



Factors Influencing Peri-urban Residents' Decisions to Adopt Gardening
Innovations, Hat Yai District, Thailand

Troy Santos

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of
Master of Science in Agricultural Development

Prince of Songkla University

2017

Copyright of Prince of Songkla University



Factors Influencing Peri-urban Residents' Decisions to Adopt Gardening
Innovations, Hat Yai District, Thailand

Troy Santos

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of
Master of Science in Agricultural Development

Prince of Songkla University

2017

Copyright of Prince of Songkla University

Thesis Title Factors Influencing Peri-urban Residents' Decisions to Adopt Gardening Innovations, Hat Yai District, Thailand

Author Mr. Troy Santos

Major Program Agricultural Development

Major Advisor

.....
(Assoc. Prof. Dr. Somyot Thungwa)

Co-advisor

.....
(Dr. Kobchai Worrapiumphong)

Examining Committee:

.....Chairperson
(Prof. Dr. Buncha Somboonsuke)

.....Committee
(Assoc. Prof. Dr. Somyot Thungwa)

.....Committee
(Dr. Kobchai Worrapiumphong)

.....Committee
(Dr. Cherdsak Kuaraksa)

The Graduate School, Prince of Songkla University, has approved this thesis as partial fulfillment of the requirements for the Master of Science Degree in Agricultural Development

.....
(Assoc. Prof. Dr. Damrongsak Faroongsarng)

Dean of Graduate School

This is to certify that the work here submitted is the result of the candidate's own investigations. Due acknowledgement has been made of any assistance received.

.....Signature

(Assoc. Prof. Dr. Somyot Thungwa)

Major Advisor

.....Signature

(Mr. Troy Santos)

Candidate

I hereby certify that this work has not been accepted in substance for any degree, and is not being currently submitted in candidature for any degree.

.....Signature

(Mr. Troy Santos)

Candidate

Thesis Title	Factors influencing peri-urban residents' decisions to adopt gardening innovations, Hat Yai District, Thailand
Author	Mr. Troy Santos
Major Program	Agricultural Development
Academic Year	2017

ABSTRACT

Pressing and urgent environmental and social issues have taken on prominence in recent years. Thus, many individuals and organizations seek ways to alleviate these issues. One such way is through urban agriculture, which has been advocated as benefiting individuals, society, and the natural environment. Though some proponents' claims are hotly disputed, the potential for these benefits remains. This research comprised 2 objectives. The first was to investigate the current situation of urban agriculture in Hat Yai, Thailand's third largest urban area. Data was collected through a focus group and a questionnaire, with the local urban agriculture group for both tools. Content analysis and descriptive analysis were used to examine the data. Results indicate that the majority of urban gardeners are 46-75 years old, female, making less than the provincial household average. Due to lack of land for gardening, they predominantly grow in pots and other containers in front of their homes. Their major motivations for gardening, were to improve their health and to save money. The second objective was to determine various factors influencing residents to adopt or reject gardening innovations. It was reasoned that obstacles to adoption of urban gardening could be mitigated by adoption of one or more of the innovations that were introduced in the research. Answering the second objective made up the major portion of the research, where several new methods were introduced that participants were asked to try, then decide to adopt or reject. A questionnaire, in-depth interviews, and

observations by the researcher were the main data collection tools. Content analysis was used to examine these data. Everett Rogers' *Diffusion of Innovations* formed the theoretical foundation. Three sets of factors set forth in the book, namely attributes of innovations, characteristics of adopters, and contact with the change agent, along with aforementioned obstacles constituted the basis for examining the influential factors in participants' decisions to adopt or reject. In addition to these factors, other limitations were examined, including know-how, and space and time available for gardening. Intrinsic and extrinsic motivations were also investigated for their roles underlying participants' decisions. Attributes of the innovations and contact with the researcher were influential among both adopters and non-adopters, however, motivation was determined to have the most influence. Additionally, an unwillingness to further complicate urban life, and a misunderstanding of the methods and their design flexibility hindered adoption.

ACKNOWLEDGEMENTS

I sincerely thank everyone who helped with this research, starting, of course, with my main advisor, who helped tremendously with every aspect of research design, offered important advice along the way, and introduced the author to the local urban agriculture group. I am grateful to my co-advisor for the numerous times he was ready with invaluable advice, the help he offered with various aspects of the research, and his frequent priceless encouragement during the many challenging times.

A heartfelt thank you goes to every one of the participants for their valuable time and energy, their enthusiasm, their input that made up the major content of the research results, and for putting up with my difficult questions, and for some, too-frequent visits, phone calls, and social media contact.

The research was greatly helped along by the work of the directors of the Songkhla Community Foundation, which is the organization that oversees the activities of the Hat Yai urban agriculture group. Their tireless efforts are instrumental in making the group the expanding success that it has become.

I genuinely thank and respect the leaders of the group and the members of the group for agreeing to interviews, and for their energy and enthusiasm to growing vegetables and growing the group. The same genuine appreciation and respect is due the personnel at the Hat Yai Municipal Office for the interviews, and for their commitment to the people of Hat Yai.

Troy Santos

CONTENTS

	Page
ABSTRACT	v
ACKNOWLEDGEMENTS	vii
CONTENTS	viii
LIST OF TABLES	xi
LIST OF FIGURES	xii
CHAPTER I Introduction	1
1.1 Research Background	1
1.1.1 Environmental and social repercussions of urbanization	1
1.1.2 Cities of the future	1
1.1.3 UA is heavily promoted for its various benefits	2
1.1.4 Some negative aspects of UA	3
1.2 Objectives	3
1.3 Expected benefits of this research	4
1.4 Scope of the research	5
1.5 Definitions	5
CHAPTER II Literature Review	7
2.1 Theory of Diffusion of Innovations	7
2.2 A definition of urban agriculture	11
2.3 Urban agriculture around the world, past to present	11
2.4 History of UA in Thailand	12
2.4.1 Urban gardening in contemporary Thailand	13
2.4.2 Urban gardening in Hat Yai	14
2.5 Positive and negative impacts of UA, and skepticism of the benefits	16
2.5.1 Health impacts	17

CONTENTS (CONT)

	Page
2.5.2 Social impacts	20
2.5.3 Economic impacts	21
2.5.4 Environmental impacts	22
2.5.5 Summary of impacts	28
2.6 Literature regarding gardening methods introduced in this research	29
2.6.1 Wicking boxes	30
2.6.2 Hugelkultur beds	31
2.6.3 Sheet mulch beds	34
2.7 Case studies	36
2.7.1 Social marketing	36
2.7.2 Health	37
2.7.3 Agriculture	39
CHAPTER III Methodology	40
3.1 Study of current situation of UA in Hat Yai	41
3.1.1 Sampling methods for study site and sample group	41
3.1.2 Hat Yai, Southern Thailand	42
3.1.3 Data collection tools	44
3.1.4 Data analysis	44
3.2 Study of factors influencing adoption/rejection of gardening innovations	45
3.2.1 Gardening methods	45
3.2.1.1 Wicking boxes	45
3.2.1.2 Hugelkultur Beds	46
3.2.1.3 Sheet Mulch Beds	48
3.2.1.4 Two alternative methods	49

CONTENTS (CONT)

	Page
3.2.2 Meeting the Hat Yai UA group	50
3.2.3 Sampling methods for study site and sample group	50
3.2.4 Khlong Toei Community	52
3.2.5 Data collection tools	53
3.2.6 Data analysis	54
3.2.7 Garden size	55
CHAPTER IV Results and Discussion	56
4.1 Urban agriculture in Hat Yai	56
4.1.1 Hat Yai's UA group	56
4.1.2 The current situation	57
4.1.2.1 Support for UA in Hat Yai	57
4.1.2.2 The focus group	58
4.1.2.3 The questionnaire: Basic data on Hat Yai District gardeners	60
4.1.3 Future of UA in Hat Yai	68
4.2 Factors influencing adoption or rejection of the gardening innovations	69
4.2.1 Obstacles to UA in Hat Yai	69
4.2.1.1 More commonly cited limiting factors	70
4.2.1.2 Less commonly cited limiting factors	72
4.2.1.3 Motivation	74
4.2.2 Factors affecting adoption or rejection of the gardening methods	76
4.2.2.1 Participants' backgrounds	77
4.2.2.2 Participants' innovation-decision processes	85
4.2.2.3 Relation between background and innovation-decision process	92

CONTENTS (CONT)

	Page
4.2.3 Attributes of the innovations and participants' attitudes of them	94
4.2.3.1 Motivation in the context of attributes of the innovations	100
4.2.4 Innovativeness and adopter categories	100
4.2.4.1 Characteristics of adopter categories	101
4.2.4.2 Identification of appropriate category for adopters	104
4.2.5 The change agent	107
4.2.6 Summary of factors influencing adoption/rejection of the methods	109
4.2.6.1 The more and less common limiting factors	110
4.2.6.2 Attributes of the innovations	110
4.2.6.3 Innovativeness and adopter categories	111
4.2.6.4 Adopter categories	111
4.2.6.5 The researcher	111
4.2.6.6 Motivation	111
CHAPTER V Conclusions	112
5.1 The current situation of urban agriculture in Hat Yai District	112
5.2 Synthesis of factors influencing adoption or rejection of methods	113
5.2.1 Misunderstanding the methods	113
5.2.2 Unwillingness to further complicate life	114
5.2.3 Factors influencing adoption or rejection of the gardening methods	114
5.2.3.1 Perceptions	114
5.2.3.2 Attributes of the wicking box	115
5.2.3.3 Contact with the researcher	117
5.2.3.4 Intrinsic motivation	118
5.2.3.5 This researcher's short-comings	119

CONTENTS (CONT)

	Page
5.2.3.6 Summary of research results	119
5.3 This research's contribution to the research community	121
5.4 Use of this research's results for expanding UA in Hat Yai	123
5.5 Suggested model for future research	124
References	127
Appendices	137
Appendix A: Hat Yai District population data, 2006 to 2015	138
Appendix B: Conceptual framework for second objective	139
Appendix C: Questionnaire for UA group	140
Appendix D: In-depth, semi-structured interview questions for key informants	143
Appendix E: Land use map from the Royal Thai Survey Department, 2012	146
Appendix F: Questionnaire for participants	147
Appendix G: In-depth, semi-structured interview questions for participants	148
Appendix H: Scope of observations	151
Appendix I: Names of plants grown by participants	152
Appendix J: Researcher's published manuscript	154
VITAE	168

LIST OF TABLES

	Page
Table 2.1 Development timeline of Hat Yai's UA group	15
Table 2.2 Two of Muang Klaeng's mitigation measures and projected benefits	27
Table 3.1 Methodology	41
Table 4.1 Focus group framework and results	59
Table 4.2 Respondents' basic personal data	62
Table 4.3 Data on the gardens and activities in the gardens	65
Table 4.4 Weekly number of meals and gardening hours	67
Table 4.5 Respondents' problems/obstacles doing UA	68
Table 4.6 Higher and lower income breakdown of adopters and non-adopters	103
Table 4.7 Adopter categories	106
Table 5.1 Relative influence of each factor, on adopters and non-adopters	120

LIST OF FIGURES

	Page
Figure 1.1 Onions on windowsill	2
Figure 1.2 Hanging plastic water bottle garden	2
Figure 2.1 The 4 components of diffusion of innovations	8
Figure 2.2 Rogers' 5 stages of the innovation-decision process	9
Figure 2.3 Attributes of innovations	10
Figure 2.4 Lak Si District Office rooftop garden	14
Figure 2.5 Two main pathways that UA can improve food security	19
Figure 2.6 UN estimate of Thailand's urban and total population, 1950 to 2050	23
Figure 2.7 Evapotranspiration and shading on a building with a green roof	24
Figure 2.8 Very common wicking box style	30
Figure 2.9 Cross section of a hugelkultur bed	32
Figure 2.10 Tall and steep hugelkultur beds create various micro-climates	33
Figure 2.11 Cross section of a sheet mulch bed	35
Figure 3.1 Geographical location of Hat Yai District study area	43
Figure 3.2 One of the researcher's wicking boxes	46
Figure 3.3 Internal composition of the hugelkultur bed	47
Figure 3.4 The researcher's first hugelkultur bed, immediately after construction	47
Figure 3.5 The researcher's first sheet mulch bed	49
Figure 3.6 A simple bottle garden design	50
Figure 3.7 Buffet bed with a worm hotel	50
Figure 4.1 Focus group	60
Figure 4.2 Training at a group member's home	71
Figure 4.3 This garden juts out into the street	72
Figure 4.4 Nit's morning glory plants	89

LIST OF FIGURES (CONT)

	Page
Figure 4.5 Phairin and Jane's wicking boxes with bok choy	92
Figure 5.1 Diagram of main factors involved in innovation-decision process	122
Figure 5.2 Model for future research	126

CHAPTER I

Introduction

1.1 Research Background

The potential benefits of urban residents growing a portion of their own food are numerous and substantial. Due to deteriorating environmental and social conditions, and worsening human health, it is vitally important that we find and promulgate ways to manifest these potential benefits on a wider scale. Urban agriculture (UA) holds promise for societies and the environment to become healthier, and for residents of cities to realize health and economic benefits.

1.1.1 Environmental and social repercussions of urbanization.

Urbanization is high on the list of humanity's challenges associated with rising populations. International organizations such as the United Nations, and governmental and non-governmental organizations around the world warn of increasing problems due to large numbers of people quickly migrating to urban areas (Parrish and Stockwell, 2015; Tacoli, 2012; World Health Organization, 2010; US Environmental Protection Agency, n.d.-a). In addition, affluence and technology, which are concentrated more in urban areas than in rural areas, also affect the quality and stability of the natural environment.

Some health indicators and conditions improve due to urban life, while others deteriorate because of it. On the whole, high density living negatively affects people's happiness and mental and physical health (Lederbogen, 2011), and with ever rising concentrations, the severity of negative effects will likely increase.

1.1.2 Cities of the future.

Since more and larger cities are the future, how should newer ones be designed and existing ones be redesigned for environmental and social sustainability? In part due to environmental, social and human health crises, UA has become a feature of a growing number of local, national, and international development agendas, and many experts perceive potential for it to contribute towards alleviating these crises (Mougeot,

2006; van Veenhuizen, 2006; Hamilton et al., 2013). Support for growing a portion of one's own food is lacking at all local and national levels, and with the general public, but acceptance is growing. And it is one element of projections of the future of cities.

Considering the plethora of do-it-yourself (DIY) technologies appropriate for very small-scale home gardeners, (Figs. 1.1 and 1.2), one can see that there has never been a time richer in innovations for urbanites to grow food for household consumption.



Figure 1.1 Onions on windowsill

Source:<http://i1.ytimg.com/vi/>

[Ym2QDdhU0EY/maxresdefault.jpg](http://i1.ytimg.com/vi/Ym2QDdhU0EY/maxresdefault.jpg)



Figure1.2 Hanging plastic water bottle garden

Source:<https://www.facebook.com/agriculture>

[mao/posts/891315497572711](https://www.facebook.com/agriculture)

1.1.3 UA is heavily promoted for its various benefits.

Many people's lives have improved through gardening at home, therefore it is reasonable to attempt to expand the practice to those who have not ever considered it, as well as to those who complain that it is impossible for them. Improved mental and physical health, financial savings, better relations among family members and among members of the community, and a cleaner neighborhood are among the positive aspects adherents have been pointing to for many years about growing their own food

(Smit, Nasr and Ratta, 2001; Mougeot, 2006). Having said that, it must be added that there is no consensus that urban gardeners are actually improving their health and financial situations; though it would seem obvious that these improvements are real, this is an ongoing debate.

1.1.4 Some negative aspects of UA.

Concomitant with the potential positive aspects of UA, there are no doubt negative aspects. Urban soils have been contaminated both directly and indirectly over the many decades since the industrial revolution. The soil has been subject to dumping of various toxic chemicals, and been polluted via water and air. Pollutants include heavy metals, organic pollutants, and pesticides. Exposure to these causes health problems to consumers of urban produce as well as to gardeners. Gardens are ideal habitat for mosquitoes and rats, which transmit debilitating and deadly diseases to humans. Lastly, though no reference has been found to support this assumption, logic would have it that rural farmers will suffer to the degree that UA becomes widespread.

The several research questions are aimed at promoting UA in Hat Yai. They are listed below, beginning with questions that form the basis for the first objective, followed by questions that form the basis for the second objective.

- What is the current general situation of UA in Hat Yai?
- What are residents' motivations for gardening?
- Are the proposed innovations appropriate for Hat Yai residents?

These are the foundation needed for answering the following questions.

- What factors influence adoption and rejection of urban agriculture?
- What factors will influence adoption and rejection of the introduced gardening methods?

1.2 Objectives

The ultimate objective of this research is to make a contribution to local environmental and social sustainability, via 2 research objectives.

1. To learn the current situation of UA in Hat Yai.
2. To determine the factors influencing adoption or rejection of selected gardening innovations.

1.3 Expected benefits of this research

The researcher expects that this research will be of benefit to some or all of the people who have had some part in this research. These include the participants themselves, the key informants, and the researcher himself. First, the participants could benefit from having participated in this research in one or more of the following ways.

- Participants may notice improved health and an/or an improved financial situation. But due to the small scale of these garden activities, it is not expected that there will be any substantial benefit in health or the household economy.

- It is possible that they will enjoy better relations with neighbors, and, enjoy a general betterment in quality of life.

- Of greater possibility than the first two, is that this research will reinforce already motivated participants to grow a portion of their own food, and generally take better care of their and their family's health.

This research contains content that is relevant for both the municipal office and the foundation overseeing the local UA group. To date there have been no studies performed to evaluate the effects of UA on any aspect of the lives of urban gardeners in Hat Yai District. Knowing what factors will lead to participants' decisions to start gardening can be useful during outreach efforts in order to increase the number of urban gardeners and gardening communities. It is possible that the municipal office and foundation overseeing the UA group will benefit in the following ways.

- They will gain a better understanding the local situation.
- They will be better able to formulate and implement strategies and measures to further promote and support UA in Hat Yai District.
- They will be more effective during outreach to urban residents who are not yet gardening.

In addition, this researcher expects to benefit from every step of this research.

- It is creating a foundation for this researcher's future in adoption/rejection and diffusion research.

1.4 Scope of the research

- *Content* of the study was an investigation of two research objectives. One was to collect and interpret data on the current situation of urban agriculture in Hat Yai District. The other was to examine the factors involved in the decisions to adopt or to reject urban gardening innovations of 10 Hat Yai District peri-urban residents. *Diffusion of Innovation Theory* guided data analysis, but care was taken to ensure that the data were not shaped to fit the theory.

- *Area* for the first objective was all of Hat Yai District, while the study area for the second objective was Khlong Toei Community, which is a peri-urban part of Hat Yai District.

- *Timeframe* The research commenced in May, 2014, when the researcher started making wicking boxes. Data collection continued into June, 2016.

- *Population* for the first objective was all urban gardeners of Hat Yai District. The population for the second objective was all residents of Khlong Toei Community who were not gardening when the research commenced.

1.5 Definitions

- **Adoption** is a decision to use an innovation for an indefinite period of time.
- **Garden** in this research was the place that participants grew vegetables, which was less than 1-square meter for some participants. Thus, the term as used in this research was very flexibly applied. There is no universally agreed upon delineation of what size constitutes a garden.

- **Heterophily** is the degree to which 2 or more individuals are dissimilar, with respect to particular attributes.

- **Hugelkultur** is a gardening method with rotted wood and other organic matter under soil, into which the gardener plants seeds and/or seedlings.

- **Innovation** refers to specific gardening methods that were introduced in this research.

- **Homophily** is the degree to which 2 or more individuals are similar, with respect to particular attributes.

- **Peri-urban areas** are areas that have more than 10,000 and fewer than 50,000 inhabitants, lying between an urban and a rural area, and with a less extensive, less complex infrastructure than urban areas.

- **Rejection** is a decision to not use an innovation for an indefinite period of time.

- **Sheet mulch bed** is a gardening method with layers of nitrogenous material alternated with layers of carbonaceous material, into which the gardener plants seeds and/or seedlings.

- **Urban areas** are areas with a population of 50,000 inhabitants or more, having extensive, complex infrastructure.

- **Urban agriculture** is agriculture in an urban or peri-urban setting.

- **Urban gardening** is synonymous with urban agriculture. The terms are used interchangeably in this thesis.

- **Wicking box gardening** is a closed gardening method with an internal water supply, upon which soil sits, “wicking” water up from moister to drier soil.

CHAPTER II

Literature Review

2.1 Theory of Diffusion of Innovations

Everett Rogers' explanation of how innovations are adopted forms the theoretical underpinning of this research. In his book, *Diffusion of Innovations* (2003), he broadly explained how and why innovations are adopted by individuals or organizations, then subsequently spread through small or large groups of people. The impetus for Rogers' book was the body of early diffusion of agricultural innovation studies carried out in rural USA starting in the 1930s.

The following factors are components of diffusion. *Innovations* are defined as objects (e.g. pocket calculators and home video tape equipment), ideas (e.g. the metric system and using seat belts), and practices (e.g. boiling water for health purposes, and teaching "modern math") that are new or old, and not yet adopted by a particular individual or group. *Communication channels* are the various ways that information about the innovations are introduced into the social system, and conveyed from person to person within the system. Mass media advertisements, sales pitches, friendly conversations are all examples of these many ways that people communicate regarding innovations. A *social system* is a group of people working together to solve a problem in order to accomplish a goal. Examples include female peasants in a Korean village and doctors in a hospital in the United States.

These members of the social system are classified into adopter categories according to their relative rate of adoption: innovators, early adopters, early majority, late majority, and laggards. *Time* is considered in 3 aspects: 1) the length of time that it takes for an individual or group to complete the process from initial contact with the innovation through to adoption or rejection 2) the relative speed at which the process is completed, as compared with other individuals or groups in the social system 3) the rate of adoption, in a given time period, of the innovation into the social system. Figure 2.1 displays the 4 components of the process of diffusion of innovations. It illustrates the 5 adopter

categories in a social system who are exposed to the innovation, all in the context of the classic normal distribution curve. It shows the relative proportions and characteristics of each adopter category. The innovation is the rectangular object on the curve. The people are the social system, divided into adopter categories. Time is illustrated as a continuum from left to right (innovators to laggards). Only communication channels are not well represented, in that only person to person contact is rendered.

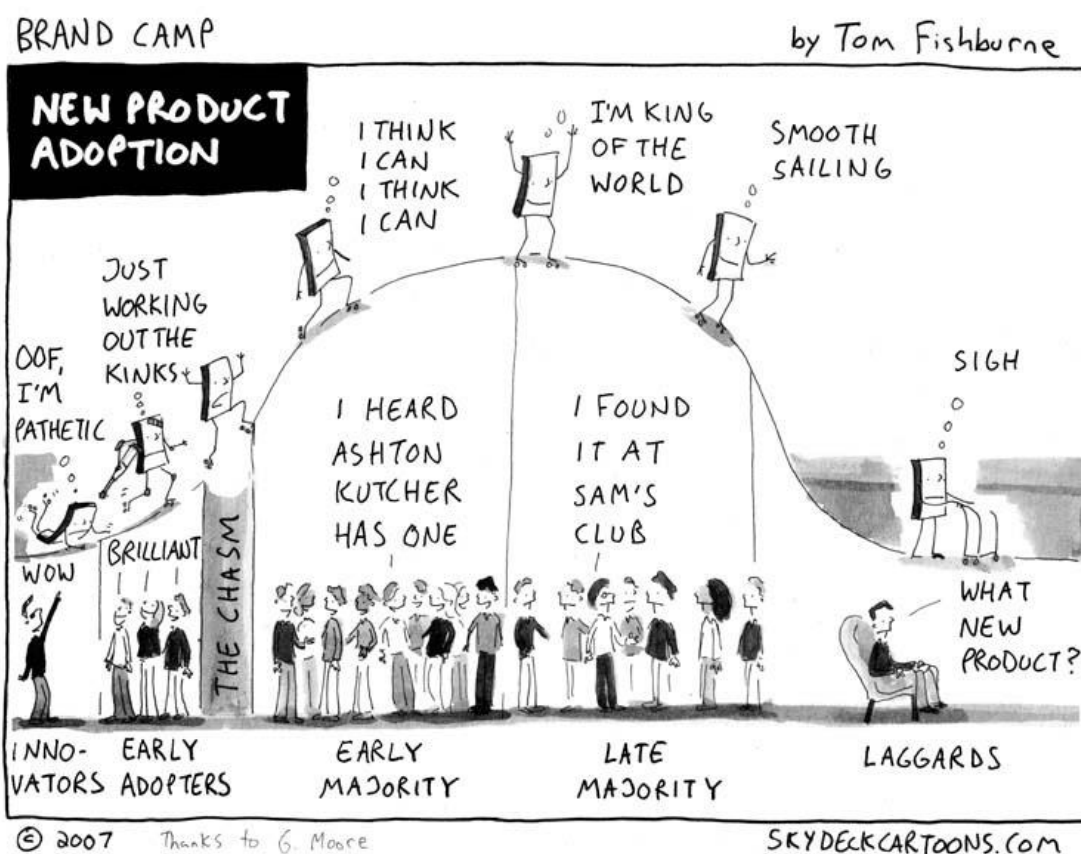


Figure 2.1 The 4 components of diffusion of innovations

Source: <https://marketoonist.com/2007/02/new-product-adoption.html>

Rogers identified 5 stages of the innovation-decision process beginning with initial exposure to the innovation and ends in a long-term decision to adopt or reject it (Fig. 2.2).

- *The knowledge stage* is when exposure to the innovation is gained along with some understanding of how it functions.

- The *persuasion* stage is when a favorable or unfavorable attitude toward the innovation is formed.
- The *decision* stage is when activities are engaged in that lead to a decision to adopt or reject the innovation.
- The *implementation* stage is when the innovation is put into use.
- The *confirmation* stage is when reinforcement is sought for an innovation – decision that has already been made.

A Model of Five Stages in the Innovation-Decision Process

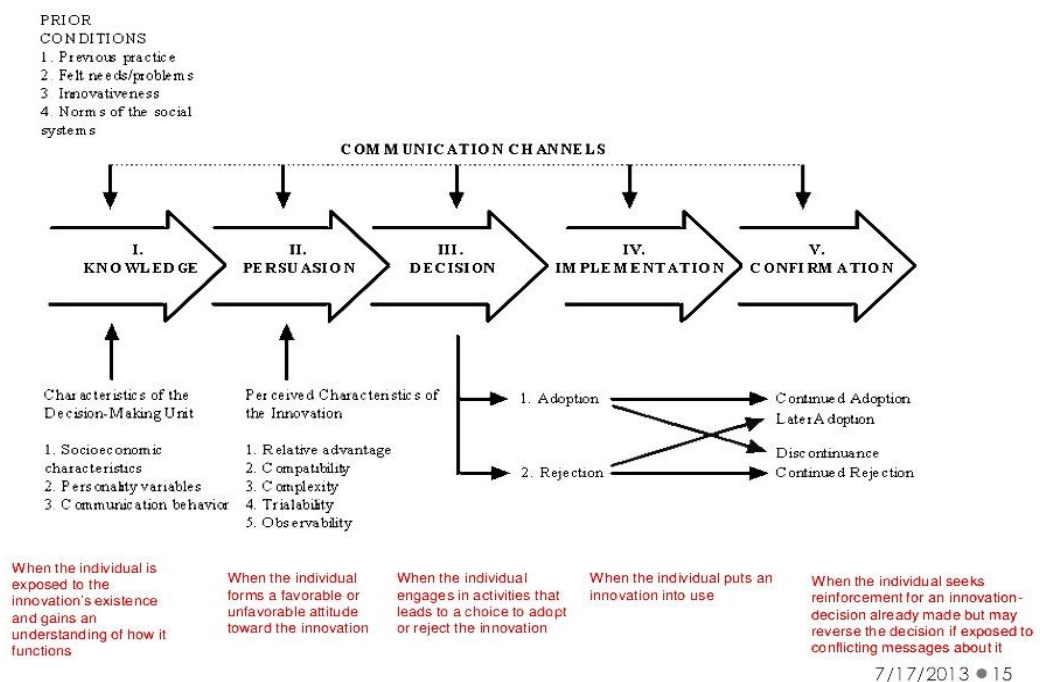


Figure 2.2 Rogers' 5 stages of the innovation-decision process.

Source: <https://www.slideshare.net/sandhyajohnson/innovation-diffusion-everett-rogers/15>

Of particular importance to this research are the delineations of the 5 characteristics of innovations that play a role in determining whether they are adopted or rejected (Fig. 2.3). They are (1) the *relative advantage* of adopting the innovation compared with using what already exists (2) the innovation's *compatibility* with the lifestyle or culture of the person or group contemplating the innovation (3) the innovation's

perceived *complexity* (i.e. ease or difficulty of use) (4) the innovation's *trialability* (the ease or difficulty of testing it) (5) the *observability* of the benefits of using the innovation. The arrows in the figure illustrate the interrelatedness between relative advantage and the other 4 attributes.

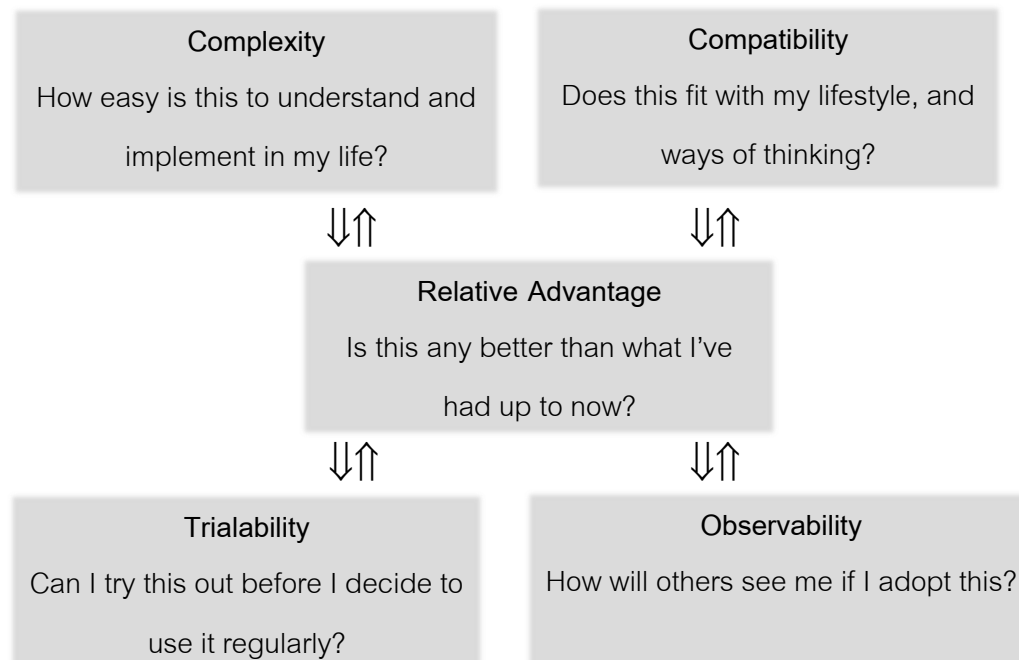


Figure 2.3 Attributes of innovations

Source: Adapted from Rogers (2003)

Rogers identified nine traditions where the bulk of innovation diffusion research has been done. Among the more prominent have been the sociology fields, education, communication, and marketing. Within marketing is the social marketing approach, which is aimed at changing people's behaviors in ways that the people themselves desire. Rogers provided examples of social marketing research and campaigns that targeted smoking, drug abuse, and safe driving. In addition, Rogers identified 8 types of research that have dominated diffusion studies. Among them are communication channels, opinion leadership, personal interactions within social networks, and innovativeness of adopters. Research on social marketing will be reviewed in a later section.

2.2 A definition of urban agriculture

Definitions of urban agriculture run the gamut from simple and direct, yet arguably incomplete, to long and detailed, and arguably inclusive of characteristics that are unnecessary to state. Urban agriculture is intrinsically different from rural agriculture in some noteworthy aspects, such as scale (usually far smaller than rural agriculture), locations of gardening spaces (e.g. on the street in front of homes, on rooftops, etc.), motivations (oftentimes for personal consumption and or pleasure), and the people consuming the produce (usually local people).

The definitions used by Hamilton et al. (2013) and Zezza and Tasciotti (2010) are so brief that they do not point out these differences between rural and urban agriculture. On the other hand, because urban agriculture *is agriculture*, the definitions used by Golden (2013), Redwood (2009), and Smit et al. (2001) are overly detailed. It is simply unnecessary to include in the definition activities which are inherent in the term agriculture.

Here, a middle ground definition of urban agriculture is preferred, as described by the United Nation's Food and Agriculture Organization, defining it as agriculture that "is practised on small to medium size areas within the city for growing annual and tree crops, raising small livestock and fish for home-consumption or sale" (2001). Many researchers use the term peri-urban in their writings to indicate urban agriculture on the fringes of cities, but in this thesis, generally the term *urban* includes *peri-urban* unless the term *peri-urban* is used specifically. Because the term agriculture is generally concerned with large scale commercial ventures (and usually synonymous with the term farming), and gardening is more often a small scale, non-commercial activity, the term gardening will often be used. Care has been taken to use the more suitable term in appropriate places in the text.

2.3 Urban agriculture around the world, past to present

In earlier times, before most homes had refrigerators, people living in and around cities had to grow food because it could not withstand long storage times and transportation to distant cities. Dickie (1968) wrote of ancient Persian gardens from 4000

B.C. for wealthy folk that included ornamental plants as well as food plants. In *Urban Agriculture: Food, Jobs and Sustainable Cities* (2001) Smit et al. examined UA in general, including the history of urban gardening around the world since ancient times. Remains of the ancient Indus Valley civilization show signs of intensive raised bed farming systems. *Chinampas* of the pre-Columbian Aztec civilization were complete systems of urban agriculture that fed thousands. In Belize, a tiny country in Central America, Caracol and Lamanai are 2 sites that have been studied for several decades. Caracol is estimated to have had between 100,000 and 150,000 inhabitants, living amidst agricultural terraces. Just north of the center of Lamanai are raised beds that were worked for more than 2,000 years, until Britain colonized the country.

Smit et al. (2001) stated that allotment gardens in European countries originated in the latter part of the 19th century and that during century's 2 world wars, kitchen gardening was promoted by governments in Canada, the United States, and England. The authors "generally identify the institutionalization of [UA] as beginning" in Ghana in 1974 (2001). Since then it has become increasingly commonplace in various countries on all continents. In more current years, a host of international organizations, including various UN departments and agencies, have created programs and information materials aimed at promoting urban agriculture around the world (Korth et al., 2014), with systematic reviews of UA literature indicating that it is more popular across the globe than ever (Hamilton et al., 2013; Poulsen, McNab, Clayton and Neff, 2015; Zezza and Tasciotti, 2010).

2.4 History of UA in Thailand

Homegardening ties past and present gardening in urban, peri-urban and rural areas. In Southern Thai language, this is *Suan Som Rom*, which is similar to agroforestry, but without the emphasis on the commercial aspect of agroforestry. Though homegardens have been primarily rural, Gajasen and Gajasen (1999) studied homegardens that have existed since the early part of the 20th century in urban and peri-urban areas of Central Thailand. In Sri Lanka, they have been an urban feature for centuries (Galhena, Freed and Maredia, 2013), and in Vietnam, permaculturist Geoff

Lawton toured a thriving peri-urban homegarden that has been in the family for hundreds of years (Gapinski, 2008).

Kanokwalee (2009) provided a brief history of fruit trees in Thailand's capital since the Sukhothai period (1238 A.D. to 1438 A.D.), when the king chose to plant sugar palms. In the early part of the Rattanakosin period (1782 to present), many streets were lined with tamarind, jackfruit, and mango trees. It was during this period that the city may have come to be called Bangkok, due to the many *makok* (*Spondias mombin*) trees in the area. The author also stated that many areas of Bangkok had orchards and implied that they were watered from the canals that they flanked.

2.4.1 Urban gardening in contemporary Thailand.

Urban gardening is gaining in popularity in Thailand, and though several provinces in Thailand have UA groups, only the group in Bangkok and the group in Chiang Mai Province will be examined here. The Bangkok group (named *Suan Phak Khon Mueang*, which translates as "city people's vegetable garden") is the oldest, largest, and has the most extensive activities. In 2010 the Sustainable Agriculture Foundation (Thailand) cooperated in creating the group with the Thai Health Promotion Foundation. The group's activities are concentrated in the Central Region of the country, with objectives to:

- increase the area and number of urban gardeners
- create and support innovative learning centers promoting gardening methods suitable to urban lifestyles
- create a network of urban gardeners to foster lifestyle changes and
- campaign the public for greater self-sufficiency, eco-friendly consumption, and increase mutual care and assistance in society (Thai City Farm, n.d.-a).

Also in the capital is the Lak Si District building with a 440-square meter rooftop vegetable garden established in 2003 (Fig. 2.4), which is also used for various community activities, including semi-monthly urban agriculture workshops (Kanokwalee, 2009).



Figure 2.4 Lak Si District Office rooftop garden

Source: <http://bk.asia-city.com/restaurants/article/bangkok-city-farming-solutions>

In Chiang Mai, a project called Green Beauty Scented supports and promotes organic urban gardening, oriented mainly towards improving health and increasing members' financial savings. The volunteers in the project's 4 activities emphasize helping those who want to garden but have little or no gardening know-how. They teach gardening, encourage gardening in communities and at temples, help restaurants design edible gardens, and do garden work at homes of people who lack the skills and the people to do the work (Thai City Farm, n.d.-b).

2.4.2 Urban gardening in Hat Yai.

A major flood in 2010 catalyzed the formation of the UA group (also named *Suan Phak Khon Mueang*), through a project funded by the Rockefeller Foundation (Thinphanga, n.d.), which got off the ground in 2012. Aims of the project were to deal with post-flood disaster management and the health of project participants. Under the project, Songkhla Community Foundation (SCF) created the group, and is responsible for supporting, promoting, and organizing its activities. Presently, both the Hat Yai Municipal Office and SCF support and promote UA, though separately and do not coordinate efforts.

The SCF director contends that with the level of support that the municipality has offered so far, many communities have been unable to realize much success with UA (C. Phocharueng, personal communication, June 2, 2016). To date, there have been no studies performed to evaluate the effects of UA on any aspect of the lives of urban gardeners in Hat Yai District. Table 2.1 highlights important developments in the group's history.

Table 2.1 Development timeline of Hat Yai's UA group (Suan Phak Khon Mueang)

Year	Development
2009-2011	<ul style="list-style-type: none"> ● Songkhla Community Foundation (SCF) created and oversaw <i>Project to develop quality of life and a community plan for coping with and adapting to climate change in communities of Hat Yai Municipality</i>
2012-2013	<ul style="list-style-type: none"> ● SCF created "Khrua Ruean See Kheao" [which translates as Green kitchen] with 30 members and 4 learning centers, which later evolved into the current group
2014-2015	<ul style="list-style-type: none"> ● SCF and Hat Yai Municipal Office jointly held a contest with UA group members of 4 regions of Hat Yai District ● <i>Model Kitchen</i> certificate was awarded to all 30 UA group members to encourage their development as model communities. The event contributed to expansion of the group
2016-2017	<ul style="list-style-type: none"> ● Increased membership by 20 communities and schools ● Gardening experts were developed to be gardening leaders Communities were developed to be learning centers that group members as well as others can go learn gardening ● Rotated monthly trainings at learning centers, which were members' homes ● Satellite groups (outside Hat Yai District) met at least once a month ● Public relations efforts increased ¹ ● Avenues increased for spreading innovations and products ² ● Sold organic agricultural products and imparted knowledge on urban gardening at a local outdoor market, called Greenway ³ ● Cooperated with a local seed bank to share organic seed varieties for free with members ● Created and maintained a rooftop garden at DIANA Department store

Source: Songkhla Community Foundation

¹ Public relations efforts increased by creating social media groups on Facebook and LINE, to exchange ideas, information, urban gardening innovations, buy and sell products, nurture relationships, and for networking

² An example of an added avenue for spreading innovations and selling the group's products is Prince of Songkla University's annual agricultural fair, where the group's UA experts presented and demonstrated urban gardening

³ The local market was originally only for clothing and other non-foodstuffs, but an organic foods section was added so the UA group could provide consumers with quality food and other agricultural products

2.5 Positive and negative impacts of UA, and skepticism of the benefits

The potential benefits to growing food in the world's cities and their perimeters are vast. At the personal and household levels, physical and mental health improvements are commonly reported, as are a better financial situation, and a healthier home environment. On a larger scale, there are reports of communities seeing improvements in their local economies, environmental conditions, and relations between people. However, these benefits are often not well documented and there is considerable discord regarding their veracity. Impediments to realization of the full potential of UA include lack of know-how of many gardeners and lack of support among many local officials.

It should be noted that there is possible bias in some of the research cited in this chapter. Ellis and Sumberg (1998) critiqued the then current literature, reporting on 2 common threads among researchers: advocates of urban agriculture and those interested in "empirical investigation," contending that the former unjustifiably support UA. To the extent that some researchers do hold to a bias, the reliability of their entire research is questionable, from research question to conclusion. Aside from Ellis and Sumberg's 1998 critique, no other research cited in this thesis is older than 2001, so none of the literature they assessed was reviewed here. But some researchers that they criticized as being partial are indeed cited here (and are still commonly cited in current literature), from works dated 2001 and later. This section will deal with the potential and realized benefits, dissenting voices, and risks of UA.

2.5.1 Health impacts.

Because Korth et al. (2014) made a compelling argument for greater attention to research design, and so cast doubt on the many reports of improved health among urban gardeners, this section will begin with a brief synopsis of their review, then follow up with further criticisms. Although health may seem to be the most obvious of benefits, some researchers claim the literature is inconclusive, Korth et al. (2014) being among them. Their objective was to review impact evaluations to determine the effects of UA in low and middle-income countries with respect to food security and nutrition. They started with 8142 citations dated between 1980 and 2013, then for various reasons, narrowed this number down to 173. However, none of these 173 met their criteria for quality research. They sought research that met 2 criteria:

Studies that did not provide a comparison were excluded. This was defined as a second group of participants who did not receive the UA intervention. Similarly, studies that did not measure change over time (i.e. included at least two data points at any point before, during and after intervention roll-out) were excluded.

Inclusion of a control group and at least two data points are standard in impact evaluations. This begs the question why it is that researchers are designing their impact evaluations without one or both of these features that are standard to impact evaluations.

Zeza and Tasciotti (2010) claim that much of the health data regarding UA is unreliable, because much of it is anecdotal and qualitative. But they “confirm the existence of an association between urban agriculture and indicators of dietary adequacy and diversity in a majority of the [4 African] countries for which [they] have data”. In the United States, McCormack, Laska, Larson, and Story (2010) reviewed 16 studies carried out between 1980 and 2009 to assess the impacts of farmers’ markets and community gardens on American adult health, asserting that, “there is limited research assessing the specific health benefits of farmers’ markets and community gardens. Additional well-designed studies are needed”.

L. J. A. Mougeot and Jac Smit are among the advocates that Ellis and Sumberg cautioned may have too easily supported UA. Mougeot (2006) related the story of an urban gardening project that started in 2 districts in Haiti's capital city in 1996 and grew to 19 districts by 1999. The results were better diets and health, and other things, as will be seen in the section *Social impacts*. This story suggests not only that UA has potential benefits for gardeners, their families, and entire communities, but also provides insight into how innovations diffuse through networks. Golden (2013) did a literature review of government agency reports and peer-reviewed research that examined health, social, and economic impacts (see below regarding *Social impacts* and *Economic impacts*) of community gardens in the United States. She cited many studies reporting better diets among gardeners and/or families with gardeners, better understanding of health and nutrition, better access to food in "food insecure areas," and better mental health and more physical activity. Smit studied UA around the world starting in the 1960s and together with Joe Nasr and Annu Ratta (2001), and with Martin Bailkey (2006), reported on numerous instances of improved health as a result of UA. Smit et al. (2001) reported on a study from the 1990s in Kampala, Uganda, where "children of low-income farming families were found to be as healthy as children of wealthy families and healthier than children of non-farming low-income families". Kwack (2007) insisted on the necessity of plants for human health. He maintained that humans benefit, through all 5 senses, from being in the presence of plants, citing myriads of studies indicating that all interaction with plants, and consumption of plant foods, are essential for maintaining and regaining human health. Figure 2.5 illustrates the 2 major pathways that proponents insist UA improves food security: better access to food, and more money in the household.

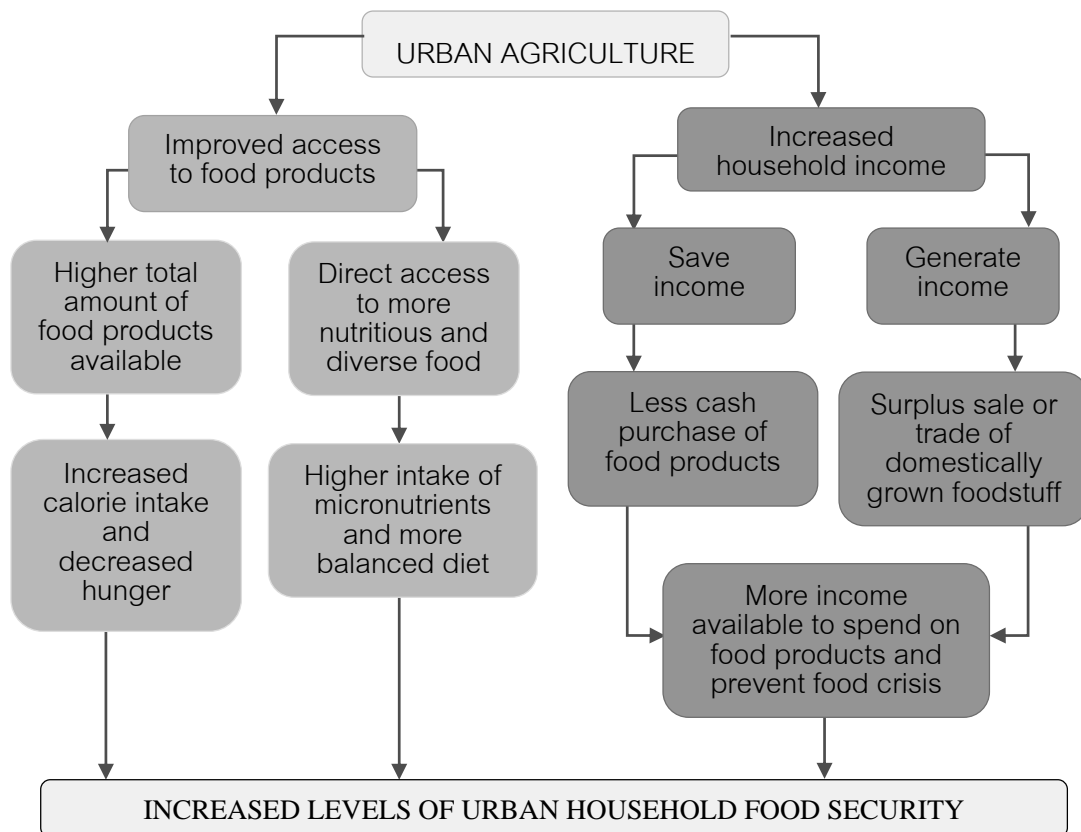


Figure 2.5 Urban agriculture's two pathways to improved food security.

Source: Adapted from Korth et al. (2014).

The risks and dangers of gardening in urban areas should not be taken lightly. In *Cities Farming for the Future*, van Veenhuizen (2006) cautions that diseases can spread from insects and animals to humans, and crops and soils become contaminated due to the use of unclean reused water, agrochemical use, and exposure to traffic and industrial pollution. Mosquitoes are a major vector for diseases that kill millions annually (Caraballo, 2014), and gardens are an ideal habitat due to the presence of standing water (Hamilton et al., 2013). Because some urban gardeners, especially in developing countries, use water tainted with biological contaminants and heavy metals, produce gets contaminated, causing severe health issues for consumers, and for the gardeners using the unclean water (and even untreated sewage) (Orsini, Kahane, Nono-Womdim, and Gianquinto, 2013; Smit et al., 2001). Kim et al. (2014) reported low awareness of and concerns about heavy metals (e.g. lead) and organic chemicals (e.g. residual pesticides)

in urban soils among gardeners in Baltimore, USA. They conducted surveys and interviews with gardeners and key informants from 15 community gardens, reporting their results on a wide range of issues, including limited knowledge of safe gardening practices to minimize exposure, and barriers to soil remediation. The Thai Health Promotion Foundation (gidanan ganghair, 2014) published an online article alerting consumers of produce grown in cities of possible contamination, especially lead, and how they can keep safe. The measures mentioned are mostly the same as from the Baltimore study.

2.5.2 Social impacts.

In this section, the concerns raised above will be set aside for now, dealing with reported benefits that contain a common thread – relations with other people and relations with a place. The Haiti project (mentioned in *Health impacts* above) that Mougeot (2006) claimed resulted in better diets and health also led to better relations in the communities, and empowerment of women. Residents of cities in the United States saw that community gardens beautified their neighborhoods, thereby creating “more local pride and attachment to the space” which “resulted in safe spaces that were less likely to be vandalized or crime-ridden” (Golden, 2013). In a study that Kwack would have appreciated, gardeners “claimed that the presence of plants modified behavior in a way that broke down barriers and promoted social interaction that built friendships” (Golden, 2013). Two other social benefits mentioned in Golden’s literature review were from research that illustrated how these community gardens fostered relations across cultures and across generations. Immigrants were able to use and share extensive farming experiences with native-born residents, and sell vegetable and fruit varieties from their home countries at local farmers’ markets. Some older residents living in assisted-care facilities in densely populated urban areas found it difficult to move from living in their own homes, in less densely populated areas, but sharing their farming skill with younger neighbors aided the move.

Lastly, Golden (2013) reported on education and development programs for urban youths. These included opportunities for leadership development, job training, nutrition, and education on environmental and social issues which resulted in increased

“activism and advocacy to alleviate inequities”. In Bangkok, a garden for autistic children is a place where these “special children” develop motor skills, communication skills, gardening skills, and for at least one boy, provides job training. Many children new to the garden are reluctant to get involved in the gardening activities but when they see the other children having a good time, they join in too (Thai City Farm, n.d.-c).

Eviction of gardeners who do not have rights to the land they garden, figures among the negative social impacts of UA. Smit and Bailkey (2006) and Mubvami and Mushamba (2006) cite these examples in the USA and Kenya, respectively, in *Cities Farming for the Future*.

2.5.3 Economic impacts.

As with the potential for health benefits from UA, it seems that for the most part, economic benefits worldwide are also difficult to substantiate. In *Cities Farming for the Future*, Moustier and Danso (2006) did a literature review that consisted mostly of research in urban areas of Africa, claiming that most small scale urban farmers are stuck in the classic cycle of poverty, yet state that collecting reliable data is a difficult pursuit for various reasons. Zezza and Tasciotti (2010) reported inconsistencies in the literature. They asserted that worldwide evidence showing that UA contributes much to urban incomes is inconclusive, but that their review of studies of 15 countries reveals UA provides substantial income in the 4 countries of Africa that they covered. Hampwaye (2013) concurred with Zezza and Tasciotti with regard to Africa, citing authors who report that families engaged in UA in several African countries “have enjoyed a relatively greater share of economic benefits as a result of [UA]”. Hampwaye’s own research of 400 urban farming families in 4 cities in Zambia from 2008-2009 concluded that UA contributed roughly half of the household income in 3 of the 4 cities.

Regarding the income generated for and in cities, Baumgartner and Belevi (2001) argued that “urban agricultural activities generally form part of the informal economy and are usually not included in official statistics” thus the actual contribution is likely higher than official reports. They claim that UA “can contribute significantly to municipal, regional and national efforts to deal with poverty”.

Golden (2013) stated that there is limited research on the economic impacts of urban agriculture in cities of the USA, citing only 3 studies where community gardeners saved money on food expenditures. Part of this savings comes from low rents for the garden plots and because tools and utilities are often provided for free by the garden project.

2.5.4 Environmental impacts.

Since the late 1960s, population issues have been hotly debated in the context of sustainability. Paul Ehrlich postulated a mathematical equation that garnered praise and criticism, stemming from claims that environmental impacts were a result of population size, society's affluence, and technological sophistication, or I=PAT:

$$I \text{ (environmental impact)} = P \text{ (population)} A \text{ (society's affluence)} T \text{ (technological sophistication)}$$

Much debate ensued, and others proposed their own equations, but population was common to all of them (Chertow, 2001). More recently, in an online article for Yale University entitled *Too many people, too much consumption*, Ehrlich and Ehrlich made a very similar argument (2008). The trend indicated in UN reports is for more populated cities, at higher densities than is generally the case currently (UN Population Fund, 2007; UN, Department of Economic and Social Affairs, 2014). In 2008, for the first time in history, the ratio of urban dwellers to rural dwellers came to favor the urban. The United Nations reported that 54% of all people in the world live in urban and peri-urban areas, and predicted that this will increase to 66.4% by 2050 (UN, 2014). Similarly, these statistics show that Thailand had a 2014 population of 67.22 million, with 49.2% living in urban and peri-urban areas. The UN estimated that Thailand's urban percentage was 16.5% in 1950 and will reach 71.8% in 2050 (Fig. 2.6).

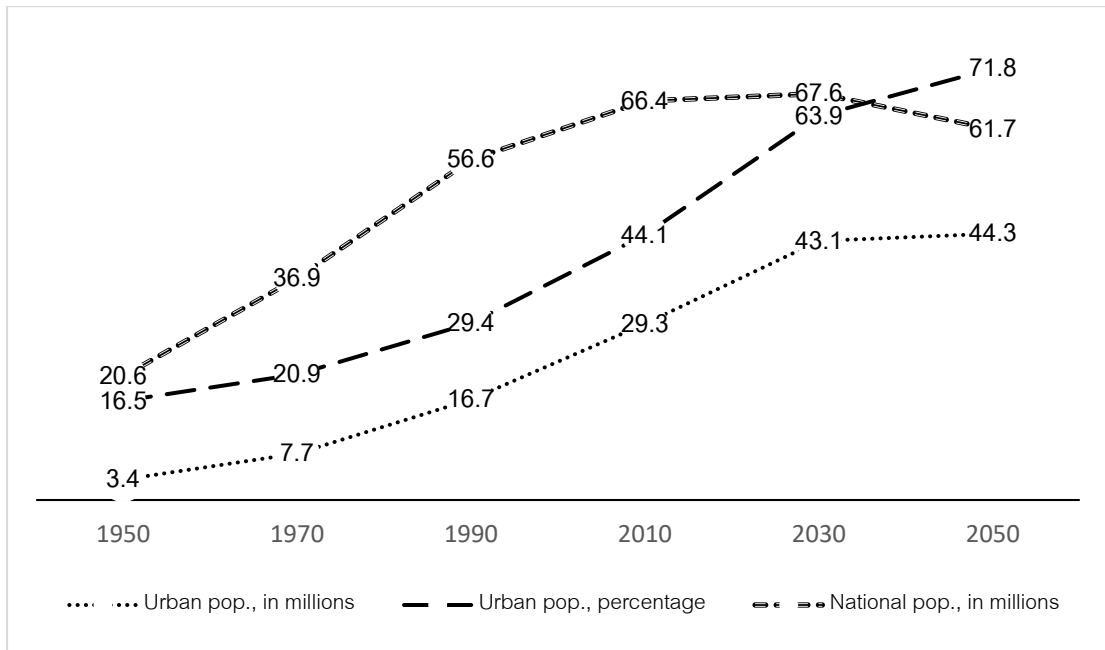


Figure 2.6 UN estimates of Thailand's urban and total population, 1950 to 2050

Source: UN, Department of Economic and Social Affairs, Population Division.

As shown in the $I = PAT$ equation above, affluence of societies and sophistication of technology also affect the quality and stability of the natural environment, but they are far more formidable in trying to quantify and qualify.

The breadth of possible environmental benefits is perhaps on par with the possible social benefits. Three of these possibilities will be examined here: mitigation of the so-called heat island effect, reduction of emissions of greenhouse gases, and improvements in solid waste management. Measures in all 3 areas are interconnected - they impact one another - thus an integrated effort is crucial.

Urbanization underlies the issues surrounding urban agriculture. As has already been discussed, the more people inhabiting the planet, the greater are the stresses on the environment, on social infrastructure, and on people individually and collectively. In addition, affluence and technology also play roles in adding to as well as in alleviating those stresses. Hence, the following discussions regarding positive and negative impacts should all be seen in the context of increasing world populations, especially urban populations. The United States Environmental Protection Agency

reported that, due to the heat island effect, the “annual mean air temperature of a city with 1 million people or more can be 1.8–5.4°F (1–3°C) warmer than its surroundings” (US EPA, 2016). In a series of reports (US EPA, n.d.-b) on mitigating the urban heat island effect, the agency claimed that green roofs reduce the effect in 2 ways, as illustrated in Figure 2.7: 1) *shading*: this blocks sunlight from reaching the surface of the roof, thereby cooling the roof, and reducing the heat transmitted back into the atmosphere, and 2) *evapotranspiration*: this cools the air as plants transpire moisture out of their leaves into the atmosphere. This report described research comparing rooftop surface temperatures of a green rooftop with a conventional rooftop. On a hot August day in Chicago, USA, the surface of the green roof was between 43°C and 28°C lower, and the temperature just above the surface was 4°C cooler, compared to the adjacent building with a conventional rooftop.

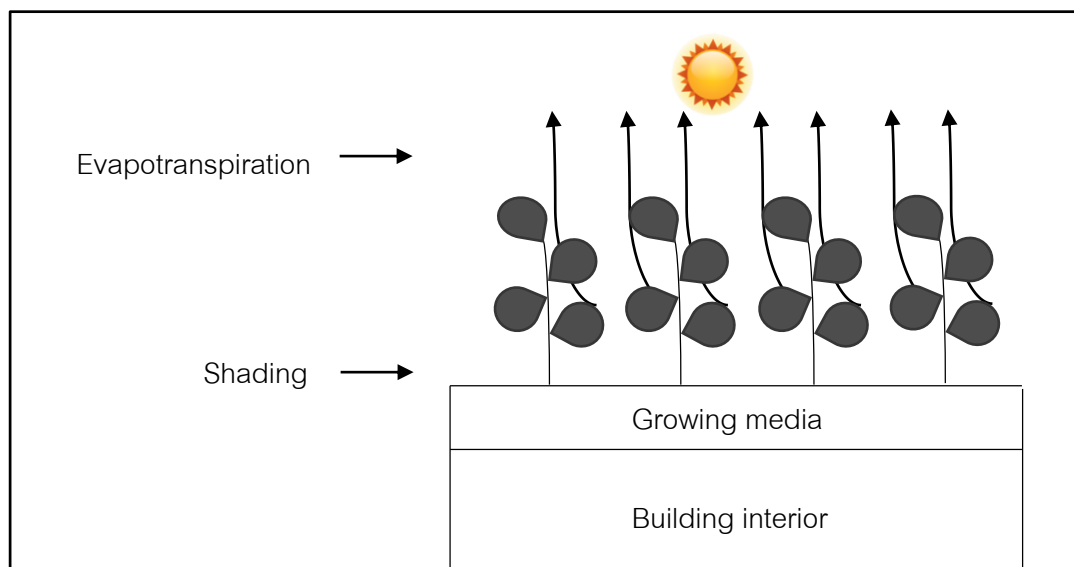


Figure 2.7 Evapotranspiration and shading on a building with a green roof. Adapted from a figure in the source.

Source: [https://www.epa.gov/sites/production/files/2014-](https://www.epa.gov/sites/production/files/2014-06/documents/greenroofscompendium.pdf#page=5&zoom=auto,-175,671)

[06/documents/greenroofscompendium.pdf#page=5&zoom=auto,-175,671](https://www.epa.gov/sites/production/files/2014-06/documents/greenroofscompendium.pdf#page=5&zoom=auto,-175,671)

A modeling study mentioned in this EPA report determined that with 50% of the available surfaces of downtown Toronto, Canada under green roofs, the whole city would be cooled by 0.1 to 0.8 °C, and that irrigating the roofs would cool the city by a further 2.0 °C with a cooling effect of 0.5 to 1.0 °C extended “over a larger geographic region” around the city. The report also recommended planting trees and other vegetation in cities (a.k.a. urban forestry) to lower urban temperatures, again identifying shading and evapotranspiration as the mechanisms for the cooling.

Green roofs moderate temperatures inside buildings too, thus reducing electricity expenses, and the heat island effect. In a city with 3 million people in Southeast China, for 1 month in August, 2011, Wu, Liu, and Xiao (2013) measured the internal and external temperatures of 2 adjacent rooms, 1 with a green roof and 1 with a conventional roof. Internal temperature in the room with the green roof was more constant, external surface temperature was 6°C lower, and energy use was 18.7% lower than the room with the conventional roof. They explained that green roofs moderate internal temperatures in 2 ways: 1) as plants absorb a portion of solar radiation (which is effectively shading, as explained above), they keep temperatures inside buildings lower than building interiors without a green cover, and 2) by decreasing thermal loss that would otherwise escape to the atmosphere (thus also contributing to cooling of the air above the buildings).

In the late 1980s and early 1990s, researchers started to look at the environmental effects of products and services comprehensively. The term Life Cycle Assessment (LCA) was coined and has recently been used by some researchers to determine the environmental impacts of UA. Kulak, Graves, and Chatterton (2012) performed an LCA on the effects of GHG emissions from 2 food supply chains, and determined that urban food supply systems have the potential to reduce a considerable amount of GHG emissions. However, it is not always more environmentally benign to transport foods short distances, in part because of economy of scale, and different fuel efficiencies of different types of vehicles (Economic Research Service, 2010). Is a systemic approach to reducing GHG emissions that includes UA as a component (i.e. doing UA in many places including rooftops) a feasible approach to reducing GHG emissions?

A systemic approach has been implemented here in Thailand, in Rayong Province, about 2 hours east of Bangkok. Muang Klaeng municipality aims to become a Low-Carbon City by 2020, through an integrated set of activities aimed at reducing GHG emissions (Pongloe, Wijaya, and Mindarti, 2015). Their campaign has been held up as a model of a municipality on the road to sustainability (Menikpura, Sang-Arun, and Bengtsson, 2013; Thailand Environment Institute, 2012; Pongloe et al., 2015). UA is a central part of Muang Klaeng's 4-part strategy towards sustainability. The UA part includes kitchen gardens, rice fields, animal husbandry, EM-production and use, vermicomposting, and use of slaughterhouse waste (DELGOSEA, 2011). Asia Low Emission Development Strategies Partnership (2013) reported expecting a reduction of at least 61.6 tons of CO₂ equivalent in GHG emissions by 2020 due in part to growing rice nearby, thus eliminating carbon emissions from transporting rice from distant places. As results from reductions in GHG emissions, other benefits are predicted (Table 2.2). For example, at the municipal level, substantial savings and increased revenue, as well as extending the life of the landfill. At the community and individual levels, newly generated income and increased food security have been forecast. For a city to be sustainable, planning, management and administration must be systemic and integrated, and for that, local government leadership is essential.

Table 2.2 Two of Muang Klaeng's mitigation measures and projected benefits

Mitigation Measure	GHG Emission Reduction	Expected Co-Benefits
Installed municipal waste separation belt to sort organic waste and recyclables from general waste prior to landfill disposal	448.4 tCO ₂ e avoided over 10 years from landfill methane	<ul style="list-style-type: none"> • Lowered solid waste disposal costs for municipal authorities by 312,500 baht over lifetime of equipment (10 years) • New revenues generated from sale of recyclables • Extended the life of the municipal landfill
Constructed municipal rice mill for local processing and consumption	At least 61.6 tCO ₂ e avoided from transport of rice from outside of Muangklang	<ul style="list-style-type: none"> • New income generated from rice sales, benefiting smaller scale farming households • Reduced dependence on prices in the rice market and purchases from outside the municipality • Increased food security for local communities

Source: <https://cdkn.org/wp-content/uploads/2013/03/Asia-LEDS-Partnership-Case-Study-Thailand-Low-Carbon-City-Initiative-March-2013.pdf>

Because Muang Klaeng's landfill was filling up fast, they realized they needed to divert waste. Thus, besides having measures in place to reduce emissions of GHG, they also implemented measures to reduce all manner of solid waste, through a recycling program and through collection of organic waste, the latter used for UA (DELGOSEA, 2011; Vajarodaya, 2013). Only 29% of total recyclables and 35% of total

organic waste is being diverted, though the municipality is working to improve these figures. Despite these arguably small proportions being diverted, Menikpura et.al. (2013) claimed that through Integrated Solid Waste Management, the municipality has seen a “60% GHG reduction as compared [to] the scenario where all waste would have been disposed through sanitary landfilling” (2013).

There are of course, negative environmental consequences of growing food in and near urban areas. High density living areas already use huge amounts of water, and for urban agriculture to take a large role, they would take much more water than at present. One solution is to use treated urban wastewater (a.k.a. grey water), such as countries around the world have been doing for many years (Baumgartner and Belevi, 2001; Hoorweg and Munro-Faure, 2008). Aside from this, environmental pollutants such as sulfur dioxide, nitrogen dioxide, and ozone were identified in a 2003 study to have detrimental effects on the growth of crops grown in peri-urban areas of Varanasi, India (Agrawal, Singh, Rajput, Marshall, and Bell).

2.5.5 Summary of impacts.

It has been demonstrated that there are many voices trumpeting the values of growing food in cities. Stronger physical and emotional health, improved relations among various stakeholders, better financial conditions, and safer environmental conditions are all touted. The dissenters have been vocal since the 1990s, yet the proponents still seem to prevail at the international level of support, though to a lesser extent at local and national levels. No matter what the truth is with regard to these benefits, the health risks are certain and need to be seriously addressed.

If urban agriculture is having mostly positive impacts on urban gardeners, as many researchers insist, why is there dissent? Several possibilities occurring among those involved in the realm of urban agriculture could explain this to some degree. First, meeting the full potential of UA seems daunting, in part because it appears that many urban gardeners are not very skilled. Because most backyard urban gardeners in a Canadian study had low skills, they harvested much less than skilled gardeners, thus falling far below the full potential of urban gardening (CoDyre, Fraser, and Landman,

2015). Second, urban planners in many countries of the world do not support UA, and even hamper it (Hamilton et al., 2013; Hampway, 2013; Poulsen et al., 2015). Smit et al. (2001) complained that many of the world's urban planners consider farming in cities to be inconsistent with modern city life. What's more, Martin, Clift, Christie, and Druckman (2014) cited "an imposing array of structural limits to urban food production: land, sustainability, labor and capital". They claim that under ideal circumstances, a city is only able to grow about 8% of a healthy diet, so realistically much less than this percentage. They contend that the main value of growing food in cities is the social benefits. Third, badly designed research on UA's benefits has led several authors to doubt the value of city gardening (Korth et al., 2014; McCormack et al., 2010; Zezza and Tasciotti, 2010).

Considering these 3 points, it is no wonder that detractors contend that it is not worth spending precious resources on what they see as the meager potential of UA to alleviate poverty and improve food security of vulnerable people (Ellis and Sumberg, 1998). Yet, it is important to keep in mind Baumgartner and Belevi's (2001) claim that income generated from UA is generally part of the informal economy, so does not usually get reported in official statistics, therefore most urban gardeners' actual incomes are likely higher than reported. If urban gardeners receive the necessary training and official support, and researchers carry out well-designed research (and report the results fully and accurately), will there be more agreement regarding the value of urban agriculture?

In very few words, summing up the research on urban agriculture's contribution to the lives of residents of urban areas: there is strong potential. There is capacity in urban agriculture for better human health, more social harmony, stronger economic conditions, and increased environmental health.

2.6 Literature on gardening methods introduced in this research

This section will briefly examine the 3 gardening methods introduced in this research. Urban gardeners participating in online gardening forums in many countries around the world use these methods. Many of these forum participants report being new to these methods, while a few appear to have considerable experience and understand the intricacies of how these methods work. All of these methods are reported to be frugal

with water, can be made to a small scale or even very small scale, and require little time and attention after construction. All methods strongly emphasize creating very rich soil, which supports vigorous and healthy plant growth.

2.6.1 Wicking boxes.

Most wicking boxes are sturdy watertight containers, with a water reservoir at the bottom and rich fertile soil above this reservoir. An undated document by the inventor, Colin Austin, titled *Wicking worm bed* explains how the original design works. The method uses capillary action to *wick* moisture up from moister soil to drier soil. Features of the design are an overflow drain hole near the bottom of the container, a vertical watering pipe, and a *worm hotel*, which must be large enough to put in food scraps that will become food for microbial life, excretions of which become worm food (Austin, n.d.). Many people have modified Austin's original design since it was initially promulgated. Among the common modifications are a non-soil substrate such as coconut coir, sand, or small pebbles, a horizontal pipe for even distribution of water into the reservoir, and a permeable fabric in between the reservoir and soil that permits water to wick up into the soil while preventing soil from going down into the reservoir, as in Figure 2.8.

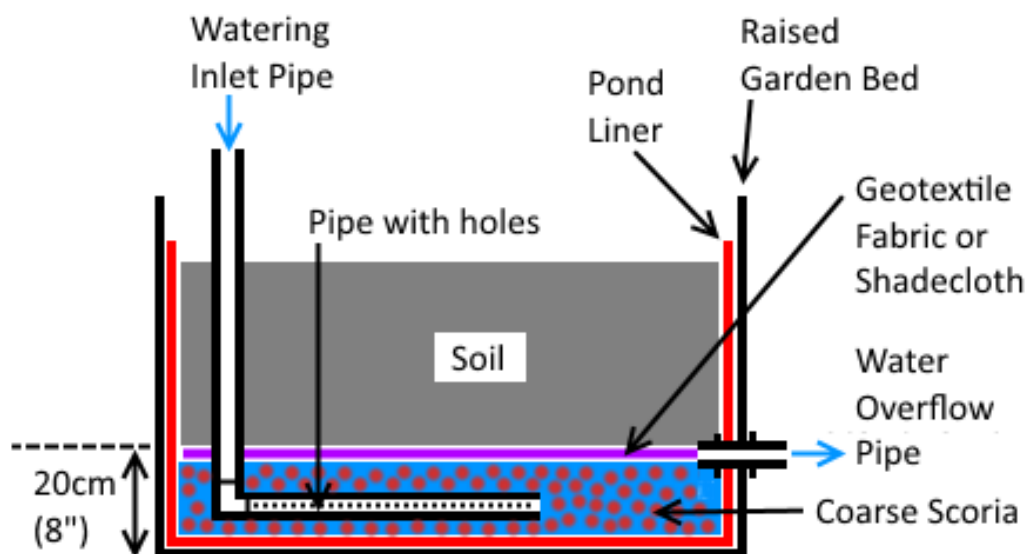


Figure 2.8 Very common wicking box style

Source: <https://deepgreenpermaculture.com/diy-instructions/wicking-bed-construction/>

For 1 year, Sullivana, Hallarana, Sogorkaa, and Weinklea, (2015) compared yields for cayenne pepper, cherry tomatoes, and lacinto kale grown in various types of beds common in urban gardens, concluding that wicking boxes “[hold] promise for highly productive and low maintenance growing in small spaces”. The main benefit is the water efficiency; as little as “half of the water is needed compared with standard top-down irrigation methods” (Somerville, Cohen, Pantanella, Stankus, and Lovatelli, 2014).

The following many advantages of using a properly maintained wicking box were compiled from the research by Sullivana et al. (2015), an FAO technical paper about aquaponics that includes a chapter introducing wicking boxes (Somerville et al., 2014), and an online article from Verge Permaculture (Avis, 2011).

- After filling the reservoir with water, the soil will remain moist longer than in other gardening methods. Depending on circumstances, watering as seldom as twice a month may be enough.
- The soil gets water evenly and continually, which benefits plant growth.
- There will be no salting of the soil as happens with conventional beds when water evaporates and leaves behind mineral salts.
- Properly made and maintained, the soil surface will be dry, inhibiting weed seed germination.
- By incorporating a worm hotel, and adding kitchen scraps, worms and other organisms travel throughout the soil, aerating and enriching it.

There are a few disadvantages; the most significant is that it is relatively easy to inappropriately maintain the system. For example, not letting the soil dry out once every few months could lead to anaerobic soil, which would harm or kill the plants. Also, a plastic tote unprotected from sunlight will become brittle and break within a few years.

2.6.2 Hugelkultur beds.

Very simply put, a hugelkultur bed is soil on top of wood and other mostly carbonaceous materials. The design of these beds generally is meant to be similar to the ground ecology of a forest except that the layers are reversed: wood and other organic matter are covered with soil (Fig. 2.9). The soil in a hugelkultur bed is slowly enriched

through decomposition of the various materials under the soil layer. Ideally, rotted wood is used for at least 2 reasons. One reason is that it soaks up copious amounts of water during the rainy season and releases it during the dry season. Also, decomposition of fresh cut wood leads to a deficiency in soil nitrogen. The initial size can be very small, but tall and wide beds are not uncommon because they hold water well, thus require little or even no watering.

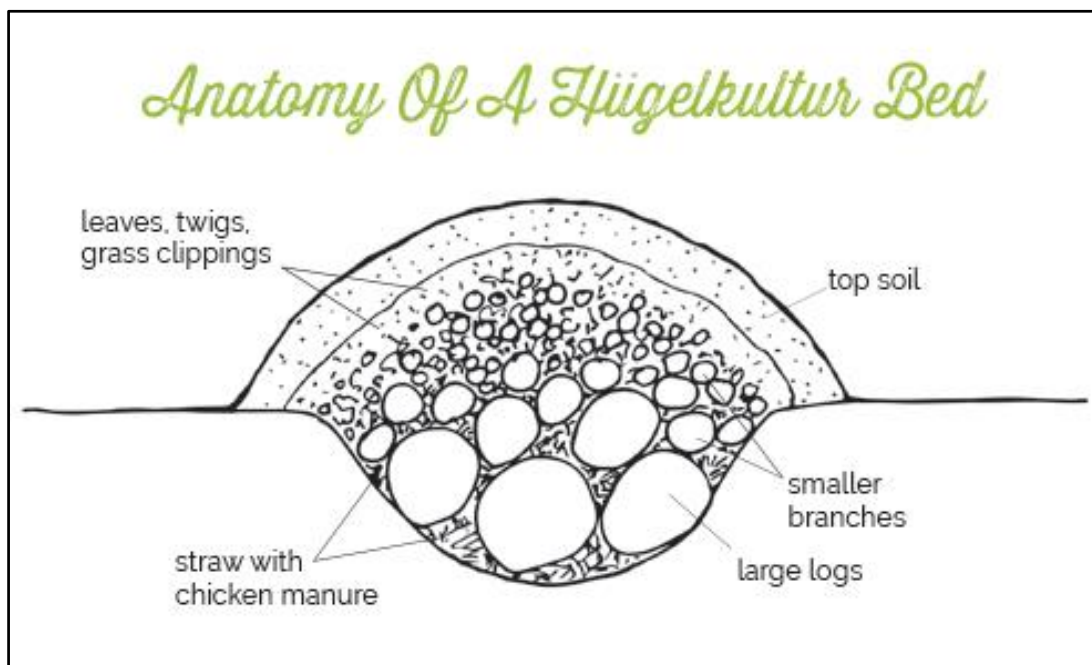


Figure 2.9 Cross section of a hugelkultur bed

Source: <https://www.beauty.provenwinners.com/diy-hugelkultur>

Because there is no authoritative source on hugelkultur, information was compiled from several sources, mainly Feineigle (2012) and Miles (2010). These were supplemented with information from the hugelkultur forum on www.permies.com and articles on www.permaculture.co.uk.

Typically, when creating a hugelkultur bed, larger pieces of wood go on the bottom, smaller materials on the larger pieces, finer carbonaceous and nitrogenous materials fill the spaces, a thick layer of soil sits on this, and finally a mulch layer finishes the top. The end shape of the bed will be that of a pile.

Among the reported benefits are that soil compaction is minimized allowing plants to grow much more vigorously than in conventional beds. Beneficial fungal activity is maximized because of the large amount of wood and other carbonaceous materials. As this buried material breaks down, air pockets are created, into which bacteria and mycelia fungi enter and form a symbiotic relationship with the plant roots. “Plants that grow in mycelium [i.e. the hyphae comprising the vegetative part of a fungus] rich soils far out perform those that don’t have the benefit of the mycelium” (RedHawk, 2015). Plant roots gravitate toward these spaces and thrive in them, giving a boost to the growing plants. Additionally, the mycelia contribute to the breakdown of the wood, freeing up nutrients.



Figure 2.10 Tall and steep hugelkultur beds create various micro-climates

Source: <http://permaculturenews.org/2012/01/04/hugelkultur-composting-whole-trees-with-ease/>

Figure 2.10 displays the many microclimates created by these raised beds. For example, plants that require shade can be put on the north sides, while sun-loving plants can go on the south and west sides. Also, plants preferring less water can be planted toward the top where the soil will generally be drier, and plants preferring moister soil can go towards the bottom because the soil is generally going to be wetter. Beds as tall as 2 meters are fairly common because they will maintain a tall height for many months or even years. Many people in temperate climates report successes with a

wide variety of plants including cucurbits (e.g. melons, squashes, gourds, and cucumbers), legumes, nightshades (e.g. eggplants, potatoes, tomatoes), leaf vegetables, and root crops such as carrots, radishes, and sweet potatoes. All of these are annuals, but there are claims that this style of bed is also ideal for perennials.

Hugelkultur originated several hundred years ago in Central Europe, and most people currently making these beds are in colder climates. Some people say it will not work in tropical areas mainly because the wood breaks down too fast. Though there is very little information about hugelkultur in the tropics, those who report on the Permies hugelkultur forum are pleased with the results of their tropical hugelkultur beds, and have no problem with the bed size dramatically shrinking in 1 or 2 years.

2.6.3 Sheet mulch beds.

As with hugelkultur beds, these beds are meant to imitate the ecology of a forest floor, with modifications. As in a hugelkultur bed, the various layers are not fully broken down, hence the bed will shrink in size over time, creating the beneficial fungi and plant-available nutrients, as in the decomposition process on a forest floor. Anything may be planted in these beds, including annual and perennial vegetables, ornamental plants, even root crops and trees. There is no fixed height to the bed; some people make it as low as about 30 centimeters. Others take the materials to about 1 meter high, but because the bed will generate a high heat from the composting process, they must wait until this process has finished before planting the bed. As with hugelkultur beds, most people making these beds live in temperate climates.

The name *sheet* describes the alternating layers of various components of the bed. The basic design is to alternate thick layers of carbonaceous material with thin layers of nitrogenous material. The materials can vary, depending on what is available. There is flexibility regarding the materials composing the bed as well as in the sequence of layers. Most designs incorporate a weed barrier of cardboard or newspaper. The sequence of layers described here is borrowed from a popular permaculture gardening book, called *Gaia's Garden, A Guide to Home Scale Permaculture*, (Hemenway, 2001). First, soil amendments and/or animal manure are applied to the site chosen for the sheet

mulch bed. A layer of newspaper and/or cardboard is placed directly on top of existing plants to kill them, on top of which a thin nitrogen-rich material to encourage worms. On top of this, spread a thick layer of a carbonaceous material such as dry leaves, straw, or sawdust. A 3 to 5-centimeter-thick layer of compost is next, followed by about 5 centimeters of a single, uniform-looking material that will form an attractive finish to the top of the bed (Fig. 2.11). The author cautioned that it is important that a proper carbon to nitrogen ration is adhered to during bed construction.

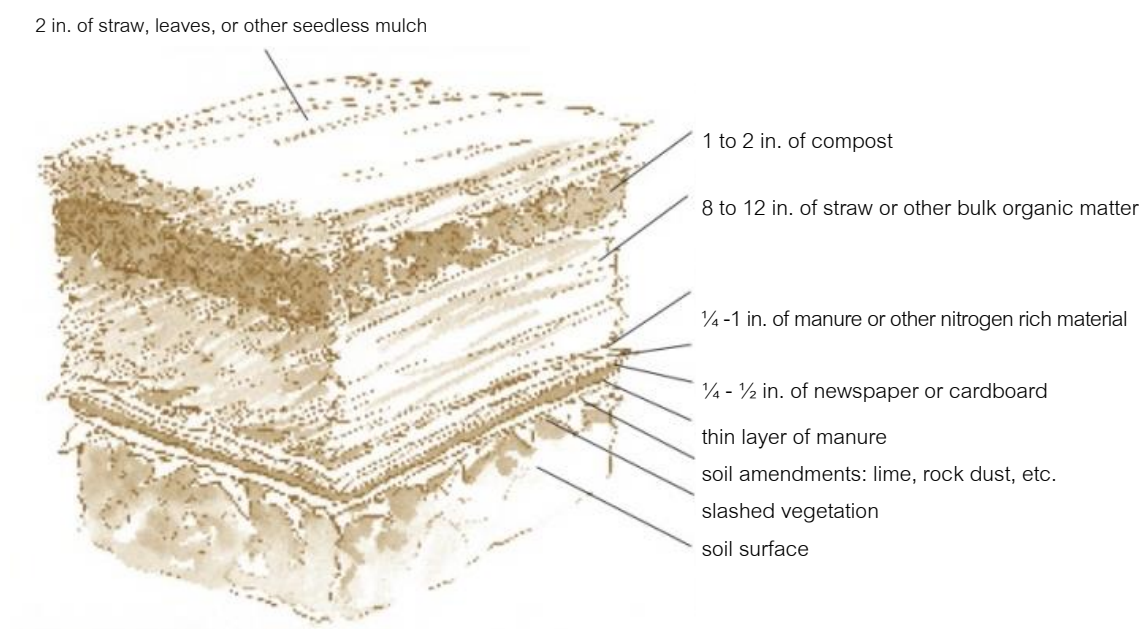


Figure 2.11 Cross section of a sheet mulch bed. Adapted from a figure in the source.

Source: *Gaia's Garden, A Guide to Home Scale Permaculture*

The bulk of the information below regarding sheet mulch bed benefits was taken from an article from an agroforestry organization (Elevitch and Wilkinson, 1999) and an information sheet from Oregon State University's Extension Service (2013). Though not cited, supplemental information was obtained from various internet sources, mainly www.permies.com. It should be noted that perhaps the only substantial difference between making this style of garden bed in tropical and in temperate climates is that higher temperatures and humidity in the tropics lead to more biological activity in the bed, thus faster decomposition of the materials. Sheet mulch beds

- promote plant health and vigor
- improve nutrient and water retention in the soil
- encourage biological activity
- suppress weed growth
- feature a finishing layer providing a pleasing, uniform appearance

2.7 Case studies

This section will discuss various subjects related to the research question and the research objectives. Below are some adoption case studies that are relevant to this research. First is a discussion of social marketing, followed by some social marketing case studies regarding health. These particular health studies were chosen because health is the most often cited reason for people to take up urban gardening, and because they were approached from a social marketing perspective. Social marketing seems to hold clues to convincing people to make individual and group attitude and behavior changes that are of benefit to themselves as well as others affected by those changes. This is followed by agriculture-related research. No social marketing case studies investigating adoption or rejection of urban agriculture were found in the literature. Instead, chosen were 1 study on adoption of organic farming, and 1 on adoption of ornamental urban gardening.

2.7.1 Social marketing.

Rogers (2003) identified 9 major traditions where *Diffusion of Innovation* theory is popular among researchers, identifying marketing as among them. Within marketing he mentioned *social marketing* (not to be confused with *social media marketing*), defining it as “the application of commercial marketing strategies to the diffusion of nonprofit products and services” and elaborated that application of social marketing is mainly to “change behaviors in directions desired by individuals whose actions are impeded by inertia or other factors”. Pettigrew (2015) departed from this somewhat by not overtly including the idea that target behavior change is sought by the target individual or group: “it requires a firm focus on the behaviour change that is sought

among specific target groups". A more detailed, consensus definition, was reached by 3 of the world's social marketing organizations, which also omits any overt indication that the desire for the behavior change is within, not without:

Social Marketing seeks to develop and integrate marketing concepts with other approaches to influence behaviours that benefit individuals and communities for the greater social good.

Social Marketing practice is guided by ethical principles. It seeks to integrate research, best practice, theory, audience and partnership insight, to inform the delivery of competition sensitive and segmented social change programmes that are effective, efficient, equitable and sustainable (European Social Marketing Association, 2013).

Thus, according to Rogers' definition of social marketing, the target behavior must be desired by the target group, whereas for the world's social marketing organizations, this is not necessary. The aims of social marketing research are consistent with this research insofar as the expected benefit of this research, as stated in chapter 1, is to aid in outreach to residents who are interested in starting gardening, but have not yet started. Rogers' view of social marketing is somewhat preferred by this researcher.

There is a danger that is inherent to both marketing and social marketing. That is the possibility of manipulation of one or more persons by another person or persons. Manipulation by marketers in order to ultimately sell products and/or services is arguably unethical, and there is certainly potential for unethical practices within social marketing campaigns (Dann, 2007). As in any field, some people maintain an ethical foundation, while others do not.

2.7.2 Health.

Many people around the world look to urban gardening for health reasons, and from Rogers' (2003) perspective, the perceived health benefits may give *relative advantage* to urban gardening. But most health gains are likely to be slow in coming, which would make such innovations unattractive, and as he pointed out in 2002, the rate of adoption is likely to be slow.

Pettigrew (2015) reviewed literature on health and social marketing campaigns aimed at improving health. She made the case for a comprehensive social marketing campaign based on the idea that so-called healthy food can taste good and be affordable, and so can compete with so-called unhealthy food. She offered a broad outline of how to approach this using “the four P’s of marketing” (i.e. product, promotion, place, pricing) and three principles from marketing: segmentation, exchange, and competition, the first 2 of which are similar to Rogers’ attributes of innovation principles. *Segmentation* is tailoring what you are offering to meet the needs of those being targeted (similar to Rogers’ compatibility attribute). *Exchange* is offering something attractive about the newly adopted behavior in exchange for the rejected behavior (similar to Rogers’ relative advantage attribute). *Competition* is identifying and understanding the things that compete for the attention and interest of the target group. Within each of these 7 elements of marketing, Pettigrew explained distinctions between commercial marketing and social marketing. She elaborated on how the elements fit into a comprehensive approach to orient the public’s attention to appreciating all the pleasures of healthy foods as part of a healthy lifestyle, instead of scaring everyone away from unhealthy foods, which, she declared, has not been successful.

Goodwin and Hill (1998) conducted research from a social marketing perspective on the factors that led women to commit to long term or to only short-term exercise routines. They interviewed 22 American women aged 17 to 52 who are members of, or are instructors at, fitness centers. Those who maintained a long-term exercise routine saw it as a part of their lives that connects to other things in their lives (e.g. identity, circle of friends, self-confidence), and associated the decision to start exercising with a transition in their lives (e.g. a job change, cancer diagnosis, or a return to school). Some of these women were struck by a painful “moment of truth” experience that moved them to start exercising seriously, such as one woman’s extreme difficulty during an aerobics class, or a comment from another woman’s father regarding the woman’s eating behavior. The long-term exercisers were focused on present benefits, while short term exercisers were focused on future benefits. Goodwin and Hill (1998) and Pettigrew (2015) showed in their researches that an emphasis on integrated healthy lifestyles, not simply bits and pieces of a healthy lifestyle incorporated into a mostly unhealthy lifestyle, is more successful in the long term.

2.7.3 Agriculture.

A case study of adoption of an innovative farming system was carried out by a team from Chiang Mai University, in northern Thailand in the early 2000s (Limnirankul and Gypmantisiri, 2010). They set out to determine the factors that affected changes in attitudes and practices among 13 farmers converting to a pesticide-free transitional farming style. Through participant observation and interviews, they found 2 factors affecting adoption and 3 affecting rejection. The 2 favoring adoption were a paradigm shift on the part of farmers, (which resulted from dissatisfaction with the conventional agricultural system) and support from family members. The 3 affecting rejection were incompatibility issues: the new system was incompatible with the farmers' other time demands, marketing preferences, and payment preferences. The paradigm shift among these farmers may be similar in nature to the "moment of truth" experience among the ladies in Goodwin and Hill's study.

Uren, Dzidic and Bishop (2015) investigated the cultural and psychological motivations of homeowners in Freemantle, a suburb of Perth, Australia, to convert their European style gardens to ornamental native plant gardens. The authors stated that it is increasingly clear that the former style garden, though still the norm, is incompatible with the local and global environmental situation. They interviewed 12 residents who have native style gardens to determine why they switched from European style to native plant gardens. Though native plants were considered less aesthetically pleasing than the more usual European style gardens (which typically include lawns), residents of this city mostly chose native plants.

In Fremantle, residents were free to choose (what Rogers called an *optional innovation-decision*), but they felt a need to conform to the community's norms. Though the residents indeed chose native plant gardens, many expressed "environmental guilt" as a basis in their decision to adopt native gardens (Uren et al., 2015), meaning they adopted the native plant garden in part due to feeling pressure to conform, not solely because they wanted the native garden plants. Residents wanted to fit in, wanted status, as well as beautiful and easy to maintain gardens. The research concluded that the motivations were mainly external.

CHAPTER III

Methodology

It would be useful now to restate the two research objectives. The first was to learn the current situation of UA in Hat Yai, while the second was to determine the factors influencing adoption or rejection of selected gardening innovations. Each of the two research objectives was conducted with different participants, though all lived in Hat Yai District, and all except some of the key informants, are members of the UA group. The portion of this research regarding the first objective was simpler in scope and was of shorter duration than that of the second objective. The first section locates Hat Yai geographically. The second section explains the sampling methodology and data collection tools used for the first objective, while the rest of the chapter deals with the second objective exclusively.

Table 3.1 displays the aspects of this research's methodology, separated into 2 columns, one for each objective. Several aspects of the methodology in each objective were similar, which helped to streamline the research process.

Table 3.1 Methodology

Step	First objective	Second objective
Preliminary steps	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Selection of methods • Experimentation with methods
Sampling	<ul style="list-style-type: none"> • Criterion sampling for both study site and sample group 	<ul style="list-style-type: none"> • Criterion sampling for study site • Criterion sampling and convenience sampling for sample group
Presentation	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Given to each participant
Data collection tools	<ul style="list-style-type: none"> • Focus group • Questionnaire • Key informant interviews 	<ul style="list-style-type: none"> • Questionnaire • Participant interviews • Observations • Photographs
Data analysis	<ul style="list-style-type: none"> • Content analysis for focus group and interviews • Descriptive analysis for questionnaires 	<ul style="list-style-type: none"> • Content analysis for questionnaires and interviews

3.1 Study of current situation of UA in Hat Yai

3.1.1 Sampling methods for study site and sample group.

The sampling method for the first research objective was criterion sampling. The criteria were that the group had to be convenient to contact, and had to be within close proximity to the researcher. The Hat Yai urban gardening group was chosen because it met these criteria. Criterion sampling was used also for selecting who would fill out the questionnaire: they must have been either preparing to start gardening, or had already started. One member had just started preparing her garden, while the others had

already been gardening for varying lengths of time, therefore the UA group was selected. The researcher was introduced to the group by his main advisor, and both attended several of the group's monthly trainings out of interest in gardening, in order to become familiar with the group, how it operates, and the content of the trainings.

3.1.2 Hat Yai, Southern Thailand.

The study site was Hat Yai District (translated in bottom map in Figure 3.1 as *Amphoe Hat Yai*), in southern Thailand's Songkhla Province, almost 1,000 kilometers south of Bangkok, near the border with northern Malaysia. The general topography of the district is that of a broad basin bounded by mountains in the immediate east, and more mountains in the distant west. It experiences a monsoon climate with generally 2 seasons: a hot season and a rainy season, with November typically being the month of highest rainfall. Hat Yai is a confluence of many canals, situated at the foot of a mountain, thus flooding is a major threat at the end of the rainy season. Research from 2004 claimed that, "As a consequence of extensive deforestation, particularly in headwater source areas, the municipality has become vulnerable to natural disasters; primarily floods" (Tanavud, Yongchalemchai, Bennui, and Densreeserekul, 2004). "The urban area of Hat Yai has been growing at a dramatic rate in the last two decades and the city is now ranked as the third largest in Thailand after Bangkok and Chiang Mai" (Thinphanga, n.d.). The district's December 2015 population was 362,267. Population data from 2006 to 2015 obtained from the Hat Yai District Office (Accessed on April 20, 2016) suggest that the population will continue to increase (Appendix A).

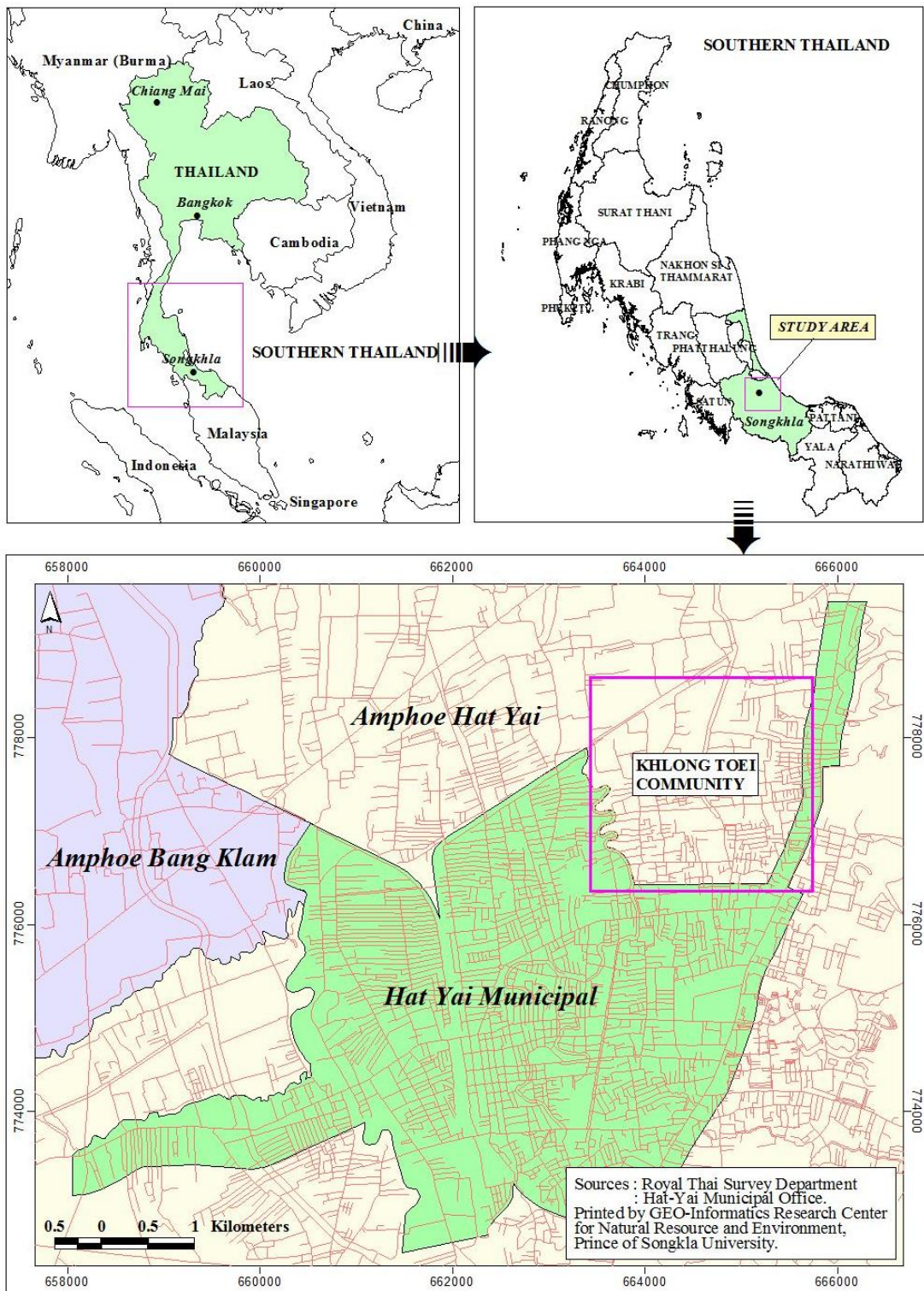


Figure 3.1 Geographical location of Hat Yai District study area
 Source: GEO-Informatics Research Center for Natural Resource and Environment,
 Prince of Songkla University

3.1.3 Data collection tools.

Data was collected using a focus group, a questionnaire, and key informant interviews. The focus group assessed members' personal experiences and perceptions of positive and negative aspects of UA in Hat Yai, with respect to personal factors, local environmental and social factors, and local and national government factors such as policies that affect members.

A 20-question questionnaire (Appendix C) with closed-ended and open-ended questions was passed out to focus group participants, and later circulated to other members of the UA group. The questionnaire was composed of 3 parts, basic personal data, data about the gardens and garden activities, the problems and obstacles gardeners face, and their recommendations for improving UA. Seventy-five questionnaires were filled out and returned, with 67 selected for analysis after screening out questionnaires unfit for analysis.

In-depth, semi-structured interviews (Appendix D) were conducted with 5 key informants involved in different capacities with UA. The director of SCF and the agricultural extension agent were interviewed regarding various aspects of UA in Hat Yai from their perspectives. A development officer at the Hat Yai Municipal Office was interviewed as well, for general information. An email questionnaire was filled out by a manager of Bangkok's Suan Phak Khon Mueang, and a Facebook chat was conducted with a representative of Chiang Mai's Green Beauty Scented, for basic information about these respective groups. These 2 groups were chosen because, together with the Hat Yai group, they form the 3 largest UA groups in Thailand. As such, they were most suitable for contrast and comparison with the Hat Yai group.

3.1.4 Data analysis.

Results of the focus group were entirely qualitative and were analyzed by content analysis. Questionnaire responses were first tabulated by hand then analyzed by descriptive analysis. Interviews were also analyzed for topics that pertain to these objectives. The interviews were conducted in Thai, transcribed, then read thoroughly for pertinent information to supplement the researcher's understanding, then analyzed by content analysis. It was not necessary to translate them into English as the relevant information was simple, beginner level content.

3.2 Study of factors influencing adoption/rejection of gardening innovations

The rest of this section will deal with the second objective. Before commencement of the research, this researcher experimented with the three gardening methods that were to be introduced to participants. This experimentation was undertaken for personal consumption and to better understand them. Seven wicking boxes were constructed, and 2 hugelkultur beds and 1 sheet mulch bed, with substantial help from several university students.

3.2.1 Gardening methods.

Wicking boxes, hugelkultur beds, and sheet mulch beds were introduced in this research for participants to consider adopting. It was communicated clearly that they were free to choose one of these methods, or another if they preferred. These 3 were selected as appropriate to introduce in this research because: 1) they are being used successfully in urban areas in other countries, and should be suitable to Thailand as well 2) they are easy to maintain, requiring little time and effort 3) they are water efficient 4) materials are easy to find 5) little or no financial investment is needed for construction and maintenance, and 6) many people report that they are very satisfied with them. In addition to these methods, 2 others that are practiced in Thailand (including Hat Yai) among Thais were also chosen. Every participant was offered the chance to see the 3 methods in the researcher's garden. Though some expressed interest, none accepted the offer. Seeing up close and then discussing the garden methods would likely have given the participants a clearer idea of how they were constructed, maintained, and how they could have been suited to their specific situations.

3.2.1.1 *Wicking boxes.*

These were made by the researcher starting in May, 2014 and used until December, 2014 on the rooftop of an apartment building in Hat Yai City, where the researcher lived. This is the simplest and quickest method to make, especially if a small styrofoam box is used, as in Figure 3.2. Seven of these were made using clear plastic totes, wooden boxes, and styrofoam boxes. A small hole for the drainage pipe was made in one side, between 2 and 20 centimeters from the inside bottom, depending on the height of the box. The space below this was the reservoir. A slotted PVC pipe was placed

inside on the bottom, connected to the vertical watering pipe. Coconut coir was placed in the reservoir up to the drainage hole. On this was placed 1 layer of cotton cloth. Then potting soil was put in, up to the lip of the container.

Like the other methods, because of the potential to adapt and modify the basic principles, a wicking box is suited to a variety of spaces. The more common versions of this method use a small or medium-sized box, making them suited to urban environments. However, a wicking *bed* would require a larger space because it requires a piece of land suitable for digging a hole in the ground, which will be the wicking bed.



Figure 3.2 One of the researcher's wicking boxes

3.2.1.2 *Hugelkultur* beds.

Two *hugelkultur* beds were made in June and July, 2015 at the researcher's university and used on and off since then. Both were made by stacking heavily rotted logs of undetermined tree species on the ground, covering them with wood chips and sawdust, then dead grass mats, then well-sifted soil that was mixed with chicken manure, and finally liberally sprinkling spent coffee grounds on top (Figs. 3.3 and 3.4). Dimensions of the first bed were about 1.25 meters high, about 1.25 meters wide, and about 1.5 meters long. Only about 10 centimeters of soil was placed on the bed

because sufficient good quality soil was difficult to obtain. One positive aspect of this method is the flexibility with respect to materials that can be used in its construction. Except for the soil, materials used in these beds were plentifully available on campus.



Figure 3.3 Internal composition of the hugelkultur bed



Figure 3.4 The researcher's first hugelkultur bed, immediately after construction

This method is most suited to people who have access to wood and an adequate amount of soil. Because it looks unconventional, and many neighbors do not appreciate seeing this in their neighborhood, it is best to keep it out of sight, or make it attractive. But, it can be made to a very small scale by putting small pieces of rotting wood into a small container, putting soil on top of the wood, and growing plants in that.

3.2.1.3 *Sheet mulch beds.*

The bed in Figure 3.5 was made at the university, and has been used on and off since July, 2015. Two somewhat different styles of this bed were made. The first was made by alternating three layers of 6 or 8 centimeters of carbonaceous material (mostly dry leaves), with two layers of 2 or 3 centimeters of freshly cut green grass. A thin layer of fill dirt was sprinkled between the layers of green and dry materials. A microbial inoculant was watered into the bed during construction. Spent coffee grounds were sprinkled liberally on top of both beds. The second bed was constructed in the same fashion, except that the base of the bed is rotted logs.

Upon completion, both beds were about 25 centimeters high, about 1 meter wide, and about 2.5 meters long. As the material in both beds settled and decomposed, the height of the beds naturally decreased, so additional material was added. The rather large size of these 2 beds is one reason it took several months (from July to September, 2015) to complete. If all materials had been on hand, and with enough help, construction could have been done in two days. In both beds, small wells were made in the mulch, about 25 centimeters wide and deep in a hexagonal pattern to maximize the use of the surface of the beds. Two large handfuls of soil were put into the wells, then seedlings were transplanted.

As with the hugelkultur bed, a sheet mulch bed is most suited to more spacious urban spaces, though, like the hugelkultur bed, organic materials may be put into a small container, thereby making it suitable for small spaces. Thus, it would also become more attractive than simply laying the layers of materials on the ground.



Figure 3.5 The researcher's first sheet mulch bed

3.2.1.4 *Two alternative methods.*

The first of the 2 others selected for introduction in this research may be called plastic bottle gardening, which many Thais are familiar with. This is a style of vertical gardening where plastic bottles hang vertically, connected in various ways. There are countless variations on this basic theme. Holes may be cut in the sides to put soil and plants into the holes. This method is very space efficient so ideal for tight urban living spaces. Figure 3.6 shows one simple design.

The other is Plaeng Phak Buffet (which translates as Buffet Bed), developed by the Hat Yai UA group's agricultural extension agent. This in-ground method emphasizes diversity (thus, the term buffet) of plants and plant sizes (and accommodates trees) in a small space. It incorporates a container for kitchen waste to feed worms and other soil organisms to nurture a healthy soil eco-system (Fig. 3.7).



Figure 3.6 A simple bottle garden design
Source: <http://inhabitat.com/grow-up-designing-vertical-gardens-for-tiny-spaces/>

Figure 3.7 Buffet bed with a worm hotel
Source: www.thaicityfarm.com/autopagev4/show_page.php?topic_id=666&auto_id=29&TopicPk=

There are Thais doing both of these latter 2 methods, so if potential participants were willing to join the research yet were unwilling to try 1 of the 3 former methods, it was reasoned that they might be willing to choose 1 of the latter, because they could find information and instruction in Thai language. It was made clear that the researcher had no experience with these latter methods, but would help with construction.

3.2.2 Meeting the Hat Yai UA group.

In March, 2015, the researcher was introduced to the Hat Yai UA group during the group's monthly activity at a member's farm, has attended several of the monthly activities since then, and has since maintained a positive relationship with the group.

3.2.3 Sampling methods for study site and sample group.

Criterion sampling was used to select the community, and to determine which community members to ask to join the research. The criteria for selecting the community were 1) there must be some houses and some apartments 2) some houses

must have at least a little bit of land, even if covered with cement 3) some homes (including apartments) must have rooftops or balconies, or space available in front of homes where residents can grow plants in pots 4) there must be access to wood, ideally rotted wood. The sole criterion for selecting community members was that they were willing to regularly devote at least a little time to the garden. In addition, 3 participants were recruited via a post to the local UA group's Facebook page.

Kho Hong Municipality was selected because of its proximity to the university and because it met the criteria listed above. During a meeting with Kho Hong Municipality staff in which they were informed of the objectives of the research and the criteria for selecting a community, Khlong Toei Community was agreed upon. Two informal meetings were held with officials of Khlong Toei Community conducted to inform them of the research, its objectives, and the criteria for selecting research participants. One member of the meetings eventually became a participant.

The sampling approach was a combination of convenience sampling and criterion sampling. The researcher entered Khlong Toei Community on several afternoons and approached people in front of their homes, with several people expressing interest in joining the research. The residents and their homes met the criteria below, thus combining criterion sampling and convenience sampling. Thai language flyers were created by the researcher and handed out to anyone who expressed interest in joining. The flyers had color photographs of the 5 methods, with Thai language information, and internet links to more information, mostly in Thai language.

Sample Size Ten participating households was determined to be enough to include at least one household that meets each of the criteria, and enough to get a variety of experiences of Khlong Toei residents, yet not too many participants to manage.

After potential participants expressed interest in participating, yet before actually agreeing to participate, they were individually given an hour-long slide presentation by the researcher in Thai language about various aspects of the research. The major portion of this was pictures of the methods, including verbal explanations on how to make and maintain them, and how they are suited to urban life. These presentations were an opportunity for them to decide if they wanted to participate or not;

all ten agreed to participate. During the presentation, it was made clear that it was important for the research that they try an innovation. But in order to increase their chances of agreeing to participate, it was more strongly emphasized that they were not required to do so in order to join the research. In hindsight, this is understood to be an error on the part of the researcher mainly because it limited the number of participants who agreed to try a method. Aliases have been used instead of participants' real names in order to ensure their privacy. The females' aliases are Jo, Nit, Phairin, and Jane, while the males' aliases are Sing, Wut, Mai, Thin, Suwit, and Chalit.

3.2.4 Khlong Toei Community.

The following data was obtained from Kho Hong Municipal Office's Development Strategy for Kho Hong Municipality, 2014-2018 (Kho Hong Municipality, 2014), and Supinda Manakarn, a Kho Hong Municipal Office Tourism Development Officer (personal communication, October 30, 2015). The major geographical feature of the municipality is Kho Hong Hill, located to the east of the community. The entire area is a foothill, sloping gently down towards the west from Kho Hong Hill. Soil types are mainly rocky laterite and sandy loam, with clay soil in some places. Mild flash floods are common in the community but the water usually does not get very high, or last very long, and the damage is relatively mild. The major category of land use (55%) in the municipality is agriculture, whereas in Khlong Toei specifically, the main land use is housing and commercial buildings. Due to the influence of monsoons, there are two seasons. The hot season starts in February and ends in July, and the rainy season starts in August and ends in January. The southeast monsoon period lasts from May to October, while the northwest monsoon period lasts from October to January.

Khlong Toei Community is located in Kho Hong Municipality, about 2.5 kilometers from Prince of Songkla University, which is also located in the municipality. The major roads running close to the community are Phetkasem Road/Highway 4, which is close to the south edge of the community, and Highway 407, near the eastern border. Railway tracks form the northern border, and on the west end, Khlong Toei canal separates Khlong Hae Community from Khlong Toei Community.

Khlong Toei has a total area of 2.3 square kilometers, and is a mostly working-class community. The total population as of August 2015 was 9753 people, with 5281 females (54%) to 4472 males (46%), with a population density of 4,240 people per square kilometer (Data accessed from Khlong Toei Municipal Office, November 3, 2015), even denser than the capital city, Bangkok. A land use map from the Royal Thai Survey Department dated 2012, obtained from PSU's GEO-Informatics Research Center indicates a small area of rubber farms and a smaller area of mixed orchards in the northwest part of the community (Appendix E).

3.2.5 Data collection tools.

All of the following data collection tools were used to gather primary data, while various media such as online journals, websites, and books were used to gather secondary data. All participants were informed of and agreed to the details of the data collection, and their roles. They were informed that they could opt out of the research at any time. All agreed that if they did opt out, they would sit for an exit interview detailing the reasons for quitting before the end of the data collection period.

A *Questionnaire* (Appendix F) was filled out by participants at the beginning stage of the research with closed-ended questions for basic socio-economic data, such as age, gender, religion, occupation, etc., including style of home (e.g. house, townhouse, etc.).

Interviews (Appendix G) In-depth, semi-structured interviews with each participant were used to ask open-ended questions and explore areas that are particular to specific participants. Some of the questions asked during these interviews regarded: 1) their perceptions about the safety of produce from the market 2) participants' previous experience with gardening (if any) 3) their thoughts and feelings about the pros and cons of growing some of their own food 4) why they had not already taken up gardening 5) whether they had ever considered starting a kitchen garden 6) what motivated them to join this research. Attention was given to making the interviews not too long or too complicated. Almost all participants allowed a video recording to be made. A Thai person accompanied the researcher during 2 of the formal interviews.

Observations (Appendix H) were made of many things, including verbal and non-verbal expressions of participants, various conditions of the garden beds, and relations between various community members as well as with the researcher. To this end, gardens of most participants were visited about once a week, to observe the gardens, take photographs and when possible, talk with the participants.

Photographs were taken of the areas where the gardens were made before making them, while making them, and often while collecting data.

It was well understood that there is a language barrier that the researcher must be careful of. As well, the researcher understood the need to be sensitive to cultural differences, and highly observant to note possible discomfort in participants. Every effort was made to create relationships of trust and openness. The researcher addressed such topics during the presentations.

Data collection commenced in December, 2015, with the first of the in-depth interviews with participants, and finished in June, 2016, with the last closing interview. In mid-February, 2016, the research advisors called for a meeting with participants to discuss why only 1 of the 10 had agreed to try a method. Five participants attended, with 4 more agreeing to try a method.

3.2.6 Data analysis.

Content analysis has been used as the tool for reviewing the interviews and questionnaires. On many occasions, the audio recording of the interviews was referred to for the sake of clarity. Diffusion of Innovation theory was the foundation for the data analysis portion of this research. Given the broad nature of the theory, that it covers all aspects of this research, and has been tested and refined for decades in various occupational fields and cultures around the world, this theory was an invaluable tool for understanding the results of this research. Having said that, "letting the data speak" was the underlying principle during both collection and analysis of the data. The theory has been used insofar as it fits the data; caution was taken to ensure that the data was not shaped to fit the theory.

3.2.7 Garden size.

One topic that was not encountered at any point during the literature review is how small of a cultivated space is considered an urban garden. Someone growing one or two spring onion plants in a small pot is not doing any substantial gardening. Yet, for the purposes of this research, there was no lower size limit. Two participants indeed did start off with a very small garden.

CHAPTER IV

Results and Discussion

Unless an innovation is highly compatible with clients' needs and resources, and unless clients feel so involved with the innovation that they regard it as "theirs," it will not be continued over the long term.

Everett M. Rogers (Diffusion of Innovations, 2003, p. 172)

This chapter will bring together the results of the 2 parts of the research, discussing these results primarily in the context of Rogers' book *Diffusion of Innovations*. Section 4.1 will examine the current situation and future direction of UA in Hat Yai, to fulfill the first objective. Section 4.2 will discuss factors influencing Hat Yai residents' decisions to adopt or reject the gardening innovations, to fulfill the second objective.

4.1 Urban Agriculture in Hat Yai

This discussion draws on data from the focus group conducted in January, 2016 with 15 members of the local UA group, the questionnaire circulated to group members, and interviews held with key informants, each filling a different capacity with respect to UA in Hat Yai. The history of urban agriculture in Hat Yai will be briefly examined, followed by the situation current up to the time of writing, in mid-2017. Lastly, prospects for the future of UA in will be discussed from the researcher's standpoint, as per key informant interviews, and through the group's recent social media activity.

4.1.1 Hat Yai's UA group

Since the UA group's inception in 2012, in the wake of the flood, health has been the primary driver. Members have been quite active, with informal once-per-month Sunday morning trainings at members' gardens, attended mostly by middle-aged women, among whom health is often a strong interest. There is also much activity on 2 social media (LINE and Facebook), which provide the only way to determine the number of group members, as SCF does not keep statistics.

4.1.2 The current situation.

In order to understand a wide variety of aspects of the current situation, this section will look at the organizations that support UA, the framework and results of the focus group, and the questionnaire, to shed light on the perspectives, experiences, and profiles of gardeners and for basic information on their gardens.

4.1.2.1 *Support for UA in Hat Yai.*

The two organizations promoting and supporting UA in Hat Yai are the municipal office and SCF. To gather information on the municipal office's efforts and results, the researcher conducted an interview with an official in the municipal office section responsible for overseeing UA. The municipal office's initial efforts bore fruit with 10 communities in 2012-2013, though several have since ceased gardening, leaving 6 communities that still cooperate with the municipal office. There is currently a policy at the section-level within the municipal office, yet no municipal level policy aimed at promoting UA. The main obstacle to UA gaining ground in Hat Yai is that too many people are stuck in an old "give-me" attitude, unwilling to take on a more proactive attitude. The public wants the municipal office to supply everything, such as seeds, soil, and experts to train the public, yet there is no budget for such a project with 103 communities in their jurisdiction. The municipal office must assist communities with many matters that are more urgent and important than growing vegetables (K. Ratanakhom, personal communication, April 7, 2016). Some individuals and some communities involved in the UA group also get support from the municipal office. For example, in early 2016, the municipal office sponsored a multi-city trip to distant provinces so community leaders interested in furthering UA within their communities could see examples and get motivation from others within the country.

For another perspective on UA in Hat Yai, and general information regarding the UA group, an interview was conducted with the director of Songkhla Community Foundation on April 18, 2016. The foundation was involved for several years with a local health promoter with various groups of health-minded individuals and small markets selling organic vegetables, and "safe vegetables" before getting involved in creating the current local UA group in 2012. Anyone can join the monthly trainings which are held at 5 members' homes, considered training centers, attracting usually about 20 to

25 people. The foundation uses a multi-faceted approach to expanding the presence of UA in Hat Yai: the social media groups, the trainings, various small local markets, a garden on the rooftop of a local department store, accepting teams from television shows to the training centers to make shows for broadcast, and word-of-mouth as outreach efforts, while also making the 5 training centers available to anyone interested in coming. An interview with the group's lead gardening expert (an agricultural extension agent), brought to view another obstacle related to urban dwellers' lack of time. Few people attend all the monthly trainings because they are not always available on the day of training. They miss important lessons and trainings, thus encounter problems they are unprepared to handle (W. Phetmisri, personal communication, May 17, 2016). Lacking information and training could create confusion and frustration, eventually leading some people to quit gardening.

4.1.2.2 The focus group.

A focus group was held in January, 2016 (Fig. 4.1) in order to assess the then-current situation and to chart the future of the group (C. Phocharueng, personal communication, January 29, 2016). The line of questioning was geared towards assessing members' personal experiences, and perceptions of positive and negative aspects of UA in Hat Yai, with respect to individual factors, local environmental and social factors, and local and national government factors such as policies that affect members. Many of the responses from participants coincide with experiences and perceptions of others involved in UA in Thailand, and in other parts of the world, and were expressed to the researcher during the sampling phase of the research. Table 4.1 shows the framework and summarizes the results of the semi-structured question and answer session between the SCF director and the 15 participants. Health, financial, community, and environmental factors featured prominently among the positive aspects of UA, while lack of time, space, general know-how were among the negative aspects. The foundation concluded that further expansion of the group would be conducted according to the framework of the focus group, i.e. at the household level, community level, and policy level, with an environmental underpinning.

Table 4.1 Focus group framework and results

	Positive aspects	Negative aspects
Individual aspects	<u>Health</u> <ul style="list-style-type: none"> gardening is good for health it is good exercise less exposure to chemicals in food it is pleasurable, relaxing, refreshing 	<u>Lacking</u> <ul style="list-style-type: none"> time space general gardening skills and knowledge equipment knowledge motivation soil seeds
	<u>Miscellaneous</u> <ul style="list-style-type: none"> saves money admire the vegetables challenges one's skills 	<u>Miscellaneous</u> <ul style="list-style-type: none"> gardening is complicated gardening is inconvenient
Environmental and social aspects	<u>Environment</u> <ul style="list-style-type: none"> reduces global warming chance to reuse things, reduce waste/garbage 	<u>Water</u> <ul style="list-style-type: none"> sometimes water is lacking sometimes the garden floods
	<u>People</u> <ul style="list-style-type: none"> education and training for children UA is a family hobby chance to learn about self, children and community share the produce <u>Beautification</u> <ul style="list-style-type: none"> one community's trash dump was converted to a community garden gardening can create beautiful, green spaces 	<u>Soil</u> <ul style="list-style-type: none"> low quality many weeds <u>Miscellaneous</u> <ul style="list-style-type: none"> various garden pests diseases

	Positive aspects	Negative aspects
National and local policy aspects	<ul style="list-style-type: none"> • there is a supporting school curriculum • local and national governments offer support, e.g. job training by Hat Yai Municipality • there is some support with materials and equipment • there is support from NGOs, such as SCF • there is a network for exchanging info 	<ul style="list-style-type: none"> • lack on-going local policy supporting information, equipment, and seeds • aid does not cover all areas • outreach does not reach all areas



Figure 4.1 Focus group

4.1.2.3 *The questionnaire: Basic data on Hat Yai District gardeners.*

The first section of the 3-section questionnaire gathered basic personal data in order to know the respondents' (and other household members') socio-economic variables, as per the first objective. The local municipal office and the group's parent organization may be able to use this information in outreach efforts. Table 4.2 will follow the discussion of respondents' answers. All of this data and more may be found in the researcher's published manuscript (Appendix J).

Gender and Ages Breakdown of the 67 respondents shows 87% were women while 13% were men. The Chiang Mai group also says that women predominately tend to do the garden (W. Thala, personal communication, March 26, 2016). Ages ranged from the youngest at 24 to the oldest at 84. The 56- to 65-year age bracket was the largest, with nearly 1/3 of respondents. 76% were 46 to 75 years old, while just under 24% were aged 24 to 45. About 2/3 of urban gardeners in Malaysian cities were 26 to 45 years old (Rezai, Shamsudin, and Mohamed, 2016; Rezai, Shamsudin, Mohamed, and Sharifuddin, 2014), while only about 1/4 of Hat Yai urban gardeners were a similar age. The gender and ages of most respondents may be understood by considering that women typically take better care of their health than men, and in general, older people are more interested in health than younger people (Kennedy and Funk, 2015).

Income Respondents' incomes were compared with the average monthly household income for Songkhla Province. In 2015, this was 27,660 baht per month (National Statistical Office, n.d.-a). Compared with respondents' monthly incomes, it is clear that 45% had income below this average, 37% had income above this average, and 18% had a similar monthly income. The most common monthly household income bracket was 10,000-19,999 baht (27% of respondents). This was below the provincial average, but above the poverty line, which for Songkhla Province in 2014, was 2,922 baht per person per month (National Statistical Office, n.d.-b). 18% of respondents marked the lowest income bracket 0-9,999 baht. The initial UA group was started by middle-class residents, while nearly 45% of participants in this study had a lower than average income, suggesting an expansion of awareness of the potential benefits of growing one's own food.

Occupations and Education levels Over half (54%) of respondents were either retired or for other reasons did not work outside the home and an appreciable number of respondents (21%) were self-employed. It is likely these groups were highly flexible with finding time for gardening, and so more likely to take it up in the first place. Nearly two-thirds of respondents had education levels on opposite ends of the education spectrum. 36% of respondents had a bachelor's degree, while 37% had a primary school

education (though some did not finish primary school). Out of the 12 respondents who lived in the slum community, 10 had only a primary school education. 76% of the 25 respondents with a primary school education reported making clearly less than the provincial average for 2015, while only 4% (1 person) reported clearly more than the average. 63% of the 24 respondents with a bachelor's degree reported making clearly more than the provincial average, while 25% (6 people) reported making clearly less than the average. There is a correlation between education level and income, yet the data gathered in this research cannot answer why these 2 education levels are represented so much more than the others. In contrast, urban gardeners in Malaysia were much more likely to have the equivalent of a bachelor's degree than their counterparts in Hat Yai, with 61% and 44%, as reported in Rezai, et al., (2014) and Rezai, et al., (2016), respectively.

Table 4.2 Respondents' basic personal data (n = 67)

Items		
<i>Genders</i>	No.	Percentage
Females	58	86.6
Males	9	13.4
<i>Ages</i>	No.	Percentage
24-35	9	13.4
36-45	7	10.4
46-55	17	25.4
56-65	20	29.9
66-84	14	20.9
<i>Incomes (in Thai Baht, per month)</i>	No.	Percentage
0-9,999	12	17.9
10,000-19,999	18	26.9
20,000-29,999	12	17.9
30,000-39,999	9	13.4
40,000-49,999	6	9.0

Items		
50,000 & up	10	14.9
<i>Occupations</i>	No.	Percentage
House-husband/House-wife	36	53.7
Self-employed	14	20.9
Government service	6	9.0
Company employee	2	3.0
Student	2	3.0
Other	7	10.4
<i>Education levels</i>	No.	Percentage
Primary school	25	37.3
Middle school	3	4.5
High school	8	11.9
Vocational school	2	3.0
Higher vocational school, Technical college, Certificate	2	3.0
Bachelor's degree	24	35.8
Master's degree	3	4.5

Section 2 of the questionnaire gathered data on the gardens and activities in the gardens, as per the first objective. The purpose here was to get an understanding of the current characteristics regarding gardens, also for use in future outreach efforts. Below is a descriptive analysis of the most pertinent results, followed by Table 4.3. Most respondents marked several answers, thus the figures do not add up to 67 respondents or to 100%.

Motivations for starting a garden Health was unsurprisingly the main reason that respondents started a garden, with 94% marking this reason, including the youngest and all but the oldest respondent. The next most common reason was to save money, with 67% of respondents. 58% of respondents started gardening as a hobby. The Chiang Mai group's website says that lower income households started gardening largely

to save money, while higher income households took more interest in health (Pholsawek, 2014). McClintock, Mahmoudi, Simpson, and Santos (2016) corroborated by stating that higher income gardeners in Portland, OR, USA considered avoiding pesticides more important than saving money, while lower income gardeners considered saving money more important. Urban gardeners in the Malaysian studies saw health as a benefit of UA, and though the studies do not state clearly, it seems health was not a strong motivation (Rezai, et al., 2014, and Rezai, et al., 2016). In addition to health and financial motivations, social and environmental reasons were cited by the Hat Yai UA group on the questionnaire and in the focus group, members of the Bangkok and Chiang Mai groups, and hobby gardeners in other countries (Guitart, Pickering and Byrne, 2012; McClintock et al., 2016; Scheromm, 2015).

Garden inputs Organic fertilizers were the most common, with 88% responding positively. Leaders of the UA group support and encourage organic gardening, but this is not required (W. Phetmisri, personal communication, May 6, 2016) and 27% use chemical fertilizers sparingly. This contrasts slightly with the Chiang Mai group members, who avoid synthetic agricultural chemicals entirely, emphasizing inputs which are close at hand in order to reduce their dependence on outside inputs, and the Bangkok group, whose members also completely avoid synthetic inputs (W. Thala, and V. Nimhattha, personal communications, March 26, 2016, and May 26, 2016).

How gardeners use produce All 67 respondents marked that they consume garden produce at home. Next most common, 61%, marked giving away produce. 40% said they exchange produce with others. Only 9 respondents marked selling produce, as indeed, few have enough space to grow enough for all their own needs, let alone enough to sell. Only two from the lowest income bracket were among the 9 selling produce, both of whom live in the slum, where there is no space surrounding homes, thus it is all but impossible for a large enough garden to grow to sell at the nearby fresh market.

Gardening methods The most common way of planting was to use planters and pots, with 88% responding that this was among the ways they plant. Due to the nature of city living, many homes have little or no land for planting, so planting in pots on the street in front of one's home is the most common option. Simply planting in in-ground beds was next, with 50%. Using various discarded containers, such as UHT milk cartons, or small baskets was marked by 34%. A leader in the UA group is an agricultural extension agent, and together with SCF, have promoted a method called *plaeng phak buffet* (which translates as *buffet bed*). The beds were designed for urban spaces, so about one square meter is the suggested size. Despite making its productivity clear through promotion via social media and frequent demonstrations, only 8 respondents marked using this method.

Garden locations 94% reported using the space immediately adjacent to the house for planting, due to space limitations. Though many homes in Hat Yai have balconies, only 5 people reported using them for planting. Surprisingly, nobody among these 67 gardeners had a rooftop garden.

Table 4.3 Data on the gardens and activities in the gardens (n = 67)

Items		
<i>Motivations for starting a garden</i>	No.	Percentage
Health	63	94.0
Save money	45	67.2
Hobby	39	58.2
Environmental concerns	24	35.8
Home beautification	22	32.8
Other	6	9.0
<i>Inputs that gardeners use</i>	No.	Percentage
Organic fertilizers	59	88.1
Microbial inoculants	48	71.6
Chemical fertilizers	18	26.9

Items		
Compost	15	22.4
Organic pesticides	6	9.0
Other	11	16.4
<i>How gardeners use their produce</i>	No.	Percentage
Eat at home	67	100.0
Give away	41	61.2
Exchange with others	27	40.3
Use to make compost	16	23.9
Use to make microbial inoculants	13	19.4
Sell	9	13.4
Other	3	4.5
<i>Gardening methods used</i>	No.	Percentage
Planters & pots	59	88.1
Planting in the ground	34	50.7
Miscellaneous discarded containers	23	34.3
Raised beds	15	22.4
Vertical bottle gardening	10	14.9
Buffet beds	8	11.9
Other	8	11.9
<i>Locations of gardens</i>	No.	Percentage
Around the home (in front, in back, beside)	63	94.0
Separate from the home	12	17.9
On the balcony	5	7.5
Inside the home	2	3.0
On the roof	0	0.0

(Respondents marked multiple answers to each of the above sections.)

Number of meals per week with produce from gardens Table 4.4 shows that 64% of respondents consumed fewer than 7 meals per week containing produce from their gardens. The average number of meals was 9. It is possible that some meals consisted of only a few leaves from vegetable plants or culinary herbs. Also possible is that some meals consisted of a large amount of produce from the garden, especially among those marking one meal a week. 13% of respondents reported 1 meal per week, while 19% reported 21 meals.

Table 4.4 Weekly number of meals and gardening hours (n=67)

Items	No.	%	Avg.	Min- Max
Number of meals per week with produce from gardens	-	-	9.0	1-21
≤ 3	25	37.3	-	-
4-7	17	25.4	-	-
8-11	3	4.5	-	-
12-15	7	10.4	-	-
16-19	2	3.0	-	-
20-21	13	19.4	-	-
Number of hours per week spent gardening	-	-	7.9	1-35
≤ 4.9	24	35.8	-	-
5.0-9.9	22	32.8	-	-
10.0-14.9	14	20.9	-	-
15.0-19.9	2	3.0	-	-
≥ 20.0	5	7.5	-	-

The third section asked what problems and obstacles gardeners have faced, mirroring many of the same issues raised during the focus group. Table 4.5 summarizes the more common responses. Many of these responses may be seen as requests for assistance in various forms, i.e. the very requests that the municipal office

officials want residents to stop asking for. These include requests for materials such as seeds, soil, fertilizers, as well as training from an expert provided by either a government agency or non-government organization. Due to the large variety of responses, it was convenient to group them in categories of space, knowledge (including garden pests and soil problems), and time, in this order of frequency. Confusion regarding what to do about garden pests and soil problems is actually a sign of a lack of know-how, because if one knows how to prevent or deal with these situations, they will not be problems for long. Thus, in the table below, garden pests and soil problems come under know-how. Many respondents stated several problems, therefore the figures do not add up to 67 respondents or to 100%.

Table 4.5 Respondents' problems/obstacles doing UA (n=67)

Problems/Obstacles	No.	%
Limited space	27	40.3
Know-how	31	46.3
Garden pests (e.g. snails, rats/mice, birds, dogs, chickens)	20	29.9
Soil problems (e.g. low soil quality, lack of soil)	11	16.4
Time	4	6.0

(Respondents marked multiple answers to each of the above sections.)

4.1.3 Future of UA in Hat Yai.

The future course that the group will take has begun to take shape. In late 2016, the group started expanding to the main district in the province, and to several other communities within Hat Yai District. Several core members of the Hat Yai group have exchanged visits between these new communities for training. The activity on the LINE social media group has been exceptionally active since this new wave of visits and trainings, and coincides with the sharp and marked increase in the number of members of the social media groups. Between May 2016 and June 2017, the number of members

on these 2 social media rose from 170 to 260 in the LINE group (a 53% increase), and 3,546 to 4,195 in the Facebook group (an 18% increase). As for the municipal office's program, the official interviewed stated that if enough community leaders show interest in advancing UA within their communities, the municipal office ready to assist, and is willing to consider initiating a municipal-level policy to promote it (K. Ratanakhom, personal communication, April 7, 2016).

4.2 Factors influencing adoption or rejection of the gardening innovations

This remainder of this chapter will focus on the main body of the research, specifically the multitude of factors that possibly affected the 10 participants' decisions to either outright reject the gardening innovations, or to try, then eventually adopt, 1 gardening innovation. The data for analysis and discussion is chiefly from interviews with the participants, but draws on a basic information questionnaire, frequent visits and conversations, and observations. The theoretical basis for part of the discussion will be Everett Rogers' *Diffusion of Innovation*. This section will begin with context for adoption-rejection of UA in general. This will be followed by a detailed examination of each participant's process leading to their respective decisions. After this, the relevant parts of Rogers' book will be examined for influence on the participants' decisions. A discussion of motivation will be included. A summary of the various salient factors involved in the decision process will close the section.

4.2.1 Obstacles to UA in Hat Yai.

First, it is useful to put the question of adoption-rejection of gardening innovations in a slightly larger context, namely various reasons why so few urban residents are gardening. Checking with several online fora in Thailand where this question was posed, found answers regarding space, time, dislike of the hard work, laziness, procrastination, the convenience of markets, and avoiding the sun. During data collection, many people in the study site stated several of the same reasons. The more common limiting factors encountered were lack of time, space, and know-how, laziness, and the difficulty of the work. Less often heard were the restrictions imposed by landlords of row houses, and by absent landowners who would not allow community members to use their

unused plot of land for gardening. Convenience of traditional local markets, and hyperstores, both of which are plentiful, only appeared during formal interviews with participants.

This thesis will argue that, in most instances, little or no motivation is likely the most substantial obstacle to adopting innovations. In the discussion that follows, the factors should be considered in light of motivation. For most people, the limiting factors to urban gardening are not insurmountable. Nearly always, when sufficiently motivated, ways around hindrances will be found. With sufficient motivation to grow vegetables, but insufficient know-how, even lacking space and with little free time, a person will do whatever it takes to create a vegetable garden. The same may be said of the factors examined regarding some attributes of the innovations and factors arising through contact with the change agent. In the presence of ample motivation, there will be few or no real hindrances. Put briefly, it is the position of this researcher, that in most cases, the most salient factor of adoption or rejection is motivation.

4.2.1.1 *More commonly cited limiting factors.*

Know-how was a limiting factor for all participants, though almost all had prior gardening experience. Sing was unfamiliar with many aspects of gardening, and only with the wicking box did he obtain a decent harvest. Wut was unfamiliar with growing vegetables in fill dirt, though enriching it with cow manure seemed to make it adequately fertile. Nit had no experience whatsoever with gardening. Mai's yard long beans (*Vigna unguiculata*) and morning glory (*Ipomoea reptans*) succumbed to aphids and disease in his small backyard garden. He did not know what to do about either situation and simply waited to see what happened. In the end, he harvested almost nothing of both. Phairin had unpleasant experiences in the past growing vegetables, leading her to growing only ornamentals and flowers. Most of the others remarked that they lacked know-how. More people lack know-how than space or time, yet, as illustrated in Figure 4.2, ongoing training is available.



Figure 4.2 Training at a group member's home
Source: Prayun Songsaengon

Lack of space was the second most common limiting factor, to which many urbanites have no practical solution. However, most homes do have some space adjacent to their homes, or a balcony, and/or a rooftop. Moreover, many people plant in pots in front of their homes, jutting a little out into the street (Fig. 4.3). The research participants' space available for gardening ranged from less than 1 square meter, to about 400 square meters. Jane's initial garden was less than a half square meter. Thin had a long but narrow space, only about 50 centimeters wide, next to one side of his house for his garden, which got very little sun exposure during the day. Sing had about 400 square meters, which he wanted to use as part of a learning center for community members to learn ways of sustainable living, including gardening.



Figure 4.3 This garden juts out into the street
Source: Ari Thanayano

Time was the third most limiting factor. Especially working-age urbanites lead quite busy and complicated lives, thus, a hobby such as gardening stands little chance of gaining much attention. Work and sleep alone take up at least half of most people's weekday hours. Raising children, relaxing, and doing various civic responsibilities account for another large portion of many people's urban lives. Six participants have children or grandchildren to raise, 7 have jobs that take up varying amounts of time, and all have various other responsibilities and activities. Jo spent about an hour nearly several days a week at a fitness center and helped her husband with their tutoring business at their home; San took care of the responsibilities of being an apartment building owner while also working long hours at a telephone shop; Chalit spent about half the month in another province because of his job and helped his wife with her home tutoring business; and Mai left home for work early every weekday morning and returned home late at night.

4.2.1.2 *Less commonly cited limiting factors.*

Only 3 limiting factors (convenience of buying food, prohibitions, and laziness) will be discussed in detail. This one comment by Chalit, however, is worth mentioning briefly now, and more in later sections. He remarked during an interview that

he thinks many people do not want to make their lives more complicated than they already are.

The convenience of buying food at markets and supermarkets was mentioned by several people encountered during the sampling phase, and by nearly all participants in the main part of the research. In 2016, 31% of Thailand's workforce were farmers (National Statistical Office of Thailand, n.d.-c.). This is likely to be a factor in the prevalence of fresh markets and supermarkets. The study area has a daily fresh market that is in close proximity to all of the participants in this study, and other markets and various places to buy produce and ready-made food (including a popular hyper market on the periphery of the study area), were convenient for participants. Food is readily available everywhere in the city, 24 hours a day. Nine of the 10 participants commented that it is convenient to buy food from these and other markets and supermarkets. Another consideration is the price of food. All participants said that the prices at these various places to buy produce and ready-made food was reasonably-priced. Ease of access to food could easily blight the motivation to grow one's own food. For those who regard themselves as lazy, any latent motivation to grow food may understandably be weaker than the motivation to simply buy food, especially if one has to go to buy other things as well.

Some landowners who have not developed their land, have expressed to those living nearby that they are not allowed to grow anything on the land. Similarly, some owners of apartment buildings or row houses prohibit tenants from growing anything on the property, even in pots placed on the ground. The absent landowner of the property on Jai Dee cul-de-sac was an exception, as he openly allowed residents to have their gardens on his property until the land was sold. The researcher met 2 people during the sampling phase who lived in row houses, where there was no space between, no balconies, and no rooftops. They said the owners prohibited them from growing anything in front of their homes, thus they did not even have ornamental plants. These people really have no practical way around these obstacles, because they have no place at all for a garden.

During the sampling phase, laziness was cited by some as a reason for not gardening, and during the data collection phase, one participant said that she had not wanted to start a garden because she was lazy. It is useful here to define laziness, and to take a closer look at what may be behind so-called laziness. Burton (2014) provides a definition from a *Psychology Today* online article entitled “The Psychology of Laziness”:

A person is being lazy if he is able to carry out some activity that he ought to carry out, but is disinclined to do so because of the effort involved. Instead, he carries out the activity perfunctorily; or engages in some other, less strenuous or less boring activity; or remains idle. In short, he is being lazy if his motivation [emphasis in original] to spare himself effort trumps his motivation to do the right or expected thing.

For this discussion, the last sentence, about motivation, is the key point to consider. In support of this, clinical psychologist Dr. Dathan Paterno claimed in an online interview, that the phenomenon of laziness is an effect of 3 potential things: 1) we believe that we are incapable of adequately doing a task 2) we have diversions, distractions, or other more important things to think about, such as problems with other people 3) lack of internal or external motivation (Loudon, 2014). Put briefly, people who said they do not garden because they are lazy, are not *inherently* lazy; Paterno’s claims offer a more definitive explanation of why they are not gardening.

4.2.1.3 Motivation.

During the sampling phase, the researcher observed something interesting when surveying the study area. The researcher met Khlong Toei community residents who were in front of their homes, and asked if they had a vegetable garden, and if not, why not. Often, the responses were those more common and some less common reasons, as indicated above. When the researcher responded that there were ways to deal with those obstacles, the majority of residents maintained that they could not start gardening. It appeared that some people may have had other reasons for not suddenly showing interest. This is not to discount that the factors above actually affect urban

dwellers' decisions to not garden. However, those are *external* factors; it is more difficult, yet at least as important, to learn of the *internal* factors in decision-making. This research focused more on the external factors, yet to completely ignore internal motivation, would be to dismiss an important factor that underlies basic decisions in every person's daily life, no less the decisions to adopt or reject urban gardening. In order to more fully answer the research question, participants' motivations will be explored below.

First, of the several kinds of motivations, *intrinsic motivation* and *extrinsic motivation*, are germane to this study. Baumeister and Vohs (2007) defined intrinsic motivation as

the type of motivation characterized by the experience of interest and enjoyment. The reward for intrinsic motivation is said to be in the doing of the activity rather than in what it leads to. In other words, intrinsically motivated behaviors are maintained by the spontaneous feelings that accompany the activity.

Thus, urban gardeners who are simply interested in the activity of gardening, or enjoy it, are motivated internally – they have intrinsic motivation. They may not reap abundant harvests, notice improved health, or other benefits, but they are happy to do the work just the same. The same authors defined extrinsic motivation as

doing an activity for a reward. In that case, the person is not doing the activity because the activity itself is interesting and enjoyable but rather because doing the activity allows the person to earn the reward.

Urban gardeners hoping for these rewards are externally motivated – they have extrinsic motivation. Extrinsic motivations, in contrast to intrinsic motivations, are far more numerous, because they originate outside the individual. The person may want abundant harvests, better health, financial savings, to participate in activities with family or friends, or have other reasons. The 6 sub-dimensions of relative advantage are all extrinsic motivations. Additionally, the reward can come as avoiding an unwanted consequence, such as deteriorating health. Innovations adopted for such reasons are what Rogers called *preventive innovations*, in which the motivation to adopt is usually weak.

Briefly, adopters' intrinsic and extrinsic motivations for adopting the wicking bed are as follows. Sing was intrinsically motivated to try the hugelkultur bed, and the wicking box. He was intrinsically motivated by his interest in gardening, and enjoyment of it. He was extrinsically motivated by a desire to have his land become a learning center for community members to go learn ways of sustainable living, including gardening. Nit was extrinsically motivated to provide vegetables to neighbors, and to please her neighbor and friend. Suwit was extrinsically motivated mainly by the desire to help this researcher with his thesis, but also by the desire to take part in activities with his friends in the cul-de-sac. Jane was extrinsically motivated also in large part to be of help to this researcher, but also to a small degree by the intrinsic motivation of feeling pleasure while gardening. Phairin was driven mostly by the intrinsic motivation of a love for gardening, with a mild extrinsic motivation to help this researcher.

All of the non-adopters were not motivated enough to try the innovative gardening methods. Jo's husband and the researcher made a hugelkultur bed, but it turned out aesthetically unappealing to her, thus she neglected it. Had she found it attractive, she may have been intrinsically motivated to work with it. Wut nearly tried 2 of the new methods, probably extrinsically motivated to please this researcher. If he had been intrinsically motivated to try them, the outcome may have been different.

In reference to Paterno's claims, that laziness derives from 1) a belief that we cannot do a task well 2) other things demanding our attention, or 3) insufficient internal or external motivation, the following perspective is posited. The first 2 of Paterno's claims on origins of laziness are explainable by the third. In the face of a belief in one's inability to do a task, or when other things demand our attention, if motivation is sufficient, these 2 conditions are not insurmountable obstacles.

4.2.2 Factors affecting adoption or rejection of the gardening methods.

Basic background data about each participant will be discussed, then the participants' situations with respect to the following factors: know-how, space, time, their motivations for gardening in general, and level of interest in gardening. Minor factors such as convenience of the markets, difficulty of the work, and laziness are discussed to a lesser extent because they are generally not as significant as other factors. Following this will be a detailed discussion of each participants' innovation-decision process.

4.2.2.1 Participants' backgrounds.

Socio-economic data on each participant was obtained through a closed-ended questionnaire, to gather basic background information. This data regarded the household as well as the individual participant. A more thorough discussion of each participant's background and motivation for gardening will follow.

Jo is a 30-something year old (she declined to give her exact age) female, Buddhist, married to a Dutch man who has been the researcher's friend since 2004. They have 2 daughters aged 5 and 7, and live in a 2-story house with a large yard. She has a bachelor's degree, and she and her husband make a comfortable income running a homeschool and a private English language school at their home.

Her interest in gardening was mild before starting this research, but became stronger towards the end. She stated during the initial interview, that she was willing to give it a try and would continue if she enjoyed the work, if it did not take too much time, if the harvests were good (even if the vegetables were not great looking), and she did not get tired of doing it (she said she was lazy). She was initially only motivated by an eagerness to introduce gardening to her daughters, in part because she and her husband had become increasingly interested in the family's health. Later on, her interest increased and she became more motivated when she saw the opportunity for the couple's 2 small daughters to gain business experience by selling surplus vegetables to the parents of the school children. Also, she came to see the garden as a sort of classroom, where her children (who also attend their homeschool) and the other homeschool children can learn about nature. As with most urban gardeners, a chief concern is their health, and she wanted their children to "eat clean" and remarked that both of their daughters enjoyed eating vegetables.

She commented that she had more than enough time to tend to the few plants she had planted, and that her daughters helped out. She initially was interested only in doing a very small garden consisting of two planters on the 2nd story balcony of their home, so space was not a limiting factor. She explained that she had enough experience and understanding of gardening to do a small garden. And, though she grew

up with a garden all through her childhood years, and had helped both at home and at her school's vegetable garden, she never got very interested in gardening as a child. She remarked that children naturally want to know things, but after you become familiar with it, you lose interest. In June, 2016, she decided to start a larger garden, making it an outdoor classroom for their children, and the homeschool children. This needed more time, space and skill, none of which were lacking.

Sing is a 42-year old male, Buddhist, has a bachelor's degree, and is married to a lady with whom he runs a small mobile phone shop about 1 kilometer from their 2-story house. They make a very modest monthly income, considering they have 2 children. They have an 11-year old son and a 5-year old daughter, and live in a house with a 1200 square meter plot of land adjacent to the house.

Though he was very busy working in his phone shop 6 days a week, and doing other things that urban family life entails, he made time to tend to a small garden. He used roughly 50 or 60 square meters but could have used up to 400 square meters, so space was not a limitation for him. He grew up in this neighborhood, on the outskirts of the city, where there is much less development just beyond his house, and even some farms and small rubber plantations. His family always maintained a kitchen garden while he was growing up, in which he gained a modest amount of experience with various aspects of farming, and has had limited experience with gardening as an adult.

His interest in gardening was strong and hoped to have a thriving garden someday. He enjoyed gardening and found it relaxing. Like others, he was motivated by concerns about the health of his family, so wanted to avoid exposure to chemicals in produce from the nearby fresh market, wanted his children to eat more vegetables, saw gardening as potentially good for his physical and mental health, and wanted to reduce the family's expenses on food, and perhaps make a little income if there was a surplus. Another motivation was to establish a learning center on his land where people could come to learn to grow vegetables, and even to use his own land as their garden.

Wut is a 43-year old male, Buddhist, married with 1 high school son. They live in a small house directly across the street from Sing, his brother-in-law by marriage. He has a technical college certificate and travels about 20 minutes 6 days a week to a job at a printing company, where he makes a middle-bracket income.

He had a satisfactory amount of time to tend to his garden. It was about 75-square meters, situated about 100 meters from his house. He comes from the northeastern region of Thailand, where a large part of the population is engaged in agriculture, and *Wut's* parents are no different. During childhood, there was always a family garden that he helped in until he was 14 or 15 years old. And, when he was in his 30s, living in an apartment, he grew vegetables on the rooftop, many years before urban gardening started to grow in popularity in Thailand. One thing challenged his gardening experience, and that was growing in fill-dirt, something he had not encountered before.

His interest in gardening was strong. It is interesting to note though that he was not sure he actually enjoyed gardening. He said it was a sort of hobby and that he never liked it nor disliked it. However, there are things about gardening that he did enjoy, such as the physical activity, the refreshing feeling he gets from seeing the plants, and the ease of knowing what needs to be done: where there are weeds, pull them, and when the plants need water, water them. As he believed market vegetables contained too much agricultural chemical residue, a strong motivation for him was looking after the health of his family. Another strong motivation was the lifestyle around food. His wife is a vegetarian, and *Wut* himself also enjoyed eating vegetables, and they wanted the convenience of being able to pick fresh vegetables close to their home, for a meal with very fresh vegetables.

Mai is a 25-year old male, Buddhist, single, and shares a 2-story townhouse with 2 other males in a small cul-de-sac. With a bachelor's degree, he makes a modest salary working as a technician at the largest university in Hat Yai District, about a 15-minute drive from his home.

He had more than enough time to tend to the small, roughly 10-square meter garden immediately behind their townhouse. This was enough space for a garden for their own purposes, because they just wanted a few raw vegetables to eat with the prepared meals that they bought outside the home. Mai grew up in a farming family and always had a kitchen garden, where he got a moderate amount of gardening experience during both childhood and adulthood.

He stated that gardening was only a hobby for him and found some enjoyment in it. But his interest was mild, and if the garden required too much effort he would abandon it. He added that he did not seek solutions when he encountered troubles such as disease and insects. Unlike others, health was not a motivation for him to garden. He said that though he understood the risks of eating conventionally grown produce, he was not overly concerned because he and the others in the household were young and healthy. He simply considered gardening to be a hobby.

Nit is a 60-year old widow, Buddhist, living with her son-in-law and granddaughter in a 2-story townhouse directly opposite Mai. Her education level is the lowest among all participants, having completed only the 3rd grade. In the past, this was the extent of compulsory education in Thailand. The household income is modest, but enough to meet their needs.

Several of her answers were contradictory especially regarding time, so the following is this researcher's best attempt at ferreting out the truth. She was no longer working but spent very little time at home on most days but had enough time to add water to 2 styrofoam wicking boxes. Among her daily activities is walking around the city nearly every day, often from morning until early evening. Also, she would travel to Singapore, about once every month or two, when her daughter invited her. She had very little space for a garden but there was enough for 2 wicking boxes which took up less than 1-square meter. She grew up in an urban part of Hat Yai, had not grown up with a home garden, and has not had any experience with gardening either during childhood or since.

She had absolutely no interest in gardening and remarked that she was not doing it seriously. She was motivated to try gardening (and so join the research) only out of courtesy and friendship to a mutual friend, who asked her to join, and lived across the street in the same cul-de-sac, next door to Mai. A minor motivation, which was more an afterthought, was that she would be very pleased that neighbors could come to pick vegetables that she grew. Though she had several health issues, and understood that market vegetables are often reported to have unsafe levels of various chemicals, she remarked that she had no choice but to buy them.

Thin is a 28-year old male, Buddhist, single, living in a rather large 2-story house with his mother. He makes a very comfortable income as a Traditional Chinese Medicine doctor, and during this research was also finishing up a master's degree.

He always said he had enough time for the garden, though he was obviously very busy with work (which often required traveling out of Songkhla Province), school, and a relationship. He remarked that gardening is something he makes time for only in his spare time. The roughly 5-square meters of garden space was far from ideal for most vegetables. It was a narrow strip about a half meter wide, running between the house and the wall separating his property from his neighbor's, and got very little sunlight. It consisted mostly of shallow fill dirt. He got a little experience with gardening at his school during childhood in a nearby province, but did not grow up with a kitchen garden at home.

He rated his interest in gardening at about 60 or 70% and that he enjoys being in his garden. One thing he enjoyed about gardening was the challenge of finding solutions to insect and disease problems that arose. He was motivated to garden by a desire to be more generally self-reliant with respect to food, and at the same time be less exposed to the chemicals in produce from the market.

Suwit is a 57-year old male, Buddhist, living with his wife in a 2-story townhouse in Jai Dee cul-de-sac. He is a retired lawyer, and declined to state his income, citing that he was not comfortable disclosing this information.

He had more than enough time for gardening. Initially, he only joined the work on the 10-square meter group plot, where there was plenty of space. Later on, he and his wife started a 3-square meter plot on the vacant lot, growing pumpkins, where space again was not a limitation. He grew up in a farming family in a rural part of Songkhla Province, but had no gardening experience as a child, though there was always a family garden.

He had no interest in gardening and said straight out that he did not like the hard work involved and the exposure to the elements. He related repeatedly that he had no motivation for gardening, and his main motivation for even joining the research was not for his own personal gain. He wanted to contribute to this research because he respects the institution of higher education. He also iterated that he wanted to benefit this researcher because he respects the intentions and lifestyle of this researcher. Since he was going to help with the gardening anyway, getting fresh organic vegetables, and being with his friends in this cul-de-sac became minor motivations. But because he frequently got organic vegetables from his parents' family farm, and he was already joining his friends for other activities, these two latter reasons were only mildly motivating. He said that having contact with this researcher, and knowing that he is still in the research, helped to sustain his interest even though he was not particularly motivated to do the work.

Jane is a 44-year old female, Buddhist, living with her husband and their two daughters, aged 10 and 15, living in a 2-story townhouse in Jai Dee cul-de-sac. She has a bachelor's degree, and privately tutors English to young school children. She also declined to state her income, without specifying why.

She had enough time for gardening, initially because she only planted 2 small planters in front of her home, but later on during the research, she helped Phairin, who did more of the work than Jane. Though the available space in the front of her home is very limited, because she only decided to try 2 small pots, space was not a limiting factor. Space was still not a limiting factor after joining Phairin because they used the vacant lot for several wicking boxes that took up only about 3-square meters of space that nobody else had used for anything. She grew up in a rural part of Songkhla Province, as

did Suwit, and got gardening experience starting when she was about five years old, when her mother started teaching her the family's farm work. She explained that, since moving to the city as a young lady, she has forgotten much of what she once knew. But added that she could grow food for her family's personal consumption if she had to.

Her motivation was mild, because like Suwit, she had no need to grow her own food since she regularly got organic vegetables from her family in the countryside. She added though that if she had land she would grow vegetables, because she liked the work. She initially declined to join the research, but after learning that spring onions and culantro (*Eryngium foetidum*) are easy to grow and because her husband enjoys cooking with them, she eagerly agreed to join. This interest was not so much because she now had a chance to garden, but rather she was motivated by the chance to provide her husband with plants that he would be pleased to have readily available. Another motivation was that because she was also teaching, she understood what students want, and so was happy to help with this research.

Phairin is a 53-year old female, Buddhist, living with her husband, 2 adult daughters and a 1-year old grandchild. They live in a 2-story townhouse, in the Jai Dee cul-de-sac. She has a Bachelor's degree, works at an office job 5 days a week, and like the others in this cul-de-sac, declined to specify an income.

She had said that all in all, she had enough time to devote to gardening, but complained that she had a variety of other responsibilities (especially taking care of her immediate family and granddaughter) competing for gardening time. As with the others in this cul-de-sac, she grew up in the countryside, and when she arrived in Hat Yai, was unpleasantly surprised that she had little time to tend to a vegetable garden. At the beginning of this research, she had no space to grow vegetables, but was helping Noot and Somchai in the 10-square meter group garden. Later she and Jane planted several wicking boxes in the vacant lot across the street, using up about 3-square meters of otherwise unused space. Growing up in the countryside, she had a lot of experience with her family's kitchen garden and farm. She was disappointed when she moved to the city, and found growing conditions dissimilar to the conditions of her family's rural farm. Almost everything she grew died, therefore she gave up on growing vegetables and

concentrated on growing only ornamentals and flowers, because they thrived much more easily.

Her interest in gardening was strong but initially hesitated to join the research for 2 reasons. First, because of her experiences in the past when plants died, and second because she did not know who she could garden with and did not want to do it alone. Her motivations were to get organic vegetables and to help with the research. She found the necessary motivation in having friends in the cul-de-sac to garden with and to exchange ideas and experiences with.

Chalit is a 30-year old male, Buddhist, married without children, living in a 2-story house. He has a Bachelor's Degree, makes a comfortable salary as a safety engineer, and helps his wife's tutoring business at their home.

Due to being particularly busy with work, he had little time to devote to his garden. His job required that he work well over 8 hours a day, 7 days a week, with about half the month spent in other provinces outside Songkhla. Thus, he lamented, he had precious little time at home. When he was at home, he tutored science to children who came to their home for his wife's tutoring business. His space available for a garden was very limited. With no land for a garden, and uninterested in converting the ornamental garden in the carpark, or to add vegetables to this garden, he decided to hang 3 bottles horizontally on the security bars on the kitchen shutters. Later he started also planting in a plastic wash basin and some small pots in the driveway, in front of the house. In total, he had roughly 2-square meters of garden space, making space a limiting factor. He gained plenty of gardening experience growing up in the countryside, where his parents are farmers. But like others, his experience in the countryside left him unprepared for urban growing conditions.

His interest in gardening was strong, and enjoys being with plants, no matter whether they are ornamentals or vegetables. He said that he enjoyed the trial and error inherent in gardening, looking for information to solve problems, and analyzing situations, while considering his limited time and space. He pointed to several things as motivations for joining the research. He had already been wanting to grow vegetables and

noticed ideas during the presentation that were new and interesting to him that could save time yet still provide good harvests. Health is important to him and so he would like to minimize his and his wife's exposure to chemicals in produce. Lastly, like others, he wanted to help out with the research. He commented that, because he has research experience, he knows that doing research is difficult, for foreigners as well as for Thais.

4.2.2.2 *Participants' innovation-decision processes.*

Rogers discussed at length whether or not there are actually distinct stages of the process. He concluded that there is sufficient evidence to support the claim that people who start the innovation-decision process go through at least some stages, adding that not all the stages are clear-cut. So, it was with this research; several participants reached the *implementation stage* of this process, while others did not go beyond the initial stage of awareness of the methods. For some participants, some stages were particularly difficult to distinguish, especially the decision and implementation stages. Rogers explained that the decision stage entails "*activities that lead to a choice to adopt or reject an innovation (emphasis added)*", then seems to contradict himself by stating that, until the implementation stage, "the innovation-decision process has been a *strictly mental exercise* of thinking and deciding (emphasis added)". Resolving this apparent contradiction seems to lie in determining whether or not the activities in the decision stage were partial, and exploratory. If so, they may properly be placed in the decision stage.

Jo's innovation-decision process Her husband was actually the catalyst for her to make the decision to try gardening. He was a little more interested in having a vegetable garden, but had no interest in taking care of it. The knowledge stage of this process occurred after the researcher discussed the research plan with Jo's husband, who then discussed it with her. During the persuasion stage, her initial impression of the 3 methods was unfavorable because they were strange to her, yet added that she understood the methods and understood how and why they work. They were new to her and it was the "uncertainty associated with this newness" (Rogers, 2003)

that framed her attitude. Newness is sometimes a positive factor, but usually only for the innovator class of adopters, and Jo was not an innovator. She never stated overtly, but judging from her comments, and coolness toward the methods, it is likely that she “never really [considered] the use of the innovation,” so passively rejected them at this stage (Rogers, 2003). She did not enter the decision stage because she did not engage in activities that led to her rejection. Instead of trying one of the methods, she decided to try planting in pots on the balcony of their home. Eventually she neglected the plants and they died. Afterwards, her husband decided to try to stimulate her interest in a hugelkultur bed, so he and the researcher made one. She had an unfavorable impression of it, because it was unattractive and was not made using materials she wanted. Volunteer plants were coming up strong and healthy, but because direct composting of fruit and vegetable scraps was done improperly, mold infected the plants and ants created various troubles. She never became interested in the hugelkultur bed either, and became interested in starting in-ground garden beds, largely so their daughters and homeschool children could get gardening experience. As far as the 3 methods are concerned, she stopped at the persuasion stage.

Sing's innovation-decision process The knowledge stage came as Sing attended a meeting called by a community volunteer arranged so the researcher could briefly explain this research to community members, then ask them to join the research. In the meeting, he immediately expressed interest in joining. Later, during the data collection period, he mentioned that he liked learning and trying new and unusual things with respect to gardening and food. Thus, it is unsurprising that he had a favorable impression of the idea of having a garden during the persuasion stage. It should be noted here that Sing expressed a generally favorable attitude towards Westerners, but added that the researcher being a Westerner had no bearing on his decision to join the research or to try the two methods. He formed a favorable impression upon learning of the methods, but since he had the choice to choose any method at all, he chose typical in-ground beds because he was more familiar with them. Later, at the meeting with this research's co-advisor, he gladly agreed to try 2 of the 3 methods. He related that had he understood

well from the outset that the researcher tried to persuade him to try one or more of the introduced methods, he would have quickly obliged. Because he was eager to try new gardening ideas, during the decision stage, immediately after the meeting with the co-advisor, he and the researcher made a hugelkultur bed, and two days later, Sing made a wicking box. During the implementation stage, the plants in the wicking bed grew well, and there was no necessary maintenance. However, the hugelkultur bed probably lacked soil and is the likely reason the plants never grew very well. Despite explanations that he was responsible for the garden beds after construction, he did not add soil or do anything else to improve the plants' growth. He did not seek reinforcement for adoption of the 2 methods he had tried, so never reached the confirmation stage.

Wut's innovation-decision process The knowledge stage happened during the initial presentation of this research, which included a detailed explanation of the methods. Yet only at the end did it become apparent that he did not understand how the methods worked, and why they could meet the needs of many urban gardeners, lacking what Rogers called "principles knowledge." During the persuasion stage, he always had a negative impression of the methods, insisting at the end of the research, that there was too much unnecessary effort. However, during the middle period of the research, he said on two occasions that he would try a hugelkultur bed and a sheet mulch bed, but never initiated the work. He did not explain why he did not actually try them, but it is likely that since he was pleased with his methods, he never became interested enough. He never entered the decision stage because he did not engage in activities that led to his rejection. His decision was arrived at logically, not through a trial of any of the methods. Given his easy-going attitude towards gardening, he was uninterested in trying these untested ideas that he considered would be not worth the effort. He wanted to try improving the soil through manure and microbial inoculants. The manure was free and plentiful, and is a tried and true method of soil enrichment, so he was comfortable with this. He only learned of microbial inoculants during interviews with the researcher, from whom he learned that a wealth of information on these inoculants is easily available in Thai language. It is likely that using these 2 things to improve the fill-dirt was more consistent

with his easy-going gardening attitude than searching out a variety of materials, some of which may have required a little more effort to obtain.

Mai's innovation-decision process As with most of the participants in this research, the knowledge stage for him occurred during the presentation of the research and gardening methods. During the persuasion stage, he formed unfavorable impressions of the methods because he saw them as unnecessary for him. His reasons for the unfavorable impressions are 1) he was not very interested in gardening 2) he misunderstood the fundamentals of the wicking box, but did not say so until the end of the research 3) he felt that it would require too much effort to gather the materials to make a sheet mulch bed and 4) he was happy with his previous knowledge of gardening, gained from his childhood in the countryside. As with Wut, he never entered the decision stage because he logically decided to reject the methods; he had not engaged in activities that led him to reject the methods. Also, it is likely that he never really considered the methods, and if so, then he passively rejected the methods. He added that the methods might be good for people with little time or space, but not for him because he had enough time and space. Had he been asked at the beginning to try a method, he said he would have, because he would have felt bad if he had not obliged.

Nit's innovation-decision process The knowledge stage also occurred for her during the presentation of the research and the methods. Later, while she maintained the boxes, it became clear that she had only awareness-knowledge, but had neither how-to knowledge nor principles knowledge. Lack of how-to knowledge was demonstrated by her watering every day, though she was told repeatedly during the data collection period that only once a week or less was enough. And, lack of principles knowledge was demonstrated by daily watering the soil directly in addition to filling the boxes through each boxes' watering pipe, though it was repeatedly explained to her that only filling the boxes via each boxes' pipe was sufficient. During the persuasion stage, it is difficult to know if she had truly formed a favorable impression of any of the methods. As stated above, she only agreed to try gardening and join the research out of courtesy and friendship to a mutual friend. This friend urged her to try 2 wicking boxes (Fig. 4.4), to which she agreed.



Figure 4.4 Nit's morning glory plants

This decision was based almost entirely on her friendship with, and trust in, the mutual friend, but also because she understood that the boxes would require little time and effort to make and maintain. During the decision stage, she tried the two wicking boxes and at this time did indeed form a favorable impression of the method. During the implementation stage, she or her daughter watered every day, and neighbors harvested two rounds of vegetables that everyone was pleased with. Rats were a small problem for a while but she did not do anything to deter the rats or seek anyone's help because her interest level was not that high. She said that in the future, she will likely change to culinary herbs that require less frequent watering, because she is worried that nobody will water the plants when she is away in Singapore.

Thin's innovation-decision process The knowledge stage occurred during the presentation of the research and the methods. During the presentation, he expressed disinterest in the methods, so it may be said that the persuasion stage also occurred during the presentation. He would not explain why he was uninterested, only

stating that he preferred instead to do a simple in-ground bed. He explained during the closing interview that had he had more gardening skills and knowledge that he would have tried one of the methods, but would not elaborate on why he did not consult the researcher or ask for my help with the methods.

Jai Dee cul-de-sac This a small cul-de-sac of 7 households. The residents of 4 households were close friends and often traveled and ate together. Noot and Somchai had already started gardening when Noot saw this researcher's Facebook post looking for participants among the local urban gardening group. She then contacted her neighbors Suwit, Jane, and Phairin, who all agreed to join after this researcher conducted the research presentation. Noot and Somchai participated in the portion of this research regarding the first objective, while Suwit, Jane, and Phairin participated in this portion regarding the second objective.

There was a large vacant lot across the street from the participating houses where there was more than enough space for a garden. The owner gave Noot and Somchai permission to garden on his property until the time the land would be sold. During the initial stage of this research, these participants worked together on a roughly 10-square meter garden plot. Later on, they each took an additional 3-square meter section of the vacant lot.

Suwit's innovation-decision process The awareness stage occurred during the presentation of the research and the methods. Before the actual presentation, upon first hearing that gardening was not inherently hard work, and required a lot of space, he expressed surprise and immediate interest. This could perhaps have been the beginning of the persuasion stage for him. However, his low level of interest in gardening and in the methods, became obvious during the initial interview. At this time, he made it clear that he was not particularly interested in the methods themselves. It is very possible that he never really considered using the methods, which would mean that he had already passively rejected the methods at this stage. Yet because he had agreed to join the garden work with his friends in the cul-de-sac, there was still the opportunity for him to form a favorable impression of the methods. There was no clearly defined decision stage

for him. He actually did form a favorable impression of the wicking bed method at this stage, through participation in the garden work with his friends. Had he been more interested in gardening, and had he had more experience and understanding of gardening, he may have formed an impression before the decision stage. There is no distinguishing when the implementation stage started as he had already joined the group doing the garden work in the decision stage. He expressed satisfaction with the wicking boxes because the yields were better than he had expected. He stated during the closing interview that he would probably use wicking boxes in the future, but that this was not 100% certain because he was still getting organic vegetables on a regular basis from his parents' farm in the countryside. Thus, he cannot be said to have entered the confirmation stage.

Jane's innovation-decision process The awareness stage occurred during the presentation of the research and the methods. Like Suwit, she may have passively rejected the methods, in part because she was also getting organic vegetables from her parents' farm in the countryside. But, also like Suwit, she agreed to join her friends in the cul-de-sac, therefore she also had the opportunity to form a favorable impression of the wicking boxes. During the persuasion stage, she formed a favorable impression of the methods. Need to get more info so I can ask about her impressions of the methods.

Phairin's innovation-decision process For her, the awareness stage also occurred during the presentation of the research and methods. She was already long interested in gardening, but the persuasion stage formed an unfavorable impression of the methods because they were unfamiliar. She started the decision stage after the meeting with the researcher's co-advisor when she agreed to try a method. She and Jane cooperated on several boxes that they made with this researcher. The vegetables in the initial wicking boxes did not grow well, because the soil used was inappropriate for growing vegetables. The second attempt produced much better harvests because she used a rich soil (Fig. 4.5). It was sometime during the second wicking box attempt that the implementation stage occurred, and she adopted the wicking box. By the time of the closing interview, she was a solid wicking box proponent. Due to her enthusiasm for

vegetable gardening, and her strong satisfaction with the wicking boxes, the researcher felt that she was the participant most likely to continue with the method into the long-term future.



Figure 4.5 Phairin and Jane's wicking boxes with bok choy

Chalit's innovation-decision process Like all the others, the awareness stage occurred for him during the presentation of the research and methods. During the persuasion stage, he formed an unfavorable impression of the methods, remarking that they were unsuited to his situation. This suggests that he did not have principles knowledge, because if he had understood the principles of the methods, he would have understood that more than one of them could have been easily enough applied to his situation. As with several others, he never reached the decision stage because he rejected the methods at the beginning.

4.2.2.3 *Relation between background and innovation-decision process.*

The following analysis and discussion will synthesize the relation between participants' backgrounds and their innovation-decision process to look for

patterns that may help to explain why adopters adopted the innovative gardening methods and why non-adopters rejected them. Included are the more commonly cited obstacles to UA with respect to participants' socio-economic background. It should be kept in mind that with a sample size of only 10 participants, it is impossible to generalize these results to the larger population.

- *Gender*: It is impossible to make any conclusions about gender. There were 6 male participants and 4 female participants. Of the adopters, 3 were females, and 2 were males. Of the non-adopters, 1 was a female and 4 were males.

- *Type of home*: More participants who lived in townhouses adopted than those who lived in stand-alone houses. Of the participants in townhouses, 4 adopted, while 2 rejected. Of those in stand-alone houses, 1 adopted and 3 rejected. The only relevant factor related to type of home is the amount of space for a garden. Stand-alone houses have much more space available for a garden than townhouses, yet fewer residents of the former type adopted. Although these homes had space for a hugelkultur bed or a sheet mulch bed, only 1 participant tried a hugelkultur bed.

- *Ages*: All adopters were generally older than the non-adopters. Adopters were 42 to 60 years old, while non-adopters were 25 to 43. All of the several ideas this researcher has speculated on with regard to age in this context have been discounted.

- *Occupations*: The only likely factor related to occupations that could have influenced decisions to adopt or reject is time, but participants' jobs could not have not played a role in the outcome of the innovation-decision process. Only the doctor – a non-adopter – may have been so busy that he could not do the gardening, and may have had nobody else to help when he could not do the work himself. Though 2 of the non-adopters were very busy with their jobs, they said that others in the home were available to tend the gardens. Among adopters, 2 were retired, and among non-adopters, 2 were company employees. There were self-employed participants among both adopters and non-adopters.

- *Education*: The level of completed education does not help to explain adoption and non-adoption. Of the 10 participants, 8 had a bachelor's degree. An equal number of these were adopters and non-adopters. One adopter had not completed primary school, while one non-adopter had a vocational college certificate.

- *Experience and know-how*: This was not a factor in the decisions. Both participants who had no experience with gardening (Nit and Suwit) decided to adopt, while the 2 participants with the most experience and know-how were non-adopters (Wut and Mai). The opposite might be logically assumed: that the more experienced would be among the innovators.

- *Intrinsic motivation*: This appears to have been the most influential factor. Sing and Phairin – both adopters – clearly enjoyed gardening, while 1 non-adopter (Wut, who had decades of experience) was unsure if he enjoyed gardening, though pointed to some aspects of gardening that he did enjoy. Two other adopters (Nit and Suwit) had no intrinsic motivation, yet adopted because they had adequate extrinsic motivations. Based on observations made mostly during conversations with Nit and Suwit, this researcher's opinion is that they are unlikely to continue using the wicking box for the long term, because they were not intrinsically motivated. One adopter (Jane) was only mildly intrinsically motivated to adopt, so other external factors may determine whether or not she continues to use the wicking box.

Consistent with the claims in section 4.2.1.3, the stand-out factor is internal motivation. All socio-economic factors, and factors related to experience and know-how, space (type of home) and time (occupation) show no correlation to adoption or rejection decisions. Intrinsic motivations are generally more potent than extrinsic motivations, thus the adoption decision of the intrinsically motivated adopters is likely to be longer-lasting than that of the extrinsically motivated adopters.

4.2.3 Attributes of the innovations and participant's attitudes of them.

This section examines participants' attitudes of the 3 gardening methods that were introduced, through the lens of Rogers' analysis of *attributes of innovations*. He determined that, by describing innovations in view of 5 main attributes and several sub-

dimensions, it is possible to explain the rate of adoption. This research did not examine rate of adoption, but these attributes help to explain the decisions by research participants to either adopt or reject the 3 gardening methods. The 5 attributes are relative advantage, compatibility, complexity, trialability, and observability. As a whole, examining participants' comments regarding these attributes, in addition to observations made by the researcher, contributed more to understanding their decisions than other extrinsic motivation factors analyzed in this research. For the sake of clarity, definitions of important terms are reiterated briefly.

Relative advantage is defined as “the degree to which an innovation is perceived as better than the idea it supersedes” (Rogers, 2003). During the design phase of the research, all 3 methods were determined by the researcher to be improvements in various ways over the methods that were common among city dwellers. Based on participants' comments during interviews, this was the most influential factor in most decisions to either adopt or reject. Meaning, either presence or absence of the perception of relative advantage led most participants to adopt or reject.

Five participants tried a wicking box, and all formed favorable attitudes toward the relative advantages. Sing and Phairin tried and adopted wicking boxes, appreciating that they were easy to create and needed no maintenance other than occasional watering, and that they gave good harvests. Sing tried a hugelkultur bed also, but because the plants did not grow well, the potential relative advantages were not realized. Three adopters (Sing, Jane, and Phairin) have more or less recent experience with vegetable gardening so could compare these methods to what they were already accustomed to. In contrast to adopters, all 5 non-adopters did not try any of the methods; most determining that there was no relative advantage for their situations. Wut explained that the in-ground method that he was used to was adequate, and the time and effort needed just for construction of a hugelkultur bed or a sheet mulch bed were not worth it for him.

The sub-dimensions identified by Rogers are “economic profitability, low initial cost, a decrease in discomfort, social prestige, a saving in time and effort, and immediacy of reward”. The sub-dimensions worth examining here were low initial cost, immediacy of reward, and a saving in time and effort.

The initial costs of making the wicking boxes were to buy very cheap second hand styrofoam boxes, and sacks of inexpensive potting soil. There was no cost in making Sing's hugelkultur bed. Participants remarked that these initial costs were not too expensive, thus low initial cost is seen here as a positive influence on adopters.

After some modification, the next 2 sub-dimensions, immediacy of reward, and a saving in time and effort, were the 2 main factors involved in participants' decisions to adopt the wicking boxes. The first of these, *a saving in* time and effort, has been modified here to say *required* time and effort. Four of the five adopters expressed satisfaction with the amount of time required, and 2 expressed satisfaction with the amount of effort required. The boxes were only about 20 x 30 x 30 centimeters, thus watering only took a few minutes once a week or less, after the boxes were made, filled with soil, and planted. Similarly, little effort was required for minimal weeding. For the majority of participants, who were not already gardening immediately before joining the research, there cannot be said to have been any *saving* in time and effort. Thus, the measure here is that they were satisfied with the amount of time and effort *required*, not the time and effort *saved*. Suwit had plenty of free time, thus was the only adopter who was not swayed by the small amount of time required. Phairin often felt she was very busy with raising her granddaughter, and other household responsibilities, so appreciated the little time and effort the boxes required. Nit remarked that she was happy that watering the wicking boxes required little time, because she often spent most of the day away from her home. Also, because she sometimes went away for several days at a time, she was not always available to water the boxes. Both she and Suwit were not interested in gardening, hence they appreciated the minimal time requirement.

The second sub-dimension, immediacy of reward, is interpreted by this researcher to mean that benefits of the wicking boxes would have been noticed within days after planting. There was no such immediate reward, which only came several weeks after making the boxes and planting them out. The reward was an abundance of healthy vegetables, which all adopters identified as an important reason for adoption. Thus, by considering the abundant harvest as a reward, albeit not an *immediate* one, it is possible to see *reward* as a modified sub-dimension that was very influential in adopters' decisions. Sing remarked that he was pleasantly surprised at how much morning glory the wicking box yielded. Suwit was very happy with the kale and Chinese cabbage harvests, commenting that the amounts harvested were beyond his expectations. Phairin countered him by saying that abundant harvests are to be expected, but that she was also very satisfied. It may be said of the wicking boxes that for a small initial cost and minimal time and effort, they offered substantial rewards. Relative advantage swayed all adopters, but also was influential in the decisions of most non-adopters, in that comments by the latter may be interpreted as having seen no relative advantage.

Rogers defined *compatibility* "as the degree to which an innovation is perceived as consistent with "(1) sociocultural values and beliefs, (2) previously introduced ideas, and/or (3) client needs for the innovation". During the design stage of this research, the idea of compatibility was considered only in the context of "needs of potential adopters" as perceived from the researcher's point of view. A shortcoming in the design of the research is that these 3 factors were not investigated thoroughly.

The 3 methods may have been incompatible with Thai sociocultural values and beliefs, insofar as Jo stated that she considered them strange, that most Thai people would not understand them, and would also see them as strange. Wicking boxes appear very similar to the already common practice of planting in styrofoam boxes, thus compatible on the surface, but some people may not be ready to adapt to subtle differences that are not readily apparent. Hugelkultur beds have a distinct mound shape, which, as a garden bed, is unusual in most parts of the world, hence would probably not be easily accepted by many Thais. In fact, people writing in to the Permies hugelkultur

forum who make these in front of their suburban homes comment that their neighbors express dissatisfaction with the appearance of the beds. Sheet mulch beds as well, due to the unconventional appearance, may also be unacceptable in Thailand. During the presentation of the research, it was made clear that both hugelkultur beds and sheet mulch beds may be adapted to very small scale and can be made very attractive. The wicking box was compatible with the needs of Phairin in that she was already familiar with container gardening (for ornamentals) and wanted space-efficiency. Also, though she had enough time for gardening, and was allowed to use the vacant lot across from her home, she did complain of limits to her time and space. Sing said of the wicking box that he liked its compatibility for people who have little time to look after their gardens, adding that if they travel often, there is no need to worry that the vegetables will wilt.

As Rogers pointed out, there is often no clear distinction between some attributes. Here, the hazy difference between relative advantage and compatibility is illustrated by Wut stating that there was no need for the 3 methods because he was happy with in-ground beds. This statement may be interpreted as he saw no relative advantage, or that he considered them incompatible with his needs. Mai, Thin, and Chalit also said they had no need for the methods because they were not suited to their situations. Mai said that the methods were applicable only for urban gardeners who had limited space and time, which was not his situation. It is possible to interpret their statements with the same uncertainty about Wut's statement. Compatibility was an important factor in the decisions of many adopters and non-adopters.

Rogers definition of *complexity* is "the degree to which an innovation is perceived as relatively difficult to understand and use". Complexity is related to *how-to knowledge* (the "use" part of his definition) and *principles knowledge* (the "understand" part of his definition), which were explained above. All of these methods may have been seen by participants as complex, as they seem to have been difficult to understand. Judging from comments from participants who said these methods were not suited to their needs, there seems to have been a misunderstanding during the presentations of the methods. Since all 3 methods use principles that are quite different from what is in

common use among most Thais (as well as most people in any country), imparting an understanding of them apparently requires a communication skill that the researcher did not possess during the presentations. Both Sing and Wut stated well into the data collection period that they did not understand how the hugelkultur bed and the sheet mulch beds worked. This lack of understanding, and the participants not communicating such, could very well have hindered eventual adoption by several participants. Nit, from the beginning of the data collection phase, clearly did not understand how the wicking box worked (in that she watered every day, and watered both the soil directly as well as into the watering pipe), yet she did not express that she did not understand. Phairin and Sing, on the other hand, were in the minority as they understood the wicking boxes well from the start. Though the wicking boxes are unusual in their design, function, and in how they are used, their user-friendliness was a positive influence on adopters.

Trialability, as Rogers defined it, is “the degree to which an innovation may be experimented with on a limited basis”. When diffusion researchers do large scale research, their participants often have much at stake if they adopt innovations that prove harmful or unfortunate. Therefore, the participants will usually start off by trying out an innovation on a small scale to determine if the results are acceptable, and perhaps adopt full-scale after an appropriate trial period. The risk of adopting the gardening innovations in this research posed no risk at all, thus any pressure to trial a method would have been mild. For purposes of this research, the trial period coincided with the decision stage (when participants started using the methods), and the implementation stage, when they stated their intention to either continue or discontinue using the methods (at the end of the data collection period). Owing to the small extent of the adopters’ use of the wicking boxes, and the absence of any risk of adopting the methods, this factor is considered irrelevant to the results of this research.

Observability was defined as “the degree to which the results of an innovation are visible to others”. The participants’ gardens were largely unexposed to the general public. Sing’s garden is set off the street, where passersby would have had no idea a garden existed there. Both Nit’s cul-de-sac and Jai Dee cul-de-sac were small, so

mostly only their neighbors had any chance to see the wicking boxes. Observability in all cases was thus limited to a very small number of people. Rogers stated that social status is a sub-dimension of relative advantage. Using an innovation in complete isolation, there is no sense of gain in social status, and observability has no role in adoption (and diffusion) of innovations. Due to the very limited visibility of these wicking boxes to others, this factor is also considered irrelevant to the results of this research.

A potential adopter's perceptions of an innovation's attributes play a major part in the decision leading to its adoption. As Rogers insisted, these same perceptions also play a major part in the process of non-adopters. In the case of these gardening innovations, it may be summed up that the major factors here were perceived presence or absence of relative advantage, compatibility, and complexity.

4.2.3.1 *Motivation in the context of attributes of the innovations.*

Examining motivation in the context of the attributes of the innovations illustrates that, in nearly every case, even if the relative advantages are low, if sufficiently motivated intrinsically or extrinsically, the innovation will at least be given a trial. Afterwards, upon a practical and reasonable review of the entire situation (including one's motivation), the innovation will either be adopted or rejected. For instance, if an innovation requires a relatively high initial cost, offers only delayed rewards, and has high demands on time and effort, in a motivated individual, the innovation will be given a fair trial. The same goes for an innovation that is inconsistent with socio-cultural values, is unlike anything previously introduced, does not meet the client's needs well, is difficult and inconvenient to trial, is considered complex, and brings few or no benefits of others observing the innovation, it will be tried out, so long as the individual is motivated enough. One possibility is that the innovation will only be adopted for its uniqueness, and not for practical purposes. In almost all cases, the root factor in adoption and rejection is *degree* of motivation.

4.2.4 *Innovativeness and adopter categories.*

This section will examine each of the 10 participants from the standpoint of how innovative they were, using Rogers' adopter categories as the basis for analysis. Data comes from the interviews, informal visits with participants, and from the

researcher's observations. The analysis will commence with a study of characteristics of adopter categories relevant to the context of this research, then continue with a brief attempt to identify an appropriate category for each adopter.

In Rogers' book, the adopter categories may be considered plots of relative time (over a given period of time) on a scale of adoption from the first adopters in a social system to its last adopters. Such a time scale would be irrelevant to this situation due to its small number of participants, and the even smaller number of adopters. A time scale would only be useful when considering relative adoption times of a large group of people, in order to understand adoption patterns within the group. Despite the small number of participants and the short time frame, these adopter categories are still useful as a tool to examine innovativeness as a factor that possibly influenced participants to either adopt or reject the gardening methods. More innovative people are more likely to adopt.

In the context of organizational innovativeness, Rogers discussed how an individual, or set of individuals, is responsible for the innovativeness of the organization. This research used the individual as the sole unit of analysis, not the household, which could be likened to an organization. It cannot be ruled out that one or more members of a particular household had at least some influence on the participants to decide to adopt or reject, yet this has not been considered. Thus, all decisions by participants are considered to correspond to Rogers' "optional innovation-decisions," which he defined as, "choices to adopt or reject an innovation that are made by an individual independent of the decisions of the other members of the" group under study (2003).

4.2.4.1 Characteristics of adopter categories.

In *Diffusion of Innovations*, Rogers elaborated to varying degrees on the variables of socio-economic characteristics, personality values, and communication behaviors of "earlier adopters" contrasted with "later adopters," the former being more innovative. Only a few selected socio-economic characteristics and 1 of the communication behaviors are of value for analysis here. The author's discussion of these variables was quantitative, in contrast to the qualitative nature of this research. Therefore,

any consistency between Rogers' findings and those of this research are not necessarily significant. Rogers stated that there has been little research on the personality values because of the difficulties in measuring them during diffusion surveys. These variables would have been difficult to investigate during this research as well, and were not included in the research design.

The socio-economic characteristics analyzed here are

- age
- education level
- social status (income and occupational prestige)

The communication behavior analyzed here is

- contact with the change agent

Socio-economic characteristics

Age Rogers said that there is no consistency in studies as to whether there is a correlation between age and innovativeness. While most results show no relationship, "some indicate that [earlier adopters] are older," which is consistent with the results from this research. Adopters were 42 to 60, while non-adopters were 25 to 43.

Education level Rogers' findings were that "earlier adopters have more years of formal education than do later adopters," thus, tend to be more innovative. This is inconsistent with the findings of this research, where an equal number of adopters and non-adopters (4 out of 5, or 80%) held a bachelor's degree.

Social status Rogers' book listed several variables as indicators of social status, only 2 of which are suitable for analysis here: income and occupational prestige. Income is a simple quantitative, objective factor, while occupational prestige is a qualitative, subjective factor. Findings in *Diffusion of Innovations* were that higher social status corresponded with earlier adoption, and so innovativeness, though these research results were inconsistent with Rogers' findings.

- *Income* With regard to income specifically, there was no correlation between income and adoption or rejection. The incomes of participants ranged from 15,000 baht per month per household to 80,000 baht per month per household.

Rogers used the relative term “wealthier” to discuss wealth with respect to socio-economic status, thus, this research will compare participants’ wealth relative to the provincial average. The Songkhla Provincial average income for 2015 of 27,660 baht, is used here as the standard for comparison. Participants in this research whose incomes were higher than this average are grouped in “Lower incomes,” while incomes lower than this average are grouped in “Higher incomes” (Table 4.6). Two adopters had higher incomes, while 1 adopter had a lower income. Three non-adopters had higher incomes, while 2 had lower incomes. Three respondents declined to divulge their incomes, but the researcher is a friend to the husband of one participant, so knows the family to a degree enabling confidence to have placed the family in the higher income bracket. The researcher has no idea of the incomes of the other 2 participants who declined to state their incomes. Disposable income is likely a better indicator than gross or net income for adoption-rejection research, though this factor was not accounted for in this research. The research results show no pattern of correlation with income levels and innovativeness.

Table 4.6 Higher and lower income breakdown of adopters and non-adopters

	Lower incomes	Higher incomes	Unknown
Adopters	2	1	2
Non-adopters	1	4	0

- *Occupational prestige* This variable is subjective, yet there is some degree of objectivity that may be analyzed. This generally consider doctors and lawyers to be prestigious occupations. One of the participants in this research was a young practicing doctor of Chinese medicine, and 1 was a retired lawyer. Only these 2 may be said to have high occupational prestige. The doctor rejected the methods without trial, while the retired lawyer adopted the wicking box method. The occupations of the other participants included several who were self-employed, some lower level company employees, a housewife, and a retiree. The findings of this research show no correlation with participants’ occupational prestige and innovativeness.

Communication behaviors

Though Rogers gleaned 9 factors regarding communication behavior from research studies, data from participants in this research was collected regarding only change agent contact.

Contact with a change agent, i.e. the researcher Rogers concluded that, "Earlier adopters have more contact with change agents than do later adopters". This researcher made every effort to maintain close contact with participants during the data collection period, and to a lesser extent, afterwards. Due to various factors, the amount of contact was not the same with all participants, mainly due to factors among participants, such as work and other personal responsibilities. Analysis of the number of contact days suggests that it was possible that adopters were to some degree influenced by contact with the researcher. There were more total days of contact with adopters than with non-adopters (79 days vs. 62 days). The most contact was had with the 2 adopters who were most enthusiastic about gardening and about the innovations (20 days and 27 days), though the smallest number of contact days was had with an adopter (6 days). This contact was in person, via social media, and on the phone. But these numbers do not take into account that it was extremely difficult to make contact with several participants, mainly non-adopters. The quality and amount of contact with the researcher had a bearing on adopters' decisions, but due to the small sample size of this research, cannot be seen conclusively as supporting Rogers' findings.

With respect to the possible influence of the characteristics of adopters, it is concluded here that if any factor had an appreciable influence, it was the amount of contact adopters had with the researcher. The socio-economic factors contributed to more or less homophilous relationships, which may have facilitated relatively smooth communication, possibly influencing the amount of contact, and in turn perhaps influencing adopters' decisions.

4.2.4.2 Identification of appropriate category for adopters.

In this section, 3 factors will be considered in placing the 5 adopters into adopter categories: the analysis of their socio-economic characteristics and communication behavior, and the researcher's observations, as another means of

determining their innovativeness, and therefore likelihood of adopting a method. At the end of this section, Table 4.7 will show these placements.

Sing could be classed as an innovator or an early adopter. His age and the frequent contact with the researcher would place him as an early adopter. Yet, he stated from the outset, and repeatedly thereafter, that he was interested in new gardening ideas, and his quick and enthusiastic trial of the wicking box and hugelkultur bed are evidence of his innovativeness.

Nit is either a laggard or perhaps even a non-adopter. Only her age would place her an adopter category, yet, because she had no interest in gardening, she is best placed as a laggard. It should be kept in mind that she only agreed to join the research out of courtesy to her neighbor friend. She was the first to try a method, and was pleased with the results she got from it, yet she exhibited none of the characteristics of an adopter.

Suwit is also best categorized as a laggard or a non-adopter. All of his socio-economic factors (with the possible exception of his income), would place him as an adopter, while the communication behavior would not. He had no interest in gardening, and was motivated to join the research for reasons unrelated to gardening, and is similar to Nit as a laggard, or perhaps a non-adopter.

Jane is probably best categorized in the early majority category or late majority category due to 1 of the 4 socio-economic characteristics (communication behavior), in combination with her enjoyment of gardening.

Phairin would fit in either the early adopter or perhaps the early majority category because of two of the socio-economic characteristics and the communication behavior, as well as her readiness to try the wicking box, eagerness to do the work, enthusiasm in talking about her wicking boxes, and love of gardening in general.

To sum up the comparison of Rogers' analysis of the personal characteristics that are common to earlier adopters, and those of this research, the results were mixed, but leaned towards not confirming his findings. The socio-economic characteristics of these participants generally did not coincide with Rogers' findings. Age coincided, while education level, and social status derived from income and occupational

prestige did not. The communication behavior (amount of contact with the researcher) was consistent with his findings. When considering Sing's and Phairin's eagerness to try the wicking boxes, and their comments during informal visits, these 2 adopters should be considered the most innovative of the adopters, and their adoption would coincide with Rogers' findings that innovative individuals are more likely to adopt. The one thing that this research uncovered that Rogers seems to have overlooked is intrinsic motivation as the pivotal factor influencing an adoption decision. It is not this researcher's intention to argue that Rogers was unaware or uninterested in intrinsic motivation. It is quite possible that the community of adoption and diffusion researchers did not seriously consider this factor in their research designs, and / or did not notice it during data collection, so upon reviewing the thousands of adoption and diffusion researches, this issue was not available to discuss in his book.

With regards to being considered innovative, it should be kept in mind that this is pertains to particular innovations, and by no means implies an inclination to be generally innovative in life. Adoption research is specific to a particular innovation, or to a particular aspect of life, and any identification of being innovative or not innovative, is in regards only to the innovation under study.

Table 4.7 provides a quick and convenient visual review of the researcher's assessment of appropriate adopter categories of each adopter. Vertical lines in the row of participants' names were purposefully left out for flexibility in category placement. Sing, Phairin, and Jane could be placed in either of 2 categories, while Nit and Suwit clearly belong only in the late majority category.

Table 4.7 Adopter categories

Adopter categories	Innovator	Early adopter	Early majority	Late majority	Laggard
Participants' names	Sing	Phairin	Jane	Nit, Suwit	

4.2.5 The change agent.

Rogers (2003) defined a change agent as “an individual who influences clients’ innovation-decisions in a direction deemed desirable by a change agency”. In this research, the change agent was the researcher, as the main initial efforts were to have participants try a gardening innovation. However, because it was also made clear that agreeing to try one of the innovations was not a condition of participating in the research, the researcher did not strictly adhere to this definition of a change agent.

The author proposed 12 factors related to the change agent that influence adoption of innovations, 6 of which are worth examining here. Similar to the socio-economic characteristics, 1 of these is quantitative, while the others are qualitative. Four suggest that the “change agent’s relative success in securing the adoption of innovations is positively related” to 1) extent of contact initiated by the change agent 2) expression of empathy by the change agent 3) participants’ perception that the change agent is credible, and 4) a high degree of *homophily*, i.e. sameness. The other 2 describe the participants, namely, higher socio-economic status, and higher formal education. Change agents are typically of a higher socio-economic status than most clients, and are more likely to have an affinity with clients who also have a higher socio-economic status, thus “have the most contact with clients who are much like themselves”. Frequent contact often influences clients to adopt innovations.

These 6 factors will be investigated in the same order as they appear above. 1) *Extent of contact from the change agent*: This was detailed in section 4.2.5.1, thus there is no need to elaborate here. 2) *Empathy from change agent*: This researcher was aware that he usually was using the empathic interpersonal skills that Rogers said are effective in achieving adoption, not consciously in order to increase the chances that participants would adopt, but out of genuine interest in communicating with the participants, in gardening, and in the gardening methods. 3) *Perception of change agent credibility*: the author stated that, in general, heterophilous change agents “are perceived as having competence credibility”. Considering that none of the participants had ever had any knowledge of these gardening innovations, and that the researcher was able to talk at length about them, and help make several boxes and one hugelkultur bed, it is likely

that all or most participants believed that the researcher was competent with the innovations.

The fourth, *high degree of homophily*, will be discussed at length because it is the most important aspect of the relations between clients and change agent. Rogers made 4 generalizations that “suggest that more effective communication between change agents and their clients occurs when they have a higher degree of homophily with each other”. The degree of homophily-heterophily between the Thai participants and this American research student is difficult to gauge. Though this was not mentioned in the book, the *perception* of the degree of similarity in the eyes of clients and change agent is more important than a quantifiable analysis of homophily-heterophily.

Rogers mentioned several factors leading to homophily, among them, education and socio-economic status, therefore participants and researcher will be compared in terms of the following 3 factors: 1) age 2) income, and 3) education level. All 3 are quantifiable, yet a qualitative component (i.e. the participants' possible perceptions) is included in the last two.

- *Age* The researcher was 52 during data collection, with participants ranging from 25 to 60. The researcher was older than 7 of the participants, with a difference between 1 and 27 years. Adopters ranged from age 42 to 60, while non-adopters ranged from 25 to 43. There was relatively high age homophily between adopters and the researcher.

- *Income* During the data collection period, the researcher informally made known his income level to all participants. This income was less than or equal to the participants with the lowest income. Thus, lower income participants more likely saw the researcher as homophilous, while higher income participants more likely saw the researcher as heterophilous. Because both adopters and non-adopters fell into both lower and higher income groups, no conclusion can be made whether income homophily-heterophily influenced participants' decisions.

- *Education level* Academics and those pursuing higher education, are held in high regard by many Thais. Four adopters and 4 non-adopters held a bachelor's degree, while no participants held a higher degree. Several participants commented that they understood the rigors of research, and that they were motivated to join in part to assist with the researcher's education goals. Participants probably perceived a high degree of education homophily, even though (or perhaps because), the researcher has not completed the master's degree.

The ultimate question in this section regards whether the participants' decisions to adopt or reject were affected to any degree by the perceived homophily-heterophily between them and the researcher. The above analyses of the 3 characteristics, included both objective and subjective factors. Because of the emphasis placed on participants' perceptions of homophily-heterophily (as perceived by the researcher), the conclusion is inescapably a subjective one. Contact with the researcher had at least a mild influence on 4 adopters, while it is likely that this contact had little or no influence on 1 adopter. Furthermore, there may have been a tendency on the part of the researcher to initiate more contact with participants who were more homophilous, though there is no way to substantiate this.

Regarding motivation, as is the case with attributes of the innovations, so the case with factors associated with the change agent. Though the client may feel that the change agent makes contact too infrequently, lacks warmth, empathy, and credibility, and is very dissimilar, these will not deter a potential adopter who is otherwise sufficiently motivated.

4.2.6 Summary of factors influencing adoption/rejection of the methods.

This summary will begin with a review of the more and less common factors limiting adoption, then turn to the factors as per Rogers' book, and conclude with the role of motivation in participants' decisions regarding adoption or rejection. This researcher understands well that all of the more and less common limiting factors, as well as many of the factors investigated in Rogers' book, are actually influential in urbanites' decisions with regard to rejecting urban gardening, and the gardening methods. Yet, as

has been argued, looking deeper reveals that intrinsic motivation was the most influential factor in the decision-making process. For a researcher or development worker to overlook the motivation factor, is to pay undue attention to factors that may wield lesser influence on decisions to adopt or reject innovations.

4.2.6.1 *The more and less common limiting factors.*

Know-how, and space and time for gardening, were the most commonly cited obstacles to gardening, and complaints amongst participants. Similarly, misunderstanding of the methods, with respect to space, was a factor of rejection for several non-adopters. The convenience of buying food, so-called laziness, prohibitions on gardening, and possibly the reluctance of city dwellers to make life more complicated than it already is, also had a role in the decisions of Hat Yai's urban residents in rejecting UA.

4.2.6.2 *Attributes of the innovations.*

Relative advantage: This influenced all adopters, but also was influential in the decisions of most non-adopters, in that comments by the latter may be interpreted as having perceived no relative advantage during the presentation of the methods. Adopters were satisfied with all 3 of the attributes examined in this research: the rewards (i.e. harvests), the required time and effort, and the low initial cost of the wicking boxes, and are considered to have been influential in adopters' decision. They spoke most highly of the rewards, then the required time and effort, and least of the low initial cost. It may be summed up that for a small initial cost and minimal time and effort, the wicking boxes offered substantial rewards.

Compatibility: This was an important factor in the decisions of many adopters and non-adopters. The fact that wicking boxes appear very similar to the already familiar practice of growing in various kinds of containers was very likely a substantial factor in adoption.

Complexity: Wicking boxes are unusual in their design and in how they work, yet their user-friendliness influenced adoption. One adopter misunderstood how and why the boxes work, though still yielded satisfactory harvests, which may be seen as evidence of their simplicity.

4.2.6.3 *Innovativeness and adopter categories.*

Characteristics of adopter categories: None of the socio-economic characteristics indicate a pattern of influence on adopters or non-adopters. The communication behavior (contact with the researcher) had a degree of influence on most adopters' decisions, and little to no influence on decisions of non-adopters. Sing and Phairin were the 2 most intrinsically motivated, the most enthusiastic, and were justifiably the most innovative.

4.2.6.4 *Adopter categories.*

Comparison of the personal characteristics common to adopters in this research and Rogers' earlier adopters showed mixed results, but leaned toward inconsistency with his findings.

4.2.6.5 *The researcher.*

Contact with the researcher had at least a mild influence on 4 adopters, while it is likely that this contact had little or no influence on 1 adopter. Furthermore, there may have been a tendency on the part of the researcher to initiate more contact with participants who were more homophilous.

4.2.6.6 *Motivation.*

Some city dwellers perhaps should not garden, and not adopt such innovations. They have no practical solutions to the limits of know-how, space, and time. Even if highly motivated to garden or adopt, if it would create stress, then it is probably not in their best interest. Examples include renters who have been prohibited from gardening, or the minority of people who really should not take time away from other responsibilities. However, the majority of urban residents do indeed have the space and time to garden, and to give a serious trial to gardening innovations. Even lacking the know-how, such that it would be necessary to take time to gain the competence, with sufficient motivation, either internal or external, the time will be found. Similarly, potential adopters who have a low perception of most or all of the factors of relative advantage will adopt an innovation if they are motivated enough from other factors. Additionally, even if contact with the change agent has a negative influence, in the presence of sufficient motivation, such negative contact will not deter adoption. Only in instances where a person has given a sincere consideration of the relative advantages and compatibility of an innovation, then decides adopting it is not in their best interest, is the question of motivation moot.

CHAPTER V

Conclusions

To him that will, ways are not wanting.

Outlandish Proverbs, 1640

Where there is a will, there is a way.

English proverb from early 1800s

This chapter will wrap up the 2 research objectives. The current situation will be summarized briefly, mostly with respect to the relevant aspects of the subsequent sections. A detailed synthesis of the factors affecting participants' decisions to adopt or reject the introduced innovations will follow. Closing this chapter will be the researcher's suggestions on how this research may be useful in efforts to expand UA in Hat Yai, and suggestions for future research aiming to promote UA.

5.1 The current situation of urban agriculture in Hat Yai District

Support for urban agriculture from the municipal office and Songkhla Community Foundation are founded on different logic, take different forms, and have had different degrees of success. Urban agriculture in the district started in 2012, as a long term strategy to improve food security in the wake of the recent disastrous flood. Hat Yai urban agriculture is dominated by women, three-quarters of gardeners are between 46 and 75 years old. Most have lower incomes than the provincial average. Most also do not work outside the home, thus have the time to devote to gardening.

Nearly 9 of 10 gardeners avoid synthetic inputs, preferring organic inputs, including microbial inoculants. Because many urban residents have very limited space, the most common method of planting is in pots and other containers, immediately adjacent to the home. Consistent with organic gardening practices, health is still the predominant motivation for gardening; and the wish to save money by reducing food expenses also motivates many people. Yet, there is reason to believe that very few urban gardeners are indeed improving their health or saving money, as may be seen in the researcher's manuscript (Appendix J).

Lack of know-how, space, and time are the main hindrances to urban gardeners, and will be addressed in more detail in the sections below. The municipal office has many responsibilities other than attending to residents' calls for assistance with gardening to address these hindrances, but the municipal office would rather see residents become more self-reliant and interdependent.

5.2 Synthesis of factors influencing adoption or rejection of gardening methods

This section will synthesize the various factors examined in this research to respond to the second research objective, namely, the factors that influenced the 10 participants to adopt or reject the 3 urban gardening methods introduced in this research. A wide-ranging and large number of things were considered in the complex analysis and discussion of chapter 4, including the theoretical foundation, and factors regarding the innovation (i.e. the wicking box), regarding the participants, and regarding the researcher.

Before the actual synthesis, 2 factors that apparently had more influence among non-adopters will be addressed, namely misunderstanding the methods, and an unwillingness to complicate life. This synthesis will weave various factors together, while taking up themes, as follows: perceptions on the part of participants, adoption or rejection of the methods, and homophily-heterophily with the researcher. Then, taking a step back, most of the foregoing factors will be examined with respect to intrinsic motivation. The synthesis will close with the shortcomings of the researcher, and how they may have influenced non-adopters. Two factors that influenced non-adopters will be discussed first.

5.2.1 Misunderstanding the methods.

From the start of the research, it is likely that some participants misunderstood the methods, although all were asked more than once if they understood. Around the middle of the data collection period, Sing and Wut remarked that they actually did not understand the hugelkultur and sheet mulch beds. After another explanation, Wut agreed to try both, but it seemed that this was only in order to please the researcher. He never got around to making them, or contacting the researcher for help, though he was well aware of this offer of help. Other non-adopters also seem to have misunderstood that all the methods may be modified to suit a given space; Wut, Mai, Thin, and Chalit

commented that the methods were not suited to the conditions of their garden spaces. To reiterate, commenting like this demonstrates misunderstanding.

Two non-adopters truly had small spaces. Thin's garden area received very little sunlight, and Chalit's was spread over various spots, totaling about 3-square meters. If they had understood the methods' potential for flexibility, they would have realized that these methods could be modified to meet their needs, i.e. were compatible with their needs. The only way this researcher can see to explain their comments is to say that they misunderstood that the methods are highly modifiable.

5.2.2 Unwillingness to further complicate life.

Reluctance to further complicate an already complicated life with things that appear unimportant is actually a rational and wise decision. Additionally, time is a factor insofar as it takes time to learn what an innovation is and how it works. It is all too clear that urban life places heavy demands on many people, especially those of working-age. With a finite number of hours in each day, and an infinite number of things that a person could do at any given time, everyone needs to make choices about what to do. What captures a person's interest the most? What things take up space in our minds and hearts? Making decisions about what to do with our time is often an activity not based on logic, or even intuition, but rather based on incomplete and faulty information, as well as on impulse.

5.2.3 Factors influencing adoption or rejection of the gardening methods.

A synthesis of various factors involved in participants' decisions will be attempted under the following 2 themes: participants' perceptions of attributes of the methods and of the researcher. Participant's perceptions of the methods influenced adopters and non-adopters alike. Adopters' perceptions of the researcher influenced their decisions, while the perceptions of the researcher likely had little to no influence on non-adopters.

5.2.3.1 *Perceptions.*

As has been pointed out several times in the body of the thesis, perception is a crucial element. An important element of this research has been to determine how to overcome perceived obstacles to urban gardening. When someone

says, "It can't be done," yet others are doing it, then a curious mind must surely wonder what is happening in the mind of the naysayer, and wonder if motivation is lacking. Perception is related to motivation in the following way. Compare 2 people who have been introduced to a gardening innovation. They both have similar amounts of all the factors considered thus far, i.e. gardening know-how, space and time for a garden, socio-economic backgrounds, etc. Both perceive a lack of time and space. But one is stuck in the belief that they lack space and time, and not sufficiently motivated, so will not consider trying the innovation. The other is sufficiently motivated, so will make space and time to try the innovation.

5.2.3.2 Attributes of the wicking box.

In the case of these gardening innovations, it may be stated that the major factors here were perceived presence or absence of relative advantage, compatibility, and complexity. Factors are mentioned in the order of their relative influence. All 3 subdomains of relative advantage that were examined influenced adopters: rewards (i.e. harvests), required time and effort, and low initial cost of the wicking boxes. The reward was a harvest of strong, healthy vegetables, that satisfied everyone involved. Because the wicking boxes were simple to make and to use (i.e. low complexity), the small amount of time and effort required to make and maintain them pleased the adopters. The only costs for the wicking box was to buy a second-hand styrofoam box, and 2 small bags of potting soil. To sum up the relative advantages of the wicking boxes, it may be said that they offered substantial rewards in return for a small initial cost, and minimal time and effort.

For the adopters, the *relative* advantage of the wicking box was that the harvests were better than what they were familiar with from their own and others' efforts in the past, and they spent less time and effort than they had been used to. Though there was a minimal cost for the styrofoam boxes was, because they were not used to paying for boxes, this sub-domain may not be said to have had a *relative* advantage.

The perception that the wicking boxes were compatible with existing methods (because they are a kind of container garden), had an influence. They look slightly strange on the outside, due to the small hole in the side and the pipe protruding from the soil, but not so unusual as to make them unacceptable, i.e. culturally incompatible. Internally, they are markedly different from typical garden containers due to the water reservoir at the bottom. Yet, they were seen as not overly complicated to make, and simple to use. It may be argued that, if they had been seen as complicated to make and use, they would also have to be considered culturally incompatible. The same can perhaps be said of most innovations introduced into most countries.

It may be that, during and just after the presentation, all participants considered the methods to be too complex. During the presentation, the researcher used slides and hand and body gestures to explain the methods. The specific steps involved in making the hugelkultur bed, the sheet mulch bed, and the wicking box may have made them seem too complicated, therefore incompatible with participants' needs for simplicity. Each participant was invited to the researcher's garden to see the methods, but none accepted. Wut talked at length about his easy-going and uncomplicated lifestyle. If the explanation given during the presentation was not clear enough for him, he may have seen them as too complicated for him to be interested in trying. The fact that others also misunderstood the methods suggests that they also considered them too complicated. Only Nit agreed to try a method from the beginning, and only out of deference to her friend and neighbor. Only at the urging of one of the research advisors, did the other four adopters decide to try a method. At the end of the data collection period, all adopters agreed that the wicking boxes were easy to use and maintain. The comment that some urban residents may be unwilling to take up gardening because they are reluctant to make city life more complicated, is possibly relevant to all participants, but especially likely to Wut, with his easy-going lifestyle.

What sort of urban resident might be most suited to using a wicking box? It could appeal to a variety of people, but the largest group of people who might be interested are those who want to garden, but lack space for a larger garden, lack

gardening know-how, and would prefer to tend to the garden infrequently. Aside from this profile, those who are interested in gardening innovations, as well as those who are interested in creating a complicated system that would combine 2 or more wicking boxes, and perhaps incorporate 1 or more boxes into an aquaponics system.

5.2.3.3 *Contact with the researcher.*

Much of the content of this section is the opinion of the researcher. The content is based on data collected and observations made during the data collection period, as well as on Rogers' findings. The quality and amount of contact with the researcher had a degree of influence on 4 adopters' decisions, and little or none on 1 adopter's decision. Their perceptions of the researcher played an important part in the relationship. The salient factors were extent of contact initiated by the researcher, participants' perception that the researcher had *competence credibility*, participants' perception of homophily with the researcher, and participants' perception of empathy from the researcher. The latter 2 were more determinative. Though the quantitative factors tended towards homophily, there was a bond between 4 adopters (Sing and the Jai Dee cul-de-sac residents) and the researcher that cannot be accounted for using these factors.

It is this researcher's subjective opinion that the defining factor was more due to common interests than any factor from an objective analysis of the homophily-heterophily factors. For various reasons, the quality of contact with these 4 adopters was generally more positive than with all other participants, with the possible exception of Wut. The main reason is likely due to the common interest in gardening, and in the wicking box method. Recall that Wut also had a strong interest in gardening, though he was unsure if he enjoyed it. Another reason is that the researcher showed genuine interest in helping the participants to have a positive experience with the research and with the wicking boxes. Yet another very possible reason is the relations among members of Jai Dee cul-de-sac. The 3 participants in that cul-de-sac, and their 2 gardening friends (Noot and Somchai), were close friends long before they joined the research. It is likely that the synergy of friendships and interest in gardening contributed most to the close relationship

between these 3 adopters and the researcher. That quality of contact may have influenced the researcher to contact them more than non-adopters, though answering definitively is impossible.

Generally speaking, researchers have a higher socio-economic status than most participants, and are more likely to have an affinity with homophilous participants, leading to more contact. This researcher made an effort to contact all participants at least once a week, which, in retrospect, was too often given the slow nature of the growth of plants. Jo mentioned that she often felt uncomfortable with the frequency of contact from the researcher, in part because she had not been working on the garden.

One last element relevant to contact with the researcher was that there was someone to help the participants with the entire process. This was not a topic of discussion during the data collection period, but was in fact raised during the focus group and mentioned by some respondents on the questionnaire. In general, people are eager to have help from someone who they perceive as having *competence credibility*.

All 5 non-adopters decided from the very beginning to not try one of the introduced methods. It cannot be ruled out that the researcher's conduct during the presentation had a negative effect, influencing them to reject the methods.

5.2.3.4 *Intrinsic motivation.*

The main take-away from this research is that intrinsic motivation is a factor that should be considered in research investigating innovation adoption and rejection. Daily life shows numerous examples where this most elementary motivation underlies decisions. A substantial impetus in this research design was derived from the day this researcher was in the field trying to recruit participants to join the research, and encountered people who insisted they could not start gardening. This researcher knows well from first-hand personal experience that we sometimes do not see past apparent obstacles, and avoid noticing when other people are overcoming the same obstacles. Paraphrasing a saying that circulated in U.S. newspapers in the early 20th century is germane: *People who say it cannot be done should not interrupt those who are doing it.* In a similar vein, the old English language proverb, *Where there is a will, there is a way,*

elucidates this well the same idea that, if a person is motivated enough to do something, it will be done. No matter if the potential adopter sees unattractive characteristics in the innovation, or something disagreeable with the researcher/change agent, or other personal obstacles, if the motivation is strong enough, a way will be found to at least give the innovation a try. Only in cases where a potential adopter has considered their situation well, and decided that it is not in their best interest to adopt the innovation, would the question of intrinsic motivation be moot.

5.2.3.5 This researcher's short-comings.

A more thorough analysis on the part of the researcher of what methods might be considered compatible may have led to more participants trying a method. As it was, this research did uncover useful information regarding non-adopters' reasons for rejecting the methods, but a higher number of participants trying one or more methods would still probably have resulted in some participants eventually rejecting them.

Another likely barrier to more participants trying a method was the researcher's communication skills. Had the introduction and explanation of the methods been done better, it is possible that participants would have properly understood the workings and principles of the methods, and realized that they could have been modified to be compatible with the participants' garden spaces.

5.2.3.6 Summary of research results.

The conclusion stemming from the data analyzed in this research is that the most substantially influential factor was motivation. Next most influential factors were the subdomains of relative advantage, and 2 of the 3 subdomains of compatibility, followed by complexity and the researcher. The particulars of the participants' backgrounds and socio-economic characteristics showed little to no influence.

The results of this research are summarized in Table 5.1, showing the relative levels of influence of each factor examined in this research. The factors were classified into 4 levels: little to no influence, mild influence, strong influence, and most substantial influence. They were placed into the various levels according to the researcher's best judgement, based mainly on the participants' comments during formal interviews, but also during informal conversations. All factors were classified relative to

one another, with no arbitrary standard to determine what factor belonged to what level of influence. In other words, there was no standard such as, if a participant spoke 5 or more times, of how much they appreciated the low initial cost, then this factor would be placed in the *strong influence* level. The influence levels of the subdomains of relative advantage were determined first, then the relative influence of other factors was determined by comparing their influence with that of the subdomains of relative advantage. It is important to keep in mind that these classifications are generalizations of all the gardening methods, and don't apply equally to all of the methods. Similarly, these are generalizations of adopters and of non-adopters.

Table 5.1 Relative influence of each factor, on adopters and non-adopters.

Factors	Influence on adopters	Influence on non-adopters
Relative advantage		
<i>low initial cost</i>	strong influence	N/A
<i>required time & effort</i>	strong influence	N/A
<i>reward</i>	strong influence	N/A
Compatibility		
<i>client needs for the innovation</i>	strong influence	strong influence
<i>previously introduced ideas</i>	strong influence	strong influence
<i>sociocultural values & beliefs</i>	mild influence	mild influence
Complexity	mild influence	N/A
Researcher	mild influence	N/A
Participants' backgrounds	little to no influence	little to no influence
Participants' socio-economic characteristics	little to no influence	little to no influence
Motivation	most substantial influence	N/A

5.3 This research's contribution to the research community

Figure 5.1 is a generalized illustration of findings from this research (highlighted with dots) in combination with findings from Rogers' book (highlighted with vertical lines). The new finding from this research is the importance of motivation, in that it is at the root of the process of adoption and rejection of innovations. Perhaps this research is most significant in that it brought into focus the role of intrinsic and extrinsic motivations (especially the former), in the process, more than to discover new aspects or factors of the process. Rogers' findings that were confirmed in this research are these 3 attributes of the innovations (and these sub-domains) along with contact with the researcher.

It is this researcher's opinion that all participants already had some level of motivation before awareness of the methods through contact with the researcher. Participants interested in the methods themselves were intrinsically motivated, while those who were not interested in them (e.g. were interested in helping the researcher, or joined the research in order to please a friend) were extrinsically motivated. This motivation catalyzed them to take enough interest in the methods to at least consider trying one or more. The awareness of the methods resulted from contact with the researcher, (the *capable person*, in the diagram).

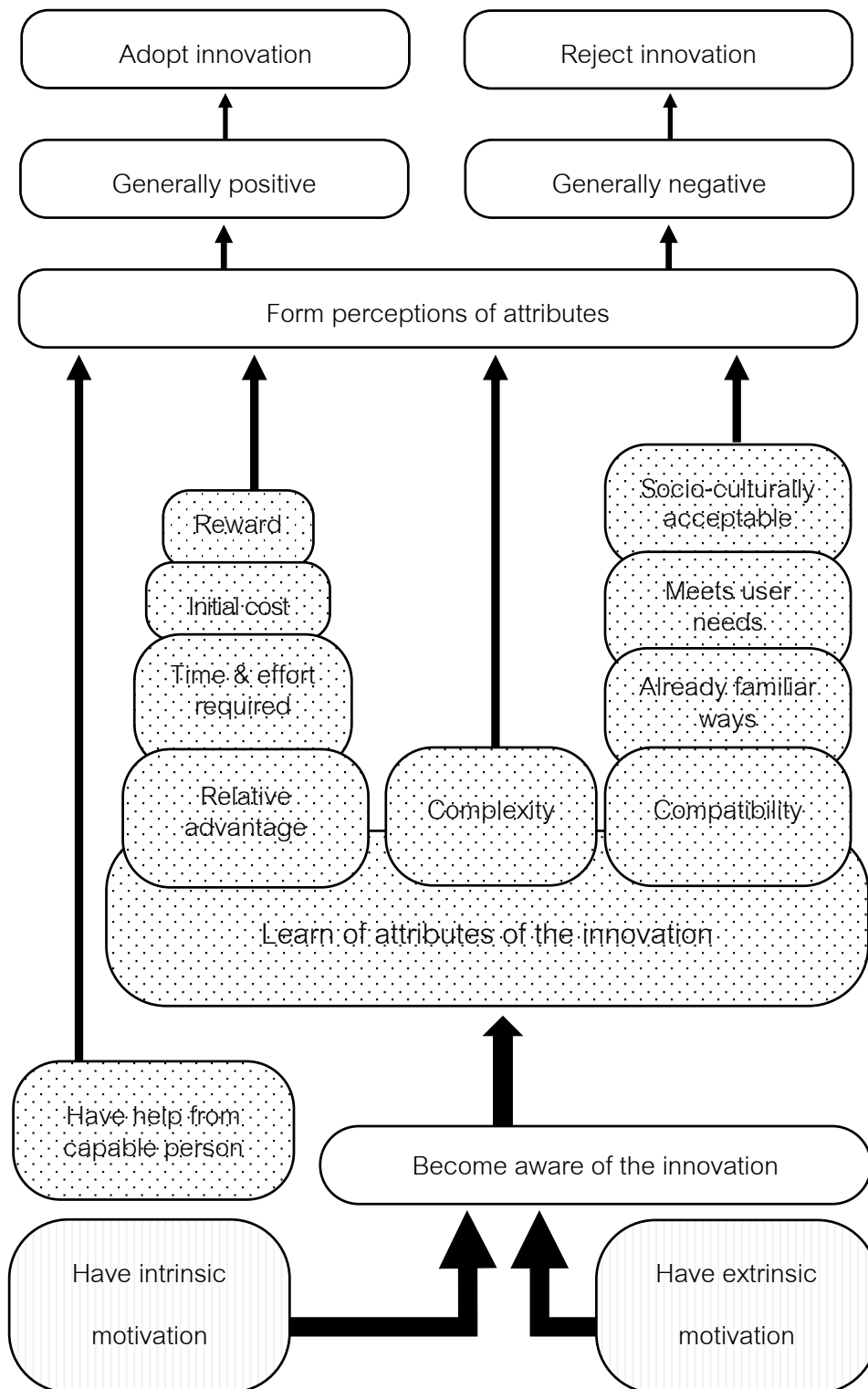


Figure 5.1 Diagram of main factors involved in innovation-decision process

5.4 Use of this research's results for expanding UA in Hat Yai

The most obvious value of this research is the results regarding urban agriculture in Hat Yai. The local municipal office and Songkhla Community Foundation may find information they were previously unaware of in both the quantitative and the qualitative results. It is very possible that the municipal office staff responsible for the urban agriculture projects, are already aware of the socio-economic characteristics of people in their jurisdictions. Yet, primary data will at the very least confirm what the staff already believe. Such quantitative data from the questionnaire may show trends that suggest what strategies might be useful in the promotion of UA in the district. For example, the background data may be used to better understand (or perhaps confirm their existing understanding) of the socio-economic characteristics of the district's urban gardeners, which can be used to plan outreach efforts into communities where people who fit these characteristics predominately live. The data in the questionnaire regarding the gardens, gardeners' activities, and their obstacles and complaints, also may very well be an aid for municipal officials' outreach efforts. Likewise, the comments in the key informant interviews may be useful for a broad understanding of the urban agriculture situation in the district.

Because this is the first research of its kind in Hat Yai, it could serve as a starting point for future researchers, students and others interested in learning more about UA in Hat Yai, and in Thailand more generally.

Songkhla Community Foundation may benefit from this research as well, though probably to a lesser extent than other organizations and individuals. This is because the administrators of the foundation have been intimately involved with every aspect of UA (at the levels of the individual and household, the community, and local government) in Hat Yai for several years, long enough for them to know very well nearly all the information in the questionnaire and the interviews. Indeed, 2 of the 3 in-depth interviews were carried out with individuals who know the foundation and the UA group best. Again, the data on the questionnaire can at best confirm what they are already sure of.

The research carried out with the 10 participants may be of interest to the above individuals and organizations interested in expanding UA not only within the district, but also without the district. Insofar as this research examined factors not only of adoption, but of rejection as well, it took a focus that may help others to see what cannot be gleaned from only examining factors of adoption.

Lastly, this research has potential value to adoption researchers, especially in the field of UA, but also to a lesser extent in other fields of research. The secondary data can be of lesser value to the municipal officials and the foundation.

In order for the latent benefits to become useful to others, the entire thesis, or at least some portions of it, will ideally be translated into Thai language. The number of Thais who will even try to read this thesis in English is very small indeed.

5.5 Suggested model for future research

Despite the justified skepticism toward the health and financial benefits of UA, this researcher remains a proponent. Following the conclusion here that motivation is the main influential factor, future research into promoting urban agriculture could focus on the specific motivations of urbanites who express interest in starting to garden or expand their existing garden, yet are hindered by obstacles. Researchers could use a participatory research approach to finding ways to overcome participants' obstacles. The fields of development work, social marketing, and adoption-rejection and diffusion of innovations are all consistent with the aims of promoting urban gardening among those who are interested in realizing its potential benefits. As the social marketing research articles by Goodwin and Hill (1998) and Pettigrew (2015) demonstrate, emphasizing that growing a portion of one's own food is to be understood as an integral part of research participants' lifestyles.

In order to promote UA, important initial steps are to first examine the general situation of those who are already gardening, then the situations of residents who are not gardening, and search for potential ways to facilitate adoption. It is important to place emphasis on getting to know what factors influence adoption and rejection. Thus, equal attention must be paid to discovering the factors influencing both decisions. Participants should realize there is no pressure to adopt.

Figure 5.2 illustrates that the first part will be a situation analysis with residents who are already gardening. The second part will be a participatory approach to learn what strategies help residents who express interest in starting UA, but insist they cannot overcome limitations and obstacles. Results from the situation analysis will be used to structure the participatory approach.

Future research as described below includes personal development and motivational skills in addition to traditional research skills. The researcher(s) will ideally be Thais or at least have Thais doing the interviews in order to maximize mutual understanding between participants and researcher(s).

Situation analysis

This research will include questionnaires and key informant interviews. The questionnaires will have questions from this research's questionnaire, and will try to get the following: 1) fairly accurate measurements of the area of the respondents' gardens. (This researcher did not get accurate measurements.) 2) the obstacles, if any, that respondents overcame before starting gardening, and 3) participants' motivations for starting gardening, why they continue gardening (perhaps there has been a change of motivation), and determine if their hopes are being realized.

Participatory approach

This part will also have questionnaires and interviews. Participants will do a self-assessment, such as a SWOT analysis, with special attention on know-how, space, time, and level of interest in and perceptions of gardening.

Getting as deep into a person's psyche as they will allow, will be useful in seeing if they have limiting beliefs, and if so, helping them to overcome them. Learn what their reasons are for not starting a garden; is it lack of know-how, space, time, interest? If it is one of the 3 former, then introducing an innovation and helping them to get started may be enough for them. If they are uninterested in gardening, then probe deeper to find out why. Maybe there is a way to motivate them to start. Perhaps an intrinsic motivation will emerge, or perhaps merely an extrinsic motivation will emerge. It must be reiterated that the objective of the research would be to help participants find ways to overcome their obstacles to gardening, not in promoting UA to those who have not expressed interest in gardening.

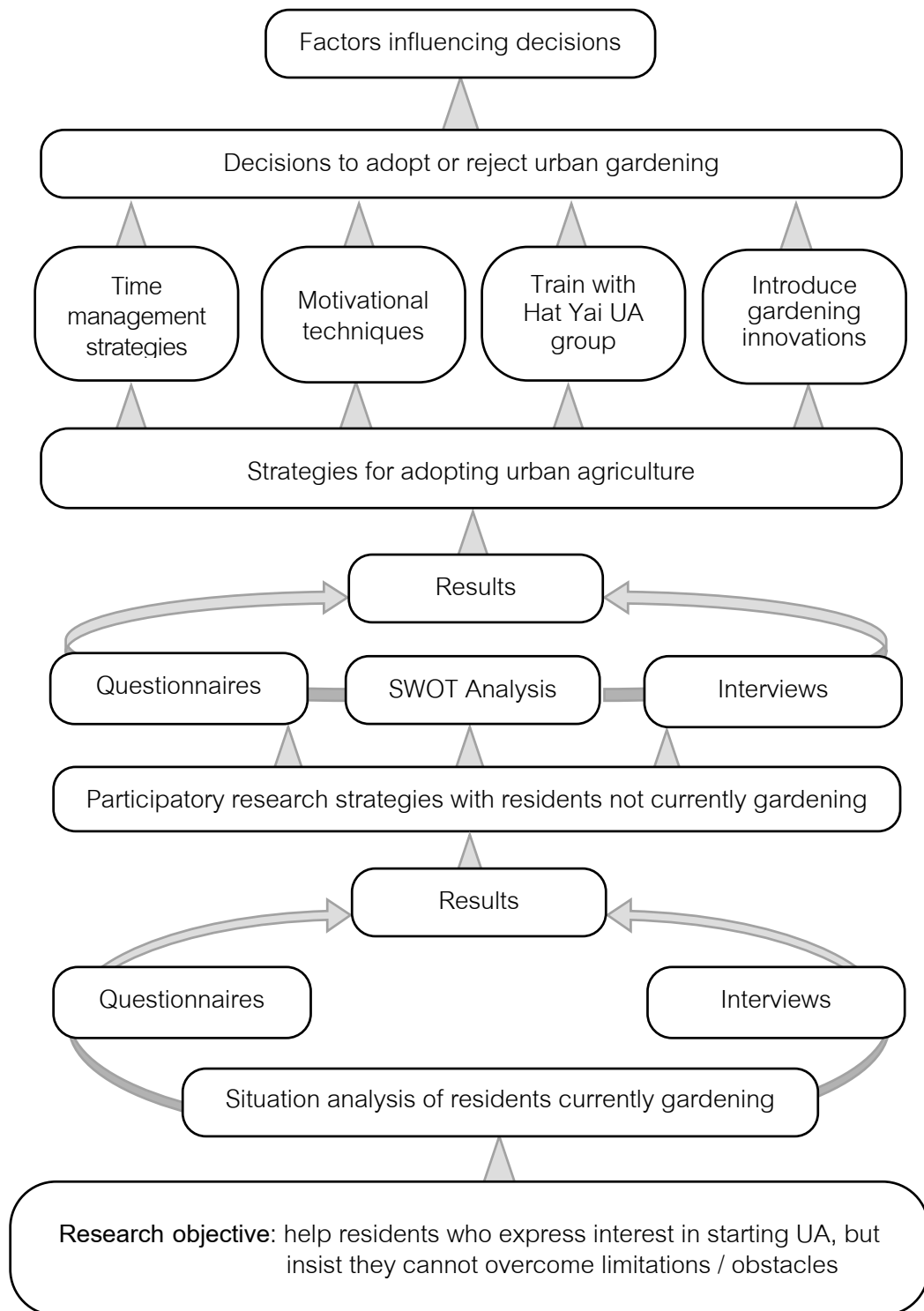


Figure 5.2 Model for future research

References

- Agrawal, M., Singh, B., Rajput, M. Marshall, F., & Bell, J.N.B. (2003). Effect of air pollution on peri-urban agriculture: A case study. *Environmental Pollution*, 126, 323-329. doi.org/10.1016/S0269-7491(03)00245-8
- Asia LEDES Partnership. (2013). Case studies on low emission development: Thailand's low carbon city initiative. Retrieved from <https://cdkn.org/wp-content/uploads/2013/03/Asia-LEDES-Partnership-Case-Study-Thailand-Low-Carbon-City-Initiative-March-2013.pdf>
- Austin, C. (n.d.). Wicking worm bed. Retrieved from <http://www.waterright.com.au/Wicking%20worm%20beds.pdf>
- Avis, R. (2011, May 30). From the bottom up: A DIY guide to wicking beds. Web blog posted to <http://vergepermaculture.ca/blog/2011/05/30/guide-to-wicking-beds/>
- Baumeister, R.F., & Vohs, K.D. (2007). *Encyclopedia of social psychology*. Thousand Oaks, CA: SAGE Publications.
- Baumgartner, B., & Belevi, H. (2001). Systematic overview of urban agriculture in developing countries. EAWAG–Swiss Federal Institute for Environmental Science & Technology, & SANDEC–Dept. of Water & Sanitation in Developing Countries. doi.org/10.1504/IJETM.2003.003382
- Burton, N. (2014, October 25). The psychology of laziness-The psychology of laziness, procrastination, and idleness. *Psychology Today*. Retrieved from: <https://www.psychologytoday.com/blog/hide-and-see/201410/the-psychology-laziness>
- Caraballo, H. (2014). Emergency department management of mosquito-borne illness: Malaria, Dengue, and West Nile Virus [Abstract]. *Emergency Medicine Practice*. 16(5). http://www.ebmedicine.net/topics.php?paction=showTopic&topic_id=405
- Chertow, M.R. (2001). The IPAT equation and its variants: Changing views of technology and environmental impact. *Journal of Industrial Ecology*, (4)4, 13-29. doi.org/10.1162/10881980052541927

- CoDyre, M., Fraser, E. D. G., & Landman, K. (2015). How does your garden grow? An empirical evaluation of the costs and potential of urban gardening. *Urban Forestry & Urban Greening* 14, 72-79. doi.org/10.1016/j.ufug.2014.11.001
- Dann, S. (2007). Reaffirming the neutrality of the social marketing tool kit: Social marketing as a hammer, and social marketers as hired guns. *Social Marketing Quarterly*, 8(1), 54-62. Retrieved from <http://sci-hub.bz/10.1080/15245000601158390>
- DELGOSEA. (2011). Best practices on local governance in urban public service delivery in Southeast-Asia. Partnership for Democratic Local Governance in Southeast Asia (DELGOSEA). Retrieved from: http://carbonn.org/uploads/tx_carbonndata/A9R12E1.tmp.pdf
- Dickie, J. (1968). The Hispano–Arab garden its philosophy and function. *Bulletin of the School of Oriental and African Studies*, 31, 237-248.
<http://doi.org/10.1017/S0041977X0014649>
- Economic Research Service. (2010). Comparing the structure, size, and performance of local and mainstream food supply chains. [ERR-99]. Retrieved from United States Department of Agriculture:
http://www.ers.usda.gov/media/122609/err99_1_.pdf
- Ehrlich, P., & Ehrlich A.H. (2008, August 4). Too many people, too much consumption. *YaleEnvironment*³⁶⁰ Retrieved from
http://e360.yale.edu/features/too_many_people_too_much_consumption
- Elevitch, C., & Wilkinson, K. (1999). Sheet mulching: Greater plant and soil health for less work. *Agroforestry Net*. Retrieved from <http://www.agroforestry.net/free-publications/sheet-mulching>
- Ellis, F., & Sumberg, J. (1998). Food production, urban areas and policy responses. *World Development*, 26(2), 213-225. Retrieved from
<http://www.cityfarmer.org/ellisumbergurbanag.pdf>

- European Social Marketing Association. (October 5, 2013). Social marketing. Retrieved from http://www.europeansocialmarketing.org/wp-content/uploads/2013/12/final_endorsed_consensus_definition_of_social_marketing_october_20131.pdf
- Feineigle, M. (2012 January 4). Hugelkultur: Composting whole trees with ease. Weblog posted to <http://permaculturenews.org/2012/01/04/hugelkultur-composting-whole-trees-with-ease/>
- Food and Agriculture Organization. (2001). Urban and peri-urban agriculture. Retrieved from http://www.fao.org/unfao/bodies/COAG/COAG15/X0076e.htm#P106_11554
- Gajaseneni, J., & Gajaseneni, N. (1999). Ecological rationalities of the traditional homegarden system in the Chao Phraya Basin, Thailand. *Agroforestry Systems*, 46, 3-23. doi: 10.1023/A:1006188504677
- Galhena, D.H., Freed, R. & Maredia, K.M. (2013). Home gardens: A promising approach to enhance household food security and wellbeing. *Agriculture & Food Security*, 2(8), 1-13. doi:10.1186/2048-7010-2-8
- Gapinski, F. (2008, May 3). 300-year old food forest in Vietnam. [Video file]. Retrieved from <https://www.youtube.com/watch?v=-5ZgzwoQ-ao&list=WL&index=71>
- gidanan ganghair. (2014, October 15). กินผักที่ปลูกในเมืองปลอดภัยจริงหรือ [Are city-grown vegetables really safe to eat?]. Thai Health Promotion Foundation. <http://www.thaihealth.or.th/Content/26134->
- Golden, S. (2013). Urban agriculture impacts: Social, health, and economic: A literature review. University of California Division of Agriculture & Natural Resources. <http://asi.ucdavis.edu/programs/sarep/publication/food-and-society/ualitreview-2013.pdf>
- Goodwin, C., & Hill, R.P. (1998). Commitment to physical fitness: Commercial influences on long-term healthy consumer behaviors. *Social Marketing Quarterly*, Spring 1998, 68-83.
- Guitart, D., Pickering, C., & Byrne, J. (2012). Past results and future directions in urban community gardens research. *Urban Forestry & Urban Greening*, 11, 364-373. doi.org/10.1016/j.ufug.2012.06.007

- Hamilton, A. J., Burry, K., Mok, H., Barker, S.F., Grove, J. R., & Williamson, V.G. (2013). Give peas a chance? Urban agriculture in the developing world: A review. *Agronomy for Sustainable Development*, 34, 45-73. doi:10.1007/s13593-013-0155-8
- Hampway, G. (2013). Benefits of urban agriculture. *Geoforum*, 43, R7-R8. doi:10.1016/j.geoforum. 2013.03.008
- Hemenway, T. (2001) *Gaia's garden: A guide to home scale permaculture*. White River Junction, VT: Chelsea Green Publishing.
- Hoorweg, D., & Munro-Faure, P. (2008). Urban agriculture for sustainable poverty alleviation and food security. Retrieved from http://www.fao.org/fileadmin/templates/FCIT/PDF/UPA_-WBpaper-Final_October_2008.pdf
- Kanokwalee, S. (2009). Urban agriculture: Ecological functions for urban landscape. http://www.land.arch.chula.ac.th/data/file_20091118100206.pdf
- Kennedy, B. & Funk, C. (2015, December 11). Public interest in science and health linked to gender, age and personality. Retrieved from <http://www.pewinternet.org/2015/12/11/public-interest-in-science-and-health-linked-to-gender-age-and-personality/>
- Kho Hong Municipality. (2014). แผนยุทธศาสตร์การพัฒนาเทศบาลเมืองคองหงส์ (พ.ศ. 2557-2561) [Kho Hong Municipality development strategy 2014-2018]. Kho Hong Municipal Office.
- Kim, B.F., Poulsen, M.N., Marguiles, J.D., Dix, K. L., Palmer, A.M., & Nachman, K.E. (2014). Urban community gardeners' knowledge and perceptions of soil contaminant risks. *PLoS ONE*, 9(2), 1-9. doi:10.1371/journal.pone.0087913
- Korth, M., Stewart, R., Langer, L., Madinga, N., Da Silva, N.R., Zaranyika, H., van Rooyen, C., & de Wet, T. (2014). What are the impacts of urban agriculture programs on food security in low and middle-income countries: a systematic review. *Environmental Evidence*, 3(21). doi:10.1186/2047-2382-3-21

- Kulak, M., Graves, A., & Chatterton, J. (2012). Reducing greenhouse gas emissions with urban agriculture: A Life Cycle Assessment perspective. *Landscape and Urban Planning*, 111, 68–78. doi.org/10.1016/j.landurbplan.2012.11.007
- Kwack, B. H. (2007). The value of human life with horticultural practices and products. In T. A. Lumpkin, & I. J. Warrington, (Eds.), *Proceedings of the International Symposium on Horticultural Plants in Urban and Peri-Urban Life* (pp. 17-22). The Netherlands:ISHS.
- Lederbogen, F., Kirsch, P., Haddad, L., Streit, F., Tost, H., Schuch, P., Wüst, S., Pruessner, J.C., Rietschel, M., Deuschle, M., & Lindenberg, A.M. (2011, June 23). City living and urban upbringing affect neural social stress processing in humans. *Nature*, 474, 498-501. doi:10.1038/nature10190
- Limnirankul, B., & Gypmantasiri, P. (2010). Transforming agri-food systems in peri-urban area of Northern Thailand: A case study of vegetable farming of Ban Ping Noi farmers. 9th European IFSA Symposium, Vienna. Retrieved from http://ifsa.boku.ac.at/cms/fileadmin/Proceeding2010/2010_WS4.4_Limnirankul.pdf
- Loudon, G. (2014, March 30). *There is no such thing as a lazy kid*. [Video file]. Retrieved from <https://www.youtube.com/watch?v=hO79CGL2t80>
- Martin, G., Clift, R., Christie, I., & Druckman, A. (2014). The sustainability contributions of urban agriculture: Exploring a community garden and a community farm. In R. Schenck, & D. Huizenga (Eds.), 2014. *Proceedings of the 9th International Conference on Life Cycle Assessment in the Agri-Food Sector (LCA Food 2014)*. Retrieved from <http://lcafood2014.org/papers/277.pdf>
- McClintock, N., Mahmoudi, D., Simpson, M., & Santos, J.P. (2016). Socio-spatial differentiation in the sustainable city: A mixed-methods assessment of residential gardens in metropolitan Portland, Oregon, USA. *Landscape and Urban Planning*, 148, 1-16. doi.org/10.1016/j.landurbplan.2015.12.008

- McCormack, L.A., Laska, M.N., Larson, N.I., & Story, M. (2010). Review of the nutritional implications of farmers' markets and community gardens: A call for evaluation and research efforts. *Journal of the American Dietetic Association*, 110, 399-408. doi:10.1016/j.jada.2009.11.023
- Menikpura, S.N.M., Sang-Arun, J., & Bengtsson, M. (2013). Integrated Solid Waste Management: An approach for enhancing climate co-benefits through resource recovery. *Journal of Cleaner Production*, 58, 34-42. doi.org/10.1016/j.jclepro.2013.03.012
- Miles, M. (2010, August 3). The art and science of making a hugelkultur bed— Transforming woody debris into a garden resource. Retrieved from <http://permaculturenews.org/2010/08/03/the-art-and-science-of-making-a-hugelkultur-bed-transforming-woody-debris-into-a-garden-resource/>
- Mougeot, L. J. A. (2006). Growing better cities: Urban agriculture for sustainable development. Ottawa: International Development Research Center.
- Moustier, P., & Danso, G. (2006). Local economic development and marketing of urban produced food. In R. van Veenhuizen (Ed.), *Cities farming for the future* (pp. 171-206). Manila, Philippines: International Institute of Rural Reconstruction and ETC Urban Agriculture.
- Mubvami, T. & Mushamba, S. (2006). Integration of agriculture in urban land use planning and adaptation of city regulations. In R. van Veenhuizen (Ed.), *Cities farming for the future* (pp. 53-86). Manila, Philippines: International Institute of Rural Reconstruction and ETC Urban Agriculture.
- National Statistical Office, Thailand. (n.d.-a). The household socio-economic survey [for 2015]. Retrieved from http://service.nso.go.th/nso/nsopublish/BaseStat/tables/00000_Whole%20Kingdom/N2P02-income.xls
- National Statistical Office, Thailand. (n.d.-b). The household socio-economic survey [for 2015]. Retrieved from http://service.nso.go.th/nso/web/statseries/tables/00000_Whole_Kingdom/Poverty_2.xls

- National Statistical Office, Thailand. (n.d.-c.) The labor force survey whole kingdom Quarter July-September 2016.
http://web.nso.go.th/en/survey/lfs/data_lfs/2016_lf_Q3_Whole.pdf
- Oregon State University Extension Service. (2013). Sheet mulch-lasagna composting. LC 731. Retrieved from
http://extension.oregonstate.edu/lane/sites/default/files/documents/lc731sheetmulchmay2015_0.pdf
- Orsini, F., Kahane, R., Nono-Womdim, R., & Gianquinto, G. (2013). Urban agriculture in the developing world: A review. *Agronomy of Sustainable Development*, 33, 695–720. doi:dx.10.1007/s13593-013-0143-z
- Parrish, D., & Stockwell, W. (2015, January 8). Urbanization and air pollution: Then and now. *Eos*, 96. doi:10.1029/2015EO021803.
- Pettigrew, S. (2015). Pleasure: An under-utilised 'P' in social marketing for healthy eating. *Appetite*, 104, 60-69. doi:10/1016/j.appet.2015.10.004
- Pholsawek, J. (2014, October 1). สวนผักชักรเมือง [Vegetable gardens love the city]. *Technologychaoban*, 27(584), 124. Retrieved from
<http://info.matichon.co.th/techno/techno.php?srctag=05124011057&srcday=2014-10-01&search=no>
- Pongloe, P., Wijaya, A.F., & Mindarti, L.I. (2015). Low carbon city policy implementation in Muangklang Municipality, Thailand. *International Journal of Applied Sociology*, 5(2), 99-105. doi:10.5923/j.ijas.20150502.05
- Poulsen, M.N., McNab, P.R., Clayton, M.L., & Neff, R.A. (2015). A systematic review of urban agriculture and food security impacts in low-income countries. *Food Policy* 55, 131–146. doi.org/10.1016/j.foodpol.2015.07.002
- RedHawk, B. (2015, April 3). Mushrooms for hugelkultur. Message posted to
<http://www.permies.com/t/45743/hugelkultur/mushrooms-hugelkultur>
- Redwood, M. (2009). Agriculture in urban planning: Generating livelihoods and food security. Ottawa: International Development Research Centre.

- Rezai, G., Shamsudin, M.N., & Mohamed, Z. (2016). Urban agriculture: A way forward to food and nutrition security in Malaysia. *Procedia-Social and Behavioral Sciences, 216*, 39-45.
- Rezai, G., Shamsudin, M.N., Mohamed, Z., & Sharifuddin, J. (2014). Factor influencing public participation in urban agriculture in Malaysia. *Proceedings of the International Conference on Advances In Economics, Social Science and Human Behaviour Study-ESHB, 22-25*. doi:10.15224/ 978-1-63248-027-9-39
- Rogers, E.M. (2003). *Diffusion of Innovations*. New York: Free Press.
- Scheromm, P. (2015). Motivations and practices of gardeners in urban collective gardens: The case of Montpellier. *Urban Forestry & Urban Greening, 14*, 735–742.
- Smit, J., & Bailkey, M. (2006). Urban agriculture and the building of communities. In R. van Veenhuizen (Ed.), *Cities farming for the future* (pp. 145-170). Manila: International Institute of Rural Reconstruction and ETC Urban Agriculture.
- Smit, J., Nasr, J., & Ratta, A. (2001). *Urban agriculture: Food, jobs, and sustainable cities*. New York: United Nations Development Programme.
- Somerville, C., Cohen, M., Pantanella, E., Stankus, A., & Lovatelli, A. (2014). Small-scale aquaponic food production: Integrated fish and plant farming. FAO Fisheries and Aquaculture Technical Paper No. 589. Rome, Italy: FAO. Retrieved from www.fao.org_3_a-i4021e_i4021e09
- Sullivana, C., Hallarana, T., Sogorkaa, G., & Weinklea, K. (2015). An evaluation of conventional and sub-irrigated planters for urban agriculture: Supporting evidence [Abstract]. *Renewable Agriculture and Food Systems, 30*, 55-63. doi.org/10.1017/S1742170514000131
- Suthirawut, P. (2008). *แผนสุขภาพจังหวัดสงขลา [Health directions of Songkhla Province]*. Hat Yai: Health Creation Network, Songkhla Province.
- Tacoli, C. (2012). Urbanization, gender and urban poverty: Paid work and unpaid carework in the city. UNFPA. Retrieved from: <http://www.unfpa.org/sites/default/files/resource-pdf/UEPI%207%20Tacoli%20Mar%202012.pdf>

- Tanavud, C., Yongchalermchai, C., Bennui, A., & Densreeserekul, O. (2004). Assessment of flood risk in Hat Yai Municipality, Southern Thailand, using GIS. *Journal of Natural Disaster Science*, 26(1). doi.org/10.2328/jnds.26.1
- Thai City Farm. (n.d.-a). แนะนำโครงการ [Introducing the project]. <http://www.thaicityfarm.com/autopagev4/showarticle.php?autoid=46>
- Thai City Farm. (n.d.-b). เขียว (สวย หอม) กินได้ ปฏิบัติการสร้างอาหารของคนเมือง เชียงใหม่ [Green (Scented Beauty) that you can eat. Acting to create food for urbanites of Chiang Mai]. Retrieved from http://www.thaicityfarm.com/autopagev4/show_page.php?topic_id=523&auto_id=47&TopicPk=
- Thai City Farm. (n.d.-c). สวนผักบำบัดกับเด็กออทิสติก [Vegetable garden as therapy for autistic children]. Retrieved from http://www.thaicityfarm.com/autopagev4/show_page.php?topic_id=654&auto_id=47&TopicPk=
- Thailand Environment Institute (TEI). (2012). Support of the capacity development on low carbon development policies at the sub-national level through NAMAs in Thailand. Retrieved from http://pub.iges.or.jp/modules/envirolib/upload/4212/attach/NAMA_MRV_Thailand_Final_Report__Dec_2012_db.pdf
- Thinphanga, P. (n.d.). โครงการจัดทำแผนพัฒนาคุณภาพชีวิตและผังชุมชนเพื่อการรับมือและปรับตัวกับการเปลี่ยนแปลงสภาพภูมิอากาศของชุมชนในพื้นที่เมือง หาดใหญ่ [Project to develop quality of life and a community plan for coping with and adapting to climate change in communities of Hat Yai Municipality]. Hat Yai: Songkhla Community Foundation. [Executive Summary is in English.]
- United Nations Population Fund. (2007). State of world population 2007. Retrieved from: <https://www.unfpa.org/publications/state-world-population-2007?page=8>
- United Nations, Department of Economic and Social Affairs, Population Division (2014). File 2: Percentage of population at mid-year residing in urban areas by major area, region and country, 1950-2050 (Excel file). World urbanization prospects: The 2014 revision. Retrieved from <http://esa.un.org/unpd/wup/CD-ROM/>

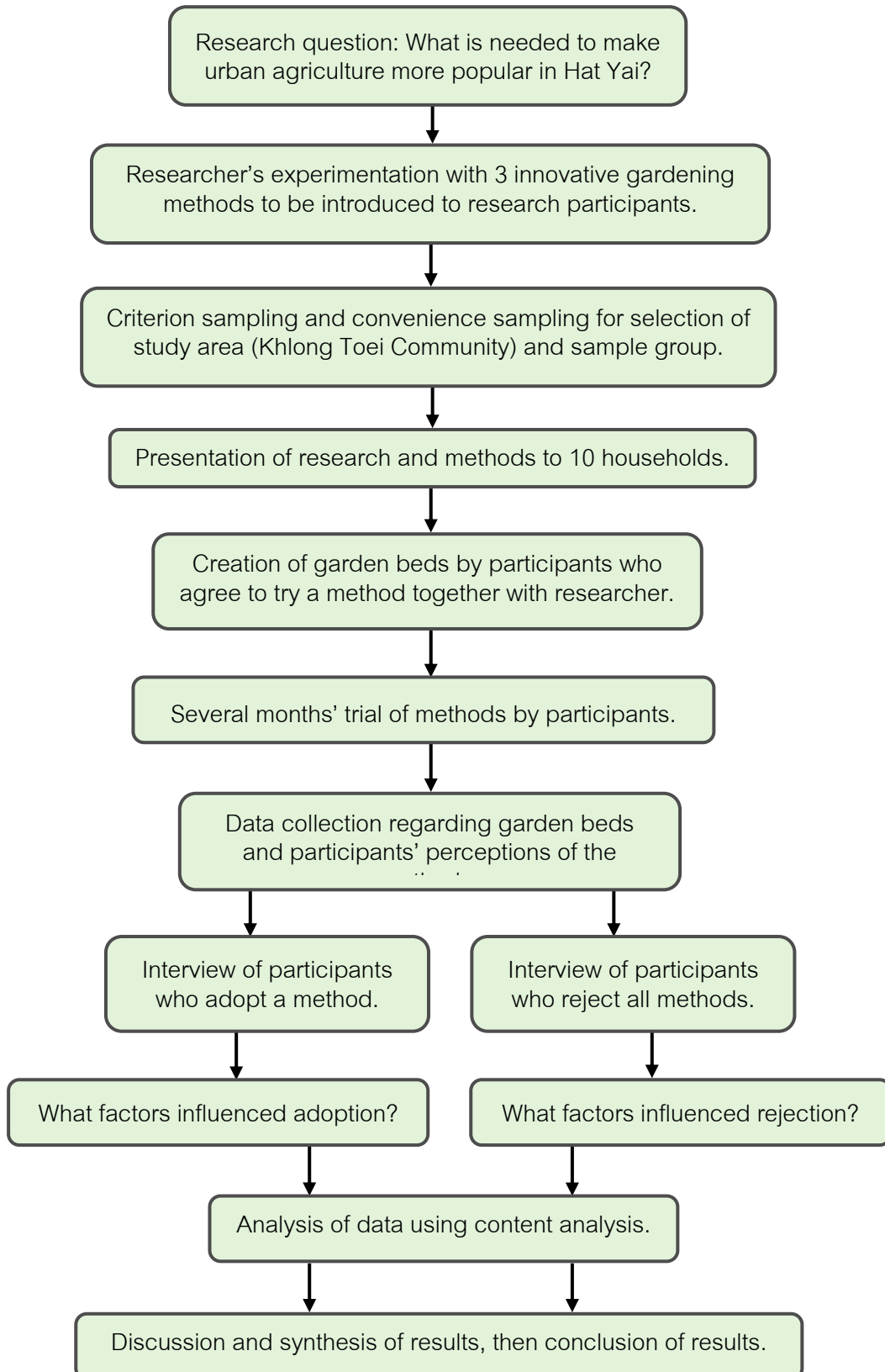
- United States Environmental Protection Agency. (2016). Heat island effect. Retrieved from <https://www.epa.gov/heat-islandsUnited States>
- United States Environmental Protection Agency. (n.d.-a). What is urbanization? Retrieved from: https://www3.epa.gov/caddis/ssr_urb_urb1.html
- United States Environmental Protection Agency. (n.d.-b). Reducing urban heat islands: Compendium of strategies-Green roofs. Retrieved from <https://www.epa.gov/sites/production/files/201406/documents/greenroofscompendium.pdf#page=5&zoom=auto,-175,671>
- Uren, H.V., Dzidic, P.L., & Bishop, B.J. (2015). Exploring social and cultural norms to promote ecologically sensitive residential garden design. *Landscape and Urban Planning*, 137, 76-84. doi:10.1016/j.landurbanplan.2014.12.008
- Vajarodaya, P. (2013). Local authority's solid waste management: A case study of Muangklang Municipality, Rayong Province. [In Thai]. *International Journal of Applied Sociology* 5(2), 99-105. doi:10.5923/j.ijas.20150502.05
- van Veenhuizen, R. (2006). Cities farming for the future. Retrieved from http://www.ruaf.org/sites/default/files/Chapter%201_1.pdf
- World Health Organization. (2010, April). Urbanization and health. *Bulletin of the World Health Organization*, 88(4), 241-320. Retrieved from: <http://www.who.int/bulletin/volumes/88/4/10-010410/en/>
- Wu, J., Liu, M., & Xiao, L. (2013). Analysis on thermal measuring of rooftop farming garden: A case study of Julong Residential District in Zhongshan. *Advanced Materials Research Vol, 717*, 306-311. doi:10.4028/www.scientific.net/AMR.717.306
- Zeza, A., & Tasciotti, L. (2010). Urban agriculture, poverty, and food security: Empirical evidence from a sample of developing countries. *Food Policy*, 35, 265-273. doi:10.1016/j.foodpol.2010.04.007

APPENDICES

Appendix A: Hat Yai District population data, 2006 to 2015

Year	Population
2006	359,812
2007	326,204
2008	349,212
2009	341,191
2010	344,693
2011	347,378
2012	351,118
2013	354,511
2014	358,259
2015	362,267

Appendix B: Conceptual framework for second objective



2.2 Where do you plant vegetables? (Mark all that apply)

- Around home Rooftop Separate from the home
 Inside the home Balcony

2.3 Specify each gardening method used (Mark all that apply)

- In planters/pots
 In-ground bed
 "Buffet Bed"
 Hanging bottle garden
 Raised beds
 Misc. containers
 Other

2.4 What are your reasons for using the methods specified in 2.3? (Mark all that apply)

- Try new method Familiarity Beauty
 Lack of space Convenience Other

2.5 How is the produce from the garden used? (Mark all that apply)

- Consume in household
 Give away (to relatives, neighbors, friends, co-workers)
 Exchange (with relatives, neighbors, friends, co-workers)
 Sell
 Make compost
 Make microbial inoculants
 Other

2.6 What types of plants do you grow? (Mark all that apply)

- Leafy vegetables
 Fruiting vegetables
 Perennial vegetables
 Flowers and ornamentals
 Trees

2.7 How do you improve and maintain the health of the garden? (Mark all that apply)

- Organic fertilizers Compost
 Chemical fertilizers Organic inputs
 Microbial inoculants Chemical inputs
 Other

2.8 Approximately how many hours do you spend tending the garden per week?

- 0-4.9 5-9.9 10.0-14.9 15.0-19.9 20 & more

2.9 Who are the main people tending the garden? (Mark all that apply)

- Father Son
 Mother Daughter
 Other

2.10 Approximately how many meals per week does the household consume your garden produce?

- 0-3 4-7 8-11 12-15 16-21

2.11 Are you satisfied, in terms of quantity and quality, with the produce from your garden?

- Satisfied Not satisfied

Part 3. Problems and suggestions

3.1 What problems have you encountered doing urban agriculture?

3.2 What suggestions do you have for people doing urban agriculture?

Appendix D: In-depth, semi-structured interview questions for key informants

SCF Interview Apr 18, 2016

Please tell me who's answering the questions, and your full name please.

1. What is your view of the municipality's policy on UA?
2. How much interest is there among municipal officials? (If I remember correctly, you've complained that they aren't really serious about UA.)
 - A. How well do they carry out the policy? (I won't cite your name.)
3. The focus group:
 - A. Before the focus group on Jan 29, how did SCF promote the UA group in the past?
 - (1) Did SCF have goals regarding the group (number of members, number of learning centers, etc.)?
 - B. In what ways is SCF now promoting the UA group, since the focus group?
 - (2) Does SCF have goals regarding the group (number of members, number of learning centers, etc.)?
4. Can you say something about interest being a factor in adoption of UA?
5. What can be done to
 - A. get more people's attention?
 - B. get more people's interest?
 - C. get more people to try gardening?
6. What obstacles hinder the foundation in promoting UA?

Qs for K. Chakrit

- 1) Seems to me that UA is a minor, relatively unimportant part of the strategy to deal with climate change. Preventing??, minimizing the damage from, and dealing with the affects of flooding is the major part of the project, right?
How well has UA met the goals of dealing with climate change and floods?

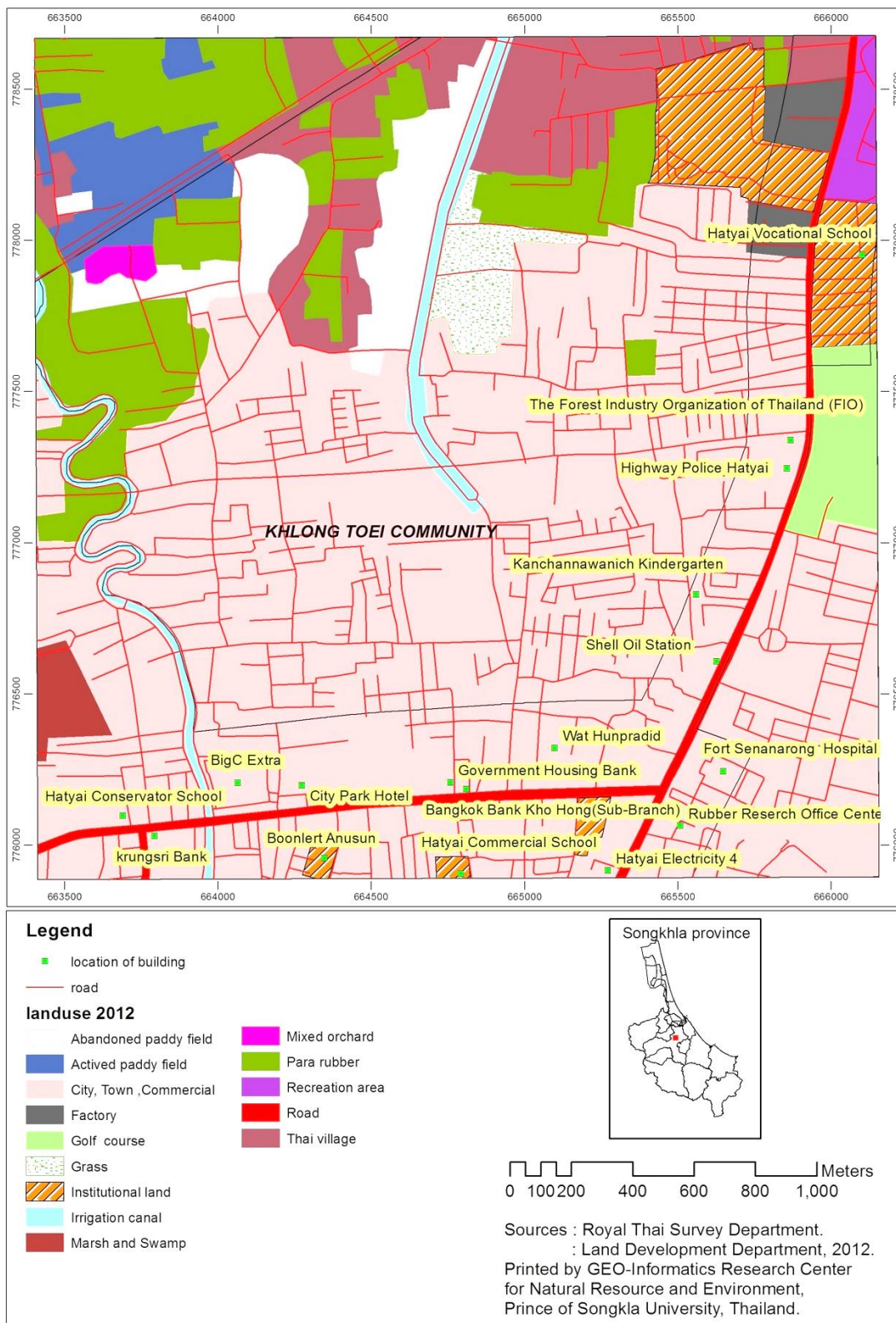
- 2) pg 10 & 12 of ถอดบทเรียน say that floodwater is being moved from the city center to the two project target areas. This raises at least one question: **A)** Is this a case where powerful business owners who wanted their businesses protected, influenced politicians (and others?) to have the flood protection measures work in their favor, at the expense of much less powerful people? If this is the case, then it is very similar to what people in other countries complain about, including my own country. **B)**
- 3) The ACCCRN project started in only Khutao & Hat Yai Nai communities.
 - 1) The project is over, right?
 - 2) If the project is over, are the various activities still on-going? (Okay, I realize the water level monitoring exists. Also, many activities have the name Khutao in the name, but none have the name Hat Yai Nai, and many don't have any commy name at all. Why?) How about other activities (**Pages 60-67**): such as the water filtration station, grease traps ถังดักน้ำมันครัว, sauna โรงอบสมุนไพร, ตลาดน้ำซึ้อ, Green Commy, commy waste mgmt, Khutao organic network of (**still?**) **seven farmers (organic or ปลอดภัย?)**, still selling in the places mentioned (mostly hospitals, and PSU)?
 - 3) What's the status of the project now?
 - 4) How, when, & why did it expand into other communities?
 - 5) The UA group was started up under this project, right? Your books don't say much about the various activities of the UA group.
 - 6) I don't see any relation, in your books, between the Khutao group and the others in the UA group.
- 4) In the intro to a short paper that I'm doing regarding the situation analysis of UA in HY, I'll need to say why this research is important. Why would anyone care about this situation analysis? My only idea is to see how well UA is helping communities to cope with climate change and floods.
- 5) Is water hyacinth a problem in Khlong Utapao? Does it obstruct water flow and fisherfolk?

Interview w/ K. Kanyakorn Ratanakhom

Kanyakorn APRIL 8TH, AT 11:30AM

1. Does the municipality have a policy regarding UA?
 1. Does the municipality have targets / goals?
 1. If so, may I have a copy of some sort?
 2. How well does the municipality implement the policy? (I won't cite your name.)
2. What are the obstacles that hinder interest in and adoption of UA by city residents?
 1. When I've spoken to people, and they've told me that space, time, and knowledge are their constraints, then I tell them that these don't have to be constraints, only 1 person has shown any surprise or subsequent interest. So, I wonder if interest isn't more important than these 3 factors. Of course there are very possibly other factors involved in their not showing interest.
 2. Can you say something about interest being a factor in interest in and adoption / rejection of UA?
3. What can be done to
 1. get more people's attention?
 2. get more people's interest?
 3. get more people to try gardening?
4. What obstacles hinder the municipality in promoting UA?
5. From where can I get population data for the years 2006 to 2015?
6. Is water hyacinth much of a problem in Hat Yai?
 1. If so, how clean are the waterways where it's a problem?
 2. I'd love it if there were a business that took this (and other plants?) and made compost from it.
 3. If the municipality spends money on removing this plant from waterways, or sees that its removal would perhaps mitigate floods, then maybe the municipality could support such a business in some way, by, at the very least, providing land for drying and composting the plant(s).

Appendix E: Land use map from the Royal Thai Survey Department, 2012



Appendix F: Questionnaire for participants

1. What is your name?
2. What district of Khlong Toei do you live in?
3. What type of home do you live in?
4. What is the number, gender, and age of each member of the household?
5. What is your occupation?
6. What is the religion of the household?
7. What is the household's monthly income?
8. What is your highest level of education completed?
9. About how much time do you expect you will spend in the garden?
10. Perceptions about adequacy of space for a garden:
 - a. Before the presentation?
 - b. After the presentation?
11. Have you ever seen other people with a vegetable garden in the city?
 - a. What were your impressions?
12. Do you have experience gardening?
13. Did you grow up in a household with a garden?

Appendix G: In-depth, semi-structured interview questions for participants

THREE BIG OBSTACLES TO UA

1. Time

- a. How much time will you spend / have you been spending in the garden each week?

2. Space

- a. Before this presentation, what was your belief about the adequacy of the space available to you for having a garden?
- b. Now that you've seen the presentation, what is your belief about the adequacy of space?

3. Know-how: Experience with & exposure to gardening & gardens

- a. Have you ever seen or heard of others doing UA?
- b. Did you actually see the garden(s), or only hear about it / them?
- c. What were your impressions, (no matter if you saw or heard about it / them)?
- d. Do you have experience with gardening?
- e. Did you grow up in a HH with a garden?

ATTITUDES & OPINIONS:

1. Before I approached you about gardening, had you ever thought about doing it?
 - a. If so, did you?
 - b. If not, why didn't you?

[These three questions could give really good answers, because they could provide useful comparisons.]

2. Health

- a. How is your & your family's health?

- b. About how much money does the HH spend on medicine & doctor / dentist bills per month or per year? Or maybe per three months would be a slightly better timeframe.
 - c. About how often do you & your family members get sick / visit doctor / dentist?
 - d. How concerned are you about your & your family's health?
3. Meals:
- a. How do you and others in HH feel about eating veggies?
 - b. Do you or anyone else in the HH want to increase consumption of vegetables?
 - c. How often does someone in the HH cook? / how many times per week?
 - d. What veggies do you cook with? (leafy veg / fruit veg / spices)
 - e. Where do you usually buy veggies?
 - f. How convenient or inconvenient is it for you to buy vegetables?
 - g. In your experience, how do conventional produce and organic produce compare in terms of price and quality?
4. HH Finances
- a. Is there enough money between pay periods?
 - b. Are you in debt?
5. Beauty of home environment
- a. Is the beauty of your home & surroundings okay with you?
would you like to make it more beautiful?
 - b. Compared with other homes in the neighborhood, is your home more /
equally / less beautiful?
6. Environment
- a. Are you aware of news of environmental crises? if yes, are you
concerned?
 - b. Do you believe you have an effect on, and play a part in solving the
problems?

7. Relations

- a. How are HH relations?
- b. How are relations between your HH and others in the neighborhood?
- c. Look at these pictures (of urban gardens) please and tell me what feelings / thoughts occur?

Appendix H: Scope of observations

Observations included the participants, the researcher himself, and the gardens. With respect to participants, during face to face contact, their speech and actions were observed, including subtle nuances of verbal and physical expression, while also taking into account the context of the conversations. The language and tone of voice were observed during phone conversations. While communicating by social media, the language and the context were observed. The researcher also paid attention to his own speech and physical conduct, as well the context of the conversation. The gardens were an important point of observation, while taking photographs and talking with participants.

The researcher enjoys observing people, including himself, so observation comes easily. While observing participants, there were times when their words seemed to not match what the researcher observed, or contradicted what they had said at other times. At times, the apparent inconsistencies were pointed out in order to gain clarification, while at other times they were ignored.

The researcher was well aware that, due to his limited Thai language skills and understanding of Thai culture, especially of southern Thai language and culture, misunderstandings inevitably occurred.

Of particular interest were the gardens, especially with respect to participants' comments and questions about the methods. Close attention was also paid to relations between various community members as well as with the researcher.

Appendix I: Names of plants grown by participants

Participants made their own decisions regarding what to plant, though suggestions were given, especially when participants inquired about what to plant. However, no attempt was made to convince them to plant anything in particular. Three common suggestions were morning glory (*Ipomoea aquatic*), bok choy (*Brassica parachinensis* L.H. Bailey), and kale (*Brassica alboglabra*) and were indeed planted by many participants but no effort was made to ascertain whether or not they did as was suggested. The common and scientific names of each species grown by each participant given below.

- Jo planted morning glory (*Ipomoea aquatic*), kale (*Brassica alboglabra*), sunflower greens (*Helianthus annuus*), and bok choy (*Brassica parachinensis* L.H. Bailey).

- Sing planted morning glory (*Ipomoea aquatic*), kale (*Brassica alboglabra*), musk melon (*Cucumis melo*), and long beans (*Vigna unguiculata sesquipedalis*).

- Wut planted morning glory (*Ipomoea aquatic*), kale (*Brassica alboglabra*), brinjal (*Solanum melongena*), lime (*Citrus aurantifolia*), Thai basil (*Ocimum basilicum* var. *thyriflora*), and roselle (*Hibiscus sabdariffa*).

- Mai planted morning glory (*Ipomoea aquatic*), long beans (*Vigna unguiculata sesquipedalis*), Chinese cabbage (*Brassica rapa* var. *chinensis*), and cucumber (*Cucumis sativus*).

- Nit planted morning glory (*Ipomoea aquatic*) and Thai basil (*Ocimum basilicum* var. *thyriflora*).

- Thin planted chili (*Capsicum frutescens*), lime (*Citrus aurantifolia*), Thai basil (*Ocimum basilicum* var. *thyriflora*), and katuk (*Sauropus androgynous*).

- Suwit planted bok choy (*Brassica parachinensis* L.H. Bailey), kale (*Brassica alboglabra*), and chili (*Capsicum frutescens*).

- Jane planted colantro (*Eryngium foetidum*), spring onions (*Alliumcepa* var. *aggregatum*), bok choy (*Brassica parachinensis* L.H. Bailey), and Chinese cabbage (*Brassica rapa* var. *chinensis*).
- Phairin planted bok choy (*Brassica parachinensis* L.H. Bailey) and Chinese cabbage (*Brassica rapa* var. *chinensis*).
- Chalit planted morning glory (*Ipomoea aquatic*), bok choy (*Brassica parachinensis* L.H. Bailey), hoary basil (*Ocimum basilicum*), and Thai basil (*Ocimum basilicum* var. *thyrsoflora*).

Appendix J: Researcher's published manuscript

How well do Hat Yai, Thailand urban gardeners meet their aims?

Authors¹ Troy Santos^{1*}, Somyot Thungwa², and Kobchai Worrapiumphong³

1,2,3 Faculty of Natural Resources, Prince of Songkla University, Hat Yai, Thailand, 90110

Santos, T., Thungwa, S., and Worrapiumphong, K. (2017) **How well do Hat Yai, Thailand urban gardeners meet their aims?** Journal of Agricultural Technology x(x):xxx.

Urban populations are growing, placing more and more stress on the natural world, social institutions and individuals. UN forecasts are for further urban population increases, including Thailand's cities. Residents of Hat Yai, Thailand's major southern city, meet these challenges through urban agriculture (UA). The objectives of this research were to gather basic data on these mostly hobby gardeners and their gardens, and explore how well they were meeting their intentions. Criterion Sampling was used with the sole criterion that respondents were at least preparing to start gardening. Data from a questionnaire filled out by UA group members, focus group results, and key informant interviews were analyzed. Results indicate that women do most of the gardening, the largest age group is 61-65, the majority have below average incomes, and a roughly equal number have a primary school education or a bachelor's degree. Most garden organically, wish to improve their health, and to save money. Many gardeners are short on gardening knowledge and skills, and complain of tight gardening spaces. Compared with Bangkok's UA group, Hat Yai's group on average harvests food with similar frequency but with about 4 times the number of gardening hours. By increasing gardening skills and knowledge, and density of use of growing spaces, yet without increasing gardening time, they may harvest more food, thus possibly improve their health and save money. Recommendations are for municipal officials and the group's parent organization to increase material assistance and gardening skills training, and help increase the efficiency of use of space.

Keywords: urban agriculture, hobby gardening, urbanization, Hat Yai

Introduction

¹ **Corresponding Author:** Troy Santos; **E-mail address:** troysantos@gmail.com

Rising urban populations around the world increase the stress on social institutions and individuals. The UN (2014) reported Thailand's urban population in 1950 was 16.5% in 1950 and will reach 71.8% in 2050, or 7 of every 10 people. This study site, Hat Yai District, is among these growing urban areas. According to Thinhphanga (circa 2014-2015), "it is an important economic, trade, and tourism hub" where the urban part "has been growing at a dramatic rate in the last two decades and the city is now ranked as the third largest in Thailand after Bangkok and Chiang Mai" (p. 8-9). The district's 2015 population was 362,267. Hat Yai District Office population data from 2006 to 2015 (Accessed on April 20, 2016), suggest a continued population increase. It is located in tropical southern Thailand's Songkhla Province, almost 1,000 kilometers south of Bangkok, near the border with northern Malaysia.

Urban agriculture (UA) is becoming more common worldwide, and is often considered for its potential to contribute to urban environmental and social sustainability (Orsini, Kahane, Nono-Womdim, & Gianquinto, 2013; Zezza & Tasciotti, 2010; Hamilton, *et al.*, 2014). The potential benefits of UA may seem obvious, but solid evidence that these potentials are being met is lacking (Hamilton, *et al.*, 2014; Korth, *et al.*, 2014). This research focused on hobby urban gardeners who, in contrast to commercial growers, were mainly motivated by reasons of personal health and financial savings. So that more people may do so, it is useful to know if they are meeting their aims, and to identify and address shortcomings. This research question asks if Hat Yai urban gardeners are meeting their health and financial aims.



Figure 1. Ari lives on a street with no space between homes, yet harvests enough for about 15 meals per week, spending about 20 hours per week.

Social effects of urbanization

This section will briefly review some of the literature regarding the health and income situations of residents of cities, particularly with respect to less wealthy classes. It can be said that health care in cities is more available than in rural areas. 22% of urban residents of the world do not have health care, and in this way fare better than their rural counterparts, 56% of whom lack care (Scheil-Adlung, 2015). On the contrary, a news release by the World Health Organization (WHO) and the UN Human Settlements Programme (UN-Habitat) stated that in nearly 100 countries the inequities in access to health care and sanitation between the richest and the poorest city dwellers are a “persistent challenge” (World Health Organization, 2016). Millions of people migrate annually to cities in search of better livelihoods and higher incomes, though many do not realize what they hoped for (Hamilton *et al.*, 2014). Regarding employment and poverty, Grant (2012) examined “the capacity of urban areas to create jobs, [and showed] how growth is concentrated in cities that paradoxically offer mostly informal employment, and trap large shares of their residents in poverty” (p. 24).

The Food and Agriculture Organization (FAO) (2003) has defined *food security* as existing “when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life” (p. 29). Szabo (2016) studied how urbanization affects food security, concluding that the effects are often negative. She discussed physical and financial access to food, stating that urbanization brings better infrastructure, therefore better physical access to food, but that the poor have more difficulty than wealthier classes in securing adequate healthful and hygienic food. In a similar vein, a relatively recent concern are so-called *food deserts*, where millions of mostly lower-income classes, mainly in developed nations (mostly in the USA) live where there is “poor access to healthy and affordable food” (Beaulac, Kristjansson, & Cummins, 2015, p. 1). In addition, Redwood (2009) illustrated that low income residents in several cities around the world often spend up to 60% and in some places, even 85% of their incomes on food. Mohiddin, Phelps, and Walters (2012) reported a correlation between rapid urban growth in developing countries, slums, and undernutrition.

Objectives: To gather data on Hat Yai District gardeners, gardens and garden activities, and examine if they are improving their health and saving money.

Methodology

Criterion Sampling was used in choosing the Hat Yai urban gardening group which met the criteria of ease of access to members. It was used also for participant selection with the sole criterion that they were at least preparing to start a garden. The researchers attended several of the group’s monthly trainings out of interest in gardening and the content of the training, and in order to become familiar with members of the group and how it operates.

Data was collected using a variety of tools. A focus group assessed members’ experiences and perceptions of positive and negative aspects of UA in Hat Yai. Results of the focus group were entirely qualitative and were analyzed by content analysis. These data do not contribute to answering the objectives, but contribute to gaining a broad perspective of UA in Hat Yai and are briefly discussed at the end of the Results & Discussion section.

A 20-question questionnaire with closed-ended and open-ended questions was passed out to focus group participants, and later circulated to other members of the UA group. The questionnaire covered basic personal data, data about the gardens and garden activities, and asked what problems and obstacles gardeners face and what recommendations they have for improving UA. 75 questionnaires were filled out and returned, with 67 selected for analysis. Responses were first tabulated by hand then analyzed by descriptive analysis, according to this research's 2 objectives. Interviews and focus group results were also analyzed for topics pertaining to the objectives.

In-depth interviews were conducted with 4 key informants involved in different capacities with UA in Hat Yai. Basic information about the Bangkok and Chiang Mai UA groups was obtained through email and social media.

Results and Discussion

Urban agriculture groups in Thailand

Several provinces in Thailand have UA groups. SCF's director claims that the Hat Yai group is second in size only to the Bangkok group. Both groups are named *Suan Phak Khon Mueang* (which translates as City People's Vegetable Garden). The Bangkok group is the oldest, has the largest membership, and the most extensive activities. Green Beauty Scented is the UA group in Thailand's 2nd largest city, Chiang Mai. Their outreach programs support and promote organic urban gardening, oriented mainly toward improving health and members' financial situations. Available data for these groups is given below.

Basic data on gardeners' households in Hat Yai District

Section 1 of the questionnaire gathered basic personal data in order to know the respondents' (and other household members') socio-economic variables, as per the first objective. The local municipal office and the group's parent organization may be able to use this information in outreach efforts.

Gender breakdown of the 67 respondents shows 87% were women while 13% were men. The Chiang Mai group also says that women predominately tend to do the garden (W. Thala, personal communication, March 26, 2016). **Ages** ranged from the youngest at

24 to the oldest at 84. The 61- to 65-year age bracket was the largest, with 18% of respondents. 76% were 46 to 75 years old, while 24.0% were aged 24 to 45. About 2/3 of urban gardeners in Malaysian cities were 26 to 45 years old (Rezai, Shamsudin, & Mohamed, 2016; Rezai, Shamsudin, Mohamed, Sharifuddin, 2014), while only about a quarter of Hat Yai urban gardeners were a similar age. The gender and ages of most respondents may be understood by considering that women typically take better care of their health than men (WHO, 2014), and in general, older people are more interested in health than younger people.

Income levels of respondents was compared with monthly household income for Songkhla Province. In 2015, the average monthly household income was 27,660 baht per month (National Statistical Office, n.d.a). Compared with respondents' monthly incomes, it is clear that 45% had income below this average, 37% had income above this average, and 18% had a similar monthly income. The most common monthly household income bracket was 10,000-19,999 baht (27% of respondents). This was below the provincial average, but above the poverty line, which for Songkhla Province in 2014, was 2,922 baht per person per month (National Statistical Office, n.d.b). 18% of respondents marked the lowest income bracket 0-9,999 baht. The initial UA group was started by middle-class residents, while nearly 45% of participants in this study had a lower than average income, suggesting an expansion of awareness of the potential benefits of growing one's own food.

Occupations Over half (54%) of respondents were either retired or for other reasons did not work outside the home and an appreciable number of respondents (22%) were self-employed. It is likely these groups were highly flexible with finding time for gardening, and so more likely to take it up in the first place. Nearly two-thirds of respondents had **education** levels on opposite ends of the education spectrum. 36% of respondents had a bachelor's degree, while 37% had a primary school education (though some did not finish primary school). Out of the 12 respondents who lived in the slum community, 10 had only a primary school education. 76% of the 25 respondents with a primary school education reported making clearly less than the provincial average for 2015, while only 4% (1 person) reported clearly more than the average. 63% of the 24 respondents with a

bachelor's degree reported making clearly more than the provincial average, while 25% (6 people) reported making clearly less than the average. There is a correlation between education level and income, yet the data gathered in this research cannot answer why these 2 education levels are represented so much more than the others. In contrast, urban gardeners in Malaysia were much more likely to have the equivalent of a bachelor's degree than their counterparts in Hat Yai, with 61% and 44%, as reported in Rezai, *et al.*, 2014 and Rezai, *et al.*, 2016, respectively.

The gardens and garden activities

The 2nd section of the questionnaire gathered data on the gardens and activities in the gardens, as per the first objective. The purpose here was to get an understanding of the current characteristics regarding gardens, also for use in future outreach efforts. Below is a descriptive analysis of the results.

Motivations for starting a garden Health was unsurprisingly the main reason that respondents started a garden, with 94% marking this reason, including the youngest and all but the oldest respondent. The next most common reason was to save money, with 67% of respondents. 58% of respondents started gardening as a hobby. The Chiang Mai group's website says that lower income households started gardening largely to save money, while higher income households took more interest in health (Pholsawek, J. Oct. 13, 2014). McClintock, Mahmoudi, Simpson, and Santos (2016) corroborated by stating that higher income gardeners in Portland, OR, USA considered avoiding pesticides more important than saving money, while lower income gardeners considered saving money more important. Urban gardeners in the Malaysian studies saw health as a benefit of UA, and though the studies do not state clearly, it seems health was not a strong motivation (Rezai *et al.*, 2014; Rezai *et al.*, 2016). In addition to health and financial motivations, social and environmental reasons were cited by the Hat Yai UA group on the questionnaire and in the focus group, members of the Bangkok and Chiang Mai groups, and hobby gardeners in other countries (Guitart, Pickering, & Byrne, 2012; Scheromm, 2015; McClintock *et al.*, 2016).

Garden inputs Organic fertilizers were the most common, with 88% responding positively. Leaders of the UA group support and encourage organic gardening, but this is not required (W. Phetmisri, personal communication, May 6, 2016) and 27% use chemical fertilizers sparingly. This contrasts slightly with the Chiang Mai group members, who avoid synthetic agricultural chemicals entirely, emphasizing inputs which are close at hand in order to reduce their dependence on outside inputs, and the Bangkok group, whose members also completely avoid synthetic inputs (W. Thala, and V. Nimhattha, personal communications, March 26, 2016, and May 26, 2016).

How gardeners use produce All 67 respondents marked that they consume garden produce at home. Next most common, 61%, marked giving away produce. 40% said they exchange produce with others. Only 9 respondents marked selling produce, as indeed, few have enough space to grow enough for all their own needs, let alone enough to sell. Only two from the lowest income bracket were among the 9 selling produce, both of whom live in the slum, where there is no space surrounding homes, thus it is all but impossible for a large enough garden to grow to sell at the nearby fresh market.

Gardening methods The most common way of planting was to use planters and pots, with 88% responding that this was among the ways they plant. Due to the nature of city living, many homes have little or no land for planting, so planting in pots on the street in front of one's home is the most common option. Simply planting in in-ground beds was next, with 50%. Using various discarded containers, such as UHT milk cartons, or small baskets was marked by 34%. A leader in the UA group is an agricultural extension agent, and together with SCF, have promoted a method called *Plaeng Phak Buffet* (which translates as *Buffet Bed*). The beds were designed for urban spaces, so about one square meter is the suggested size. Despite making its productivity clear through promotion via social media and frequent demonstrations, only 8 respondents marked using this method.

Garden locations 94% reported using the space immediately adjacent to the house for planting, due to space limitations. Though many homes in Hat Yai have balconies, only 5 people reported using them for planting. Surprisingly, nobody among these 67 gardeners had a rooftop garden.

Do Hat Yai urban gardeners fulfill their intentions for gardening: health and savings

The 2nd objective was to examine whether Hat Yai urban gardeners are meeting their most common intentions for gardening, i.e. to improve their health and to save money. By analyzing the number of meals per week with something from their gardens, and the number of hours per week spent gardening, it was possible to speculate on how well they were fulfilling their intentions. No effort was made in this research to determine to a high degree of certainty whether or not they are in fact fulfilling these intentions. Establishing improvements (or deterioration) in health and / or a financial savings (or loss) as definitely a result of UA would have required more complex research, well beyond the scope here. Below is a descriptive analysis of the results.

Number of meals per week with produce from gardens 64% of respondents consumed fewer than 7 meals per week containing produce from their gardens. The average number of meals was 9. It is possible that some meals consisted of only a few leaves from vegetable plants or culinary herbs. Also possible is that some meals consisted of a large amount of produce from the garden, especially among those marking one meal a week. 13% of respondents reported 1 meal per week, while 19% reported 21 meals. In Chiang Mai, members consumed produce from their gardens 2-3 times per week (W. Thala, personal communication, March 26, 2016). For some members of the Bangkok group, every meal had something from their gardens, but for most members, 2 meals, 3-5 days per week was the norm (V. Nimhatta, personal communication, May 26, 2016). Chiang Mai gardeners averaged 2.5 meals per week and Bangkok gardeners averaged 10. Hat Yai gardeners were just below the Bangkok group, averaging 9 meals per week.

Number of gardening hours per week 35% of respondents spent less than 5 hours gardening each week, which is a little more than those who spent from 5.0-9.9 hours per week (32%), while 20% spent 10.0-14.9 hours. The 2 smallest brackets spent the most time tending their gardens: 3% spent 15.0-19.9 hours and 8% spent 20.0 hours or more. Members of the Chiang Mai group generally spent up to 3 hours per week gardening (W. Thala, personal communication, March 26, 2016) and Bangkok members spent at least 1-2 hours each day (V. Nimhatta, personal communication, May 26, 2016). The Hat Yai respondents averaged 7.9 gardening hours per week, while the range was from 1 hour (3 people) to 35 hours (1 person). The family of the respondent reporting 35 hours per week lives in a peri-urban part of the district, and has a 1.2-acre commercial farm, the largest among respondents.

Table 1 Weekly number of meals & gardening hours (n=67)

Items	No.	%	Avg.	Min- Max
Number of meals per week with produce from gardens	-	-	9.0	1-21
≤ 3	25	(37.3)	-	-
4-7	17	(25.4)	-	-
8-11	3	(4.5)	-	-
12-15	7	(10.4)	-	-
16-19	2	(2.9)	-	-
20-21	13	(19.4)	-	-
Number of hours per week spent gardening	—	—	7.9	1-35
≤ 4.9	24	(35.8)	-	-
5.0-9.9	22	(32.8)	-	-
10.0-14.9	14	(20.9)	-	-
15.0-19.9	2	(2.9)	-	-
≥ 20.0	5	(7.5)	-	-

The data in this research shows that Hat Yai urban gardeners spent nearly twice the time per meal on average than their Bangkok counterparts, thus it appears there is considerable potential for increased productivity and efficiency. Due to somewhat infrequent harvests, it is likely that most respondents' health and financial situations have not substantially improved as a result of gardening. Many Hat Yai urban gardeners complained of various garden pests and soil problems, limiting their harvests. Thus, attending to these issues would likely increase harvests, and perhaps lead to improvements in health and increases in savings. Another limiting factor is that many respondents marked giving away produce, reducing their own consumption.

A large number of respondents' main obstacle was space. Because an abundance of DIY methods and commercial container gardening products are available that address space limitations, the municipal office and the UA group's parent foundation may promote these methods and products in support of gardeners. Hat Yai urban gardeners overwhelmingly use pots and planters for gardening so many people may readily adopt the DIY methods and container gardening. Future UA research in Hat Yai could focus on the issue of limited space, garden pests, and soil health. With increased outside support, it is possible that productivity and/or efficiency will increase, thus facilitating more Hat Yai urban gardeners improving their health and financial situations.

Conclusion

In Hat Yai, true to its origins among health-conscious individuals, urban gardeners are still predominantly middle-aged and older health-minded folks. Three quarters of urban gardeners are 46 and older, so are more likely to be interested in health than their younger peers. Mainly due to this interest in health, most garden organically. Their two most common motivations for gardening were to improve their health and to save money, yet due to comparatively low productivity, it is likely that neither of these motivations was realized by most urban gardeners in the Hat Yai group.

Respondents and key informants want increased support from government and non-government agencies for training and materials, who are well aware of this wish. Because methods and products are available that may suit Hat Yai's urban gardening

situations, it is possible that municipal officials and SCF could promote these in order to increase yields and decrease time spent, thereby improve gardeners' health and finances.

Acknowledgements

The authors would like to thank the members of the Hat Yai urban gardening group who spent their time filling out the questionnaires, and Songkhla Community Foundation (SCF) for their patient help at several stages of the research.

References

- Beaulac, J., Kristjansson, E., & Cummins, S. (2015). A Systematic review of food deserts, 1966-2007. *Preventing Chronic Disease, 6*(3).
- Food and Agriculture Organization. (2003). Trade reforms and food security: Conceptualizing the linkages. Rome: FAO.
- Grant, U. (2012). Urbanization and the employment opportunities of youth in developing countries. UNESCO. 2012/ED/EFA/MRT/PI/25.
- Guitart, D., Pickering, C., & Byrne, J. (2012). Past results and future directions in urban community gardens research. *Urban Forestry & Urban Greening, 11*, 364-373.
- Hamilton, A. J., Burry, K., Mok, H., Barker, S. F., Grove, J. R., & Williamson, V. G. (2014). Give peas a chance? Urban agriculture in the developing world: A review. *Agronomy for Sustainable Development, 34*, 45-73.
- Korth, M., Stewart, R., Langer, L., Madinga, N., Da Silva, N.R., Zaranyika H., van Rooyen, C. & de Wet, T. (2014). What are the impacts of urban agriculture programs on food security in low and middle-income countries: a systematic review. *Environmental Evidence 3*(21).
- McClintock, N., Mahmoudi, D., Simpson, M., & Santos, J.P. (2016). Socio-spatial differentiation in the sustainable city: A mixed-methods assessment of residential gardens in metropolitan Portland, Oregon, USA. *Landscape and Urban Planning, 148*: 1-16.
- Mohiddin, L., Phelps, L., & Walters, T. (2012). Urban malnutrition: a review of food security and nutrition among the urban poor. [Commissioned by Save the Children UK.]

- National Statistical Office, Thailand. (n.d.a). The Household Socio-Economic Survey [for 2015]. Retrieved from http://service.nso.go.th/nso/nsopublish/BaseStat/tables/00000_Whole%20Kingdom/N2P02-income.xls
- National Statistical Office, Thailand. (n.d.b). The Household Socio-Economic Survey [for 2015]. Retrieved from http://service.nso.go.th/nso/web/statseries/tables/00000_Whole_Kingdom/Poverty_2.xls
- Orsini, F., Kahane, R., Nono-Womdim, R., & Gianquinto, G. (2013). Urban agriculture in the developing world: A review. *Agronomy for Sustainable Development*, 33, 695-720.
- Pholsawek, J. Oct. 13, 2014. สวนผักอีกรุ่นเมือง [Suan Phak Hak Mueang]. Retrieved from Technology Chao Ban. http://www.technologychaoban.com/news_detail.php?tnid=1385§ion=11
- Redwood, M. (2009). Agriculture in urban planning: Generating livelihoods and food security. Ottawa: International Development Research Centre.
- Rezai, G., Shamsudin, M.N., & Mohamed, Z. (2016). Urban Agriculture: A Way Forward to Food and Nutrition Security in Malaysia. *Procedia - Social and Behavioral Sciences*, 216, 39-45.
- Rezai, G., Shamsudin, M.N., Mohamed, Z., & Sharifuddin, J. (2014). Factor Influencing Public Participation in Urban Agriculture in Malaysia. *Proceedings of the International Conference on Advances In Economics, Social Science and Human Behaviour Study-ESHB*, 22-25.
- Scheil-Adlung, X. (2015). Global evidence on inequities in rural health protection: new data on rural deficits in health coverage for 174 countries. (Extension of Social Security series; No 47). Geneva: International Labour Office, Social Protection Department.
- Scheromm, P. (2015). Motivations and practices of gardeners in urban collective gardens: The case of Montpellier. *Urban Forestry & Urban Greening*, 14, 735–742.

Szabo, S. (2016) Urbanisation and Food Insecurity Risks: Assessing the Role of Human Development. *Oxford Development Studies*, 44(1), 28-48.

Thinphanga, P. (n.d.). โครงการจัดทำแผนพัฒนาคุณภาพชีวิตและผังชุมชนเพื่อการรับมือและปรับตัวกับการเปลี่ยนแปลงสภาพภูมิอากาศของชุมชนในพื้นที่เมืองหาดใหญ่ [Project to develop quality of life and a community plan for coping with and adapting to climate change in communities of Hat Yai City]. Hat Yai: Songkhla Community Foundation. [Executive Summary is in English.]

United Nations, Department of Economic and Social Affairs, Population Division. (2014). File 2:Percentage of population at mid-year residing in urban areas by major area, region and country, 1950-2050. World urbanization prospects: The 2014 revision, CD-ROM edition.

World Health Organization. (2014). Noncommunicable Diseases (NCD) Country Profiles. Retrieved from http://www.who.int/nmh/countries/tha_en.pdf?ua=1

World Health Organization / UN Habitat. (2016). Urban health: major opportunities for improving global health outcomes, despite persistent health inequities. [Joint news release: WHO | Kobe Centre | UN Habitat].

Zeza, A. & Tasciotti, L. (2010). Urban agriculture, poverty, and food security: Empirical evidence from a sample of developing countries. *Food Policy*, 35, 265-273.

(Received xxxxxx, accepted xxxxxx)

VITAE

Name Mr.Troy Santos

Student ID 5710620029

Educational Attainment

Degree	Name of Institution	Year of Graduation
Bachelor's degree	University of California, Santa Cruz	1999

Scholarship Awards during Enrollment

Thailand's Education Hub for Southern Regions of ASEAN Countries (TEH-AC)

List of Publication and Proceeding

Santos, T., Thungwa, S., Worrapiumphong, K. (2017). How well do Hat Yai, Thailand urban gardeners meet their aims? International Journal of Agricultural Technology, 13(5).