QUANTIFYING, PREDICTING AND PROMOTING EDIBLE GARDENING IN EASTBOURNE, AOTEAROA, NEW ZEALAND

by

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ABSTRACT

Urban edible gardening has potential economic, social, environmental, resiliency and sustainability benefits. Due to these benefits researchers are calling for effective behaviour change measures to increase the uptake of urban edible gardening. Responding to this need, the objectives of this study were to quantify and predict participation in edible gardening in Eastbourne, Aotearoa, New Zealand, in order to generate a greater understanding of the behaviour on which to base recommendations for its effective promotion. This is the first study to quantify the relative influence of psycho-social factors on edible gardening and use the Theory of Planned Behaviour (TPB) as a conceptual framework.

Results showed that 89% of respondents participated in edible gardening, although the extent of their participation was limited. Furthermore, perceived behavioural control was the psycho-social factor which had the greatest influence on edible gardening intention and behaviour. Results also indicated that lack of sufficient skills, knowledge, time, space and sun were the greatest barriers to edible gardening in Eastbourne, making these factors the logical targets of behaviour change interventions. Community Based Social Marketing tools were considered as a framework for providing recommendations for lowering these barriers and increasing participation in edible gardening.

Key Words: edible gardening, urban agriculture, theory of planned behaviour, community-based social marketing

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Chapter 1

Introduction

Food is not like any other commodity because it is necessary for human life (Roberts, 2008); thus the factors that influence its procurement are particularly complex. Researchers believe that early humans were strictly hunter-gatherers until almost 10,000 years ago when evidence suggests that they first began to cultivate plants and animals (Harlan, 1971). Since its beginnings, the success and efficacy of agriculture has grown, allowing us to create urban centres (Bryant & Johnston, 1992) and highly specialised economies. Currently, food production often occurs in a global context with products grown wherever costs are lowest and then transported to areas of demand (Roberts, 2008). These agricultural products are typically grown in rural areas, but there has been an increasing acknowledgement that urban agriculture contributes significantly to the global food supply (Smit, Ratta, & Nasr, 1996). The most recent global estimate, conducted in 1996, asserted that products of urban agriculture comprised 15% of the total food supply and that the activity involved over 800 million people worldwide (many as consumers), with 200 million people producing food primarily for the market (Smit et al., 1996).

1.1 Definitions

Urban agriculture became an area of research in the 1960s (Mougeot, 2000) and has gained attention as an area of academic study (e.g., Heimlich & Barnard, 1992; Koc, MacRae, Mougeot, & Welsh, 1999; Mougeot, 2005; Viljoen, 2005). The term describes a range of activities including the production of non-food products. One of the most often quoted definitions (Ambrose-Oji, 2009), proposed by Mougeot (2000), is:

> Urban agriculture is an industry located within (intraurban) or on the fringe (periurban) of a town, a city or a metropolis, which grows or raises, processes and

> distributes a diversity of food and non-food products, (re-)using largely human and material resources, products and services found in and around that urban area, and in turn supplying human and material resources, products and services largely to that area. (p. 10)

Given the diversity of activities considered under the term urban agriculture and the complexity of factors which influence its practice, researchers employing quantitative methods often focus their study on one region as opposed to analysing one aspect of urban agriculture worldwide (Lesher, n.d.). Some researchers further limit their studies to one aspect of urban agriculture which can be defined by the product (food or non-food), its purpose (commercial production or non-commercial production), or the location (home garden, allotment or plot gardens, community gardens, vacant lot regeneration, rooftop gardens etc).

In order to conduct meaningful primary research into the factors that influence urban agriculture, I have narrowed the scope of my study to the growing of fruit, vegetables and/or herbs on urban residential properties. This particular focus allows me to make a critical contribution to the literature. Although growing fruit, vegetables and/or herbs on urban residential properties has many potential benefits, the psycho-social determinants have not been thoroughly studied.

This subset of urban agriculture has been referred to in the general press as urban edible gardening (Appleby, 2008; Foes-lamb, 2007; Chiang, 2005), and in the academic literature as one of a variety of terms including homegardening (Drescher, Holmer, & Iaquinta, 2006), house-lot gardening (Winklerprins, 2002), backyard gardening (Kortright, 2007), and kitchen gardening (Leach, 1982). However, the terms homegardening, house-lot gardening and backyard gardening apply to non-food growing activities, and the term kitchen garden

has sometimes been defined as being a walled garden, so I chose to use the term urban edible gardening.

1.2 Quantifying Edible Gardening

Many case studies have quantified participation in urban agriculture using a definition of urban agriculture as the growing of food in urban areas (for reviews see Mougeot, 2005; Smit et al., 1996). The few studies which have quantified participation in urban edible gardening specifically have found that a substantial portion of the urban population under study participates in this behaviour (Fisher, 2009; Gaynor, 2005; Kortright, 2007). For example, a 2005 telephone survey of residents of Waterloo, Canada, indicated that 46% of respondents from suburban neighbourhoods grew food (fruit, vegetables, herbs, berries or nuts) in their yard or balcony (Fisher, 2009). Whereas in Toronto, Canada, of 125 residents surveyed, 52% grew fruit, vegetables and/or herbs on their residential properties (Kortright, 2007). Furthermore, in Australia, 30-40% of metropolitan households in Victoria, and 23-33% of metropolitan households in Western Australia produced home-grown vegetables in 1992 (Gaynor, 2005). Given these significant rates of participation in the edible gardening behaviour, it is important to understand its consequences.

1.3 Benefits of Edible Gardening

Edible gardening has economic, social, environmental, resiliency and sustainability consequences. The extent to which these consequences are beneficial or harmful depends on the behavioural context and gardening methods (Gomiero, Paoletti, & Pimentel, 2008). Many researchers make unsubstantiated claims about the benefits of urban agriculture because they assume, rather than demonstrate, that the requisite gardening methods will be used. As Nugent (n.d.) writes, “urban and periurban agriculture varies widely from city to city and cannot be easily characterised from general experiences. Therefore, the field remains dominated by partial evidence and unsubstantiated claims” (p. 1). The next

section of the introduction chapter will explore the consequences of non-commercial urban edible gardening, focusing on the potential benefits, while providing the caveat that many of these potential benefits can be negated by poor gardening methods, and/or certain contexts (e.g., poor yields).

A further point of clarification is to note that urban edible gardening has some unique benefits, but also some benefits which are common to all urban greenspace, and other benefits common to all food growing (regardless of location). Therefore, some references will be made to the general urban greenspace and general food growing literature. In the forthcoming sections, I will outline the environmental, health, social, economic, food security, resilience and sustainability impacts of urban edible gardening. To begin the discussion of benefits, I will note how the environmental impacts of urban edible gardening include potential gains in soil quality, biodiversity, emissions reduction, air quality, and stormwater mitigation.

1.3.1 Environmental benefits

Urban edible gardening can benefit soil quality by "closing the nutrient loop" (Girardet, 2005; Nelson, 1996). Industrial agriculturalists in rural areas have diminishing soil quality because the soil nutrients of their farmland get exported to the city in the form of food, and then either get consumed by humans and excreted, or buried in landfill (Girardet, 2005). This linear use of nutrients has caused farmers to become increasingly dependent on petroleum-based fertilizers which they use to replace the lost nutrients, although these fertilizers lack important ingredients of healthy soil such as the organic matter and micro-organisms that natural composts contain (Nelson, 1996). However, urban edible gardening provides an opportunity to recycle soil nutrients within the urban area, creating the potential to establish what Gaynor (2006) calls a sustainable urban metabolism. This process reduces the environmental impact on both the rural nutrient source, by

decreasing demand for it, and the nutrient sink, by reducing the demand for costly and ecologically harmful waste management infrastructure.

Urban edible gardening can also contribute to biodiversity conservation and ecological health. Boncodin, Prain and Campilan (2000) and Drescher (1998, cited in Drescher et al., 2006) have shown that homegardens play a role in the conservation of indigenous crops. Also, due to the intensive nature of urban agriculture, it often results in higher yields per unit area (Heimlich, 1988, cited in Heimlich & Bernard, 1993), leading Smit (2000) to argue that increasing urban production can decrease the amount of rural land converted to agriculture. This conserves biodiversity present in the unconverted areas. Furthermore, industrial agriculturalists typically grow monocultures, whereas urban agriculturists, particularly edible gardeners, usually grow a variety of species (Sommers & Smit, 1994) which is likely to be better for ecosystem function (Swift & Anderson, 1994). Monocultures often require heavy pesticide use to control biological pests, whereas small scale urban agriculture is often less chemically dependent and more biologically friendly (Smit, 2000) due to its ability to make use of techniques such as companion planting and biological pest control.

Edible gardening also has the potential to decrease the environmental costs of transport: when food producers and consumers are one and the same, transport related carbon emissions and pollutants are eliminated (Church, 2005). This benefit of reduced transport has given rise to the concept “food miles” which is used to indicate how far a food item has travelled from production to plate, with the implication that local is better. Paxton (2005) provides a good overview of the benefits of low food miles, although the concept is contested (MacGregor & Vorley, 2006; Saunders, Barber, & Taylor, 2006).

Urban edible gardening offers unique environmental benefits when non-greenspace areas (such as balconies or roofs) are converted to food growing areas. For example, replacing

impervious surfaces with soil for raising food reduces the effects of flash flooding, such as sewer overflows and erosion (Getter, & Rowe, 2006; VanWoert et al., 2005). Furthermore, conversion of non-green space to green space also mitigates the urban heat island effect (the phenomena of cities being significantly warmer than their surrounding rural areas), and can improve local air quality (Oberndorfer et al., 2007).

In addition to all these direct environmental benefits of urban food growing, research suggests that growing food may increase other non-gardening related pro-environmental behaviour. Dunn, Gavin, Sanchez, and Solomon (2006) suggest that people are more likely to conserve nature when they have direct experience with the natural world, and growing food necessarily involves interaction with nature.

1.3.2 Health and social benefits

Edible gardening also has potential dietary and health benefits. Urban edible gardening improved the diet of Phillipinos by increasing the variety of fruits and vegetables consumed (Miura, Kunii, & Wakai, 2003), while in Uganda, children of families participating in urban agriculture in general had significantly improved nutritional status compared with children of families who did not engage (Maxwell, 1995). In developed countries, urban agriculture has also been shown to improve the diet (Alaimo, Packnett, Miles, & Kruger, 2008; Allen, Alaimo, Elam, & Perry, 2008; Blair, Giesecke, & Sherman, 1991) and physical health of participants (Pate et al., 1995). For example, in a survey of 144 urban gardeners in Philadelphia, USA, gardeners ate significantly more vegetables in 6 of 23 vegetable categories than did non-gardeners, and consumed significantly fewer sweets and sweet drinks (Blair et al., 1991). Also, because growing food is a moderate form of exercise, this gardening activity can contribute to the recommended 30 minutes of daily moderate-intensity physical activity that has been shown to reduce risk of several chronic diseases including coronary heart disease, hypertension and osteoporosis (Pate et al., 1995).

Urban edible gardening can also contribute to mental health and has social benefits. For instance, Brogan and James (1980) reported that the percentage of front yards with vegetable gardens in a neighbourhood was a positive predictor of psycho-social health of its residents. Furthermore, Kuo and Sullivan (2001) found that in urban areas, the greener a building's surroundings were, the fewer crimes reported at the address. Urban edible gardening can also contribute to social cohesion which accrues from creating networks to trade, barter or gift the products of edible gardening. For example, Winklerprins (2002) documented how the products of urban edible gardens in Santarém, Brazil, provided a means of entering into and sustaining critical social networks that offered access to a range of other goods and services which subsidise urban life.

1.3.3 Economic benefits

Although the main economic benefits of urban edible gardening are income and employment generation and therefore fall outside the scope of this discussion on the benefits of non-commercial production, economic benefits still exist for non-commercial producers. Engaging in urban edible gardening can reduce expenditure on food (Freeman, 1993; Maxwell, 1995; Mwangi, 1995). For example, the 1991 Solomon Island National Nutrition Survey (cited in Sommers & Smit, 1994) showed that by growing their own food, families in the capital city Honiara, saved up to 20% of their food bill. Saving food dollars is particularly important for people in developing countries who can be spending 60-80 percent of their income on food (Halweil & Nierenberg, 2007). Urban edible gardeners that produce on roofs can also reduce a building's heating and cooling costs, save on roof replacement costs due to green roofs' increased durability (Oberndorfer et al., 2007), save on reduced storm water management costs due to green roofs' water retaining capacity (Peck & Kuhn, 2001), and may also increase property values (Banting el al., 2005).

1.3.4 Food security and resiliency benefits

Perhaps the greatest benefits of urban edible gardening are its contributions to food security and community resilience. According the United Nations Committee on World Food Security (1996, November, ¶ 1), "Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life." Urban edible gardening has been shown to increase food security in Kenya (Mwangi, 1995) and Cuba (Buchmann, 2009).

Resilience is defined as "the capacity of a system to absorb disturbance and re-organise while undergoing change, so as to retain essentially the same function, structure, identity and feedbacks" (Walker, Hollinger, Carpenter, & Kinzig, 2004, ¶ 7). In terms of a community's food system, resilience involves maintaining food security in the face of shocks to the system. The resiliency benefits of edible gardening may be under valued by communities and/or countries who are food secure. For example, in 2008, the New Zealand Minister of Agriculture said, "I can confirm that the Labour-Progressive Government does not have a food security strategy because New Zealand is a nation that produces many times more the quantity of food than is required to sustain our own domestic needs, and there is, therefore, demonstrably no food security risk for New Zealand" (New Zealand Parliament, 2008, April 17). In this statement, the Minister of Agriculture failed to acknowledge that the issue of food security is not only a matter of production but that of distribution, and distribution can be disrupted by a number of factors. Indeed, in New Zealand, despite the production of an over-abundance of food, 16% of females and 11% of males reported in the 1997 National Nutrition Survey that "Food runs out in my/our household due to lack of money, sometimes or often" (Parnell, Reid, Wilson, McKenzie, & Russell, 2001). This vulnerability of citizens in a food abundant nation highlights the importance of community food resilience, especially because a number of factors threaten to cause drastic change to global food systems in the near future.

Population dynamics and peak oil are two such factors that threaten our food system. The worldwide population is expected to increase by 2.5 billion by 2050, and due to increased rural-urban migration, urban populations are expected to increase by 3.1 billion in the same timeframe (Department of Economic and Social Affairs of the United Nations, 2008). This population increase will require greater agricultural output than at present, and due to urbanisation, the need for this extra agricultural production will be concentrated in urban areas. However, the peak oil scenario will make it hard to increase production and meet distribution needs using industrial methods. Our current agricultural system relies on fossil-fuel based fertilisers, pesticides and herbicides to generate the food yields that have been heralded as the "Green Revolution", but as we face peak oil production, we will struggle to maintain current food yields, let alone increase them (Heinberg, 2003).

Other threats to our food system are climate change and financial crisis. The global mean surface temperature is estimated to rise between 1.8°C and 4.0°C by 2100 (Bernstein et. al, 2007) which will affect the amount and location of arable land (Costello et al., 2009). This temperature increase may also cause water crises in the long term as the Himalayan glaciers that feed the rivers of China and India disappear (Costello et al., 2009). Furthermore, almost all G20 countries have national budget deficits at levels never before seen in peacetime (Gillies, 2009), which is an indication that further financial and economic crisis may occur. As Figure 1.1 shows, financial and economic crisis contributes to food crisis in a variety of ways. This figure highlights how vulnerable our food system is because our globalised economic and financial systems are not dynamic and adaptable: a subprime credit crisis can set off a series of events which lead to food crisis.

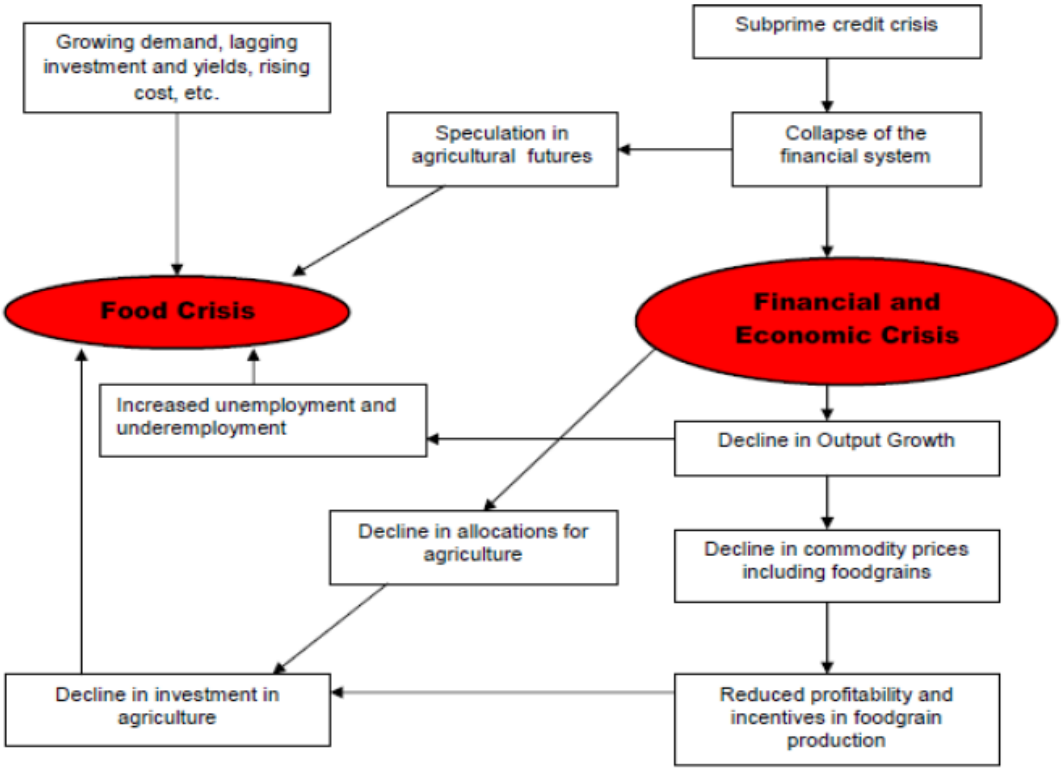


Figure 1.1. The link between financial and economic crisis and food crisis. Note. From "Rising food prices and their implications for employment, decent work and poverty reduction (Employment Sector, Employment Working Paper No. 30, p. 14)" by R. Islam and G. Buckley, 2009, Geneva, Switzerland: International Labour Office, Economic and Labour Market Analysis Department. Copyright 2009 by International Labour Organization.

Fortunately, urban edible gardening has the potential to ameliorate some of the negative effects of a growing and urbanising population, peak oil, climate change and financial crisis, by providing a measure of resilience. Advocates of resilience building do not promote self-sufficiency, rather they suggest building parallel infrastructure which increases a system's adaptive capacity (Hopkins, 2008). The practice of urban edible gardening requires knowledge, skills, and inputs, which may take considerable time to acquire. In this regard, participation in urban edible gardening may not confer large current benefits, particularly in terms of caloric output, however participation helps build the skills that may be required by the community to cope with the effects of future change. Given the likelihood and the potentially devastating effects of population growth, financial crisis peak oil and climate

change on our food system, building resilience through urban edible gardening (or indeed any form of urban agriculture) is a prudent precautionary measure.

1.3.5 Sustainability benefits

Another term closely related to resilience is sustainability. Sustainability is often defined as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations World Commission on Environment and Development, 1987, August 2), and it is often pictured as the intersection of the economy, environment and society. Urban agriculture has been promoted as a means of achieving sustainability in publications such as "For Hunger-Proof Cities—sustainable urban food systems" (Koc et al., 1999) and "Continuous Productive Urban Landscapes—designing urban agriculture for sustainable cities" (Viljoen, 2005). As a subcategory of urban agriculture, urban edible gardening has the potential to contribute to sustainability through its aforementioned potential economic, environmental, social, and resiliency benefits.

1.4 Factors which influence participation in edible gardening

Due to the potential environmental, economic, social, resiliency and sustainability benefits of edible gardening, it is important to understand the factors that influence participation in this behaviour in order to promote it. This section will explore the literature which identifies these factors. Where research has been conducted on urban edible gardening I will review it; however, due to the paucity of studies on the subject, I will also identify factors influencing urban agriculture in general. Researchers have used various methods to identify factors influencing participation in edible gardening and/or urban agriculture, so I will review descriptive case studies, comparative studies, surveys of participants, typology studies, theoretical models and empirical models. These methods have been used to

identify many types of influential factors including economic, institutional, cultural, social, and demographic factors, as well as psychological factors such as motivations.

Some researchers have conducted case studies in which they created a profile of edible gardeners in an area. For example, Miura et al. (2003) profiled 152 urban edible gardeners in Davao City, in the Philippines, noting their age, education, family size, family income, household food consumption costs, yard size, number of varieties of fruits and vegetables planted, and body mass index. This information provides a context in which edible gardening occurs, but without comparing the attributes of non gardeners with the gardeners, this research approach can not determine the relative influence of different factors on gardening behaviour. For instance, if 60% of urban agriculturalists in a given city were women, one might conclude that gender influences the urban edible gardening behaviour; however, if 60% of population of the city were women, then one's gender would not be a factor that discriminated between gardeners and non-gardeners.

A few studies (Maxwell, 1995; Mazereeuw, 2005; Mwangi, 1995) have compared the demographic characteristics of gardeners with non-gardeners in urban settings. For example, a telephone survey of urban residents of the Waterloo region in Canada found that the proportion of residents who grew food on their private, residential properties was found to be the same across gender, age and income groups (Mazereeuw, 2005). However, residents who had lived in Canada for more than 10 years were more likely to grow their own food than those who had lived in Canada for less than 10 years. Mwangi (1995) and Maxwell (1995) also found that length of stay affected the probability of participation in urban agriculture in Nairobi (Kenya) and Kampala (Uganda), respectively. Additionally, Maxwell found that larger households were more likely to grow food.

Other reports and research publications have identified factors that influence participation in urban edible gardening on a more theoretical basis, making claims without citing

quantitative empirical evidence (Drescher, 1999; Nugent, 2000; Sander-Regier, 2008). For example, Drescher (1999) created a household-gardening model which identified the factors that influence urban edible gardening without citing empirical evidence or testing the model. The factors he identified include land, water, seeds, knowledge, labour time, fertilizers, pesticides, herbicides, tools, stores and buildings.

Drescher and other researchers also acknowledge the influences of (non-) supporting structures such as national education and health systems, governmental bodies, non-governmental organisations, household and local networks, and global financial and economic systems. For example, national education and health systems influence individuals' livelihood strategies and their ability to participate in edible gardening (Drescher, 1999). Governmental bodies (central or localised) influence urban edible gardening through urban planning regulations and building codes (Brown & Carter, 2003) as well as land-tenure laws (Kortright, 2007), while non-governmental organisations (including national and international development agencies) can provide start-up capital or credit, education and advice, soil testing, rainwater collection advice and resources, tool banks, shared processing facilities, etc. (Drescher, 1999). The presence of household and local networks can influence the urban edible gardening behaviour by providing support as well as a demand for the agricultural products (Winklerprins, 2002), and the global financial and economic systems can affect food crisis/security as depicted in Figure 1. Further non-empirically tested external factors proposed to influence edible gardening behaviour include local climate and topography (Drescher 1999; Nugent, 2000), prevalence of plant pests and diseases (Drescher, 1999), political stability, and culture of gendered responsibilities (Mongeout, 2000).

Another strategy for explaining the factors that influence urban agriculture is to create typologies. Typologies are used as a means to explain clusters of factors influencing an activity or behaviour. Moustier and Danso (2006) created four types: home subsistence

farmers, family-type commercial farmers, entrepreneurial farmers and multicropping peri-urban farmers. Whereas, Kortright (2007) observed Toronto residents with edible backyards who did not fit into any of Moustier and Danso's four types and created another five types: cook gardeners, teaching gardeners, environmental gardeners, hobby gardeners, and aesthetic gardeners. Neither of these studies used empirical methods to create the typologies. In contrast, Koirenko and Hoermann (2008) conducted a factor analysis of 33 statements measuring attitudes towards practicing urban agriculture, followed by cluster analysis to create typologies in urban agriculturalists in the Ukraine. They found that 37% of urban agriculturalists were "seekers of leisure activities" 37% were "urban and peri-urban agriculture dependent", 17% were "recreational growers", and 9% were "little engaged growers".

An external/internal distinction has been made by researchers such as Kollumus and Agyman (2002), to help classify influences on behaviour. Examples of external factors which influence urban edible gardening include the economic, institutional, cultural, social and demographic factors I described earlier, and internal factors include attitudes, values, emotions, knowledge, awareness, responsibilities, priorities, perceptions of control and motivations (Kollmuss & Agyeman, 2002). In order to assess the effect of internal factors on behaviour, one must ask the participant to identify the influences. Prior to my research, only one study of the motivations for urban edible gardening had been published. Hujber (2008), found that in Melbourne, Australia, urban edible gardeners grew food for the following reasons: enjoyment (38%), environmental (16%), health (15%), economic (15%), community (9%), and food security (7%).

However, studies of motivations for other forms of urban agriculture have also been conducted in both developed and developing countries. In developed countries, motivations for participating in urban agriculture are diverse. Urban gardeners in Philadelphia, USA, were motivated to participate in community gardens for the following

reasons (Blair et al., 1991): recreation (21%), mental health (19%), physical health/exercise (17%), produce quality/nutrition (14%), spiritual reasons/contact with nature (10%), self-fulfilment (7%), and cost/convenience (7%). While in Melbourne, Australia, urban community gardeners reported these reasons for growing (Hujber, 2008): enjoyment (31%), community (21%), health (22%), economic (15%), environmental (10%), and food security (1%).

In developing countries, motivations for participating in urban agriculture seem to be primarily economic. In Lusaka, Zambia, urban gardeners who cultivated plot gardens identified their primary motivation as (Sanyal, 1985): financial (78%), it made them feel settled (7%) and to eat well (1%). Furthermore, in a study conducted in 16 developing countries and one developed country, Nugent (2000) interviewed urban agriculturalists to determine their reasons for growing food, and found the following (participants were allowed to list multiple reasons and numbers indicate occurrences): production for home consumption (13), income enhancement (8), economic crisis (6), high prices of market food (5), income or asset diversification (4), supplementary employment (3), conflict (1), and poor weather (1).

These differences in motivations for engaging in urban agriculture between developing and developed countries emphasise the contextual nature of urban agriculture. The country comparisons above showed that external factors, such as the development status of a country, can influence internal factors such as beliefs, attitudes and motivations. Indeed, many theories of behaviour (e.g. Theory of Reasoned Action or Theory of Planned Behaviour), only measure internal factors such as beliefs and values because the external factors are assumed not to have explanatory power beyond their influence on the measured internal factors (Staat, 2003). Academics (e.g., Bamberg & Moser, 2007) use the term ‘psycho-social’ to describe the relationship between the personal, internal environment, and the wider social world (i.e. the influence of social factors on an

individual's mind or behaviour). Henceforth I will refer to internal variables as psycho-social variables.

Although numerous studies have identified possible factors influencing gardening behaviours, none have measured the relative influence of psycho-social variables on participation. To determine the relative influence of variables on participation in edible gardening, one would need to test a predictive model. For example, Blaylock and Gallo (1993) used a predictive model to determine the factors influencing the decision to produce vegetables at home in the USA. However, they restricted their model to external factors. To date, no studies have sought to determine the relative influence of psycho-social determinants, such as attitude, subjective norms and perceived behavioural control, on the edible gardening behaviour.

1.5 Filling the Research Gap

In order to fill this gap in the literature, my thesis research will empirically determine which psycho-social factors have the greatest influence on edible gardening. Filling this research gap will contribute to a greater understanding of participation in edible gardening which can then be used to promote it. Understanding and promoting participation in edible gardening is important because edible gardening has numerous benefits, and with the advent of likely changes to the global food system, the behaviour may become even more beneficial.

The factors influencing urban agriculture have primarily been studied in developing countries, or in poor areas of developed countries, however, the potential benefits of urban agriculture are by no means limited to the poor. As a result, I have chosen to conduct my research in Eastbourne, New Zealand. New Zealand is a developed country (NationMaster, n.d.) and Eastbourne is a community in which residents' average income is

higher than the national average (Statistics New Zealand, 2006). This study will allow me to contribute to the literature not only by conducting the first study to empirically determine which psycho-social factors have the greatest influence on edible gardening, but also by comparing my results to studies done in different contexts (albeit with different methods) to see the extent to which the drivers of edible garden are generalisable.

1.5.1 New Zealand Context

New Zealand is a highly urbanised, agricultural nation, known for its rural dairy and sheep farming. Urban edible gardening in New Zealand has not been a frequent subject of research. However, census data showed that in 1956, 20% of Auckland households grew more than 25% of the vegetables they consumed, but that dropped to 15% in 1971 (Vale, 1980 cited in Ghosh, Vale, & Vale, 2008). Unfortunately, the census no longer includes questions regarding vegetable production, and little is known about the present extent of edible gardening in New Zealand today. However, the importance of urban edible gardening has been recognised in New Zealand. For example, Ghosh et al. (2008) investigated how edible gardening affects the sustainability potential of residential developments in Auckland, and concluded that community behaviour change measures were critical to increase its uptake. My study is a response to this need for effective behaviour change measures.

1.6. Research aims and objectives

1.6.1 Research Aim

The aim of this research is to quantify and predict participation in edible gardening in Eastbourne, in order to generate a greater understanding of the behaviour on which to base recommendations for its effective promotion.

1.6.2 Research Objectives

1) quantify the prevalence and extent of edible gardening in Eastbourne,
2) use a predictive model of the edible gardening behaviour in order to empirically test which psycho-social factors have the greatest influence on the behaviour, then interpret these results to determine which of these factors are the biggest barriers to participation in edible gardening in Eastbourne,
3) provide recommendations for potential interventions to lower these barriers, in order to promote edible gardening in Eastbourne.

Chapter 2

Conceptual Framework

In order to achieve my three objectives, I undertook a mixed methods approach. Collecting and analysing a mixture of both qualitative and quantitative methods provides a more thorough understanding of the proposed research question than is provided by using either method alone (Plano-Clark & Creswell, 2008). The methodology I chose to employ is utilized in the first step of Community-Based Social Marketing (CBSM), a tool for fostering sustainable behaviour (McKenzie-Mohr, 2000a, 2000b). I chose this framework for behaviour change because it is consistent with my aims. CBSM has been developed and tested in order to foster sustainable behaviour in community settings, and my final objective is to provide recommendations for potential interventions to increase edible gardening (a sustainable behaviour) in Eastbourne (a community setting). Furthermore, each of the CBSM behaviour change tools is relevant to one or more of the theory of planned behaviour (TPB) constructs. I used the TPB to identify targets for edible gardening interventions, therefore the use the CBSM framework seemed appropriate.

According to McKenzie-Mohr (n.d.), CBSM is a pragmatic approach to bring about behaviour change and involves:

1) identifying barriers to the target behaviour
2) designing a behaviour change strategy
3) piloting the strategy with a subset of a community, and
4) evaluating the effectiveness of the program after it has been fully implemented.

I undertook step one in McKenzie-Mohr's CBSM framework in Eastbourne in order to understand the predictors of edible gardening. Further, I made recommendations for step two with the intention that the recommendations could be used by community groups to fully develop steps two through four to promote the behaviour.

McKenzie-Mohr (n.d.) suggests that the first step in the framework can be achieved by utilising a three step process: (1) reviewing the literature, (2) holding focus groups, and (3) conducting a questionnaire. I chose this mixed methods technique, as opposed to interviews or focus groups alone, because my questionnaire was easily distributed to the entire Eastbourne community. Ease of distribution is important because having a large sample size is valuable for understanding the variance of particular variables within a population (Hankins, French, & Horne, 2000).

While reviewing the academic literature on behaviour change in environmental studies, I discovered that many psychological theories and models of behaviour exist. For example, researchers have used the following psycho-social theories and models of behaviour to explain a wide range of behaviours (all cited in Jackson, 2005): Field Theory (Lewin, 1951), Rational Choice Theory (Homans, 1961), Self-Perception Theory (Bem, 1972), Theory of Interpersonal Behaviour (Triandis, 1977), Norm Activation Theory (Schwartz, 1977, 1992), the Theory of Reasoned Action (Ajzen & Fishbein, 1980), Structuration Theory (Giddens, 1984), Self-Discrepancy Theory (Higgins, 1987), Attitude-Behaviour-Context Theory (Stern & Oskamp, 1987), the Theory of Planned Behaviour (Ajzen, 1991), the Motivation-Ability-Opportunity Model (Ölander & Thøgersen, 1995), Value-Belief-Norm Theory (Stern, Dietz, Abel, Guagnano & Kalof, 1999), and the New Ecological Paradigm (Dunlap & van Liere, 1978). Of these psycho-social models of behaviour, I chose to employ the Theory of Planned Behaviour (TPB) by Ajzen (2002) to model the edible gardening behaviour.

Using a psycho-social model to predict behaviour has advantages compared to other methods of explaining behaviour. The advantage of using a predictive model is that it allows researchers to simultaneously determine the relative influence of variables on behaviour and measure the magnitude of effect of variables on behaviour. Furthermore, the use of psycho-social variables in the model means that the cognitive effects of external

variables are measured. By choosing to investigate edible gardening using a predictive model with psycho-social variables, I gained a more thorough understanding of the factors influencing edible gardening than was possible using the methods of previous studies.

I chose the TPB because it has been used in hundreds of studies (Francis et al., 2004) including research on other pro-environmental behaviours (Fielding, McDonald, & Louis, 2008; Tonglet, Phillips, & Bates, 2004) and agricultural practices (Beedell & Rehman, 1999; Burton, 2004; Fielding, Terry, Masser, Bordia, & Hogg, 2005; Wauters, Bielders, Poesen, Govers, & Mathijs, 2010). Furthermore, the methodology of questionnaire creation (Ajzen, 2002; Francis et al., 2004) and statistical analysis of data is well documented (Hankins et al., 2000; Francis et al., 2004).

The TPB identifies intention as the primary antecedent of behaviour, and attitude, subjective norms and perceived behavioural control as antecedents of intention (Fig. 2.1). Furthermore, to the extent that perceived behavioural control reflects actual control, perceived behavioural control will also predict behaviour (Ajzen, 2002). Attitudes towards the behaviour measures the degree to which a person evaluates a behaviour to be favourable or unfavourable; subjective norm measures a person's perceived social pressure to perform a behaviour; and perceived behavioural control measures a person's perceived ease or difficulty of performing the behaviour. Further, intention is assumed to capture the motivational factors that influence behaviour and is a measure of how much effort an individual is planning to exert to perform the behaviour (Ajzen, 1991).

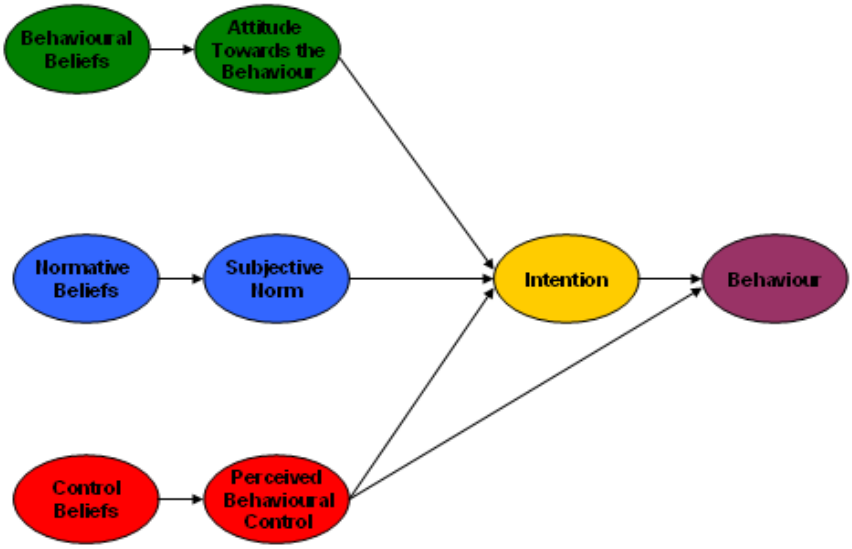


Figure 2.1. The theory of planned behaviour. Note. From "Efficacy of the Theory of Planned Behaviour: A meta-analytic review" by C. J. Armitage and M. Conner, 2001, British Journal of Social Psychology, 40, 472. Copyright, 2001, The British Psychological Society.

When defining a behaviour of interest, Ajzen (2002) recommends that researchers define it in terms of TACT: (T)arget, (A)ction, (C)ontent and (T)ime, and explains that the principle of compatibility must be followed for TPB to maintain predictive validity. The principle of compatibility requires that the intention, attitude, social norm and perceived behavioural control constructs are defined by exactly the same target, action, context, and time elements as the behaviour.

According to the TPB theory, the constructs which predict intention can be measured directly and indirectly. Direct measures are global statements in which the respondent must choose between a pair of bipolar adjectives or statements which reflect instrumental or experiential attitudes, injunctive or descriptive norms and perceived capability or controllability over the behaviour (see Appendix A for further explanation and examples). Direct measures capture the respondent's global attitude towards the behaviour, global subjective norm or global perception of behavioural control, and are used to identify which of these categories of psychosocial variable has the greatest influence on intention.

Information about the influence of direct measures is helpful for planning interventions to increase behaviour. However, indirect measures also offer additional information.

The indirect method of determining attitude, subjective norm and perceived behavioural control involves identifying and measuring the beliefs that are the foundations of these constructs (see Appendix B for further explanation and examples). Indirect measures are assumed to mimic cognitive processes, and thus can provide insight into why people hold certain attitudes, subjective norms and perceptions of behavioural control (Ajzen, 1991, 2002). Using indirect measures, attitude is determined by aggregating all the salient beliefs about the likely outcomes of the behaviour (measured on a scale of 1-7) and evaluations of these outcomes (measured on a scale of -3 to +3); subjective norm is determined by aggregating all the salient beliefs about the normative expectations of others (measured on a scale of 1-7) and motivation to comply with these expectations (measured on a scale of -3 to +3); and perceived behavioural control is determined by aggregating all the salient beliefs about the presence of factors that may facilitate or hinder performance of the behaviour (measured on a scale of 1-7) and the perceived power of these factors (measured on a scale of -3 to +3). The aggregation occurs by multiplying each behavioural belief score by its corresponding outcome evaluation score to create a composite score, then summing all of the composite scores of each construct to get a general score which can be used in regression analysis to predict the directly measured construct. Or, in structural equation modelling analysis, the composite scores can be used to create an indirectly measured latent variable which can then be used to predict the directly measured latent construct.

As I will explain in the methodology section, I employed this TPB framework to guide my questionnaire content and analysis, in order to achieve my stated aim and objectives.

Chapter 3

Methods

3.1 Site selection

I undertook this research in Eastbourne, New Zealand, an area of Lower Hutt City, which is located in the Eastern Bays of Wellington Harbour (Fig. 3.1), and is classified as being part of the Wellington main urban area (Mackie, 2009). During the study period I was an active member of this community, participating in the Eastbourne Dune Restoration Group and the East Harbour Carbon Reduction Action Group (EHCRAG). I selected Eastbourne based on my familiarity with local issues and stakeholders, which was important for establishing that my research questions were locally relevant and useful. For example, my familiarity with the community allowed me to know that the community was concerned about environmental issues, and dialogue with members of EHCRAG before the study allowed me to confirm that locals were interested in the proposed research. Furthermore, my connections in Eastbourne and the pre-study dialogue increased the likelihood that my research will be used by individuals or organisations to implement future behaviour change interventions.

Figure 3.1. Map of Wellington harbour with the Eastbourne questionnaire zone identified in the boxed area. Note. From Google-Maps. Copyright 2009 by MapData Sciences Pty Ltd.

3.2 Site Characteristics and Resident Demographics

Eastbourne is a relatively small community with a population of 4,719, occupying 1,869 dwellings (Statistics New Zealand, 2006). The community is located between Wellington harbour to the west and the hills of East Harbour Regional Park to the east and south; to the north lies the industrial zone of Seaview. The area has a history of food production, which is evidence that edible gardening is possible in this region. “During the 1920s and especially during the Depression, households had to be reasonably self-sufficient. Even well off families in the Bays had large vegetable gardens and fruit trees, and many people kept hens” (Beaglehole & Carew, 2001, p. 126). Furthermore, during the course of World War II a group of women grew over a ton of vegetables for a servicemans’ hospital in Wellington (Beaglehole & Carew, 2001, p. 187).

Eastbourne residents are comparatively older (14.4 % > 65 years old compared with 12.3 % for NZ as a whole), more educated (62.8 % of people over 15 years old have a post-school qualification versus 40% for NZ as a whole), wealthier (the median personal income was $37,000 compared with $24,400 for NZ as a whole), and less ethnically diverse (87.4 % European New Zealanders versus 67.6 % for NZ as a whole) (Statistics New Zealand, 2006) than the average for New Zealand.

3.3 Focus Groups

In order to conduct focus groups, I applied to the Victoria University of Wellington's Human Ethics Committee and was granted permission (see Appendix C). The purpose of these focus groups was to determine the salient behavioural, normative and control beliefs within the Eastbourne community with the intent of including them in the questionnaire. I held separate focus groups for those residents who participated in edible gardening and those who did not. This was to encourage people to speak freely about their behaviour and motivations without fear of judgement from someone with the opposite behaviour. Focus group participants were all current Eastbourne residents. To recruit participants I used my local contacts as a starting point for a snowball technique (Goodman, 1961).

I held an exploratory-type focus group (Kuniavsky, 2003) to determine the range of factors which influence the edible gardening behaviour in Eastbourne. I asked open-ended questions to begin the sessions and guided the discussion to ensure the group considered all the factors identified by the TPB (attitude, social norms and perceived behavioural control). I recorded the focus groups with tape-recorder and transcribed all comments. The transcripts were analysed using an informal coding method by which all mentions of attitude, social norms and perceived behavioural control factors were highlighted for

consideration for inclusion in the questionnaire. Questionnaire content decisions will be discussed in a subsequent section (3.4.2).

3.4 Questionnaire

3.4.1 Format of questionnaire

I conducted an anonymous written questionnaire (Appendix D), for which I received ethics approval (see Appendix E). I chose the written format because it is the recommended method when using the theory of planned behaviour (Francis et al., 2004). The questionnaire was printed on two A4 sheets of paper, folded and stapled to be read as an A5 size booklet, because unlike other potentially confusing formats, booklets are usually handled without error (Dillman, 2000).

Based on Dillman's (2000) recommendations, I grouped questions into six parts in order to make the overall questionnaire task appear more manageable, as well as for functional purposes, because various sections had directions which applied only to that subset of questions.

3.4.2 Content of questions

I employed the conceptual framework of the TPB model to guide my questionnaire content. Therefore, I used Ajzen's (2002) TACT method and defined the edible gardening behaviour as "growing (action) fruit, vegetables and/or herbs (target) on one's residential property (context) in 2008 (time). In order to measure the edible gardening behaviour (as defined above), I asked questionnaire recipients to indicate which category or categories of food they grew (question 4.1), the percentage of each food category they ate in 2008 that was produced on their property (questions 4.2-4.4), and the percentage of their residential property devoted to edible gardening (question 4.5). Although these measures were not direct measures of food quantities grown, they served as proxy measures. Direct

measures of quantity, such as kilograms of food grown, were deemed too hard to estimate by pilot questionnaire participants (see details on pilot below).

Following Ajzen's (2002) compatibility principle, I defined intention as the intention to grow fruit, vegetables, and or herbs, on one's residential property in 2008. I asked two questions about this intention (questions 28 and 4.6), but also asked about future intention to grow in 2009 (question 29). The predictors of intention (attitude, subjective norms and perceived behavioural control) were each measured directly with a series of four questions. Experiential attitudes were measured using the enjoyable/unenjoyable (question 43) and good/bad (question 51) adjective pairs, while instrumental attitudes were measured using the valuable/worthless (question 47) and beneficial/harmful (question 50) adjective pairs. Injunctive norms were measured by "It is expected of me that I grow" (question 12), "I feel under social pressure to grow" (question 25) and "Most people who are important to me (think that I should/think that I should not) grow" (question 48), while descriptive norms were measured by "Of the people who are important to me (none/all) grow" (question 45). Perceived capability over the behaviour was measured with two questions, "I am confident that I could grow…if I wanted" (question 15) and "For me, growing…is or would be (easy/difficult)" (question 44). Perceived controllability was measured with "It is my decision to grow" (question 6) and "I feel that it is (possible/impossible) to grow" (question 49).

In addition to these direct measures, I included indirect measures of attitude and perceived behavioural control, but not social norms (for reasons explained below). The indirect measures of attitude included in the questionnaire emerged from the focus group discussion of salient beliefs about outcomes of the edible gardening behaviour in Eastbourne: freshness (questions 40 and 45) safety (questions 41 and 65), saving money (questions 36 and 59), reducing profit of commercial growers (questions 31 and 58), and environmental benefits (questions 32 and 66). In addition, I included a behavioural belief

question and a corresponding outcome evaluation question about edible gardening as it relates to climate change (questions 35 and 54) in order to assess whether more education is needed around the benefits of urban agriculture to climate change mitigation (Church. 2005; Dixon, Donati, Pike & Hattersley, 2009). Other salient beliefs about outcomes of the edible gardening were included but without their corresponding outcome evaluations because I wanted some information about these beliefs without making the survey too lengthy. These were questions regarding the outcome beliefs about taste (question 34), attracting pests (question 39), bonding with family (question 42), well-being (question 38), and food security (question 37).

Based on the focus group discussions, the questionnaire also included indirect measures for the following perceived behavioural control factors: time (questions 1 and 63), soil quality (questions 10 and 62), knowledge of what is good to grow (questions 30 and 61), sun (questions 14 and 57), wind (questions 3 and 53), and access to knowledgeable staff in garden centres (questions 11 and 60). I also included from the focus group questions of control beliefs strength regarding practical skills (question 2), space (question 4), and access to support (question 16) without including their corresponding control belief power questions in order to limit the questionnaire length. Although not mentioned in the focus groups, further questions about physical ability (questions 5 and 56) were included because this factor had been mentioned in the literature (Mazereeuw, 2005).

The questionnaire also included 15 questions regarding the demographics of respondents (questions 6.1-6.10 and 6.13-6.17) and one question each about childhood exposure to the behaviour (question 6.11) and participation in related activities (question 6.12). In addition, I included a shorter version of the Environmental Attitudes Inventory (Milfont & Duckitt, in press) in Part 5 with the intention to contribute to the research of my supervisor Dr. Taciano Milfont.

To pilot my questionnaire, I asked 20 people to answer a draft questionnaire and provide feedback. The overwhelming opinion during the pilot was that the questionnaire was too long and too repetitive. Based on these opinions, and in an effort to ensure an acceptable response rate, I chose to eliminate questions which were measures of specific social norm beliefs. This decision was supported by the focus group participants and pilot survey respondents, who had asserted that social norms did not have a substantial influence on their edible gardening behaviour. However, because the TPB model (Ajzen, 1991) and other research (Armitage & Conner, 2001; Trafimow & Finlay, 1996) identify social norms as an important, albeit weak, predictor of intention (and therefore behaviour), I retained the four direct measures of social norm.

3.4.3 Style of Questions

For most questions I used Likert scale-style questions based on the manual for constructing TPB questionnaires by Francis et al. (2004). Likert scale-style questions used a 1 to 7 scale, although some questions needed to undergo a linear transformation from the 1 to 7 scale to a -3 to +3 scale by subtracting the number four from the reported value prior to data analysis (Ajzen, 1991). For behaviour, as well as demographic questions, tick-the-box style questions were employed following stylistic considerations suggested by Dillman (2000) to minimize item non-response.

3.4.4 Distribution of Questionnaire

In order to maximise response rate, I used aspects of Dillman's (2000) Tailored Design Method. My first contact with participants was a pre-notice letter (see Appendix F) on Victoria University letterhead to help establish the questionnaire as legitimate and important. I hand-delivered the pre-notice letter to each household a week before I delivered the actual questionnaire. As suggested by Dillman, the pre-notice letter was brief and designed to build anticipation for the questionnaire. Research has shown that such a letter improves response rates to mail surveys.

I delivered the actual questionnaire a week later. A pre-paid return envelope and the Eastbourne Edible Gardening Questionnaire were folded and tucked into the one page cover letter and placed in an envelope also bearing the Victoria University logo. The pre-paid envelope was included to decrease the cost of complying with the request to return the questionnaire, and the university logo was used to establish the purpose and credibility of the request for personal information, techniques which contribute to higher response rates (Dillman, 2000).

3.5 Data Analysis

According to Hankins et al. (2000) data analysis of TPB models usually involve multiple regression or structural equation modelling (SEM). SEM has several advantages over multiple regression, as long as sufficient sample sizes are used (Hankins et al., 2000):

1) SEM allows the examination of the extent to which variables are related to each other, as in multiple regression; however, unlike in multiple regression, SEM allows the examination of how well individual variables are measured. This clarifies to what extent observed relationships between variables are affected by poor measurement of the variables in the analysis.
2) SEM can be used to model more complex relationships in a single analysis than can multiple regression, which must have only one dependent variable.
3) SEM generates information about the extent to which a proposed model fits a particular data set, which allows for comparisons of theoretically competing models. Multiple regression can not be used for this purpose.

Given that I had 684 survey responses, I chose to use SEM methods to analyse how the TPB factors predict intention, and then logistic regression to analyse how intention predicts behaviour. Following Wauters et al. (2010) and Lynne and Rola (1988), logistic

regression was used to predict behaviour because the edible gardening behaviour was modelled as a dichotomous variable (either a respondent participated in this activity or did not).

I carried out all general statistics, including generating correlation matrices, in SPSS 16.0. For SEM, I employed the LISREL 8.80 programme and used the maximum-likelihood estimation procedure with the observed covariance matrix as input. Before testing the structural model (which specifies the relationship among latent variables as posited by the TPB theory), I evaluated the measurement model (which specifies the relationship among the measured variables underlying the latent constructs) for each of the latent constructs, for both reliability and validity. Reliability is a measure of the internal consistency of the observed variables selected to represent an unobserved latent construct, and was assessed using Chronbach's alpha. I used an alpha coefficient of .40 as my criteria for reliability based on Mueller (1986, as cited in Milfont, 2007). Validity is a measure of the extent to which a specific observed variable actually measures the latent construct it is intended to measure (Schumacker & Lomax, 2004). The validity of each observed measure was assessed by confirmatory factor analysis. Factor loadings of below .32 were considered invalid, .32-.44 were considered poor, .45-.54 were considered fair, .55-.62 were considered good, .63-.70 were considered very good, and above .71 excellent (Comrey & Lee, 1992, cited in Tabachnick and Fidell, 2007). Only the direct measures of constructs were assessed for reliability or validity. Indirect measures were not assessed because according to Ajzen's TPB, it is reasonable to hold contradictory beliefs; it is the aggregation of these beliefs that determines the overall attitude, norms or perceptions of behavioural control.

Once reliability and validity were established for the directly measured latent constructs, I fit the TPB model to my data using SEM. The indicators for the directly measured constructs were all observed variables defined by single questions, however, for the

indirectly measured latent constructs of attitude and perceived behavioural control, item parcels were created. Item parcels were created because the optimum number of indicators for a latent variable construct is 3-4 (Hall, Snell, & Foust, 1999). Generally, when more three or four scales are used to measure a latent construct, subsets of items are summed or averaged to form item parcels, which then serve as indicators (Hall et al., 1999). For the indirect measures of attitude and perceived behavioural control I used a randomised technique to create the following item parcels:

iA1= sum of the composite scores for climate change and freshness

iA2=sum of the composite scores for reducing the profit of commercial growers and saving money

iA3= sum of the composite scores for safety and effects on the environment

iPBC1= sum of the composite scores for time and soil quality

iPBC2= sum of the composite scores for knowledge of good types to grow and access to advice

iPBC3= sum of the composite scores for sun and physical ability

iPBC4= composite score of wind

These parcels were used in SEM as the indicators for the indirectly measured attitudes and perceived behavioural control latent constructs.

Following Milfont and Duckitt (2004), I used the following model fit indices: Chi-square to degrees of freedom ratio ($\chi 2/df$), root mean square error of approximation with 90% confidence interval (RMSEA with 90%C.I.) standard root mean square residual (SRMR), and comparative fit index (CFI). To test for good fit between the hypothesized model and my observed data I used the following cut-off values determined by Hu and Bentler (1999): a cut-off value close to .06 for RMSEA, close to .08 for SRMR, and close to .95 for CFI. I also used a cut off value of 3 for the $\chi 2/df$ statistic, as recommended by Schumacker and Lomax (2004).

Having determined that my model sufficiently described my data, I was able to identify the TPB construct (attitude, subjective norm or perceived behavioural control) which best predicted intention. Then I determined which specific beliefs pertaining to this construct had the greatest influence on intention. As suggested by Francis et al. (2004), I dichotomised intention and conducted a series of t-tests to determine which specific beliefs discriminated between intenders and non-intenders. Similarly, to determine which specific beliefs had the greatest influence on behaviour, I conducted a series of t-tests to determine which beliefs discriminated between those that grew fruit, vegetables and/or herbs and those that did not.

Chapter 4

Results and Analysis

4.1 Questionnaire response rate and respondent demographics

Of the 1,946 questionnaire delivered to households in Eastbourne, 684 (35%) were returned by February 10th, 2009 (I defined this date a priori as the deadline for inclusion in analysis). My questionnaire responses were skewed towards older participants with 28.5% aged 65 years or older responding (only 14.4% of Eastbourne residents are 65 year or older; Statistics New Zealand, 2006). Furthermore, more women (55% of respondents) answered the survey than expected (50% of Eastbourne population is women; Statistics New Zealand, 2006). However, the ethnicity of respondents was representative of the area with 86.6% NZ European (versus 87.4% in Eastbourne as a whole; Statistics New Zealand, 2006). These statistics indicate that the respondent population is only somewhat generalisable to the general population in Eastbourne, although results of further analysis (see section 4.3) minimised the impact of the aforementioned discrepancies between respondent and general populations: Rates of participation in edible gardening did not differ across age or gender.

4.2 Quantifying the edible gardening behaviour

In order to address my research objective of quantifying the edible gardening behaviour, I first assessed the presence/absence of the edible gardening behaviour in the respondent population. For the purposes of this research, I defined edible gardening as growing at least one species of fruit, vegetable *or* herb on one's residential property. The vast majority of respondents (89.6%) participated in edible gardening (Fig. 4.1). Further, 42.2% of respondents grew all three types of food (fruit, vegetables and herbs), 31.1% grew two types (2.0% fruit and vegetables only, 7.1% fruit and herbs only and 22.0% vegetables and

herbs only), and 16.3% grew only one type (3.3% fruit only, 2.3% vegetables only and 10.7% herbs only).

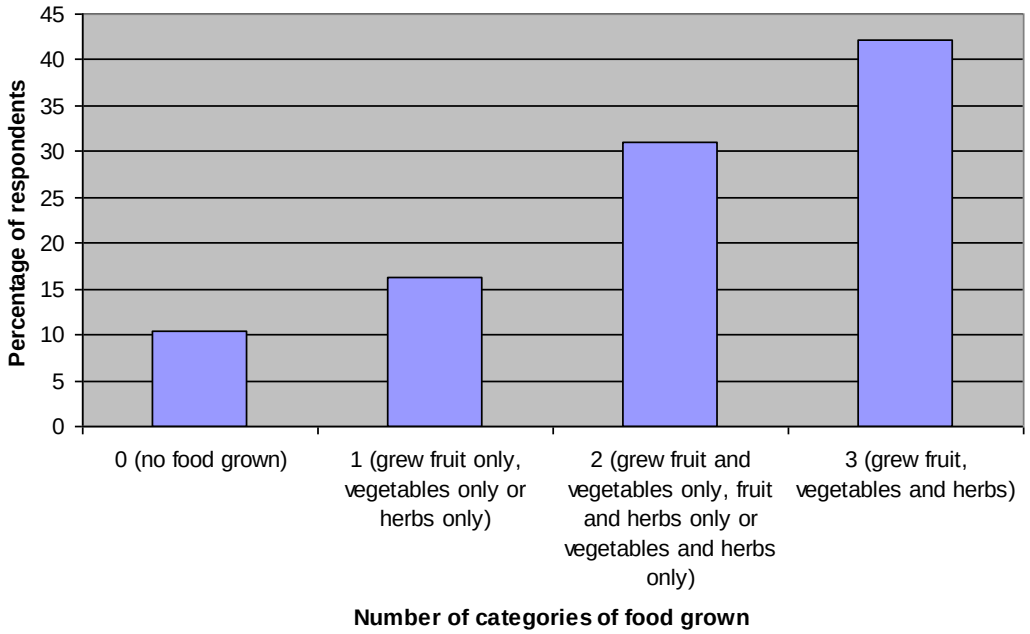


Figure 4.1. Frequency distribution for the gardening behaviour as defined by the number of types of food grown.

Next, I assessed the extent of edible gardening in Eastbourne and found that the majority of respondents reported growing less than 15% of their yearly intake of fruit, vegetables and herbs (Fig. 4.2). Furthermore, very few residents prioritised food growing on their land: only 0.2% of respondents grew food on greater than 40% of their residential property, whereas 81.8% grew food on less than 10% of their land (Fig. 4.3). These findings show that while the overwhelming majority of respondents engage in the edible gardening behaviour, the extent to which they engaged in this behaviour was limited due to the majority of respondents prioritising non-edible gardening uses for their land.

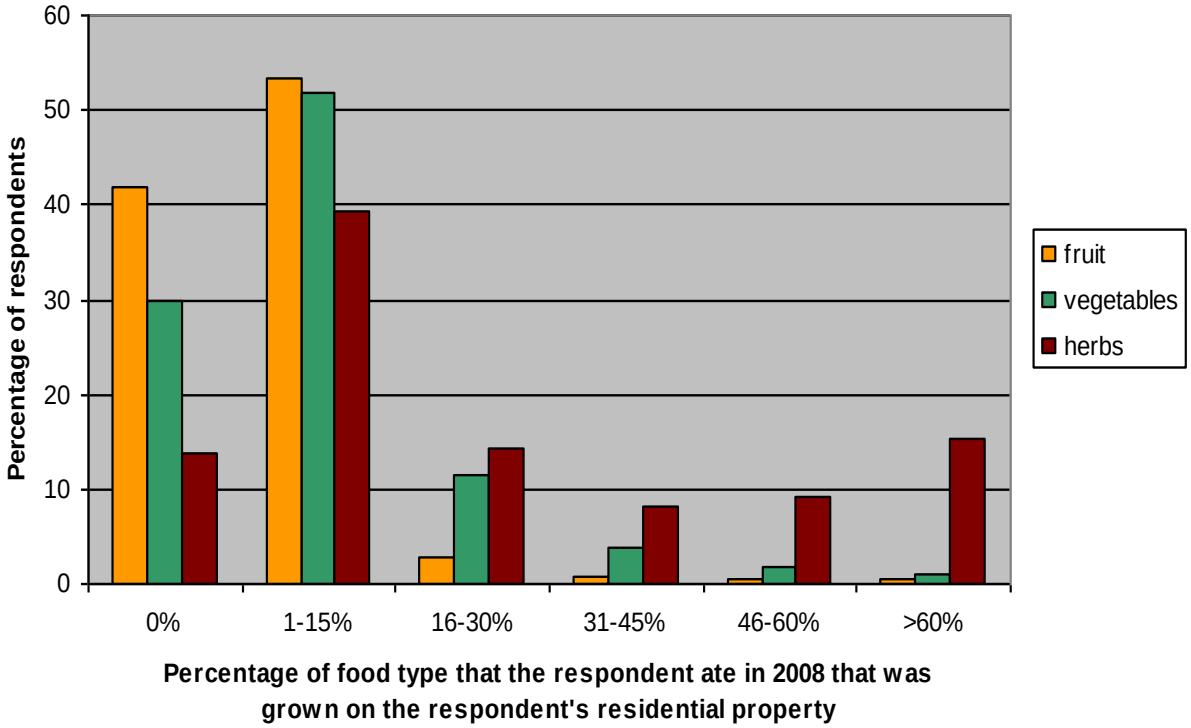


Figure 4.2 Frequency distribution for the percentage of each food type that the respondent ate in 2008 that was grown on the respondent's residential property.

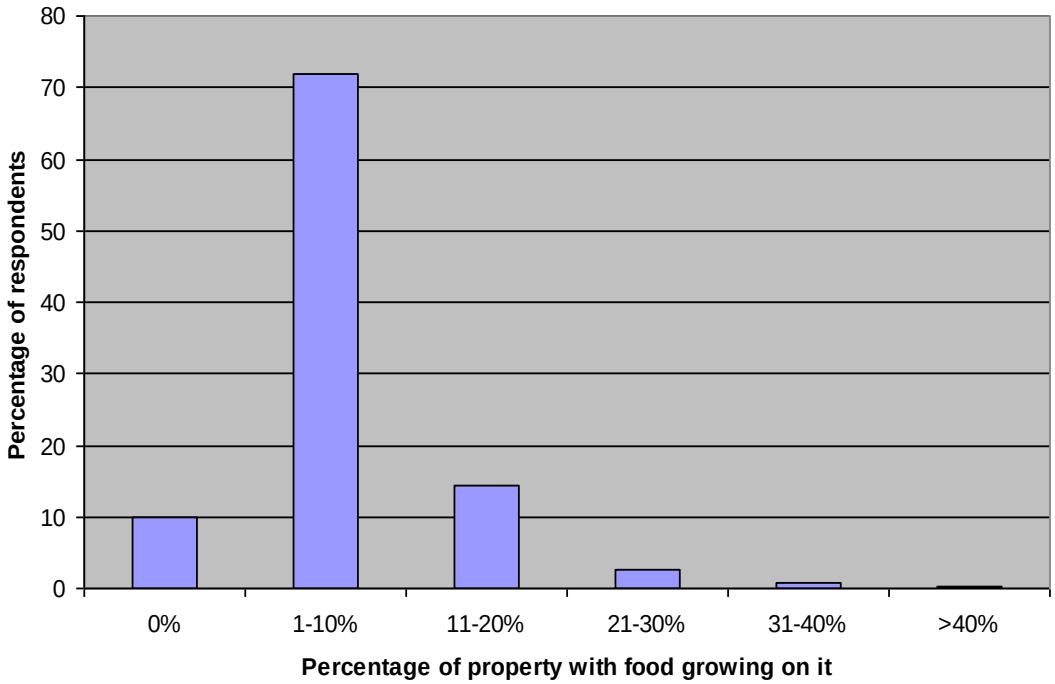


Figure 4.3. Frequency distribution for the percentage of the respondent's residential property that had fruit, vegetables, and/or herb growing on it in 2008.

4.3 Predicting participation in edible gardening

Logistic regression showed that intention to participate in edible gardening strongly predicted the edible gardening behaviour (β=.73), while perceived behavioural control had a weaker predictive value (β=.31) (Fig. 4.4). The combined effect of these variables explained 41.6% of the variance in edible gardening behaviour, which shows that the TPB explained edible gardening as well as it does most behaviours (Armitage and Conner, 2001).

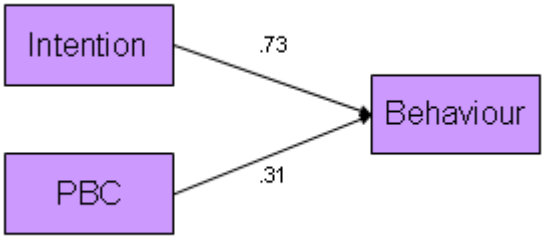


Figure 4.4. Standardised multiple regression coefficients for the logistic regression model of the edible gardening behaviour. The behaviour was dichotomised into those that grew nothing (n=69) and those that grew something (n=594). Nagelkerke R2 for the model was 0.416 and p<0.001. PBC= perceived behavioural control.

Confirmatory factor analyses were performed for each scale (fit indices are reported in Appendix G). All questions had significant and strong loadings on their correspondent construct (Table 4.1), except for question 12 ("It is expected of me that I grow") and question 25 ("I feel under social pressure to grow") of the global subjective norm scales which were non-significant. However, eliminating these two questions decreased the internal consistency of the measure (from a Chronbach's alpha of .409 to below .4), so I retained these questions in the global subjective norm construct.

Table 4.1. Assessing the internal consistency of the latent constructs.

Construct	# of items	# of respondents	scale	mean	standard deviation	factor loadings	mean inter-item correlation	α
Global Attitude	4	651	1-7	6.0396	1.00531	.73-.80	0.540	0.813
Global norm	4	623	1-7	3.3612	0.88847	.11-.65	0.147	0.409
Global PBC	3	648	1-7	5.3940	1.20510	.62-.65	0.395	0.657
Intention	2	651	1-7	5.3372	1.79368	.84-.93	0.793	0.881

In the next step, Ajzen's TPB-based structural equation model of edible gardening was assessed (Fig. 4.5). The fit indices (Table 4.2) showed that the model fit the data well using the model fit criteria reported in the methods section of this thesis (see section 4.5). Furthermore, the predictor variables explained 58.0% of the variation in intention to participate in edible gardening. Analysing the profiles of respondents who grew nothing versus those that grew something, we see that as the TPB predicts, participants in edible gardening reported positive intentions to perform the behaviour while non-participants in edible gardening reported negative intentions (Fig. 4.6). Furthermore, participants in edible gardening reported stronger positive attitudes towards the behaviour, weaker negative social pressure against gardening, and stronger positive perceptions of behavioural control, than did respondents who did not participate in edible gardening (Fig. 4.6).

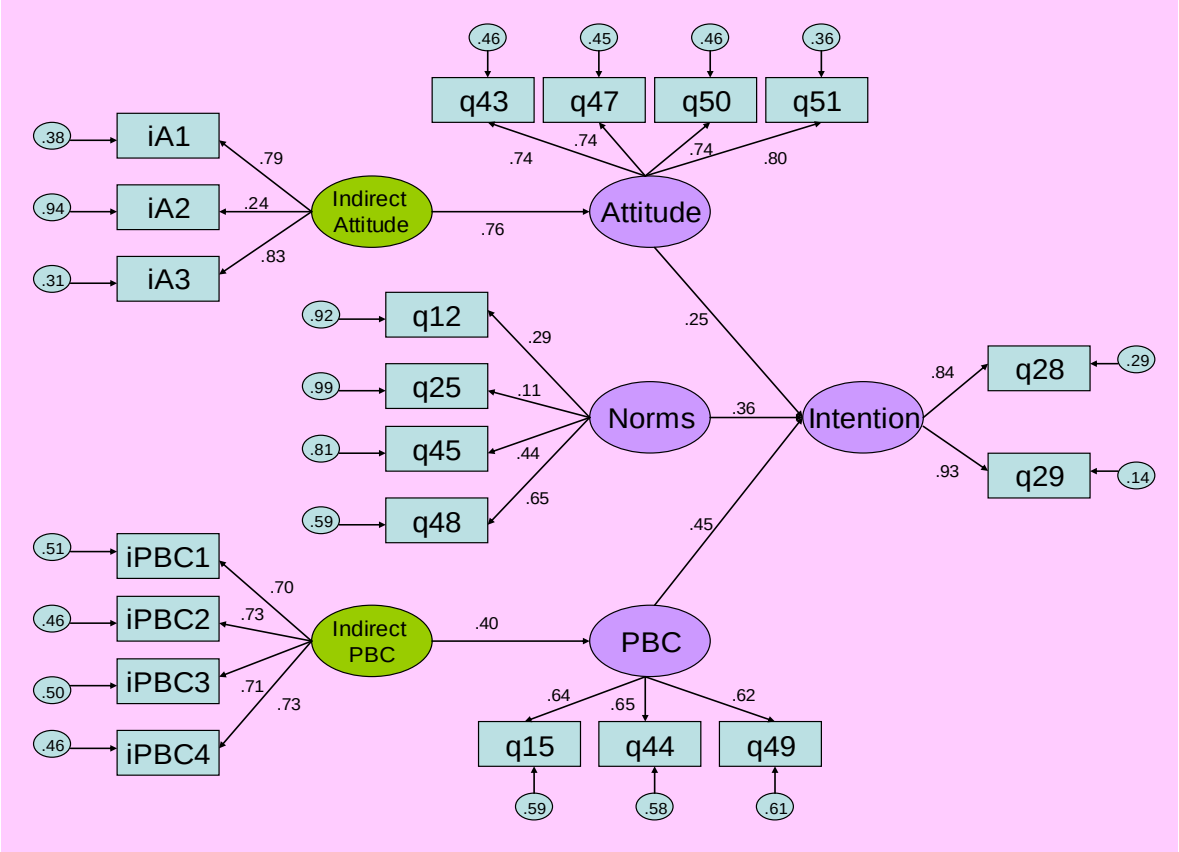


Figure 4.5. Standardised multiple regression coefficients for the TPB-based full latent variable model of intention to participate in edible gardening. Arrows from latent variables represent significant causal paths ($t < 1.96$, $p > 0.05$). Arrows to observed variables indicate the error terms. PBC= perceived behavioural control. Definitions of indicators to the indirect attitude and indirect PBC latent constructs are defined in the methods.

Table 4.2. Model fit of the TPB model of intention to participate in edible gardening (Fig. 4.5).

Construct	χ^2	df	χ^2/df	RMSEA (90%CI)	SRMR	CFI
Full model	457.54	162	2.82	0.058 (0.052 - 0.064)	0.088	0.96

Note: χ^2 was significant at $p < 0.001$. χ^2 = Chi-square, df = degrees of freedom; χ^2/df = ratio of Chi-square to degrees of freedom; RMSEA = root mean square error of approximation; 90%CI = 90 percent confidence interval; SRMR = standardised root mean square residual; CFI = comparative fit index.

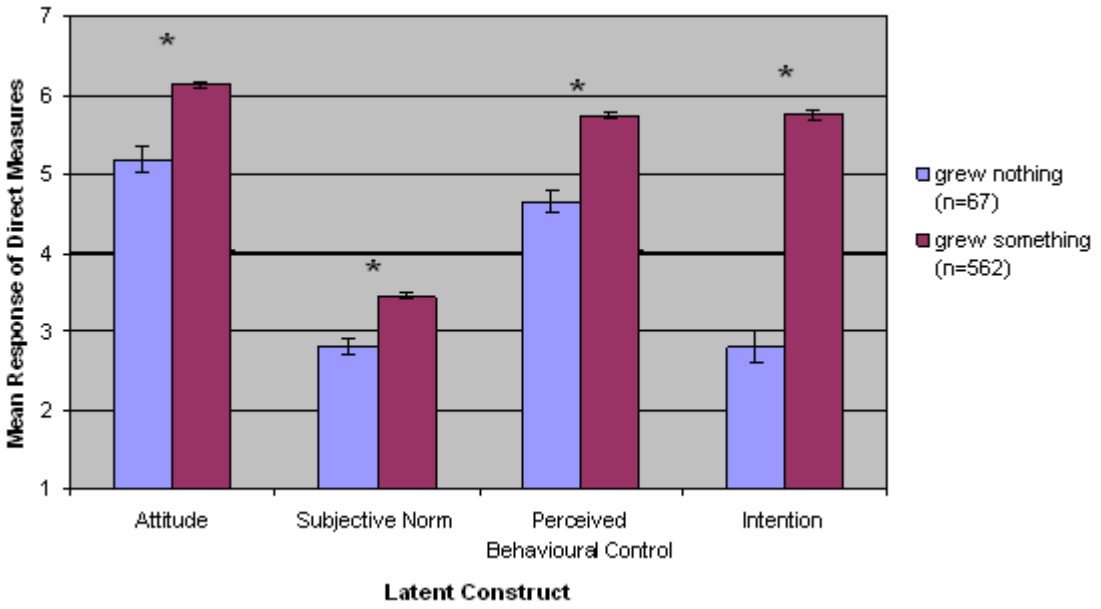


Figure 4.6. Mean of direct measure of TPB latent constructs for those who grew some fruit, vegetables and/or herbs on their residential property versus those who grew none. Scale of measurement for all questions for all constructs ranged from 1-7. A score of 1 indicated strong negative attitudes, social pressure, perceptions of control or intention, while 7 indicated a strongly positive position. 4 indicated a neutral or unsure position. T-tests were conducted, and in order to reduce Type 1 error, statistical significance was considered to be $p<0.01$ (noted with a * symbol)

The strongest of the influences on intention was perceived behavioural control (β=.45), followed by subjective norms (β=.36) and attitude (β=.25) (Fig. 4.5). These results show that interventions to increase intention to participate in edible gardening should mostly target perceptions of behavioural control, but that individuals' attitudes and subjective norms are also important.

In order to determine which perceived behavioural control beliefs had the greatest influence on intention, I performed discriminant analysis. I found, using a series of t-tests, that eight of the ten behavioural control beliefs discriminated between the intenders and non-intenders (Fig. 4.7): beliefs about having sufficient time, practical skills, physical ability, access to edible gardeners for support, knowledge of food types to grow on property, wind,

space, and sun. This finding indicates that these factors were perceived as barriers to edible gardening.

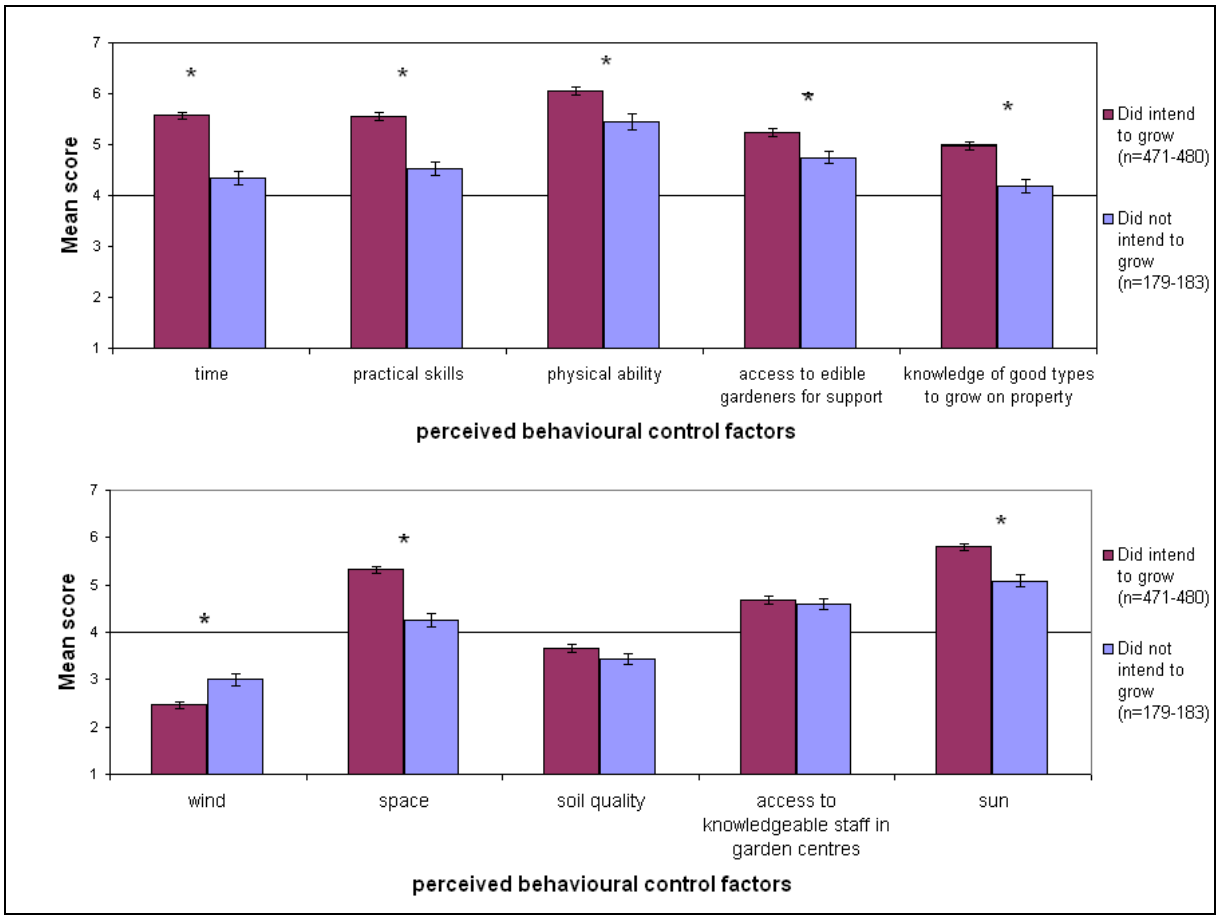


Figure 4.7. Mean score of perceived behavioural control beliefs of those that intended to grow versus those that did not intend to grow fruit, vegetables and/or herbs on their residential property. A score of 1 indicated beliefs of total insufficiency of the factor to enable edible gardening, while 7 indicated beliefs of total sufficiency of the factor to enable edible gardening. A score of 4 indicates undecided or neutral. T-tests were conducted, and in order to reduce Type 1 error, statistical significance was considered to be $p<0.01$ (noted with a * symbol). Error bars depict plus/minus standard error of the mean.

The extent to which perceptions of behaviour control reflect actual levels of control, perceived behavioural control can predict behaviour (Ajzen, 2002). Therefore, to identify which of the perceived barriers represented actual barriers to participation in edible gardening, I again performed discriminant analysis. Results indicate that only five of the eight perceived barriers discriminated between growers and non-growers: beliefs about

having sufficient time, practical skills, knowledge of good types to grow, space and sun (Fig. 4.8). Due to their direct and indirect (mediated by intention) influence on the edible gardening behaviour, these barriers are logical beliefs to target in interventions to increase edible gardening.

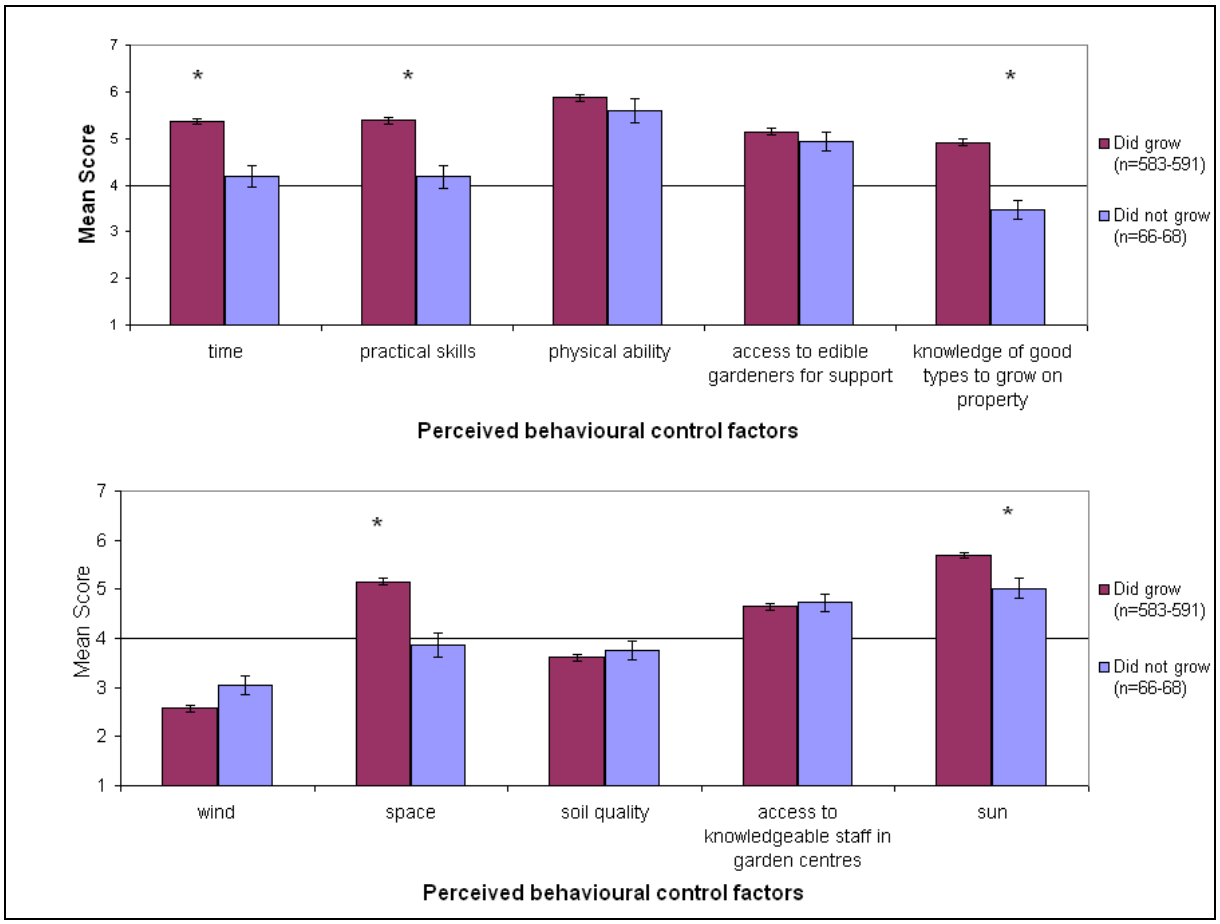


Figure 4.8. Mean score of perceived behavioural control beliefs of those that grew some fruit, vegetables and/or herbs on their residential property versus those versus those who grew none. Scale of measurement was 1-7. A score of 1 indicated beliefs of total insufficiency of the factor to enable edible gardening, while 7 indicated beliefs of total sufficiency of the factor to enable edible gardening. A score of 4 indicates undecided or neutral. T-tests were conducted, and in order to reduce Type 1 error, statistical significance was considered to be $p<0.01$ (noted with a * symbol). Error bars depict plus/minus standard error of the mean.

Demographic variables are external variables and are not included in the TPB because they are assumed not to add predictive value (Staats, 2005). The TPB is meant to capture the influence of various demographic variables on behaviour within the measures of attitude,

social norms and perceived behavioural control. Nevertheless, I decided to include these variables in my results for two reasons (1) in order to compare them with other studies and (2) to provide information on groups to target for interventions. I measured rates of participation in edible gardening over nine demographic variables (age, gender, ethnicity, presence of children in the home, bay of residence, type of dwelling, status of ownership, length of stay and exclusive versus shared use of yard) and found that for three demographic variables, rates of participation differed significantly between subgroups of that variable. As Figure 4.9 shows, the rate of participation in edible gardening was significantly higher for respondents who lived in a house (versus those that did not live in a house), respondents who have lived in same residence for more than 10 years (versus those living 10 years or fewer at their residence) and respondents who have exclusive use of their yard (versus those who have shared use).

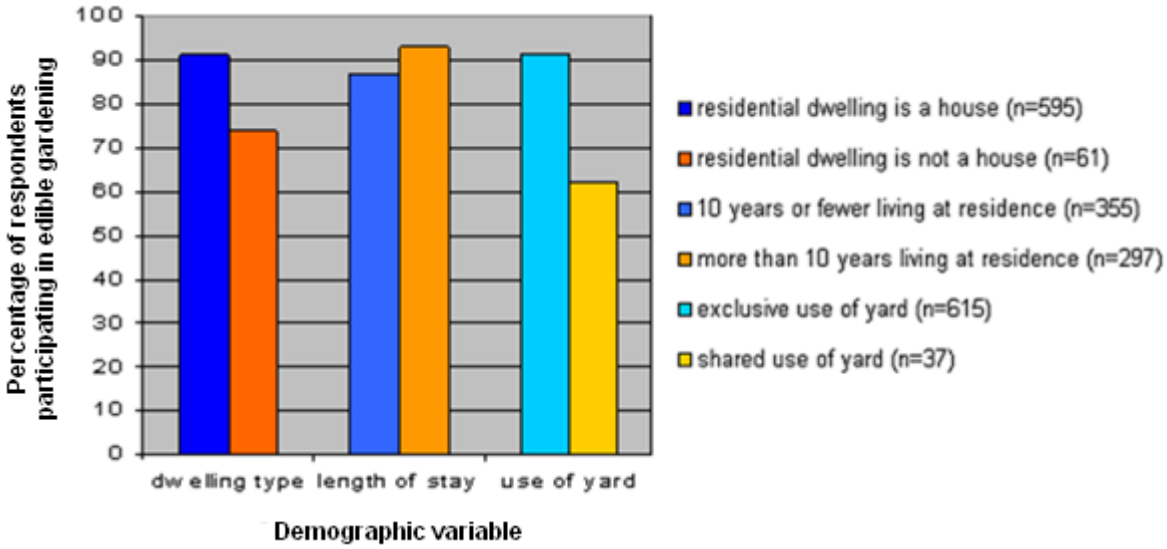


Figure 4.9. The percentage of respondents participating in edible gardening for each demographic variable in which rates of participation differed significantly ($p<.01$) between subgroups of that variable as determined by t-tests.

Chapter 5

Discussion and Conclusion

The aim of this research was to quantify and predict participation in edible gardening in Eastbourne, in order to generate a greater understanding of the behaviour on which to base recommendations for its effective promotion. People worldwide already engage in edible gardening but understanding and promoting participation in this activity is important because it has numerous benefits, and with the advent of likely changes to the global food system, the behaviour may become even more beneficial. This chapter will discuss the implications of the finding that 89% of respondents were edible gardeners, and the finding that perceived behavioural control was the greatest predictor of intention to edible garden, as well a direct predictor of behaviour. Recommendations for behavioural interventions to increase participation in edible gardening will then be suggested.

5.1 Study implications

The number of respondents who participated in edible gardening in Eastbourne (89%) was far higher than in previous studies. For example, Kortright (2007) reported that approximately 54% of residents participated in edible gardening in Toronto, and Fisher (2009) found 46% of suburban respondents participated in Waterloo, Canada. Furthermore, Gaynor (2005) estimated that in 1992, 50-60% of households in Melbourne and 40-50% in Perth were participating in edible gardening. However, a self-selection bias may have caused problems in measuring the levels of participation in Eastbourne. As was shown in a study of community gardeners, (Perez-Vazquez, Anderson, & Rogers, 2005), gardeners may have been more likely to a respond to a written questionnaire than non-gardeners. This self-selection bias would have caused an overestimation of the rate of participation in edible gardening in Eastbourne, nevertheless, the high rate of participation

reported by respondents is a positive outcome given the enormous potential benefits of the activity.

As was discussed in the introduction, edible gardening has potential social, environmental, resiliency and sustainability benefits. Through their edible gardening, eighty-nine percent of respondents are potentially increasing their mental health (Brogan & James, 1980) and physical health (Blair et al., 1991; Pate et al., 1995), as well as contributing to environmental outcomes by reducing food transport related emissions and pollution (Church, 2005). Furthermore, they have the opportunity to recycle soil nutrients (Nelson, 1995) and the ability to create a sustainable urban metabolism (Gaynor, 2006). Edible gardeners in Eastbourne are also contributing to community resilience. These respondents have the requisite knowledge, skills and resources to produce at least one specimen of edible plant, knowledge and skills that could be relied upon if disruptions to the current food system were to occur. The finding that eighty-nine percent of respondents were edible gardeners shows that not all food is purchased and demonstrates that Eastbourne has a degree of parallel infrastructure in its food system. For example, recalling Figure 1.1, urban edible gardening could buffer the effects of financial and economic crisis (such as unemployment or underemployment) on food crisis, by providing a food source that does not need to be purchased.

These benefits of edible gardening are important, and as a result, people may want to increase participation in Eastbourne and elsewhere. For example, to increase sustainability, Ghosh et al. (2008) have called for community behaviour change measures to increase uptake of edible gardening. But in order to promote the behaviour, an understanding is needed of the factors which drive participation. Although many theories of behaviour exist, this study used Ajzen's theory of planned behaviour to understand the edible gardening behaviour in Eastbourne. According to Ajzen's theory of planned behaviour the high rate of participation in edible gardening in Eastbourne was due to the high intentions of

residents to engage in the behaviour, and their sufficient levels of actual control over the behaviour. Further, strong intention to participate in edible gardening was due to a combination of sufficiently strong positive attitudes, evaluations of subjective norms, and perceptions of behavioural control. However, I did not assume this theory explained the edible gardening behaviour in Eastbourne, rather, I empirically tested these theoretical reasons and found that they held explanatory value for participation in edible gardening in Eastbourne.

Data analysis based on structural equation modelling revealed that the TPB model explained 58% of the variance in intention to participate in edible gardening, whilst logistic regression showed that the TPB model explained 41% of the variance in participation in edible gardening. These findings show that the TPB model fit the data well, considering that Armitage and Conner (2001) reviewed 185 independent studies which showed that the TBP accounted for 39% and 27% of the variance in intention and behaviour respectively. The finding that the theory of planned behaviour fit the data well indicates that efforts to increase the edible gardening behaviour should target intention, as it is the primary influence on behaviour. However, in order to implement an intervention to get people who do not intend to participate in edible garden to intend to participate, an understanding of the factors influencing intention is required.

Data analysis revealed that for edible gardening in Eastbourne, perceived behavioural control had the greatest influence on intention, followed by subjective norms and attitude. These relationships were all positive and significant, indicating that increases in perceptions of behavioural control, attitudes and subjective norms would increase participation in edible gardening, mediated by intention to participate. However, the finding that perceived behavioural control was the greatest determinant of intention indicates that when it came to the decision to participate in edible gardening, perceptions of control were more likely to sway people to intend to, or not intend to, participate in

edible gardening than were their attitudes or subjective norms. Nevertheless, all three constructs were influential.

Interestingly, attitudes are usually the strongest influence on intention (Armitage and Conner, 2001). Ajzen (1991) states that the relative influences of the TPB constructs on intention will vary across behaviour, so weak influence of attitude is not entirely unexpected. Recalling the TPB model (Figure 2.1), attitudes are determined by behavioural beliefs which are beliefs about the likely outcomes of the behaviour and the evaluations of these outcomes (Ajzen, 1991). The weak influence of attitude on intention means that changes in beliefs about the outcomes of edible gardening and the evaluations of these outcomes will have a weak effect on intention and therefore a weak effect on behaviour. Furthermore, both edible gardeners and non-gardeners had strong positive attitudes (indicated by the means of the direct measure of attitude shown in Figure 4.6), so there is little need to promote the benefits of the behaviour in order to increase participation.

However, perceived behavioural control, as the most influential predictor of intention, would be the logical first construct to target for interventions to increase intention to participate in edible gardening. Other studies of environmental behaviour have also noted the relative importance of perceived behavioural control. For example, Mannetti, Pierro, and Livi (2004) used the TPB model to explain intentions to recycle and found that the most important predictor of intention was perceived behavioural control.

The strong influence of perceived behavioural control on intention indicates that the edible gardening behaviour is not entirely under volitional control (Ajzen, 1991). The volitional control of a behaviour lies on a continuum from complete volitional control in which all people have the requisite skills, resources, and opportunities to perform a behaviour, to non-volitional control in which no one has the requisite skills, resources, and opportunities. The extent to which a behaviour is under volitional control will determine

the influence (or predictive value) of perceived behavioural control construct on intention (Ajzen, 1991). This is because when considering a behaviour, an individual is unlikely to form a behavioural intention for an action that the individual believes he or she can not perform (Staats, 2003). The fact that perceived behavioural control strongly influenced intention means that at the time of intention formation, some people perceived the existence of barriers to the behaviour.

Discriminant analysis revealed that beliefs about having sufficient time, sufficient practical skills, sufficient physical ability, sufficient access to edible gardeners for support, sufficient knowledge of good types to grow, sufficient lack of wind, sufficient space, and sufficient sun to participate in edible gardening differentiated between individuals that did and did not intended to edible garden. Therefore, these factors formed perceived barriers to the edible gardening behaviour, and are thus an appropriate targets for interventions to increase intention to participate in edible gardening. In addition to influencing behaviour through intention, perceived behavioural control also had a moderately strong direct effect on behaviour. Further discriminant analysis revealed that beliefs about having sufficient time, practical skills, knowledge of good food types to grow, space and sun differentiated between participants and non-participants in edible gardening, making these beliefs actual barriers to edible gardening.

To clarify, the difference between a perceived and actual barrier is determined by the point in time in which the barrier was considered. The TPB is a cognitive model which represents a decision-making process at time 1 (intention formation) and a behaviour at time 2. Due to the delay between forming an intention and performing a behaviour, new beliefs may form which moderate the intention-behaviour relationship. For behaviours that are not entirely volitional, the construct of perceived behavioural control holds predictive value for both time points: intention and behaviour (Armitage & Conner, 2001). Barriers which factored into the intention to participate in edible gardening are perceived

barriers, whereas actual barriers are those that were encountered after the intention was formed. In the case of edible gardening, five factors were found to be perceived barriers, influencing some respondents' intention to participate in edible gardening, as well as actual barriers, barriers which hindered the performance of the edible gardening behaviour by those who initially intended to participate in edible gardening. As such, beliefs about having sufficient time, practical skills, knowledge of good food types to grow, space and sun are the logical factors to target first for interventions to increase the edible gardening behaviour.

This research is the first study to model the psycho-social factors influencing edible gardening and as a consequence, comparisons with other studies must be done with caution. Due to their lack of modelling, previous studies did not systematically consider the influences of attitude and subjective norm constructs (Hujber, 2007; Kortright, 2005), and in these studies, these factors were not identified as major barriers to edible gardening. The major barriers to edible gardening identified by Hujber (2007) and Kortright (2005) were perceived behavioural control factors. For example, Kortright (2005) identified gardening skills as a major barrier to edible gardening in Toronto, Canada. Kortright also reported that, although participants in her study were not asked what they perceived as barriers to edible gardening, participants nevertheless mentioned perceived behavioural control factors such as, space, sun (lack of), and soil quality as barriers. Furthermore, after interviewing 63 government officials and food growers, Hujber (2008) reported perceptions of lack of space, water, finances and supportive policies as the major barriers for edible gardeners and community gardeners in Melbourne, Australia. Interestingly, through the use of the TPB model, my study was the first to systematically consider the effect of attitude, subjective norms and perceived behavioural control on participation in edible gardening, and *still* found perceived behavioural control factors to be the biggest barriers. The similar conclusions reached by these studies, despite their different research

methods, suggests the finding that perceived behavioural control factors are major barriers to edible gardening may be generalisable to other urban areas.

In addition to modelling the effect of psycho-social variables on the edible gardening behaviour, I also performed discriminant analysis to determine the influence of external variables on participation in edible gardening. Of the nine demographic variables I measured (age, gender, ethnicity, presence of children in the home, bay of residence, type of dwelling, status of ownership, length of stay and exclusive versus shared use of yard), the type of dwelling, length of stay, and exclusive versus shared use of yard variables showed significant differences in rates of participation between subgroups within each variable. Interestingly, the effect of length of stay on participation in urban agriculture may be generalisable. I found that residents who had lived in Eastbourne for more than 10 years were more likely to grow fruit, vegetables and/or herbs on their residential property than those who had lived in Eastbourne for 10 years or less. Similarly, Mazereeuw (2005) found that in Waterloo, Canada, residents who had lived in Canada for more than 10 years were significantly more likely to participate in edible gardening. Furthermore, length of stay may be generalisable to developing countries: Mwangi (1995) and Maxwell (1995) also found that length of stay affected the probability of participation in urban agriculture in Nairobi (Kenya) and Kampala (Uganda), respectively. These findings are important in light of the predicted increases in urbanisation. By 2050, urban areas worldwide are predicted to gain 600 million inhabitants from rural areas (Department of Economic and Social Affairs of the United Nations, 2008) creating a greater demand for food in urban areas. Yet, as the aforementioned studies show, this increase in demand is unlikely to be met by the recent immigrants growing food for themselves unless changes occur. Perhaps interventions to increase urban edible gardening could target newer residents in order to help meet this increase in demand. Based on the questionnaire results, other targets for interventions in Eastbourne would be people living in apartments or people with shared yards, although these variables were not tested in other studies.

Having established factors that most influence the edible gardening behaviour in Eastbourne, I will now discuss how to use this knowledge to design effective interventions to promote the behaviour.

5.2 Recommendations for interventions

Many theories and tools to influence human behaviour change exist (e.g., Andreasen, 1995; Gardner and Stern, 2002; McKenzie-Mohr, n.d., 2000a, 2000b; Crompton, 2008). However, I will focus my discussion on Mckenzie-Mohr's (n.d) community-based social marketing tools for several reasons. Firstly, this tool set has been developed in order to foster sustainable behaviour in community settings and my aim involved promoting edible gardening (a sustainable behaviour) in Eastbourne (a community setting). Furthermore, each of these tools is relevant to certain aspects of behaviour, which we can consider in light of the TPB (Table 5.1). Finally, many behaviour change methods are designed to facilitate behaviour change among people who already intend to change (e.g., Gollwitzer, 1999), however the CBSM tools are relevant not only to intenders, but non-intenders as well.

Table 5.1. The community-based social marketing tools relevant to each construct of the theory of planned behaviour.

TPB Construct	**Relevant Behaviour Change Tools**
Attitude	Incentives Effective communication
Subjective Norms	Increasing social pressure Effective communication
Perceived Behavioural Control	Convenience: Making it easy to act Behavioural prompts Effective communication
Intention	Verbal or written commitments Effective communication

Given that perceived behavioural control was the most influential factor on intention to edible garden, it is logical to target this construct for an intervention to increase participation in edible gardening. Perceived behavioural control is determined by *beliefs* about the presence of factors that may facilitate or impede performance of the behaviour and the perceived power of these factors (Ajzen, 1991). Perceived behavioural control does not measure the actual amounts of these control factors. For example, in my questionnaire I measured people beliefs about whether they had sufficient sun in order to participate in edible gardening, although I did not actually measure the sunlight hours on people's residential properties. As a result, I refer to the beliefs as barriers. However, for the purposes of planning interventions, these beliefs are assumed to reflect reality. The logic behind this assumption is utilitarian: Changing the availability or amount of the underlying variables will increase perceptions of control regardless of whether the perceptions initial perceptions of sufficiency were accurate. Therefore, recommendations for interventions will aim to increase people's practical skills and knowledge of what is good to grow their residential properties, as well as the amount of time, space and sun available to them, rather than to change their perceptions of sufficiency only.

The CBSM tool that is most appropriate to addressing the perceived behavioural control construct is "Convenience/making it easy to act", which involves lowering barriers to the behaviour to make it more convenient/do-able; in order words, to give people the resources to perform the behaviour (thereby increasing their perceptions of control). However, McKenzie-Mohr (n.d.) does not provide much advice on how to lower barriers, admitting that strategies for removing barriers must be tailored to each situation. In the case of edible gardening in Eastbourne, "Making it easy to act" would be achieved by lowering the barriers of insufficient skills, knowledge, time, space and sun.

The barriers of insufficient practical skills and knowledge of what is good to grow can be overcome by providing information. This information can be imparted in any number of

ways, such as “how to” brochures, workbooks, videos, or courses, but will be most beneficial if the information is transmitted using effective communication techniques (McKenzie-Mohr, n.d.). Effective communication is another CBSM behaviour change tool and involves delivering information that is specific and easy to remember conveyed in a vivid, concrete and personalised manner (McKenzie-Mohr, n.d.). This requires knowing one’s audience and framing the message well. For example, in the material to promote waste minimisation, the city council in Lower Hutt, New Zealand, has used a graphic (Fig. 5.1) to convey the information that residents throw away too much rubbish. To make the information vivid, concrete and personalised, they have used a local landmark (the Hutt Clock tower) to give perspective.

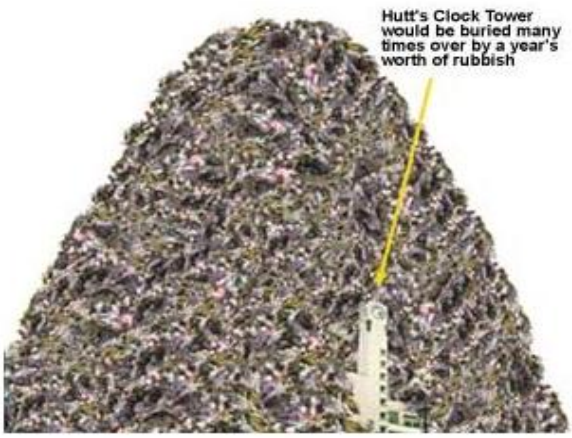


Figure 5.1. Example of the effective communication intervention technique. Used by Hutt City Council to convey information to promote waste minimisation by Hutt City Council (n.d.).

Edible gardening methods are context dependent (e.g., dependent on the amount of sunlight, wind, rain etc.), and as such, information on how to do them should be as personalised as possible. A course should provide an opportunity for dialogue so that the tutor could gain insight into the particular situations of the pupils and tailor his or her advice in ways that brochures, workbooks or videos could not. Therefore, I suggest that a “How to Edible Garden” course be held in Eastbourne to overcome the barriers of insufficient skills and knowledge of good types to grow.

Furthermore, McKenzie-Mohr (n.d.) recommends using a credible source to disseminate information. Information from a high credibility source (expert or trustworthy) has been found to increase behavioural compliance (Craig & McCann, 1978). In New Zealand, scientists are deemed very credible compared to other sources of information (Cullen, Hughey, & Kerr, 2006), thus perceptions of behavioural control after a "How to Edible Garden" course may be higher, and rates of participation in edible gardening higher, if the course were presented by a horticulture scientist.

In order for a course to be an effective intervention, there must be a group of people willing to take the course, so advertising plays a roll in interventions as well. For an intervention to increase edible gardening in a community in which perceived behavioural control presented the biggest barrier to edible gardening, all materials should emphasise that the target audience is capable and has the power to participate. Recently a "How to Edible Garden" course was run by Transition Towns in Lower Hutt City, New Zealand entitled, "Gardening: Yes You Can!" The title of the course used on a flyer to advertise the course (see Appendix H) was a good choice in order to appeal to people who may have perceived barriers to edible gardening and never formed an intention to perform the behaviour. Similar advertising may be effective in Eastbourne. Furthermore, advertising could target groups based on demographic evidence regarding existing participation. For example, in Eastbourne the households with shared yards and the households living in apartments could be targeted due to their relatively low levels of participation in edible gardening. Additionally, results from this study and others (Maxwell, 1995; Mazereeuw, 2005; Mwangi, 1995) suggest that targeting newer arrivals to the area might prove to be effective. Further evidence for this target comes from Schafer and Bamberg (2008), who have found evidence for linking sustainable behaviour to sensitive life events such as moving residence.

During the “Gardening: Yes You Can!” course, participants received information about the horticultural requirements of plants, as well as planning, building and planting a community garden space (Morrison, 2009). They also drew up plans for their own edible gardens and had opportunities to receive design feedback and get advice pertinent to their unique garden situation. The course was taught by credible people, a trained horticulturalist scientist and an eco-home designer, both locally based and knowledgeable about local conditions. Although behaviour has not been measured, participant feedback from the course indicated participants’ knowledge and skills about edible gardening had increased (Morrison, 2009). This feedback suggests that a similar course may be effective in Eastbourne to address the barriers of lack of knowledge of good types of edible plants to grow on one’s residential property and lack of practical skills.

A “How to Edible Garden” course could also address the barriers of lack of sufficient time, space and sun. For example, The Dirt Doctor business in New Zealand holds courses on “How to Edible Garden” and advertises that using their techniques, the activity need not take more than 30 minutes a week to feed a family of four (Dirt Doctor, n.d.). The Dirt Doctor technique takes little time because it involves using a special tool which cuts weeds easily, then leaving them where they were cut, to serve as mulch. The Dirt Doctor also addresses the issue of space by teaching skills to maintain soil quality. Plants can be grown close together so long as the soil contains enough nutrients so that they don’t compete with each other. These skills could be taught to time-poor and space constrained people, and modest goals could be advocated, rather than suggesting that participants feed a family of four. Planting a single species would be a good first request. For time-poor people, fruit trees or perennial herbs could even be advocated. Although there is the initial investment of procuring the plant or seed and planting it, the maintenance is minimal.

The issue of space and sun can be overcome using effective communication to advocate growing food plants in pots. For those residents without access to space, the edible

gardening behaviour could be encouraged to be undertaken in pots on balconies, paved areas, or even window sills. Further, people who perceive that lack of sun is a barrier to edible gardening could be encouraged to grow in pots so they can move them to maximise sun exposure. Additionally, the growing of shade tolerant plants could be advocated.

Space, sun and time are barriers that can be addressed not only through effective communication of information, but also by providing these resources directly. For example, providing containers in which people could garden on a patio, balcony or windowsill could address space issues, and helping people get rid of shade causing trees or shrubs could address issues of sun. Furthermore, volunteers could agree to help set up and/or help maintain gardens for time-poor residents. Although these interventions require much greater resources than does a course, some organisations have provided these services. For example, Growing Gardens, a non-profit organisation in Portland, Oregon, provides some of these resources for low income families.

> With the help of hundreds of volunteers, Growing Gardens installs raised garden beds in the yards of low-income households. Gardeners in apartments or with limited space receive containers to grow food on patios and porches. Each household is enrolled into a three year support program. Seeds, plants, compost bins, tools, soil amendments and education through experienced volunteer Mentors, educational newsletters & workshops in the Learn & Grow Program all assure the success of Home Gardeners (Growing Gardens, Home Gardens page, ¶ 2).

This group has had success, planting gardens for 68 households in 2008 and supporting 88 more households through years two and three of their programme.

In order to increase the conversion of intention to behaviour, McKenzie-Mohr suggests using the CBSM commitment tool. Using the commitment tool means seeking a verbal or written pledge from the participants in your intervention, and could be effective in increasing edible gardening practice. This commitment must be voluntary to be effective

(McKenzie-Mohr, n.d.), so seeking the commitment of people who already express some intention to perform the behaviour, such as participants in an edible gardening course, would be ideal. Commitment strategies have been shown to increase recycling (Wang & Katzev, 1990), and bus ridership (Matthies, Klöckner, & Preibner, 2006) among others. Written commitments have been found to be more effective than oral commitments and public commitments more effective than private commitments (McKenzie-Mohr, n.d.). Furthermore, by keeping the commitment small (e.g., one new plant), people are more likely to achieve the commitment (McKenzie-Mohr, n.d.).

Of course, perceived behavioural control was not the only factor which influenced intention to edible garden. Subjective norms had a relatively strong influence on intention to edible garden, although the actual influence may have been even higher than reported for two reasons. Armitage and Conner (2001) showed that the influence of subjective norms may be underestimated due to the use of poor measurement of norms, and Stiff (1994, cited in Manetti, 2004) reported that the impact of subjective norms may be underestimated when it is measured by anonymous questionnaires completed in private. Given that my subjective norm construct possessed measurement error, and I measured the subjective norms of edible gardening using an anonymous questionnaire which was completed in private, subjective norms may be a substantial target for interventions to increase edible gardening in Eastbourne. Therefore, other CBSM tools, such as "Norms: building community support" could be effective for increasing the edible gardening behaviour.

According to McKenzie-Mohr (n.d), social norms are best encouraged through modelling the desired behaviour to the target audience. McKenzie-Mohr cites the success of modelling in getting U.S. farmers to adopt agricultural practices that limit soil erosion. Nisbett et al. (1976; cited in McKenzie-Mohr, n.d.) found that an initial information campaign was ineffective at changing farmer behaviour. However, after the U.S.

government worked directly with a small number of farmers to install wind screens and alternative methods of tillage, neighbouring farmers observed the success of these new practices, and then adopted similar measures.

In order to increase subjective norms to participate in edible gardening in Eastbourne, interventions could seek to model the behaviour. For example, modelling the behaviour could be done by conducting the "How to Edible Garden" course in a garden setting as is done by Growing Gardens, or by touring successful residential gardens. Modelling is a tool for increasing perceptions of control by demonstrating how barriers can be overcome. For example, Growing Food, Growing Community, a community group based in Wallingford, Washington, (USA), holds edible garden walks in which experienced gardeners lead people on a tour of neighbourhood gardens, in order to share what they know (Growing Food, Growing Community, n.d.). By holding such events, this community group aims to promote edible gardening, thereby building community and increasing economic and environmental sustainability.

Interestingly, the mean response for the direct measures of subjective norms for participants and non-participants in edible gardening indicate that all residents feel negative pressure to participate in edible gardening. However, the high prevalence of the behaviour in the community indicates that in reality, there is a community norm to participate in the behaviour. In order to make this community norm more salient, I suggest as a possible intervention that residents plant at least one of their edible plants in the front yard where it is visible. This would hopefully contribute to increasing the intention of non-participants to engage in the edible gardening behaviour.

Even though attitude was the TPB factor with the least influence on intention to participate in edible gardening, the β-value was still positive, indicating that increases in attitude should lead to increases in intention. Therefore targeting attitude could also

contribute to a positive intervention. The main CBSM tool to change attitude is creating incentives (McKenzie-Mohr, n.d.). Incentives changes attitudes towards the behaviour by changing beliefs about the outcome of the behaviour. However, incentives are costly to implement. In addition, once in place, caution must be used when removing incentives, as behaviour may not be sustained when they are removed. So, I would not recommend the use of incentives over the other CBSM intervention tools.

To summarise, to increase participation in edible gardening in Eastbourne, I would first recommend that a course be held which used effective communication techniques to address the barriers of lack of sufficient skills, knowledge, time, space and sun. Furthermore, I would recommend that commitments from participants be sought to increase the likelihood that intention will translate to behaviour. Also, to increase social pressure, edible gardening could be modelled in the community and made more prominent. Having provided these recommendations, I will now discuss the limitations of this research and suggest future studies.

5.3 Study limitations and suggested future research

The main limitation of this study is that this study was designed to understand the factors influencing the presence or absence of the edible gardening behaviour but not how much people grew. This means that the understanding of edible gardening gained by this study is useful for increasing the number of participants in edible gardening, rather than getting existing edible gardeners to increase the amount of food they grow. This research design was implemented without knowledge of the prevalence or extent of the behaviour, and proved to be a limitation because, at the most, the rate of participation can only improve by roughly 11%. However, interventions to increase the extent of edible gardening by existing gardeners would apply to the 89% of Eastbourne residents who participated in edible gardening in 2008. Furthermore, interventions to increase the extent of edible

gardening would be helpful in Eastbourne because the extent in 2008 was limited. Very few residents prioritised food growing on their land: only 0.2% of respondents grew food on greater than 40% of their residential property, whereas 81.8% grew food on less than 10% of their land. Not surprisingly, the land devoted to edible gardening was unable to meet a sizable portion of the community's diet of fruit, vegetables and/or herbs. The majority of respondents reported growing less than 15% of their yearly intake of fruit, vegetables and herbs. Increasing the extent of urban edible gardening in Eastbourne would increase many of the benefits to the community such as the resiliency benefits. Therefore interventions to increase the extent of edible gardening by existing edible gardeners would also be beneficial.

It is tempting to hope that intervention techniques aimed at increasing participation in edible gardening could also increase its extent, however the TPB model had poorer predictive value for the extent of edible gardening in Eastbourne. This finding is unsurprising given Ajzen's (2002) principle of compatibility. This principle requires that when using the TPB, that attitude, subjective norm, perceived behavioural control, and intention constructs be defined in terms of exactly the same target, action, context and time elements as behaviour. The 2008 Eastbourne Edible Gardening Questionnaire was designed to predict edible gardening defined as growing some (at least one specimen of) fruit, vegetables, OR herbs (Figure 5.2 A). However, when attitude, subjective norms, perceived behavioural control, and intention are defined in this way, but are used to predict the extent of edible gardening, the model has a poorer fit. Intention and perceived behavioural control predicted 28.4% of the variance in edible gardening behaviour as defined by growing everything (fruit, vegetables, AND herbs; see Figure 5.2 B); further, intention and perceived behavioural control predicted only 12.8% of the variance in edible gardening as defined by growing on greater than 10% of one's residential property (Figure 5.2 C). These findings indicate that the factors which lead people to grow at least one species of fruit, vegetable or herb are not entirely the same factors that predict that they grow all three species type, and are quite

different from the factors that predict whether they will grow on more than 10% of their residential property. Predicting edible gardening when it is defined as growing all three types of food, or as growing on greater than 10% of one's property, would provide insight into how to promote these more involved forms of edible gardening. Therefore, in order to increase the extent of edible gardening, the TPB ought to be applied to edible gardening as defined in these new ways.

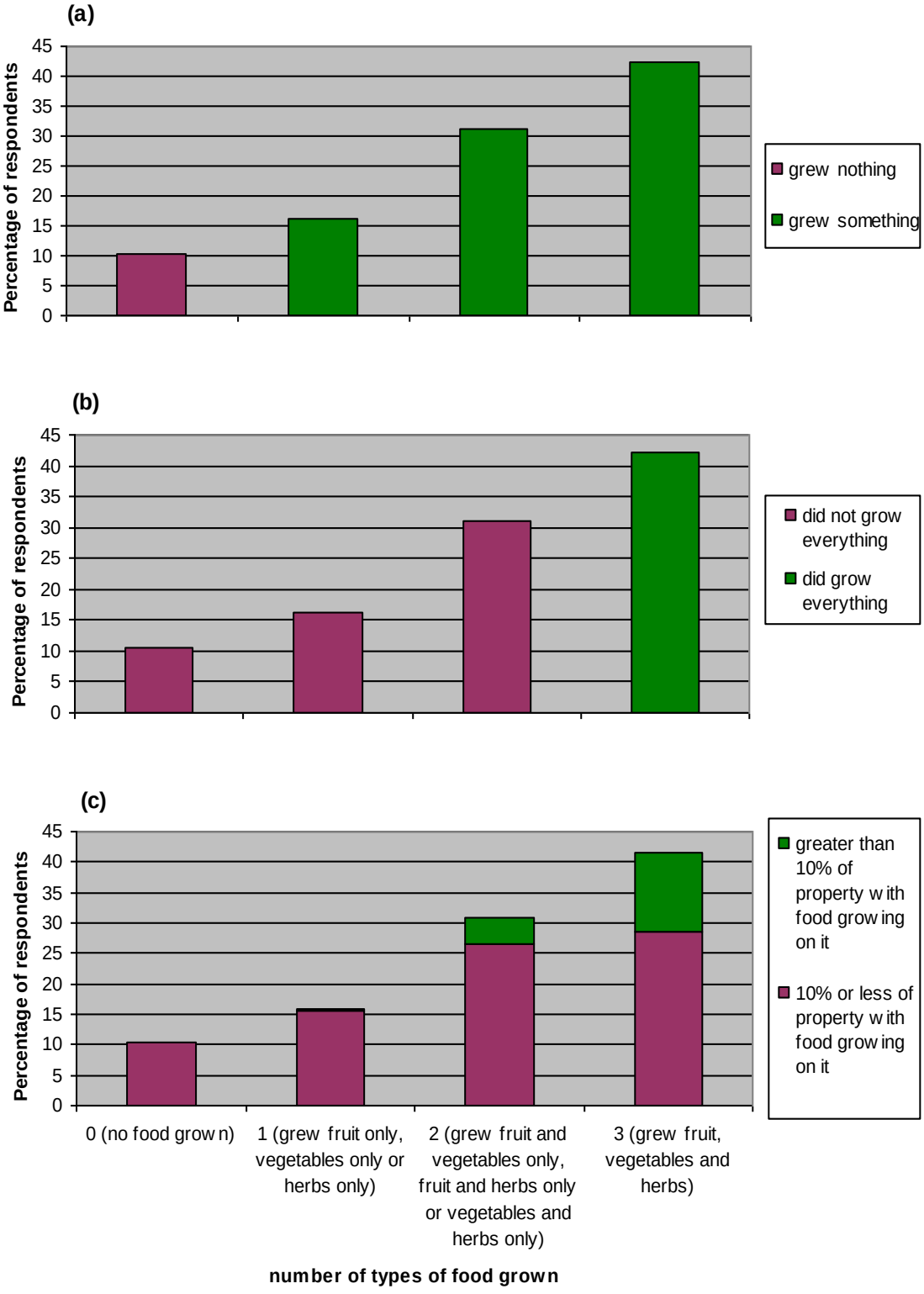


Figure 5.2. Different ways to define the edible gardening behaviour.

Another limitation was the lack of a proper elicitation study to determine the modal salient beliefs. If future research into the factors influencing the extent of edible gardening in Eastbourne were to employ the TPB framework, it ought to include a more in depth elicitation study. An in depth elicitation study would not only determine what the personal salient beliefs were for members of a focus group (as I did), but also determine what the modal salient beliefs were. Such a study would quantify the presence of the personal salient beliefs across the group, and include only the beliefs that were widely held. This would require a more lengthy and detailed study than time allowed during this Master's research, but such an approach would strengthen the predictive value of the indirectly measured constructs.

A further way to potentially increase the explanatory power of the TPB model of edible gardening would be to include indirect measures of subjective norm. It is puzzling why both participants and non-participants in edible garden reported pressure not to participate, despite the community having a high rate of participation. Including indirect measures may illuminate the source of this negative pressure. Perhaps the pressure comes from the economic and fiscal culture of New Zealand. New Zealand was fifth in the 2009 world rankings of economic freedoms produced by the Heritage Foundation and the Wall Street Journal (Heritage Foundation, 2009) which is a combined measure of 10 freedoms including business freedom in which New Zealand scored 99.9 and trade freedom in which NZ scored 84.6 (out of a possible 100). These statistics indicates the strength of commitment NZ government has for free enterprise policy, globalisation and comparative advantage, and within this culture it is not surprising that people feel pressure to trade money for food, not to grow it. Nevertheless, empirical evidence is needed to understand the source of subjective norms for edible gardening.

As I highlighted in the introduction, this study was the first comprehensive study of the psycho-social influences on edible gardening. Eastbourne has a demographic profile

different to that of the average Wellington resident or the average New Zealander (Statistics New Zealand, 2006), therefore similar TPB studies of edible gardening ought to be conducted elsewhere in New Zealand, and worldwide, to determine how generalisable the results of this study are. Although comparisons with other studies (Hubjer, 2008; Kortright, 2007) indicate my results are somewhat generalisable, empirical research conducted in other areas, using the methods I employed, would be needed to confirm this hypothesis. Furthermore, although perceived behavioural control as a construct is a barrier which seems to be generalisable, the specific barriers vary (Hubjer, 2008; Karaan, 1998; Kortright, 2007). Additional research would allow for a greater understanding of the context in which specific barriers exist and allow for more targeted interventions in studied, as well as unstudied, urban areas.

Research into the gardening methods of urban edible gardeners would also be beneficial. The sustainability benefits of the behaviour greatly depend on the methods employed (Gomiero et al., 2008), yet no studies to date have been carried out in Eastbourne. For example, quantifying the use of petro-chemical fertilizers, pesticides, and water would help form a picture of the environmental costs of the behaviour. If the sustainability of the methods was found lacking, interventions to adopt different gardening practices could be implemented.

Future research ought to be conducted on the efficacy of interventions to increase the edible gardening behaviour. Although the TPB model has predictive value for edible gardening and therefore some explanatory power, interventions based on this model are not guaranteed to succeed. It would be helpful if interventions based on this study were conducted like experiments so the effectiveness could be measured. Many community groups intending to promote a sustainable behaviour implement intervention techniques, such as Transition Towns of Lower Hutt holding the “Gardening: Yes You Can!” course; however, often they do not have a control group, or follow up with participants to

determine if their intervention was successful. Further, although many of McKenzie-Mohr's examples of interventions were conducted like experiments, he often neglected to report effect sizes. The widespread reporting of the success and failures of different techniques could lead to improved efficacy over time, as advocates of behaviour change avoid implementing interventions which were previously ineffective. Due to the current state of our environment, we need to maximise the effectiveness of interventions for sustainable behaviour.

5.4 Conclusion

The research aim of explaining and promoting participation in edible gardening in Eastbourne, New Zealand was achieved by fulfilling my three objectives.

- The first objective, quantifying the behaviour, was met by creating and distributing to all Eastbourne households, the 2008 Eastbourne Edible Gardening Questionnaire, and analysing the responses. Results showed that 89% of respondents participated in edible gardening although the extent of their participation was limited. Only 0.2% of respondents grew food on greater than 40% of their residential property, whereas 81.8% grew food on less than 10% of their land.

- The second objective, predicting the behaviour in order to determine its barriers, was achieved by fitting the TPB model to the edible gardening data collected in the questionnaire. The TPB model fit the data well, showing it had good explanatory value. Results indicated that beliefs about having sufficient skills, knowledge, time, space and sun were the greatest barriers to edible gardening in Eastbourne.

- Finally, the third objective, providing recommendations for promoting the behaviour, was achieved by considering the CBSM framework. Certain CBSM tools,

such as effective communication and commitments, were recommended to lower the barriers to edible gardening in Eastbourne.

This study was the first to use psycho-social variables within a predictive model of participation in urban edible gardening. The use of a predictive model made it possible to simultaneously determine the relative influence, and magnitude of effect, of each variable on behaviour. Furthermore, the inclusion of psycho-social variables means that, not only did I measure the influence of external variables on behaviour, I measured the influence on behaviour of the cognitive effects of these external variables. Results from this original empirical study are similar to results from studies using other methods. This study found, as did previous studies, that perceived behavioural control factors are the biggest barriers to urban edible gardening indicating that these barriers may be generalisable.

The findings of this study are important because urban edible gardening has potential economic, social, environmental, resiliency and sustainability benefits. There have been calls to promote the uptake of urban edible gardening, and these thesis results can be used to maximise the effectiveness of promotional campaigns. The current global food system is under threat by peak oil, climate change, financial crisis and increased urbanisation. However, urban edible gardening has the potential to mitigate the effects of these threats.

Appendix A: Explanation and examples of direct measures of TPB constructs

TPB Construct	Explanation of measure Example of measure
Instrumental attitudes	Items which address people's beliefs that the behaviour achieves something.
	Taking public transport to work is beneficial/harmful.
Experiential attitudes	Items which address people's beliefs about how it feels to perform the behaviour.
	Taking public transport to work is enjoyable/unenjoyable.
Injunctive norms	Items which address people's beliefs about whether important others think they should perform the behaviour.
	People important to me think that I should/should not take public transport to work.
Descriptive norms	Items which address people's beliefs about whether important others themselves perform the behaviour.
	People important to me take/do not take public transport to work.
Perceived capability	Items which address people's beliefs that they are capable of performing the behaviour.
	Taking public transport to work is easy/difficult for me.
Perceived controllability	Items which address people's beliefs about whether performance of the behaviour is or is not up to them.
	Taking public transport to work is/is not my decision.
	There is a bus stop close enough to my house to allow me to take public transport to work.
	If I had a bus stop closer to my house, I would be less likely/more likely to take public transport to work.

Appendix B: Explanation and examples of indirect measures of TPB constructs

TPB Construct	**Explanation of question type 1**
	Explanation of question type 2
	Example question type 1
	Example question type 2
Attitudes	Beliefs about specific outcomes of the behaviour.
	Evaluations of these specific outcomes of the behaviour.
	Taking public transport to work saves me money.
	Saving money is important/unimportant to me.
Subjective Norms	Beliefs about specific social pressures to perform the behaviour.
	Motivation to comply with these specific social pressures.
	My friends think I should/should not take public transport to work.
	I care/do not care what my friends think about my mode of transport to work.
Perceived Behavioural Control	Beliefs about the presence or absence of factors which may facilitate or hinder performance of the behaviour.
	Evaluations of the importance or power of these factors to influence behaviour.

Appendix C: Ethics approval for focus groups

TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI
VICTORIA
UNIVERSITY OF WELLINGTON

MEMORANDUM

Phone 0-4-463 5676

Fax 0-4-463 5209

TO	Barbara Lake
COPY TO	Dr Michael Gavin, Supervisor
FROM	Dr Allison Kirkman, Convener, Human Ethics Committee

DATE	October 29, 2008
PAGES	1

SUBJECT	**Ethics Approval: No 16157, What are the barriers and triggers to home food production in Eastbourne, New Zealand**

Thank you for your application for ethical approval, which has now been considered by the Standing Committee of the Human Ethics Committee.

Your application has been approved from the above date and this approval continues until 7 July 2009. If your data collection is not completed by this date you should apply to the Human Ethics Committee for an extension to this approval.

Best wishes with the research.

Allison Kirkman
Convener

Appendix D: Questionnaire

Note: Questions 1-66 were not numbered in the version of the questionnaire delivered to Eastbourne households. Numbers were added for this Appendix so that questions could be identified by number in the figures and text of the thesis.

TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI

VICTORIA
UNIVERSITY OF WELLINGTON

EASTBOURNE
EDIBLE GARDENING
QUESTIONNAIRE
2008

Please answer all questions and then return your completed questionnaire in the enclosed pre-paid envelope.

THANK YOU FOR YOUR TIME!

Please answer each of the questions below as they apply to you in regards to edible gardening. For the purpose of this survey, edible gardening means **growing** your own **fruit, vegetables, and/or herbs** on the land belonging to the Eastbourne house, apartment or dwelling in which you live. If you do not have land associated with your residential property in Eastbourne, you can answer for growing your own fruit, vegetables and/or herbs in pots on a deck, or on a window sill.

Part 1: The process of edible gardening

Please indicate the extent to which you *agree* or *disagree* with each statement about the process of edible gardening.

1 Strongly disagree	2 Disagree	3 Somewhat disagree	4 Unsure/ neutral	5 Somewhat agree	6 Agree	7 Strongly agree

1. I don't have the time to grow fruit/vegetables/herbs.	1 2 3 4 5 6 7
2. I have the practical knowledge and skills to grow fruit/vegetables/herbs.	1 2 3 4 5 6 7
3. It is too windy in my residential property to grow fruit/vegetables/herbs.	1 2 3 4 5 6 7
4. I have the space to grow fruit/vegetables/herbs.	1 2 3 4 5 6 7
5. My physical ability makes it difficult for me to grow fruit/vegetables/herbs.	1 2 3 4 5 6 7
6. It is my decision whether I grow fruit/vegetables/herbs on my residential property.	1 2 3 4 5 6 7
7. In order to grow fruit/vegetables/herbs on my residential property, I would need to chop down existing trees.	1 2 3 4 5 6 7
8. Picking or harvesting fruit/vegetables/herbs is enjoyable.	1 2 3 4 5 6 7
9. I know how to preserve fruit/vegetables/herbs.	1 2 3 4 5 6 7
10. I have poor soil quality on my residential property.	1 2 3 4 5 6 7
11. It is difficult to access knowledgeable staff in garden centres for good advice.	1 2 3 4 5 6 7
12. It is expected of me that I grow fruit/vegetables/herbs.	1 2 3 4 5 6 7
13. It is important to have the skills to be able to grow fruit/vegetables/herbs.	1 2 3 4 5 6 7
14. I have enough sun on my residential property to grow fruit/vegetables/herbs.	1 2 3 4 5 6 7
15. I am confident that I could grow fruit/vegetables/herbs if I wanted.	1 2 3 4 5 6 7
16. I don't have access to food growing gardeners for support and encouragement	1 2 3 4 5 6 7
17. A drawback of growing fruit/vegetables/herbs is dealing with the excess when these food items are ripe.	1 2 3 4 5 6 7

18. I lack practical experience at growing fruit/vegetables/herbs.	1 2 3 4 5 6 7
19. I am sceptical that I can grow enough fruit/vegetables/herbs to make it worth my time.	1 2 3 4 5 6 7
20. Having a lawn is preferable to growing fruit/vegetables/herbs.	1 2 3 4 5 6 7
21. I feel the amount of work necessary to grow fruit/vegetables/herbs is overwhelming.	1 2 3 4 5 6 7
22. I know how to grow fruit/vegetables/herbs.	1 2 3 4 5 6 7
23. In order to grow fruit/vegetables/herbs, I would need to terrace the land.	1 2 3 4 5 6 7
24. For me growing fruit/vegetables/herbs is not a priority.	1 2 3 4 5 6 7
25. I feel under social pressure to grow fruit/vegetables/herbs.	1 2 3 4 5 6 7
26. Growing flowers is preferable to growing fruit/vegetables/herbs.	1 2 3 4 5 6 7
27. Growing native bush plants is preferable to growing fruit/vegetables/herbs.	1 2 3 4 5 6 7
28. In 2008, I intended to grow fruit/vegetables/herbs.	1 2 3 4 5 6 7
29. I intend to grow fruit/vegetables/herbs in 2009.	1 2 3 4 5 6 7
30. I don't know what types of fruit/vegetables/herbs are good to grow on my residential property.	1 2 3 4 5 6 7

Part 2: The outcomes of edible gardening

Please indicate the extent to which you *agree or disagree* with each outcome statement listed below. If you already grow fruit, vegetables and/or herbs, answer in regards to the outcomes you experienced this year.

1 Strongly disagree	2 Disagree	3 Somewhat disagree	4 Unsure / neutral	5 Somewhat agree	6 Agree	7 Strongly agree

31. Growing my own fruit/vegetables/herbs would reduce the profit of commercial growers.	1 2 3 4 5 6 7
32. Growing my own vegetables/herbs would be better for the environment.	1 2 3 4 5 6 7
33. I would enjoy sharing the fruit/vegetables/herbs I grew with others.	1 2 3 4 5 6 7
34. My homegrown fruit/vegetables/herbs would taste better than those bought at the store.	1 2 3 4 5 6 7
35. Growing my own fruit/vegetables/herbs would help fight climate change.	1 2 3 4 5 6 7
36. I would save money by growing my own fruit/vegetables/herbs.	1 2 3 4 5 6 7
37. Growing my own fruit/vegetables/herbs would provide food security in case of a civil emergency.	1 2 3 4 5 6 7
38. Growing my own fruit/vegetables/herbs would give me a greater sense of wellbeing.	1 2 3 4 5 6 7

39. Growing my own fruit/vegetables/herbs would attract unwanted pests to my garden.	1	2	3	4	5	6	7	
40. My homegrown fruit/vegetables/herbs would be fresher than those bought at the store.	1	2	3	4	5	6	7	
41. My homegrown fruit/vegetables/herbs would be safer to eat than those bought at the store.	1	2	3	4	5	6	7	
42. Growing my own fruit/vegetables/herbs would help me bond with family and friends.	1	2	3	4	5	6	7	

Part 3: Complete the statement about edible gardening

Please circle a number on the scale provided after each statement, to express your choice.

43. For me, growing my own fruit/vegetables/herbs is (or would be) _____.	unenjoyable	1	2	3	4	5	6	7 enjoyable
44. For me, growing my own fruit/vegetables/herbs is (or would be) _____.	easy	1	2	3	4	5	6	7 difficult
45. Of the people who are important to me, _____ grow fruit/vegetables/herbs on their residential properties.	none	1	2	3	4	5	6	7 all
46. In 2009, I am _____ to grow fruit/vegetables/herbs.	very unlikely	1	2	3	4	5	6	7 very likely
47. In my opinion, growing my own fruit/vegetables/herbs is (or would be) _____.	valuable	1	2	3	4	5	6	7 worthless
48. Most people who are important to me _____ grow fruit/vegetables/herbs on my residential property.	think that I should not	1	2	3	4	5	6	7 think that I should
49. I feel that it is_____ to grow fruit/vegetables/herbs on my residential property.	possible	1	2	3	4	5	6	7 impossible
50. For me, growing fruit/vegetables/herbs is (or would be) _____.	beneficial	1	2	3	4	5	6	7 harmful
51. In my opinion, growing my own fruit/vegetables/herbs is (or would be) _____.	bad	1	2	3	4	5	6	7 good
52. I grew up in a family that grew _____ of the fruit/vegetables/herbs that we ate.	all	1	2	3	4	5	6	7 none
53. If it were less windy in my residential property, I would be _____ to grow fruit/vegetables/herbs.	less likely	1	2	3	4	5	6	7 more likely

54. I believe that my help in fighting climate change is _____.	unimportant	1 2 3 4 5 6 7	important
55. For me, eating fresh fruit/vegetables/herbs is _____.	unimportant	1 2 3 4 5 6 7	important
56. If I was more physically able, I would be _____ to grow fruit/vegetables/herbs.	less likely	1 2 3 4 5 6 7	more likely
57. If I had more sun on my residential property, I would be _____ to grow fruit/vegetables/herbs.	less likely	1 2 3 4 5 6 7	more likely
58. In my opinion, maintaining the profit of commercial growers of fruit/vegetables/herbs is _____.	unimportant	1 2 3 4 5 6 7	important
59. For me, saving money on fruit/vegetables/herbs is _____.	unimportant	1 2 3 4 5 6 7	important
60. If it were easier to access knowledgeable staff in garden centres, I would be _____ to grow fruit/vegetables/herbs.	less likely	1 2 3 4 5 6 7	more likely
61. If I knew more about types of fruit/vegetables/herbs that are good to grow on my residential property, I would be _____ to do so.	less likely	1 2 3 4 5 6 7	more likely
62. If I had better soil quality on my residential property, I would be _____ to grow fruit/vegetables/herbs.	less likely	1 2 3 4 5 6 7	more likely
63. If I had more available time, I would be _____ to grow fruit/vegetables/herbs.	less likely	1 2 3 4 5 6 7	more likely
64. If I knew more about how to preserve fruit/vegetables/herbs, I would be _____ to grow them.	less likely	1 2 3 4 5 6 7	more likely
65. For me, eating safe fruit/vegetables/herbs is _____.	unimportant	1 2 3 4 5 6 7	important
66. For me, helping the environment is _____.	undesirable	1 2 3 4 5 6 7	desirable

Part 4: Questions about your garden

Please answer each question by ticking the box that applies or by filling in the blank.

4.1. Did you grow any of the following in your residential property in Eastbourne in 2008? Please tick (√) all that apply.

☐ fruit ☐ vegetables ☐ herbs ☐ none

4.2. What percentage of your residential property had fruit/vegetables/herbs growing on it in 2008?

☐ 0% ☐ 1-10% ☐ 11-20% ☐ 21-30% ☐ 31-40% ☐ >40%

4.3. What percentage of the fruit that you ate in 2008 did you grow on your residential property in Eastbourne?

□ 0% □ 1-15% □ 16-30% □ 31-45% □ 46-60% □ >60%

4.4. What percentage of the vegetables that you ate in 2008 did you grow on your residential property in Eastbourne?

□ 0% □ 1-15% □ 16-30% □ 31-45% □ 46-60% □ >60%

4.5. What percentage of the herbs that you ate in 2008 did you grow on your residential property in Eastbourne?

□ 0% □ 1-15% □ 16-30% □ 31-45% □ 46-60% □ >60%

4.6. Which of the following best describes your intention and behaviour in 2008?

□ I intended to grow fruit/vegetables/herbs and did.
□ I intended to grow fruit/vegetables/herbs but did not.
□ I did not intend to grow fruit/vegetables/herbs but did.
□ I did not intend to grow fruit/vegetables/herbs and did not.

Part 5. General questions about environmental issues

Listed below are statements about the **relationship between humans and the environment**. Please indicate the extent to which you *agree* or *disagree* with each of the following statements.

1 Strongly disagree	2 Disagree	3 Somewhat disagree	4 Unsure/ neutral	5 Somewhat agree	6 Agree	7 Strongly agree

I really like going on trips into the countryside, for example to forests or fields.	1 2 3 4 5 6 7
I do not believe humans were created or evolved to dominate the rest of nature.	1 2 3 4 5 6 7
Protecting the environment is more important than protecting people's jobs.	1 2 3 4 5 6 7
Whenever possible, I try to save natural resources.	1 2 3 4 5 6 7
We need to keep rivers and lakes clean in order to protect the environment, and not as places for people to enjoy water sports.	1 2 3 4 5 6 7
I think spending time in nature is boring.	1 2 3 4 5 6 7
I do not believe that the environment has been severely abused by humans.	1 2 3 4 5 6 7
I'd much prefer a garden that is well groomed and ordered to a wild and natural one.	1 2 3 4 5 6 7
Modern science will solve our environmental problems.	1 2 3 4 5 6 7
One of the most important reasons to keep lakes and rivers clean is so that people have a place to enjoy water sports.	1 2 3 4 5 6 7

Protecting people's jobs is more important than protecting the environment.	1 2 3 4 5 6 7
Humans are severely abusing the environment.	1 2 3 4 5 6 7
Governments should control the rate at which raw materials are used to ensure that they last as long as possible.	1 2 3 4 5 6 7
Modern science will not be able to solve our environmental problems.	1 2 3 4 5 6 7
I would like to join and actively participate in an environmental group.	1 2 3 4 5 6 7
A couple should have as many children as they wish, as long as they can adequately provide for them.	1 2 3 4 5 6 7
It makes me sad to see forests cleared for agriculture.	1 2 3 4 5 6 7
I would not get involved in an environmental organisation.	1 2 3 4 5 6 7
Human beings were created or evolved to dominate the rest of nature.	1 2 3 4 5 6 7
I am not the kind of person who makes efforts to conserve natural resources.	1 2 3 4 5 6 7
I am opposed to governments controlling and regulating the way raw materials are used in order to try and make them last longer.	1 2 3 4 5 6 7
Families should be encouraged to limit themselves to two children or fewer.	1 2 3 4 5 6 7
I'd prefer a garden that is wild and natural to a well groomed and ordered one.	1 2 3 4 5 6 7
It does not make me sad to see natural environments destroyed.	1 2 3 4 5 6 7

Part 6: Demographic questions

6.1. How long have you lived at your current address?

_____ number of years

6.2. Do you intend to live at this address in 2009?

- ☐ yes
- ☐ no

6.3. Do you rent or own your place of residence?

- ☐ own
- ☐ rent
- ☐ other

6.4. Does your household have exclusive use of the garden?

- ☐ yes
- ☐ no

6.5. What is the size of your outdoor area, including your lawn (as a percentage of your total property size)?

_____ percent outdoor area

6.6. What size is your lawn only (as a percentage of total property size)?

_____ percent lawn

6.7. Including you, how many people live in your household?

_____ number of people

6.8. Of the people in your household, how many are under the age of 18?

_____ number under 18

6.9. What kind of dwelling is your place of residence?

- ☐ house
- ☐ apartment with a deck/balcony
- ☐ apartment without a deck/balcony
- ☐ other, please state_____

6.10. What bay do you live in, or closest to?

- ☐ Point Howard
- ☐ Lowry Bay
- ☐ York Bay
- ☐ Mahina Bay or Sunshine Bay
- ☐ Days Bay
- ☐ Rona Bay/Eastbourne

6.11. Were you taught as a child how to grow fruit, vegetables, and/or herbs?

- ☐ yes
- ☐ no

6.12. Do you compost your food waste?

- ☐ yes
- ☐ no

6.13. What is your gender?

- ☐ female
- ☐ male

6.14. How old are you?

- ☐ 18-25
- ☐ 26-35
- ☐ 36-45
- ☐ 46-55
- ☐ 56-65
- ☐ 66-75
- ☐ >76%

6.15. Were you born in New Zealand?

- ☐ yes
- ☐ no

6.16. Throughout your life, how many years have you lived in New Zealand?

_____ years

6.17. What ethnic group do you belong to?

- ☐ New Zealand European
- ☐ New Zealand Māori
- ☐ Other, please state _____

(optional)

THANK YOU!

Appendix E: Ethics approval for questionnaire


Delete Reply Forward Spam Move...

RE: Babs Lake' survey

Monday, December 8, 2008 11:34 AM

From: "Richard Willis" <Richard.Willis@vuw.ac.nz>

To: "Babs Lake" <babslakeb@yahoo.com>

8 December, 2008

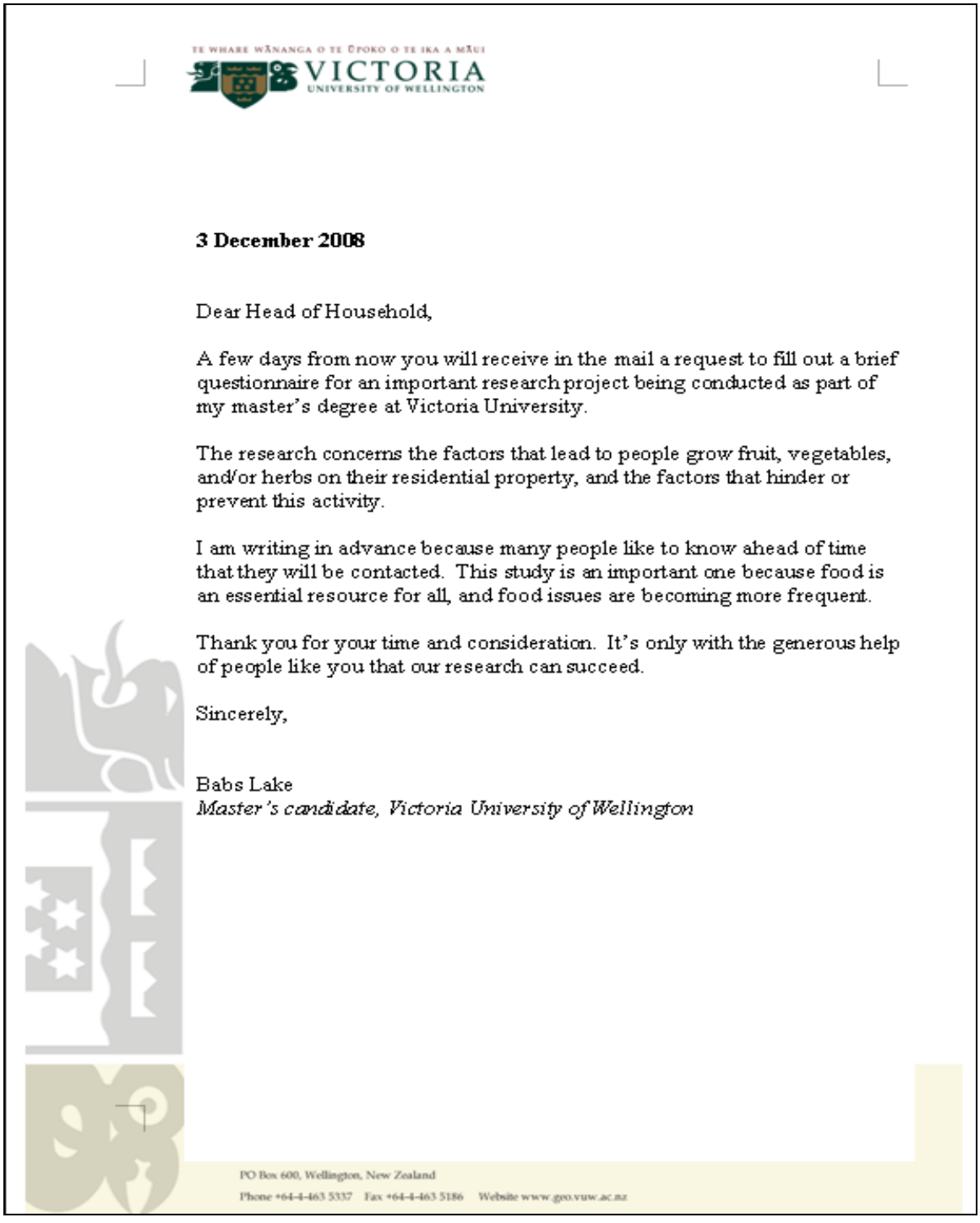
I have read Barbara Lake's questionnaire and entitled Eastbourne Edible Gardening Questionnaire 2008," as well as the participant information sheet and accept that they meet the criteria of stated in the Victoria University of Wellington's Human Ethics Policy section 4.7(b), Therefore I approve of it's distribution.

Sincerely,

Richard Willis

Deputy HOS

Appendix F: Questionnaire pre-notice letter



TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI
VICTORIA
UNIVERSITY OF WELLINGTON

3 December 2008

Dear Head of Household,

A few days from now you will receive in the mail a request to fill out a brief questionnaire for an important research project being conducted as part of my master's degree at Victoria University.

The research concerns the factors that lead to people grow fruit, vegetables, and/or herbs on their residential property, and the factors that hinder or prevent this activity.

I am writing in advance because many people like to know ahead of time that they will be contacted. This study is an important one because food is an essential resource for all, and food issues are becoming more frequent.

Thank you for your time and consideration. It's only with the generous help of people like you that our research can succeed.

Sincerely,

Babs Lake
Master's candidate, Victoria University of Wellington

PO Box 600, Wellington, New Zealand
Phone +64-4-463 5337 Fax +64-4-463 5186 Website www.geo.vuw.ac.nz

Appendix G: Model fit criteria for latent constructs in SEM of intention to participate in edible gardening

Construct	χ^2	df	χ^2/df	RMSEA (90%C.I.)	SRMR	CFI
Global attitude	18.66	2	9.33	0.11 (0.071-.016)	0.025	0.98
Global norm	27.00	2	13.5	0.14 (0.098-0.19)	0.058	0.75
Global PBC	17.11	2	8.56	0.11 (0.066-0.16)	0.038	0.96
(indirect measure) Attitude	125.78	9	62.89	0.14 (0.12-0.17)	0.056	0.89
(indirect measure) PBC	68.83	20	3.44	0.064 (0.048-0.081)	0.033	0.98
Intention	Just indentified	-	-	-	-	-

Appendix H: Advertisement for edible gardening course

Transition Towns Lower Hutt invites you to...

Gardening: Yes you can!

A practical workshop series

This series of 5 workshops will take you through the basic steps you need to design, build and plant a home food garden, and you'll be involved in creating a community garden space behind the Transition Centre

November 3, 7, 10, 14, 17
Transition Centre
51 Victoria St, Alicetown
Cost: $35 for 5 sessions
To register email transitionskills@gmail.com or ph 938 1306
Limited to 20 spaces—get in quick!

Course outline:

Introduction, overview of organic gardening & permaculture:
7.30–9.30pm Tues 3 November

Design your garden: sun, water, layout, materials:
9.30– 12.30pm Sat 7 November

Overview of building materials and options, select design:
7.30– 9.30pm Tues 10 November

Practical building session:
9.30-12.30pm Sat 14 November

Fill beds and plant seedlings, composting, celebration!
7.30– 9.30pm Tues 17 November

TRANSITION AOTEAROA

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