for intermediate looked much more natural than phase 1.

However, the random design exhibited lower diversity was a lot more natural-looking than the higher diversity in both phases. This would most likely be due to the density of the lower diversity plots. They are somewhat denser and dominated by the less amount of species which also would mean fewer competitions. These plots grew very well and were more prominent, particularly looking more natural because of the plots' randomized design.

ii. *Patterns between designs*

Between designs, each design has different patterns but it can be concluded that overall, it showed phase 2 looking more natural than phase 1. The only difference between the designs is the pattern shown by random design, particularly the lower diversity looking more natural than higher diversity.

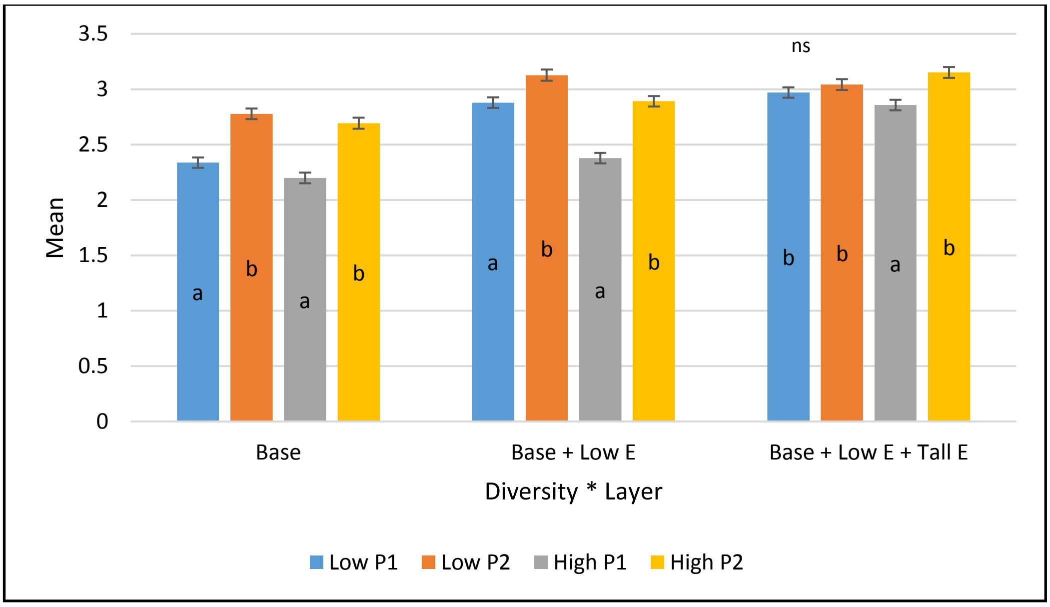


Figure 5.33: Effects of diversity (low; high) within designs (structured; intermediate; random) on respondent's perception of naturalness of the plots (Phase 1 [P1]: n=417 ; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each layer*

It can be observed in figure 5.33, that base only layer (1-layer) and base + lower emergent (2-layer) have the same patterns, which is both of the layers have an increment in phase 2. Low diversity was much more natural towards phase 2, more than the higher diversity, especially for 2-layer plots.

3-layer plots have no difference between lower diversity in phase 1 and 2. The respondents looked at them both as natural despite being young or a more mature vegetations. There is also a small change within the higher diversity in 3-layer plots. 3-layer plots are perceived continuously as natural due to the outlook of fullness and denser-looking plots. Thus, it always appeared as more natural.

ii. *Patterns between layers*

Overall, 3-layer is the most natural-looking layers. The more layers there are, the more natural it looks to the respondents. It is less natural-looking in phase 1 and more natural in phase 2 because of the density of the vegetation's whole look. When they are in a vegetative stage, they are much smaller and less natural.

5.4.7. Question 10: Does this plot look crowded?

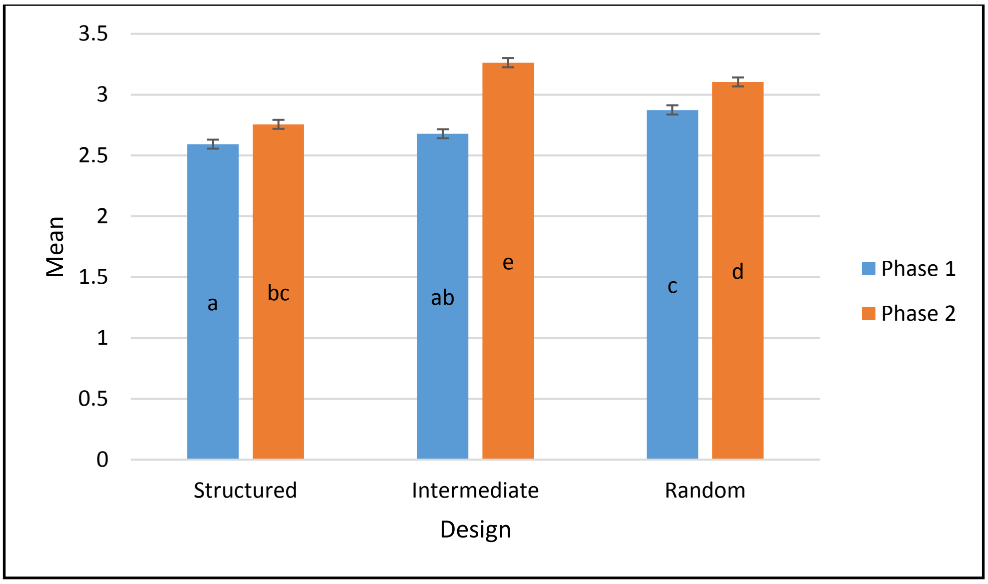


Figure 5.34: Effects of designs (structured; intermediate; random) on the respondent's perception of how crowded are the plots. (Phase 1 [P1]: n=417 ; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each design*

Figure 5.34 from phase 1 to phase 2 plots looked slightly more crowded when the vegetation was mature and more prominent. This is similar for intermediate and random design. However, the intermediate design rose significantly higher more than the other two designs. This indicated that the respondents felt that intermediate was much more crowded as the time progress. The difference is apparent between both the phase. Random also had growth in the bars in the second phase. Overall, respondents naturally perceived all designs as more crowded in phase 2 with leaves touching each other and filling up the plot boxes as it grows denser.

ii. *Patterns between designs*

We can observe that between designs in phase 2, the intermediate design was perceived as the most crowded amongst the designs. This is also very clearly more crowded than when it was in phase 1. Intermediate design is often misinterpreted and harder to distinguish. The arrangements are neither rigid nor too random. Thus this confuses the respondents. This design also grew the least attractive, according to the respondents due to the same reason. The interaction between species is also not positive as there are more bare soil and less lushness in the intermediate design. The outlook produced by this design is least attractive, and because of that, most likely, the respondents felt that most of them are more crowded, which usually is a negative notion. Although hypothetically we would expect the random design to be the most crowded looking design, the respondents felt that it is not as crowded as the intermediate design. Structured is the least crowded for both phases.

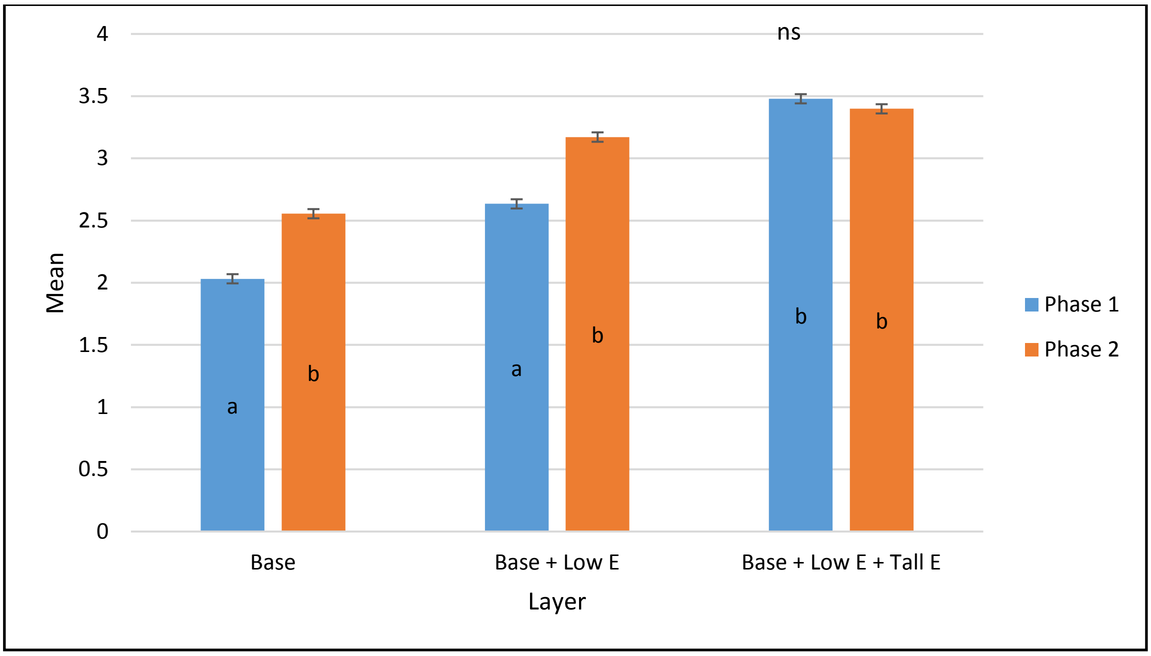


Figure 5.35: Effects of vegetation layers (base; base and low emergent; base, low emergent and tall emergent) on respondent's perception of how crowded are the plots (Phase 1 [P1]: n=417; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each layer*

Base (1-layer) and base + Low emergent (2-layer) showed increment from phase 1 to phase 2. This means the respondents perceived that the flowering phase (phase 2) looked much crowded than the vegetative stage with 2-layer more crowded. This is logical as there is more number of species in 2-layer. The 3-layer (low emergent and tall emergent) however showed no significant difference between the phases. Nevertheless, the 3-layer is perceived as the most crowded amongst the layers. The more complex the layers are, the more crowded they look.

ii. *Patterns between layer*

As a whole, the more number of layers, the more crowded they look. Thus complexity plays a role in making them look less crowded. However, it should be noted that the 3-layer did not have any difference in how they looked at them. The bar should hypothetically be higher in 3-layer plantings but what happened was the respondents felt that the 3-layer was not more crowded than the level it was in phase 1.

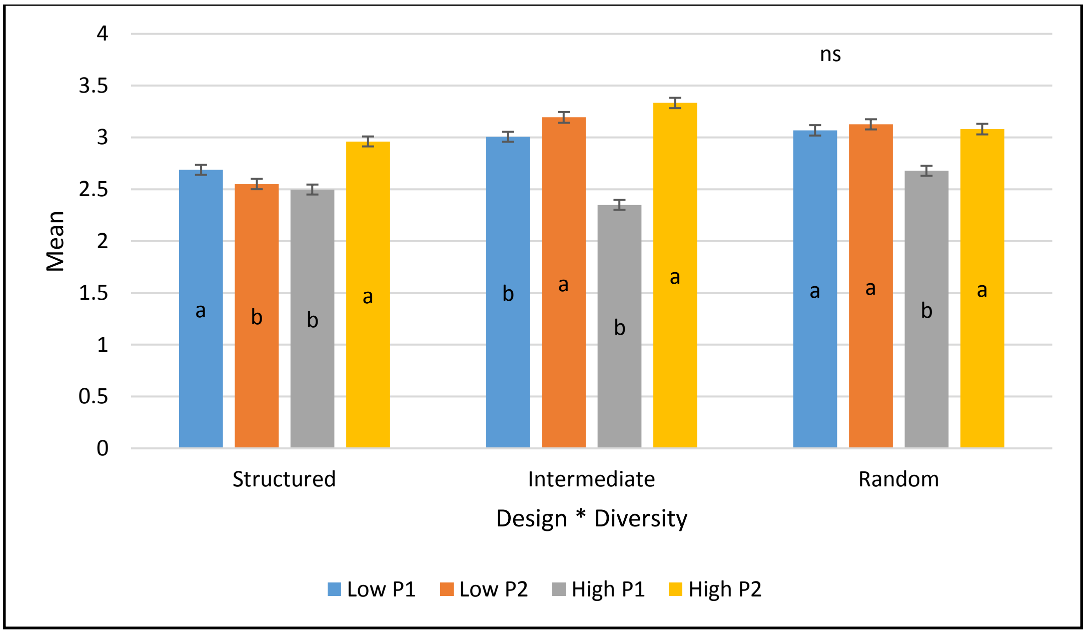


Figure 5.36: Effects of diversity (low; high) within designs (structured; intermediate; random) on the respondent's perception of how crowded are the plots. (Phase 1 [P1]: n=417 ; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each design*

What is observed in figure 5.36 is structured design exhibited low diversity was seen as less crowded in phase 2, and high diversity was perceived as more crowded. An intermediate design, however, both diversity showed an increment in phase 2, but high diversity rose dramatically from phase 1 that was the least crowded across the whole graph. The random design was also showing the addition to the way the respondents perceived its crowdedness. There was no difference between the low diversity in both phases.

ii. *Patterns between designs*

As can be observed, the most crowded combination between design and diversity is the high diversity in intermediate design, and the least crowded is low diversity in structured design. As expected, the structured design is the most well-arranged, and its self-explanatory name means that the respondents felt that this design at low diversity is less crowded than the others. The high diversity within the intermediate design, however, impacted the crowdedness level with most species. Intermediate design's vegetation is always perceived negatively, including the most crowded.

5.5. Effect of the plots on the respondents' feelings.

5.5.1. Question 11: Do you find the planting in THIS plot appropriate?

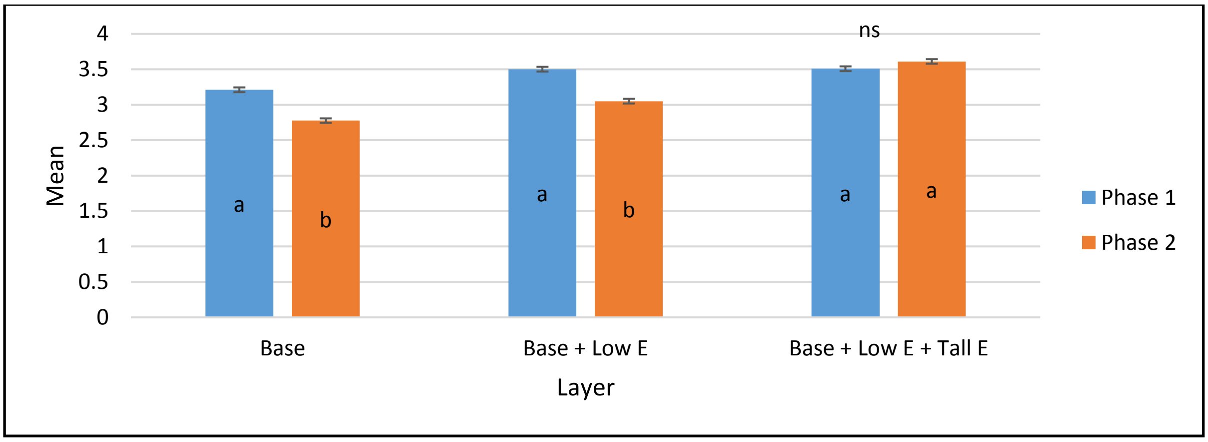


Figure 5.37: Effects of vegetation layers (base; base and low emergent; base, low emergent and tall emergent) on respondent's perception of the appropriateness of the planting in the plots (Phase 1 [P1]: n=417; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each design*

Figure 5.37 structured design the respondents felt that phase 1 is more appropriate than planting in phase 2. This is the same case with intermediate design. An intermediate design of the second phase is even less appropriate than the others. The random design, however, was perceived similarly in both phase 1 and 2. This could also be indicated that random design is frequently appropriate in the eyes of the respondents.

ii. *Patterns between designs*

Between designs in figure 5.37, it can be observed that intermediate design is the least appropriate amongst all the designs in phase 2 and the most appropriate to the respondents is the random design. The intermediate design was reduced dramatically as compared for the others. This was most likely because of a lack of clarity in terms of design. The respondents felt no clear concept over intermediate's spatial arrangements, especially in phase 2. It is not rigid and manicured design and is neither the most randomized design between the species. Thus, the respondents were not resonated towards this design. There was no difference between the designs in phase 1.

i. Differences within each layer

Figure 5.37 has a similar pattern to figure 5.36. There are differences between phase 1 and phase 2 for 1-layer (base) and 2-layer (base + lower emergence) with phase 2 being less attractive than phase 1. This indicated that the less number of species in the plots, the less appropriate they are to the respondents. Especially across time, the reductions meant that it was more appropriate when they were younger and smaller, however as the plants got more significant, they looked more inappropriate then before as planting in a public park. 3-layer (base + lower emergence + tall emergence) was seen as the most appropriate amongst the three types of plantings. There is also no difference between phase 1 and 2. They are repeatedly perceived as the most appropriate. The logic is with more layers, and there will be more species and different colours, making it very aesthetically attractive and appropriate, even at the vegetative stage.

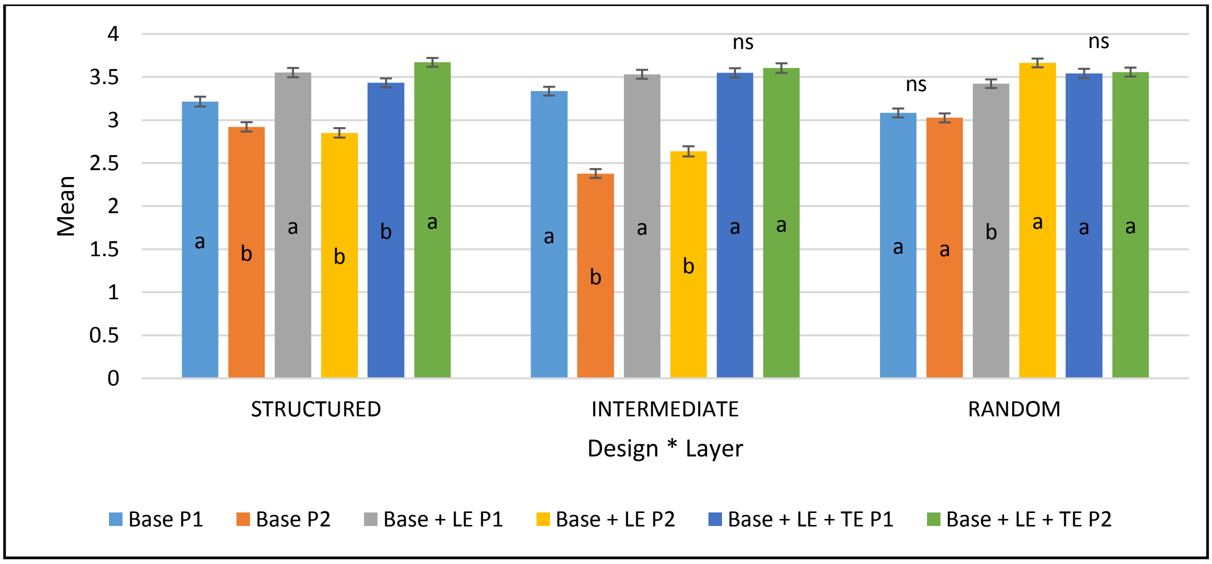


Figure 5.38: Effects of designs (structured; intermediate; random) within vegetation layers (base; base and low emergent; base, low emergent and tall emergent) on respondent's perception of the planting's appropriateness in the plots. The mean difference is significant at the 0.05 level. (Phase 1 [P1]: n=417 ; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. Differences within each design

Figure 5.38 depicted that within the structured design, the 1-layer (base) and 2-layer had shown reductions in phase 2. However, 3-layer showed an increment in terms of appropriateness of the layers within the structured design. This means the combination of structured and random design is seen as appropriate. This is also the same with intermediate design. Within the intermediate design, the 1-layer (base) and

2-layer decreased dramatically to the bars' lowest point. 3-layer plantings, however, was seen as similarly appropriate in both phases when compared between layer types. The random design, however, was the best combinations between the layers and designs. 1-layer and 3-layer within the random design were perceived as having no difference between the phases. 2-layer showed an increment in phase 2, making the 2-layer and random design as the most appropriate of them all.

ii. *Patterns between designs*

Random design is the most appropriate between all designs and within layers. This is due to the colours' attractiveness, and although it is random, it is also considered appropriate and not too disordered.

5.5.2. Question 12: How does the plot make you feel?

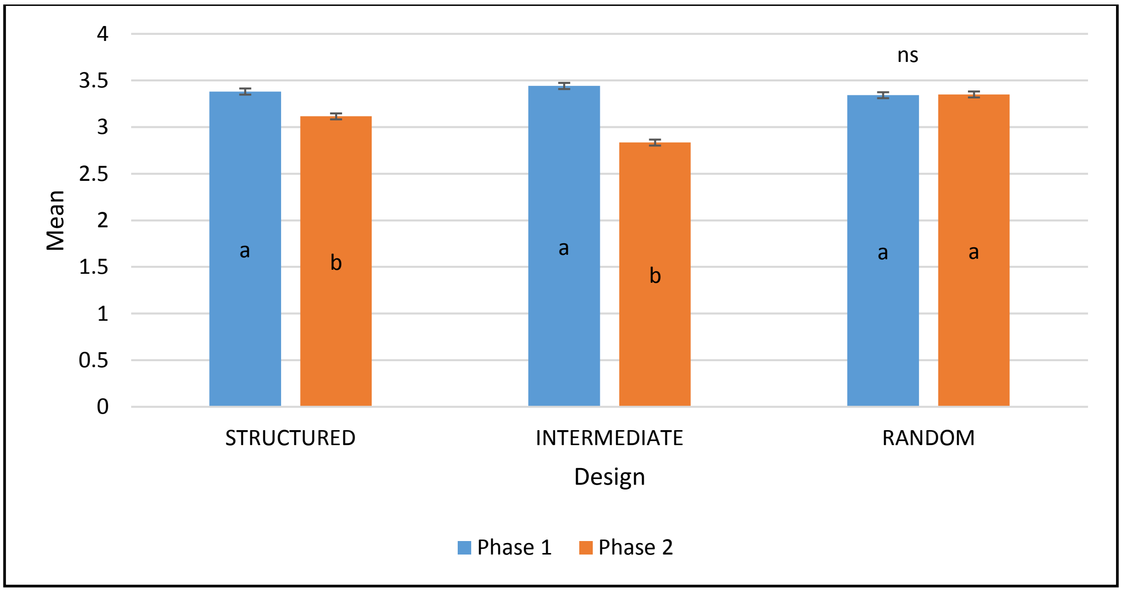


Figure 5.39: Effects of designs (structured; intermediate; random) on respondent's perception of how the plots make them feel (Phase 1 [P1]: n=417; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

The bars explained on how the plots made the respondents feel when they looked at the plots depending on the variables (design, diversity and layer) and combination of variables. The scale ranges from feeling very stressed (1) to very relaxed (5).

i. *Differences within each design*

Figure 5.39 showed that the structured and intermediate design made the respondents feel less relaxed as time progressed. In phase 1, the intermediate design is the design that made the respondents feel most relaxed. However, in phase 2, the intermediate design went down drastically to the design, making the respondents least relaxed or stressed. The structured design was also reduced, but it was better than the intermediate design. However, the random design made the respondents feel the same way they did in both phase 1(vegetative) and 2 (flowering). Although the plantings have matured and grew closer to each other, the respondents still felt relaxed when looking at it.

ii. *Patterns between designs*

Just as the random design has frequently shown all the respondents' positive attributes, this aspect is no exception. Random design is the most attractive and has positive effects on respondents. The spatial arrangement is closest to nature and very naturalistic, but the respondents resonated very well with this design.

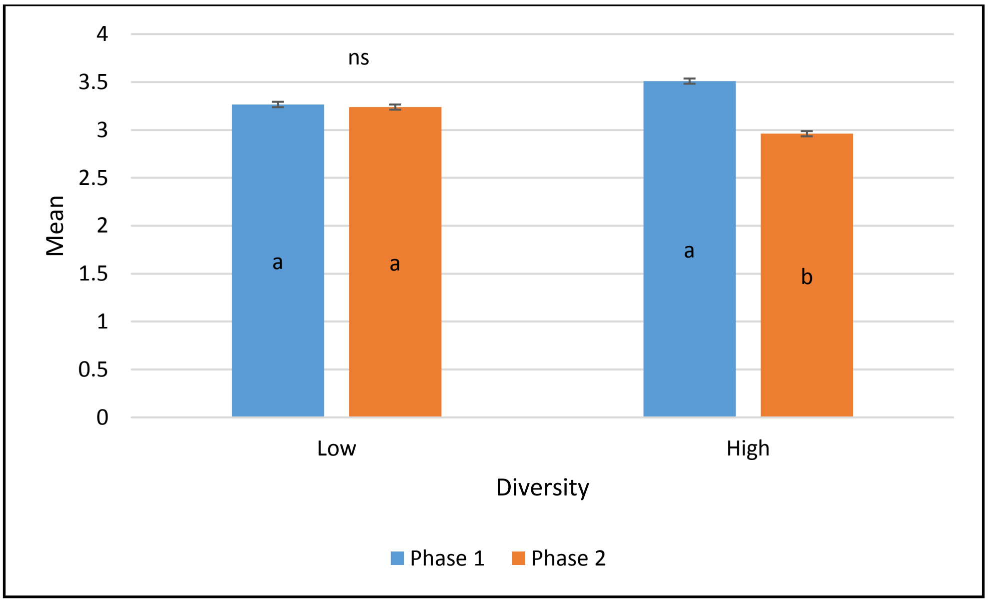


Figure 5.40: Effects of diversity (low; high) on respondent's perception of how the plots make them feel (Phase 1 [P1]: n=417; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

For the diversity variables, figure 5.40 showed that low diversity had no significant difference between phase 1 ad 2 in terms of how the diversity level (number of species) made the respondents feel. Unlike high diversity, it had a steep drop in phase 2 because it made respondents feel less relaxed and comfortable. With the multiple species' growth in higher diversity plots, the respondents might feel a little bit uncomfortable with the density difference between the vegetation. Another factor of high diversity plots was more competitions, making them grow smaller and shorter than the lower diversity that flourished and filled the plots beautifully.

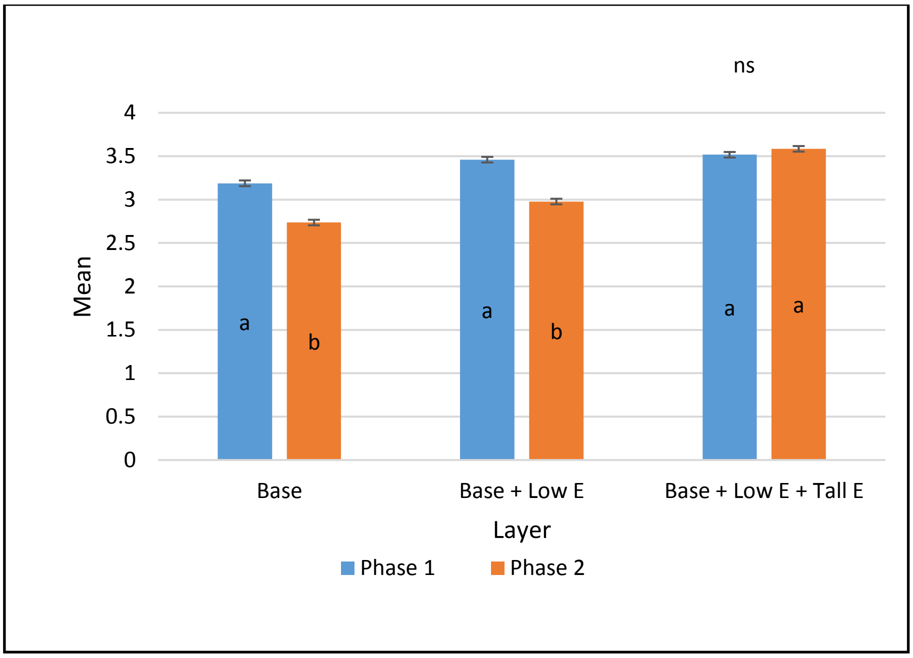


Figure 5.41: Effects of vegetation layers (base; base and low emergent; base, low emergent and tall emergent) on respondent's perception of how the plots make them feel (Phase 1 [P1]: n=417; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

Figure 5.41 depicted that 3-layer (base + low emergent + tall emergent) was displayed as having no significance between phases. Moreover, 1-layer and 2-layer are showing a slight drop in phase 2. Again, respondents' prefer 3-layer vegetation and this layering style is making them feel comfortable and happy. 3-layer vegetations have the most number of species at three different heights. So in the vegetative stage, although the plants looked small and young, the plots are filled with plants in it making it have less amount of bare soil. When it has grown, the flowers bloomed out, and the variety of colours made it more pretty and relaxing to look at.

5.5.3. Question 13: Do you like the design of THIS plot?

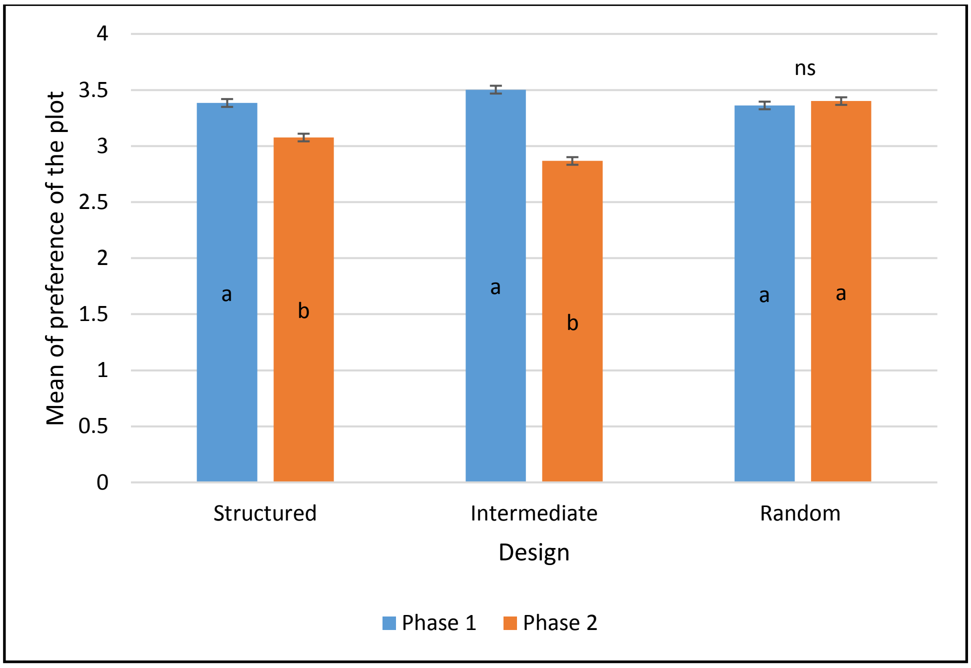


Figure 5.42: Effects of designs (structured; intermediate; random) on respondent's perception of whether they like the design of the plots (Phase 1 [P1]: n=417; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each design*

Structured and intermediate designs both showed a similar pattern (figure 5.42). They both had a reduction in phase 1, but intermediate was less liked in phase 2 than structured design. However, the random design was well-liked similarly in both phases and showed no decrease in interest with the respondents.

ii. *Patterns between designs*

Between designs, the random design scored the highest frequently because they are arranged in a random way that makes the variety to look like there are more number species and enormously once they have grown more significant, the colours and natural flow of colours made it more attractive and respondents resonated to this design. The design is a bit confusing for the intermediate design, primarily once they have grown mature. The 'inbetweener' character of this design causes respondents to be torn, and some might not choose this design as the design they like most.

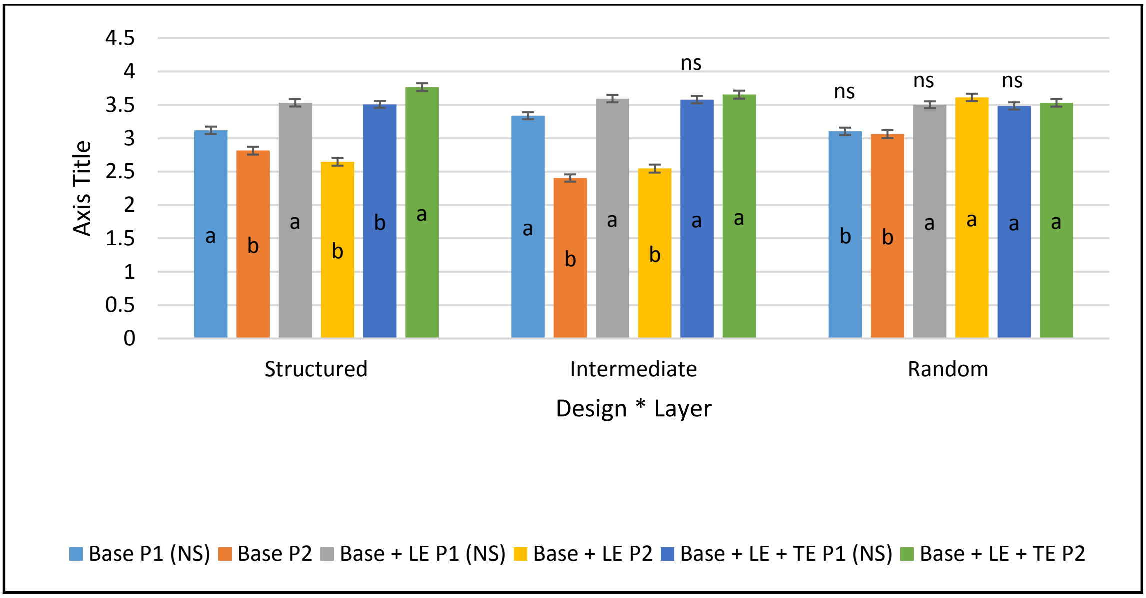


Figure 5. 43: Effects of vegetation layers (base; base and low emergent; base, low emergent and tall emergent) within designs (structured; intermediate; random) on respondent's perception of whether they like the design of the plots (Phase 1 [P1]: n=417; Phase 2 [P2]: n=412). Error bars represent standard errors. Different letters denote significant differences between bars.

i. *Differences within each design*

Figure 5.43 showed that in structured design, there are differences between phase 1 and phase 2 for all layers. The constant pattern is that the respondents liked 1-layer and 2-layer in phase 1, but less liked it in phase 2. The 3-layer, however, was like better in phase 2. So post flowering, the 3-layer in structured design was well-liked.

An intermediate design, the reduction between phases for 1-layer and 2-layer is quite dramatic. They become less liked by the respondents, particularly for 1-layer plots of intermediate designs. 3-layer, however, showed no difference between phase 1 and 2. The respondents liked the plots both the same way in phase 1 and 2.

The random design depicted that across all the layers, the respondents liked all the same. Either at phase 1 and 2. The random design was attractive and well-liked despite the size and maturity levels. This means that random design is an attractive design to be used. Although mentioned to be looking messier, the respondents tolerated them and even attracted to the colour combinations' randomness.

ii. *Patterns between designs*

Between designs, it can be observed that the respondents prefer the random design, and it has to be noted here that all 3-layer plots within all designs are also well-liked by respondents. They are always more positive as they grow, and combinations between 2-layer and rando design were the most liked by respondents.

Table 5.9: Summary of significant demographic factors that influenced the respondents' response to variables (design, diversity and layers). (Highlighted are variables that are influenced most by three or more demographic factors)

Questions	Design	Diversity	Layer
Number of plants in the plots			Education Current status
Percentage of native species	Income	Education	Ethnicity Income
Ability to support wildlife	Education		
How attractive are the colour combinations?	Age Ethnicity Current status	Age	Age Education Current status
Appropriateness	Income Current status		Income Current status
How the plots make them feel (relaxed or stressed)	Age Income Current status	Age	Income Current status
Like the designs of the plots	Age Ethnicity Current status	Age	Income Current status
Foliage attractiveness	Age Ethnicity Education Current status		Age Income Current status
Disorder or messiness	Education Current status		
Does it look cared-for?	Age Ethnicity	Age	Income

	Income	
Tidiness	Age Ethnicity Income Current status	Income
Naturalness	Ethnicity Education	Ethnicity Education Current status
Crowdedness	Education Current status	Education Current status

*Current status : Employment status (e.g. employed/ not employed / retired / self-employed etc.)

*Income : Household income (eg. B40 – RM4000.00 or less , M40 – RM4001 – RM8500 & U20 – RM8501 or higher)

Table 5.9 depicted the summary of significant demographic factors that influenced the respondents' response to variables (design, diversity and layers). Highlighted are variables that are influenced most by three or more demographic factors. As can be observed, the variables that had a significant difference between demographic factors are design and layer. Demographic factors did not show much impact on diversity levels. In design variables, age, ethnicity, and current status were the demographic factors that constantly were impacting the way the respondents look at the designs. These factors affected the attractiveness of foliage and colour combination of the designs, its tidiness, naturalness, and whether they look cared-for. These factors also affected how the designs made them feel and whether they like the designs or not.

However, in layers, the demographic factors that significantly affected how the respondents looked at the different layers were age, education background, and current status. These factors differ when looking at these aspects: the attractiveness of foliage and colour combinations of the layers and the layers' naturalness.

The demographic factor that showed the most significant difference is the current employment status, age and household income. These demographic factors are mostly related. Age and employment status are correlated, and it directly also affected the household income of respondents. For example, when the age group falls in the 56 years-old groups onwards, most of them fall in the retired, non-employed or self-employed category this also would primarily make the household income less than when they were working (if they are retired or non-employed). With this current situation of respondents' demographic factors, the 56-year-old and older age group that is retired would look at the designs and layers differently than the younger respondents that are still working.

Age

Age factors showed a significant difference between the age group, particularly for the design variable. The 56-65-year-old group preferred random designs more than structured and intermediate designs. The 26-40 years old age group preferred structured design. This exhibited contradicting preferences according to different age group. The structured design is all about control and tidiness and looked cared-for (stewardship), which the working age group usually aims for. This is reflected in the choices that 26-40 years old age group made. They find that structured design is tidy and have attractive foliage and colour combinations.

This result also mirrors data in chapter 4 whereby the 56-65 and 65 years old onwards are the most frequent visitors of public parks, and they have seen this planting in the print media before as well as in other public parks compared to the younger age group whom only a small percentage were exposed to this style of planting before. The older these respondents are the more style of planting that they are exposed to. Thus, it was proven in this result that the older they get, the more natural-looking designs they like.

Ethnicity

The patterns for liking the design variable were evident where the Chinese ethnics preferred the structured designs and the Indian ethnics liked the random design best. The Malay were indifferent and showed no significant impact on the design, which is also the same for the Sabah and Sarawak ethnics. The Chinese and the Indians are the two ethnicities that are the most frequent visitors of the park, and they were used to looking at the vegetation in the research site (public park). The frequency of visits sets them apart from the other ethnics.

Current status (employment)

The retirees preferred the random design and 3-layers best. Meanwhile, the working class were preferring structured and 3-layers too. 3-layers were the type of layering that is a constant favourite by a significant percentage of the respondents. Retirees are more relaxed and grounded as compared to the working or self-employed group. It is quite natural for them to be liking the random design, a more natural style similar to what they have seen in other countries and print media. The working or self-employed group is mainly the younger generations, 26-40 years old and have a positive correlation. This also further explained why they like the manicured and structured style.

5.6. Conclusion

i. *Impressions of the composition of, and capacity of the plots to support wildlife*

The respondents felt that the plots with random design and 3-layer have the most number of plants and could support wildlife best. Diversity level was not significant in terms of giving the respondents any impressions of the difference between the levels. In terms of percentage of native species, in phase 1, the structured design in 3-layer looked as if they have the most native species however it changed in the flowering phase (phase 2) when random design in 3-layer is the most percentage of native species. This is correct because they are the same number of layers and the same species that are just arranged differently. This shows that when the spatial arrangements are different, the respondents' impressions also differ significantly, especially in question at different growth stages. The combination of random design and the flowers' multiple colours would make the respondents think there were more native species.

ii. *How attractive did the respondents find the plots*

The intermediate design was the most attractive colour combinations and foliage in the vegetative stage but at the end, post-flowering stage, the random design was dubbed as the most attractive in colour combinations and foliage and similar to the plots looking tidy and cared for. In phase 1, the structured design was chosen, but in the end, the random design looked cared-for and had the impression that it is tidier than the others. This is particularly interesting when hypothetically, the respondents think that the most structured would be the tidiest and looked-after. The respondent also felt that random design looked the most natural-looking plots. In the other part of the spectrum, there is the negative side of impressions in terms of disorderliness or messiness and crowdedness; at first, the random design was perceived as both crowded and messy. However, in the post-flowering phase, they are no longer perceived as such. It is now the intermediate design that is making them felt crowded and messy. This showed that as the random design plots grew and mature, the level of looking disordered and messy and crowded was reduced. The more flower they bear, the more ‘unmessy’ it becomes, and it is a *vice versa* situation with intermediate design. The intermediate design left the respondents confused because of the ‘inbetweener’ character of being in the middle between a random and structured design. The respondents could not quite catch the actual character, also, with this design not doing too well, especially when combined with high diversity and 1-layer. The growth was affected, thus affecting the whole outlook aesthetically.

In terms of diversity, the respondents felt that in the beginning, the high diversity with more number of species was the most attractive in colour combinations and foliage. This is the same for the plots with this diversity perceived as the tidiest and looking cared-for. They also were the most natural-looking and more crowded. This all changed in phase 2, whereby as they grow mature, the lower diversity was perceived as, the more positive on in all the aspects mentioned. They were more attractive and tidy. They look cared-for and more natural too. However, high diversity stayed as the most crowded and most disordered looking plots. High diversity that consists of 18 species gave the species more competitions amongst the species, making the plots less attractive partly because of the plots' empty patches. This tarnished the impressions.

The layering was between 1-layer, 2-layer and 3-layer. In terms of the attractiveness of colour combinations and foliage, looking very cared-for, most natural-looking and the tidiest, 3-layer had dominated both phases. Although it is deemed as tidy, the 3-layer is also the most crowded. This indicated that the most crowded might not a negative perception. On the other hand, the most disordered and messy is the 1-layer plots. It is noticed here that the 1-layer plots were lacking aesthetical values to the respondents, and they frequently felt that it is the least attractive. The 1-layer plots, although in combinations with different designs or diversity levels, were still insignificant to make an impact on the respondents.

iii. *Effect of the plots on the respondents' feelings.*

Respondent's feeling has a lot to do with what they think is appropriate, whether they like the plantings and how they made them feel. Design-wise intermediate design at the beginning was their favourite; however, things changed in the later stage of data collection. The random design was well-liked and preferred by the respondents and deemed to be most appropriate and made them feel relaxed and at ease. The random design was an endless choice across all aspects of the questionnaire. The respondents resonated very well with naturalistic style planting. This design also worked well with respondents when in combination with 3-layers and low diversity.

Diversity level had also change across the phase. Phase 1 showed that the respondents preferred high diversity plots. The number of species was more in these plots, making it look fuller and more colourful during the vegetative stage. As time progressed, the high diversity had more competition amongst the species, making it look different and not as pleasing and relaxing to look at anymore compared to low diversity. Lower diversity grew well and filled up the plots, making them more appropriate in the respondents' eyes, and it also made them feel relaxed and liked it better. Lower diversity plots, when combined with designs and layers, achieved a much more attractive outlook. The respondents exhibited a constant favourite in 3-layer plantings. In both phases, they preferred and liked 3-layer designs. They also think that this type of layers with base, lower emergent and tall emergent made them feel more relaxed and appropriate to be planted in a public park setting.

CHAPTER 6

INTERPLOTS CORRELATIONS & FACTORIAL ANALYSIS ON EFFECT OF BEHAVIOUR TOWARDS PLOTS

6. Introduction

In chapter 5, the results of how the respondents responded to the plots were presented based on the two phases of data collections period. Phase 1 was one month after planting, and phase 2 was 12 months after planting. The respondents' preferences towards the 2D spatial and 3D layer designs and diversity were clearly shown. To explore these data further, in chapter 6, we will be looking at correlations between all the questions regarding the plots and analysing the factors involved in the decision-making in the surveys. Three main factors were identified that affected the respondents' choices through running principal component analysis (PCA). Regression between the components and aspects of the questions in 'The Plot' section (Question 10: refer questionnaire in appendix i) were plotted as graphs to show changes between phase 1 (P1) and phase 2 (P2) in terms the intrinsic characteristics of the respondents and how they assessed the planting design on the research site.

6.1. Correlations between questions related to the research plots (Question 10).

Table 6.1 illustrates the correlation between responses to the 13 questions in the questionnaires during the survey process. These questions were analysed using SPSS Ver. 24 by running the Pearson correlation based on the overall answers (from raw data) in question 10 (a-m) 'The Plots' section (refer questionnaire in appendix). The mean scores for answers within 'The Plots' section (which consists of 13 sub-questions (Q1-Q13) were correlated with the mean scores for the same questions to see if there were any patterns, which would suggest that there might be some association between the responses to different questions(i.e., naturalness, tidiness, crowdedness, and the attractiveness of colour combinations).

Table 6.1: Interplot correlation (Pearson) summary of respondents' perception of the research plots.

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13
Q1	ns	.841 **	.905 **	.809 **	ns	ns	ns	.846 **	.828 **	ns	ns	ns	.894 **
Q2	.841 **	ns	.821 **	ns	ns	ns	ns	ns	.832 **	ns	ns	ns	.908 **
Q3	.905 **	.821 **	ns	.928 **	ns	.924 **	.877 **	.950 **	.812 **	ns	ns	.825 **	.865 **
Q4	.809 **	ns	.928 **	ns	ns	.903 **	.887 **	.976 **	ns	ns	ns	ns	ns
Q5	ns	ns	ns	ns	ns	.914 **	.939 **	ns	ns	ns	ns	ns	ns
Q6	ns	ns	.924 **	.903 **	.914 **	ns	.971 **	.922 **	ns	ns	ns	ns	-.800 **
Q7	ns	ns	.877 **	.887 **	.939 **	.971 **	ns	.885 **	ns	ns	ns	ns	ns
Q8	.846 **	ns	.950 **	.976 **	ns	.922 **	.885 **	ns	ns	ns	ns	ns	ns
Q9	.828 **	.832 **	.812 **	ns	ns	ns	ns	ns	ns	ns	-.921 **	.916 **	.916 **
Q10	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Q11	ns	ns	ns	ns	ns	ns	ns	ns	-.921 **	.901 **	ns	-.851 **	.811 **
Q12	ns	ns	.825 **	ns	ns	ns	ns	ns	.916 **	ns	-.851 **	ns	.839 **
Q13	.894 **	.908 **	.865 **	ns	ns	-.800 **	ns	ns	.916 **	ns	.811 **	.839 **	ns

Correlation coefficient r ≥ 0.800

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Bold = Positive correlation; Non-bold = Negative correlation; ns = not significant

Table 6.2: Question code and nature of questions 10 (a-m).

QUESTION CODE	QUESTIONS	"SHORTHAND"
Q1	How many species of plants do you think there are in this plot?	Number of species
Q2	What percentage (%) of plants in the plot do you think are native species?	Percentage (%) of native species
Q3	How well does this plot support wildlife?	Support wildlife
Q4	How attractive are the colour combinations of this plot?	Attractive colour combinations
Q5	Do you find the planting in this plot appropriate?	Appropriateness
Q6	How does this plot make you feel?	Relaxing / stressing
Q7	Do you like the design of this plot?	Liking the plots
Q8	How attractive is the foliage?	Foliage attractiveness
Q9	How disordered or messy is it?	Disorderliness / messiness
Q10	Does it look cared for?	Look cared-for
Q11	Does it look tidy?	Tidiness
Q12	Does it look natural?	Naturalness
Q13	Does this plot look crowded?	Crowdedness

Table 6.3: Summary of correlations between characteristics of the perceived diversity values, aesthetic qualities and restorative effects

CORRELATIONS	Number of species	Percentage (%) of native species	Support wildlife	Attractive colour combinations	Appropriateness	Relaxing / stressing	Liking the plots	Foliage attractiveness	Disorderliness / messiness	Look cared-for	Tidiness	Naturalness	Crowdedness
Number of species													
Percentage (%) of native species													
Support wildlife													
Attractive colour combinations													
Appropriateness													
Relaxing / stressing													
Liking the plots													
Foliage attractiveness													
Disorderliness / messiness													
Look cared-for													
Tidiness													
Naturalness													
Crowdedness													

6.1.1. Correlation with the number of species perceived to be present

i) Correlation with the percentage of native species perceived to be present (r=0.841**)

A Pearson correlation coefficient was computed to assess the positive or negative association between the number of species and the percentage of native species in the plots. There was a strong positive correlation between these two variables; as the number of species in the plots increases, the perception of the percentage of native species in the plots increases as well and vice versa ($p \leq 0.001$).

ii) Correlation with ability to support wildlife (r=0.905**)

There was a strong positive correlation between the two variables. As the number of species in the plots increases, the perception of the vegetation's capabilities to support wildlife increases as well ($p \leq 0.001$).

iii) Correlation with attractiveness of colour combinations (r=0.809**)

There were strong positive correlations between the two variables; as the number of species in the plots increases, the perception of the attractiveness of colour combinations increases proportionally and vice versa. ($p \leq 0.001$).

iv) Correlations with attractiveness of foliage (r=0.846**)

There were strong positive correlations between the two variables, as the number of species in the plots increases, the perception of foliage's attractiveness also increased and vice versa ($p \leq 0.001$).

v) The level of disorder or messiness (r= 0.828**)

There was a strong positive correlation between the two variables. The greater the number of species in the plot, the messier and more disordered they are perceived to be and vice versa ($p \leq 0.001$).

vi) The degree of crowdedness (r= 0.894**)

There was a strong positive correlation between these two variables. The greater the number of species in the plot, the more crowded it looks and vice versa ($p \leq 0.001$).

vii) The ability to support wildlife (r= 0.821**)

There was a strong positive correlation between the two variables. The more percentage of the native plants, the less they support wildlife. (r=0.821 ; $p \leq 0.001$)

6.1.2. Correlation with the percentage of the species perceived to be native and other questions

i) Correlation with the level of disorderliness or messiness (r= 0.832**)

There was a strong positive correlation between the two variables; The greater the % of the plants thought to be native, the more disordered the plantings were seen to be and vice versa. ($p \leq 0.001$)

ii) Correlation with the perceived level of crowdedness (r= 0.908**).

There was a strong positive correlation between the two variables. As respondents think a more significant percentage of the plants are native, the more crowded they believe they look and vice versa ($p \leq 0.001$).

6.1.3. Correlation with a perceived capacity to support wildlife

i) Correlation with attractiveness of colour combinations (r= 0.928**)

There was a strong positive correlation between these two variables. The better the plots support wildlife, the more attractive the colour combinations are, and vice versa ($p \leq 0.001$).

ii) Correlation with how the plots make them feel (r= 0.924**)

There was a strong positive correlation between the two variables. The better the plots were perceived in their capacity to support wildlife, the more relaxed the plots made the respondents feel, and vice versa ($p \leq 0.001$).

iii) Correlation with the liking of the plot design (r= 0.877**)
There was a strong positive correlation between the two variables. The better the plots were perceived to support wildlife, the more the plots were liked “very much” and vice versa.
($p \leq 0.001$).

iv) Correlation with attractiveness of foliage (r= 0.950**)
There was a strong positive correlation between the two variables. The better the plots support wildlife, the more attractive the foliage is and vice versa ($p \leq 0.001$).

v) Correlation with the level of disorderliness or messiness (r= 0.812**)
There was a strong positive correlation between the two variables. The more the plantings are perceived to support wildlife, the more disordered and messy the designs are perceived to be and vice versa. ($p \leq 0.001$).

vi) Correlation with the level of naturalness (r= 0.825**)
There was a strong positive correlation between the two variables. The better the plots are perceived to support wildlife, the more natural the plots are perceived and vice versa ($p \leq 0.001$).

vii) Correlation with the level of crowdedness (r= 0.865**)
There was a strong positive correlation between the two variables. The better the plots were perceived to support wildlife, the more crowded the plots are and vice versa ($p \leq 0.001$).

6.1.4. Correlation with perceived attractiveness in terms of colour.

i) Correlation with how the plots made them feel (r= 0.903**)
There was a positive correlation between the two variables. The more attractive the colour combinations are, the more relaxed the respondents felt and vice versa ($p \leq 0.001$).

ii) Correlation with the liking of the design of the plots (r= 0.887**)
There was a positive correlation between the two variables. The more attractive the colour combinations were perceived, the more the respondents liked the plots' design and vice versa ($p \leq 0.001$).

iii) Correlation with attractiveness of foliage (r= 0.976**)

There was a strong positive correlation between the two variables. The more attractive the colour combinations are perceived, the more attractive the foliage was perceived and vice versa ($p \leq 0.001$).

iv) Correlation with the level of naturalness (r= 0.825**)
There was a strong positive correlation between the two variables. The better the plots are perceived to support wildlife, the more natural the plots are perceived and vice versa ($p \leq 0.001$).

v) Correlation with the level of crowdedness (r= 0.865**)
There was a positive correlation between the two variables. The better the plots were perceived to support wildlife, the more crowded the plots are and vice versa ($p \leq 0.001$).

6.1.5. Correlation with perceived attractiveness in terms of colour.

i) Correlation with how the plots made them feel (r= 0.903**)
There was a positive correlation between the two variables. The more attractive the colour combinations are, the more relaxed the respondents felt and vice versa. ($p \leq 0.001$)

ii) Correlation with the liking of the design of the plots (r= 0.887**)
There was a strong positive correlation between the two variables. The more attractive the colour combinations were perceived, the more the respondents liked the plots' design and vice versa ($p \leq 0.001$).

iii) Correlation with attractiveness of foliage (r= 0.976**)
There was a strong positive correlation between the two variables. The more attractive the colour combinations are perceived, the more attractive the foliage was perceived and vice versa ($p \leq 0.001$).

6.1.6. Correlations with perceived appropriateness of the plantings

i) Correlation with how the plots made respondents feel relaxed (r= 0.914**)
There was a strong positive correlation between these two variables. The more the respondents found the plots appropriate, the more relaxed they felt and vice versa. ($p \leq 0.001$)

ii) Correlation with liking the designs in the plots (r= 0.939**)

There was a strong positive correlation between the two variables. The more the respondents find the plots appropriate, the more they like the plots' design and vice versa. ($p \leq 0.001$)

6.1.7. Correlations with how the plots affected them feeling relaxed

i) Correlations with liking the plantings in the plots (r= 0.971**)

There was a strong positive correlation between the two variables. The more they liked the plots' designs, the more relaxed the respondents felt about the plots ($p \leq$ 0.001).

ii) Correlations with perceived attractiveness of foliage (r= 0.922**)

There was a strong positive correlation between the two variables. The more attractive they perceive the foliage to be, the more relaxed the respondents feel about the plots ($p \leq 0.001$).

iii) Correlations with level of crowdedness (r= -0.800**)

There was a strong negative correlation between the two variables. The less crowded the plots are, the more relaxed the respondents feel about the plots. This shows that they saw these notions as opposites ($p \leq 0.001$).

iv) Liking the designs in the plots and attractiveness of foliage (r= 0.885**)

There was a positive correlation between the two variables. The more attractive the foliage is, the more the respondents like the plots' designs (r=0.885 ; $p \leq 0.001$).

6.1.8. Correlations with perceived disorder-messiness of the plantings

i) Correlation with perceived level of tidiness. (r= -0.921**)

These two variables were negatively correlated. The more the disordered and messy the plantings are, the less tidy the respondents perceived the plantings and vice versa. This shows that they saw these notions as opposites ($p \leq 0.001$)

ii) Correlation with the perceived level of naturalness. Positively correlated (r= 0.916**)

There was a strong positive correlation between the two variables. The more disordered or messy the plantings were perceived, the more natural they were perceived to be. ($p \leq 0.001$)

iii) Correlation with the perceived level of crowdedness (r= 0.916**)

There was a positive correlation between the two variables. The more disordered or messy the planting was perceived, the more crowded they were perceived to look and vice versa ($p \leq 0.001$)

6.1.9. Correlations with the perceived level of tidiness

i) Correlation with how much the plots were perceived to look cared for (r= 0.901**)
There was a positive correlation between the two variables. The tidier the plots looked, the more cared for the plots were perceived to look and vice versa ($p \leq 0.001$).

ii) Correlation with the level of naturalness (r= -0.851**)
There was a negative correlation between the two variables. The tidier the plots looked, the less natural the plantings were perceived to look ($p \leq 0.001$).

iii) Correlation with the level of crowdedness. Positively correlated (r= 0.811**)
There were strong positive correlations between the two variables. The tidier the plots looked, the more crowded the plots looked. This shows that tidiness is perceived subjectively, and crowdedness is one aspect that is looked at the opposite way ($p \leq 0.001$).

6.1.10. Correlations with the perceived level of naturalness

i) Correlation with the level of crowdedness. (r= 0.839**)
There was a strong positive correlation between the two variables. The more natural the plots were perceived to look, the more crowded they were perceived to be and vice versa (p=0.003).

6.2. Factorial Analysis using Principal Component Analysis (PCA) technique

Factor analysis is a statistical method used to describe variability among observed, correlated variables in terms of a potentially lower number of unobserved variables called factors. For example, it is possible that variations in six observed variables mainly reflect the variations in two unobserved (underlying) variables. Factor analysis searches for such variations in response to unobserved latent variables. The observed variables are modelled as linear combinations of the potential factors, plus "error" terms. Factor analysis aims to find independent latent variables.

The theory behind factor analysis methods is that the information gained about the interdependencies between observed variables can be used later to reduce the set of variables in a dataset. It helps to deal with data sets where there are large numbers of observed variables that are thought to reflect a smaller number of underlying or latent variables. It is one of the most commonly used inter-dependency techniques and is used when the relevant set of variables shows a systematic inter-dependence and the objective is to find out the latent factors that create this commonality. To extract factors, Principle Component Analysis (PCA) was chosen.

6.2.1. Types of factor extraction

For factor extraction, we ran Principal component analysis (PCA) using SPSS Ver. 24. PCA is a widely used method for factor extraction. It is one of the data reduction techniques. As the self-explanatory name explains, the technique categorises and separates the crucial components from the unimportant ones. PCA is also used to achieve dimensionality reduction in regression settings to explain a high-dimensional dataset with a smaller number of representative variables which, in combination, describe most of the variability found in the original high-dimensional data (Rego, 2016). It allows us to capture the variance in variables in a smaller set which is the principal components. Principal components are the underlying structure in the data that will be segregated from the non-principal components by the scree plot's eigenvalues (refer figure 6.1 and figure 6.2 below).

Eigenvalues measure the amount of variation in the total sample accounted for by each factor. Eigenvalues are the ratio of explanatory importance of the factors concerning the variables. If a factor has a low eigenvalue, it contributes little to explain variances in the variables and may be ignored, as less important than the factors with higher eigenvalues. Components with higher eigenvalues will be considered a principal component and have a definite impact on the results.

Factor weights are computed to extract the maximum possible variance, with successive factoring continuing until no other meaningful variance is left. The factor model must then be rotated for analysis using the Kaiser criterion. The Kaiser rule is to drop all components with eigenvalues under 1.0; this being the eigenvalue equal to the information accounted for by an average single item. The Kaiser criterion is the default in SPSS. A variation of this method has been created where a researcher calculates confidence intervals for each eigenvalue and retains only factors which have the entire confidence interval greater than 1.0. This can be seen in the Cattell scree test.

The Cattell scree test plots the components as the X-axis and the corresponding eigenvalues as the Y-axis. As one move to the right, toward later components, the eigenvalues drop. When the drop ceases, and the curve makes an elbow toward less steep decline, Cattell's scree test says to drop all other components after the one starting at the elbow.

As shown in the graph of scree plots below (figure 6.1 and figure 6.2), 22 components are listed in the figure; however, because of the Kaiser Criterion, the components with an eigenvalue lower than 1.0 will be discarded and not considered. This analysis generated twenty-two components. These 22 components include principle and non-principle components. To further segregate the principal components, one chooses the number of principal components by eyeballing the scree plot and identifying a point at which the proportion of variance explained by each subsequent principal component drops off (similar to the elbow method in K-means, when you are trying to find the number of the component to use) (Rego, 2016). When the drop ceases, and the curve makes an elbow toward less steep decline, Cattell's scree test says to drop all other components after the one starting at the elbow. Any points below the elbow in the scree plots is not considered as the main components. Three principle components are dominant, and we chose to explore these three components further.

The three-component matrices produced by factorial analysis using Principal Component Analysis are illustrated in figure 6.1 and figure 6.2. The three components are identified as followed:

Component 1 - Factor 1	:	Nature connectedness
Component 2 - Factor 2	:	Nature diverse / nature loving
Component 3 - Factor 3	:	'Anthropocentric' view / Controlled nature

The first component or factor 1 is nature-connectedness and involves components that reflect respondents who are well-read and have more knowledge of plants than the other two groups. This category means that they made a more conscious and informed decision in answering the questionnaire. They often read on plants, ecology and environment and spend much time outdoors either in their gardens or in other parks.

The nature-diverse or nature-loving category involves respondents who prefer nature-like, informal, and less manicured planting styles. They find messiness of the vegetation as somewhat relaxing and makes them feel happy. They are not bothered by complexity, and disordered spatial arrangements and whatever looks similar to semi-natural standing plantings. However, they do not like to see soil in between the plants and would prefer denser-looking plots.

The third component is 'Anthropocentric' view or controlled nature category. Respondents in this category prefer vegetation that looks very structured and in order. They believe that humans should control nature and everything in landscapes should be well-planned and manicured. Planting styles must look very tidy, not too crowded and has less number of species. Mixing too many species is considered as messy and would make them feel stressed. They very much like homogeneity and small numbers of species.

These three components were analysed with variables and aspects in question 10 (a-m) to see the connection between these components/factors with the way they look at the plots and see which variables play a role in selecting what the respondents prefer and whether intrinsic factors are more substantial than extrinsic factors that involve colours and spatial arrangements. To see whether extrinsic factors impact their answers, we look at the changes between phase 1 (1 month after planting) and phase 2 (12 months after planting).

Phase 1

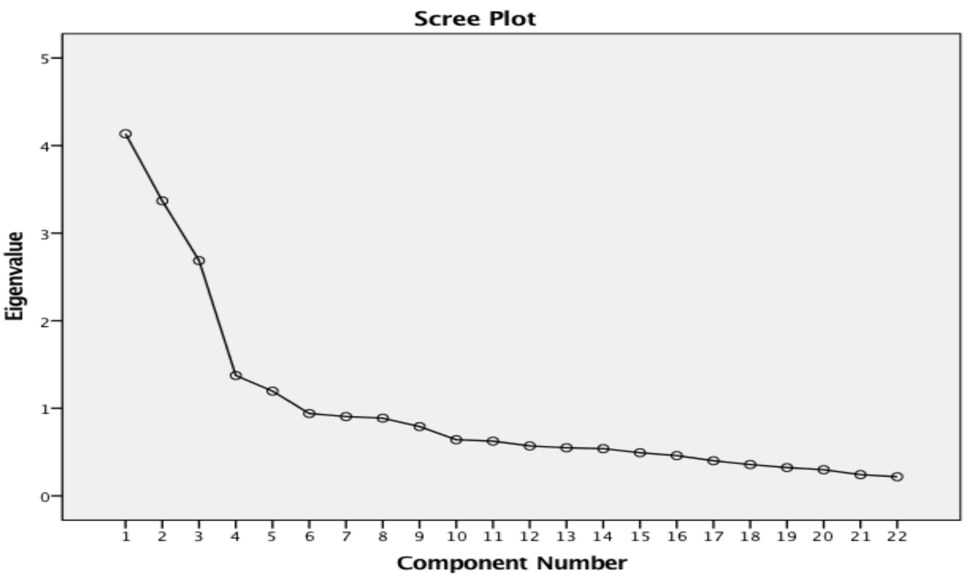


Figure 6.1: Scree plot of factorial analysis for phase 1 using Principle Component Analysis extraction method and rotation method using Oblimin with Kaiser Normalization Criterion.

Component Matrix

	Factors		
Statements	**1**	**2**	**3**
I am passionate about the natural environment.	.738		

I regularly read about the environment.	.696		
I often visit gardens that are open to the public.	.677		
I choose to spend much time outdoors.	.661		
I regularly garden.	.634		
I can design a garden.	.609		
I can recognise many Malaysian plants	.574		
Disorder/messiness in planting design makes me happy/comfortable		.755	
I prefer planting with lots of different species.		.731	
Disorder/messiness in planting design makes me closer to nature.		.721	
I like nature-like vegetation.		.694	
I like formal, ordered planting in a park.		-.637	
Mixing plants species makes it look messy.		-.600	
The plots contribute to the character of the local area.		.522	
I like informal and natural-looking planting in a park.		.677	
Planting is better when it contains native Malaysian species.			.806
Natural native planting is about a modern independent Malaysia.			.769
I like to see cultivated soil between plants.			.764
Planting is about the colour of the flowers.			
I know what naturalistic planting is.			
I prefer planting with only a few species.			
I know a lot about ecology.			

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.
a. Rotation converged in 10 iterations.

Phase 2

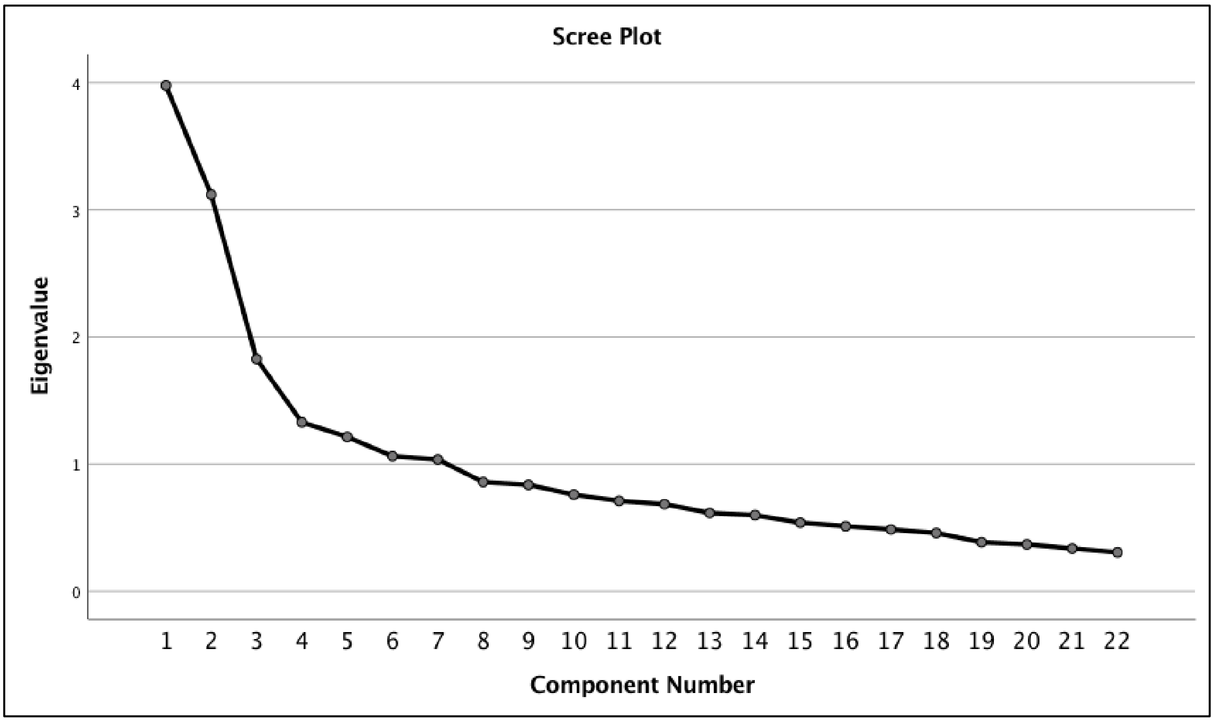


Figure 6.2: Scree plot of factorial analysis for phase 2 using Principle Component Analysis extraction method and rotation method using Oblimin with Kaiser Normalization Criterion.

Component Matrix[a]

	Factors		
	1	2	3
I know a lot about ecology.	.744		
I regularly read about the environment.	.739		
I can design a garden.	.722		
I regularly garden.	.709		
I am passionate about the natural environment.	.654		
I can recognise many Malaysian plants	.596		
I often visit gardens that are open to the public.			
I like formal, ordered planting in a park.		-.740	
Disorder/messiness in planting design makes me closer to nature.		.686	

Disorder/messiness in planting design makes me happy/comfortable		.637	
Mixing plants species makes it look messy.		-.592	
I prefer planting with only a few species.		-.588	
I like to see cultivated soil between plants.		-.517	
The plots contribute to the character of the local area.			
Planting is better when it contains native Malaysian species.			.855
Natural native planting is about a modern independent Malaysia.			.783
I like nature-like vegetation.			
I know what naturalistic planting is.			
Planting is about the colour of the flowers.			
I prefer planting with lots of different species.			
I like informal and natural-looking planting in a park.			
I choose to spend much time outdoors.			

Extraction Method: Principal Component Analysis.

Rotation Method: Oblimin with Kaiser Normalization.

a. Rotation converged in 10 iterations.

6.2.2. Interaction between the effect of factor analysis (PCA) across mixed model analysis (interplots)

Component matrix (factors) categories:

Factor 1 (F1) : Nature connectedness

Factor 2 (F2) : Nature diverse / nature loving

Factor 3 (F3) : ‘Anthropocentric’ view / Controlled nature

Table 6.4 shows the summary of significance between variables (design, diversity and layer) and aspects of 'The Plot' in question 10 (a-m) (refer Table 6.2). The yellow highlights mean that there is a significant difference between both variables. For example; F1 Q5 (Design variable) translates as the nature connectedness (F1) of the respondents finding the plots appropriate (Q5), and are significantly different between designs (structured, intermediate and random) in both phase 1 and phase 2. If one of the phases is not significant, it would not be highlighted. Sub-chapter 6.3.3 will explain further each highlighted P-value in graphics and the key points of the graphs.

Table 6.4: Compilation of significant and non-significant difference (p-value =<0.05) between variables (design, diversity and layer) and aspects of 'The Plot' in question 10 (a-m).

Question	Design variable		Diversity variable		Layer variable	
	P1	**P2**	**P1**	**P2**	**P1**	**P2**
F1 Q1	NS	NS	NS	NS	NS	NS
F1 Q2	S	NS	S	NS	S	NS
F1 Q3	NS	NS	S	NS	S	NS
F1 Q4	NS	S	S	NS	NS	S
F1 Q5	**S**	**S**	**S**	**S**	**S**	**S**
F1 Q6	S	NS	S	NS	**S**	**S**
F1 Q7	**S**	**S**	**S**	**S**	**S**	**S**
F1 Q8	NS	S	**S**	**S**	NS	S
F1 Q9	NS	NS	NS	S	NS	NS
F1 Q10	NS	NS	NS	S	NS	NS
F1 Q11	NS	NS	NS	S	NS	NS
F1 Q12	S	NS	NS	S	NS	S
F1 Q13	NS	S	NS	S	NS	S

Question	Design variable		Diversity variable		Layer variable	
	P1	**P2**	**P1**	**P2**	**P1**	**P2**
F2 Q1	NS	S	NS	NS	S	NS
F2 Q2	NS	NS	S	NS	**S**	**S**
F2 Q3	S	NS	NS	NS	S	NS
F2 Q4	NS	S	NS	NS	**S**	**S**
F2 Q5	**S**	**S**	S	NS	**S**	**S**
F2 Q6	**S**	**S**	S	NS	**S**	**S**
F2 Q7	**S**	**S**	S	NS	**S**	**S**
F2 Q8	**S**	**S**	S	NS	**S**	**S**
F2 Q9	**S**	**S**	NS	NS	**S**	**S**
F2 Q10	**S**	**S**	NS	NS	NS	S

F2 Q11	NS	S	NS	NS	**S**	**S**
F2 Q12	**S**	**S**	NS	NS	**S**	**S**
F2 Q13	NS	S	**S**	**S**	**S**	**S**

Question	**Design variable**		**Diversity variable**		**Layer variable**	
	P1	**P2**	**P1**	**P2**	**P1**	**P2**
F3 Q1	NS	NS	S	NS	**S**	**S**
F3 Q2	NS	NS	NS	NS	NS	S
F3 Q3	NS	NS	NS	NS	S	NS
F3 Q4	NS	NS	NS	NS	**S**	**S**
F3 Q5	S	NS	NS	NS	S	NS
F3 Q6	NS	NS	NS	NS	**S**	**S**
F3 Q7	S	NS	S	NS	**S**	**S**
F3 Q8	S	NS	S	NS	**S**	**S**
F3 Q9	**S**	**S**	NS	NS	**S**	**S**
F3 Q10	S	NS	S	NS	NS	NS
F3 Q11	NS	S	S	NS	S	NS
F3 Q12	**S**	**S**	S	NS	**S**	**S**
F3 Q13	NS	NS	S	NS	**S**	**S**

(yellow)	-	Significant for both phases.
P1	-	Phase 1 (1 month after planting)
P2	-	Phase 2 (12 months after planting)
S	-	Significant
NS	-	Not significant
F1	-	Factor 1
F2	-	Factor 2
F3	-	Factor 3
Q1 – Q13	-	Please refer table 6.2

Table 6. 5: Summary of connection between respondents' category based on factors analysis (PCA) and characteristics of the perceived diversity values, aesthetic qualities and restorative effects

	Factor 1 Knowledge-connectedness			**Factor 2 Nature-Loving**			**Factor 3 Controlled-nature**		
	Design	Diversity	Layers	Design	Diversity	Layers	Design	Diversity	Layers
Number of species									
Percentage (%) of native species									
Support wildlife									
Attractive colour combinations									
Appropriateness									
Relaxing / stressing									
Liking the plots									
Foliage attractiveness									
Disorderliness / messiness									
Look cared-for									
Tidiness									
Naturalness									
Crowdedness									

6.2.3. Factors affecting answers to the questions and preferred variables.

The third part of this chapter is the regression between the factors derived from the Factor analysis (PCA) and the plots' questions (i.e., appropriateness, tidiness, crowdedness). The interplay is done to compare the changes of attitude to the plantings between phase 1 and 2 in terms of factors (component) affecting how the respondents look at the planting designs. To see the changes, three aspects that describe each analysis in the scatter plots are factors, questions in the survey and variables. The combinations determine the pattern of the lines. The lines are representing the variables (i.e., design, diversity and layer) at different phases. They are formed from multiple linear regressions calculated by using mixed model analysis. Range of regression for each component factor on X-axis is between 2 to -2.

As clarified above, the principle components have three factors that divide the respondents into three categories (nature-connected, Nature diverse / nature-loving and 'Anthropocentric' view / Controlled nature). The graphs shown in the next sections are the aspects of the questionnaire ('The Plots' section) that show a significant difference in both phase 1 and 2 highlighted in the yellow boxes (refer table 6.3). Information on factor, question and variables are listed on top of the graphs.

6.2.3.1. Component factor 1 (F1): Regression of nature-connectedness

The majority of the difference between the regression of phase 1 and phase 2 depicted significant changes. The plotting of the regressions resembles results obtained in chapter 5. This means that the factors produced through Principal Component Analysis (PCA) show impact on variables and this also means that all the selections of the answers in the questionnaire are due to how the respondents perceive plants in general or in a simpler term. This is based on what is in their mind and how they usually perceive things and how they look at plants. The regression will be further explained according to factors, questions in the questionnaire (question 10 [a-m]), and variables significantly different between both phases.

Table 6.6: Summary of planting design against characteristics of the perceived diversity values, aesthetic qualities and restorative effects at phase 1 and 2

DESIGN	Structured						Intermediate						Random					
	Phase 1			Phase 2			Phase 1			Phase 2			Phase 1			Phase 2		
	Knowledge connectedness	Nature Loving	Controlled nature	Knowledge connectedness	Nature Loving	Controlled nature	Knowledge connectedness	Nature Loving	Controlled nature	Knowledge connectedness	Nature Loving	Controlled nature	Knowledge connectednes s	Nature Loving	Controlled nature	Knowledge connectedness	Nature Loving	Controlled nature
Number of species																		
Percentage (%) of native species																		
Support wildlife																		
Attractive colour combinations																		
Appropriateness																		
Relaxing / stressing																		
Liking the plots																		
Foliage attractiveness																		
Disorderliness / messiness																		
Look cared-for																		
Tidiness																		
Naturalness																		
Crowdedness																		

Table 6. 7: Summary of planting diversity against characteristics of the perceived diversity values, aesthetic qualities and restorative effects at phase 1 and 2

DIVERSITY	Low						High					
	Phase 1			Phase 2			Phase 1			Phase 2		
	Knowledge connectedness	Nature Loving	Controlled nature	Knowledge connectedness	Nature Loving	Controlled nature	Knowledge connectedness	Nature Loving	Controlled nature	Knowledge connectedness	Nature Loving	Controlled nature
Number of species												
Percentage (%) of native species												
Support wildlife												
Attractive colour combinations												
Appropriateness												
Relaxing / stressing												
Liking the plots												
Foliage attractiveness												
Disorderliness / messiness												
Look cared-for												
Tidiness												
Naturalness												
Crowdedness												

Table 6. 8: Summary of planting layers against characteristics of the perceived diversity values, aesthetic qualities and restorative effects at phase 1 and 2

LAYERS	1-Layer						2-Layer						3-Layer					
	Phase 1			Phase 2			Phase 1			Phase 2			Phase 1			Phase 2		
	Knowledge connectedness	Nature Loving	Controlled nature	Knowledge connectedness	Nature Loving	Controlled nature	Knowledge connectedness	Nature Loving	Controlled nature	Knowledge connectedness	Nature Loving	Controlled nature	Knowledge connectednes s	Nature Loving	Controlled nature	Knowledge connectedness	Nature Loving	Controlled nature
Number of species																		
Percentage (%) of native species																		
Support wildlife																		
Attractive colour combinations																		
Appropriateness																		
Relaxing / stressing																		
Liking the plots																		
Foliage attractiveness																		
Disorderliness / messiness																		
Look cared-for																		
Tidiness																		
Naturalness																		
Crowdedness																		

Factor 1: Nature-connectedness
Question 5: Do you find this planting in the plot inappropriate?

a. Variable: Design / Spatial arrangement

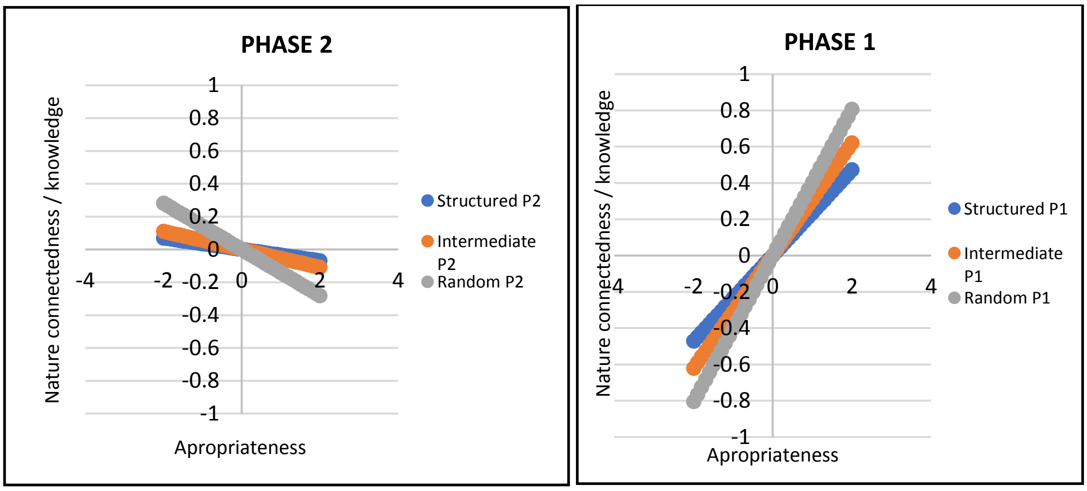


Figure 6.3: Comparison between phase 1 (1 month after planting) and phase 2 (12 months after planting) of the appropriateness of the plantings in the plots versus nature-connectedness and knowledge factors based on the design (structured, intermediate and random) variables.

In this graph (Figure 6.3), the higher the regression line is, the more appropriate it is. As shown in phase 1, the structured design line (blue line) is on the top of the other two design lines. However, random design (grey line) in phase 2 is the most appropriate. Thus, it is on the highest part of the lines. There is a significant change between phase 1 and 2. The regression between nature-connectedness and appropriateness of the design variable changed its direction in phase 2 (12 months after planting). In phase 1, the regression starts in the negative and upper left region towards the lower right region, and in phase 2, the lines move from the lower-left region to upper right region. There is an apparent increase in phase 2 (the flowering phase). What this means is, in phase 1, the more nature-connected the respondents are, the more they think that random design is the most design inappropriate. The more nature connected the respondents are, the more they think that random design is the most appropriate after 12 months of planting when it bears more flower and has more colour. However, the structured and intermediate design showed no significant difference in phase 2 but is considered more inappropriate than random design. As discussed in chapter 5, random design in the vegetative stage looks more complicated and untidy. However, in phase 2, the random design was perceived as most attractive and appropriate with colours and contrast of the flowers and foliage.

b. Variable: Layers

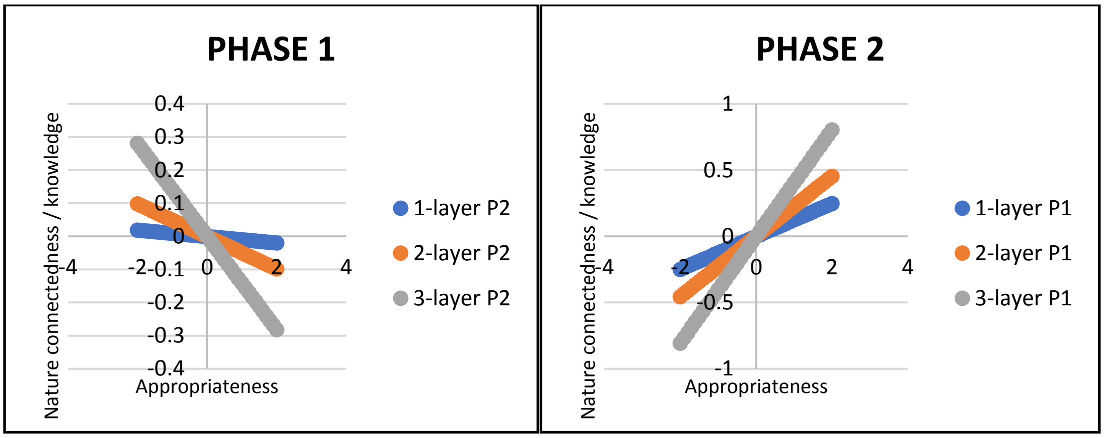


Figure 6. 4: Comparison between phase 1 (1 month after planting) and phase 2 (12 months after planting) of the appropriateness of the plantings in the plots versus nature connectedness and knowledge factors based on the layers (1-layer [base], 2-layer [base and low emergent] and 3-layer [base, low emergent and tall emergent]) variables.

Similarly, Figure 6.2 and 6.3, figure 6.4 (above) showed changes between phase 1 and 2. Nature connected respondents perceived 3-layer as inappropriate at the beginning (phase 1), but in phase 2, 3-layer vegetation was seen as the least inappropriate and 1-layer was the most inappropriate. It is suspected that the respondents could not initially in Phase 1 tell the difference between 1 and 3-layer. This becomes more apparent with time. As mentioned previously in chapter 5, the layer variable is the strongest amongst the three variables because the respondents will always perceive the 3-layer plantings despite design and diversity levels and phases. This also rings true for the nature-connected group. 3-layer had the most significant number of plants and thus more variety of species. The colour factor again had a strong effect that overrides the complexity of the multi-layer vegetation. This is why the majority of the time in phase 2 (12 months after planting), the 3-layer vegetation is preferred by all categories of respondents in responses in 'The Plots' section of the questionnaire. The more mature the plants are, the more appropriate 3-layers are according to the nature-connected group that are arguably respondents with more knowledge of plants and the environment.

Factor 1: Nature-connectedness
Question 6: How does this plot make you feel?

c. Variable: Layers

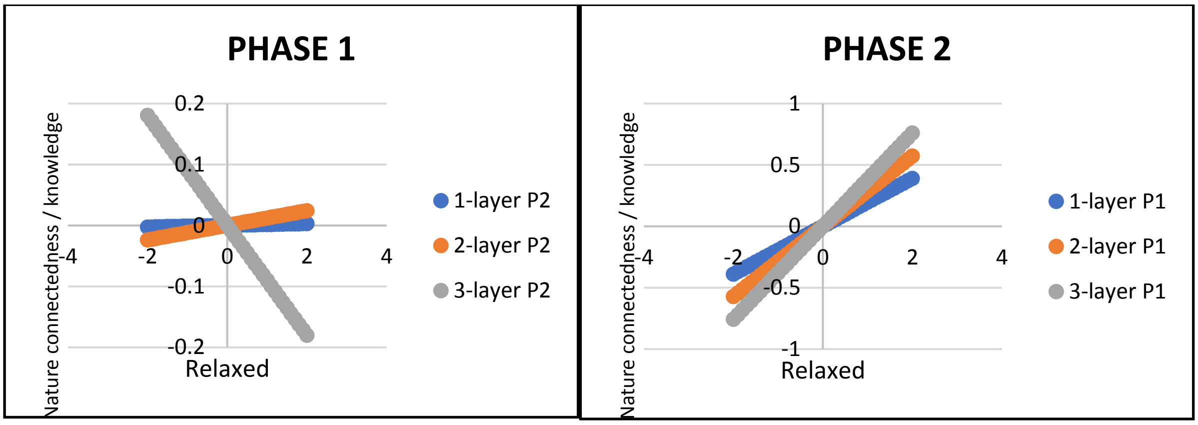


Figure 6.5: Comparison between phase 1 (1 month after planting) and phase 2 (12 months after planting) of how are the plantings in the plots making respondents feel versus nature connectedness and knowledge factors based on the layers (1-layer [base], 2-layer [base and low emergent] and 3-layer [base, low emergent and tall emergent]) variables.

In phase 1, the more nature connected the respondents are, the more they feel at ease and relaxed, looking at 2-layer and 1-layer in the beginning. 3-layer plots make them feel less at ease. However coming to the 2nd phase, the nature connected feel more at ease and relaxed with the 3-layer design. The gap between the two other layers in this phase is quite large. In the beginning, they disliked the more layered plantings, but things changed 12 months after planting. It can also be observed in the regression of phase 2, the gap between layers is becoming smaller, and this is most likely due to the dominance of a few species which made the layers look almost the same, but 3-layer has more species than the two other layers.

Factor 1: Nature-connectedness
Question 7: Do you like the design of this plot?

d. Variable: Design

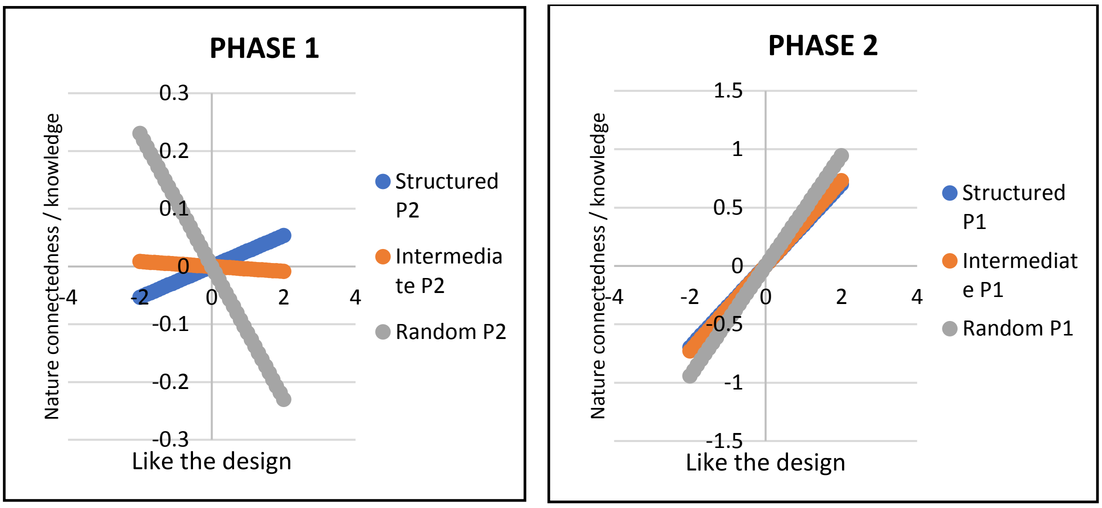


Figure 6.6: Comparison between phase 1 (1 month after planting) and phase 2 (12 months after planting) of the respondents' liking the plantings in the plots versus nature connectedness and knowledge factors based on the design (structured, intermediate and random) variables.

In terms of design, the nature-connected respondents' response towards liking the plots' design showed a drastic decline with random design in phase 1. It was very obviously not liked or not preferred by the nature-connected. The steep, sharp line showed the significance of liking the plots in phase 1. However, respondents who have more knowledge of plants are almost indifferent in phase 2 but still inclining a bit more towards random design. The gap, however, has become smaller. Intermediate and structured is insignificant and are liked almost at the same level. Like other questions and aspects of the questionnaire, the plots in the plots produce more flowers and foliage colour as they grew. The size and height of the designed plots also differed and made the overall appearance of the plots different. They especially compared with one month after planting, resulting in the gaps and the positively inclined lines.

6.2.3.2. Component factor 2 (F2): Regression of nature diversity/ Aesthetics of nature

Factor 2: Nature diversity / Aesthetic nature
Question 2: What percentage (%) of plants in the plot do you think are native species

Variable: Layers

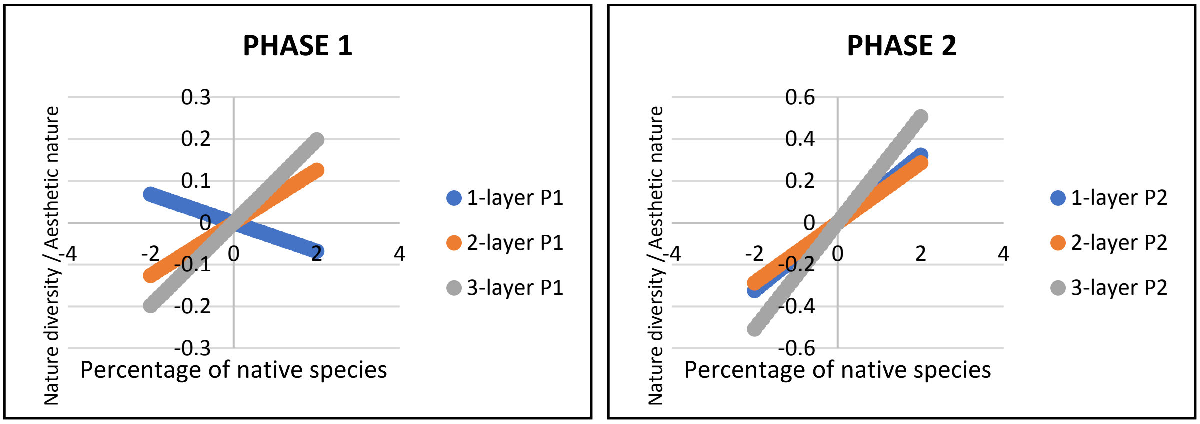


Figure 6.7: Comparison between phase 1 (1 month after planting) and phase 2 (12 months after planting) of the percentage of native species of the plantings in the plots versus nature diversity and aesthetic nature factors based on the layers (1-layer [base], 2-layer [base and low emergent] and 3-layer [base, low emergent and tall emergent]) variables.

Figure 6.7 showed that respondents who enjoy nature diversity and the aesthetics of nature impressions that 3-layers have the highest percentage of native species in the plots (which is factually correct). This was observed in both phases. It was also observed that 1-layer has the smallest percentage in phase 1, but in phase 2, the difference between 1- and 2-layer has become smaller and almost the same. This means that the nature-loving respondents do have a good idea of which are the native plants because they are more in touch with nature. However, in phase 2 as the plants have grown more maturely, the 1-layer and 2-layer plots can hardly be differentiated as there are only a few species dominate and seem to make the layers differences harder to distinguish.

Factor 2: Nature diversity / Aesthetic nature
Question 4: How attractive are the colour combinations of this plot?

b. Variable: Layers

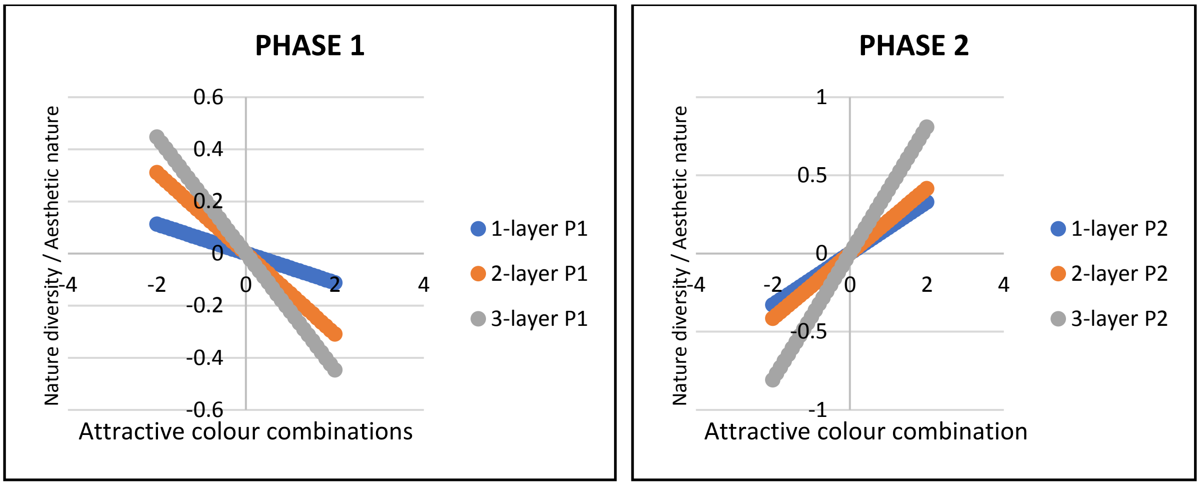


Figure 6.8: Comparison between phase 1 (1 month after planting) and phase 2 (12 months after planting) of the attractiveness of the colour combinations of the plantings in the plots versus nature diversity and aesthetics of nature factors based on the layers (1-layer [base], 2-layer [base and low emergent] and 3-layer [base, low emergent and tall emergent]) variables.

For naturalistic-style lovers, as seen in figure 6.8, in phase 1, the most attractive colour combinations are in the 1-layer plots; however, 12 months after that, the same category thinks that the 3-layer planting has the most attractive colour combinations. This is a 180 degrees turn-around due to the different outlook that the layers have as the plantings grow and mature. Three layers have more plants; thus naturally, it produces a variety of colours as compared to the other two types of layers. Different heights of the vegetation also helped with the attractiveness of the colour combinations.

Factor 2: Nature diversity / Aesthetic nature
Question 5: Do you find the planting in this plot inappropriate?

c. Variable: Design

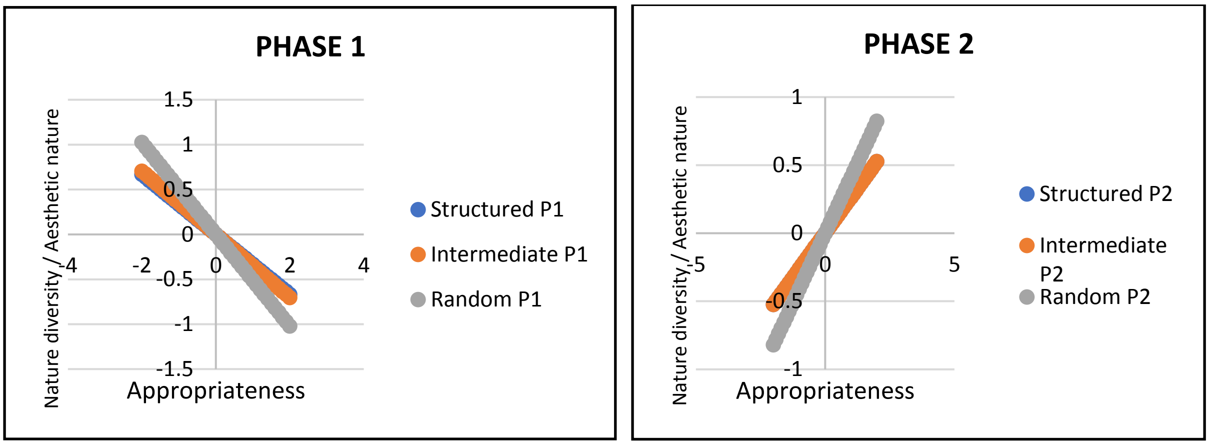


Figure 6.9: Comparison between phase 1 (1 month after planting) and phase 2 (12 months after planting) of the appropriateness of the plantings in the plots versus nature diversity and aesthetic nature factors based on planting design (structured, intermediate and random) variables.

What can be seen in figure 6.9, is in phase 1, the random design is the most inappropriate design amongst the three designs according to nature-loving and nature diversity inclined respondents. In phase 2, however, the random design is the most appropriate. The respondents seem to think intermediate and structured are both similarly less appropriate than random is. It can also be noted that there is no significant difference between structured and intermediate design for the nature-loving group.

Factor 2: Nature diversity / Aesthetic nature

Question 6: How does this plot make you feel?

e. Variable: Design

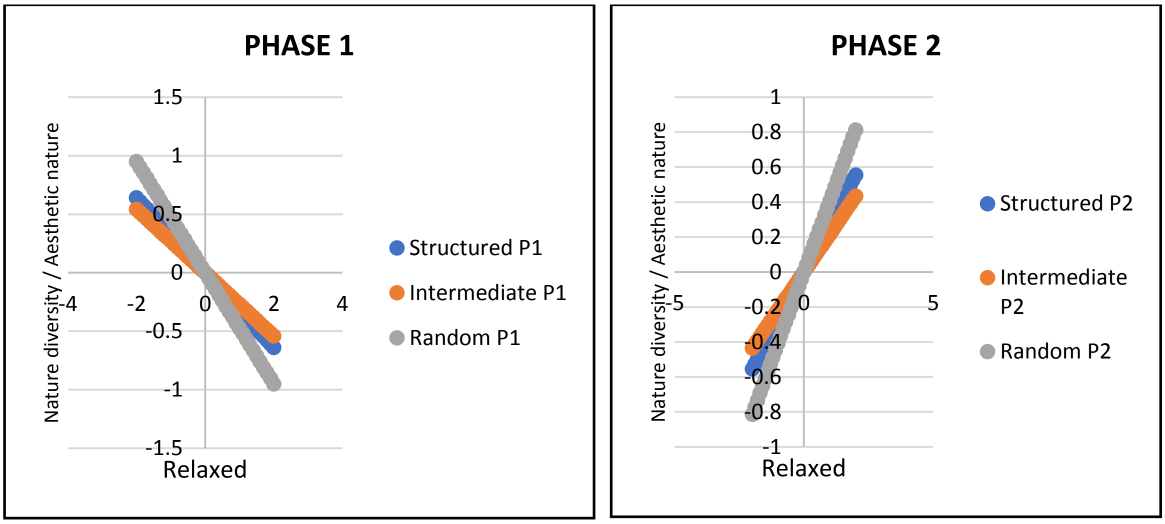


Figure 6.10: Comparison between phase 1 (1 month after planting) and phase 2 (12 months after planting) of how of the plantings in the plots make the respondents feel versus nature diversity and aesthetic nature factors based on the design (structured, intermediate and random) variables.

In figure 6.10, in the beginning, the random design is the design that makes the respondents that are nature-loving feel less relaxed and not at ease. Intermediate was the most chosen design in phase 1 in terms of making respondents most relaxed. In phase 2, the random design is the best design for making respondents most relaxed, followed by structured and intermediate design. This change appears related to the colour combination factor whereby the random design has the most attractive colour combinations. There is a strong correlation between how the designs made the respondents feel and the colour combinations.

Factor 2: Nature diversity / Aesthetic nature
Question 6: How does this plot make you feel?

f. Variable: Layers

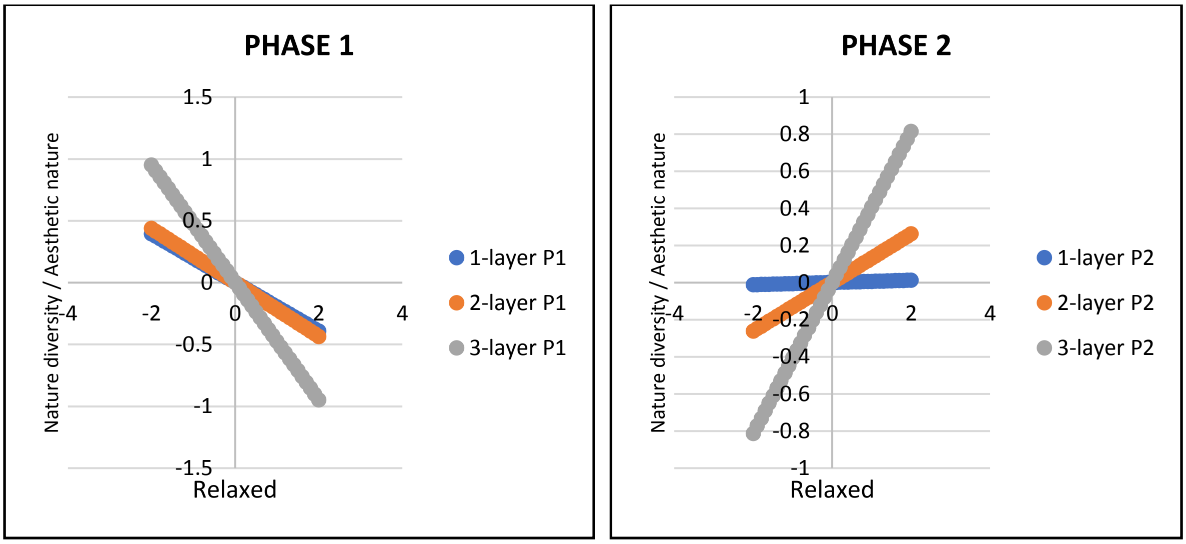


Figure 6.11: Comparison between phase 1 (1 month after planting) and phase 2 (12 months after planting) of how the plantings in the plots make the respondents feel versus nature diversity and aesthetic nature factors based on the layers (1-layer [base], 2-layer [base and low emergent] and 3-layer [base, low emergent and tall emergent]) variables

What is similar to all the other layers patterns, is in phase 1, figure 6.11 shows a 3-layer as the layer that made the respondents who are most inclined towards nature diversity least relaxed. As in other figures, in phase 2, the 3-layer became the design that made them most relaxed, with the 1-layer the least relaxed.

Factor 2: Nature diversity / Aesthetic nature

Question 7: Do you like the design of this plot?

g. Variable: Design

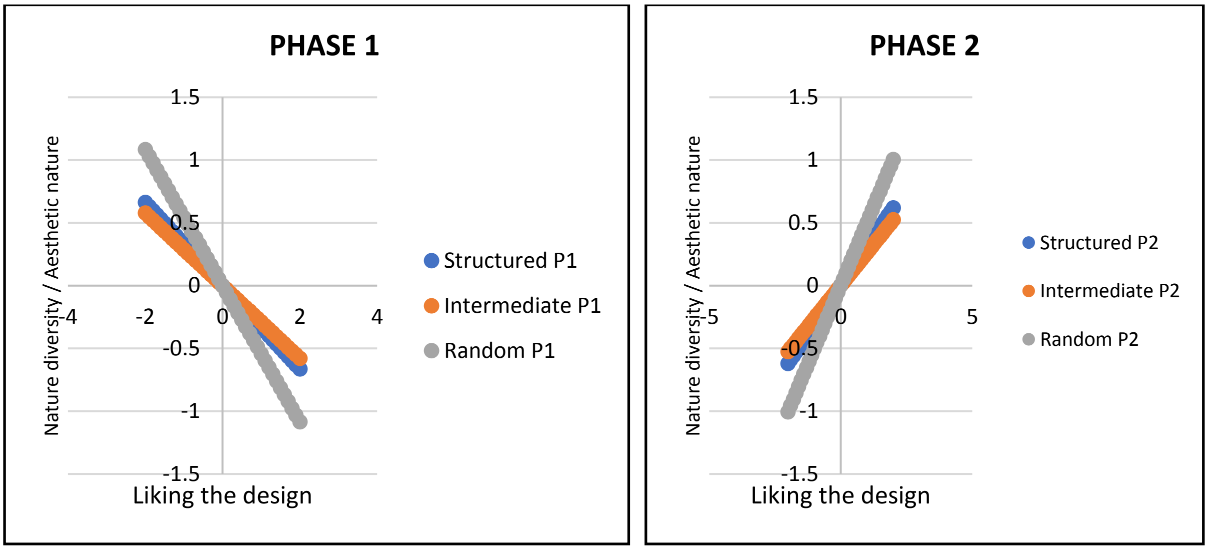


Figure 6. 12: Comparison between phase 1 (1 month after planting) and phase 2 (12 months after planting) of how the respondents like the plantings in the plots versus nature diversity and aesthetic nature factors based on the design (structured, intermediate and random) variables.

In Phase 1 (figure 6.12), the random design is the least liked by this respondent category. Intermediate and structured is almost similarly liked by the respondents. However, the axis is on instead towards the lower and negative side. As has previously been shown by Phase 2, random became the most preferred design. Structured and intermediate were less preferred then random design, but no significant difference was found between each other in both phases.

Factor 2: Nature diversity / Aesthetic nature
Question 8: How attractive is the foliage?

e. Variable: Design

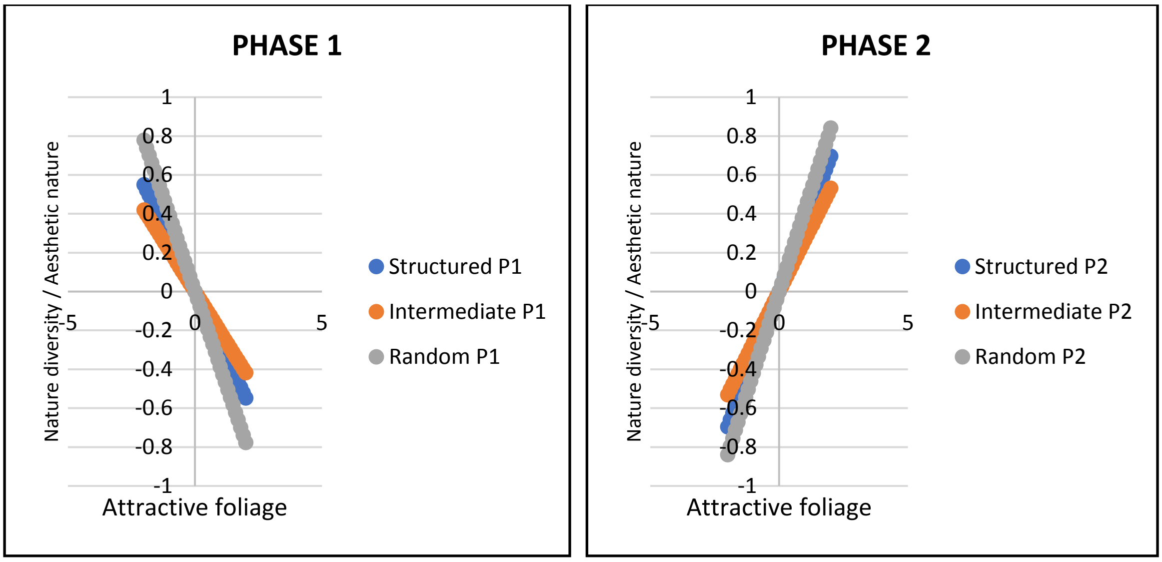
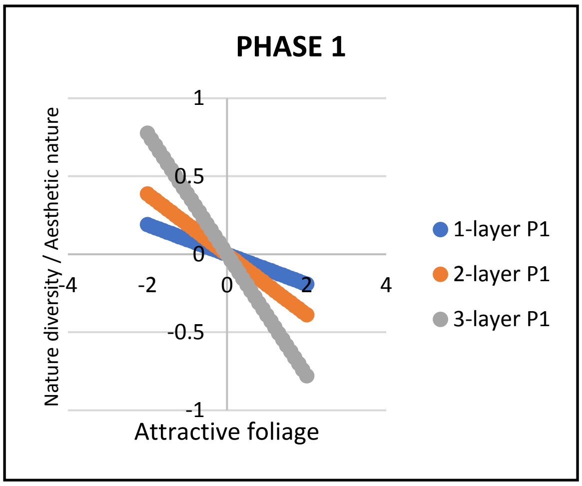


Figure 6.13: Comparison between phase 1 (1 month after planting) and phase 2 (12 months after planting) of the attractiveness of the foliage of the plantings in the plots versus nature diversity and aesthetic nature factors based on the design (structured, intermediate and random) variables.

Foliage attractiveness in both phase 1 and 2 (figure 6.13) was similar between all three designs. They overlapped each other in the scatter graph. However, the apparent difference is in phase 1, where the random design was the least attractive and in phase 2, the random design has the most attractive foliage, followed by structured and least attractive in phase 2 is intermediate design.

Factor 2: Nature diversity / Aesthetic nature
Question 8: How attractive are the foliage?

f. Variable: Layers



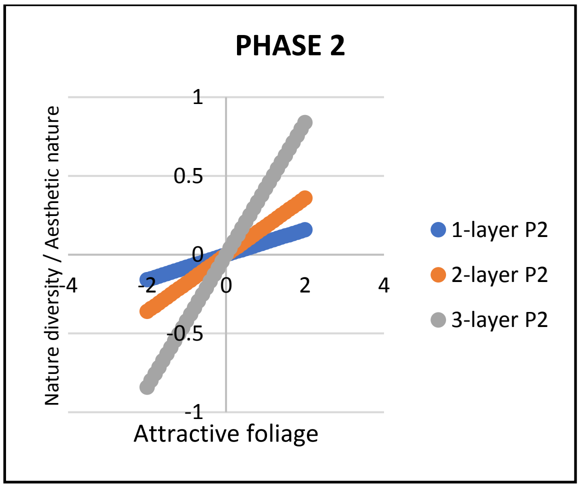


Figure 6.14: Comparison between phase 1 (1 month after planting) and phase 2 (12 months after planting) of the attractiveness of the foliage of the plantings in the plots versus nature diversity and aesthetic nature factors based on the layers (1-layer [base], 2-layer [base and low emergent] and 3-layer [base, low emergent and tall emergent]) variables.

Foliage within the 3-layer is perceived to become more attractive and beautiful with time. It was not attractive initially but surpassed the 1- and 2-layer after 12 months. All nature-loving respondents preferred 3-layers in the second phase.

Factor 2: Nature diversity / Aesthetic nature
Question 9: How disordered or messy is it?

k. Variable: Design

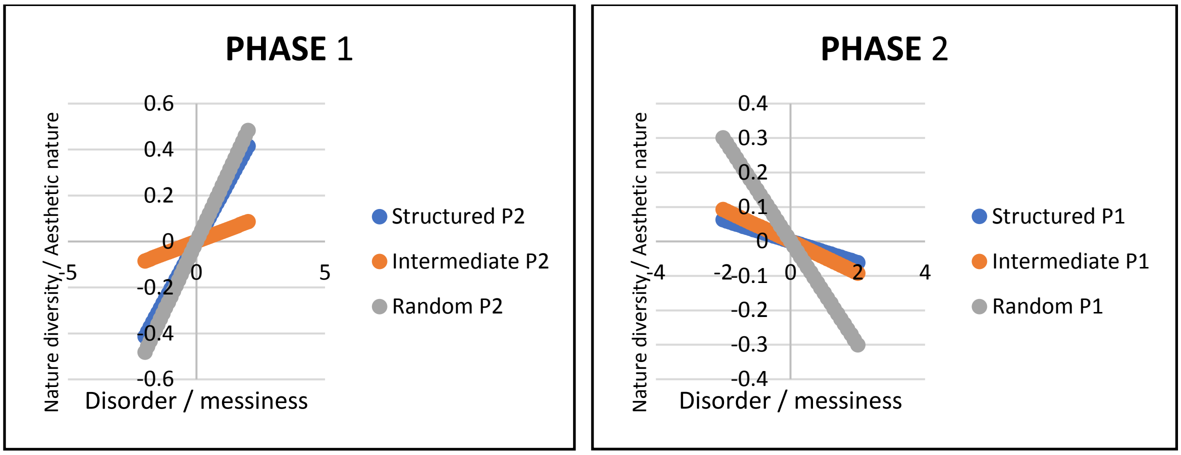


Figure 6.15: Comparison between phase 1 (1 month after planting) and phase 2 (12 months after planting) of disorderliness and messiness of the foliage of the plantings in the plots versus nature diversity and aesthetic nature factors based on the design (structured, intermediate and random) variables.

Figure 6.15 shows that in phase 1, the random design was perceived as the messiest and disordered compared to the other two designs. However, in phase 2, the random design emerged as the least disordered and less messy. The structured design was not far behind the intermediate design, not significantly different from one another and perceived as the messiest and most disordered 12 months after planting.

Factor 2: Nature diversity / Aesthetic nature
Question 10: Does it look cared for?

g. Variable: Design

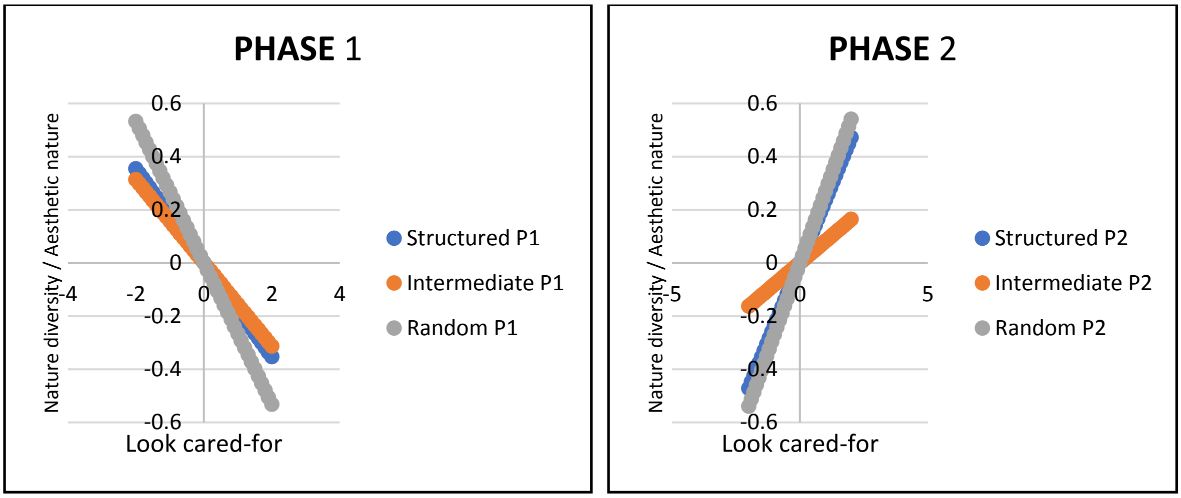


Figure 6.16: Comparison between phase 1 (1 month after planting) and phase 2 (12 months after planting) of whether the plantings in the plots look cared for versus nature diversity and aesthetic nature factors based on the design (structured, intermediate and random) variables.

In phase 1, the nature-loving respondents felt that the random design plots did not look as if they were being taken care of compared to the other designs. Twelve months on, as the plots in the plots grew and mature, the respondents felt that the random design was the most cared for, followed by the structured and then intermediate design.

Factor 2: Nature diversity / Aesthetic nature

Question 11: Does it look tidy?

h. Variable: Layers

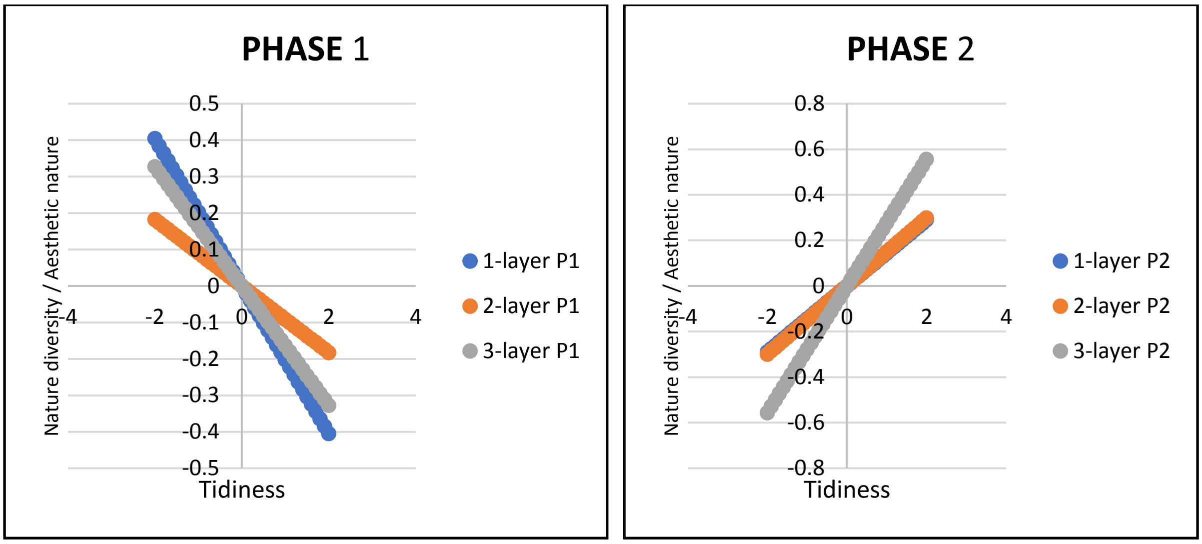


Figure 6.17: Comparison between phase 1 (1 month after planting) and phase 2 (12 months after planting) of tidiness of the plantings in the plots versus nature diversity and aesthetic nature factors based on the layers (1-layer [base], 2-layer [base and low emergent] and 3-layer [base, low emergent and tall emergent])

Figure 6.17, the scatter graph of phase 1 shows that nature-diverse respondents think that 2-layer plantings are the tidiest, followed by 3-layer and the least tidy to them is 1-layer planting. This is most likely because 1-layer planting was more sparsely planted, and more soil can be seen compared to other layers. Phase 2, however, depicted 3-layer as the tidiest followed by the one and 2-layer.

Factor 2: Nature diversity / Aesthetic nature

Question 12: Does it look natural?

i. Variable: Design

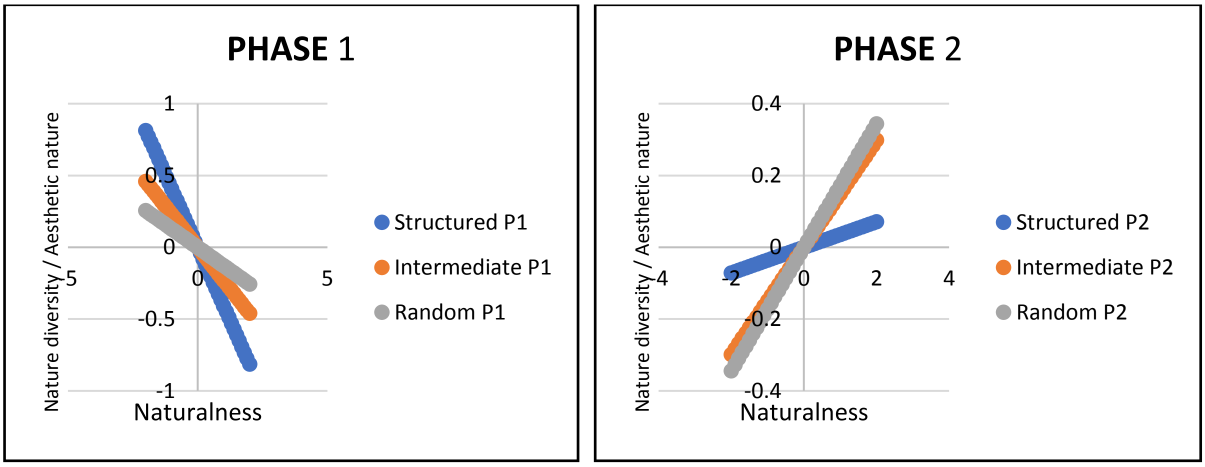


Figure 6.18: Comparison between phase 1 (1 month after planting) and phase 2 (12 months after planting) of naturalness of the plantings in the plots versus nature diversity and aesthetic nature factors based on the design (structured, intermediate and random) variable.

In the respondents' eyes that are inclined towards nature diversity and natural aesthetics, the random design was the most natural design amongst the three spatial arrangements in both phases, whether negative or positively inclined.

Factor 2: Nature diversity / Aesthetic nature
Question 12: Does this plot look crowded?

j. Variable: Layers

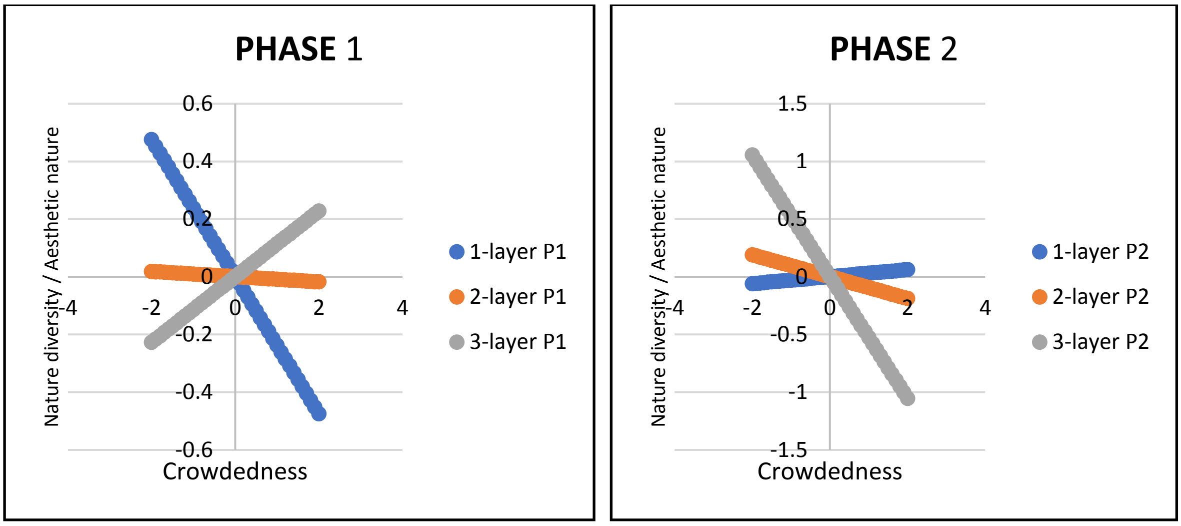


Figure 6.19: Comparison between phase 1 (1 month after planting) and phase 2 (12 months after planting) on crowdedness of the plantings in the plots versus nature diversity and aesthetic nature factors based on the layers (1-layer [base], 2-layer [base and low emergent] and 3-layer [base, low emergent and tall emergent]) variable.

In phase 1, nature-loving group of respondents seem to see the 3-layer is the most crowded, unlike in phase 2, where he 3-layer is now seen as least crowded. The 1-layer 12 months later is perceived differently by this group to be more crowded, although there are only thicker, under-story-level plants. (figure 6.19). Again, the colour combination factor plays a substantial role in this. The 3-layer plots showed that correlation between crowdedness and colour combination is a positive one. The more crowded the plots are in the plots, the more attractive the colour combination is. In a way, crowdedness is perceived more positively. Although 3-layer plots have the most number of species in it, when the plants flower and develop colourful foliage, crowdedness is no longer a barrier to attractiveness. It is seen as tidy and not crowded.

6.2.3.3. Component factor 3 (F3): Regression of 'Anthropocentric' view / Controlled nature

Factor 3: 'Anthropocentric' view / controlled nature

Question 4: How attractive are the colour combinations of this plot?

b. Variable: Layers

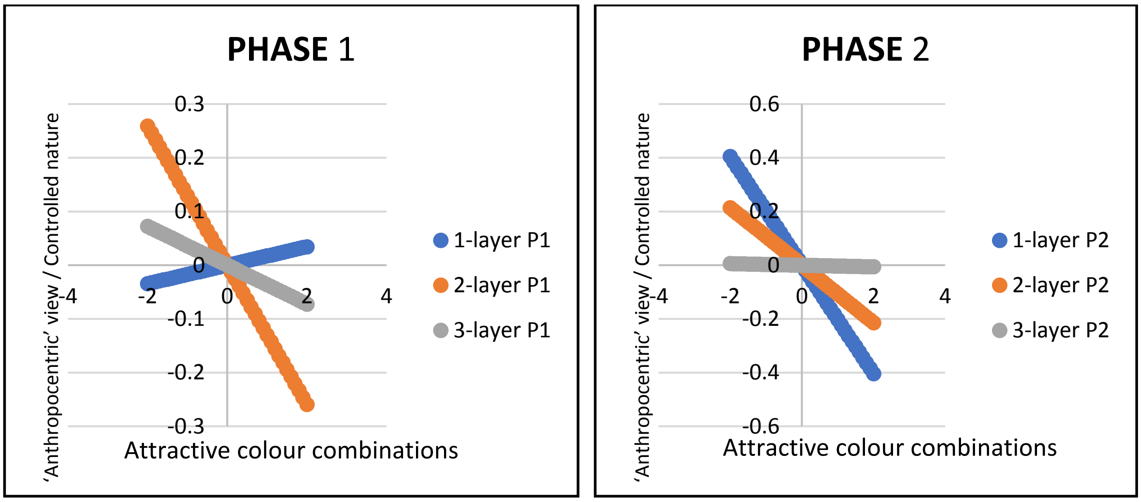


Figure 6.20: Comparison between phase 1 (1 month after planting) and phase 2 (12 months after planting) on the attractiveness of the colour combinations of the plantings in the plots versus anthropocentric view or controlled nature factors based on the layers (1-layer [base], 2-layer [base and low emergent] and 3-layer [base, low emergent and tall emergent])variable.

Anthropocentric respondents initially preferred the 1-layer plantings, perceiving it as the most attractive style of planting. This is expected of the group as they are more inclined towards structure and neatness. However, 12 months on these respondents were now more attracted towards 3-layer as the most attractive colour combination, followed by 2-layer and the 1-layer. The fewer the number of layers, the fewer species in the plot and colour combinations are less developed.

Factor 3: 'Anthropocentric' view / controlled nature
Question 6: How does this plot make you feel?

c. Variable: Layers

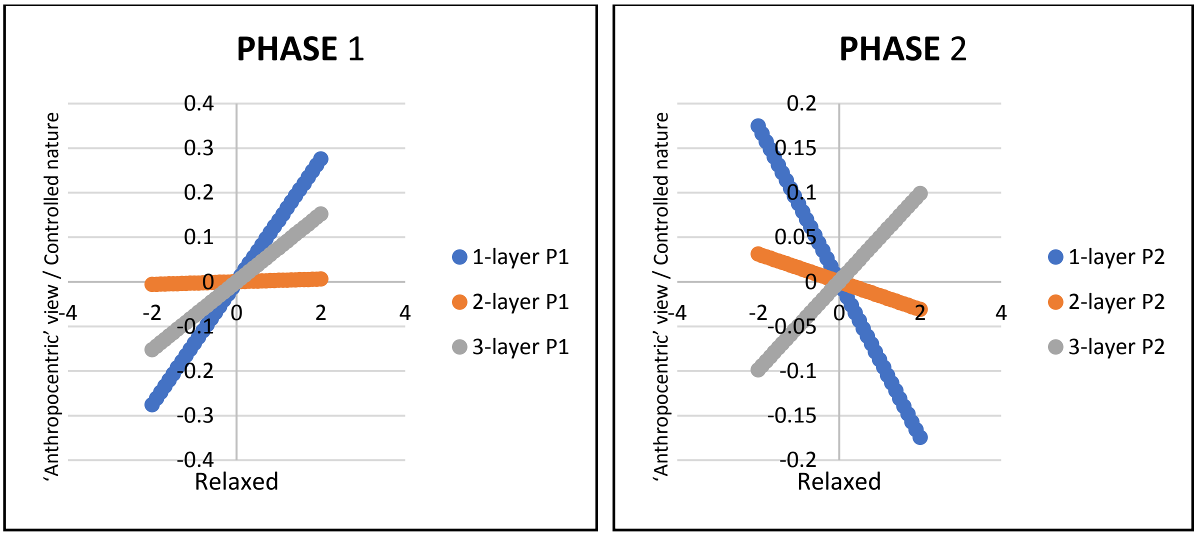


Figure 6.21: Comparison between phase 1 (1 month after planting) and phase 2 (12 months after planting) on how the plantings in the plots make the respondents feel versus anthropocentric view or controlled nature factors based on the layers (1-layer [base], 2-layer [base and low emergent] and 3-layer [base, low emergent and tall emergent])variable.

As with other questions for this factor, in the beginning, the 1-layer was perceived as the layer that respondents who like controlled-nature feel most relaxed with. In phase 2, as expected, the Anthropocentric' view group felt most at ease with 3-layer plantings and least with the 1-layer planting.

Factor 3: 'Anthropocentric' view / controlled nature

***Question 7:* Do you like the design of this plot?**

d. Variable: Layers

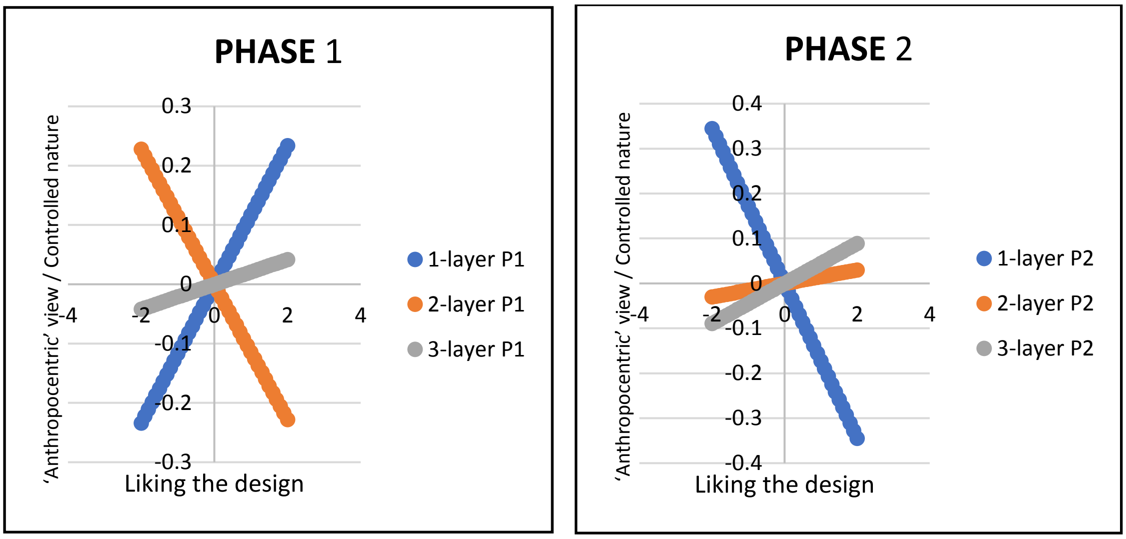


Figure 6.22: Comparison between phase 1 (1 month after planting) and phase 2 (12 months after planting) on the respondents' liking of the plantings in the plots versus anthropocentric view or controlled nature factors based on the layers (1-layer [base], 2-layer [base and low emergent] and 3-layer [base, low emergent and tall emergent])variable.

Figure 6.22 shows that this group of respondents liked the 1-layer design best and disliked the 2-layer planting the most after one month of planting. However, in phase 2, this reverses, and the 3-layer is most liked, and the 1-layer least liked. The 1-layer most looks more sparse because it only has a base layer, and there is no complexity and variety of colours and heights.

Factor 3: 'Anthropocentric' view / controlled nature
Question 8: How attractive is the foliage?

e. Variable: Layers

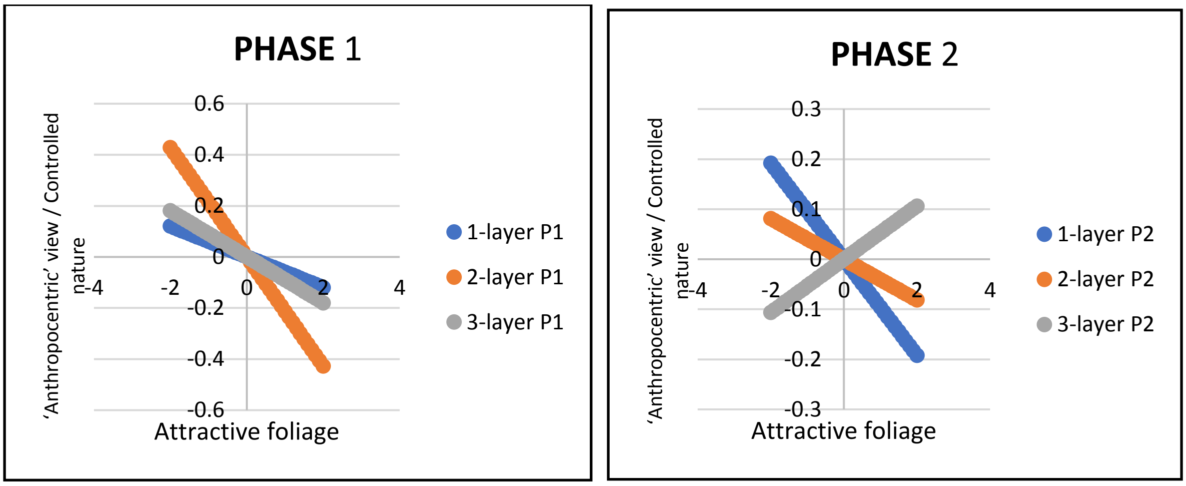


Figure 6.23: Comparison between phase 1 (1 month after planting) and phase 2 (12 months after planting) on the attractiveness of the foliage of the plantings in the plots versus anthropocentric view or controlled nature factors based on the layers (1-layer [base], 2-layer [base and low emergent] and 3-layer [base, low emergent and tall emergent]) variable.

In figure 6.23, the 1-layer was initially seen as the most attractive, followed by 3-layer plantings, and the least attractive was the 2-layer. Twelve months later, 3-layer plantings scored the highest to the controlled nature group, with the 1-layer the least attractive.

Factor 3: 'Anthropocentric' view / controlled nature
Question 9: How disordered or messy is it?

f. Variable: Design

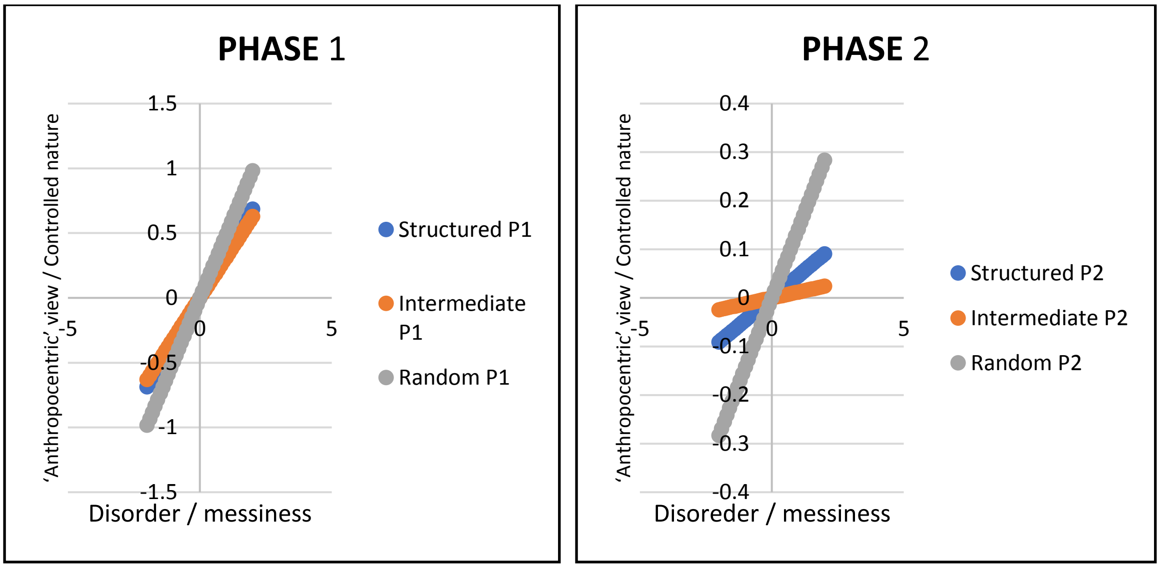


Figure 6.24: Comparison between phase 1 (1 month after planting) and phase 2 (12 months after planting) on the disorderliness and messiness of the plantings in the plots versus anthropocentric view or controlled nature factors based on the design (structured, intermediate and random) variable.

It can be seen from figure 6.24 that the controlled nature respondent category think that the random design is the most disordered and messiest. In both phases, the view of this group did not change. The only difference is that the gap between phase 2 is more extensive, showing a significant perceived difference between the designs' messiness. It is interesting to see that the other two respondents components or factor are inclined towards random design in phase 2, but not this component. The group with an anthropocentric view would regularly perceive random design as the messiest and disordered. The gaps between the regression lines in phase 2 are further away because as the plants grow, the difference between the plots' messiness is more transparent and more comfortable to distinguish. With their preference for order, the random design does not appeal to this group of respondents.

Factor 3: 'Anthropocentric' view / controlled nature
Question 9: How disordered or messy is it?

g. Variable: Layers

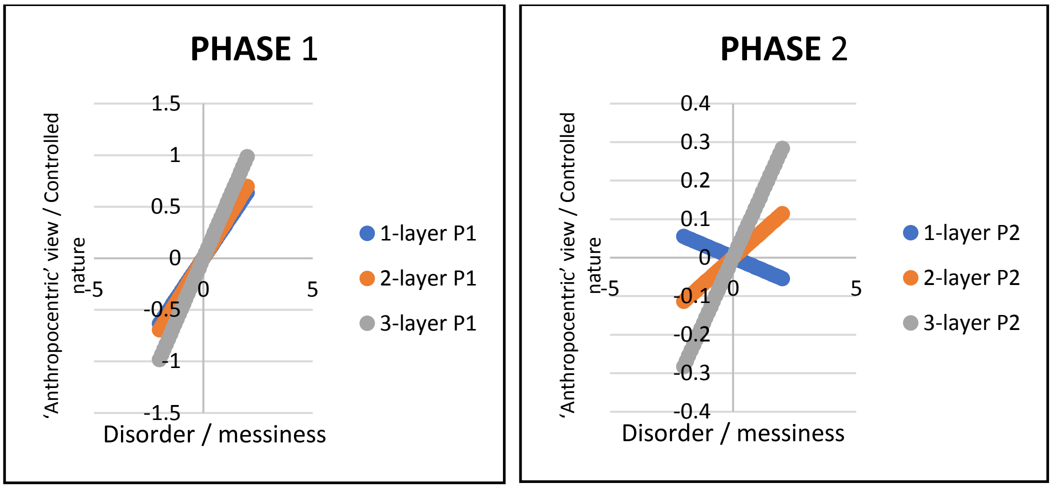


Figure 6.25: Comparison between phase 1 (1 month after planting) and phase 2 (12 months after planting) on the disorderliness and messiness of the plantings in the plots versus anthropocentric view or controlled nature factors based on the layers (1-layer [base], 2-layer [base and low emergent] and 3-layer [base, low emergent and tall emergent]) variable.

Like Figure 6.24, figure 6.25 shows that the more anthropocentric the respondents are, the more they think that the 3-layer is the messiest and most disordered, given the complexity of the layers. Despite differences in the second phase, the same result are shown in both phases.

Factor 3: 'Anthropocentric' view / controlled nature

Question 10: Does it look natural?

h. Variable: Design

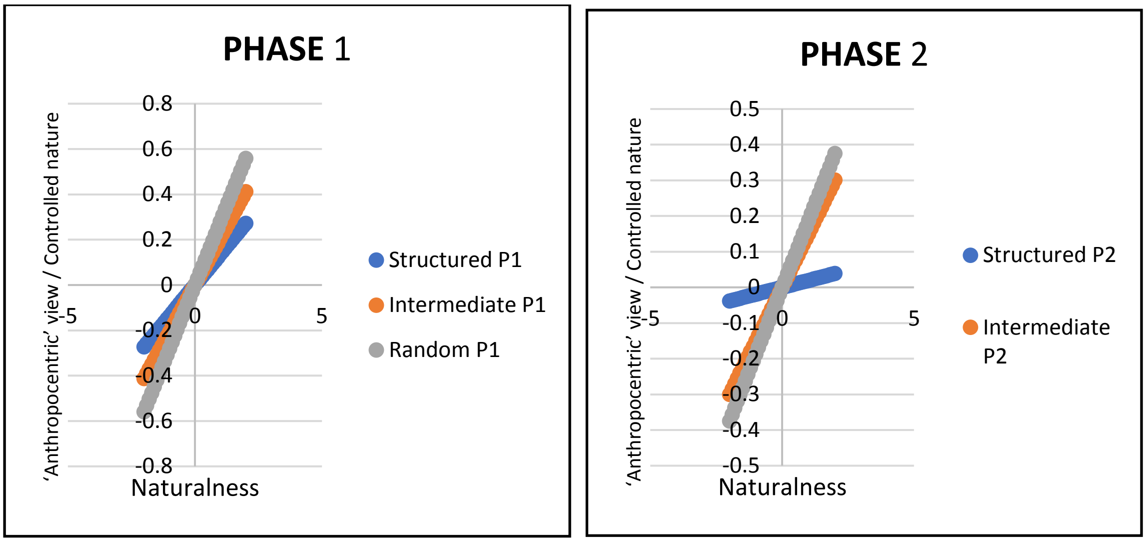
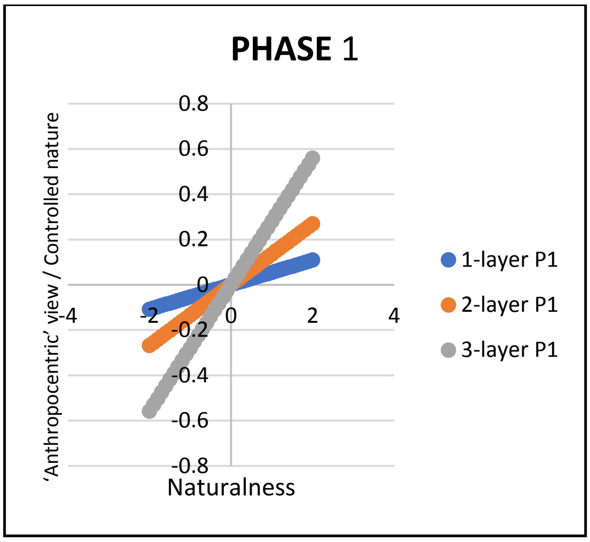


Figure 6.26: Comparison between phase 1 (1 month after planting) and phase 2 (12 months after planting) on the naturalness of the plantings in the plots versus anthropocentric view or controlled nature factors based on the design (structured, intermediate and random) variable.

Figure 6.26 illustrates the respondent's perception of what looks natural. As can be seen, for controlled nature respondents in both phase 1 and 2, random design scored the highest as looking the most natural compared to the two other designs. They identified the structured design is the most unnatural or human-made looking. The result is the same despite the level of maturity of the plantings as time progresses.

Factor 3: 'Anthropocentric' view / controlled nature
Question 10: Does it look natural?

i. Variable: Layers



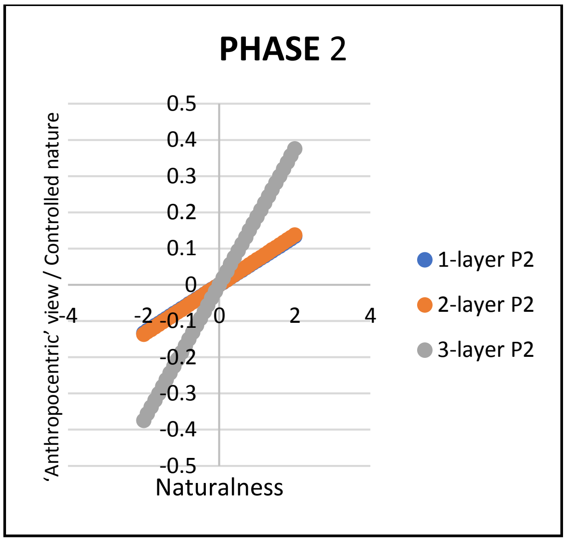


Figure 6.27: Comparison between phase 1 (1 month after planting) and phase 2 (12 months after planting) on the naturalness of the plantings in the plots versus anthropocentric view or controlled nature factors based on the layers (1-layer [base], 2-layer [base and low emergent] and 3-layer [base, low emergent and tall emergent]) variable.

What is depicted by figure 6.27 is the constant result of 3-layer planting seen as the most natural by the 'anthropocentric' viewers. In both phases, 3-layer is always perceived as the natural-looking design irrespective of the planting maturity. To this group, the more complex the layers are, the more natural and non-man-made looking it is. 1- and 2-layer plantings in the second phase are viewed as the same in terms of naturalness. This is most likely due to when both layer types reached the 12th month, the level of complexity is becoming indistinguishable between each other.

Factor 3: 'Anthropocentric' view / controlled nature
Question 13: Does this plot look crowded?

j. Variable: Layers

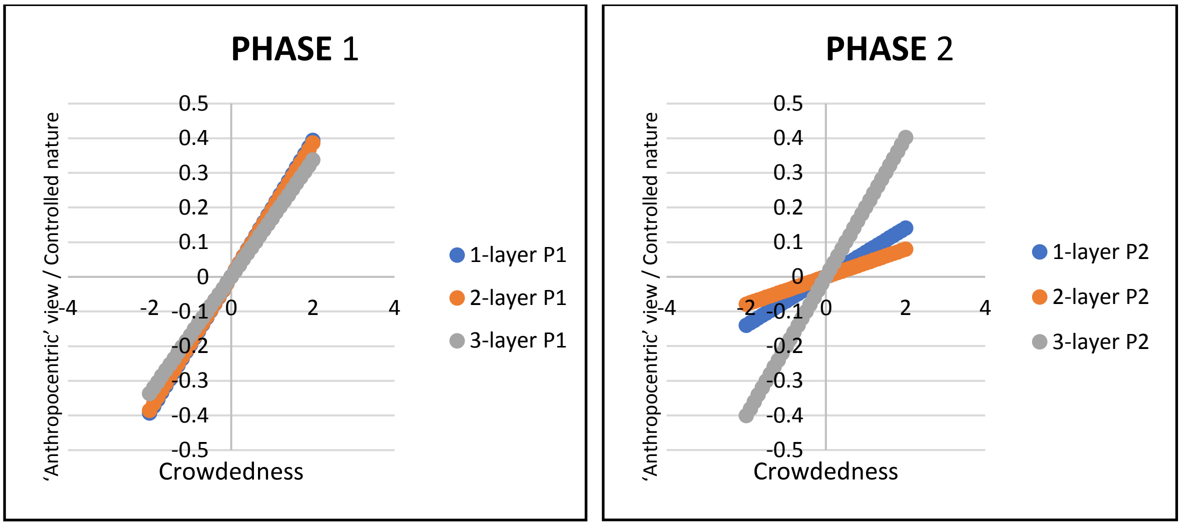


Figure 6.28: Comparison between phase 1 (1 month after planting) and phase 2 (12 months after planting) on the crowdedness of the plantings in the plots versus anthropocentric view or controlled nature factors based on the layers (1-layer [base], 2-layer [base and low emergent] and 3-layer [base, low emergent and tall emergent]) variable.

There was no significant difference between the layering types for controlled nature group of respondents in the first phase. All three are almost overlapping with each other. This indicated that no one layer was singled out as looking most crowded amongst them. However, in phase 2, the perceived difference is apparent. The 3-layer is perceived as the most crowded looking vegetation. After 12 months of growth, it is looking a lot more complex and "full". This also showed a positive correlation between crowdedness and naturalness. As figure 6.28 depicts, the controlled nature believers feel that 3-layer is the most natural-looking plots and also perceived as the most crowded in both phases

6.3. Conclusion

The key messages to take from chapter 6, are as follows;

1. The correlations are generally strongest between the plots' attractiveness, restorative effects (i.e., level of tidiness, naturalness, crowdedness and messiness or disorder) and not on native-ness or knowledge the selected species.
2. Using PCA techniques, the twenty-two overall components were reduced to three main components used to classify respondents. These components were classified based on their thoughts on plants on general, on their exposure and knowledge on landscape, horticulture and ecology.
3. Upon finalising the components, regression was used to see the intercepts and regression line’s inclinations to differentiate the components or group of respondents' points of view on particular aspects of the questions.
4. The nature connected and nature-loving or nature-diverse groups tend to agree on the same aspects and questions. In phase 2, similarly, for both groups, the respondents felt that random designs and 3-layer are the two variables that exhibited the most favourable outcome for almost all aspects of the questions.
5. In stark contrast to this, the respondents with an Anthropocentric’ view or the respondents who believe in a calm nature think that random design is the most untidy, crowded, messy and disordered. They also similarly perceived 3-layer vegetations.
6. The regression between the three components and aspects in question 10 (a-m) has also related how the respondents perceived plants in general and the way they perceived naturalistic style and multi-layered planting.
7. In chapter 5, the focus was on the respondents' preferences on the plots according to each variable and the interactions between two variables by analysing the data using mixed model analysis. This was to see in general how the respondents perceived the plots. In Chapter 6, we dig deeper and look at the factors affecting the correlations between aspects, principle component analysis technique and regressions between components and mixed model analysis in chapter 5. This way, we can understand the logic and the connection behind the selections in the questionnaire.

8. There are significant changes in almost all regressions for all aspects of the questions on the plot. The rotation of the lines is almost 180 degrees. One of the most substantial possible extrinsic factor is flowering. The colour and drama change attitudes to the plots. Even with very crowded and full and disordered plots, the respondents would still perceive them as tidy, especially for nature diverse / nature-loving respondents. The negative correlation between tidiness and liking the plots' design further proved that the attractiveness of the flowers and colourful foliage can change the view and the respondents' opinions 12 months after planting.
9. Overall, the respondents are inclined continuously in phase 2, towards the random design and 3-layers. There are minimal significant differences in the diversity variable. This is most likely due to an indistinguishable number of species in phase 2 because of the 4 most common species' visual dominance in almost all plots, especially the higher diversity plots.

CHAPTER 7

7. DISCUSSION

The discussion focuses on the outcome of the analysis of questionnaires data. This chapter also unravels layers of similarities and differences of the results with existing literature as per Chapter 2. Most importantly, this part of the thesis is based on the research questions and how the research provides answers to these questions. The first part of the discussion outlines the whole research procedures up until this point.

7. Key findings to research

It has been reported that Malaysians, and particularly stakeholders in the landscape industry are mainly still sceptical towards safety and the idea of naturalistic plantings as public landscape design (Thani *et al.*, 2015). However, from the research that was done by the author, it has proven otherwise. Never before in Malaysia has any research that did the actual/physical planting on Kuala Lumpur public spaces' research sites. Much of this research type is only done by visualisations (2D) and photo-elicitation instead of actual plantings on-site with carefully designed vegetation (3D). Following is the reiteration of **the leading research questions in this study:**

Research questions:

1. How do different 2-D spatial and 3-D layer arrangements, design and diversity, and species traits and morphologies affect public park users' environmental psychology?

2. Are designed plant communities that look similar to semi-natural plant communities more preferred than vegetation which looks dissimilar to semi-natural plant communities?

3. Is public perception and preference of these vegetation types related to participants' background factors such as gender, ethnicity, social class, income and education?

4. Can colour, and other aesthetic properties override intrinsic hostility to disorder in tropical environments?

5. Does the belief that plants are native species make them more attractive to green space users in a Malaysian context?

6. Does the belief that plants are native species make them more attractive to green space users in a Malaysian context?

Following are the table of summary of critical points of findings against the research questions.

Table 7. 1: Key scientific findings set against the research questions.

	RESEARCH QUESTION	KEY SCIENTIFIC FINDINGS
1.	Different 2-D spatial and 3-D layer arrangements, design and diversity, and species traits and morphologies affect the environmental psychology of public park users	• Design and layers factors played a more critical role in expressing the respondents' thoughts and impacted their preferences compared to diversity or number of species used in the combinations. • Perceived diversity values and restorative effect are less impactful than aesthetic quality is. • Respondents very much preferred the 3-d planting or 3-layer style of plantings, which consists of a base layer, lower emergent layer and tall emergent layer despite bearing flowers or not. • 80% of the respondents would rate random design as the highest in phase 2 (12 months after planting). • There was, however, no significant difference between low and high diversity in terms of the level of perceived disorder or messiness aspects. The respondents could not differentiate between the two levels of diversity. • The 3-D layer-arrangements significantly impact the respondents' response concerning their environmental psychology compared to a 2d type of planting with monoculture or minimal and low amount of species. The respondents were more attracted to the multiple numbers of species available and the complexity of the design and spatial arrangement
2.	Plant communities that look similar to semi-natural plant communities more preferred than vegetation which looks dissimilar to semi-natural plant communities	• The three previous chapters (Chapter 4,5 and 6) have consistently shown that the respondents preferred the random design and 3-layer (base, lower emergent and tall emergent) plots, which individually and combined are the most similar to semi-natural plant communities. • The respondents continuously perceived the random design and 3-layer (base, low emergent and tall emergent) as seen on table 6.6 and 6.7, individually or as combinations as the variables that would support wildlife best. It gave the same impression in phase 1 (vegetative stage) or phase 2 (flowering stage). • This study also exhibited the relationship between restorative effect with naturalness of the random design, which further

		proved similar to the previous findings on the linkage between psychological recovery and naturalness. • The more number of layers, number of species, and the amount of colour in the plots, the more it supported wildlife that is positively correlated to naturalness. This would also translate to, more colour, more natural-looking to the respondents.
3.	Public perception and preference of these vegetation types related to participant's background factors such as gender, ethnicity, social class, income and education	• The demographic factors did affect the respondents' visual preferences of the vegetation and its spatial arrangements in the plots • The variables that have the most number of significant preference were vegetation design and layer. • Vegetation diversity was less significant and was not affected by any demographic characteristics regarding their vegetation preference on site. • We only consider age, ethnicity, and education because they are the main factors that influence personal landscape preferences. • In the age factor, design variables that were preferred were random design, and the age category that is most attracted to the colour combinations of random design is the over 65-year-old category. • The design factor was essential to ethnicities because the spatial arrangement seems to be the element in this planting design that clearly would look significantly different from one another if compared to layer and diversity level • Malay ethnics prefer structured design most, and Indian ethnics preferred random design as well. • The less educated are arguably less exposed to a different planting style, a naturalistic style planting compared to degree holders onwards. The more well-travelled and exposed to this type of planting, the more tolerable and receptive the respondents are towards naturalistic-style planting.

4.	Does participation within the landscape, conservation and horticultural disciplines change attitudes to vegetation types?	• The percentage of respondents who participated in a landscape, conservation and horticultural field were very small. • It does not affect the significance of the overall results. • Also, these respondents did not respond differently to respondents who were not involved in these disciplines or pursuits. • However, the non-qualified group feels that high diversity as having the most number of plants in the plot. • Participation within a landscape, conservation, and horticultural disciplines did not substantially impact the attitudes to vegetation types, particularly on the vegetation within the research plots. • The non-qualified groups gave similar answers to most aspects of the questions regarding the plants in the plots. This also means that their attitude towards vegetation style of planting is intrinsic, and any professional exposure was not enough to change the attitude towards plants.
5.	Colour and other aesthetic properties override intrinsic hostility to disorder in tropical environments	• Colours that created 'drama' do override the intrinsic hostility factor of a messy, disordered and complicated planting design • Design and diversity category of colours' attractiveness was seen differently in Phase 1 and phase 2 whereby in phase 1, the more structured and more diverse plots were seen as attractive, and it changes in phase 2, 12 months later. Random design with lower diversity was seen as attractive. A total opposite of phase 1. This exhibited the impact of colour on the aesthetic values of the vegetation. • Three layers were seen as attractive in both phases the same. • Having more colours as the planting community progresses, changed the perspective of the respondents. What used to be unattractive tend to look attractive because of the colour variety that filled the plots.
6.	The belief that plants are native species make them more attractive to green space users in a Malaysian context	• Only 1.8% of respondents that has some basic knowledge of what native plants are. • The respondents that feel that 'planting is better when it contains native Malaysian species' and 'natural native planting is about a modern independent Malaysia' belongs to the 'anthropocentric' view or controlled nature group

		• What the respondents perceived as native is loosely based on what they are most familiar with in urban environments and not based on their knowledge of native plants. • The idea of a better green space with the planting of native plant species is non-plausible in this context since the percentage of respondents with native species knowledge is way too small.

7.1. Research Question 1: How do different 2-D and 3-D spatial layer arrangements, design and diversity, and species traits and morphologies affect the psychology of public park users?

Layers, density, and diversity were tested with different levels and combinations to see its impact on respondents' psychology. As presented in the results chapter, design and layers factors played a more critical role in expressing the respondents' thoughts and impacted their preferences compared to diversity or number of species used in the combinations.

The respondents were tested on perceived diversity values, aesthetic values and restorative effects of each design created. As per result, aesthetical values were most significant. This also means that other values perceived as diversity and restorative are less impactful than aesthetic quality. There are exact preferences for the phenotype or physical characteristics of the combinations of different layers, design and diversity. Questions regarding colour combinations and foliage of the planting communities' composition were frequently exhibiting differences in preferences. The aesthetic values had the most substantial score for both phases in the layer category. This brought attention to the difference in preference between 2D and 3D design.

7.1.1. 2D and 3D layer arrangement

A more focused way to define 2D and 3D layers are, 2D planting is defined as plants that occur as repeating individuals or groups of the same species such as blocks. Meanwhile, 3D planting is multi-layers used in the plantings such as base, lower emergent and tall emergent. The studies aimed to link the relationship between these two types of planting and the species trait and morphologies that defined the layers with public park users' environmental psychology.

According to the results obtained in chapter 5 and 6, the clear picture regarding the layers is respondents very much preferred the 3-D planting or 3-layer style of plantings which consists of a base layer, lower emergent layer and tall emergent layer. Albeit combined with any designs or any diversity level, the 3D planting particularly the 3-layer were repeatedly perceived as positives and had high aesthetic values in every aspect of the questionnaire (refer table 6.6, 6.7 and 6.8). In both phase 1 and 2 (vegetative and flowering phase), the respondents were also very consistent with choosing 3-layer planting. The respondents were correct in evaluating and finally choosing 3-layer as the plots with the most number of species, have the highest percentage of native plants and can support wildlife best.

The 3-layer is a combination of three different heights consisting of shade-tolerant species at the base, semi-shade tolerant at lower emergent and sun-loving species at a tall emergent layer. With different heights between the layers, the respondents could distinguish that it has the most species and much denser than the other two types of layers (1-layer and 2-layer). Although it has the most number of species, from monthly observations, there was a minimal amount of weed invasion in the plot with 3-layers. This is similar with Hitchmough, Wagner and Ahmad (2017) findings where the combination of a shade-tolerant forb under-canopy with a tall forb over-canopy was effective in restricting weed invasion under a low-maintenance regime in a Western European climate.

The combinations of the species within these multi-layers (3-layers) created an appealing planting community that attracted the attention of the respondents despite bearing flowers or not. Planting in the tropical climate gives an upper-hand because of the warm and humid climate the whole year round hastened and extended the flowering process, and the perennials that were chosen were alternately bearing flower from month three towards the end of the study which is month twelve. This also was why these species in 3-layers were also deemed as having the best colour combinations and most attractive foliage at both stages of data collection; vegetative and flowering. Although it has the most crowded and intricate layers, it is perceived as the tidiest, looked cared for and most natural-looking planting community. The respondents felt that 3-layer planting communities are appropriate to be planted in almost all situations and made them feel relaxed when looked at.

Based on the factorial analysis using PCA, the components divided the respondents into three categories. Namely nature connected group (respondents who are more exposed to knowledge of plants, gardens and ecology), diverse nature group (respondents who are nature-loving or eco-centric) and anthropocentric view group (respondents who believe human should control nature and is human-based). All three groups persistently resonated towards preferring the 3-layers planting designs.

3D planting gives a much more substantial impact on respondents' psychology than 2D style planting, similarly as per Graves, Pearson and Turner, (2017) who identified an increase in aesthetic preference with meadow flower colour diversity. Hoyle *et al.* (2018) echoed this, where higher flower colour diversity prompted a more favourable aesthetic response, but plant species diversity was not significant in explaining aesthetic preference. The colours gave a strong impression of the perceived number of present species despite the diversities and layers. In our studies, the fewer a layer that would mean fewer species and diversities, the less attracted the respondents are. Although the number of species is more than five species in one layer, the respondents still prefer the most number and more complex layers. Which in this study, the maximum number of species are 18 species and would be in the 3-layer category.

The complexity of layers means accepting respondents in Kuala Lumpur, Malaysia, in layering a planting community. It is vastly different from what was hypothesised. Combinations of layers with diversity and designs also exhibited different impact according to different variables (diversity and design). Nonetheless, any combinations of diversity and design that consists of 3-layer in it would produce a strong preference over the particular planting design. This was also mentioned by Hitchmough, Wagner and Ahmad, (2017) where designed plant communities which have more complex combinations of layers, design and diversity, can utilise the species that do not naturally co-occur to provide increased urban functionality by combining complementary ecological traits

7.1.2. Design and diversity

Design and diversity are the other two variables that were manipulated in this study. There are two types of diversity: low diversity that consists of a maximum of 9 species per plot, and high diversity that consists of 18 species maximum in a plot. Design-wise, there are three types of design: structured (unnatural), intermediate and random (natural) design. Preference for landscapes is determined in part by the context and spatial arrangement of features within a landscape (Ode *et al.*, 2009). Features such as the complexity and structure of vegetation influence preference, but the direction of the effect is influenced by aspects of peoples' personality (Van Den Berg & Van Winsum-Westra, 2010) and their attitudes towards vegetation (Kurz & Baudains, 2015).

The respondents preferred the random design in terms of the design or spatial arrangement variable. This is very much opposite the initial hypothesis. As a colonised nation for more than 100 years and very much used to the traditional Victorian age landscape design, hypothetically, respondents would have thought to be liking the structured and more ordered and manicured design. However, this has been proven to be different from the hypothesis, numerous times in this study. The respondents resonated best and liking the random design, and in every question within the survey, 80% of the respondents would rate random design as the highest in phase 2 (12 months after planting). It is also noted that there was no significant difference between intermediate and random design more often than not. This is explained in Hoyle *et al.* (2017)'s finding where there was no significant difference in perceived naturalness between intermediate and strongly natural categories of planting structure (in this research is random design). These two categories were associated with a significantly higher perceived naturalness than planting strongly unnatural in structure. The findings suggested that people can distinguish between strongly unnatural planting which shows the most visible signs of human intervention and 'the rest' but cannot tease out more subtle differences between intermediate and strong natural structure. However, they can distinguish structured, but cannot differentiate between intermediate and random (strongly natural design). This also mirrors findings from (Carrus *et al.*, 2013) where participants recognised general / different visual biodiversity levels. In contrast, Fischer et al. (2018) found that significant differences in preference ratings were found between the most biodiverse park, wasteland and street-scape green space types and those of medium biodiversity. However, that differences in preference between medium and low biodiversity scenes did not reach significance.

The second variable tested was different diversity level which is low and high diversity. Much existing research highlighting links between nature and human well-being has explicitly focused on the role of human response to biodiversity at the broad habitat or ecosystem scale. There is much less focus on diversity at the species or community scale, where arguably the most significant scope for policy and practice intervention exists (Botzat et al., 2016). According to the survey conducted, the respondents' perception was most flattering on the low diversity. This is on almost all aspect of the question regarding the plots. Lower diversity was shown to have the most attractive foliage, looked cared for, looked tidier and more appropriate. The only aspects in the questionnaire that were not agreeable to lower diversity are; the lack of several plant species in the plots, its ability to support wildlife, and its crowdedness level. These, however, are expected of hypothetically, that the respondents would think that high diversity is more crowded than the lower one. Therefore, they have more species and can support wildlife better than lower diversity can.

There was, however, no significant difference between low and high diversity in terms of the level of perceived disorder or messiness aspects. The respondents could not differentiate between the two levels of diversity. This is contradictory to a study by Lewis (2008) in British Columbia where the diversity of vegetation present in a landscape can be accurately perceived by people (Fuller et al., 2007; Qiu, Lindberg and Nielsen, 2013). There is no linear relationship between diversity and preference, and lower diversity is more preferred than a highly diverse landscape. (Qiu, Lindberg and Nielsen, 2013). Several studies have also explored preference for landscape features within a specific context. In parks, features such as trees, shrubs and water are preferred (Bjerke et al., 2006; Schroeder, 1987), while dense vegetation near paths is not preferred (Jorgensen, Hitchmough and Calvert, 2002a).

Positive relationships in the European settings between species diversity and human well-being were recorded in urban and peri-urban areas in Italy (Carrus *et al.*, 2013) and in urban parks in the UK (Fuller, Irvine, Devine-Wright, Warren, & Gaston, 2007). Findings indicated that people generally preferred higher plant species richness in urban green spaces (parks, wastelands, street-scapes). In contrast, research in Swedish green spaces revealed that recreational preferences were negatively related to high biodiversity values (Qiu, Lindberg and Nielsen, 2013). In public parks of Kuala Lumpur where our research site is located, the results are similar to the findings in Swedish green space, providing convincing cross-cultural evidence for enhanced species richness benefits.

With these results, we observed that the respondents express their way of looking at the vegetation are based on what is existing in their initial outlook towards plants. In chapter 6, it has been shown (figure 6.1 and 6.2) in the scree plot. The elbow representing the three main components is proving to be in line with the results obtained in Chapter 5. One of the components that agree with the effect of the plots on their environmental psychology is component 2. Component 2 is also categorised as respondents that are naturally diverse or nature-loving. The respondents who fall in this group tend to resonate more towards the design similar to nature. The respondents' characteristics were informal and disordered planting design more than the rigid and ordered ones. They also prefer messier and more natural-looking plants which makes them more happy and comfortable. Although there are around 18 species, the respondents still feel positive and happier when looking at the higher diversity plantings and the lower ones. The respondents chose the mixing of the species in some plots. The respondents were keen on many species and disorderliness of the vegetation. To them, it does not look messy and is still attractive. This group that prefers plantings with multiple species at higher density dislike seeing soil that is not cultivated in between the plants. The fuller looking and more number of species, the better it is. The idea for the plants to be planted with high diversity is to minimise the frequency of weeding. When the plants are more grown and started to cover up all the soil in the plots, this component group also prefers nature-like vegetation compared to the structured and symmetrical style vegetation.

From the results and previous discussions, we can gather that the 3-D planting has a significant impact on the respondents’ response concerning their environmental psychology compared to a 2D type of planting with monoculture or minimal and low species. The respondents were more attracted to the multiple species available and the complexity of the design and spatial arrangement.

According to Ahmad et al. (2007), in his studies, multi-layers’ presence was valuable from an aesthetic perspective, providing greenery during winter when otherwise winter dormant prairie vegetation is unattractive. It also significantly increased the flowering season's duration, with under-canopy species, flowering from March to May, and over canopy species from July to October. This long flowering season makes this vegetation potentially attractive both to people and invertebrate pollinators. In tropical settings, the flowering can continuously occur the whole year through provided, the selections of the species are accurate, and the timing of flowering is measured correctly.

Due to the equatorial climate conditions, the herbaceous perennial flowers can bloom intermittently (according to species) the whole year round without any 'downtime' or seasonal gaps, and the rate of growth is very high. Because of this factor, the designed planting community that has multi-layer plantings combined with moderate diversity and a random design is seen with potentials to reduce the amount of maintenance that needs to be done because it minimalised the rate of weeding due to its density and the lack of space for other species to grow in-between. This also is a potential tool to a lower maintenance landscape which is an initial step towards a positive management practice.

7.2. Research Question 2: Are designed plant communities that look similar to semi-natural plant communities more preferred than vegetation which looks dissimilar to semi-natural plant communities?

7.2.1. Designed plant communities that look similar to semi-natural plant communities

Semi-natural plant communities can be defined as the vegetation that grew spontaneously and occupied the ground without the aid of human action but has nevertheless been partly determined or markedly modified by man and his animals (Tansley, 1923). In Malaysia, the semi-natural planting communities are commonly found and seen in the rural, i.e. the village area. In the urban area, the vegetations are mostly designed and manicured according to plans. There is also a small percentage of forests reserves in the sub-urban area surrounding Kuala Lumpur.

The three previous chapters (Chapter 4,5 and 6) have consistently shown that the respondents preferred the random design and 3-layer (base, lower emergent and tall emergent) plots, which individually and combined are the most similar to semi-natural plant communities. The diversity variable for all 13 questions items (Question 10 ([a-m]) in the questionnaire, related to the plots are insignificant and did not show any clear difference between low and high diversity treatments for either of the phases. Nearly all answers to the questionnaire items related to the plots are dominated by random design preferences and 3-layer vegetation, which implies naturalistic, random, and spatial arrangement.
When we discuss the similarity of the vegetation with semi-natural plant communities, a few questionnaire items have exhibited the respondents' view. Ability to support wildlife, disorderliness or messiness, tidiness, naturalness, and crowdedness were few aspects that would show the sample of the public park users' population in Kuala Lumpur more natural-looking kind of plant communities.

In terms of ability to support wildlife, the respondents frequently perceived the random design and 3-layer (base, low emergent and tall emergent) as seen on table 6.6 and table 6.8 individually or as combinations as the variables that would support wildlife best. It gave the same impression in phase 1 (vegetative stage) or phase 2 (flowering stage). The complexity of both variables' combinations also produced an outlook that consists of various flower colours that attracted invertebrates like pollinators. This was mentioned by Hoyle *et al.* (2018) that there is a significant association between high colour diversity plots. Observable bumblebee abundance was consistent with evidence that pollinators select on perceived flower colour (Campbell et al. 2012), although this colour perception may differ from humans'. Colour is one of several floral traits, including scent and the width of flower tubes which affect pollinator use of flowers (Hirota et al., 2012). The more number of layers, the more number of species, the more colour existed in the plots, and the more it supported wildlife which is positively correlated to naturalness. This would also translate to, more colour, more natural-looking to the respondents.

The random design was chosen to test the respondents' acceptance and tolerances of such design's complexity and disorderliness. This design is also the design that is the closest to mimicking semi-natural plant communities. Qiu, Lindberg and Nielsen (2013) said that research participants gave the 'wild-looking' habitat with the highest biodiversity value negative preference comments, and the ornamental park-style woodland with the lowest biodiversity value was most preferred. It is possible that in this study people's reactions may have been related more to the structural attributes or spatial arrangement of planting which impacted on aesthetics, making it appear 'wild' than biodiversity per se. Indeed, urban people's preference for more manicured, tidy landscapes has been documented (Gobster et al., 2007; Jorgensen, Hitchmough and Calvert, 2002; Jorgensen, Hitchmough and Dunnett, 2007b; Nassauer, 2011). Hoyle, Hitchmough and Jorgensen (2017b) mentioned that planting structure had no independent main effect on perceptions of an aesthetic effect. However, it affected the perceived restorative effect, with moderately and most natural planting structures viewed as significantly more restorative than the tidiest 'least natural' planting structure. Van den Berg, Jorgensen and Wilson, (2014) found no significant difference in psychological recovery between natural conditions. The two previous studies focused only on woodland or trees, whereas our study looked at herbaceous planting. Nonetheless, this study exhibited the relationship between restorative effect with naturalness of the random design, which further proved similar to the previous findings on the linkage between psychological recovery and naturalness.

In terms of interactions between the three variables, layers and design consistently showed a significant difference which means there are clear choices between different designs and layers preferred by significantly more respondents at P=0.05. Individually, 3-layer designs (base, lower emergent, taller emergent) which were the preferred plot layers with the highest number of species within all designs, and this is true for all the answers for questions regarding the plots (in Question 10 [a-m]). The 3-layer planting was most preferred by respondents individually and combined with any types of designs (structured, intermediate and random design). This was also true when 3-layer plantings were combined with a lower diversity planting. The respondents perceived these combinations as positive and attractive. When plots were more similar to semi-natural plant communities, respondents' perceptions were that this vegetation better supported wildlife, particularly when arranged in a random design. Structured and intermediate designs were perceived as less natural-looking and less good for supporting wildlife. Perceptions of naturalness and the crowdedness also played a role in perception. All vegetation looked more natural in the second phase (P2) than Phase 1 (P1), but the respondents saw the random design and high diversity as the most natural.

Response to crowdedness in this study showed how the respondents looked at intricate planting design and interpreted this according to their perspectives. The respondents seemed to perceive that intermediate design, high diversity and 3-layer plots looked most crowded. However, the respondents also think that the combinations of random design, high diversity and 3-layer plots as the most natural. The difference is between the design variable, which intermediate was deemed crowded but random was more natural-looking.

An intermediate design particularly within 1-layer (base)and 2-layer (base &lower emergent) suffered high species mortality. This resulted in patches of bare soil. According to the scree plot in figure 6.1 and 6.2, respondents did not score well for the question 'I like to see bare soil in between plantings'. The more exposed soil, and the more uneven the vegetation's growth, the more untidy and unnatural respondents perceived them. Bare soil is typically associated with cultivation which is unnatural rather than natural. So it is also safe to conclude that, what looks similar to semi-natural vegetation which in this situation, are variables of random design high diversity and 3-layers. This also shows that ordinary public members can distinguish subtle differences between seemingly similar designed or natural vegetation (Hoyle, Hitchmough and Jorgensen, 2017a).

According to the principal component analysis, both nature-loving and anthropocentric groups' naturalness factor is significantly affected by different designs and layers. Whereby, both groups though opposites, agreed that 3-layers with random design looked most natural. Same goes to liking or preferring the designs and layers individually or as a combination. It adds up to the correlation between 3-layers with the random design is the most natural-looking and have the most attractive colour combinations, which is liked by respondents and made them feel relaxed.

7.2.2. Naturalness, tidiness, crowdedness and appropriateness.

Preference is the measurement of how much people 'like' the appearance of a landscape (Scherer, 2005). It is a useful framework for investigating the human relationship with these social and ecological systems and has been widely used to study relationships in many different kinds of urban landscapes. In these circumstances, the respondents tend to 'like' and inclined towards the random and 3-layer design more than the other design and layer counterparts in the variables.

Hypothetically, it would have been expected that the respondents, who are most familiar with the formal Victorian-age landscape style, resonate more towards the less complex, structured and manicured kind of design and a more minimal number of layers. However, this is not what we found—a total opposite. Ode *et al.*, (2009) also mentioned a preference for landscapes is determined in part by the context and spatial arrangement of features within a landscape. So, this further proves the point.

This also indicated that although in an urban setting, the respondents are susceptible to disorderliness and messiness though in the real sense, what they perceived as disordered might not be what we thought we as researchers would have in mind. A growing body of research about landscape preference and perceptions of urban natural areas, (Chiesura, 2004; Hitchmough *et al.*, 2004; Özgüner and Kendle, 2006; Jorgensen, Hitchmough and Dunnett, 2007b) all suggested that people prefer landscapes that they perceive as natural.

Being Malaysian, the majority of city dwellers originally came from the village. Having to build their lives in the capital city, they come for work, studying and migrated to make a better quality of life. They are exposed to the natural and semi-natural kind type of vegetation. These natural standing vegetation do not have any definite shape or spatial arrangement. Relating this to this factor, we could understand where the tolerance of such complex vegetation comes from. There are also studies showing that although the vast majority of the people enjoyed the diversity in the appearance of naturalistic settings, they also wanted to see evidence of care (Kaplan, 1984; Schroeder and Anderson, 1984; Burgess, Harrison and Limb, 1988; Özgüner and Kendle, 2006).

Preference for landscape has also been explained using both evolutionary (Kaplan & Kaplan, 1989; Ulrich, 1993), and cultural theories (Van den Berg and Koole, 2006; Nassauer, Wang and Dayrell, 2009). Cultural theories suggest that preference is learned and those cultural traditions (e.g. Gobster, 2001), demographic variables (such as age, education, gender), expertise (Hofmann, Westermann, Kowarik, & Van der Meer, 2012), personal experience or cognitive factors (such as values and beliefs) can all influence an individual's preference for different landscapes (Van den Berg and Koole, 2006; Howley, 2011; Lyons, 1983; Yang & Brown, 1992; Yu, 1995).

In Chapter 4, it was mentioned, the familiarity of this was also shown by the fact that education levels differ between respondents who are more exposed and less exposed to the naturalistic style of planting. The more educated the respondents are, the more exposed they are to the naturalistic style planting. In this case, degree holders and higher scored the natural, random and multi-layered plantings significantly more than the other categories.

They are exposed to it through the internet and books. They also reiterate this in how they feel about this planting style when they chose ‘Yes, in some situations’. The diploma holders and lower disagreed and are not attracted to the combinations' design (random and 3-layer). Education is the most impactful demographic factor among others (gender, age, household income) on accepting naturalistic style planting. The correlation between appropriateness strengthens the result and like the design and how it made them (the respondents) feel (relaxed). The random and 3-layer plots were perceived continuously as natural, cared-for, not crowded but disordered. However, they were also considered tidy and appropriate, and much preferred by the public park users. This raises questions about how these studies results compare to the consensus about this in practice.

In Malaysia

As mentioned in the literature review by (Ulrich, 1986, Schroeder, 1989; Michael and Hull, 1994; Parsons, 1995; Forsyth, 2003; Özgüner, Kendle and Bisgrove, 2007), typically people feel less safe in naturalistic landscapes (i.e. village natural landscape with tall grasses and roadside natural standings vegetation) and prefer well-manicured formal landscapes in terms of safety. This is in line with (Ibrahim, 2016) which stated that colonial ideas on the beautiful landscape had been part of the local culture for over a century, and the public has been sold the idea of beautification as the ideal image for public parks in Kuala Lumpur. While all these issues may be similar to those faced in other developed countries, they are more critical in Kuala Lumpur's context due to the public's negative perceptions of safety. In contrast to this, however, in the Malaysian context, Farbod, Kamal and Maulan (2015) reported that people feel safe in naturalistic landscapes in urban parks. This may be attributed to the fact that compared to North Americans and Europeans parks users, users of Malaysian parks (and Asian park users in general) tend to spend more time with friends and family members rather than they spend alone (Maulan, 2006) Tinsley et al., 2002). With more people enjoying the park together, the safety issue could be a minor problem, resulting in fewer issues with natural style plantings.

Kaplan, Kaplan and Wendt (1972), Lamb and Purcell (1990) and Purcell & Lamb (1984) identified ‘naturalness’ as an influential factor influencing human aesthetic preference. This was shown to have cross-cultural significance (Balling & Falk, 1982; Chokor & Mene, 1992; Tips and Savasdisara, 1986). A growing consensus and evidence suggest that both modes operate in determining landscape preference (Bourassa, 1990; Lobster, 1999; Kendal, Williams and Williams, 2012). Thus far, according to previous studies in the Malaysia landscape scene, plantings' naturalistic style is still divided. There are positives and negatives (safety). In this study, however, the respondents are optimistic about the natural-looking plots. They did not seem to feel stressed-out nor disturbed by it.

In Europe

There is certainly a keen professional interest in 'naturalistic' landscapes across northern Europe for the last few decades. Fashion amongst landscape professionals towards the production of more natural landscapes within the urban fabric has been simplified (Flint, 1985; Emery, 1986; Goode and Smart, 1986; Kendle and Forbes, 1997; Hitchmough *et al.*, 2004). Another UK study (Burgess, Harrison and Limb, 1988) revealed that all sections of the British community enjoy contact with the natural world in the context of people's everyday lives and there is a desire for social interaction in the open spaces.

However, similarly to the Malaysian issue, it also is related to safety issue. A study by Jorgensen, Hitchmough and Calvert (2002b) examined the interaction between spatial arrangement and vegetation structure in the context of an urban park in the UK and found that spatial arrangement was the most critical factor in determining a sense of safety. It was suggested that more naturalistic vegetation be introduced into parks and green spaces without necessarily making the parks appear unsafe. Some studies of landscape preferences demonstrate that natural areas are highly valued and preferred.

There is also evidence that some people see natural areas as scary, disgusting and uncomfortable (Bixler and Floyd, 1997), often associated with fears of physical danger (Talbot and Kaplan, 1984) and sometimes frightening places to visit (Hayward and Weitzer, 1984; Burgess, Harrison and Limb, 1988; Harrison and Burgess, 1988). It has been suggested that some urban public housing residents might prefer more formal settings with built features and well-maintained vegetation over more natural and densely wooded areas (Talbot and Kaplan, 1984). Interestingly, the studies that see nature as disturbing are relatively old, reflecting attitudes diminished in some cultures.

Research also showed that disorderliness in a scene was the most frequently mentioned concern among the participants (Kaplan and Talbot, 1988). The presence of unmaintained, natural vegetation may have the opposite effect on security perceptions (Kuo et al., 1998). Compared with this study's outcome, the respondents felt like the random and 3-layer design does look natural and disordered. However, they are comfortable and are relaxed with the design. The plots with this design are seen as having the most attractive colour combinations. Of course, the fact that the disorder was presented as plantings within a relatively ordered park means it is difficult to know how respondents would feel if this vegetation was scaled up. The respondents also think that the plots with these two variables (intricate design and multiple layers) did not look crowded despite the messiness and disorderliness. This further lowered the perception issue of safety for Malaysians with naturalistic planting in public parks.

Nassauer (1995) highlighted that people tend to perceive landscapes that exhibit biodiversity as messy, weedy and unkempt. She also suggested that to design ecosystems, what people can appreciate as beautiful may depend on design, including human intention cues. Similarly, Gobster (2001) discusses how to minimise visual conflict and perceptual conflicts associated with natural areas and suggested design cues that equate human care and stewardship activities. This is also depicted by the respondents' response to the random and 3-layer that often looked cared for despite having the most number of species. Although the design is not structured and rigid, the designs have signs of human care and are still managed. The vital key to having naturalistic style planting in the urban area is to ensure maintenance though a low one. In this study, all of the plantings did have a wooden "orderly frame" around them, and this most likely increased their ability to deal with the relative disorder within. This also suggested that respondents' adverse reaction to disordered planting is likely highly context-specific, but that disorder per se is not necessarily a problem.

People have been shown to consistently prefer natural landscapes to built-environments (Kaplan & Kaplan, 1989), and park-like landscapes (that contain specific features such as scattered trees with minimal understorey (Bjerke et al., 2006; Kaltenborn & Bjerke, 2002; Ulrich, 1993). What this means is even in precedent studies, people are resonating to something more natural than human-made. Even if the design is human-made, the natural feel and outlook will appeal to the public park users. This is what was proven by the outcome of the results whereby even in Malaysia, particularly in Kuala Lumpur, respondents (public park users) preferred natural-looking planting style than the structured and well-manicured ones.

Findings (Kaplan, 1979; Kenner & McCool, 1985; Sheets & Manzer, 1991; Ulrich, 1986; Williamson & Chalmers, 1982) indicated that naturalness was associated with vegetation and how and what extent humans had manipulated a scene. Purcell and Lamb (1998) later identified that subtle degrees of difference in preference arose from variability in 'naturalness' relating to vegetation's structural integrity.

It has also been argued that naturalistic style vegetation is also strongly valued by urban people who have been subjected to the neat and tidy approach of flower beds and mown grass in cities for some time (Kendle and Forbes, 1997). So, they want the freshness of change than the usual look of landscape in the cities. People's attitudes towards different components of the natural world are complex.

7.3. Research Question 3: Is public perception and preference of these vegetation types related to participants' background factors such as gender, age, ethnicity, social class, income and education?

7.3.1. Relation of public perceptions and preferences with background and socio-demographics.

Accepting that landscape preferences depend on personal intrinsic and extrinsic factors, the aim of the present study is twofold: (1) is to understand what the most relevant landscapes in the tropical areas are about peoples' preferences and to analyse their similarities and/or differences with previous works, and (2) is to evaluate the influence of socio-demographic characteristics (age, ethnicity, and education on respondents' landscape preferences) (López-Martínez, 2017). We also indulged on the relation of household income and current job status with the respondents' preferences. Different socio-demographic characteristics relate to the deliberately planned, designed and managed urban GI with its definable 'objective' characteristics such as vegetation type, structure, density and aesthetics (Hoyle, Jorgensen and Hitchmough, 2019). This relationship is the focus of our study for this particular research question.

The respondents' perception and preference of these vegetation types are related to their background or demographic profile. Previous studies did mention that a landscape is a product between their biophysical features and the human observer's response (Lothian, 1999; Daniel, 2001; Sun et al., 2001), we have to consider that, in the same way, there are differences between people, there are also differences in their visual preferences according to their economic, sociological, physical, and psychological characteristics (Daniel, 2001; Lothian, 1999; Sevenant and Antrop, 2008; Tveit et al., 2006). This was further looked at as the research commenced. The demographic factors did affect the respondents' visual preferences of the vegetation and its spatial arrangements in the plots. A few respondents' backgrounds are very much significant to aspects or questions asked in the questionnaire. Each category was divided into the three main variables, which are, design, diversity and layers. The variables that have the most number of significant preference were vegetation design and layer. Vegetation diversity was less significant and was not affected by any demographic characteristics regarding their vegetation preference on site.

We only consider age, ethnicity and education owing to them being the main factors which influence personal landscape preferences (Aoki, 1999; De La Fuente de Val and Mühlhauser, 2014; Munoz-Pedreros et al., 1993; Filova *et al.*, 2015; Kalterbong and Berje, 2002; Sayadi et al., 2009; Svobodova et al., 2012; Tveit et al., 2009).

Age

In the age factor, the variable that matters the most and has the highest significant difference between age categories was the design variable. The aspects that are significant to different age categories were 'how attractive are the colour combinations?', 'how the plots make them feel (relaxed or stressed)', 'like the designs of the plots', 'foliage attractiveness', 'does it look cared-for?' and 'tidiness'. Design variables that were preferred were random design, and the age category that is most attracted to the colour combinations of random design is the over 65-year-old category. The category that was always significant for the age factor on design variables, the foliage's attractiveness, liking the plots and how relaxed they are when they look at the vegetation, are the over 65 years old. This age category is the most senior, and they have the most prominent overall mean amongst the other age category. This age category is the most frequent visitor of the park, and they look at the plots daily. Their perspective on all aspects of the plots in the plots is always significantly different from those of the other age category. Thus, age category does have a substantial impact on respondents' perspective on the plants. It is quite apparent that the older the respondents are, the more they recognize or claim to recognise the naturalistic style of planting. Age factor is an essential aspect of the respondents' exposure to this style of planting.

Ethnicity

There were four main ethnicity categories in Malaysia; Malay, Chinese, Indian and Sabahan / Sarawakian. Similarly, to the age factor, the only variable that shows the majority of significant difference for ethnicity is design**.** The aspects affected by the ethnicity factors are; **'**How attractive are the colour combinations?' 'Like the designs of the plots', 'Foliage attractiveness', 'Does it look cared-for?', 'Tidiness', and 'Naturalness'. The design that is most preferred by the ethnicity category is random design. This design scored the highest mean for almost all of these questions except for tidiness aspect. The patterns of visitations played a role in influencing their preferences. Indians visit the park more regularly than other ethnicities scoring high on the higher frequency of visits. Malays oppositely differ from the Indian. Malays visited the parks in less number of times per month. Chinese are steady visitors whereby their visitation frequency was represented within all categories.

The highest mean among the ethnicity for all questions listed above and chosen random design is the Chinese ethnics. The design factor was essential to ethnicities because the spatial arrangement seems to be the element in this planting design that clearly would look significantly different from one another if compared to layer and diversity level. Layer and diversity involve adding on and taking out several plants, whereas design is about arranging the plant species according to the selected designs that differ clearly from one another. Malay ethnics prefer structured design most, and Indian ethnics preferred random design as well.

For ethnicity, the questions that have a significant difference between the ethnics' choices in design are related to the aesthetics and the outlook of the plantings. Questions on tidiness, foliage attractiveness, looks cared for, and how attractive the colour combination is vital to respondents of differing ethnicities in Malaysia.

Educational background

Education background has the most impact on the preference of vegetation than the other demographic factors. The questions that are significantly different for education factors are mostly associated with the design variable. The aspects that concern different educational background categories are vegetation's ability to support wildlife, its foliage attractiveness, disorder or messiness, and crowdedness of the plantings. These aspects mainly revolve around the spatial arrangement and the overall look in terms of the planting design complexity. The more educated group which is a degree holder and above are resonating towards random design. The less educated are preferring structured design. This is true because the less educated to a certain are less exposed to a different planting style, which is naturalistic style planting compared to degree holders onwards. The more well-travelled and exposed to this type of planting, the more tolerable and receptive the respondents are towards naturalistic planting style similar to semi-natural vegetation. This is also applied to more educated ones who have access to the internet, and they are choosing to look at different types of vegetation and not just the usual classic Victorian age style of planting that has been used in all cities across Malaysia. Different level of education interprets as being natural-looking plots (naturalness) also differ from one another. It can be said that with Higher the education the better they distinguish human intervention in the planting design

According to López-Martínez (2017), people with no higher education tended to be less critical. It is possible that people with higher educational levels were able to distinguish more accurately levels of naturalness by recognising human intervention, possibly resulting from higher levels of family income and exposure to a greater diversity of planting in private garden contexts (Hope et al., 2003). They may also have thought more critically about the meaning of 'natural' when completing the questionnaire. Previous research has shown that a higher education level was related to a lower aesthetic appreciation of gardens showing clear signs of human intervention (Kirkpatrick, Daniels, & Zagorski, 2007; Van den Berg & Koole, 2006; Van den Berg & Winsum-Westra, 2010)

Education background is the most significant for almost all attributes and aspects in the visiting pattern subject. Education level is also the sole most critical socio-demographic criteria that have the most number of significance. Concerning planting, education background showed an impact on familiarity and opinion on this type of planting. The higher the education level is, the more familiar with the nature-like type of planting. For example, a higher degree such as Masters and PhD is more familiar with nature-like planting than first-degree holder and diploma. Higher degrees and first degree has seen naturalistic of planting type of plantings in books. Primary school leavers that are mainly elderly (due to lack of schooling pre-independence period) have seen this type of plantings in books. However, diploma holders and onwards have seen this type of planting on the internet more than the less educated (lower than diploma). This showed that the more educated the respondents are, the more tech-savvy and exposed the respondents are to different plantings.

Current job status

Within the current job status or a description, nine categories divide between them. The current status is retired, unemployed, full-time student, part-time paid employment, self-employed, looking after the home/family, full-time paid employment, long-term sick/disabled and other. The result showed that the two variables shared the same score of importance and significance of preference. So the variables that are influenced by the current job status are design and layer variables.

The questions that show significance between these groups of respondents for design variables are mostly focusing on the designs' aesthetics. The questions are on how attractive the colour combinations, foliage attractiveness, crowdedness, disorder or messiness, and appropriateness. The respondents' feelings are also influenced, such as whether they like the plots and how the plots made them feel. The group within the current job status that shows the most significant and scored the highest mean amongst the categories is the design variable's retired group. These retirees prefer random design for the design with most attractive colour combinations and foliage, most appropriate and on the negative side, most crowded. However, the retirees also feel most relaxed when they look at the random design, and they like this design the most. The design that they feel is the messiest or disordered is intermediate design.

The second significant variable is the layers. The part-time employment group thinks that the plots with the most number of plants in the plots are the 3-layer vegetation (base, lower emergent, tall emergent). The next group that is significant from other groups in this category is the retirees. They perceive that 3-layer plots have the most attractive colour combinations and foliage. They are also the most appropriate, natural-looking, however crowded planting style.

Nevertheless, this multi-layer plantings made the retirees feel very relaxed, and they like the 3-layer plantings. 2-layer was perceived as the most disordered and messy by the self-employed category. This is in line with Hoyle et al. (2018) studies, whereby the respondents could not differentiate a design between a structured design and a random design. Due to the uncertain characteristics, they could not decide on whether preferring or disliking the planting style.

Household Income

The three categories that are classified for household income are B40 (below 40) – RM4000.00 or less, M40 (Middle 40) – RM4001 – RM8500 and U20 (Upper 20) – RM8501 or higher. B40 is the least affluent, M40 is middle-class people, and U20 is the most affluent. B40 group seems to perceive that 2-layer (base and lower emergent) plots have the most percentage of native species. However, they perceived 2-layer plots as the most inappropriate layer between the three and that 3-layer (base, lower emergent and tall emergent) has the most attractive foliage. M40 group seems to feel that 3-layer (base, lower emergent and tall emergent) plots made them feel most relaxed and like the plots. They also feel that they look most cared for and are generally the tidiest layer amongst the three types of vegetation layers. The U20 group, however, showed no significant with any aspects between the variables. B40 group were appreciating the restorative effect of the whole outlook of 3-layers based on the colours and physical while M40 focused on the effect of their environmental psychology. How relaxed they felt and how much they liked it. U20, however, were not too bothered with different types of layers, design or diversity. They were pretty much not affected psychologically by the vegetation in the plots.

Therefore, perception and preferences for natural areas may differ according to a variety of factors relating to the observer, including age, gender, social characteristics, cultural background, experience, motives, and the daily routine and specific interests of the individual (Rohde and Kendle, 1994; Blake, 2001; Lakhan and Lavalle, 2002; Roovers et al., 2002).

7.4. Research Question 4: Does participation within a landscape, conservation and horticultural disciplines change attitudes to vegetation types?

7.4.1. Exposure towards landscape and horticultural discipline

The percentage of respondents who participated in a landscape, conservation and horticultural was tiny. It does not affect the significance of the overall results. Also, these respondents did not respond differently to respondents who were not involved in these disciplines or pursuits. There are only two aspects (restorative qualities/aesthetics / perceived quality) that are significant for each variable (design, diversity and layers). Aspects that are significant for this group are however discussed below;

Design

The only significant aspect is for disorder or messiness. Qualified respondents feel like the random design is the most disordered or messy amongst all designs, and structured is the least disordered or messy. This, however, did not differ with the non-experts. Majority of the respondents found that random is the most disordered.

Diversity

For diversity, the talented group showed significantly different numbers of plants in the plots and their ability to support wildlife. This mirrors the finding from Hofmann et al., (2012) where the preference for dense vegetation also varies by expertise, for example, landscape designers can have quite different preferences than the general public.

The qualified (exposed to landscape, conservation and horticulture) group perceived low diversity as having the most number of plants species in the plots (mean=2.265) and high diversity seems to give the perception that high diversity has the least number of plants in the plots. This differs significantly from the non-qualified group's choices. However, the non-qualified group feels that high diversity has the most number of plants in the plot. The same situation occurs for the ability to supports the wildlife aspect. The qualified group also feels that lower diversity (plots with less number of species) has the best ability to support wildlife. The non-qualified however feels the other way around. They think that the higher diversity plots would support wildlife better than lower diversity. The contradiction in terms of diversity layer between qualified and non-qualified groups showed that the number of species in the plots gave a different perspective to the trained and untrained eye. The plots with lower diversity also looked fuller and denser in phase 2, and the plants in the plots gave an impression that they have more number of plants and able to support wildlife better. Unlike the higher diversity, the plots in this diversity level have much more competition, so the vegetation's growth and density in the plots are slower and less dense. This would give an impression that would influence the trained eyes to see the disability of the higher density to support wildlife compared to lower density plots.

Layer

For layer, the talented group looked differently from the non-qualified only on which layer looked most cared for looks cared for or not. Both the group (qualified and non-qualified) perceived 3-layer as plots with the layer that looks most cared for. Followed by 1-layer and the least cared-for is 2-layer plots. The 3-layer has more number of species and looks denser and perceived as the most crowded. Although crowdedness seems to be intrinsic to the 3-layer, this does not defy that the respondents feel that it looks very much cared-for and most definitely the tidiest type of layer. The qualified respondents within the qualified categories that felt that the 3-layer is most cared-for is the retired group. Majority of them are over 65 years old (retirees) and are one of the highest numbers of visitor in both parks daily. They look at the plots mainly in line with the hypothesised results since they look at the vegetation more than any other groups in the categories.

Looking at the aspects that showed a significant difference, only five aspects from the 13 listed in the questionnaire show the difference of perspective based on qualifications and exposure in a landscape, conservation, and horticulture. It can be concluded that participation within the landscape, conservation, and horticultural disciplines did not substantially impact the attitudes to vegetation types, particularly on the vegetation within the research plots. The non-qualified groups gave similar answers to most aspects of the questions regarding the plants in the plots. This also means that the plants' attitude is intrinsic, and any professional exposure was not enough to change the attitude towards plants.

7.5. Research Question 5: Can colour and other aesthetic properties override intrinsic hostility to disorder in tropical environments?

7.5.1. Aesthetic properties (colour combination and foliage type)

When we discuss the impact of colour and other aesthetic properties, we cannot exclude the drama factor. The results are mainly divided into phase 1 and phase 2. As we can see chapter 5, there are apparent differences between variables in both phases in different aspects. In this part, the aspects discussed are on the attractiveness of the colour combinations, foliage attractiveness, disorder and messiness, tidiness, appropriateness, crowdedness, and how much they look cared for. These are the aesthetical factors that differ from phase 1 (1 month after planting) to phase 2 (12 months after planting).

According to Hoyle et al. (2019), there were three individual dimensions of participants' **aesthetic perception**: i) Aesthetic effect (Colour, attractiveness, interest & invertebrate value), ii) Neatness and iii) Unfamiliarity and complexity. There was a vital significance although a weak correlation between perceived naturalness and aesthetic effect.

How attractive are the colour combinations?

The first aspect discussed when it comes to colour factors is to see how the first phase (P1) differs from the second phase (P2). In terms of design variable, Phase 1 (1 month after planting) indicated that intermediate design has the best colour combinations amongst all design and random design has the worst colour combinations. This changes to 180 degrees in phase 2 (12 months after planting) mainly when a random design is a most-liked design amongst the three design and the worse in phase 2 is the intermediate design. The structured design stayed neutral and was always the second choice in the designs irrespective of phase. This is rather interesting as in the beginning, and the respondents preferred the intermediate design. This is most probably due to the spatial arrangement and variety of plants in this kind of design. It is also a design that is in between a random design and structured design. It is not too messy and nor too crowded, and it was not too designed and rigid. However, things are different after 12 months, where the whole outlook the plots has changed drastically to a different one. In phase 2, the random design was chosen to be the plot with the most attractive colour combinations. If we look at the vegetation in the plots, we can see the intertwining of one species to another in a random design. Random plots always have the most significant number of colours due to the spatial arrangement. It also gives a fuller character to the plot. In phase 2, the loss of plants tarnished the aesthetic value of intermediate design. The random design, however, was always fuller-looking. Although dominated by three to four species only by the end of phase 2, the colour or drama factor has always given a positive impression of random design plots no matter how messy or disordered-looking the plots are. This is very much in line with earlier research (Hoyle *et al.*, 2017) where it was found that no significant relationship between actual planting structure and aesthetic effect. The loading of the individual items 'colour' 'attractiveness' 'interest' and 'perceived invertebrate value' onto this component indicates strong correlations between these individual indicators and that our respondents associated 'naturalness' with all these attributes of the planting. In the past preferences of urban people for tidy, manicured public landscapes have been reported widely (Gobster, Nassauer, & Daniel, 2007; Jorgensen, Hitchmough and Calvert, 2002; Jorgensen, Hitchmough and Dunnett, 2007a; Nassauer, 2011), regarding the 'deep pervasive cultural norm' of 'care' (Nassauer, 2011). We found an enormously significant, moderate negative correlation between perceived naturalness and perceived neatness. In the Netherlands however, aesthetic preference for garden planting of a specific structure: manicured; romantic or wild (Van den Berg & Winsum-Westra, 2010) has been related to an individual's 'personal need for structure' (PNS); (Neuberg & Newsom, 1993). Respondents with a high PNS rated wild gardens as less beautiful and manicured more beautiful compared to respondents with a low PNS. In the case of Kuala Lumpur green space users, the rate of PNS is relatively low due to less need for structure and the choice of random and more naturalistic designs that are more preferred on all aspects.

Diversity, however, had a different impact on the attractiveness of the colour combination. In phase 1, higher diversity was more attractive, colour combination-wise. Lower diversity was less attractive in the earlier months of planting (phase 1). This is due to the fewer species and again, the fullness of the plots that makes it look less attractive. Furthermore, there is hardly any other colour in phase 1 apart from green and purple foliage. In phase 2, the situation is turned around when the respondents find the lower diversity have a much more attractive colour combination than the higher diversity. With higher diversity plots, 12 months later, the vegetations have become a denser-looking plot, but due to a high percentage of competition between more species, the number of species that survived was less, and the end look of the whole higher diversity was less appealing. However, the lower diversity was competing and thriving amongst each other, and the plants flourished well with an adequate amount of competition and have a better outlook, particularly more attractive colour combinations. The impact of flower cover is shown in (Hoyle, Jorgensen and Hitchmough, 2019) were the percentage of flower cover also had a significant effect on perceptions of naturalness with the extremes of flower cover 46% and above, and 0%–1% considered the least natural and moderate flower cover as the most natural. Colourful flowers have also been described as 'cues to care' in some cultures and contexts (Nassauer, 1988; Nassauer, 2011). An absence of flower cover or a flower cover of over a threshold of 46% appeared more artificial to participants, perhaps suggesting an overt form of human intervention or design. However, the pattern is not consistent with flower covers of 27%–46% and 2%–9% perceived as the most natural, but 10%–26% less (Hoyle, Jorgensen and Hitchmough, 2019).

In terms of layering, there was no significant difference between phase 1 and 2 whereby the respondents always find 3-layer vegetation (base, lower emergent and tall emergent) have a more attractive colour combination as compared to 2-layer and 1-layer only plots. This is the same for either one month after planting and 12 months after planting. It can be concluded that the respondents feel that the more layers gave the most attractive colour combinations. This would probably be about more layers having more number of species thus, more colour variety. However, in phase 2, only three to five dominant species outgrew the others. Particularly for 3-layer plots. Some of the 2-layer and 1-layer plots looked more barren and have empty soil patches more than the 3-layer plots because of survivability issues, resulting in a lower number of species that could grow and survive under the hot scorching sun. This is mainly for 1-layer (base only) vegetation. Nevertheless, the plants' size (maturity level) does not affect the attractiveness of colour combinations. Colour is likely to be primarily an indicator of resource availability in flower (Goulson & Osborne, 2009; Haslett, 1989; Kim et al., 2011) which further proved the finding that there is a strong correlation between aesthetical values and attractive colour combinations.

Martens, Gutscher and Bauer (2011) found that a ‘tended’ forest environment offered more significant restorative potential than ‘wild’ conditions, yet we identified a strong significant correlation between random design and restorative effect. In this study, intermediate is the least restorative and relaxing, contrary to the findings in relation to actual structural naturalness and restorative effect (Hoyle, Hitchmough and Jorgensen, 2017b) where an intermediate level of structural naturalness was most restorative. This may be partly due to higher mortality rates and a more open exposed soil in the intermediate design which tarnished its ability to flourish at its full potential.

Foliage attractiveness

Studies exploring the influence of vegetation features have shown that elements such as trees and shrubs (Jim and Chen, 2006; Kurz & Baudains, 2010; Schroeder, 1987), the neatness of vegetation (van den Berg & van Winsum-Westra, 2010) and vegetation characteristics such as colour (Kaufman & Lohr, 2004; Kendal, Kathryn J.H. Williams and Williams, 2012) and leaf texture (Williams & Cary, 2002) can shape people’s preferences.

Some species were selected because of their attractive or colourful foliage. The variables responded differently from one another in terms of foliage attractiveness. It can be highlighted that there is an impact of having attractive foliage colours on different variables within the plots—design variable changes from phase 1 to phase 2. In phase 1, the intermediate design foliage was perceived as the most attractive design both during the earlier stage of growth and maturity similar to the colour combination of the vegetation's whole look. The random design was the least attractive in phase 1. However, in phase 2, the random design was perceived as the most attractive and intermediate design has the least attractive foliages. Species like *Tradescantia spathacea* and big large leaves of *Heliconia psittacorum* was commonly liked and with them filling up the plots, respondents perceived the random design as the most attractive foliage.

The diversity also was perceived differently from phase 1 to phase 2 with higher diversity during one month after planting more preferred than the lower diversity. However, it was a different case when in phase 2, lower diversity's foliage is much more attractive than the higher diversity despite more number of species in the plots. Foliage attractiveness is also very significant for the plots with more layers: 3-layer vegetation (base, lower emergent, and taller emergent). Perception of layers did not change from phase 1 to phase 2. The more number of layer, the more attractive the foliage are. So, it is safe to say that the more layers, the more number of plants, more species mean more flower and colours to override intrinsic hostility to a messier design. This is particularly so when random design within 3-layer combinations at low diversity is perceived as the most attractive foliage combinations.

Disorder or messiness

The respondents' reaction towards messiness and disorder or complexity of the plots' vegetations is very much affected by the colour factors and allowed overriding the messiness factor. In phase 1, the random design was perceived as the most disordered and messy design, similar to what we hypothesize. This, however, changes in phase 2, when within all aspects, it changed into the least messy looking. Although the random design is still considered the second most crowded plot, the respondents still feel attractive, not messy or disordered. This has a strong connection with colour factors. With more flowers that came out after 12 months of planting, the random design has been looked at differently. The respondents even chose the design as being the most appropriate design amongst the three designs. This was significant across all aspects and demographic factors. In chapter 6, the majority of the respondents are inclined to feel relaxed with naturalistic style planting. As proven in the factorial analysis, the respondents mentioned that 'disorder/messiness in planting design makes them happy/comfortable', 'They prefer planting with lots of different species.', 'disorder/messiness in planting design makes them closer to nature and 'they like nature-like vegetation. These statements are reflected in the choices they made in the plot questions. Hoyle, Jorgensen and Hitchmough (2019) found an association between people's subjective nature experience and definable 'objective' vegetation structure. The multiple benefits of exposure to nature in urban areas are experienced by people who spend time in public green spaces and gardens, many of whom are already nature-connected and aware of these advantages (López-Martínez, 2017).

7.5.2. Difference between selections during the vegetative and flowering phase.

In phase 1, the design that was perceived as most tidy, appropriate and looked cared for was the structured design in terms of design variables. This design has the most systematic and well-grouped spatial arrangement. It also looks manicured no matter how many layers are there and the number of species in the diversity level. The majority of the colours appearing in this design are green and purple, but with very tidy and neat groups of the same species. That is most probably why the structured design is deemed as the most appropriate and tidy design of planting of phase 1. For the crowdedness factor, in phase 1, the random design was perceived as the most crowded plots amongst all design with different species planted next to each other without any particular order or clear pattern. Unsureness of neither here nor there, kind of design makes the respondents did not find the intermediate design attractive.

As with other aspects of respondents' response, in phase 2, the structured design is still perceived as the tidiest. However, it is not chosen as the most appropriate. Instead, the random design soared as the most appropriate and the one that looks most cared for although the most crowded. This phenomenon happens mainly due to the effect of colours and spatial arrangements. With random design at 12 months after planting, all species that grew and matured with five dominating species produced beautiful and bold flower colours such as pink, orange, red and yellow. Although the spatial arrangement is randomised, untidy and crowded, it is still perceived as most appropriate. This is an excellent example of how colours that created 'drama' override the intrinsic hostility factor of a messy, disordered, and intricate planting design.

Diversity has always been less vital variables when compared with design and layers. In phase 1 and phase 2 colours in different diversity played a role in impacting the respondents' perception of the plots. Although generally, in phase 1, the respondents perceived high diversity as the most appropriate, tidy, looked most cared-for and also most crowded given the density of more number of species within a plot. With more species, more colours existed in the high diversity plots, and this gave a better impact on the public park users generally, specifically the respondents. However, this changed in phase 2, whereby respondents felt the lower diversity had flourished well although the number of species is less, the ones that grew and matured well gave out a beautiful variety of colours. Thus, lower diversity level plots are perceived as more appropriate, more look cared for and tidier than the other. The higher diversity was still deemed the most crowded in phase 2 due to more number of species, furthermore when it is bigger and matured. In this situation, although the higher diversity level has more species, the attractiveness of colour impact is less. This might also be due to the unbalanced patches or non-surviving species (smaller size). Perceived naturalness was also related to its perceived biodiversity value. Planting associated with 'naturalness' was considered attractive and restorative to walk through, yet not exceptionally tidy or designed (Harris et al., 2018).

The third variable is the layer variable which is believed to have no significant difference between phase differences. The layer that is continuously perceived as the tidiest, appropriate and looked most cared-for is the 3-layer (base, lower emergents and tall emergents), although it is also most crowded. So, in layers, different colours did not affect respondents' perception of the multi-layers' complexity. This is because there is no difference between the respondents’ choice between the phases. What matters is the more number of layers despite the level of maturity and the colours, the more attractive it is. To conclude, the colour and other aesthetic properties override intrinsic hostility to disorder in tropical environments, particularly within the planting design and diversity variables. The impact that colour has is imminent to change people’s perception of the vegetation's complexity and disorder.

7.6. Research Question 6: Does the belief that plants are native species make them more attractive to green space users in a Malaysian context?

7.6.1. Knowledge and exposure of respondents on native species

Out of 419 respondents in Phase 1 and 412 in phase 2, only 15 respondents from both phases knew and correctly defined what native plants is. This is only 1.8% of respondents that has some basic knowledge of what native plants are. The situation is further shown by their perception of the plots’ native plants species percentage. In fact, from 18 species that were selected and planted, there were only three species that are native. They are, *Opiophogon jaburan, Spathoglottis plicata* and *Alpinia purpurata*.

In phase 1, random design at high diversity level within the 3-layers planting was perceived as having the most native species in a plot. On average, for all three variables and the combinations, the respondents felt there is 20%-40% of native species in all of the plots when the fact is there is 17% (0% - 20%) of the plants in the plots that are native. The same situation occurs in phase 2. With more matured vegetation, the impression of the number of native species percentage is even more substantial. The plots that were perceived as having the most number of native species (40%-60%) are the ones in the random design at low diversity within 3-layers. It was similar to phase 1 except for the diversity level. As explained previously, the lower diversity was perceived as having more species and fuller-looking plots because they compete healthily and achieve stability ecologically unlike the higher diversity that suffers more mortalities due to competition resulting to less growth and dominations of a few species. This also affected the impression on the vegetations in high diversity plots. This statement is further supported by a strong positive correlation between the number of plants in the plots and the percentage of native species available.

As mentioned in chapter 6.2 according to factorial analysis, the respondents that feel that 'planting is better when it contains native Malaysian species' and 'natural native planting is about a modern independent Malaysia' belongs to the 'anthropocentric' view or controlled nature group. They feel that they should control what is planted around their environment and have native species would show that a modern and new breed of Malaysians can be expressed better. The issue is that what they perceive as native is loosely based on what they are most familiar with in urban environments and not based on their knowledge of native plants. So the idea of a better green space with the planting of native plant species is non-plausible in this context since the percentage of respondents with native species knowledge is way too small. This was also mentioned in an Australian study (Kendal et al., 2012) which demonstrated that more educated participants chose native xerophytic planting with narrow grey-green foliage over more colourful flowering non-native species for their gardens. In Australia, nativeness is essential, particularly for the educated and nature-connected citizens that feel very patriotic over their native species. This is, however, not the case for Malaysian in Kuala Lumpur.

7.6.2. Native plants and Malaysia public park users

There were no significant correlations between the perception of ability to support wildlife with a percentage of native species in the plots. Although the greater the number of plant species in the plots, the more the respondents would think the percentage of native species is higher. Positive correlation relating to native species percentage in the plots are only with the level of crowdedness and tolerance of disorder and messiness. With the higher level of crowdedness, disorder and messiness, the more the plots are perceived as having more native species. This indicated that the native species is associated with crowdedness and messiness. This also indicated that native species are not making the plots looking more attractive or more appealing to green space user in the Malaysian context since the correlation is the messier, the more crowded and disordered the plots are, the less attractive the whole outlook of the plots despite having native plants in it.

Respondents that are 'nature-connected' have more knowledge of plants and the environment. 'Nature-connectedness' was identified as a meaningful dimension of our participants' beliefs. Particularly in the institutional garden sites, many of our participants showed a semi-professional interest in gardening. This has been shown to reinforce positive appreciation of nature (Clayton, 2007) and these participants expressed strongly biocentric (nature-centred), after Ives and Kendal (2013) beliefs. Our respondents, particularly the most nature-connected, would be more exposed than the 'average' UK citizen to the much-reported physical and psychological benefits (Clark et al.,2014; Hartig *et al.*, 2014) of spending time in nature (Hoyle, Jorgensen and Hitchmough, 2019). The more nature-connected, the more in-touch the respondents are with nature; the more educated the respondents are, the more familiar they are with native plants. However, in Chapter 6, it was shown that there is no significance between nature-connectedness and the native species knowledge and importance of native species in the planting community for landscape purposes. In conclusion, native species does not make the vegetation more attractive to the respondents in Kuala Lumpur’s green public space.

7.7 Future Design, Practice and Management

The research done in the two public parks of Kuala Lumpur has shown a clear choice and a preference by the public park users. These combinations of design and spatial arrangements would be potential future designs in beautifying the public parks. Thus, this part discusses this research's implication on the design, practice and park management going forward.

The following is a table of summary of key findings and the potential implications of the research on the future design, practice and management of urban parks in Kuala Lumpur and Malaysia.

Table 7.2: Potential implications of the research on the future design, practice and management of urban parks in Kuala Lumpur and Malaysia.

Implications	• The landscape of the Kuala Lumpur public parks can be changed positively. This is from the studies' outcome whereby the public park users are susceptible to changes towards a more naturalistic planting style. • Lower maintenance and a more robust planting community could be assembled going forward to minimize the expanses of the vegetation. They should be more self-sustainable and yet still looks good with minimal maintenance. • KL city hall should further test these selected plant species in the final list and plant them in a more prime area to receive more user feedback. With these experiments, public parks could use the data as a tool for potential KL landscape changes as a whole.
Future Design	• Age and education level were the two significant demographic factor that was shown to have the most number of clear preference on the composition’s spatial arrangements

	• The random and multi-layered design can be achieved and potentially can be a tool to achieve a self-sustaining and low maintenance design.
Practice and Management	• By having a fair amount of layers and coverage percentage, weeding will potentially be reduced. • In terms of pruning and trimmings, the naturalistic style planting does not need to be edited as often as compared to the structured design as they are looking more natural and the fair amount of 'messiness' would have a higher threshold to park users. • They would still have to be maintained, but the frequency of it is minimalized. • Watering is also potentially brought to a minimal due to the selected species' low watering needs within the planting community.

Future Design

After going through the studies' output, a few considerations are made based on the perceptions of the different combinations of design, layers and diversity levels of the vegetation. In terms of future designs, practice and management of Kuala Lumpur public parks, changes can be made positively. In a nutshell, public park users are susceptible to a more naturalistic style of planting.

The most important and impactful characteristics that were significant for design and layer variables are:

- The naturalness of the vegetation.
- Multiple colour combinations of flowers and foliage.
- How relaxed the design and layers of vegetation made them feel.
- How much they liked the planting composition.
- Disorderliness level and how appropriate the compositions are to them.

These characteristics were amongst the items tested on the respondents, and these six came as the most impactful. Designers should understand that not as per hypothesis, Malaysians favour the design that has a fair amount of naturalness in the spatial arrangements or any compositions. As shown in multiple sections in the thesis, it is intelligible that the KL public park users prefer the more complex layers and randomized design.

These natural-looking design and layers combinations often gave the multi-colour effect of flowers and foliage to the vegetation that enhances the intrinsic factor that has always preferred colours than monotones. These circumstances are similar and agreed by all the categories listed in the analysis of the components. Respondents with nature connectedness or have arguably more exposure to garden, ecology and nature favoured the combinations similarly for the nature-loving and even the exo-centric (anthropocentric views) group. As discussed in the previous subtopic in this chapter, colours do override intrinsic hostility to disorder. So design decisions that will be made can be based on having more amount of colours instead of only one or two colours in a composition. Having more is tolerable and acceptable.

All the respondents in this study were proven to be relaxed and calm in the presence of naturalness and the right amount of disorderliness or messiness. What was observed in the results was how, despite being deemed 'messy' and more nature-like, respondents do really liked these combinations, and they also find it appropriate. Randomized species in the plots with complex layers did not faze them nor made them uncomfortable. It made them feel at ease, provided there is multi-colours' presence that changes throughout the year in the same composition. Being a tropical country, Malaysia is blessed with warm and humid weather all year round, so herbaceous perennials can continuously bear flowers. Landscape designers have a good variety of species (high biodiversity) that can be chosen to be used in public park designs in the future.

Age and education level were the two significant demographic factors shown to have the most evident preference for the composition's spatial arrangements. The range of between 50 to 65 years old respondents was very positively responsive and most familiar with this random and multi-layered design, and they are also the category that visited the park most often than the other age group. Both parks exhibited the same statistics. Education level-wise, the higher education level (degree onwards) also showed inclinations towards the more natural way or, the less rigid and manicured design and layers. This might be due to their exposure or better knowledge in the newer, more modern design than currently practised in Malaysia. They are also considered susceptible to change of landscape planting style of Kuala Lumpur public parks in the future due to the majority of them being in the nature connected category in component one. Other demographic factors did not play many roles in terms of showing a clear preference for planting design. Thus, it can be deduced that the designers are all right to use the naturalistic style planting design to be used in the public parks of Kuala Lumpur in the future.

It is also important to reiterate that multiple layers of the composition are more significant and essential than the design and diversity between the variables. Thus, more layer (in this study, 3-layers) is well-liked by all category and respondents despite phases and diversity levels. So should be put on randomized spatial arrangements and multi-layering.

Practice and Management

The naturalistic style planting is often related to the 'messy' looking and a more fluid style. What designers often try to achieve is to build a composition that could self-sustain in a manner where they do not require much watering, much fertilizing, minimal weeding and can withstand the bright sun or extra shade—basically a robust design with lower maintenance. With the random and multi-layered design, these characters can be achieved and can potentially be a tool to achieve a self-sustaining and low maintenance design.

In the Braun-Blanquet ecological quadrat sampling, there were only seven species with the best coverage percentage and thrive well under the high solar irradiance, and shady area, especially for the lowest layer (base layer) grown under the more broad leaves of low and tall emergent. The amount of weeding will be significantly reduced by having the right amount of layers and coverage percentage. There is less space for the weeds to grow due to the natural 'mulching' effect created by choosing suitable base layer species. In terms of pruning and trimmings, the naturalistic style planting does not need to be edited as often as compared to the structured design as they are looking more natural and the tolerable amount of 'messiness' would have a higher threshold to park users. They would still have to be maintained, but the frequency of it is minimalized.

Randomized and multi-layered vegetations that were involved in pre-selection were carefully selected herbaceous perennials with robust characteristics. They only need minimal watering and minimal fertilization; thus, the maintenance cost is also lowered because of the minimal needs in cultural practices. Going forward, selections of the robust surviving species are vital for the designers to consider. This is to achieve a self-sustainable, lower-maintenance plant composition. Having these characteristics would tremendously impactful to decrease the annual budget for maintenance in a public park.

7.7.1 Summary of key findings

1. 3-D layer arrangements, design and diversity alongside species traits and morphologies did affect public park users' environmental psychology. Designed plant communities that look similar to semi-natural plant communities are more preferred than vegetation which looks dissimilar to semi-natural plant communities. This made the best combinations from the findings are multi-layered species with randomized spatial arrangements.

2. Public perception and preference of these vegetation types are related to participants' background factors, particularly age and education level differences. Significantly, public park users who are older (55-year-old onwards) and/or with higher education level (degree onwards) are susceptible to a more naturalistic style planting.

3. Colour of flowers and foliage (and other aesthetics properties) did override intrinsic hostility to disorder in tropical environments making the respondents responded positively towards it. Colour could majorly change opinions from dislike to like as the vegetative phase turns into the flowering stage despite 'messiness' or 'disorderliness'.

4. The belief of native species makes the vegetation looks more attractive to green space users in a Malaysian context is inaccurate. This is due to lack of knowledge and understanding of what native species is, to begin with. More emphasis and exposure need to be done to Malaysian to create a sense of belonging with native plants and, most importantly, to educate them on the beauty of native biodiversity that Malaysia has and this should be utilized to the optimum level.

CHAPTER 8

8. OVERALL CONCLUSION

This research aims to investigate the human response to multi-species designed plantings in Malaysian urban green space as a contemporary, potentially more sustainable and low maintenance planting design. In this part of the tropical region, naturalistic style planting has not been introduced in the urban setting. When the word naturalistic is mentioned, Malaysians would automatically relate it with the natural standing jungle that existed for thousands of years all around the country. This indicated that the unfamiliarity of this type of planting is still at large. In this study, we found that the ones with a particular idea of what a naturalistic planting looks like are the nature connected or respondents knowledgeable about nature and ecology, elders who are 56-year-old and onwards, and respondents educated particularly with higher degrees. So through this 15 months study, we tried to tap into the respondents' acceptance of naturalistic style planting and see how they responded with a different and similar kind of planting in Malaysia.

The three primary variables that were tested were design, diversity level and layers. The response of Malaysian, particularly in public park users of Permaisuri Lake Garden and Pudu Ulu Park were as follows:

The design that the respondents majorly resonated to in Phase 2 is the random design. In phase 1, most of them chose either structured design or intermediate design depending on the aspects that they are evaluating on. However, it was a landslide for random design in phase 2. This design gave the impressions of having more species than the other designs when the number of species is similar. The difference is only on the arrangement and where each species is placed in the plots, similarly, to the percentage of native species available in the plot. There is always more number of species in random design plots. This design also produced the most attractive colour combinations. Flowers and foliage alike. They looked cared-for, not messy nor crowded. Psychologically, the respondents liked this design, felt appropriate, and made them feel very relaxed.

The nature-diverse or eco-centric group of respondents resonated positively with this design in almost all aspects (aesthetic, restorative, and psychology). Nature diverse never chose the structured design in any of the questionnaires options. This is also the same case for nature connected. Equipped with good education and exposure on plants and ecology, they are more aware and chose this design based on facts and sound logic. They understood the impact that this design can have on maintenance and long-term culture practices management.

Layerings was created to elevate the complexity of the vegetation. Each layer has its functions, and they either make or break the design based on their natural interactions. There is 3-type of layers, which are 1-layer (base), 2-layer (Base and lower emergent) and 3-layer (Base, lower emergent and tall emergent). Amongst the three, 3-layer was chosen time and time again as the best type of layerings. Albeit in whichever phase of maturity, the plants are.

The vegetations in 3-layer were the most attractive, grow and interacted very well, and score a positive score across the board. In terms of impressions, restorative effect and attractiveness. It is tidy and looked cared for when combined with random design, 3-layer also scored high in all aspects of the questions. 1-layer, however, was deemed as most disordered and messy in phase 2. This brought us to the conclusion that it is not the number of species that existed in the positively attractive plots but how it is arranged and the complex layers that produce more colours and are perceived as tidy. The interactions between the 3-layers were symbiotic for each other, and they help protect and support each other. The under-storey forbs grew well under the shade of taller bigger forbs.

Diversity level (high and low) was differentiating the number of species present in the plots. High diversity was initially the clear choice in phase 1 however, when the plants are matured and have interacted with each other, the difference between the number of species has faded making them non-significant between each other. There were a minimal number of aspects that resonated towards lower diversity, for example, attractive colour combinations and attractive foliage. The lower diversity interacted very well and did not have a high competition than the higher diversity. This made them flourish and bloomed beautifully. High diversity was even considered as the disordered ones in phase 2. Nonetheless, overall diversity was not a significant variable in the preference of vegetation compositions.

There is a correlation between the restorative effect and colour combinations. This is based on the respondents' ultimate choice of combinations of vegetation spatial arrangements which are **random design and planted with 3-layer (multi-layer)**. It is also positively correlated to naturalness and negatively to crowdedness. This proves that the more natural the spatial arrangement is, the more attractive the vegetation is according to the respondents.

Education background plays the most substantial role in the adaptation to changes in landscape design in Malaysia. By educating Malaysian on native plants and exposing them to different and new ideas of naturalistic style planting would enhance acceptance on the fresher and more vibrant outlook of Kuala Lumpur city parks. The globalisation process would make the idea of naturalistic style planting more acceptable. The world has become smaller, and the exposure of these types of plantings with a certain level of complexity should potentially be implemented. Exposures through media & the internet would familiarize more Malaysians in the future of this type of design and spatial arrangements, especially when the country's level of education is increasingly positive and better.

The current landscape design in Malaysia's urban parks gets slightly saturated, whereby the same designs are repeatedly used in almost all urban parks around Malaysia. With optimistic outcomes and acceptance from this study, it is looking positive that stakeholders would incorporate naturalistic style planting into urban parks. If rejuvenated with new under-utilized native and non-native species, the design would give a breath of fresh air to the parks in Kuala Lumpur and Malaysia.

8.1. Brief Reflection on the Research Process

During the research process, a few hindrances became an obstacle that has to be overcome and twerked to get reliable data and results. In the beginning, getting approval from the Kuala Lumpur City Hall was very tough. Presentations upon presentations were made to convince them to use the public park's area to do an actual planting and created a planting community. The local authority's constant worry was majorly regarding on the aesthetic of the design and composition that would be put on site. They finally agreed after projections of visualization of how it would be like and what the scale would be like was shown. The vegetations were initially planned to be planted fluidly along with the site and not in a box. However, that was the conditions that the research have to meet in order for it to be conducted. So, the designs are restricted in a wooden box, and the box's locations were carefully selected in both parks.

Six enumerators (postgraduate students) were engaged in this study to help with the data collection process. They were briefed beforehand to minimise bias in their answers and how they answer might influence the respondents' response. They were only there to help with the survey process and to brief the respondents what the respondents have to do and which plot to visit according to questionnaire sets. I believe the enumerators did an excellent job in trying to be as non-influencing and unbiased as possible.

From this survey too, this research managed to tap into the emotions of public park users that use them daily to the less frequent visitors. They respond to a new planting style that has never been introduced in this part of the tropics. So it is interesting to see and hear the commentaries made post-survey about the vegetations' composition and how it is related to their environmental psychology. This study also has proved that sometimes, what we conformed in our mind as a perfect or suitable design, is not necessarily similar to what the mass is thinking. For example, in this study, the study's surprising result was very much contradicted with what was hypothesised in the beginning. The spatial arrangements and the chosen species deemed 'messy' and disordered can be looked as exciting and well-liked. The outcome was also different from the majority of the preceding relatable studies done in Malaysia. This is an eye-opener that Malaysians are ready for a new change of landscape designs and incorporating less popular plant species choices in the urban park setting.

With this output, further studies can be done to further ignite the changes in Malaysia landscape designs and be done with enough data and findings to appeal to the masses. City councils, park managers, landscape or garden designers and other stakeholders must join hands to ensure the changes could start with trial runs on planting the recommended designs and layer dimensions in the prime area of the parks around Kuala Lumpur. Also, going forward, Malaysians should be further educated on native plants. Native plants might not be attractive, but they might also have positive traits that are good and robust for lower maintenance. Education and exposures on native species should begin from school levels to inject some patriotism or sense of belonging that could be created within designing public and private green spaces.

8.2. Hindsight Improvements Made to The Research Design

In terms of improvements that could be made to the designs, the first would be changing some of the questionnaires' questions. Some questions could be leading questions which would lead to biases in the data. So, I would rephrase the questionnaire to ensure that respondents are not lead to what I think is the correct answer or what I feel is suitable. For example; 'Do you like this nature-like vegetation more than the traditional horticultural type of planting in the park?'. This question is a leading question, and respondents unknowingly answered with a pre-set thought. By correcting this type of questions, biases would be minimized.

The next improvement that I would do to make the research a much sounder one would be to conduct a qualitative study through the interview method. Quantitative study shows patterns and is excellent in quantifying and allowed me to test a hypothesis by systematically collecting and analyzing data, but with qualitative methods, I can explore ideas and experiences in much more depth. Initially, during pre-planning, apart from conducting a survey and another study that was supposed to be conducted was a microcosm study. However, due to some constraints on the micro-climate controlled-environment structure, this study has to be dropped from the research plan. So, an interview would be a great addition to this research.

Another improvement that I would do is I would conduct the same survey on Malaysian students living in Sheffield or any parts of the UK. This data would give a fair comparison because their exposure and familiarity with European style planting would skew the pattern, making it interesting to see the output.

8.3. Potential Future Research

Based on this study, it is recommended for future research, in continuation from this study to do a microcosm study. This is to see the interaction between the selected species. This would give a better insight into the robustness of the plant while undergoing competition to grow. This data would help in doing planning for a landscape project all-around urban parks in Malaysia. Another aspect that should be looked at is these plants' management practices—the costs involved in the annual maintenance of a perennial herbaceous plant present in the plots. The process of weeding (time and cost), pruning, fertilizing and watering should be documented and analyzed to see how much the multi-layered species' selections would decrease maintenance cost.

Going forward, researchers could conduct further testing on the parks. This could be done through planting the selected combinations of randomized spatial arrangements with multi-layer species in a more prime area of the parks. It should also be allowed to planted in a more fluid shape and not constricted to an individual box or a small corner to enable the full impact of this style of planting to be experienced by the public park users. Another aspect that could be looked at in a more detailed manner is safety issues relating to naturalistic style planting in the Kuala Lumpur public parks. In previous studies, there has not an actual planting on site that was tested. With this experimentation, researchers could further tap into correlations of fear and natural-style planting.

A vital factor that was showing its impact in this study was colour. In further researches, the colour difference should also be further looked at. Multiple perspectives could be tested on the colour subject. Colour preferences, colour brightness, colour hues and colour reflections are some examples of perspectives that can be explored in the future. Focus can be put on the impact of vegetation colour towards the public park user's environmental psychology in strengthening mental health and well-being.

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APPENDIX

QUESTIONNAIRE (KAJI SELIDIK)

Please answer all the following questions as accurately as possible by ticking ☑ the appropriate boxes (one per question unless otherwise stated).
Sila jawab soalan-soalan berikut setepat yang mungkin dengan menandakan ☑ kotak yang bersesuaian (Satu tanda dalam kotak jawapan bagi setiap soalan kecuali dimaklumkan sebaliknya)

Please wander around the plots for a couple of minutes to get an idea of how similar-different the plots look before starting to fill in the questionnaire.
Silakan berjalan di sekeliling plot-plot yang terdapat di tapak kajian selama beberapa minit dahulu untuk mendapatkan gambaran dan idea tentang persamaan atau perbezaan di antara plot sebelum mula menjawab kaji selidik.

THE PARK (*Taman*)

1. Is this your first visit to this park?
(Adakah ini kali pertama anda melawat taman ini?)
☐ No (*Tidak*) ☐ Yes (*Ya*) (Skip to Q3) (*Terus ke soalan 3*)

2. How often do you visit this park?
(*Berapa kerap anda melawat taman ini* ?)

☐ Daily (*Setiap hari)*	☐ 4-6 times per week (*4-6 kali seminggu*)	☐ 1-3 times per week (*1-3 kali seminggu*)	☐ A few times a month (*Beberapa kali sebulan*)	☐ Once a month or less (*Sebulan sekali atau kurang dari itu*)

3. Which other open spaces do you visit regularly? *(**you can tick ☑ more than 1 box)*
(*Kawasan terbuka manakah lagi yang sering anda lawati?)*(*Anda boleh tanda ☑ lebih dari satu kotak pilihan)*

☐ Other urban parks around the city (*Taman bandaran lain di sekitar Bandaraya KL*)
☐ Village (*kampung*)
☐ Seaside (Persisiran *Pantai*)
☐ National parks *(Taman Negara)*
☐ Other (*Lain-lain*). Please state (*Sila nyatakan*): ______________________

4. **Please rate these reasons for coming to the park in order of importance to you 1=most important and 5 least important. (*Sila beri perkadaran tentang tujuan anda datang ke taman ini. 1=sebab paling penting dan 5=sebab paling tidak penting*)**

	1 – Least Important (*Paling tidak penting*)	**2**	**3**	**4**	**5- Most Important *(paling penting)***
A. To escape to nature (*untuk menikmati alam semulajadi)*	☐	☐	☐	☐	☐
B. To enjoy the planting (*Untuk menikmati tanaman yang ada*)	☐	☐	☐	☐	☐
C. To exercise (*Untuk bersenam)*	☐	☐	☐	☐	☐
D. To meet/socialise with people (*untuk bertemu/ bersosial dengan masyarakat*)	☐	☐	☐	☐	☐
E. Other organised activities (*Untuk menyertai aktiviti yang telah diatur*)	☐	☐	☐	☐	☐

5. **Who are you visiting the park with? *(****you can tick ☑ more than 1 box)*
(*Anda melawat taman ini dengan siapa*?)(*Anda boleh tanda ☑ lebih dari satu kotak pilihan)*

☐ By myself (*Bersendirian*)
☐ Family (*Keluarga*)
☐ Friends (*Rakan-rakan*)
☐ Work Colleagues (*Rakan Sekerja*)
☐ Other (*lain-lain*). Please state (*Sila nyatakan*): ______________________

THE PLOTS (*PLOT-PLOT*)

Please tick only one answer unless the instructions ask you to respond differently to this (*Sila tandakan SATU jawapan sahaja melainkan diarahkan sebaliknya*)

6. **a. What was your familiarity with nature-like planting before seeing THIS planting? (*Adakah anda biasa melihat tanaman naturalistik seperti yang terdapat di dalam alam semulajadi sebelum ini?*)**

☐ No, I have never seen vegetation like this (Skip to Q7) (*Tidak, saya tidak pernah melihat tanaman seperti ini)(Terus ke Soalan 7)*

☐ Yes, I have seen similar vegetation (continue to answer below). (*Ya, saya pernah melihat tanaman seperti ini)(Teruskan menjawab soalan di bawah)*

Where did you see this type of planting? (Tick any relevant boxes*).* ***(Di manakah anda melihat tanaman jenis ini?)****(Tandakan mana-mana kotak yang sesuai)*

☐ b. In pictures in books (*Di dalam gambar dalam buku*)

☐ c. in pictures in newspapers/ magazines (*Di dalam gambar dalam surat khabar / majalah)*

☐ d. on the internet (*Di dalam Internet*)

☐ e. in other parks (*Di taman lain*)

☐ f. on the TV (*Di dalam TV*)

☐ g. Other (*lain-lain*). Please state (*Sila nyatakan*):

______________________.

7. **Do you think nature-like planting is appropriate in the park? (*Adakah anda berpendapat, tanaman naturalistik sesuai untuk digunakan di taman?)***

☐ Not appropriate at all (*Tidak sesuai sama sekali*)

☐ Inappropriate (*Tidak Sesuai*)

☐ Don't know (*Tidak pasti*)

☐ Quite appropriate (*Agak sesuai*)

☐ Very appropriate (*Sangat sesuai*)

8. **Do you like this nature-like vegetation more than the traditional horticultural type of planting in the park? (*Adakah anda suka tanaman secara naturalistik ini lebih daripada tanaman secara susunan biasa digunakan di dalam taman ini?*)**

☐ No, in all situations (*Tidak, dalam semua keadaan*)

☐ No, in some situations (*Tidak, dalam sesetengah keadaan)*

☐ Don't know (*Tidak pasti*)

☐ Yes, in some situations (*Ya, dalam sesetengah keadaan*)

☐ Yes, in all situations (*Ya, dalam semua keadaan*)

9. Do you know what "native plant" means? (*Please write your answer in the space provided)*

Adakah anda tahu apakah maksud 'Tanaman Asal' *(Sila berikan jawapan anda dalam ruang yang telah diberikan)*

☐ **NO; go to Q10 (TIDAK; Terus ke soalan 10)**

☐ **YES (*YA*)**

Native plant means…
(*Tanaman asli bermaksud…*)
____
____
____

ATTITUDES TO PLOTS / *SIKAP TERHADAP PLOT*

10. Please indicate your thoughts on each statement below for plots 1-18 by ticking ☑ ONE of the boxes in each line:
(Sila nyatakan fikiran anda terhadap setiap pernyataan di bawah bagi Plot 1 hingga 18 dengan menanda ☑ SATU kotak dalam setiap baris)

PLOT 1 (IH2)

STATEMENTS (KENYATAAN)	SCALE (SKALA)				
A. How many species of plants do you think there are in THIS plot? ***(Pada fikiran anda, berapa spesies tumbuhan ada dalam PLOT INI?)***	1-5 species ☐	6-10 species ☐	11-15 Species ☐	16-20 Species ☐	Over (*lebih daripada*) 20 Species ☐
B. What percentage (%) of plants in the plot do you think are NATIVE SPECIES? ***(Pada fikiran anda, berapa peratus (%) tumbuhan di dalam plot ini merupakan SPESIES ASLI?)***	0%-20% ☐	20%-40% ☐	40%-60% ☐	60%-80% ☐	80-100% ☐
C. How well does THIS plot support wildlife?	Very badly (*Sangat lemah*) ☐	Badly (*Lemah*) ☐	Average (*Biasa*) ☐	Well (*Baik*) ☐	Very well (*Sangat baik*) ☐

(Sejauh mana PLOT INI dapat menyokong hidupan dan serangga)					
D. How attractive are the colour combinations of THIS plot? ***(Bagaimana menariknya kombinasi warna plot INI?)***	Very unattractive *(Sangat kurang menarik)* ☐	Slightly unattractive *(Kurang menarik)* ☐	No opinion *(Tiada pilihan)* ☐	Slightly attractive *(Menarik)* ☐	Very attractive *(Sangat menarik)* ☐
E. Do you find the planting in THIS plot inappropriate? ***(Adakah anda merasakan tanaman di dalam PLOT INI tidak sesuai?)***	Very Inapropriate *(Sangat tidak sesuai)* ☐	Inapropriate *(Tidak sesuai)* ☐	No opinion *(Tiada pendapat)* ☐	Apropriate *(Sesuai)* ☐	Very Apropriate *(Sangat sesuai)* ☐
F. How does THIS plot make you feel? ***(Bagaimana PLOt INI memberi kesan kepada anda?)***	Stressed *(Tertekan)* ☐	Not relaxed *(Tidak tenang)* ☐	No opinion *(Tiada pendapat)* ☐	Relaxed *(Tenang)* ☐	Very relaxed *(Sangat tenang)* ☐
G. Do you like the design of THIS plot? ***(Adakah anda menyukai rekabentuk plot INI?)***	Dislike very much *(Sangat tidak suka)* ☐	Dislike *(Tidak suka)* ☐	No opinion *(Tiada pendapat)* ☐	Like *(Suka)* ☐	Like very much *(Sangat suka)* ☐
H. How attractive are the foliage? ***(Bagaimana menariknya dedaunan dalam plot ini?)***	Very unattractive *(Sangat k menarik)* ☐	Slightly unattractive *(Kurang menarik)* ☐	No preference *(Tiada pilihan)* ☐	Slightly attractive *(Agak menarik)* ☐	Very attractive *(Sangat menarik)* ☐
I. How disordered or messy is it? ***(Bagaimana bercelarunya plot ini?)***	Very messy *(Sangat tidak teratur)* ☐	Quite messy *(Agak tidak teratur)* ☐	No opinion *(Tiada pendapat)* ☐	Quite neat *(Sedikit tidak teratur)* ☐	Very neat *(Teratur)* ☐
J. Does it look cared for? ***(Adakah ia kelihatan terjaga?)***	Very Uncared for *(Terbiar)* ☐	Uncared for *(Agak terjaga)* ☐	No opinion *(Tiada pendapat)* ☐	Cared for *(Terjaga)* ☐	Very cared for *(Sangat terjaga)* ☐
K. Does it look tidy? ***(Adakah ia kelihatan kemas?)***	Very untidy *(Sangat tidak kemas)* ☐	Quite untidy *(Agak tidak kemas)* ☐	No opinion *(Tiada pendapat)* ☐	Quite tidy *(Agak kemas)* ☐	Very tidy *(Sangat kemas)* ☐
L. **Does it look natural?** ***Adakah ia kelihatan semulajadi?)***	Very natural *(Sangat semulajadi)* ☐	Natural *(Semulajadi)* ☐	No opinion *(Tiada pendapat)* ☐	Designed *(Direkabentuk)* ☐	Very designed *(Sangat direkabentuk)* ☐
M. Does THIS plot look crowded? ***(Adakah PLOT INI kelihatan sesak?)***	Very crowded *(Sangat sesak)* ☐	Quite crowded *(Agak sesak)* ☐	No opinion *(Tiada pendapat)* ☐	Quite sparse *(Kurang sesak)* ☐	Very sparse *(Sangat tidak sesak (jarang)* ☐

PLOT 4 (IL1)

STATEMENTS (KENYATAAN)	SCALE (SKALA)				
A. How many species of plants do you think there are in THIS plot? ***(Pada fikiran anda, berapa spesies tumbuhan ada dalam plot ini?)***	1-5 species ☐	6-10 species ☐	11-15 Species ☐	16-20 Species ☐	Over (*lebih daripada)* 20 Species ☐
B. What percentage (%) of plants in the plot do you think are NATIVE SPECIES? ***(Pada fikiran anda, berapa peratus (%) tumbuhan di dalam plot ini merupakan SPESIES ASLI?)***	0%-20% ☐	20%-40% ☐	40%-60% ☐	60%-80% ☐	80-100% ☐
C. How well does THIS plot support wildlife? ***(Sejauh mana plot INI dapat menyokong hidupan dan serangga)***	Very badly *(Sangat lemah)* ☐	Badly (*Lemah*) ☐	Average *(Biasa)* ☐	Well *(Baik)* ☐	Very well *(Sangat baik)* ☐
D. How attractive are the colour combinations of THIS plot? ***(Bagaimana menariknya kombinasi warna plot INI?)***	Very unattractive *(Sangat kurang menarik)* ☐	Slightly unattractive *(Kurang menarik)* ☐	No opinion *(Tiada pilihan)* ☐	Slightly attractive *(Menarik)* ☐	Very attractive *(Sangat menarik)* ☐
E. **Do you find the planting in THIS plot inappropriate?** ***(Adakah anda merasakan tanaman di dalam PLOT INI tidak sesuai?)***	Very Inapropriate *(Sangat tidak sesuai)* ☐	Inapropriate *(Tidak sesuai)* ☐	No opinion *(Tiada pendapat)* ☐	Apropriate *(Sesuai)* ☐	Very Apropriate *(Sangat sesuai)* ☐
F. How does THIS plot make you feel? ***(Bagaimana plot INI memberi kesan kepada anda?)***	Stressed *(Tertekan)* ☐	Not relaxed *(Tidak tenang)* ☐	No opinion *(Tiada pendapat)* ☐	Relaxed *(Tenang)* ☐	Very relaxed *(Sangat tenang)* ☐
G. Do you like the design of THIS plot? ***(Adakah anda menyukai rekabentuk plot INI?)***	Dislike very much *(Sangat tidak suka)* ☐	Dislike *(Tidak suka)* ☐	No opinion *(Tiada pendapat)* ☐	Like *(Suka)* ☐	Like very much *(Sangat suka)* ☐
H. How attractive are the foliage? ***(Bagaimana menariknya dedaunan dalam plot ini?)***	Very unattractive *(Sangat k menarik)* ☐	Slightly unattractive *(Kurang menarik)* ☐	No preference *(Tiada pilihan)* ☐	Slightly attractive *(Agak menarik)* ☐	Very attractive *(Sangat menarik)* ☐
I. How disordered or messy is it? ***(Bagaimana bercelarunya plot ini?)***	Very messy *(Sangat tidak teratur)* ☐	Quite messy *(Agak tidak teratur)* ☐	No opinion *(Tiada pendapat)* ☐	Quite neat *(Sedikit tidak teratur)* ☐	Very neat *(Teratur)* ☐
J. Does it look cared for?	Very Uncared for *(Terbiar)*	Uncared for *(Agak terjaga)*	No opinion	Cared for *(Terjaga)*	Very cared for *(Sangat terjaga)*

(Adakah ia kelihatan terjaga?)	☐	☐	*(Tiada pendapat)* ☐	☐	☐
K. Does it look tidy? ***(Adakah ia kelihatan kemas?)***	Very untidy *(Sangat tidak kemas)* ☐	Quite untidy *(Agak tidak kemas)* ☐	No opinion *(Tiada pendapat)* ☐	Quite tidy *(Agak kemas)* ☐	Very tidy *(Sangat kemas)* ☐
L. Does it look natural? ***Adakah ia kelihatan semulajadi?)***	Very natural *(Sangat semulajadi)* ☐	Natural *(Semulajadi)* ☐	No opinion *(Tiada pendapat)* ☐	Designed *(Direkabentuk)* ☐	Very designed *(Sangat direkabentuk)* ☐
M. Does THIS plot look crowded? ***(Adakah plot ini kelihatan sesak?)***	Very crowded *(Sangat sesak)* ☐	Quite crowded *(Agak sesak)* ☐	No opinion *(Tiada pendapat)* ☐	Quite sparse *(Kurang sesak)* ☐	Very sparse *(Sangat tidak sesak (jarang)* ☐

PLOT 9 (SL3)

STATEMENTS (KENYATAAN)	SCALE (SKALA)				
A. How many species of plants do you think there are in THIS plot? ***(Pada fikiran anda, berapa spesies tumbuhan ada dalam plot ini?)***	1-5 species ☐	6-10 species ☐	11-15 Species ☐	16-20 Species ☐	Over (*lebih daripada*) 20 Species ☐
B. What percentage (%) of plants in the plot do you think are NATIVE SPECIES? ***(Pada fikiran anda, berapa peratus (%) tumbuhan di dalam plot ini merupakan SPESIES ASLI?)***	0%-20% ☐	20%-40% ☐	40%-60% ☐	60%-80% ☐	80-100% ☐
C. How well does THIS plot support wildlife? ***(Sejauh mana plot INI dapat menyokong hidupan dan serangga)***	Very badly *(Sangat lemah)* ☐	Badly *(Lemah*) ☐	Average *(Biasa)* ☐	Well *(Baik)* ☐	Very well *(Sangat baik)* ☐
D. How attractive are the colour combinations of THIS plot? ***(Bagaimana menariknya kombinasi warna plot INI?)***	Very unattractive *(Sangat kurang menarik)* ☐	Slightly unattractive *(Kurang menarik)* ☐	No opinion *(Tiada pilihan)* ☐	Slightly attractive *(Menarik)* ☐	Very attractive *(Sangat menarik)* ☐
E. **Do you find the planting in THIS plot inappropriate?** ***(Adakah anda merasakan tanaman di dalam PLOT INI tidak sesuai?)***	Very Inapropriate *(Sangat tidak sesuai)* ☐	Inapropriate *(Tidak sesuai)* ☐	No opinion *(Tiada pendapat)* ☐	Apropriate *(Sesuai)* ☐	Very Apropriate *(Sangat sesuai)* ☐
F. How does THIS plot make you feel?	Stressed *(Tertekan)* ☐	Not relaxed *(Tidak tenang)* ☐	No opinion *(Tiada pendapat)* ☐	Relaxed *(Tenang)* ☐	Very relaxed *(Sangat tenang)* ☐

(Bagaimana plot INI memberi kesan kepada anda?)					
G. Do you like the design of THIS plot? ***(Adakah anda menyukai rekabentuk plot INI?)***	Dislike very much *(Sangat tidak suka)* ☐	Dislike *(Tidak suka)* ☐	No opinion *(Tiada pendapat)* ☐	Like *(Suka)* ☐	Like very much *(Sangat suka)* ☐
H. How attractive are the foliage? ***(Bagaimana menariknya dedaunan dalam plot ini?)***	Very unattractive *(Sangat k menarik)* ☐	Slightly unattractive *(Kurang menarik)* ☐	No preference *(Tiada pilihan)* ☐	Slightly attractive *(Agak menarik)* ☐	Very attractive *(Sangat menarik)* ☐
I. How disordered or messy is it? ***(Bagaimana bercelarunya plot ini?)***	Very messy *(Sangat tidak teratur)* ☐	Quite messy *(Agak tidak teratur)* ☐	No opinion *(Tiada pendapat)* ☐	Quite neat *(Sedikit tidak teratur)* ☐	Very neat *(Teratur)* ☐
J. Does it look cared for? ***(Adakah ia kelihatan terjaga?)***	Very Uncared for *(Terbiar)* ☐	Uncared for *(Agak terjaga)* ☐	No opinion *(Tiada pendapat)* ☐	Cared for *(Terjaga)* ☐	Very cared for *(Sangat terjaga)* ☐
K. Does it look tidy? ***(Adakah ia kelihatan kemas?)***	Very untidy *(Sangat tidak kemas)* ☐	Quite untidy *(Agak tidak kemas)* ☐	No opinion *(Tiada pendapat)* ☐	Quite tidy *(Agak kemas)* ☐	Very tidy *(Sangat kemas)* ☐
L. Does it look natural? ***Adakah ia kelihatan semulajadi?)***	Very natural *(Sangat semulajadi)* ☐	Natural *(Semulajadi)* ☐	No opinion *(Tiada pendapat)* ☐	Designed *(Direkabentuk)* ☐	Very designed *(Sangat direkabentuk)* ☐
M. Does THIS plot look crowded? ***(Adakah plot ini kelihatan sesak?)***	Very crowded *(Sangat sesak)* ☐	Quite crowded *(Agak sesak)* ☐	No opinion *(Tiada pendapat)* ☐	Quite sparse *(Kurang sesak)* ☐	Very sparse *(Sangat tidak sesak (jarang)* ☐

PLOT 12 (RL2)

STATEMENTS (KENYATAAN)	**SCALE (SKALA)**				
A. How many species of plants do you think there are in THIS plot? ***(Pada fikiran anda, berapa spesies tumbuhan ada dalam plot ini?)***	1-5 species ☐	6-10 species ☐	11-15 Species ☐	16-20 Species ☐	Over (*lebih daripada)* 20 Species ☐
B. What percentage (%) of plants in the plot do you think are NATIVE SPECIES? ***(Pada fikiran anda, berapa peratus (%) tumbuhan di dalam plot***	0%-20% ☐	20%-40% ☐	40%-60% ☐	60%-80% ☐	80-100% ☐

ini merupakan SPESIES ASLI?)					
C. How well does THIS plot support wildlife? ***(Sejauh mana plot INI dapat menyokong hidupan dan serangga)***	Very badly *(Sangat lemah)* ☐	Badly *(Lemah)* ☐	Average *(Biasa)* ☐	Well *(Baik)* ☐	Very well *(Sangat baik)* ☐
D. How attractive are the colour combinations of THIS plot? ***(Bagaimana menariknya kombinasi warna plot INI?)***	Very unattractive *(Sangat kurang menarik)* ☐	Slightly unattractive *(Kurang menarik)* ☐	No opinion *(Tiada pilihan)* ☐	Slightly attractive *(Menarik)* ☐	Very attractive *(Sangat menarik)* ☐
E.* Do you find the planting in THIS plot inappropriate?** ***(Adakah anda merasakan tanaman di dalam PLOT INI tidak sesuai?)	Very Inapropriate *(Sangat tidak sesuai)* ☐	Inapropriate *(Tidak sesuai)* ☐	No opinion *(Tiada pendapat)* ☐	Apropriate *(Sesuai)* ☐	Very Apropriate *(Sangat sesuai)* ☐
F. How does THIS plot make you feel? ***(Bagaimana plot INI memberi kesan kepada anda?)***	Stressed *(Tertekan)* ☐	Not relaxed *(Tidak tenang)* ☐	No opinion *(Tiada pendapat)* ☐	Relaxed *(Tenang)* ☐	Very relaxed *(Sangat tenang)* ☐
G. Do you like the design of THIS plot? ***(Adakah anda menyukai rekabentuk plot INI?)***	Dislike very much *(Sangat tidak suka)* ☐	Dislike *(Tidak suka)* ☐	No opinion *(Tiada pendapat)* ☐	Like *(Suka)* ☐	Like very much *(Sangat suka)* ☐
H. How attractive are the foliage? ***(Bagaimana menariknya dedaunan dalam plot ini?)***	Very unattractive *(Sangat k menarik)* ☐	Slightly unattractive *(Kurang menarik)* ☐	No preference *(Tiada pilihan)* ☐	Slightly attractive *(Agak menarik)* ☐	Very attractive *(Sangat menarik)* ☐
I. How disordered or messy is it? ***(Bagaimana bercelarunya plot ini?)***	Very messy *(Sangat tidak teratur)* ☐	Quite messy *(Agak tidak teratur)* ☐	No opinion *(Tiada pendapat)* ☐	Quite neat *(Sedikit tidak teratur)* ☐	Very neat *(Teratur)* ☐
J. Does it look cared for? ***(Adakah ia kelihatan terjaga?)***	Very Uncared for *(Terbiar)* ☐	Uncared for *(Agak terjaga)* ☐	No opinion *(Tiada pendapat)* ☐	Cared for *(Terjaga)* ☐	Very cared for *(Sangat terjaga)* ☐
K. Does it look tidy? ***(Adakah ia kelihatan kemas?)***	Very untidy *(Sangat tidak kemas)* ☐	Quite untidy *(Agak tidak kemas)* ☐	No opinion *(Tiada pendapat)* ☐	Quite tidy *(Agak kemas)* ☐	Very tidy *(Sangat kemas)* ☐
L. **Does it look natural?**	Very natural	Natural *(Semulajadi)*	No opinion	Designed *(Direkabentuk)*	Very designed

Adakah ia kelihatan semulajadi?)	*(Sangat semulajadi)* ☐	☐	*(Tiada pendapat)* ☐	☐	*(Sangat direkabentuk)* ☐
M. Does THIS plot look crowded? ***(Adakah plot ini kelihatan sesak?)***	Very crowded *(Sangat sesak)* ☐	Quite crowded *(Agak sesak)* ☐	No opinion *(Tiada pendapat)* ☐	Quite sparse *(Kurang sesak)* ☐	Very sparse *(Sangat tidak sesak (jarang)* ☐

PLOT 13 (SH1)

STATEMENTS (KENYATAAN)	SCALE (SKALA)				
A. How many species of plants do you think there are in THIS plot? ***(Pada fikiran anda, berapa spesies tumbuhan ada dalam plot ini?)***	1-5 species ☐	6-10 species ☐	11-15 Species ☐	16-20 Species ☐	Over (*lebih daripada*) 20 Species ☐
B. What percentage (%) of plants in the plot do you think are NATIVE SPECIES? ***(Pada fikiran anda, berapa peratus (%) tumbuhan di dalam plot ini merupakan SPESIES ASLI?)***	0%-20% ☐	20%-40% ☐	40%-60% ☐	60%-80% ☐	80-100% ☐
C. How well does THIS plot support wildlife? ***(Sejauh mana plot INI dapat menyokong hidupan dan serangga)***	Very badly *(Sangat lemah)* ☐	Badly *(Lemah)* ☐	Average *(Biasa)* ☐	Well *(Baik)* ☐	Very well *(Sangat baik)* ☐
D. How attractive are the colour combinations of THIS plot? ***(Bagaimana menariknya kombinasi warna plot INI?)***	Very unattractive *(Sangat kurang menarik)* ☐	Slightly unattractive *(Kurang menarik)* ☐	No opinion *(Tiada pilihan)* ☐	Slightly attractive *(Menarik)* ☐	Very attractive *(Sangat menarik)* ☐
E. Do you find the planting in THIS plot inappropriate? *(Adakah anda merasakan tanaman di dalam PLOT INI tidak sesuai?)*	Very Inapropriate *(Sangat tidak sesuai)* ☐	Inapropriate *(Tidak sesuai)* ☐	No opinion *(Tiada pendapat)* ☐	Apropriate *(Sesuai)* ☐	Very Apropriate *(Sangat sesuai)* ☐
F. How does THIS plot make you feel? ***(Bagaimana plot INI memberi kesan kepada anda?)***	Stressed *(Tertekan)* ☐	Not relaxed *(Tidak tenang)* ☐	No opinion *(Tiada pendapat)* ☐	Relaxed *(Tenang)* ☐	Very relaxed *(Sangat tenang)* ☐
G. Do you like the design of THIS plot? ***(Adakah anda menyukai rekabentuk plot INI?)***	Dislike very much *(Sangat tidak suka)* ☐	Dislike *(Tidak suka)* ☐	No opinion *(Tiada pendapat)* ☐	Like *(Suka)* ☐	Like very much *(Sangat suka)* ☐
H. How attractive are the foliage?	Very unattractive *(Sangat k menarik)* ☐	Slightly unattractive *(Kurang menarik)* ☐	No preference	Slightly attractive *(Agak menarik)* ☐	Very attractive *(Sangat menarik)* ☐

(Bagaimana menariknya dedaunan dalam plot ini?)			*(Tiada pilihan)* ☐		
I. How disordered or messy is it? ***(Bagaimana bercelarunya plot ini?)***	Very messy *(Sangat tidak teratur)* ☐	Quite messy *(Agak tidak teratur)* ☐	No opinion *(Tiada pendapat)* ☐	Quite neat *(Sedikit tidak teratur)* ☐	Very neat *(Teratur)* ☐
J. Does it look cared for? ***(Adakah ia kelihatan terjaga?)***	Very Uncared for *(Terbiar)* ☐	Uncared for *(Agak terjaga)* ☐	No opinion *(Tiada pendapat)* ☐	Cared for *(Terjaga)* ☐	Very cared for *(Sangat terjaga)* ☐
K. Does it look tidy? ***(Adakah ia kelihatan kemas?)***	Very untidy *(Sangat tidak kemas)* ☐	Quite untidy *(Agak tidak kemas)* ☐	No opinion *(Tiada pendapat)* ☐	Quite tidy *(Agak kemas)* ☐	Very tidy *(Sangat kemas)* ☐
L. Does it look natural? ***Adakah ia kelihatan semulajadi?)***	Very natural *(Sangat semulajadi)* ☐	Natural *(Semulajadi)* ☐	No opinion *(Tiada pendapat)* ☐	Designed *(Direkabentuk)* ☐	Very designed *(Sangat direkabentuk)* ☐
M. Does THIS plot look crowded? ***(Adakah plot ini kelihatan sesak?)***	Very crowded *(Sangat sesak)* ☐	Quite crowded *(Agak sesak)* ☐	No opinion *(Tiada pendapat)* ☐	Quite sparse *(Kurang sesak)* ☐	Very sparse *(Sangat tidak sesak (jarang)* ☐

PLOT 18 (RH3)

STATEMENTS (KENYATAAN)	SCALE (SKALA)				
A. How many species of plants do you think there are in THIS plot? ***(Pada fikiran anda, berapa spesies tumbuhan ada dalam plot ini?)***	1-5 species ☐	6-10 species ☐	11-15 Species ☐	16-20 Species ☐	Over (*lebih daripada)* 20 Species ☐
B. What percentage (%) of plants in the plot do you think are NATIVE SPECIES? ***(Pada fikiran anda, berapa peratus (%) tumbuhan di dalam plot ini merupakan SPESIES ASLI?)***	0%-20% ☐	20%-40% ☐	40%-60% ☐	60%-80% ☐	80-100% ☐
C. How well does THIS plot support wildlife? ***(Sejauh mana plot INI dapat menyokong hidupan dan serangga)***	Very badly *(Sangat lemah)* ☐	Badly *(Lemah)* ☐	Average *(Biasa)* ☐	Well *(Baik)* ☐	Very well *(Sangat baik)* ☐
D. How attractive are the colour combinations of THIS plot? ***(Bagaimana menariknya kombinasi warna plot INI?)***	Very unattractive *(Sangat kurang menarik)* ☐	Slightly unattractive *(Kurang menarik)* ☐	No opinion *(Tiada pilihan)* ☐	Slightly attractive *(Menarik)* ☐	Very attractive *(Sangat menarik)* ☐
E. **Do you find the planting in THIS plot**	Very Inapropriate *(Sangat tidak sesuai)*	Inapropriate *(Tidak sesuai)*	No opinion	Apropriate *(Sesuai)*	Very Apropriate *(Sangat sesuai)*

inappropriate? *(Adakah anda merasakan tanaman di dalam PLOT INI tidak sesuai?)*	☐	☐	*(Tiada pendapat)* ☐	☐	☐
F. How does THIS plot make you feel? ***(Bagaimana plot INI memberi kesan kepada anda?)***	Stressed *(Tertekan)* ☐	Not relaxed *(Tidak tenang)* ☐	No opinion *(Tiada pendapat)* ☐	Relaxed *(Tenang)* ☐	Very relaxed *(Sangat tenang)* ☐
G. Do you like the design of THIS plot? ***(Adakah anda menyukai rekabentuk plot INI?)***	Dislike very much *(Sangat tidak suka)* ☐	Dislike *(Tidak suka)* ☐	No opinion *(Tiada pendapat)* ☐	Like *(Suka)* ☐	Like very much *(Sangat suka)* ☐
H. How attractive are the foliage? ***(Bagaimana menariknya dedaunan dalam plot ini?)***	Very unattractive *(Sangat k menarik)* ☐	Slightly unattractive *(Kurang menarik)* ☐	No preference *(Tiada pilihan)* ☐	Slightly attractive *(Agak menarik)* ☐	Very attractive *(Sangat menarik)* ☐
I. How disordered or messy is it? ***(Bagaimana bercelarunya plot ini?)***	Very messy *(Sangat tidak teratur)* ☐	Quite messy *(Agak tidak teratur)* ☐	No opinion *(Tiada pendapat)* ☐	Quite neat *(Sedikit tidak teratur)* ☐	Very neat *(Teratur)* ☐
J. Does it look cared for? ***(Adakah ia kelihatan terjaga?)***	Very Uncared for *(Terbiar)* ☐	Uncared for *(Agak terjaga)* ☐	No opinion *(Tiada pendapat)* ☐	Cared for *(Terjaga)* ☐	Very cared for *(Sangat terjaga)* ☐
K. Does it look tidy? ***(Adakah ia kelihatan kemas?)***	Very untidy *(Sangat tidak kemas)* ☐	Quite untidy *(Agak tidak kemas)* ☐	No opinion *(Tiada pendapat)* ☐	Quite tidy *(Agak kemas)* ☐	Very tidy *(Sangat kemas)* ☐
L. Does it look natural? ***Adakah ia kelihatan semulajadi?)***	Very natural *(Sangat semulajadi)* ☐	Natural *(Semulajadi)* ☐	No opinion *(Tiada pendapat)* ☐	Designed *(Direkabentuk)* ☐	Very designed *(Sangat direkabentuk)* ☐
M. Does THIS plot look crowded? ***(Adakah plot ini kelihatan sesak?)***	Very crowded *(Sangat sesak)* ☐	Quite crowded *(Agak sesak)* ☐	No opinion *(Tiada pendapat)* ☐	Quite sparse *(Kurang sesak)* ☐	Very sparse *(Sangat tidak sesak (jarang)* ☐

YOUR ATTITUDES IN GENERAL TOWARDS PLANTING IN PARKS
(*SIKAP ANDA SECARA AM TERHADAP TANAMAN DI DALAM TAMAN)*

Please tick ☑ the appropriate box *(Sila tandakan ☑ di kotak yang bersesuaian)*	**Totally Disagree (*Sangat tidak setuju*)**	**Disagree (*Tidak setuju*)**	**No Opinion (*Tiada Pendapat*)**	**Agree (*Setuju*)**	**Totally Agree (*Sangat setuju*)**
11. I like formal, ordered planting in a park. (*Saya suka tanaman yang berbentuk formal dan tersusun rapi di dalam taman*)					
12. I like informal and natural-looking planting in a park. (*Saya suka tanaman yang berbentuk tidak formal dan tampak semulajadi di dalam taman*)					
13. Planting is better when it contains native Malaysian species. (*Tanaman adalah lebih baik sekiranya ia terdiri daripada spesies pokok asli dari Malaysia*)					
14. Natural native planting is about a modern independent Malaysia. (*Tanaman secara semulajadi dan menggunakan spesies tumbuhan asli menggambarkan masyarakat Malaysia yang moden dan merdeka*)					
15. I know what naturalistic planting is. (*Saya tahu apa itu tanaman secara naturalistik / mirip semulajadi*)					
16. I like nature-like vegetation. (*Saya suka penanaman yang berciri naturalistik / mirip semulajadi*)					
17. I like to see cultivated soil in between plants. (*Saya suka melihat tanah yang terdapat di antara tanaman*)					
18. Mixing plants species together makes it look messy. (*Mencampurkan pelbagai jenis spesies tanaman membuatkan ia tampak tidak kemas / bercelaru*)					
19. Disorder/messiness in planting design makes me closer to nature. (*Rekabentuk penanaman yang kurang kemas / bercelaru membuatkan saya lebih dekat dengan alam semulajadi*)					
20. Disorder/messiness in planting design makes me happy/comfortable (*Rekabentuk penanaman yang kurang kemas / bercelaru membuatkan saya gembira / selesa)*					
21. The plots contribute to the character of the local area. (*Plot-plot tanaman ini menyumbang kepada karakter kawasan tempatan anda*)					

22. I prefer planting with lots of different species. (*Saya lebih suka tanaman dengan banyak spesies yang berbeza*)					
23. I prefer planting with only a few species. (*Saya lebih suka tanaman dengan menggunakan beberapa jenis spesies sahaja*)					
24. Planting is about the colour of the flowers. (*Penanaman adalah berkait rapat dengan warna bunga-bungaan)*					
25. I often visit gardens that are open to the public. (*Saya selalu melawat taman-taman awam*)					
26. I can recognise many Malaysian plants (*Saya boleh mengenalpasti banyak tanaman yang berasal dari Malaysia)*					
27. I regularly garden. (*Saya selalu bercucuk-tanam)*					
28. I choose to spend a lot of time outdoors. (*Saya suka menghabiskan masa lapang di luar rumah)*					
29. I can design a garden. (*Saya boleh mereka bentuk taman*)					
30. I am passionate about the natural environment. (*Saya sangat meminati alam semulajadi dan alam sekitar*)					
31. I regularly read about the environment. (*Saya sering membaca bahan bacaan yang berkaitan dengan alam sekitar*)					
32. I know a lot about ecology. (*Saya mempunyai banyak pengetahuan mengenai ekologi*)					

ABOUT YOU / *TENTANG ANDA*

Gender / *Jantina*

☐ Male / *Lelaki*

☐ Female / *Wanita*

☐ Prefer not to say / *Tidak mahu diketahui*

Age / *Umur*

☐ 18 – 25

☐ 26 – 40

☐ 41 – 55

☐ 56 – 65

☐ Over 65

Nationality / *Kewarganergaraan*

☐ Malaysian / *Rakyat Malaysia*

☐ Non-Malaysian / *Bukan Rakyat Malaysia*

Please state / *Sila nyatakan*: ______________

Ethnicity / *Kumpulan Etnik*

☐ Malay / *Melayu*

☐ Chinese / *Cina*

☐ Indian / *India*

☐ Sabahan or Sarawakian Bumiputra / *Bumiputera Sabah atau Sarawak*

☐ Others / *Lain-lain*

Please state / *Sila nyatakan*: ______________

What is your educational background?

Apakah latar belakang pendidikan anda?

Please tick the box that describes your highest level of education.

Sila tandakan kotak yang menunjukkan tahap tertinggi pendidikan anda.

☐ Primary School up to age 12 / Sekolah Rendah sehingga umur 12

☐ Secondary School up to age 17 / Sekolah Menengah sehingga umur 17

☐ Sixth Form / Diploma / Matriculation / A-Level / Vocational Training

Tingkatan Enam / Diploma / Matrikulasi / A-level / Latihan Vokasional

☐ Bachelors degree / *Ijazah Sarjana Muda*

☐ Higher Degree (Masters or Doctorate) / *Ijazah Lanjutan (Sarjana atau Kedoktoran)*

How would you best describe yourself? (please tick one box only)

Apakah keterangan terbaik tentang anda? (sila tandakan satu kotak sahaja)

☐ Retired / *Bersara*

☐ Unemployed / *Tidak bekerja*

☐ Full-time student / *Pelajar sepenuh masa*

☐ Part-time paid employment / *Bekerja sambilan*

☐ Self-employed / *Bekerja sendiri*

☐ I look after the home/family / *Saya mengurus rumah/keluarga*

☐ Full-time paid employment / *Bekerja sepenuh masa*

☐ Long-term sick/disabled / *Pesakit/orang kurang upaya jangka panjang*

☐ Other. / *Lain-lain* Please state / *Sila nyatakan*: ______________

What is your occupation? (*Please write your answer in the space provided)*

Apakah pekerjaan anda? (Sila tulis jawapan anda dalam ruang yang disediakan)

____

Do you have a qualification in landscape, conservation or horticulture?
Adakah anda mempunyai kelayakan dalam bidang landskap, pemuliharaan atau hortikultur? ☐ Yes / *Ya* ☐ No / *Tidak*
If yes, please state your qualification: / *Jika ya, sila nyatakan kelayakan anda:*

____

Which of these brackets best describe your monthly household income?
Manakah di antara yang berikut paling tepat menerangkan pendapatan isi rumah bulanan anda?

☐ B40 – RM4000.00 or less / Kurang daripada RM4000.00
☐ M40 – RM4001 – RM8500
☐ U20 – RM8501 or higher / *Lebih daripada* RM8501.00

Post Code: Please write your answer in the space provided:
Poskod: Sila nyatakan poskod kawasan tempat tinggal anda:

____

What gets you outdoors in your leisure time? (*Apakah yang menggalakkan anda keluar pada waktu santai anda?)*

☐ Campaign for Conservation / *Usaha pemuliharaan alam sekitar*
☐ Hike on the mountains / *Mendaki bukit*
☐ Go to public parks / *Bersiar-siar di taman awam*
☐ Gardening at home / *Mengerjakan taman di rumah*
☐ Bird watching in nature / *Memerhatikan burung dalam alam semulajadi*
☐ Dog Walking / *Berjalan bersama haiwan peliharaan*
☐ Others / *Lain-lain* Please state / *Sila nyatakan*: __________________________

Additional Comments (If any) / *Komen Tambahan (Jika ada*):

____

-THE END-
-TAMAT-

Thank you for taking the time to participate in the research
Terima kasih kerana meluangkan masa anda untuk turut serta dalam penyelidikan ini