OFF-FARM EMPLOYMENT PARTICIPATION AMONG PADDY FARMERS IN THE MUDA AGRICULTURAL DEVELOPMENT AUTHORITY AND KEMASIN SEMERAK GRANARY AREAS OF MALAYSIA

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Poverty is one of the most serious challenges confronting paddy farmers worldwide, including those in Malaysia. Off-farm employment is an alternative strategy and has the potential to improve the income and well-being of the paddy farmers. This study assesses the off-farm employment decision among 500 paddy farmers in the Muda Agricultural Development Authority and Kemasin Semerak granary areas. Specifically, the study determines the relationship between the determinants of off-farm employment and the off-farm participation decision using descriptive analysis and logit regression methods. The results reveal that the farmers' age, gender and number of dependants, as well as other income and the type of farm were the variables that influenced their likelihood to engage in off-farm employment. Evidently, the variables of farm size and level of education were insignificant in affecting off-farm participation.

I. INTRODUCTION

The term "paddy" refers to rice cultivated in low land with irrigation. Rice farming in Malaysia can be regarded as one of the first irrigated rice production systems observed in Asia. Paddy is produced mainly by small holders with an average farm size of 1.06 hectares (ha) (Malaysia 1976). There are approximately 296,000 paddy farmers in Malaysia, of which 116,000 are full-time farmers who depend on paddy cultivation for their livelihood. Of the paddy farmers, 65 per cent have farms of less than one hectare, while only 4 per cent have more than three hectares. According to the Malaysian Agricultural Research and Development Institute, the total planted area is about 670,000 ha: 386,000 ha within the eight granary areas, about 218,000 ha outside the granary areas and about 70,000 ha representing upland/hill paddy, especially in Sabah and Sarawak, East Malaysia. Average yield for the country is about 3.5 tons per hectare (t/ha)—an average of 4.2 t/ha in the granary areas and 3.2 t/ha elsewhere.

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Malaysia is an inefficient producer of rice—an observation recorded as early as 1988 in a World Bank study. The study noted that the producers' price was double than that of imported rice. It was estimated that 74 per cent of paddy producers' monthly income came from income support measures. This suggests that the Malaysian paddy subsector is non-viable and non-sustainable. Government support for research and development, production and marketing have taken many forms. Credit facilities, fertilizer subsidies, irrigation investment, guaranteed minimum price, income support programmes, subsidized retail price as well as research and extension support (training and advisory), to the tune of billions of dollars for the past 50 years, have been a fiscal drain on the nation. Despite the massive fiscal outlays for this constituency, rice production is still chronically inefficient with respect to meeting the market and population demand. Given the continued decline in cultivated area, negligible gains in productivity, continued increases in the cost of production and decreasing profitability, rice production in Malaysia can be said to be a sunset industry (Pio Lopez 2007).

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

The Third Malaysia Plan (1976) reported that the incidence of poverty was as high as 88 per cent among the rice farmers. This was due to the small size of holdings, the prevalence of tenancy, the lack of drainage and irrigation facilities and low yields. Rice production in some parts of Malaysia is facing a host of physical and operational constraints, such as a shortage of land and water resources, escalating prices of agricultural inputs and labour shortages, as well as inefficient water use, low adoption of technology, uneconomic land holdings, high post-harvesting losses and inadequate infrastructure facilities (Morooka, Ohnishi and Yasunobu 1991). A literature review shows that the agricultural sector 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 rural areas due to mechanization and the high scarcity of land, improving off-farm employment opportunities will be an important way to increase rural household incomes, particularly in the granary areas. Specifically, if farmers are engaged in rural-based non-farm activities (such as manufacturing and trading), they are likely to intensify production efforts and increase agricultural productivity to provide the resources necessary for investment in the rural-based non-agricultural activities. Off-farm employment is generally thought to have a negative impact on the income of the farmers at

the household level. However, since there is surplus labour (or farming is not able to absorb the idle family labour), off-farm employment may not compete with farming activities. In order to have a better understanding of this relationship, there is a need to examine the off-farm employment participation among paddy farmers.

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

As economic development progresses, the traditional image of a farm household has shifted to include diverse activities other than agriculture. Many evidences show that the share of rural-household income earned from non-farm activities has been growing substantially. Previous studies found that non-farm income in rural areas accounted for 40 per cent, on average, of total incomes in Latin American countries (Reardon, Stamoulis and Winters 2002). A similar trend was also observed in sub-Saharan Africa, where non-farm income contributed from 30 to 42 per cent of total household income. In Asian countries however, the shares were lower but still significant—around 29 to 32 per cent (Davis 2003). These considerable shares of non-farm income were mainly influenced by the expansion of off-farm employment in rural areas. Many studies found that the majority of farm households were engaged in off-farm employment.

Off-farm activities had also helped to reduce the income uncertainty in rural areas. Diversification of employment helps to smooth income by spreading risk across several activities (Gordon 1999). By reducing the income uncertainty, farm households have opportunities to invest in more advanced agricultural technologies. The adoption of better technology is expected to be highly profitable and will encourage the transition from traditional to modern agriculture. Off-farm employment is crucial to the rural poor, off-farm activities not only provide a significant share of the total income of rural households, but also increase the proportion of the rural poor in the labour force. Participating in off-farm activities offers a diversification strategy for the household, and off-farm incomes provide a source of liquidity in areas where credit is constrained.

It has been widely recognized that off-farm work plays a very important role in augmenting small farmers' income in developing countries. For example, in paddy households in Malaysia in 1979, off-farm income contributed more than three times the annual net income from paddy (Taylor 1981). Therefore, promoting off-farm employment is proposed as a strategy for supplementing the income of farmers.

Corner (1981), referring to the Muda Agricultural Development Authority (MADA) area, observed that there is a need for the expansion of off-farm employment as an anti-poverty strategy, because it will be difficult to raise the farm income of the majority of small paddy farmers above the current poverty level without substantial—and probably inefficient—government subsidies. Furthermore, it is unlikely that the gap between the income levels of the small farms and those of the larger farms and in the non-farm sector can be bridged by a purely agricultural strategy. Shand and Chew (1983) conducted their research in Kelantan, Malaysia and illustrated the significance of off-farm employment of farm households. A large majority of Kemubu farmers had relied heavily on off-farm employment to supplement their farm income in order to achieve even a modest standard of living.

Shand (1986) conducted a study at the Kemubu Agricultural Development Authority area to examine the important factors affecting farm and off-farm allocation of labour. It was found that, due to mechanization, the household labour force was being underutilized in paddy farming and that surplus labour could be tapped by creating more employment through the intensification of farm and off-farm work. Radam and Latiff (1995) conducted research in the Northwest Selangor Integrated Agriculture Development Project area to examine the off-farm labour decision of farmers. They found that the factors influencing the farmers' decision to seek off-farm employment, such as human capital, variables of ages and education levels have the highest impact on off-farm labour participation.

The objectives of the present study are to assess the off-farm employment decisions of 500 paddy farmers in the granary areas of MADA and Kemasin Semerak. Specifically, the study (a) determines the relationship between the determinants of off-farm employment and the off-farm participation decision, (b) describes the characteristics of respondents and their status in off-farm employment, (c) examines the income level of the farm households attributable to paddy farming and off-farm employment, and (d) describes the effect off-farm employment has on paddy farmers.

II. METHODOLOGY

Surveys were conducted between June and July 2007 to examine off-farm employment decision-making among paddy farmers in the granary areas of MADA and Kemasin Semerak. A total of 500 paddy farmers were selected for this study using stratified random sampling. The questionnaire consisted of two types of structured questions: dichotomous choice and multiple categories. The collected data were analysed using Statistical Package for Social Science software for the descriptive analysis and logit regression.

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 comparisons among the variables. 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 is specified. Each observation was treated as a single draw from a

Bernoulli distribution (Greene 2000). The dependent variable is set up as a 0 and 1 dummy, taking the value 1 for the farm household members who participate in off-farm work and 0 for the members who do not. The predicted value of the dependent variable can be interpreted as the probability of participating in off-farm work, given the values of the independent variables.

A logit model for estimating off-farm work participation may be written as:

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

$$Y_i = \{ 1 \text{ if } Y_i^* > 0$$

0 otherwise,

where Y_i is a binary choice which equals 1 if farm household members work off-farm, 0 otherwise; u_i is a continuously distributed variable independent of X_i and the distribution of u_i is symmetric about 0 (Wooldridge 2002). The observed variable Y_i is related to a latent variable Y_i^* (also known as the utility index) that is determined by a matrix of explanatory variables and is the parameter vector to be estimated.

The dependent variable: on and off-farm participation

Since it analyses individual participation in off-farm work, this study uses a dummy variable, which indicates two possibilities of individual participation: off-farm and farm work.

Off-farm work participation is defined in this study as the participation of individuals, whether they own their land or work for a wage, in a secondary or additional job away from his or her own plot of land. Such employment includes (a) primary activities in the non-agricultural sector, and (b) secondary activities in either the agricultural sector (for example, a secondary job at a fish farm, either self-owned or for wages) or the non-agricultural sector (for example, a secondary job in transportation or at a retailer, or a farm household member who owns a barber shop or works as a vendor).

On-farm work participation is defined in this study as the participation of individuals in the agricultural sector as their only job, with no secondary or additional job.

Independent variables: determinants of off-farm participation

Based on empirical studies, the independent variables in this study are the determinants of off-farm work participation. Three groups of independent variables are analysed in this study, as described below.

Individual characteristics

Gender. This dummy variable represents the gender segregation between men and women among household members. The estimated sign of this variable is expected to be negative, which will indicate that women are less likely to participate in off-farm work.

Age. This is used to capture the life-cycle effect on participation in off-farm work. The variable predicted parameter is expected to have a negative sign to indicate that after a certain age the tendency to participate in off-farm work will decline.

Level of education. This represents human capital endowment. It is expected that an increase in individual years of schooling will increase the tendency to engage in off-farm work.

Family characteristics

Number of dependants. This is the number of individuals living in a household. Having more people living in a household indicates a greater burden on the actively working individuals, which is expected to increase the likelihood of participation in off-farm work.

Other income. This is defined as all other non-labour income, including pensions, insurance benefits, transfers, remittances, bonuses and other. Individuals with higher non-labour revenue are expected to be less likely to participate in off-farm work.

Farm characteristics

Farm size. This is the size of any farmland owned by the household, in hectares. Besides capital, this variable indicates land ownership, which reflects asset holding related to poverty. It is assumed that a small farm size is related to a poor farm household and vice versa. Thus, it is expected that off-farm participation is less likely to be favoured by individuals owning larger farms.

Land market. This is related to landless households that rented land or had shared crops. Individuals who come from these types of household tend to have a stronger motivation to engage in off-farm work, given the low level of income generated from farm wages.

III. RESULTS AND DISCUSSION

The empirical results and discussions are presented in the following two subsections. In the first subsection, the descriptive analysis is used to describe the basic features of the data in this study. It describes the respondents' profile and their perceptions of off-farm employment. Meanwhile, the second subsection looks into the logit analysis to study the factors that influence paddy farmers in off-farm employment participation.

Results of the descriptive analysis

Table 1 presents the socio-economic profile of respondents. Three (0.6 per cent) of the respondents were younger than 25 years of age; 173 (35.6 per cent) were between 25 and 50; 307 (61.4 per cent) were between the ages of 51 and 75; and 12 respondents (2.4 per cent) were 76 or older. It is evident that the majority of respondents are between 51 and 75 years of age.

Table 1. Descriptive analysis of respondents

Characteristic	Number	Percentage	Characteristic	Number	Percentage
Age (year)			**Paddy income (RM)**		
<25	3	0.6	<3 000	250	50.0
25-50	173	35.6	3 000-6 000	133	26.6
51-75	307	61.4	>6 000	117	23.4
>75	12	2.4			
Gender			**Off-farm participation**		
Male	406	81.2	Yes	252	50.4
Female	94	18.8	No	248	49.6
Level of education			**Off-farm income (RM)**		
No education	80	16.0	<2 000	111	44.0
Primary education	172	34.4	2 000-3 000	70	27.8
Secondary education	184	36.8	>3 000	71	28.2
Tertiary education	64	12.8			
Farm size			**Total income (RM)**		
0.1-0.8 ha	406	81.2	<4 000	141	28.2
0.9-2.2 ha	78	15.6	4 000-6 000	119	23.8
2.3-3.43 ha	16	3.2	>6 000	240	48.0
Number of dependants			**Change in income after off-farm work**		
< 3	133	26.6	Increase	212	84.1
3-6	285	57.0	Same	37	14.7
> 6	82	16.4	Decrease	3	1.2

Notes: The categories of off-farm participation, off-farm income and change in income after off-farm work consider only those who participate in off-farm employment (252 out of 500 respondents). The surveys were conducted between June and July 2007.

Of the total respondents in both land areas, 406 (81.2 per cent) were male and 94 (18.8 per cent) female. This suggests that paddy farming is dominated by male farmers within the granary areas under study. Of the respondents, 16 per cent had no formal education, 34.4 per cent had primary education, 36.8 per cent possessed secondary education and 12.8 per cent possessed tertiary education. A total of 406 respondents (81.2 per cent) cultivated a small farm and 78 (15.6 per cent) cultivated a medium-sized farm. Only 16 (3.2 per cent) of the respondents cultivated a large farm.

A total of 133 respondents (26.6 per cent) had fewer than three people as dependants; 285 (57 per cent) had between three and six people as dependants, and 82 (16.4 per cent) had more than six dependants. Most respondents had three to six dependants. The total number of respondents that participated in off-farm employment was 252 (50.4 per cent); 248 (49.6 per cent) did not engage in any kind of off-farm employment.

The total number of respondents in the low paddy income category was 250 (50 per cent), while 133 (26.6 per cent) had a mid-level income and 117 (23.4 per cent) had a high income from their paddy yield. A total of 252 respondents reported off-farm income; of those, 111 (44 per cent) had low off-farm income, 70 (27.8 per cent) had a mid-level off-farm income, and 71 (28.2 per cent) had a high income from off-farm employment. The total number of respondents with low total income was 141 (28.2 per cent); 119 respondents (23.8 per cent) had a mid-level total income, and 240 (48 per cent) reported a high total income.

The total number of respondents who experienced an increase in income after engaging in off-farm employment was 212 (84.1 per cent); 37 respondents (14.7 per cent) reported that their income had remained the same, and only three respondents (1.2 per cent) reported having experienced a decrease in income. The decrease in income as experienced by a few farmers was attributed to the high transportation cost to and from the off-farm area. The findings thus suggest that jobs should be made available within a reasonable distance of a farmer's settlement.

It can be concluded that off-farm employment had a positive effect, as well as the potential to decrease poverty among paddy farmers, given that the majority of respondents who engaged in such employment experienced an increase in income.

Logit analysis

A logistic regression model was used to predict the probability factors that determined off-farm participation among the paddy farmers. As indicated above, the dependent variable was off-farm employment participation. Those who were participating were assigned the value of one, while a zero value was assigned if the respondent was not participating. See table 2 for detailed definitions of the variables.

Table 2. Variables and their definition

Variable	Definition
AGECAT1	Respondents who are less than 25 years old
AGECAT2	Respondents who are 25-50 years old
AGECAT3	Respondents who are 51-75 years old
AGECAT4	Respondents who are 76 years or older
EDUCAT1	Respondents who have no formal education
EDUCAT2	Respondents who have primary education
EDUCAT3	Respondents who have secondary education
EDUCAT4	Respondents who have tertiary education
GENDER	Gender
DEPCAT1	Respondents who have less than three dependants
DEPCAT2	Respondents who have three to six dependants
DEPCAT3	Respondents who have more than six dependants
TOICAT1	Respondents who earn less than RM1,000 as other income
TOICAT2	Respondents who earn between RM1,000 and RM2,000 from other income
TOICAT3	Respondents who earn more than RM2,000 from other income
FSCAT1	Respondents who own 0.5-1.0 ha of land
FSCAT2	Respondents who own 1.1-2.0 ha of land
FSCAT3	Respondents who own 2.1-3.0 ha of land
FTCAT1	Respondents who own their own farm
FTCAT2	Respondents who rent the farm
FTCAT3	Respondents who own a farm and rent another

As noted, the independent variables included (a) individual characteristics, such as age, level of education and gender, (b) family characteristics, such as the number of dependants and other income, and (c) farm characteristics, covering farm size, farm type and land holding.

Based on the estimated model, five variables (AGECAT1, GENDER, DEPCAT (1, 2 and 3), TOICAT1 and FTCAT1) were found to be significantly related to the dependent variable (to determine the choice between off-farm employment participation or otherwise).

The interpretation of the negative coefficient of age was that an individual's participation declines as his or her age increases. In other words, the probability of off-farm work participation increases at younger ages, but it will decrease as individuals get older. As shown in table 3, only AGECAT1 (age category of under 25) was significant, with a 0.240 expected likelihood of participating in off-farm employment.

Table 3. The logit results

VARIABLE	B	S.E	WALD	SIG.	EXP(B)
AGECAT1	-1.426	0.444	10.318	0.001*	0.240
AGECAT2	-0.562	0.327	2.979	0.084	0.569
EDUCAT1	0.311	0.441	0.495	0.482	1.364
EDUCAT2	0.366	0.388	0.893	0.345	1.443
EDUCAT3	0.306	0.406	0.568	0.451	0.736
GENDER	- 0.775	0.318	5.955	0.015*	2.172
DEPCAT1	4.179	1.720	5.903	0.015*	0.015
DEPCAT2	4.735	1.709	7.680	0.006*	0.009
DEPCAT3	5.587	1.732	10.409	0.001*	0.004
TOICAT1	-0.602	0.271	4.943	0.026*	0.548
TOICAT2	-0.891	0.756	1.391	0.238	0.410
TOICAT3	-20.043	11908.268	0.000	0.999	0.000
FSCAT1	-21.295	40192.817	0.000	1.000	2E+009
FSCAT2	-22.774	40192.817	0.000	1.000	8E+009
FSCAT3	-23.137	40192.817	0.000	1.000	1E+010
FTCAT1	5.164	1.146	20.289	0.000*	174.832
FTCAT2	2.011	1.199	2.814	0.093	7.474
CONSTANT	-21.302	40192.817	0.000	1.000	0.000

Notes: -2log likelihood=432.943. Percentage of correct prediction=79.4. See table 2 for definition of variables. *Significant at 5 per cent.

The positive coefficient of education indicates that individuals who had more years of schooling had a higher probability of participating in off-farm work. One additional year of formal education increased the likelihood of individuals to participate in off-farm employment. But looking at table 3, the education variable did not prove to be significant with regard to off-farm employment in either of the granary areas. This suggests that the farmers' participation in off-farm employment was not significantly influenced by their education level. Gender was shown to have a significant effect on off-farm employment. With the addition of a male to a household in the sample size considered, the odds of participating in off-farm employment (versus not participating) increased by a factor of 2.172.

The number of dependants variable also demonstrated a significant correlation with off-farm employment. The positive coefficient indicates that as the total number of dependants increases, the farmer is more likely to participate in off-farm employment to supplement income. DEPCAT1 (the category of farmers who have fewer than three dependants) was significant, with 0.015 expected likelihood of participation as the number of dependants increased. DEPCAT2 (category of respondents who have three to six dependants) was significant with 0.009 expected likelihood of participation, and DEPCAT3 (category of respondents who had above six dependants) also was shown to be significant, with 0.004 expected likelihood of participation.

The negative coefficient of TOICAT (total other income) indicated that as other income, such as pension remittance and gifts from children, increases, there will be less likelihood of participation in off-farm employment. In this case, TOICAT1 was significant with 0.548 likelihood of participation in off-farm employment.

The negative coefficient of FSCAT (farm size) implied that as the size of the farm increased, there was less likelihood of the respondents participating in off-farm employment. But turning once again to table 3, in this case farm size was shown to be insignificant to participation in off-farm employment. FTCAT1 (farm type, category 1) was significant to off-farm employment with 174.832 likelihood of participation.

IV. CONCLUSION AND SUGGESTIONS

Poverty is one of the most serious problems facing paddy farmers in Malaysia. Off-farm employment is an alternative strategy and has the potential to improve the income and well-being of paddy farmers. It also helps to reduce income uncertainty in rural areas. The diversification of employment helps to smooth income by spreading risk across several activities. By reducing income uncertainty, farm households have opportunities to invest in more advanced agricultural technology. The adoption of better technology is expected to be highly profitable and encourages the transition from traditional to modern agriculture.

The present study assessed the off-farm employment decisions of the paddy farmers in the MADA and Kemasin Semerak granary areas. From the study, it can be seen that

the paddy farmers have a positive perception of off-farm employment. After receiving the benefits of generating income without negative effect to their farms, those who participated agreed that off-farm employment had improved their standard of living. Those who had not yet participated in such employment were hoping to do so in the future if job opportunities became available. The test of hypotheses of the relationships showed that both individual and family characteristics had a significant effect on off-farm employment, while farm characteristics were insignificant. It can also be deduced that combining both on-farm and off-farm activities would generate more income for households, as compared to relying solely on farm income.

The trend towards bimodal farm-size distribution will likely continue in the granary areas, since it is the middle-aged cohort of farmers who are most likely to work off the farm. Meanwhile, the oldest cohort will not engage in off-farm employment. In order to increase the income level of farmers, measures that boost productivity, such as farm mechanization, improved technologies, increased capital intensities and subsidies, are often advocated. These measures may increase output and revenue in the short run, but farmers will be worse off in the long run. This is because the limited land holding and other resources of farmers prevent the efficient use of much technology. In addition, production techniques are increasingly labour saving, and economies of size give larger operating units an advantage over smaller operations. Therefore, there is a need for the government to formulate policy to increase the availability of off-farm jobs in the vicinity of farmers. Furthermore, the private sector should be encouraged to create income-generating activities in the rural areas.

Training programmes should be directed towards training farmers in skills that can be used in off-farm jobs. There is no specific emphasis on off-farm employment either in the national agriculture or rural development policies of Malaysia. One should be developed as soon as possible, so that the country can reap the benefits of off-farm employment.

REFERENCES

Corner, L. (1981). "The impact of rural outmigration: labor supply and cultivation techniques in a double cropped padi area, West Malaysia", PhD thesis, Macquarie University, Sydney.

Davis, J.R. (2003). "The rural non-farm economy, livelihoods and their diversification: issues and options" (Chatham, Natural Resources Institute).

Food and Agriculture Organization of the United Nations (FAO) (1998). "Rural non-farm income in developing countries", in *The State of Food and Agriculture* (Rome, FAO).

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

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

Gregore, P.L (2007). *Economic Reforms for Paddy Sub-sector* (Malaysian Institute of Economic Research).

Jayasuriya, S.K. and R.T. Shand (1985). "Technical change and labor absorption in Asian agriculture: some recent trends", *World Development*, vol.14, No. 3, pp. 415-428.

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

Malaysia (1976). *Third Malaysia Plan 1976-1980* (Kuala Lumpur, Government Printers).

Morooka, Y., A. Ohnishi and K. Yasunobu (1991). "Reciprocal form of family farm and group farming: a perspective of 'kelompok tani' in Malaysia and Indonesia", *Japanese Journal of Farm Management*, vol. 29, No. 3, pp.13-29.

Pio Lopez, G. (2007). "Economic reforms for paddy sub-sector", *The Star Online*, 25 June, available at http://biz.thestar.com.my/news/story.asp?file=/2007/6/25/business/18087959&sec=business.

Reardon, T.K., G. Stamoulis and P. Winters (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).

Radam, A. and Ismail Abd. Latiff (1995). "Off farm labour decisions by farmers in Northwest Selangor Integrated Agricultural Development Project (IADP) in Malaysia", *Bangladesh Journal of Agricultural Economics*, vol. 18, No. 2, pp. 51-61.

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

Shand, R.T. (1986). "Agricultural development, non-farm employment and rural income distribution: a case study in Kelantan Malaysia", in Choe, Y.B. and F.C. Lo, eds. *Rural Industrialization and Non-farm Activities of Asian Farmers*, *Proceedings of the International Seminar on the Role of Rural Industries for National Development in the Asian Region*, 22-25 April 1985, Seoul, Korea (Rural Economics Institute, Seoul).

Taylor, D.C. (1981). *The Economics of Malaysian Paddy Production and Irrigation* (Bangkok, The Agricultural Development Council).

Wooldridge, J.M. (2002). *Econometric Analysis of Cross Section and Panel Data.* (Massachusetts, The MIT Press).