
Economic Aspects of Urban Vegetable Gardening in Bangkok Metropolitan, Thailand

Suneeporn Suwanmaneepong* and Panya Mankeb

Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang, Chalongkrung Rd. Ladkrabang, Bangkok 10520 Thailand.

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The purposes of this research were to investigate characteristics of urban vegetable growers in Bangkok Metropolitan and estimate the economic value of urban vegetable gardening. The structural questionnaire was applied as a research instrument for data collection from 60 urban vegetable growers in Bangkok and Metropolitan in the year 2016-2017. Snowball sampling was used in order to select participants. Descriptive statistics namely frequencies, percentage, mean, standard deviation were employed to analyse the data. Additionally, the estimation of direct and indirect values of urban vegetable gardening was applied to measure economic aspects. The result showed that the majority of urban vegetable growers had monthly income at 30,000 Thai Baht, worked as company officers, were middle-aged female during 31-40 years, graduated with university degrees, and were single. This finding supported the characteristics of city residents' lifestyle. Regarding economic value estimation obtained from urban vegetable production, the result revealed that, on average, this practice could reduce household food expenditure at 3,994.42 Thai Baht per month, and generate income at 20,308.69 Thai Baht per month. Commercial gardens could generate more household income from urban vegetable gardening than home consumption about 10 times and reduce more household expenditure than home consumption around 2 times. The results from this study encouraged related organizations to promote urban vegetable growing with economic values.

Keywords: Economic Aspects, Urban Vegetable Gardening, Urban Vegetable Growers, Urban Agriculture, Urban Vegetable, Bangkok Metropolitan

Introduction

Regarding the increasing of population, urbanization, as well as food security, urban agriculture has often been proposed as a solution for producing food in which population is highly dense. Explicit benefits of urban agriculture are mostly in the forms of reducing transportation costs, connecting people, directly accessing to food systems, and using areas efficiently (Martellozzo *et al.*, 2014). Urban agriculture contributed to food

* **Corresponding Author:** Suwanmaneepong, Suneeporn.; **E-mail address:** ksuneeporn@gmail.com

security, nutrition, and livelihoods (FAO, 2008). In recent years, urban agriculture has increasingly received support as a strategy for food security and urban sustainability (Colasanti *et al.*, 2012). As noted by Maxwell (1995), a significant number of people, especially in developing countries, produced staple crops through urban agriculture.

In over-urbanized countries such as Thailand, the overall urban population density was approximately 4,300 people per square kilometer in 2010, and urbanization occurred in Bangkok accounting for nearly 80% of the total urban area (World Bank, 2015). The attention in urban agriculture has been increased by urban residents. In 2010, urban vegetable productions as one type of UA have been promoted in Bangkok Metropolitan by Thai Health Promotion Foundation (THPF). THPF provided funds for urban agriculture projects by conducting training programs for city residents to plant vegetables in their homes. Urban vegetable gardens funded by THPF have operated for three years in Bangkok with seven training centers. Currently, there are more than 1,000 participants involved in the urban vegetable production project. More than 60% of participants applied their knowledge from trainings into practice and extended through social media (NSTDA, 2014). Urban agriculture in Bangkok continued expanding by communities. Numerous benefits of UA can be demonstrated such as providing fresh produces for family, creating extra sources of family income, as well as establishing community networks.

Owing to considerable benefits of UA practicing, policymakers in countries would like to promote the UA practice. In Thailand, however, there is a lack of policies to support urban agriculture. In order to make effective urban agricultural practicing, policymakers require the understanding of factors persuading urban dwellers to practice urban agriculture. The urban agriculture shares similarities with other agricultural practices in terms of adoption and diffusion process (Feder *et al.*, 1985; Lapple and Van Rensburg, 2011). Economic aspects can provide a powerful tool for communicating the values of urban agriculture to policymakers, as well as other decision makers (Buckley and Peterson, 2015).

Numerous studies have focused on the economic aspect of urban agriculture. Blair *et al.* (1991), for example, studied the economic evaluation of the Philadelphia Urban Gardening Project, by interviewing 144 gardeners from Philadelphia revealing that the evaluated economic value of the produce grown was around \$160 a site. Gale (1997) investigated the economic impact of direct marketing for farmers; the result indicated that only small minority farms are able to generate significant income through direct sales. Cohen *et al.* (2012) measured urban gardening's social, health, economic, and ecological benefits. Feenstra (1999) described the advantage of community-based gardens, namely, selling products or employing and training community members. The survey of Maxwell (1995) exposed that typical backyards in Accra can

produce between 44 to 146 kilogram of cassava and 26 to 104 kilogram of plantain per year. Although monetary percentages are only a small portion comparing to the overall annual food expenditures, these households do not have to buy and carry 10% to 25% of their annual requirements.

The adoption of urban vegetable production in Bangkok, Thailand has been widely interested; however, the economic aspects of urban vegetable gardening in Bangkok has rarely been expressed. Therefore, the objectives of this study were to

- 1) Determine characteristics of urban vegetable growers in Bangkok Metropolitan
- 2) Estimate economic values of urban vegetable gardening in Bangkok metropolitan

The findings from this study can provide the powerful tool for publicizing the benefits of urban agriculture to policymakers, or other decision-makers to encourage urban dwellers for growing vegetable for their benefits.

Materials and methods

Sampling size

Urban residents growing vegetables in Bangkok Metropolitan are uncertain population. Hence, the sample size can be calculated by using the simple calculation formula by Daniel and Cross (1995) as follows

$$n = \frac{z^2 p(1-p)}{d^2}$$

where n = sample size,

Z = Z statistic for a level of confidence, 90%, Z = 1.645

P = expected prevalence or proportion (in proportion of one; if 30%, P = 0.3),

d = precision (in proportion of one; if 10%, d = 0.01).

Accordingly, the calculated minimum sample size is 56.83; however, in this study, the sample size was rounded up to 60 respondents.

Data Collection and analysis

This research was undertaken in the Bangkok Metropolitan, Thailand. The area is known for higher levels of population density in the country (World Bank, 2015). Data were collected from field surveys by using snowball sampling technique which interview respondents make suggestions for who else should be included in the sample (Russell Bernard, 2006; Schut *et al.*, 2015). This study started with an interview with a competency person who establishes prototype learning center of urban vegetable

gardening -- Mr. Nakorn Limpacuptathavon at Vegetable Princes' Learning Center. Each month, this center arranges urban vegetable growing training course for 30 urban dwellers. After each interview, the next respondent was suggested and included until the samples reached 60.

Data collection

Questionnaires were used as data gathering instruments comprising of three main parts: the first part was characteristics of urban vegetable growers, the second one was the characteristics of growing or gardening vegetable in their land, and the last part was the economic values of their vegetable outputs. The estimation of economic values from urban vegetable gardening was adopted from the concept of Maxwell (1995), and Kosolkarn (2016) establishing a conceptual framework as demonstrated in Fig. 1.

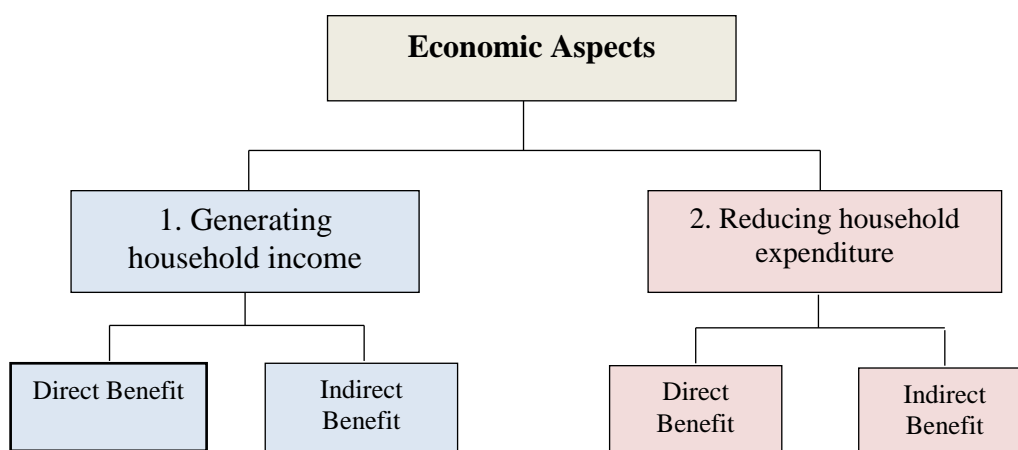


Fig. 1: The concept of economic aspect evaluation of urban vegetable growing

The economic values of urban vegetable gardening were measured in two aspects: the first aspect was generating household income, and another one was reducing household expenditure.

1. Generating household income can be presented as follows:

1.1. The direct benefit can be indicated by income from selling output (THB/month)

1.2. The indirect benefit can be indicated by income from:

- Arranging training courses (THB/month)
- Selling vegetable gardening supplies (THB/month)
- Selling of manure /organic fertilizer (THB/month)
- Selling processed vegetables (THB/month)

2. Reducing household expenditure can be demonstrated in terms of:

2.1. The direct benefit can be indicated by the reduction in expenditure spent on buying fresh vegetables (THB/month)

2.2. The indirect benefit can be indicated by:

- Reducing expenditure on traveling to the markets /supermarkets (THB/month)
- Reducing expenditure on out-door activities (THB/month)
- Reducing expenditure on traveling cost for exercise (THB/month)

Descriptive statistics namely frequency, percentage, mean, and standard deviation were employed to analyse quantitative data.

Results***Characteristics of urban vegetable growers in Bangkok Metropolitan*****Socio-economic characteristics**

Characteristics of the urban residents are important for decision-making in various levels of urban agriculture. The results in Table 1 expose that the majority (60%) of samples were female in middle age, during 31-40 years old (50%). Of all participants, 56.7% obtained bachelor's degree. In addition, more than half of them were single (51.7%), were employers in government and private company (55%), earned more than 30,000 THB per month, and had more than 4 family members.

Table 1 Socio-economic characteristics of urban vegetable gardening (n = 60)

Items	Frequency	Percentage (%)
Gender		
Male	24	40.0
Female	36	60.0
Age (year)		
21-30	16	26.7
31-40	30	50.0
41-50	8	13.3
More than 50	6	10.0
Level of education		
No Education	2	3.3
Primary school	1	1.7
Secondary school	3	4.0
Bachelor's degree	34	56.7
Postgraduate degree	20	33.3
Marital status		
Single	31	51.7
Married	28	46.7

Items	Frequency	Percentage (%)
Widowed /Divorced	1	1.7

Table 1 Continued

Items	Frequency	Percentage (%)
Main occupation		
Government officer	13	21.7
Company officer	14	23.3
Own business	15	25.0
Housewife	4	6.7
Farmer	10	16.7
Student	4	6.7
Monthly income		
Less than 10,000 THB	1	1.7
10,001-20,000 THB	22	36.7
20,001-30,000 THB	12	20.0
More than 30,000 THB	25	41.7
Average family size (S.D. = 1.46)	4	

Note: 35.820 Thai baht (THB) = 1 US dollar (as of the survey period on Decemeber 2016)

Characteristics of urban vegetable growing

Table 2 represents the characteristics of urban vegetable growing. On average, the respondents spent time on urban vegetable gardening for 2.11 years; they participated in training courses related to urban vegetable growing about twice a year. They, in addition, occupied average land size at 479.81 square meter (m²) with two household labor used in urban vegetable gardening.

Table 2. Characteracteristics of urban vegetable growing

Items	mean	S.D
1. The length of time for urban vegetable gardening	2.11 years	21.82
2. The number of times attending training in urban vegetable gardening per year.	2 times/year	1.08
3. The land size of the urban vegetable gardening	479.81 m ²	1466.42
4. The number of household labor used in urban vegetable gardening	2 persons	1.24

The sources of information and network in urban vegetable gardening

Concerning the source of information about urban vegetable gardening, half of the respondents (50%) indicated that they learned about urban vegetable gardening from social media (Fig. 2a), particularly, from facebook such as Cityfarmthailand, or Heart Core Organic, when city

residents would like to grow vegetables, or learned from Thai Health Promotion Foundation website in the topic of urban vegetable gardening learning center. Noticeably, most of the respondents (65%) did not belong to members of urban vegetable gardening networking (Fig. 2b).

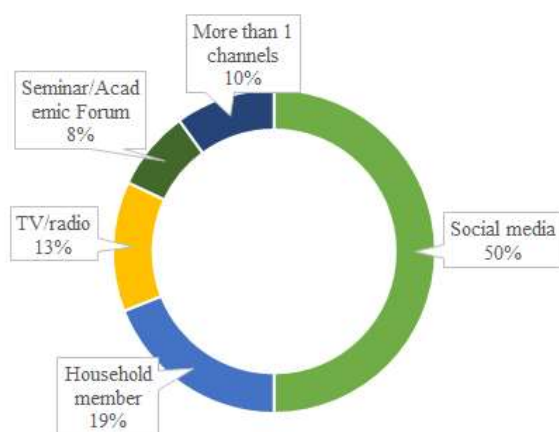


Fig.2a: The sources of information of urban vegetable gardening

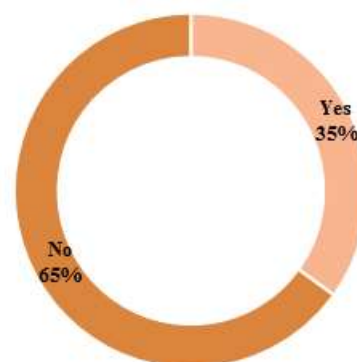


Fig.2b: The memberships of urban vegetable gardening networking

Area distribution of urban vegetable gardening in Bangkok Metropolitan

More than half of respondents (38 samples) lived in 22 districts of Bangkok namely, Khlong San, Chatuchak, Don Mueng, Taling Chan, Bangkokkapi, Bang Khun Tein, Bang Khun Thian, Bang Khen, Bang Kho Laem, Bang Na, Bang Bon, Bueng Kum, Phayathai, Minburi, Yan Nawa, Rat Burana, Ladkrabang, Ladprao, Wattana, Suan Luang, Sai Mai, and Laksri. In addition, 12 samples resided in metropolitan region namely, Nakhon Pathum, Nonthaburi, Pathum Thani, Pakket, Buddha Monthon, and Samut Prakarn (Fig.3).

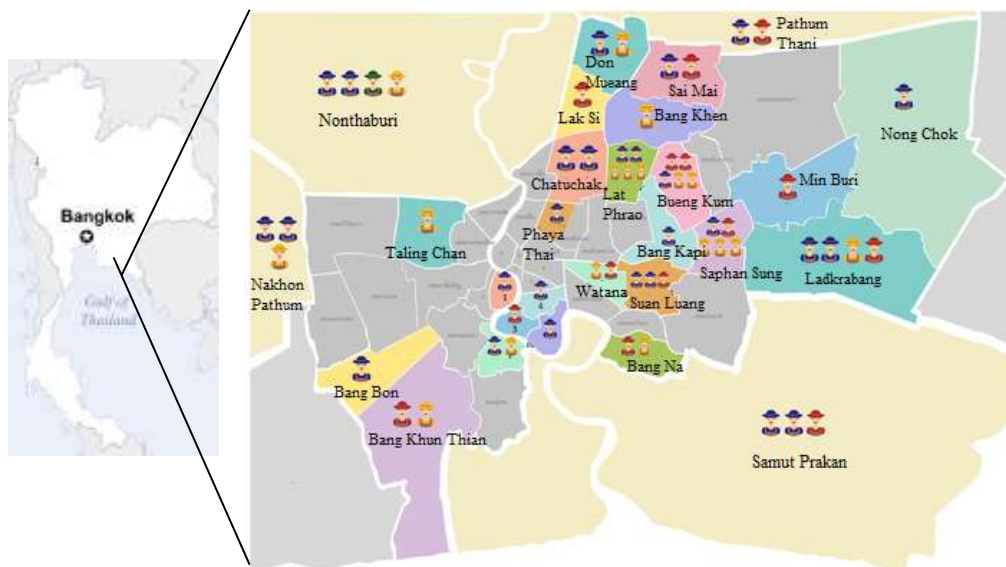


Fig. 3: Area distribution of urban vegetable gardening in Bangkok Metropolitan, Thailand.

Pertaining to the types of urban vegetable gardening, the majority of respondents (43.3%) grew urban vegetables in commercial gardens, small farms, or in some parts of their residence (31.7%) such as condominiums, townhouses or their own backyards. About 20% grew vegetables on roofs of their buildings, and only 5% planted them in community empty spaces (Fig. 4a). The respondents grew urban vegetables in order to provide fresh and toxic-free vegetables for home consumption (57%), to sell their products, and to be sources of household income (43%) (Fig. 4b).

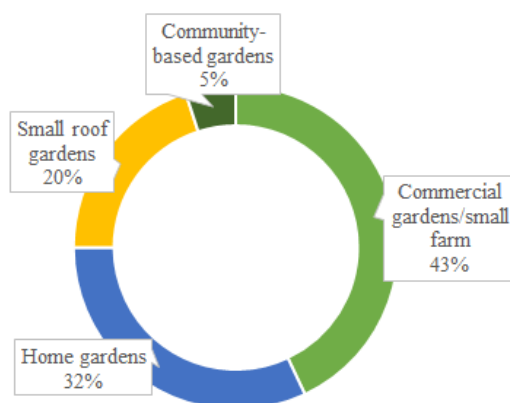


Fig.4a: The types of growing urban vegetables

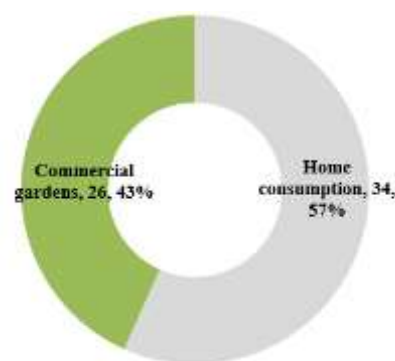


Fig.4b: The reasons for growing urban vegetables

The estimation of economic values of urban vegetable gardening

The economic values of urban vegetable gardening were measured in two aspects; the first aspect was generating household income, and the second one was reducing household expenditure. Moreover, both direct and indirect benefits of urban vegetable gardening were investigated. The main reasons for practicing urban vegetable can be classified into two groups: for home consumption (34 respondents) and for commercial gardens (26 respondents).

Generating household income from urban vegetable gardening

Economic aspects in terms of generating household income from urban vegetable gardening are revealed in Table 3. Regarding home consumption, urban vegetable gardening can generate income from selling vegetable output at 1,094 Thai baht (THB) per month, as well as generate indirect income from other activities related to urban vegetable gardening such as arranging training courses, selling vegetable gardening supplies, and selling of manure/organic fertilizer at 2,035.46 THB per month.. Interestingly, commercial gardens can generate household income from urban vegetable gardening higher than home consumption approximately 10 times. The direct benefit for this group was 12,091.30 THB per month, and the indirect benefit was 8,217.39 THB per month, totally 20,308.69 THB per month.

Table 3. The estimation of direct and indirect values of the generating household income from urban vegetable gardening in Bangkok Metropolitan

Items	Home consumption (n=34)		Commercial gardens (n=26)	
	\bar{x}	SD.	\bar{x}	SD.
1.Direct Benefit (THB/month)	1,094.60		12,091.30	
1.1) income from selling output (THB/month)	1,094.60	4,061.74	12,091.30	13,893.06
2.Indirect Benefit (THB/month)	940.86	4,796.72	8,217.39	28,791.13
2.1) Arranging training courses (THB/month)	540.54	2,577.62	1,695.65	3,866.34

Items	Home consumption (n=34)		Commercial gardens (n=26)	
	\bar{x}	SD.	\bar{x}	SD.
2.2) Selling vegetable gardening supplies (THB/month)	135.14	585.10	1,260.87	2,988.12
2.3) Selling of manure/organic fertilizer (THB/month)	135.14	822.00	347.83	1,102.01
2.4) Selling Processed vegetables (THB/month)	130.04	812.00	4,913.04	20,834.66
3.Total (THB/month)	2,035.46		20,308.69	

Note: 35.820 Thai baht (THB) = 1 US dollar (as of the survey period on Decemeber 2016)

Reducing household expenditure from urban vegetable gardening

Economic aspects in terms of reducing household expenditure from urban vegetable gardening are exposed in Table 4. Concerning home consumption, urban vegetable gardening can reduce expenditure of buying fresh vegetables at 624.32 Thai baht (THB) per month, and can reduce indirect expenditure from related activities for example traveling expenditure to markets/supermarkets, outdoor activities, and traveling cost for exercise at 802.71 THB per month. Obviously, commercial gardens can reduce more household expenditure from urban vegetable gardening than home consumption about 2 times. The direct benefit for this group was 1,352.17 THB per month, and the indirect benefit was 1,215.22 THB per month.

Table 4. The estimation of direct and indirect values of reducing household expenditure from urban vegetable gardening in Bangkok Metropolitan

Items	Home consumption (n=34)		Commercial gardens (n=26)	
	\bar{x}	SD.	\bar{x}	SD.
1. Direct Benefit (THB/month)	624.32		1,352.17	
1.1) Reducing expenditure on buying fresh vegetable (THB/month)	624.32		1,352.17	1,038.30
2.Indirect Benefit (THB/month)	802.71		1,215.22	
2.1) Reducing expenditure on	408.11		521.74	474.78

Items	Home consumption (n=34)		Commercial gardens (n=26)	
	\bar{x}	SD.	\bar{x}	SD.
traveling to the markets/supermarkets (THB/month)				
2.2) Reducing expenditure on out-door activities (THB/month)	191.90		184.78	296.81
2.3) Reducing expenditure on traveling cost for exercise (THB/month)	202.70		508.70	717.90
3.Total (THB/month)	1,427.03		2,567.39	3,994.42

Note: 35.820 Thai baht (THB) = 1 US dollar (as of the survey period on Decemeber 2016)

Conclusion

Urban vegetable growing is one of urban agriculture types which can assiat city residents to improve their livelihoods and overall well-being. This research investigated the economic aspects of 60 urban vegetable growers in Bangkok Metropolitan, Thailand. The result revealed that the majority of rban vegetable growing obtained monthly income of 30,000 Thai baht, worked as company officers, were middle-aged female of 31-40 years, graduated with university degrees, and were single. This finding supported the lifestyle characteristics of city residents. In regard to the economic value estimation from urban vegetable production, the result exposed that this practice, on average, can reduce household food expenditure at 3,994.42 Thai baht per month, and generated income at 20,308.69 Thai baht per month. Meanwhile, commercial gardens can generate approximately 10 times more household income from urban vegetable gardening than home consumption and can reducee twice more household expenditure than home consumption.

The results from this study can encourage related organizationto promote urban vegetable growing with economic aspects. The importance and the benefits obtained from urban vegetable growing, however, still have various other aspects for instance health, social, or network, that were not mentioned in this study. As a result, future research should concern the abovementioned beneficial aspects of urban vegetable growing.

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