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Factors Affecting the Decision Making in Off Farm Employment Among Paddy Farmers in Kemasin Semerak

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ABSTRACT

Poverty is one of the most serious problems confronting paddy farmers worldwide, and Malaysia is not an exception. Off farm employment is an alternative strategy and it has a potential to improve the income and well-being of the paddy farmers. This study assessed the off-farm employment decision among 250 paddy farmers in Kemasin Semerak granary area. In specific, the study attempted to determine the relationship between the determinants of the off-farm and the off-farm participation decision. It was also undertaken to describe the characteristics of respondents and their status in the off-farm employment. Furthermore, it examined the income level of the farm households from the paddy farming and the off-farm employments as well as showed the effects of the off-farm employment to the paddy farmers, using the descriptive analysis and logit regression methods. The variables which were found to influence the likelihood of the paddy farmers to be engaged in the off-farm employment included the farmers' age and gender, the number of dependants, as well as other income and farming types. From the study, it was evident that the farm size and education were not significant factors as no significant association was observed between them and the off-farm participation.

Keywords: Off-farm employment, paddy farmers, logit model, participation decision

INTRODUCTION

Established in 1982, Kemasin Semerak is among the second five granary areas with the aim to accelerate 'in-situ' rural development with integration through flood control, irrigation and drainage system and increase farm productivity. Under the Projek Kemasin Semerak (PERKASA) administration, the width of the area is about 68,350 hectare, and this includes Bachok Territory, Pasir Puteh Territory and certain parts of Kota Bharu Territory. From this total, only 24,000 hectares of the agricultural land involved about 30,195 farmers in various agricultural sectors.

The term "paddy" means rice cultivated in low land with irrigation. Rice farming in Malaysia can be regarded as one of the origins of the irrigated rice production systems commonly observed in Asia. Paddy is produced mainly by small holders, with an average farm size of about 1.06 hectares. There are approximately 296,000 paddy farmers; out of this, 116,000 are full-time farmers who are depending on paddy cultivation for their livelihood. Sixty five percent of the paddy farmers have farms of less than one hectare, while only four percent of them possess more than three hectares. According to the Malaysian Agricultural Research and Development Institute (MARDI), the total planted area is about 670,000 ha, with 386,000 ha within the eight granary areas, about 218,000 ha outside the granary area and about 70,000 ha representing upland/ hill paddy, especially in Sabah and Sarawak. The average

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yield for the country is about 3.5 t/ha, with the average of 4.2 t/ha in the granary areas and 3.2t/ha outside.

According to the study conducted by the World Bank study in the early 1988, Malaysia is an inefficient producer of rice. This could be proven from the producers' price which was two times higher than imported rice. It was estimated that 74 percent of the paddy producer's monthly income came from the income support measures, which suggested that the Malaysian paddy sub-sector is both non-viable and non-sustainable. The government's support for R&D, production and marketing in the form of credit facilities, fertilizer subsidies, irrigation investment, guaranteed minimum price, income support programmed, subsidized retail price as well as research and extension support (training and advisory) to the tune of billions of dollars for the past fifty years, have been a fiscal drain to the nation. Despite the massive fiscal outlays for this constituency, the production of rice is still chronically inefficient. Continued decline in the cultivated areas, negligible gains in productivity, continued increase in the cost of production and decreasing profitability have caused the rice production in Malaysia to become a sunset industry.

Rice cultivation in Malaysia is closely associated with the rural population and traditional farmers. In this sub-sector, labour is characterized by aging farmers and low levels of education. Poverty and dependency are significant in this sub-sector and most would be living below the absolute poverty line without the government support. All these lead to the sub-optimal allocation of resources at the national level. The situation is further aggravated by the high cost of material inputs, which causes the investment in paddy cultivation to become not attractive whenever the open market price of paddy is considered. Although the government has invested heavily in the rice sector for economic reasons, the profit margins have sharply declined at the farm level. Labour, farm power, fertilizer and agro-chemicals demanded about 90% of the total yield. The share of the labour component alone was about 45% (Jayawardane, 1996).

The Third Malaysia Plan (1976) identified the incidence of poverty as high as 88% among the rice farmers and this was due to the small size of holdings, prevalence of tenancy, lack of drainage and irrigation facilities and low yields. The production of rice in some parts of Malaysia is facing a host of physical and operational constraints such as the shortage of land and water resources, escalating prices of agricultural inputs, shortages in labour, low efficiency in water use, low adoption of technology, uneconomic land holdings, high post-harvesting losses, and inadequate infrastructural facilities (Marooka *et al.*, 1991). The available literature explains that the agricultural sector only has a very limited capacity to absorb the existing supply of rural labour and has failed to satisfy even the minimum subsistence requirements of a large proportion of the rural population (Jayasuriya and Shand, 1985).

Given the prevalence of surplus labour in the rural areas, due to mechanization and the high land scarcity, improving the off-farm employment opportunities will be an important way to increase the rural household incomes, particularly in the granary areas. In specific, if farmers are engaged in the rural-based non-farming activities (such as manufacturing and trading), they are likely to intensify the production efforts and increase agricultural productivity to provide the resources necessary for the investment in the rural-based non-agricultural activities. Thus, off-farm employment is thought to have a negative impact on the farm income at the household level. However, since there is a surplus labour (or farming is not able to absorb the idle family labour), the off-farm employment may not have a negative impact on farming activities. In the case of the surplus labour, the off-farm employment may not be able to compete with farming activities for labour, thus creates the need to examine the off-farm employment participation among paddy farmers.

Off-farm activities, which are defined as the participation of individuals in remunerative work away from a "home plot" of land, have been seen to perform an increasingly important role in sustainable development and poverty reduction especially in the rural areas (FAO, 1998). The economy of the off-farm employment has become the interest of various governments, non-governmental organizations (NGOs), international agencies and development practitioners, because of its growing commonness in many developing countries. In fact, it has been considered as an alternative source of income for the agricultural sector and an essential way to increase the overall rural economic activity and employment in many developing countries.

As economic development progresses, the traditional image of the farm household has been shifted into more diverse activities other than agriculture. Many evidences provide that rural household income share, from the non-farm activities, has been substantially growing. Several previous studies found that the income from the non-farming activities in the rural areas accounted for 40% in the average of the total income in the Latin American countries (Reardon *et al.*, 2002). A similar trend was also observed in the sub-Saharan Africa, whereby the non-farming income contributed from 30% to 42% of the total household income. However, lower shares were indicated for Asian countries, but they were still significant i.e. around 29% to 32%, respectively (Davis, 2004). The considerable shares of the non-farming income are mainly influenced by the expansion of the off-farm employment in the rural areas. Moreover, many studies have found that the majority of the farming households are engaged in the off-farm employment.

Off-farm activities have also helped to reduce the income uncertainty in the rural areas. Diversification of employment helps to gain smooth income by spreading risk across several activities (Gordon, 1999). By reducing income uncertainty, farm households have opportunities to invest in more advanced agricultural technologies. The adoption of a better technology is expected to be highly profitable and will encourage the transformation from traditional to modern agriculture sector. It can not be denied that off-farm employment is crucial to the rural poor. Not only income from the off-farm activities represents a significant share of the total income of the rural households, the off-farm jobs also absorb an increasing proportion of the rural labour among the rural poor. Participating in the off-farm activities offers a diversification strategy for the households and the off-farm incomes provide a source of liquidity in the areas where there is credit constraint.

The off-farm employment is gaining attention particularly as a strategy for supplementing the farmers' income, and it has been widely recognized that the off-farm work plays a very important role in augmenting small farmers' income in developing countries. For example, the income from the off-farm activities contributed to more than three times the annual net income from paddy for the paddy households in Malaysia in 1979 (Taylor, 1981).

Shand and Chew (1983) conducted their research in Kelantan, Malaysia, and illustrated the significance of the off-farm employment for the farm households. A large majority of the farmers in Kemubu are relying heavily on the off-farm employment to supplement their income in order to achieve an even modest standard of living.

In MADA, Corner (1981) observed that there was a need for the expansion of the off-farm employment as an anti-poverty strategy. This is particularly due to the fact that it would be difficult to raise the income from farming among the majority of the small paddy farmers to above the current poverty level, without substantially and probably inefficient government subsidies. Similarly, it was unlikely that the gap between the income levels of the farmers in the small farms and those on the larger farms and in the non-farming sector could be bridged purely by an agricultural strategy.

Alias and Ismail (1995) conducted a research in the North-west of Selangor (IADP) to examine the off-farm labour decision of the farmers and found that the factors influencing their decision to seek for the off-farm employment were the human capital variables of ages and education levels, which were indicated to have the highest impact on the off-farm labour participation. Shand (1986) conducted a study at the KADA area to examine the important factors affecting both the farm and off-farm allocation of labour and found that underemployment of households' labour in paddy farming existed and that the surplus labour could be tapped by creating more employment through intensification of the farming and off-farming work.

The objectives of this study were to assess the off-farm employment decision among 250 paddy farmers at Kemasin Semerak granary area. In specific, the study was undertaken to determine the relationship between the determinants of the off-farm and the off-farm participation decision. It was also carried out to describe the characteristics of the respondents and their status in the off-farm employment. Furthermore, it attempted to examine the income level of the farm households from the paddy farming and the off-farm employment, as well as study the effect of the off farm employment on the paddy farmers.

Paddy farmers are facing a host of problems such as unstable yields (due to flood, lack of good irrigation etc.), low farm income (due to unstable yields), and price control *(Fig. 1)*. Nevertheless,

they have more time due to mechanized farming so there is an opportunity for them to diversify their sources of income by engaging in the off farm employment so as to increase their income. This, in turn, will lead to the improvement in their standard of living; nevertheless, there are also other factors which determine their participation in the off farm employment, such as their age, level of education, number of dependents, other income, as well as the size and of their farms.

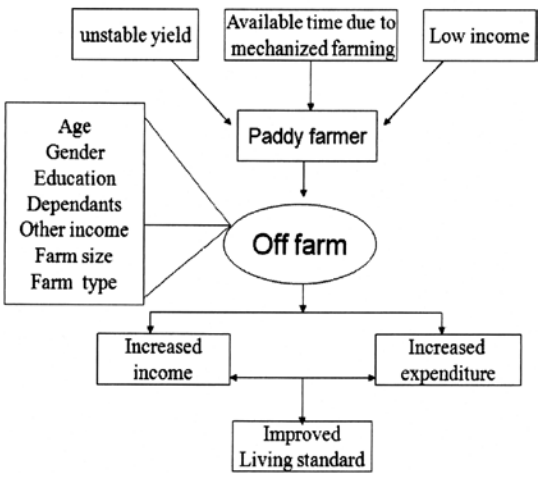

Fig. 1: Host of problems facing by paddy farmers

METHODOLOGY

Surveys were conducted to examine the off farm employment decision-making among the paddy farmers in granary area of Kemasin Semerak. Two hundred and fifty paddy farmers were selected for this study, and they were selected using the stratified random sampling (a sampling procedure in which the population is separated into categories prior to the selection of elements. The strata is also collectively exhaustive and no population element can be excluded. Then, random is applied within each stratum. Sampling equal numbers from strata varying widely in size has been used to equate the statistical power of tests of differences between strata. The structured questionnaire was design to gather the necessary information and data on the off-farm employment participation decision among the paddy farmers. The questionnaire consisted of structured questions and was divided into two types, dichotomous choice and multiple category questions. A dichotomous choice question offers just two answer choices, i.e. yes or no, and the multiple category questions have more than two choices of answer. The collected data were analyzed using the statistical package for social science (SPSS) software for the descriptive analysis and logit regression.

In this study, the descriptive analysis was used to describe the characteristics of the variables, in terms of the frequencies and the percentage of distribution of the survey, which aided in making comparison among the variables. Meanwhile, the logit model was used to estimate the decision rule for farmers' off-farm work participation; a binary choice model based on the method of maximum likelihood was specified. Each observation was treated as a single draw from a Bernoulli distribution (Greene, 2000). The dependent variable was set as a 0 – 1 dummy, taking the value 1 for the farm household members who participated in the off-farm work and 0 for the members who did not. The predicted value of the dependent variable could be interpreted as the probability of participating in the off farm work, given the values of the independent variables.

The logit model to estimate the participation in the off-farm work may be written as:

$$Y_i^* = \beta X_i + u_i,\ u_i \sim N[0, 1],\ i = 1,..., n$$

$$Y_i = \begin{cases} 1 \text{ if } Y_i^* > 0 \\ 0 \text{ otherwise} \end{cases}$$

The Dependent Variable: On- and Off-Farm Participation

Since it analyzed the individual participation in off-farm work, this study used dummy variable, which indicated two possibilities of individual participation between the off-farm and on-farm work.

The participation in the off-farm work in this study is defined as the individuals' participation in secondary or additional job away from own plot of land. This job firstly includes primary activities in the non-agricultural sector. In addition, it also includes secondary activities in both agricultural (e.g. a rice farmer who owns land or a wage worker, and has a secondary job in fish farming either privately owned or wage job) and non-agricultural sector (e.g. a rice farmer who owns land or a wage worker, and has a secondary job in transportation or retailer; a farm household member who owns a barber shop or vendors).

The participation in the on-farm work in this study is defined as the individuals' participation in the agricultural sector as the main job only, with no secondary or additional job at all. For instance, a rice farmer with owned land or wage rice farmer, owner of animal husbandry or workers in fish farming, etc. It is important to note here that all of them did not participate in any other kinds of employment.

Independent Variables: Determinants of the Off-farm Participation

Based on the empirical studies mentioned in Chapter 2, independent variables in this study were the determinants of the participation in the off-farm work. In total, there were four groups of independent variables analyzed in this study:
Individual characteristics: Three variables were used as individual characteristics in this study; they are as follows:
Gender: This dummy variable represented the gender segregation between the male and female among household members. The variable predicted parameter was expected to have a negative sign to indicate that the females were less likely to participate in the off-farm work.
Age: This factor was used to capture the life-cycle effect to participate in the off-farm work. The variable predicted parameter was expected to have a negative sign to indicate that after certain ages, the increasing "tendency" to participate in off-farm work would also decline.
Level of education: This variable represented the human capital endowment. It was expected that the increase in the individual years of schooling would increase the tendency to engage in the off-farm work.

Family characteristics: The variables used to represent the family characteristics include:
Dependents Size is the number of individuals living in a household. It was expected that a larger dependent size would increase the tendency to participate in the off-farm work. Having more people living in a household also meant that more burden and reason to the actively working individuals, and this would increase the likelihood to participate in the off-farm work.
Other incomes are defined as all other non-labour incomes including pension, insurance benefits, transfer, remittances, bonus, etc. Individuals with higher other revenue were expected to be less likely to participate in the off farm work since they already possessed the certainty from passive sources of income.

Farm characteristics are variables which indicate the endowment of a farm household. These include:
Farm size is the size of any farm land owned by the households in hectares. Besides capital, this variable shows land ownership which reflects asset holding related to poverty. It was assumed that small farm size was related to poor farm household, and vice versa. Thus, the participation in the off-farm work was expected to be less likely favoured by individuals with larger farm size owned.
Land market is related to whether or not landless household rented in land or had shared crops. Individuals who come from this household were expected to increase the motivation in the off-farm participation due to deficiency in the income from farm waged works in other farms or small percentage of shares on cultivated land.
Farm types indicate the most valuable crops or livestock which a farm household produced for either market or home-consumption.

RESULTS AND DISCUSSION

The empirical results and discussion are presented in two sub-sections. In the first sub-section, a descriptive analysis was used to describe the basic features of the data in this study. In particular, it described the respondents' profile and their perception towards off-farm employment. Meanwhile, the second sub-section looks into the logit analysis to determine the factors which influence paddy farmers to participate in the off-farm employment.

The Results of the Descriptive Analysis

Table 1 presents the socio-economic profile of the respondents. Zero point four percent of the respondents were less than 25 years old, 31.2% were between 25-50 years, and 65.2% were between 51-75 years, while 3.2% were above 75 years. Seventy six point four percent of the respondents are males, while female contributed to only 23.6%. Twenty four percent of the respondents did not have any formal education, 30.4% of the respondents had a primary education, and 33.2% had secondary education, while 12.4% had tertiary education. Ninety four point four percent

TABLE 1
The respondents' demographic profile

Characteristics	Number	Percentage	Characteristics	Number	Percentage
Age (year)			Paddy income		
<25	1	0.4	<3000	154	61.6
25-50	78	31.2	3000-6000	58	23.2
50-75	168	65.2	>6000	38	15.2
>75	8	3.2			
Gender			Off-farm participation		
Male	191	76.4	Yes	136	54.4
Female	59	23.6	No	114	45.6
Level of education			Off-farm income		
No education	60	24.0	<2000	75	55.2
Primary education	76	30.4	2000-3000	37	27.2
Secondary education	83	33.2	>3000	24	17.6
Tertiary education	31	12.4			
Farm size			Total income		
0.5-1.0ha	236	94.4	<4000	90	36.0
1.1-2.0ha	10	4.0	4000-6000	53	21.2
2.1-3.0ha	4	1.6	>6000	107	42.8
Dependents size			Change in income after off farm work		
< 3	60	25.2	Increase	126	92.6
3-6	125	50.0	Same	10	7.4
> 6	62	24.8	Decrease	0	0.0

Notes: Off-farm participation, off-farm income and changes in income after participating in the off-farm activities are only attributed to those who participated in the off-farm employment. This involved 136 out of 250 respondents.

TABLE 2
Results from the Logit Analysis

Variable	B	S.E	WALD	SIG.	EXP(B)
AGECAT1	-2.394	0.857	7.801	0.005*	0.091
AGECAT2	-0.459	0.726	0.400	0.527	0.632
EDUCAT1	19.008	6966.838	0.000	0.998	2E+008
EDUCAT2	0.225	0.737	0.094	0.760	1.253
EDUCAT3	0.237	0.746	0.101	0.751	0.789
GENDER	-1.674	0.742	5.085	0.024*	5.335
DEPCAT1	4.582	1.894	5.851	0.016*	0.010
DEPCAT2	5.411	1.844	8.608	0.003*	0.004
DEPCAT3	5.655	2.041	7.680	0.006*	0.003
TOICAT1	-0.916	0.593	2.389	0.122	0.400
TOICAT2	-35.638	14184.170	0.000	0.998	0.000
TOICAT3	-20.858	12770.401	0.000	0.998	0.000
FSCAT1	-1.323	1.200	1.216	0.270	0.266
FSCAT2	-1.345	1.249	1.160	0.282	0.260
FTCAT1	6.015	1.191	25.516	0.000*	409.404
FTCAT2	2.017	1.261	2.556	0.110	7.515
CONSTANT	1.288	2.332	0.305	0.561	3.627

-2log likelihood=129.111
Percentage of correct prediction=89.2
* Significant at level 0.05

of the respondents have small size farms, 4.0% of the respondents have medium size farms and 1.6% has large farm.

Twenty five point two percent of the respondents had less than three dependents, 50.0% of the respondents had between three to six dependents and 24.8% had more than dependents. Fifty four point four percent of the respondents used to participate in off-farm employment, while 45.6% of the respondents did not participate in any kinds of off-farm employment.

Sixty one point six percent of the respondents in the area had low income, 23.2% had middle income and 15.2% had high income from paddy farming. Fifty five point two percent of the respondents who participated in the off-farm employment in the area had low income, 27.2% had middle income and 17.6% had high income from the off-farm employment. From the total income, 36.0% of the respondents in the area were identified to have low income, 21.2% had middle income and 42.8% had high income from all the sources of their income. Ninety two point six percent of the respondents in the area have experienced increase in the income after engaging in the off-farm employment, 7.4% indicated that their income remained the same and none of them experienced a decrease in their income.

The Logit Analysis

A logistic regression model was used to predict the probability factors which determined the paddy farmers' participation in the off-farm activities. As indicated earlier, the dependent variable was the participation in the off-farm employment; for this, those participating were assigned the value of one, while zero was assigned if the respondent were not participating. Further details of the categories of the variables are given in Table 3.

The independent variables were the individual characteristics (age, level of education and gender), family characteristics (the number of dependents and other income sources), and farm characteristics (size, type and land holding).

TABLE 3
Variables and their definitions

Variables	Their Definitions
AGECAT1	Respondents that are less than twenty five years
AGECAT2	Respondents that are within twenty five to fifty years
AGECAT3	Respondents that are within fifty to seventy five years
AGECAT4	Respondents that are above seventy five years
EDUCAT1	Respondents that have no formal education
EDUCAT2	Respondents that have primary education
EDUCAT3	Respondents that have secondary education
EDUCAT4	Respondents that have tertiary education
GENDER	
DEPCAT1	Respondents that have less than three dependents
DEPCAT2	Respondents that have three to six dependents
DEPCAT3	Respondents that have above six dependents
TOICAT1	Respondents that have less than RM1000 as other income
TOICAT2	Respondents that have between RM1000 and RM2000 as other income
TOICAT3	Respondents that have more than RM2000 as other income
FSCAT1	Respondents that have 0.5-1.0ha of land
FSCAT2	Respondents that have 1.1-2.0ha of land
FSCAT3	Respondents that have 2.1-3.0ha of land
FTCAT1	Respondents that have their own farm
FTCAT2	Respondents that have rent the farm
FTCAT3	Respondents that have both rent an own the farm

Table 2 illustrates the results gathered from the logit analysis. The interpretation of the negative coefficient of age was that the individual participation declined as age increased. In other words, the probability of the participation in the off-farm work increased at younger age, but this was found to decrease as individuals got older. From the table, only AGECAT1 (age category of less than 25 years) showed a significant relationship with 0.091 expected likelihood of participation in the off-farm employment increased with age.

The positive coefficient of education indicated that individuals who had had more years of schooling had a higher probability to participate in the off-farm work. One additional year of formal education was found to increase the likelihood of the individuals to participate in off-farm activities. However, looking at the above table, education did not show any significance to the off farm employment in this area, indicating that the farmers' participation in the off farm employment had nothing to do with them being educated or not. On the contrary, gender showed significant effects on the participation in the off-farm employment, whereby males had 5.335 more likelihood to participate than the females.

The number of dependent family members also imposed a significant relationship with the off-farm employment and the positive coefficient indicated that as the total number of dependents increased, there would be more likelihood for the farmer to participate in the off-farm activities to supplement their income. DEPCAT1 (category of the farmers with less than 3 dependent family members) showed a significant relationship, with 0.010 expected likelihood of participation as the number of dependents increased. DEPCAT2 (category of the respondents with 3-6 people as dependents) also showed a significant impact with 0.004 expected likelihood of participation, and DEPCAT3 (category of the respondents with more than 6 dependents) indicated a significant relationship with 0.003 expected likelihood of participation.

The negative coefficient of TOICAT (total other income) indicated that as other income sources such as pension remittance and gift from children increased, there would be less likelihood to participate in the off-farm employment. In this case, the total other income sources did not show any significant effect on the farmers' participation in the off farm work.

The negative coefficient of FSCAT (farm size category) implied that as the size of the farm increased, there was less likelihood for the respondents to participate in the off-farm employment. However, based on the data presented in Table 1, the size of farms did not show any significance on the farmers' participation in the off-farm employment. On the contrary, FTCAT1 (farm type category 1) showed a significant relationship with the off-farm employment, i.e. with 409.404 likelihood of farmers' participation.

CONCLUSION AND RECOMMENDATIONS

The study assessed the off-farm employment decision among the paddy farmers in Kemasin Semarak granary area. In particular, the study attempted to determine the relationship between the determinants of the off-farm and the off-farm participation decision. It was also undertaken to describe the characteristics of respondents and their status in the off-farm employment.

The results gathered in the present study showed that the majority of the respondents were males and married. In general, most of them were between 51-75 years old and had more than primary school education. The variables which were found to influence the likelihood of the paddy farmers to engage in the off-farm employment were their age, gender, and the number of dependants, other income sources and the types of farm. It is evident from this study, that both farm size and education were not significant factors affecting the farmers' decision towards off-farm participation, and this was proven by the insignificant association observed between the two variables and the participation in the off farm activities.

From the study, it could be observed that the paddy farmers held a positive perception towards the off-farm employment; those who participated agreed that involving in the off-farm employment had improved their standard of living by deriving benefits of generating more income. The findings also showed that combining both the on-farm and off-farm activities was found to enable the farmers to generate more income for their households as compared to those who were solely dependent on the farm income.

The trend to the bimodal farm size distribution will likely continue in the granary areas, since it is the middle age cohort of farmers who are most

likely to work off farm. Meanwhile, the oldest farmers cohort will not engage themselves in the off-farm employment. Therefore, there is a need for the government to formulate a policy to increase the availability of the off-farm jobs in the vicinity of farmers. It is equally important that the land ownership system be reviewed to enable farmers to own their own lands. Women should also be encouraged to participate in farming activities. Furthermore, NGOs should be encouraged to create more income-generating activities, particularly for those living in the rural areas.

REFERENCES

Alias Radam and Ismail Abd. Latiff (1995). Off farm labor decisions by farmers in northwest Selangor Integrated Agricultural Development Project (IADP) in Malaysia. *Bangladesh Journal of Agricultural Economics, 18*(2), 51-61.

Corner, L. (1981). The impact of rural outmigration: Labour supply and cultivation techniques in a double cropped padi area, west Malaysia. Ph.D thesis, Macquarie University, Sydney.

Davis, Jr. R. (2004). *The Rural Non-Farm Economy, Livelihoods and their Diversification: Issues and Options*. Chatham, UK: Natural Resource Institute.

FAO. (1998). *Rural Non-Farm Income in Developing Countries*. The State of Food and Agriculture. 1998.

Gordon, A. (1999). *Non-Farm Rural Livelihoods*. Chatham, UK: Natural Resources.

Greene, W.H. (2000). *Econometric Analysis*. New Jersey: Prentice-Hall International, Inc.

Jayasuriya, S.K and Shand, R.T. (1985). Technical change and labour absorption in Asian agriculture: Some recent trends. *World Development, 14*(3), 415-428.

Jayawardane, S.N. (1996). Socio-economic constraints and future prospects for crop diversification in minor irrigation schemes. Workshop on crop diversification, Colombo, Sri Lanka.

Marooka, Y., Ohnishi, A. and Yasunobu, K. (1991). Reciprocal form of family farm and group farming: A perspective of kelompok tani in Malaysia and Indonesia. *Japanese Journal of Farm Management, 69*,13-29.

Reardon, T., Kostas, G.S., and Winters, P. (2002). *Promoting Farm/Non- Farm Linkages for Rural Development: Case Studies from Africa and Latin America*. Rome: Food and Agriculture Organization of the United Nations.

Shand, R.T. and Chew, T.A. (1983). *Off-farm employment in the Kemubu Project in Kelantan, Malaysia*.

Taylor, D. C. (1981). *The economics of Malaysian paddy production and irrigation*. Bangkok: The Agricultural Development Council.