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## **Peri-Urban Vegetable Farming in Jakarta**

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## ABSTRACT

*This paper describes peri-urban agriculture in Jakarta with special case of leafy vegetable agriculture. It could be considered an intensive agriculture since it uses high inputs while its cropping intensity is also high. It actually provides employment and income for migrants coming from rural areas. However, since it uses the currently idle non-agricultural lands, the prospect of such agriculture is not clear. It is, therefore, necessary that the Government find alternative land parcels such that the migrants can continue producing vegetables. As long as the migrants can produce vegetables, it seems that they need credit and extension services. Research on integrated pest management is also required to reduce production costs and mitigate health and environmental impacts.*

*Key words: Peri-urban agriculture, idle lands, household income and employment.*

## INTRODUCTION

### Background

An urban area tends to spread its urbanization process to its vicinity. The process would continue due to a relatively high rate of population growth and high rate of demand for lands for various non-agricultural purposes, such as for housing, offices, hotels, shopping centers, recreational and sports centers, parks, and industries. The high rate of demand for urban lands brings about high 'opportunity costs' of urban agricultural lands. Consequently, lands that are legally classified as agricultural lands in urban area would be reduced continually. Ultimately, agriculture in urban areas may be found only on lands that have been planned but not yet been used for non-agricultural purposes. As stated by Yudohusodo (1992), conventional agriculture in urban area is confined in open areas beyond building borderlines only.

Any piece of land would be used for an activity that leads to the highest rent (Hoover and Giarratami, 1985). Therefore, agriculture could be maintained in urban areas only when it produces high value crops using land-saving and water-saving technology. Otherwise, agriculture could not compete with non-agriculture sectors in using lands (Soeprapto, 1992). In spite of the relatively low competitiveness of agriculture, small farms in urban areas are deemed to give relatively high value added per unit of land. It has been shown by experiences in many countries (Squire, 1981).

Nowadays, there are many small vegetable farms producing spinach (bayam), large frog (*kangkung*), salad (*selada*), mustard greens (*sawi*), etc. on land parcels in

urban areas. In the present economic crisis, the number of such vegetable farms found on lands of real estate developers will increase (Muchlis and Sultan, 1998). It occurs because the demand for such vegetables in the forms of fresh and quality products is significant in urban areas. Besides, rather than leaving the lands idle, the developers allow migrants to cultivate the lands because demand for housing is stagnant due to the present economic crisis. This is a sort of employment opportunity for landless laborers migrating from rural to urban areas to find jobs.

Therefore, it is essential that information regarding the profile and prospect of peri-urban agriculture be collected since the information is important for policy considerations.

## **Objectives**

The major objective of this paper is to present overall information on peri-urban vegetable farms. The objective can be broken down into two specific objectives as follows: (1) to describe the potential of peri-urban agricultural areas, and (2) to describe the characteristics of peri-urban farms and their performance. Such information is expected to be useful for decision making regarding peri-urban agriculture and employment opportunity for those who migrate from rural to urban areas.

## **RESEARCH METHOD**

### **Basic Concepts**

Urban areas are dominated by non-agricultural sectors because of the availability of good infrastructures, facilities, skill labors, and funding institutions. Hence, urban areas in general are characterized by the way of life of the people who have occupations in and are dependent on non-agricultural sectors (Asy'ari, 1993). Widening process of urban areas occurs particularly because rural people, having inadequate income and employment opportunity, migrate from rural to urban areas (Haeruman and Isang, 1997). Migration to urban areas, however, has been creating many problems. The limitation of urban areas in providing urban dwellers with proper living facilities is the major problem.

Lands that are being used for agriculture in urban areas have been reducing since non-agricultural activities are more promising than agricultural activities in terms of land rent. Meantime, many land parcels that have been planned for non-agricultural purposes have not yet been used particularly due to the present economic crisis. In the case of lands for housing for example, the construction has been delayed due to the stagnant demand for housing. In other words, some parts of residential lands remain fallow, popularly called 'idle or sleeping lands' (*lahan tidur*). The issue of sleeping lands appeared when the Government has been planning a program of using the idle lands for agriculture to reduce unemployment problems. Similarly, the issue of peri-urban agriculture also appeared since it was considered potential to increase employment and income.

Peri-urban agriculture actually means agriculture that is found surrounding urban boundary. Because of its location, which is relatively close to urban consumers, peri-urban agriculture is suitable for such perishable agricultural produce such as

spinach, large frog (*kangkung*), salad (*selada*), mustard greens (*sawi*), etc. Santika (1997) stated that the role of peri-urban vegetable farms is very important, especially in terms of its continuous supply guarantee to urban dwellers. Meanwhile, other horticulture produce like chilly, carrot, cabbage, etc. are produced in areas which are located far from urban areas. The comparison implicitly describes that peri-urban area has its own location advantage for particular kinds of commodity but not for the others. Location advantage here should be considered not only in relation to the nature of each commodity but also in relation to the agro-ecological conditions where each crop could grow well.

Since transportation and post harvest handling would be improving, it is likely that perishable commodities would be produced in areas relatively far from urban area. That would be true since the opportunity costs of land for agricultural purposes in urban area would be higher and higher from time to time. In contrast, up to this time there remains many farms producing leafy vegetables in peri-urban area of Jakarta and other cities. Nonetheless, it should be noted that most of these peri-urban vegetable farms are mostly performed on land parcels that have been legally planned but not yet been used for non-agricultural purposes. Such farms are found near the railway, on riverbank, real estate, public, and private lands.

Two conclusions may be drawn from the discussion. First, the terms ‘peri-urban agriculture’ and ‘urban agriculture’ can be used interchangeably because there is no strong reason to differentiate the two terms, except their scope of meanings. The former gives an impression of agriculture on the ‘edge’ of urban area, while the latter means agriculture in urban area as a whole. Second, since there will be improvements in transportation and post harvest handling technology, the terms peri-urban or urban agriculture would be less meaningful in relation to the types of crops grown. In other words, vegetable farms could be grown elsewhere as long as its agro-ecological conditions are fulfilled.

For instance, lowland rice that is likely deemed as a commodity of ‘rural agriculture’ may be found in peri-urban area. In contrast, orchid that is most likely to be considered as a commodity of ‘urban agriculture’ may be found in places far from urban area. The term peri-urban agriculture may be relevant to any kind of farm characterized by its nature that can significantly save land and water, such as ‘verticulture’ and ‘hydroponics.’

Not only is ‘peri-urban agriculture’ different from ‘rural agriculture’ in terms of the availability of land resources but also in terms of the impacts of industrialization and urbanization on the two types of agriculture. Based on Ricardian theory of rent, von Thunen argues that urbanization determines location of agricultural production, types of crops, techniques, and cropping intensity. Based on location theory, Schultz then develops a hypothesis, called ‘urban-industrial hypothesis’. It states that once urban industrialization develops further, then agricultural input and output markets would function more efficiently (see Hayami dan Ruttan, 1985).

Having reviewed several studies attempting to test the Schultz hypothesis, Hayami and Ruttan (1985) concluded that the impacts of urban industrialization on the efficiency of input and output markets are not so obvious. Nevertheless, its impact

on per capita farm income is positive. This implies that industrialization is a necessary condition for agricultural development as long as the industrialization supports agriculture. If it happens, the conversion of land from agriculture to non-agriculture should not be worried about.

In order to avoid confusion, peri-urban agriculture in this paper is defined as agriculture performed on urban lands that have been legally planned (but not yet been used) for non-agricultural purposes. That definition is purposefully chosen since it is relevant to the issue of ‘sleeping land’ appeared in the last two years; that is the issue of how to make use of empty non-agricultural lands for agriculture. The use of the temporarily unused lands in peri-urban areas, such as the use of real estate land parcels for agriculture, seems to reduce unemployment and job termination problems related to the current economic crisis.

Any attempt to use such land parcels is indeed supported by the government through a Directive of State Minister of National Land/Agency for National Land No.3/1998. All land right holders or those who have the right on land are obligated to use their fallow lands to help people find income generating activities, especially in agricultural production. Chapter 1 (Item 1) of the Directive defines fallow land as land that has not yet been used according to (a) conditions stated in the government approval, (b) government objective in giving the land rights, and (c) city planning.

### Analytical Technique

The analysis in this paper is carried out by using cross tabs about the frequencies, ranges, and means of each variable, depending on whether the variables are continuous or ordinal. To describe the performance of peri-urban agriculture, it is important to define the costs and returns of production. Since the net returns in this paper is defined as the returns to household labor and management, then the total costs is simply all costs for paid inputs.

$$NR = \sum_{i=1}^l Y_i - \sum_{i=1}^l \sum_{j=1}^k X_{ij}. \quad (1)$$

where :

$NR$  = Net returns to family resources and management.

$Y_i$  = The output value of crop  $i$ .

$X_{ij}$  = The value of paid input  $j$  for crop  $i$ .

Based on the definition, the use of household labors and management in the production is not considered as cost components or as imputed costs. The output values of crops consumed and marketed are not separated in the analysis since the proportion of the leafy vegetable output consumed is so small. The total costs is obtained by summing up all values of paid inputs such as hired labors, seeds/seedlings, fertilizers, pesticides and the land fees. Since the only input that is not paid is family labor input while the use of non-family labor is not commonly found, then the separation of cash costs and imputed costs is not so important. The ultimate purpose of cost and return in the analysis is to compute the household income expressed in terms of net returns to household resources and management (Equation 1). The analysis does not take into account the opportunity costs of capital as a cost component because the fund the farmers spent for material inputs is but the net returns from previous cropping cycle. Moreover, since one cropping cycle covers a relatively

short period (21 days), then the opportunity costs of capital in this case is insignificant and therefore it is ignored in the computation of costs.

While the net returns (returns to family resources and management) can be considered as net household income in absolute terms, it is also important to find out the relative average productivity of the leafy vegetable production. It can be measured by R/C ratio expressed in Equation (2):

$$R / C = \sum_{i=1}^l Y_i / \sum_{i=1}^l \sum_{j=1}^k X_{ij}. \quad (2)$$

Where:

R = Total returns (the nominator in the right hand side);

C = Total paid costs (the denominator in the right hand side);

Other notations are defined in Equation (1).

From the perspective of relative income distribution among inputs, the relative net returns to household labors and management may be computed from relative factor shares formulae (Equation 3):

$$FS_j = \left( \sum_{i=1}^l \sum_{j=1}^k X_{ij} / \sum_{i=1}^l Y_i \right) * 100 \quad (3)$$

Where:

FS<sub>j</sub> = Factor share of input j (in %).

FS<sub>j</sub> includes the share of net returns (returns to family labors and management).

Other notations are defined in Equation (1).

## Data Collection

All data and information presented in this paper are obtained from a study on 'Profile and Prospect of Peri-Urban Agriculture' carried out in 1998 by a team led by the author in the Centre for Agro Socio-Economic Research (CASER). West Jakarta and North Jakarta were chosen among five municipalities in Jakarta as the locations of the study because most peri-urban farms are found in the two municipalities. The total number of respondents is 40, that is 20 respondents for each municipality. Structured questionnaires were used during the interview with the respondents. Secondary data and information were collected from related Government organizations, such as the Agency for National Land (*Badan Pertanahan Nasional*), Regional Planning Board (*Bappeda*), City Planning Division (*Dinas Tata Kota*), and Agricultural Service Office (*Dinas Pertanian*) in each municipality. Semi-structured questionnaires were used in interview with officials in the institutions.

## DESCRIPTION OF LANDS AND FARM HOUSEHOLDS

### Peri-Urban Agricultural Lands

For the purpose of this paper, peri-urban agriculture is defined as agriculture in urban area carried out on lands that has been formally planned, but not yet been used, for non-agricultural purposes. Agriculture that is so defined can be found near the railway, on riverbank, and on real estate, public, and personal lands.

*Lands Near the Railways.* Lands near the railways are supposed to be used only for the safeness of the trains. The lands in either side of the railway, 10 meter wide, are owned by the State Railway Company (Perumka). In Jakarta, a large proportion of the land has been occupied by the people who build simple houses on it. A small proportion of the land, however, is cultivated by small farmers to grow many kinds of vegetable and secondary food crops, especially cassava.

*Riverbanks.* Riverbanks of Ciliwung River, Flood Canal, Cengkareng Drain, Kali Malang, dan Kali Angke can be used for small size farms spreading along the riverbanks. According to the Management Office of Ciliwung and Cisadane Rivers (PWSCC), Ministry of Public Work, area of the rivers that can be used for seasonal crops is only 8 ha. However, field observation indicates that the area on riverbanks of Ciliwung and Cisadane in Jakarta that can be used for agriculture is much larger than that.

*Real Estate Land.* In DKI Jakarta, there are 116 real estate developers consisting of 85 private real estate developers and 31 public companies, while the entire area is 1597 ha. Out of it, 438 ha have been planned for housing, but only 146 ha have been utilized; while the remaining 292 ha are still in the process of landscaping. Area that is temporarily used for agriculture is 337 ha, comprising 190 ha of lowland and 147 ha of upland, while the remaining 822 ha are still empty ('sleeping land').

*Public Land.* There are 31 public land parcels in five municipalities of DKI Jakarta that have been planned for public buildings or public offices. The total area is 862 ha. The land parcels are under the management of, among others, the Ministry of Education, The Ministry of Defense and Security, Local Government, Pertamina Oil Company, and Logistic Agency (Bulog). Most of the land parcels totaling 610 ha are in North Jakarta Municipality. As large as 34 ha of the lands are in the process of landscaping and none is in the stage of construction. About 372 ha are now being cultivated by farmers for lowland rice, secondary food crops, and vegetables; while 456 ha are still fallow. According to the National Land Agency (BPN) of DKI Jakarta (1998), the fallow land is good enough for producing vegetables and secondary food crops (*palawija*).

*Private land.* Data on private lands that can be classified as 'sleeping lands' are not entirely available, but according to Agricultural Service Office (Dinas Pertanian) the total area of personal lands is considerably large. In North Jakarta Municipality, for example, 193 ha of the lands can be classified as peri-urban agriculture, 119 ha of which are being cultivated for fish pond.

### **Farmers' Characteristics**

None of respondent farmers was born in Jakarta. All respondents in North Jakarta came from Indramayu District, while respondents in West Jakarta came from Indramayu, Subang, and Bogor Districts. Majority of the migrants came from rural North coastal region of West Java indicates. This indicates that the number of landless households in that rural region is relatively high. It seems that each location of peri-urban agriculture is dominated by migrants coming from the same place of origin.

This implies that although most migrants moved by themselves to the cultivated lands, they initially received the information on the availability of the land from their friends.

Table 1 shows that most respondents had some experience in farming before they left their places of origin. In general, they moved to Jakarta to find better jobs or higher income. Respondents who were farmers in their places of origin moved to Jakarta because their farmlands were too small. As many as 50% of respondents were farm laborers in their places of origin. The farm laborers came to Jakarta to find non-farm activities that may provide higher income, but finally they found that they had to work as peri-urban farmers. Similar story is also true for respondents who were unemployed in their places of origin.

Table 1. Background of Respondents (%).

Backgrounds	West Jakarta	North Jakarta
1. Places of origin:		
a. Indramayu	19	100
b. Subang	45	0
c. Bogor	36	0
2. Occupations in places of origin:		
a. Lowland rice farmers	9	5
b. Upland farmers	9	14
c. Farm laborers	55	48
d. Non-farm occupations	18	14
e. Unemployed	9	19
3. Ways to move to the present places:		
a. Came by himself	82	65
b. Brought by friend/neighbor	0	5
c. Followed relatives	18	30

Most respondents are still in their productive ages, but their educational levels are low. About 3% of them did not even have formal education. More than 90% of respondents earn their living from peri-urban farming (Table 2). The proportion of farmers who have secondary occupation is very small. Not only is it because the farmers cannot easily find non-agricultural jobs, but it is also because peri-urban farming requires intensive crop caring and control.

Table 2: Respondents' Age, Education, Number of Children, and House Situation.

Items	West Jakarta	North Jakarta
1. Age (years)	43 (22-60)	41 (20-63)
2. Educational level (years)	2.6 (0-5)	3.0 (0-6)
3. Number of Children.	1.8 (0-4)	1.9 (0-5)
4. Major present occupations:		
a. Farming (%)	92	90
b. Farm laborers (%)	8	0
c. Non agriculture (%)	0	10
5. House Floors:		
a. Cemented floor (%)	25	0
b. Made of wood (%)	0	33
c. Ground floor (%)	75	67

6. House Walls		
a. Made of wood (%)	83	95
b. Other materials (%)	17	0
7. House Roofs		
a. Tiles (%)	25	14
b. Tin plates (%)	50	76
c. Leaves/ <i>rumbia</i> (%)	25	10

Note: Figures in parentheses are ranges (min-max).

Since the average farm size is small and the crops may be harvested in a relatively short period, the farmers always try to intensify the use of lands. So intensive is the use of lands that almost all respondents are assisted by their wives and children. About 91% of respondents stated that they are assisted by their wives, and 86% of respondents are assisted by their children.

Landowners allow the farmers to build their houses near cultivated lands as long as the houses are not permanent ones. Farmers are not allowed to build permanent houses because when the landowners want the lands to be returned then the houses can be easily demolished. The floor should not be cemented, the walls should not be made bricks, and the roof should be of cheap materials. The houses just look like huts (*gubuk*) described as follows: in West Jakarta, only 25 % of the respondents' houses have actually cemented floors; in North Jakarta, 33% of respondents' houses have wood floors; whereas the remaining houses have ground floors. About 83% of the houses in West Jakarta and 95% of the houses in North Jakarta have walls that are made of wood. In West Jakarta, the percentages of the houses having roofs that are made of leaves (*rumbia*), tin plates, and tiles are respectively 25%, 50% and 25 %. In North Jakarta, the percentages are 10% for leaf roofs, 76% for tin plate roofs, and 14% for tile roofs. Only about 42% of the respondents in West Jakarta and 57% in North Jakarta use electric current for the light during the night time, while the remaining respondents use kerosene lamps. About 83% of respondents in West Jakarta and 71% of respondents in North Jakarta use kerosene as source of energy for cooking, while the remaining respondents use firewood.

## PERFORMANCE OF VEGETABLE FARMS

### Cultivated Land Size and Cropping Pattern

Most land parcels cultivated by peri-urban farmers in Jakarta are owned by Government or by real estate developers. Only about 10% of respondents in West Jakarta and none of respondents in North Jakarta cultivate private property lands. Before cultivating the lands, 50% respondents in West Jakarta and 81% respondents in North Jakarta had to sign agreements with the landowners. About 17% of respondents in West Jakarta and 5% in North Jakarta do not have any written contracts with the landowners, but they do have unwritten agreements with the

landowners. The remaining 33% respondents in West Jakarta and 14% in North Jakarta do not even have any agreement with landowners.

It is stated in the contracts that farmers may use the land as long as the owners have not yet planned to use the lands. When the landowners want to use the lands, they will notify the farmer such that farmers would have enough time to find new lands or other jobs before leaving the lands. Therefore, the contracts do not stipulate the duration of the contracts. In relation to the contract, farmers in West Jakarta and North Jakarta pay the leasing rates of Rp 200,000 and Rp 220,000 per 1000 m<sup>2</sup> per year respectively. Unlike in peri-urban of Bali, none of the farmers in Jakarta cultivates the lands under share cropping agreement. In Bali, about 28% of peri-urban farmers operate under shared-cropping agreement (see Soethama, et al., 1988).

Both the average number of land parcels and the average cultivated land size have changed from time to time. At first, the farmers cultivated small plots of land, then they increased the size once they felt that they are able to do so. The average number of parcels has increased from 1 to 1.1 in West Jakarta or to 1.2 in North Jakarta. On the other hand, the average land size has increased almost double in West Jakarta and more than double in North Jakarta (Table 3).

Since the farmers are able to water their vegetables by using water from the nearest rivers/streams or wells, then the farms are not much dependent on rainfall or seasons. After a crop is harvested from a sub-plot of land, the farmer soon prepares the land to grow different crops on the sub-plot. In other words, the farmers intensify the use of lands by rotating crops in each sub-plot of land. This implies that at any time, there are always many crops in a farmer' cultivated land. Depending on the land size, the number of crops varies from one to seven crops with an average of three crops at any time.

Table 3: Changes in Cultivated Lands and Percentage of Respondents by Landowners

Items	West Jakarta	North Jakarta
1. Average number of land parcels:		
a. Initially (number. of parcels)	1.0	1.0
b. Now (number. of parcels)	1.2	1.1
2. Average cultivated land area:		
a. Initially (m2)	463	298
b. Now (m2)	829	735
3. % of respondents by landowners:		
a. State-owned lands (%)	45	48
b. Real estate developers (%)	45	52
c. Personal landowners (%)	10	0

Water is not the major constraint and most vegetables are harvested in three weeks, then the cropping intensity is very high. Based on the respondents' estimates, the cropping intensity on each sub-plot of land varies from 400% to 900%, with an average of 600% per year. From the demand side, the high cropping intensity is also related to the high demand for vegetables in urban area. Note that, the demand for vegetables in Jakarta is around 282.000 ton per year (Dinas Pertanian DKI Jakarta, 1998).

In such cropping pattern and high demand for vegetables, farmers can harvest their crops almost everyday and sell the produce to collectors or sell directly to traditional markets. In other words, the farmers may receive cash income almost everyday and spend it to meet their daily consumption and production needs. To some extent, the daily cash income enables the farmers not to rely much on credit because it seems easier for them to adjust their expenditures to the daily income than to seasonal income in the case of seasonal cropping.

Peri-urban farmers that have been described as far could not be classified into one of the major types of urban agriculture suggested by Gura (1996). Gura has identified three major types of urban agriculture that play different roles with respect to urban market. The three types are 1) urban shifting cultivators, 2) household gardeners, and 3) peri-urban market producers.

*Urban shifting cultivators.* This type of urban agriculture uses empty spaces in cities, and consequently the cultivators' rights to use the land are very limited. They produce vegetables mainly for informal market, and their objective is just to meet their basic needs. The cultivators are migrants that have been residing in cities for some time, and turned to farming as a source of income. Their most important products are leafy vegetables that grow fast and absorb low inputs. They produce low price leafy vegetables for urban low-income classes.

*Household gardeners.* Household gardeners live in town and use land around their homes or near city. They produce livestock and trees in more integrated way for both subsistence and market. Their land rights are more secure and their investments are higher and longer than those of the two aforementioned types of urban agriculture.

*Peri-urban market producers.* These producers often are specialized farmers who tend to produce higher value vegetables (tomato, onion, and cabbage, among others), but they also might produce leafy vegetables. They use high external inputs and supply their products to more affluent urban population through formal channels.

It seems that none of the three types of urban agriculture suggested by Gura (1966) may exactly describe peri-urban agriculture defined in this paper. Most peri-urban farmers in Jakarta intensively produce leafy vegetables for traditional market, and their land rights are dependent on landowners that initially have planned the lands for non-agriculture. In the cases of real estate lands, government lands, and personal lands, the farmers have to move to find new lands or new jobs. If it happens, the landowners would notify the farmers several months ahead.

### **Input Use, Costs and Returns**

To obtain vegetable seeds, farmers can buy the seeds from shops/kiosks or they may produce particular vegetable seeds such as *ceisin*, *kemangi*, and spinach. To do this, farmers usually leave one or two plants not to harvest until it is old enough to be vegetable seeds.

All fertilizers such as Urea, TSP/SP-36, KCL and NPK, are also available in shops/kiosks. While farmers in general are aware about the importance of fertilizers for their crops, they use different amounts of each fertilizer per unit of land. Since

they are rarely served by agricultural extension service, the way and the amount of fertilizers they use depend on their experience only. It seems that they overuse fertilizers for the crops (Table 4).

Table 4: Use of Fertilizers and Labors in Vegetable Farms for a 21 day crop cycle per 1000 m<sup>2</sup>.

Inputs	West Jakarta	North Jakarta
1. Urea (kg)	59	64
2. TSP (kg)	30	27
3. NPK (kg)	24	27
4. Labors (mandays)	32	35

Peri-urban vegetable farms also use pesticides intensively because they have not recognized the method of integrated pest management. Such pesticides as furadan, vitanol, supracide, antracol, superflora, arifu, and so on can be easily found in shops/kiosks. In the present economic crisis, they reduce the intensity of pesticide use since the prices of pesticides are going up.

Table 5 presents the costs and returns of peri-urban vegetable farms. Since all costs here are cash costs, then the net returns here is defined as 'returns to farm household labors and management'. It is shown that the net returns per 1000 m<sup>2</sup> of the farms are Rp 1,079,000 in West Jakarta and Rp 923,000 in North Jakarta for a cropping cycle of 21 days. If the net returns are converted to the actual farm sizes, then the net returns could be considered as household income levels for one month. The household income levels per month would be Rp 895,000 in West Jakarta and Rp 678,000 in North Jakarta.

The income levels look relatively high, but it should be noted that the farmers have to set aside as much as Rp 370.000 up to Rp400.000 for purchasing material inputs in the next cropping cycle. Not to mention that vegetables in general are risky crops in relation to pest damage. This is also the reason why the farmers use pesticides intensively in order to protect their crops from pest damage. It may be found that farmers spray their crops using pesticides even one day before harvesting. Such a method of pest management is certainly harmful to human health. This implies that a specific research and extension on integrated pest management for this particular vegetable production is extremely necessary.

Table 5: Cost and Returns of Vegetable Farms for a 21 day-cropping cycle per 1000 m<sup>2</sup>

	West Jakarta		North Jakarta	
	(Rp1000)	Shares (%)	(Rp1000)	Shares (%)
1. <u>Production</u>	<u>1,456</u>	<u>100</u>	<u>1301</u>	<u>100</u>
2. <u>Costs:</u>	<u>377</u>	<u>26</u>	<u>378</u>	<u>20</u>
Seeds	121	8	119	9
Fertilizers	122	9	131	10
Pesticides	96	5	73	6
Laborers	15	1	0	0
Land rents	50	3	55	4
3. <u>Net Returns</u>	<u>1,079</u>	<u>74</u>	<u>923</u>	<u>71</u>
4. R/C	3.9	*	3.4	*

Table 5 also shows that although the total absolute cost is relatively high, the factor shares of material inputs are relatively low: 26% in West Jakarta and 20% in North Jakarta. Consequently, the percentages of net returns are relatively high: 74% in West Jakarta and 71% in North Jakarta. The high relative net returns are also reflected by the R/C ratios: 3.9 in West Jakarta and 3.4 in North Jakarta. The R/C ratios indicate that for a 21 day-crop cycle farmers in West Jakarta and North Jakarta obtained respectively Rp3.90 and Rp3.40 for each *rupiah* they spend for inputs;

The ways the farmers sell vegetables are almost similar for all locations of the study. Most farmers sell their products to collectors who come to the production sites. This is done by 83% of respondents in West Jakarta and 57% of respondents in North Jakarta. The remaining respondents sell their vegetables directly to nearest markets. After harvesting, the farmers clean, select, tie, and then immediately sell the vegetables to collectors to avoid the vegetables from being deteriorated.

Sometimes a farmer may sell his/her standing crop to a collector through *tebasan* system. In this system, the collector estimates and offers to the farmer the total value of the farmer's standing crop on the field. If the two parties agreed, the farmer is paid the total amount and then the crop is harvested by the collector himself, not by the farmer.

### **Prospect of Peri-Urban Leafy Vegetable Agriculture.**

The fact that some migrants from rural areas become peri-urban farmers is neglected as far. Despite the differences between peri-urban agriculture and agriculture in their places of origin, most migrants have some experience in farming. The average farm size is very small, and the farms are cultivated intensively, using family labors, pesticides and fertilizers. Most farmers produce leafy vegetables for urban consumers. Since peri-urban agriculture can supply vegetables every day, urban consumers may consume fresh vegetables without having to store the vegetables in refrigerators.

Peri-urban farming would continue in Jakarta as long as the farmers have the opportunity to cultivate empty non-agricultural lands and sources of water are available nearby the lands. Unlike small farmers in many rural areas in Java, most peri-urban farmers do not have additional income from non-agricultural jobs. Small farmers in rural areas could find jobs in urban and rural areas during the lean season, whereas most peri-urban vegetable farmers could not because they do not have such seasons. Since peri-urban vegetable farmers use family labors intensively, it is hard for them to do secondary jobs. They have to water their crops twice or three times a day. This work alone, prevents them from doing other jobs..

In spite of the fact that peri-urban farming significantly contributes to employment opportunity and source of income for the migrants coming from rural areas, the prospect of peri-urban farming in Jakarta remains unclear. The major reason is that it entirely relies on lands that have been planned but not yet been used for non-agricultural purposes. This implies that peri-urban agriculture should be considered as temporary farming. Once the economic crisis has gone, it is predicted that the demand

for land for housing and public facilities is predicted to increase. In other words, peri-urban agriculture would be reducing eventually.

The use of the railway company's lands and riverbanks for vegetable farming remains illegal and will be prohibitive in the future for the security and environmental reasons. In the cases of real estate, government, and private property lands, the lands would be used by the landowners someday, especially when the present economic crisis has gone. Moreover, although vegetable peri-urban agriculture intensively uses family labor, its contribution to total labor absorption is not so significant since its total area in such a city as Jakarta is limited.

Based on the aforementioned arguments, the present peri-urban vegetable agriculture would disappear in the future unless the government could find alternative locations for it. Otherwise, peri-urban vegetable agriculture should be considered as temporary employment opportunity for the migrants. Conversely, urban agriculture for ornamental plants seems to proceed because it only uses lands on the roadsides and yards. Not to mention that ornamental plants would contribute to the aesthetics of cities. It should be noted, however, that the land that can be used for ornamental plant is also limited.

With the current economic crisis, the government should pay attention to peri-urban vegetable agriculture, especially for credit, research, and extension services. They might need credit since the chemical input prices are going up these days. Research and extension on integrated pest management are required to reduce production costs and negative environmental impact of the current pest management.

## **CONCLUSIONS AND SUGGESTIONS**

1. Peri-urban agriculture in Jakarta can be found near the railway, on riverbank, and on real estate, public, and personal lands. Based on the facts, peri-urban agriculture in this paper is defined as agriculture carried out on urban lands that have been initially planned but remain unused, for non-agricultural purposes. Most of the peri-urban farmers are migrants from Indramayu, Subang, and Bogor.
2. At first glance, the income level of peri-urban vegetable farms looks relatively high, but it is actually low when converted to income per family labor per day. Besides, the farmers have to set aside some amount of the income to purchase inputs for the next cropping cycle. The farms, however, contribute significantly to employment and source of income for farm households. It should be noted that it is not easy for the farmers to find alternative jobs, especially in the present economic crisis.
3. Although credit for inputs is available from vegetable collectors, peri-urban farmers rarely take the credit. If the farmers do take the credit, there is no convincing evidence that the credit is linked to output market. In other words, the major reason for a collector to provide credit is just to maintain good relation with the farmers so that they will sell their vegetables to the collector. In this case, the credit has no effect on the prices of vegetable in a sense that the prices are equal to the prevailing market prices.

4. Considering the present economic crisis, peri-urban agriculture can be expanded to empty lands (*lahan tidur*) of real estate, government, and private lands. Hence, it is urgent that the Agency for National Land prepares the list of lands that can be used temporarily for urban agriculture. In this relation, coordination among the Agency for National Land (BPN), Ministry of Labor, Agricultural Service Offices (*Dinas Pertanian*), and Regional Planning Board (*Bappeda*) is required.
5. Because of the present economic crisis, the government should pay attention to peri-urban vegetable agriculture, especially on the aspects of research, credit, and extension services. Credit is important because of the rising price of chemical inputs. Research and extension on integrated pest management seem essential to reduce pests and diseases.

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