
Farmer's Perceptions towards Economic Sustainability of Rice Farming in Peri-Urban Area, Bangkok, Thailand

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Under rapid urbanization and land use changes, economic of rice farming in peri-urban area is the key determinant of its sustainability. The perception of rice farming in peri-urban area towards economics sustainability was discussed in the study. Therefore, the objectives of this study were 1) to investigate farmers' perceptions towards economic sustainability of rice farming in peri-urban area and 2) to identify factors influencing farmer's perception. The primary data were collected from 100 sample rice farmers selected, from five sub-districts in Ladkrabang district, which is the third largest rice production area in Bangkok, through simple random sampling technique. Data were collected through survey method using semi-structured questionnaire in 2016. The methodology used in the study involved a combination of descriptive and multiple regression analysis. The findings revealed that farmers had a good perception towards economic sustainability of rice farming for to increase the quality rice farming practice for higher rice sale, to use inputs properly and appropriately, to have sufficient workers in rice production, to have sufficient capital to produce and to access to credit source. The regression analysis demonstrated that the socio-economic factors influencing farmer's perception were: age of the household leader, the number of family labor, the number of flood in field and the numbers of contacting with agricultural extension staff. Overall, the findings contribute to the further understanding of farmer's perception towards economic sustainability of rice farming in peri-urban area.

Keywords: peri-urban rice farming, economic sustainability, rice farming, Ladkrabang, farmer's perception.

Introduction

Rapid urbanization in many countries puts strong pressure on densely populated agricultural land in the peri-urban zone. Extended metropolitan regions often penetrate important agricultural areas in emerging peri-urban zones that already have dense rural populations due to labor intensive

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agricultural activities such as the cultivation of rice (Pribadi and Pauleit, 2015). Land use conversion from agriculture to urban is a common and typical phenomenon in most developing countries, including Thailand. A rapid urbanization in capital of Thailand is a significant driving force for land use conversion that leads to unsustainable agricultural land use.

Agricultural areas in peri-urban area of Thailand are undergoing changes, as a result of a rapid urbanization. Government policies combined with pressures from a population and economic growths are much influenced on the sustainability of agricultural regimes. It is observed that agricultural areas are being converted to residential and other uses. This type of land conversion is a common and typical phenomenon in most developing countries. As a result, problems related to economic push-pull factors do exist, leading to an increase in land price, a decrease in agricultural availability and a change of land ownership (Sangawongse *et al.*, 2011).

In Bangkok, the capital city of Thailand, is under the above situation because of significant residential developments in suburb an areas. Bangkok has been sprawling into various directions particularly to North, Northeast, East and Southeast form Bangkok Metropolitan region. However, the comprehensive plan has objectives to guide Bangkok Metropolitan urban development and peripheral conservation, and preservation for the purpose of comfort and better life of the citizen. (Perera, 2006). Peri-urban agriculture is also considered to contribute to a better nutrient status and an improvement of the well-being of urban and peri-urban dwellers (Tsuchiya *et al.*, 2015, De Bon *et al.*, 2010 and Midmore and Jansen, 2003). Ladkrabang District is located in the outer part of Bangkok Metropolitan Area (BMA). A part of the district is located in the green belt demarcated by the BMA. In addition, the green belt zone is intended to control the city from sprawling into the surrounding provinces (DCP, 2000).

In order to develop extension programs to promote sustainability among farmers, the measuring farmers' perceptions, studying the socio-economic characteristics, and information-seeking behavior influencing those perceptions should be the preliminary step (Tatlidil *et al.*, (2009). Farmers' perception can be a great influence on farm management decision making just as the influence of their economic situation to management decisions (Abdul-Gafar *et al.*, 2016). Numerous studies have indicated that different factors influence farmers' perception regarding economic sustainability. Bagheri *et al.*, (2008) found a relationship between a number of socio-economic factors, such as human capital factors, information sources use, extension participation, landholding size, and the perception towards selected sustainable agricultural technologies. The study of Hosseini *et al.*, (2011) showed that economic and

policymaking factors determined 19% of the variance on the perception of respondents regarding the economic aspect of sustainable agriculture in Iran. The study of Meseret (2014) revealed that farmers' perception of soil and water conservation practices on cultivated land in Ankesha District, Ethiopia were influenced by age of the household leader, education of the household leader, farmers' previous experience of soil and water conservation, participates in extension agents, the slope of a plot, participation in soil and water conservation training, plot ownership and land tenure security. Pinthukas (2015) indicated that age, education level, the number of household labor, farm income, and extension visit significantly contributed to farmers' perception on organic vegetable production. The study by Mkuna and Mugula (2016), indicated that socio-economic factors such as age, education level, household size, and main activities of the household affect the coping strategies perception of rice farmers in Morogoro Tanzania. Abdul-Gafar *et al.*, (2016) showed the perceptions of rice farmers towards production constraints.

Literature from previous studies lack investigates on perception of rice farmer in peri-urban area towards economic sustainability that has been interesting. Therefore, this study aimed to (a) investigate farmers' perceptions towards economic sustainability of rice farming in a peri-urban area and (b) identify factors influencing farmer's perception. The study is focusing on Ladkrabang district, the rice production in a peri-urban area of Bangkok and rank as the third largest rice production in Bangkok. The part of the district is located in the green belt zone. These findings could contribute to related organization to understand farmer's perception towards economic sustainability of peri-urban rice farming and support information in developing extension programs to promote economic sustainability among farmers in peri-urban area.

Materials and methods

The study area

The study was conducted in Ladkrabang, Bangkok, Thailand. Ladkrabang is one of 50 districts of Bangkok in the eastern of the town geographically located between 13°43'24"N 100°47'3"E. The total area of the district is approximately 123,459 km². Typically, a crowded area is in the south, while the industrial estate is in the north-east.

Neighboring districts consist of (clockwise starting from the south) Bang Bo, Bang Sao Thong and Bang Phli (Samut Prakan Province), Prawet, Saphan Sung, Min Buri and Nong Chok (Bangkok) and Mueang Chachoengsao (Chachoengsao Province). Ladkrabang is divided into six sub-districts namely

Ladkrabang, Klongsongtonnon, Klongsamprawet, Lumplathio, Thapayao and Khumthong. The portrait of location map of Thailand and the surveyed areas are presented in Figure 1.

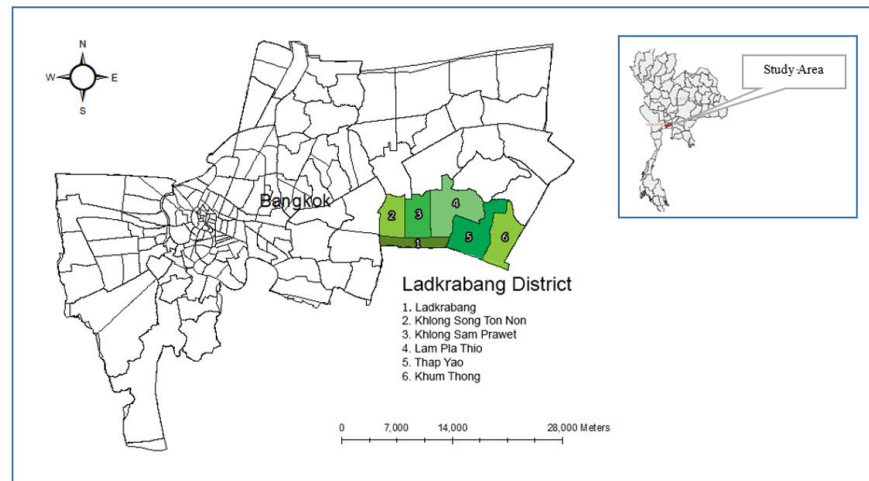


Figure 1. Location map of the study area, Ladkrabang, Bangkok, Thailand

Sampling and Sample Size

The target population of the study consists of 433 farmers in Ladkrabang district, Bangkok, who registered with the Department of Agricultural Extension (DOAE) in 2016. The sample included 100 farmers that were obtained from 20% of the total registered farmers based on the formula proposed in simple random sampling method.

Data Analysis

The data required for this study was collected using questionnaires that were distributed to statistically selected rice farmers in July to August 2016. The study employed both descriptive statistics and multiple regression analysis to analyze the data collected from respondents. Descriptive statistics including frequency distribution, percentages, means, and standard deviations were employed to explain socio-economic factors of rice farmer. Multiple regression model was employed to analyze a relationship between perception towards economic sustainability of rice farming and variables.

Analytical Model

The analytical model in this study were adopted from Agahi *et al.* (2011), Mkuna and Mugula (2016) and Bagheri *et al.*, (2008). The regression model is expressed implicitly as:

$$Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} + \beta_{13} X_{13} + \beta_{14} X_{14} + \beta_{15} X_{15} + \beta_{16} X_{16} + E$$

Where,

- Z_i = Perceptions towards economic sustainability of rice farming
- β_0 = Constant term
- β_k = Coefficient to be estimated
- X_1 = Gender of household leader
- X_2 = Age of household leader (years)
- X_3 = Level of education of the household leader
- X_4 = Religion
- X_5 = Marital status
- X_6 = Leadership
- X_7 = Member group
- X_8 = The number of family members
- X_9 = The number of family labor measured by the number of member involved in rice production
- X_{10} = The main reason to do rice farming
- X_{11} = Year of farming experience (years)
- X_{12} = Farm size (hectare)
- X_{13} = Number of cultivation (times per year)
- X_{14} = The number of flood in field
- X_{15} = The number of contacting with agricultural extension staff (times per year)
- X_{16} = Agri data source
- E = independent error term.

Farmer's perception towards sustainable agricultural components was operational as the extent of their agreement with nine economic sustainability statements adopted from Shahpasand (2014), Hosseinei *et al.*, (2011) and Agahi *et al.* (2011) and adjusted to the context of the study area. The respondents were asked to indicate the extent of their agreement on each indicator using a Likert-type five-point continuum like strongly agree, agree, undecided, disagree and strongly disagree with assigned scores of 5, 4, 3, 2 and 1.

Results and Discussion

Socio-economic characteristics of respondents:

The socio-economic characteristics of the respondents was showed in Table 1. Most of the respondents about 77% were male. About 51% of the respondents belonged to the age group ranging from 51 to 65 years old. The mean age of the respondents was 54.51 years, which is consistent with the average age of Thai rice farmers. In term of educational level, 78% of the respondents graduated from primary school. The majority of the rice farmers (93%) was Buddhism. Most of the respondents were married. A greater percentage of the respondents at 90% were none of the leadership, and 75% were a member of Bank for Agriculture and Agricultural Cooperative, a secured rural development bank with modern managerial technology and integrated financial services focusing on the uplift of farmers' quality of life (BAAC, 2016).

The result on the number of family members demonstrated that greater proportion of the total respondents (79%) had the highest household size between 3-5 persons, and the mean household size of the respondents was four persons. Family labor was one person. In the case of main reason to do rice farming, it was revealed that 64% of the respondents were inherited farms from their predecessor. The results also showed that farming experience of 65% of the respondents was more than 20 years; the mean years of farming experience were 32.16. This may implied that farmers who run their farm for a long time develop knowledge and skill that might influence and strengthen their perception (Farouque and Takeya, 2007). Regarding farm size, based on the category of farm size from Rahman *et al.* (1999) which divided into three categories of farmers identified: small (<1.00 ha), medium (1.00-3.00 ha) and large (>3.00 ha), 70% of the respondents occupied large farms, with a mean farm size of 4.92 ha. In the other words, the majority of them were a large-scale farmer. Most of the farmers were cultivated twice a year. The respondents experienced floods many times over a year at 37%. In terms of the number of contacting with agricultural extension staff, 77% of the respondents belonged to the group ranging from 1 to 5 times per year. More than half of the respondents (60%) obtained data from agricultural extension staff as data sources.

Table 1. Socio-economic characteristics of respondents

Characteristics	Categories	Frequency Percentage	Cumulative Percentage
Gender of household leader	Male	77	77
	Female	23	100
Total		100	-
Age of household leader (Mean = 54.51 years)	21-35	8	8
	36-50	24	32
	51-65	51	83
	>65	17	100
Total		100	-
Level of education of the household leader	Lower primary	3	3
	Primary school	78	81
	Junior High school	12	93
	Senior High school	7	100
Total		100	-
Religion	Buddhism	93	93
	Islam	7	100
Total		100	-
Marital status	Single	19	19
	Married	76	95
	Separated/divorced	5	100
Total		100	-
Leadership	Corporate governance	2	2
	Leader group	6	8
	Leader another group	2	10
	None	90	100
Total		100	-
Member group	Agricultural cooperative	17	17
	Leader group	1	18
	Farmer group	7	25
	Bank for agriculture and Agricultural Cooperatives	75	100
	Total		100
The number of family members (Mean = 4 persons)	<3	6	6
	3-5	79	85
	>5	15	100
Total		100	100

Characteristics	Categories	Frequency Percentage	Cumulative Percentage
The number of family labor (Mean = 1 person)	<3	91	91
	3-5	9	100
Total		100	-
The main reason to do rice farming	A love of farming	7	7
	Inherited the farm from their predecessor	64	71
	Do not have any choice	15	86
	Professions earn a living	11	97
	Land wilderness	3	100
Total		100	-
Years of farming experience (Mean = 32.16 years)	<10	13	13
	10-20	22	35
	>20	65	100
Total		100	-
Farm size (Mean = 4.92 ha)	Small (<1.00 ha)	1	1
	Medium (1.00-3.00 ha)	29	30
	Large (>3.00 ha)	70	100
Total		100	-
Number of cultivation (times per year)	2 times	98	98
	More than 2 times	2	100
Total		100	-
The number of flood in field	Every year	22	22
	Almost every year	12	34
	Many times over the years	37	71
	None	29	100
Total		100	-
The number of contacting with agricultural extension staff (times per year)	1-5	77	77
	6-10	14	14
	>10	9	9
Total		100	-
Agri data source	Radio	7	7
	Television	17	24
	Agri magazine	1	25
	Agri staff	60	85
	Word of mouth	15	100
Total		100	-

Source: Survey data analysis, 2016

The respondent's perceptions towards economic sustainability of rice farming in peri-urban area

The respondent's perceptions towards economic sustainability of rice farming in a peri-urban area were calculated by adding up the farmer's responses to the nine items on a five-point Likert-type scale, which sought to measure the farmers' perception of economic sustainability. The farmers' perception can be categorized as follows: means during 1.00-1.49 = strongly disagree (SDA), 1.50-2.49 = disagree (DA), 2.50-3.49 = moderately agree (MA), 3.50-4.49 = agree (A), and 4.50-5.00 = strongly agree (SA).

Table 2 presents the respondent's perceptions towards economic sustainability of rice farming in peri-urban area. Based on the interpretive scale described above, two items were placed in disagree (DA) category, five items were classified in agree (A) category, two items were placed in the strongly agree (SA) category, and no practice was rated to be of either strongly disagrees (SDA) or moderately agree (MA). The two practices placed in the (DA) category were "To maintain or improve production yield", and "To gain power to negotiate prices with merchants". The five practices classified in the (A) category were "To increase the quality rice farming practice for higher rice sale", "To use inputs properly and appropriately", "To have sufficient workers in rice production", "To have sufficient capital to produce", "To access to credit source". The two practices classified in the (SA) category were "To have certain market of rice" and "To gain ability to repay debt". The perception of respondents about economic sustainability show that the highest mean refers to "to have certain market of rice" (mean = 4.55), and the lowest mean refer to "to gain power to negotiate prices with merchants" (mean = 2.26). Total perception mean towards economic sustainability of rice farming in a peri-urban area was 3.82 placed in agree (A) category.

Table 2 The respondent's perceptions towards economic sustainability of rice farming in peri-urban area

Perceptions	Mean	SD	Categories
1. To maintain or improve production yield	2.29	0.48	DA
2. To increase the quality rice farming practice for higher rice sale	4.25	0.50	A
3. To use inputs properly and appropriately	4.33	0.50	A
4. To have certain market of rice	4.55	0.50	SA
5. To have sufficient workers in rice production	4.07	0.63	A
6. To have sufficient capital to produce	4.07	0.72	A
7. To access to credit source	4.17	0.62	A
8. To gain ability to repay debt	4.53	0.50	SA
9. To gain power to negotiate prices with merchants	2.26	0.56	DA
Economic sustainability	3.82	0.25	A

Regression analysis

Table 3 shows the result of multiple regression analysis. Independent variables that were significantly related to the perception of respondents about the economic sustainability of rice farming as the dependent variable were entered. The results revealed that there was significant relationship between perception towards economic sustainability of rice farming and variables consisting of Gender of household leader (X_1), Age of household leader (X_2), Level of education of the household leader (X_3), religion (X_4), marital status (X_5), leadership (X_6), member group (X_7), the number of family members (X_8), the number of family labor (X_9), the main reason to do rice farming (X_{10}), Year of farming experience (X_{11}), farm size (X_{12}), number of cultivation (X_{13}), the number of flood in field (X_{14}), the number of contacting with agricultural extension staff (X_{15}), and agri data source (X_{16}). The result indicates that 39.7% of the variance in the perception of respondents about economic sustainability can be explained by the age of farmer, the number of family labor, the number of flood in field and the number of contacting with agricultural extension staff. The F-ratio (3.422) was significant at 1%. It can imply goodness of fit the model. The magnitude of R^2 (0.397) is in line with the a priori expectation because there are so many factors that influence perceptions towards economic sustainability of rice farming.

Among all explanatory variables, Age of household leader (X_2), the number of family labor (X_9), the number of flood in field (X_{14}) and the number of contacting with agricultural extension staff (X_{15}) significantly implied that the variables would greatly influence the economic sustainability of rice farming in peri-urban area. Age of household leader has a significant relationship with perceptions towards economic sustainability ($p < 0.1$). This

finding is in agreement with other findings (Bagheri *et al.*, 2008 and Agahi *et al.*, 2011) which argued that younger farmers are more likely to have longer planning perspective to justify investments in technologies whose benefits are realized over time (Mesert, 2014). Some studies found that farmers' age had a significant influence on the adoption of SAPs (Kassie *et al.* 2013; Zdenka and Michal, 2013). However, the age group of active people implies that they are able to take actions (Mkuna and Mugula, 2016).

The number of family labor has a significant relationship with perception ($p < 0.05$). This result is in line with the finding of Pinthukas (2015). There was a significant relationship between the number of flood in field and perception ($p < 0.1$). This indicates that irrigated areas experienced floods which had big impacts on their livelihoods (Mkuna and Mugula, 2016). The number of contacting with agricultural extension staff had significant relationship with their perception ($p < 0.05$). Similar finding reported by Kabir *et al.*, (2007), Allahyari *et al.* (2008), and Tanaka *et al.* (2010) studies showed that there is a significant and positive relationship between advisory contacts of rice growers with information sources and index of applying sustainable rice production technologies. Contact with agricultural extension staff can give access to information on innovation which is in line with Farouque and Takeya (2007) study that communication exposure can help improve their knowledge about farm management.

According to Table 3, the following equation can be used to estimate of farmer's perception toward selected economic sustainability of rice farming that is $Y = 3.492 + 0.081 (X_2) + 0.0286 (X_9) + 0.036 (X_{14}) + 0.120 (X_{15}) + e$. However, the explanatory variables; gender of household leader (X_1), level of education of the household leader (X_3), religion (X_4), marital status (X_5), leadership (X_6), member group (X_7), the number of family members (X_8), the main reason to do rice farming (X_{10}), year of farming experience (X_{11}), farm size (X_{12}) number of cultivation (X_{13}) and agri data source (X_{16}) rendered no significant influences on economic sustainability. This does not mean that the above variables did not have any effect on economic sustainability, but the level of their significance fell below the level of confidence limits tested.

Table 3 Results of regression analysis related to perceptions economic sustainability of rice farming

Variables	B	SE	t-stat	p-value
Constant	3.492	.456	7.655	.000
Gender of household leader (X_1)	-.025	.056	-.450	.654
Age of household leader (X_2)	.081	.032	2.554	.012*
Level of education (X_3)	-.026	.041	-.620	.537
Religion (X_4)	-.050	.095	-.528	.599
Marital status (X_5)	.049	.051	.964	.338
Leadership (X_6)	-.011	.036	-.297	.767
Member group (X_7)	-.004	.015	-.257	.798
The number of family member (X_8)	.066	.051	1.287	.202
The number of family labor (X_9)	.286	.082	3.503	.001**
The main reason to do rice farming (X_{10})	.007	.026	.261	.795
Year of farming experience (X_{11})	.001	.001	.991	.325
Farm size (X_{12})	-.013	.009	-1.469	.146
Number of cultivation (X_{13})	-.164	.169	-.968	.336
The number of flood in field (X_{14})	.036	.021	-1.716	.090*
The number of contacting with agricultural extension staff (X_{15})	.120	.038	3.135	.002**
Agri data source (X_{16})	.008	.013	.623	.535
R ²	.397			
Adjusted R ²	.281			
F-ratio	3.422			

***Significant at %1, **Significant at %5, *Significant at %10

Source: Survey data analysis, 2016

Conclusion

Rice farming in a peri-urban area of Bangkok, Thailand were facing with a rapid urbanization and land use conversion from agriculture to urban; hence, economic of rice farming in a peri-urban area is the key determinant of its sustainability. The purpose of the study was to investigate farmers' perceptions towards economic sustainability of rice farming in a peri-urban area and identify factors influencing farmer's perception. The result indicates that perceptions towards economic sustainability were placed in agree on a category that means farmers agree that rice farming lead them to have an economic sustainability. The result from regression model indicated that the age of household leader, the number of family labor, the number of flood in field, and the numbers of contacting with agricultural extension staff significantly implied that these variables would likely influence perceptions towards economic

sustainability of rice farming in the area. Therefore, it is suggested that government as much as possible should provide the necessary arrangement for sustainable policies and practices. This finding can also be used as a basis for the further understanding of farmer's perception towards economic sustainability of rice farming in a peri-urban area. Furthermore, the study result can support information in developing extension programs to promote economic sustainability among farmers in a peri-urban area.

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References

- Abdul-Gafar, A., Xu, S., and Yu, W. (2016). Perceptions of Rice Farmers towards Production Constraints: Case Study of Niger State of Nigeria and Hainan of China. *Journal of Agricultural Chemistry and Environment* 5(01): 20.
- Agahi, H., Ghambarali, R., and Afsharzade, N. (2011). Wheat Farmers' Perceptions of Sustainable Agriculture: The Case of Kermanshah Province of Iran. *Research of the First International Conference* 74-80.
- Allahyari, M. S., Chizari, M. and Homae, M. (2008). Perceptions of Iranian Agricultural Extension Professionals toward Sustainable Agriculture Concepts. *Journal of Agriculture and Social Sciences* 4(3): 101-106.
- BAAC. (2016). Bank for Agriculture and Agricultural Cooperative. Available on the www.baac.or.th/baac_en/. Accessed on September 11, 2016.
- Bagheri, A., Fami, H. S., Rezvanfar, A., Asadi, A. and Yazdani, S. (2008). Perceptions of Paddy Farmers towards Sustainable Agricultural Technologies: Case of Haraz Catchments Area in Mazandaran Province of Iran. *American Journal of Applied Sciences* 5(10):1384-1391.
- DCP. (2000). Department of City Planning. The Greater Bangkok Plan (Litchfield Plan). Bangkok:
- De Bon, H., Parrot, L. and Moustier, P. (2010). Sustainable Urban Agriculture in Developing Countries. A Review. *Agronomy for Sustainable Development* 30(1): 21-32.
- Farouque, M. and Takeya, H. (2007). Farmers' Perception of Integrated Soil Fertility and Nutrient Management for Sustainable Crop Production: A Study of Rural Areas in Bangladesh. *Journal of Agricultural Education* 48(3): 111-122.
- Hosseini, S. J. F., Mohammadi, F., and Mirdamadi, S. M. (2011). Factors Influencing the Economic Aspects of Sustainable Agriculture in Iran. *Archives of Applied Science Research* 3(2): 503-512.
- Kabir, M. S., Haque, M. E., Uddin, M. M., Samsuddula, A. M., and MMH, S. (2007). Constraints of Adopting Ecofriendly Rice Farming Practices. *J. Innov. Dev. Strategy* 1(1): 6-11.

- Kassie, M., Jaleta, M., Shiferaw, B., Mmbando, F. and Mekuria, M. (2013). Adoption of Interrelated Sustainable Agricultural Practices in Smallholder Systems: Evidence from Rural Tanzania. *Technological Forecasting and Social Change* 80(3): 525-540.
- Meseret, D. (2014). Determinants of Farmers' Perception of Soil and Water Conservation Practices on Cultivated Land in Ankesha District, Ethiopia. *Agricultural Science, Engineering and Technology Research* 2(5): 1-9.
- Midmore, D. J., and Jansen, H. G. (2003). Supplying Vegetables to Asian cities: is there a case for peri-urban production?. *Food Policy* 28(1): 13-27.
- Mkuna, E. and Mugula, V. J. (2016). Farmer's Perceptions on Climate Change Impacts in Different Rice Production Systems in Morogoro Tanzania 334-340.
- Perera, R. (2006). Promoting Travel Demand Reduction in Transport Sector in Cities of Asian Developing Countries: Case of Bangkok. In Workshop Paper, Urban Environmental Management (UEM), SERD, Asian Institute of Technology.
- Pinthukas, N. (2015). Farmers' Perception and Adaptation in Organic Vegetable Production for Sustainable Livelihood in Chiang Mai Province. *Agriculture and Agricultural Science Procedia* 5: 46-51.
- Pribadi, D. O., and Pauleit, S. (2015). The Dynamics of Peri-urban Agriculture During Rapid Urbanization of Jabodetabek Metropolitan Area. *Land Use Policy* 48: 13-24.
- Rahman, K. M. M., Schmitz, P. M. and Wronka, T. C. (1999). Impact of Farm Specific Factors on the Technical Inefficiency of Producing Rice in Bangladesh. *Bangladesh J. Agric. Econ* 22(2): 19-41.
- Sangawongse, S., Prabudhanitisarn, S. and Karjagthimaporn, E. (2011). Agricultural Land Use Change and Urbanization in Thailand. In UM conference.
- Shahpasand, M. R. (2014). Relationship between Awareness of Sustainable Agriculture and Fertilizer Usage by Iranian Farmers in the City of Bajestan in Khorasan Province: A Case Study. *Journal of Agriculture and Sustainability* 5(2).
- Tanaka, A., Darnhofer, I., and Gräzer, M. (2010). Moving towards Low-Input Rice Cropping Practices: Past Experiences and Future Challenges for Japan. In the European IFSA Symposium, Vienna 4-7.
- Tatlidil, F. F., Boz, I. and Tatlidil, H. (2009). Farmers' Perception of Sustainable Agriculture and Its Determinants: A Case Study in Kahramanmaraş Province of Turkey. *Environment, Development and Sustainability* 11(6): 1091-1106.
- Tsuchiya, K., Hara, Y. and Thaitakoo, D. (2015). Linking Food and Land Systems for Sustainable Peri-urban Agriculture in Bangkok Metropolitan Region. *Landscape and Urban Planning* 143: 192-204.
- Zdenka, M. and Michal, M. (2013). The Determinants of Adopting Organic Farming Practices: A Case Study in the Czech Republic. *Agricultural Economics* 1: 19-28.