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Farm Management Analysis in Paddy Granary Areas in Enhancing On-Farm Income

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Abstract

Income inequality between rural and urban areas is a persistent issue that has been frequently studied and discussed with the hope of introducing or improving schemes that would lead to closing the gap between these two areas. Traditionally, paddy farmers have been mired in poverty and their livelihood has largely relied on on-farm income. In rice granary areas, on-farm income has played an important role in providing rural livelihood among paddy farmer households. Since on-farm income has played an important role in the rural livelihood, it is important to comprehend the influential factors determining on-farm income of the paddy farmers and find solutions to improve their income level and enhance future agricultural developments on the main granaries. We attempt to find out confronting problems in relation to on-farm income in the paddy sector by concentrating on paddy granary areas in Kedah, Selangor and Terengganu. This paper tries to grasp the characteristics of farm management and reveal influential determinants of gross return per hectare in value term in the three paddy granary areas while computing the benefit-cost ratio. The sample farmers were interviewed to gather information on the individual farm management practices in each area and farm management analysis was employed to analyze the obtained information. The Cobb-Douglas production function was used to indicate the significant factors influencing the farmers' income. The result shows that there are different characteristics of gross return from paddy in each studied granary area. The usage of pesticide, fertilizer and seedling method directly influence the gross return per hectare from paddy farming.

Key words

Rice granary, farm management, Cobb-Douglas, gross return, on farm income.

Introduction

Traditionally, paddy production has played an important role in sustaining paddy farmers' livelihood in Malaysia and on-farm income has been the source of earnings among rural paddy households in Malay villages (Purcal, 1971; Terano and Fujimoto 2010). Apart from plantation crops such as rubber and palm oil, areas under paddy cultivation cover larger areas of land compared to other food crops such as vegetables, fruits or cash crops (Year Book of Statistics, 2010). However in the late 70's, a drastic technological innovation called the Green Revolution took place and raised productivity in many countries including Malaysia. Although the green revolution has evolved farm households around the world, but a typical paddy farm household in Malaysia is still small in size and on-farm activities are individually managed at that level. Nevertheless with the economic development in progress, paddy farm management has begun to change and is now influenced by external changes related to economy, government policy, technological progress and the advancement of the manufacturing sector in the rural areas that forces change upon the mapping of regional society and nature. While farm households in paddy growing areas were affected to a large degree by the external environment, an internal environment such as changing farm management, using farming technology and farm input may have also impacted on-farm household income as a whole.

Paddy sector development in Malaysia

In the 60's many newly independent nations like Malaysia, considered the improvement of agricultural systems a priority in their planning for the rural development (Gomes, 2007). One of the early developments in the green revolution was the improvement of paddy farming technologies in Peninsular Malaysia. By the 70's Malaysia was comparatively advanced in paddy sector among the Southeast Asian countries through the introduction of modern technologies. High Yield

Varieties (HYV) and corresponding modern rice technologies have increased paddy productivity over the years. However, the introduction of the HYV required a proper farm management especially in the application of fertilizer, water, weedicide and pesticide to ensure that a potential yield from the HYV could be achieved.

In 1970's the Malaysian government introduced a newly initiated irrigation scheme that permitted double-cropping in a controlled environment (Drakakis-Smith, 1992). During 1970's, there were 131,700 hectares of paddy land in Peninsular Malaysia which were improved through irrigation facilities, of which 110,563 were provided in double-cropping areas (Tenth Malaysia Plan p. 286).

As can be seen in Table 1 the area under paddy plantation has been steadily increasing from 581,904 ha in 1965 to 673,745 ha in 2010. Hence with the increase in the productivity leading to higher yields the production of paddy is also showing an increasing trend over that period. Through the green revolution, paddy yield has increased from 2.4 tons per hectare in 1965 to 4.2 ton per hectare in 2010. According to statistics for rice production presented on the web database of the International Rice Research Institute (IRRI), there was a drastic increase in yield among Southeast Asian countries from 1963 to 2007 such as from 2.14 ton/ha to 4.87 ton/ha in Vietnam, 1.87 ton/ha to 2.69 ton/ha in Thailand, from 1.24 ton/ha to 3.76 in the Philippine and from 1.72 ton/ha to 4.69 ton/ha in Indonesia. Thus it was inevitable for the Malaysian paddy production to increase alongside the surrounding countries and for the green revolution to have positively impacted the paddy sector and paddy farming systems in Malaysia.

Protective measures for paddy and rice sectors

The government has to put in a great effort to deal with the issues surrounding paddy farmers. The paddy/rice policy came out with support measures through the various Malaysian Plans and National Agricultural Policies. The provision and improvement of irrigation facilities is inevitable for raising productivity. Moreover, the Guaranteed Minimum Price (GMP) for paddy and the support price for rice and the input subsidy to support farm income in the uncompetitive paddy/rice sector have all been the backbone of sustainability in the paddy/rice sector.

Under the input subsidy scheme, the Malaysian government has provided free fertilizers equivalent to 80 kg of nitrogen, 35 kg of phosphate and 20 kg of potash per hectare up to a value of RM 200 per hectare (Dano, 2005). The fertilizer subsidy was first introduced in the early 1950's with the objective of encouraging farmers to use fertilizer, hence demonstrating the higher pay-off from using adequate fertilizer, in terms of both paddy output and income (Tawang and Kamil, 1999).

The Guaranteed Minimum Price (GMP) on the other hand was introduced in1949. Currently Padiberas National Berhad (BERNAS), a privatized enterprise involved in paddy and rice trading, has undertaken to buy paddy from farmers at no less than the guaranteed minimum price of RM750 per ton since 2009. A cash subsidy for every ton of paddy sold was introduced in 1980 and the amount was increased in 1984 and 1990. Under the paddy subsidy scheme, the government made fixed payments to farmers (RM 2.48 per kilogram) for the paddy sold by them to any commercial rice mills (Fulford, 1996; Anderson, et.al., 2009).

	Planted area (ha)	Yield (ton/ha)	Production (tons)
1965	581,904	2.4	1,255,610
1970	704,767	2.6	1,681,420
1975	750,339	2.9	1,997,000
1980	716,800	3.1	2,044,600
1985	654,974	2.9	1,745,370
1990	680,647	3.1	1,884,980
1995	672,787	3.5	2,127,270
2000	698,700	3.4	2,140,800
2005	676,200	3.8	2,314,000
2010	673,745	4.2	2,548,000

Source: FAOSTAT, FAO statistics division 2012

Table 1: Paddy total planted area, average yield and total production in Malaysia, 1965-2010.

Thus far the Malaysian government has been implementing a protective policy for the rice sector through fertilizer and output price subsidies. Price support scheme was able to increase output by 65.8 percent and contribute to a 38.6 percent change in income while subsidy components such as GMP, subsidized fertilizer, price subsidy as a whole, constituted about 58 percent of total farm income (Dano and Samonte, 2005). Given the above scenario the objective of this paper is to analyze the paddy farm management in enhancing the on-farm income given the intervention and innovativeness of the paddy farmers in managing their paddy field.

Materials and methods

Productivity in rice farming has played an important role in increasing on-farm income in rice granary areas. The level of productivity directly influences on-farm income and farmer's living standards. In order to reveal influential determinant factors on rice productivity and profitability for this developing subsidized sector, we focused on rice production in the main season. The main season is a period when paddy planting is highly suitable based on the local climate (rainy season) and does not depend wholly on the irrigation system. For administrative purposes, the main season is defined as the period when paddy is planted with the commence date for planting generally falling between August to February (Year Book of Statistics, 2009).

This study used data collected in 2011 from paddy farmers living in three granary areas. These areas are; 1) Muda Agricultural Development Authority (MADA); 2) Barat Laut Selangor Integrated Agriculture Development Area (BLS); and 3) North Terengganu Integrated Agriculture Development (KETARA). A survey was conducted using structured questionnaire among paddy farmers and data was collected through face to face interviews. The total number of farmers interviewed was 117 in the three areas; 40 farmers in MADA, 42 farmers in BLS, and 35 farmers in KETARA, Terengganu. Table 2 shows characteristics of farm households in the three areas. The descriptive analysis was used to describe the farm characteristics and the Cobb-Douglas production function model was employed. The analysis is in value term to determine influential factors linked to on-farm income. In order to see the difference in expenses, t-test was applied to compare every two areas and also the benefit-cost ratio was computed in each area to roughly measure the efficiency of the farm.

Data Analysis

Based on the characteristics of cost and return analysis in farm management, there were different

Items	MADA, Kedah (n=40)			BLS, Selangor (n=42)			KETARA, Terengganu (n=35)		
	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.
Average of family size (persons)	5	10	2	5	8	1	6	11	2
Age of household head (years)	51	77	30	46	72	27	48	73	29
Education of household head (years)	9	16	0	9	15	2	8	14	0
Farming experience (years)	23	50	3	20	46	1	17	50	2
Average farm size (ha)	3.3	11.5	0.3	2.5	14.6	0.4	3.1	16.2	0.4
Job of household head									
Full-time (paddy only)	13		17	10					
Part-time	27		25	25					
Characteristics of household									
Full-time farm household	10		14	3					
Part-time farm household	30		28	32					
Number of farmers by tenual status									
Owner farmer	4		11	5					
Owner-tenant farmer	17		8	12					
Tenant-farmer	19		23	18					

Source: Own survey 2011

Table 2: The demographic profile of farm household in the three areas.

ways in gross return generated from sales of paddy for rice and paddy for seeds among the three areas.

Gross return = Yield in Kg/ha×rice price per kg (Spoor, 2010).

Firstly, focus was put on gross return per hectare in order to reveal the determinant factor on per hectare basis throughout three areas. The Cobb-Douglas production function for paddy was estimated to determine the factors that influenced the value of paddy being harvested. The value of output and input was used as the dependent and independent variables respectively. All the values were converted into per hectares basis to estimate the parameters related to the dependent variables (Nandhini, 2006; Chapke, 2011; Adhikari, 2011).

In general the Cobb-Douglas production function can be specified as follows:

$$Y = Ax_1^{b1} x_2^{b2} x_3^{b3} x_4^{b4} U$$

The non-linear Cobb-Douglas is then transformed into natural log. The model can be specified as the following linear function:

$$ln\ Y = ln\ a + lnX_1 + ln\ X_2 + X_3 + lnX_4 + U$$

Where:

lnY is gross return, measured in ringgit/ha,

a = Constant

lnX_1 is total expense of fertilizer, measured in ringgit/ha,

lnX_2 is total expense of pesticide, measured in ringgit/ha,

X_3 is a dummy variable for seedling method (transplanting = 1, direst-seeding = 0),

lnX_4 is total expense of hired labour input in ringgit/ha, and

U = error term

Benefit and cost ratio

Benefit cost ratio is the ratio between the gross return and the total cost per hectares (Adhikali, 2011). In this study, benefit cost ratio was computed by using the formula:

B/C ratio = Gross return/Total cost

Results and Discussion

Characteristics of farm household

Table 2 shows the demographic profile and characteristics of farm households in the three areas. Regarding the characteristics of the farm households, family size in the three areas was almost of the same size ranging from 5 to 6 members in each family. Farmers' age in BLS was on average 46 years old, it was below51 in MADA and 48 in KETARA areas. In the three areas, the number of school years attended was around 8 to 9 on average. The characteristics of farm households in all the three areas showed that most farmers operated their farm as part-time. The years of farming experience was from one year to 50 years. The largest farm size was 16.2 hectares in KETARA followed by 14.6 hectares in BLS, and 11.5 hectares in MADA. The number of part-time farmers was less than half of the total number of farmers in the three areas. The paddy farmers with a secondary job were the major stream in the granaries. Here, a full-time farm household indicated that any residential family members were not self-employed or employed in off-farm sectors. Throughout the three areas, more than half of the paddy farmers were also employed as part-time workers either on other paddy farms or in off-farm sectors. In addition the number of full time farm households was fewer especially in KETARA. In terms of tenant status, owner-tenant farmers and tenant farmers constituted the largest majority of farmers in the three areas.

As shown in Table 3, the average range of farm size was 2.5 hectare to 3.3 hectares which included 2.0 to 2.5 hectares of rented land. This meant that more than half of total operated farm consisted of land rented from other land owners in the three areas. For the average yield per hectare, BLS has the highest rate at 6.8 tons followed by 6.4 tons in MADA and 4.4 tons in KETARA. The characteristics of the three farming areas are also shown in Table 3 particularly in terms of farming system practices. First, there are different farming systems in the method of seedling in the three areas. While MADA did not begin the transplanting method among its interviewed farmers, the practice was already introduced and in use in BLS and KETARA at 37% and 46% levels. In the case of BLS, several private enterprises existed around paddy farms, and farmers were able to decide for themselves whether they needed either transplanting or direct-seeding practices. In KETARA, farmers were given a choice of applying direct seeding which is the traditional method of seeding or transplanting. For those farmers who choose transplanting, the farmers were given access to opportunities backed by technical support by the local office of KETARA. For fertilizer expenses, the majority of farmers in BLS used additional fertilizers which they purchase with their own

	MADA, Kedah	BLS, Selangor	KETARA, Terengganu
	n=40	n=42	n=35
Average farm size	3.3ha	2.5 ha	3.1ha
Average size of rented land in	2.5ha	2.0 ha	2.0ha
Average yield	6.4tons/ha	6.8 tons/ha	4.4 tons/ha
Method of seedling			
Direct seeding	100%	63%	54%
Transplanting	0%	37%	46%
Fertilizer			
Only subsidies	77%	20%	60%
Additional fertilizers	23%	80%	40%
Percentage of hired labour usage			
Seedling and transplanting	45%	80%	25%
Land preparation	55%	93%	62%
Fertilizer, pesticide and weedicide	38%	63%	24%
Harvesting	100%	100%	100%
Transportation	100%	100%	100%

Source: Field Survey 2011

Table 3: Characteristic of faming systems and farm management of paddy farming household.

funds and not as a part of subsidized fertilizers. In MADA and KETARA areas, 77% and 60% of farmers applied only subsidized fertilizers. In terms of the percentage use of hired labour, farmers in BLS especially used hired labour for the farming process in seedling/transplanting, land preparation, fertilizer/pesticide/weedicide by 80%, 93% and 63% respectively which are notably the highest percentages among the three areas. On the other hand, in KETARA regarding the usage of hired labour, farmers preferred to work by themselves because their secondary job such as rubber tapping was highly seasonal thus they could spare more time on their farm. Thus the amount of hired used in seeding and fertilizing the farm were less. And in all three areas, harvest and transportation were fully contracted.

Table 4 shows the cost-return analysis of rice production in the three areas. Gross return consisted of two types that was gross return including paddy and paddy seed sold to BERNAS and others and also from government subsidy for every ton sold by the farmers. While paddy farmers obtained subsidy of RM248.1 per ton for paddy sold but the income from selling of paddy and paddy as seed was determined by the price per ton which was usually different in each area. In BLS, gross return obtained from rice production sold as paddy and seed was the highest among the three areas at RM8,399 per hectare. While the average rejection rate of paddy at collection center was 16%, ranging from 14% to 17%, and average rice price was RM1,230 ranging from RM1,150 to RM1,400 per ton. The majority of the paddy farmers sold their paddy to local private factories in BLS itself.

In case of KETARA area, paddy was shipped to BERNAS, private factories and local Farmers' Association which set the percentage discarded for spoilage at an average of 21%, ranging from 18% to 23%. The average price was at RM1040 per ton, ranging from RM980 to RM1,150 per ton. On the other hand in MADA, the average rejection rate was 17% of shipped paddy in the area. Although BERNAS and private companies were the main places for paddy farmers to sell their produce the average prices were the same at RM750 per ton for both BERNAS and private companies.

Expenses included seeds, packaged price for transplanting, purchasing fertilizer/pesticide/ weedicide, hired labour, harvester/tractor, land rent and fuel. Transplanting is fully contracted to private enterprises or semi-private enterprises as a package in BSL. The package price in BLS was RM659 per hectare. However in KETARA the transplanting package which is partly supported by the local government was priced at RM469.3 per hectare.

In MADA, 100% of paddy farmers used direct seeding for their paddy production, thus there was no transplanting package [see Table 4]. In BLS and KETARA only 63% and 54% used direct seeding respectively. As can be seen in Table 4, among the

Items	MADA, Kedah	BLS, Selangor	KETARA, Terengganu
Gross return			
Sold as paddy & seed (A)	4,818.9	8,399.3	4,789.9
Paddy subsidy (B)	1,589.9	1,687.4	1,046.6
Total C (=A+B)	6,408.8	10,086.7	5,836.5
Expenses			
Seeds	259.7	120.3	221.6
Transplanting package	0.0	658.8	469.3
Fertilizer/pesticide/weedicide	351.1	984.2	556.4
Hired labour	500.1	377.9	88.2
Harvesting/transportation	830.1	447.5	224.7
Rent	1,123.4	1,714.5	1,374.7
Fuel	81.5	82.4	27.3
Total expense (D)	3,145.9	4,385.6	2,962.2
Net income (=D-C)	3,262.9	4,013.7	2,874.3

Source: Own Survey 2011

Table 4: Cost-return analysis of rice production per hectar. (Unit:Ringgit/ha)

three areas, the expenses of fertilizer/pesticide/ weedicide were the highest in BSL followed by KETARA. Farmers in BSL were innovative and used extra fertilizer, pesticide and weedicide in addition to the subsidized products they received to maximize efficiency in production and provide better management and systematic system for their farms. In KETARA on the other hand the use of additional fertilizer, pesticide and weedicide was quite substantive compared to MADA areas at RM556.4 and RM351.10 respectively [refer to Table 4]. For the harvesting process, required harvesters were also provided as a packaged deal which included hired labour, machine and fuel. However, in case of KETARA the Department of Agriculture (DOA) provided the means for transportation but a fee was not charged when farmers shipped harvested paddy to sell as seed. However, since most farmers occasionally tapped rubber as a part-time job, they worked on the paddy field during most of the farming process as well and they themselves will do the transplanting, pesticide spraying and fertilizing, thus making the expense on fuel and hired labour comparatively lower in KETARA.

The production function

The Cobb-Douglas production function for the gross return function of the three areas was assessed collectively for the efficient use of resources on paddy farming. Variables taken into consideration were purchased fertilizer (ringgit), purchased pesticide (ringgit), seedling method and hired labour (ringgit). Table 5 presents the result of the estimated model and as can be seen the coefficient of multiple determinations (R2) of the function was 0.394, which indicated that 39.4% of variation in gross return from paddy production was explained by the four independent variables. Seedling method and purchased pesticide were found to be significant at 1% level, while purchased fertilizer was found to be significant at 5%. Hired labour input was found to be non-significant. The elasticity coefficient for the cost of purchased fertilizer and pesticide indicated that by increasing the expenses on fertilizer and pesticide by 1%, there would be an increase in gross return by 0.080% and 0.099% respectively. It could then be concluded that expenses on purchased fertilizer and pesticide are inelastic and their impact on gross return is very small. However, seedling method was the largest magnitude of the regression coefficient for gross return. It indicated that switching to transplanting would increase the gross return by 0.318%. It proved that seedling method was the most influential factor in increasing the gross return per hectare.

Comparison of expenses for input per hectare among the three areas

The elasticity of input such as purchased fertilizer and pesticide was really small. The amount which was spent on fertilizer/pesticide occupied on average 35% in KETARA, 43% in BSL and 17% in MADA out of the total expenses excluding rental fee for the land. The expenses were compared by applying the student's t-test. Table 6 shows the

Variables	Regression coefficient		T-values
Constant	7.986	***	51.953
Purchased fertilizer (ringgit per hectare)	0.080	**	2.346
Purchased pesticide (ringgit per hectare)	0.099	***	3.497
Seedling method (Transplanting = 1, Broad-casting = 0)	0.318	***	4.203
Hired labour input (ringgit per hectare)	-0.011		-0.999
R^2	0.394		
F-value	17.067		
N	117		

Note: *** denotes significant at the 1 % probability level.
** denotes significant at the 5 % probability level.
* denotes significant at the 10 % probability level.
Source: Field Survey 2011

Table 5: Estimates of Cobb-Douglas production function in three areas, main granaries.

	Purchased fertilizer (ringgit/ha)				Purchased pesticide (ringgit/ha)			
	No.	Mean	t-value		No.	Mean	t-value	
MADA-KETARA								
MADA	40	60.85	1.133		40	290.25	-2.543	**
KETARA	35	101.31			35	155.45		
KETARA-BLS								
BLS	42	362.29	4.653	***	42	621.82	5.503	***
KETARA	35	101.31			35	155.45		
BLS-MADA								
BLS	42	362.29	5.232	***	42	621.82	3.462	***
MADA	40	60.85			40	290.25		

Note: *** denotes 1 % significant level
** denotes 5 % significant level
Source: Own Survey 2011

Table 6: Comparison of input expense per hectare among the three paddy areas.

	Minimum	Maximum	Mean
MADA, Kedah			
Total cost (Ringgit/ha)	1,118	4,984	3,146
Gross return (Ringgit/ha)	3,891	8,203	4,819
B:C ratio	0.9	4.7	1.5
BSL, Selangor			
Total cost (Ringgit/ha)	1,325	11,638	4,386
Gross return (Ringgit/ha)	1,958	7,336	8,399
B:C ratio	0.30	2.8	1.9
KETARA, Terengganu			
Total cost (Ringgit/ha)	1,050	6,303	2,985
Gross return (Ringgit/ha)	1,767	8,472	4,790
B:C ratio	0.6	4.7	1.6

Source: Own Survey 2011

Table 7: Benefit and cost ratio per hectare in three areas.

comparisons of input in each of the two areas; or between 1) MADA-KETARA, 2) KETARA-BLS, and 3) BLS-MADA states. Between (1) MADA and KETARA, there was no difference between input in purchased fertilizer, but MADA spent more on pesticide. Between (2) KETARA and BLS, there were small differences in major inputs of purchased fertilizer and pesticide. Both inputs in BLS were on average higher than in KETARA. Between (3) BLS and MADA, inputs in BLS were higher than in MADA for the purchased fertilizer and pesticide.

Benefit-Cost Ratio

As shown in Table 7, benefit-cost ratio for each of the three areas was calculated. In the B:C ratio, gross return did not include price subsidy (RM2.41per ton). The average B:C ratio was found to be 1.5 in MADA, 1.9 in BSL and 1.6 in KETARA which indicated that rice farming is still profitable and farmers are getting a net income from gross return even without subsidies. However, based on varied B:C ratio which is quite wide between the maximum and minimum ratios, it was assumed that gaps existed among farmers in management ability and farming technology levels.

Conclusion

This paper attempted to recognize the influential factors which determine agricultural productivity by analyzing farm management schemes for further developments in the agricultural sector in the main granaries. Data were gathered from three farming areas in Kedah, Selangor and Terengganu states in 2011. The quantification of input and output of rice farming and influential determinants on rice productivity and profitability were then analyzed. This paper discovered certain characteristics of paddy farming pertaining to individual management in typical rice farming areas in Kedah, Selangor and Terengganu states as well as some confronting problems which caused low gross return and net income for some of the states. It seems that traditional transplanting method could yield higher gross return due to higher yields.

The Cobb-Douglas production function was used to estimate the value term of major determinants of gross return on a per unit area basis. This clarified that the total expenses of purchased fertilizer and pesticide influenced the gross return with positive signs in the three areas. However, gross return was inelastic on expenses of fertilizer and pesticide, and those inputs only had a small impact on the gross return even though farmers still purchased much fertilizer and pesticide. In the production function model, only seedling method had a large impact on the gross return. Diffusion of transplanting among farmers is the key factor in increasing gross return from rice farming. Certain levels of farming experience and technical support system are required in rice farming which have been missing over the last few decades. These factors could be of importance in determining gross return to farmers. Since there were widely varied B:C ratios among the three areas, it is important to improve farmer's managerial capabilities and abilities for the use of a proper amount of fertilizer and pesticide.

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References

[1] Ahmad, T. M. A. T., Tawang, A. et. al. Effects of trade liberalization on agriculture in Malaysia:commodity aspects. CGPRT center, Working paper series, 1999, 70 p.

[2] Anderson, K., Martin, W. Distortions to agricultural incentives in Asia. The world bank, 2009, Washington, D.C. 29 p.

[3] Chapke, R. R. et. al. Resource-use efficiency of sorghum (Sorghum bicolor) production in Rice (Oryza sativa)-fallowes in Andhra Pradesh. Journal of Human Ecology, 2011, 34 (2):87-90, ISSN 0970-9274.

[4] Department of Statistics. Agricultural statistics handbook, 2008, Malaysia.

[5] Department of Statistics. Ninth Malaysia plan 2006-2010, 2006, Malaysia.

[6] Department of Statistics. Third national agricultural policy 1998-2010, 1998, Malaysia.

[7] Department of Statistics. Year book of statistics, 2009, Malaysia.

[8] Drakakis-Smith, D.W. Pacific Asia. Routledge, 1992, London. 220 p.

[9] Daquila T.C. The economies of Southeast Asia: Indonesia, Malaysia, Philippines, Singapore and Thailand. Nova science publishers. 2005, USA, 299 p, ISBN: 1-59454-188-4.

[10] Ellis, F. Peasant economics: farm households and agrarian development. Cambridge University Press. 1998. Cambridge. 257 p. ISBN: 0521 457 114.

[11] Fulford, K. W. M. Essential practice in patient-centred care. Wiley-Blackwell, 1996, 250 p., ISBN: 0632039035.

[12] Gomes, A. Modernity and Malaysia: settling the Menraq forest nomads. Routledge. 2007, USA, 200 p., ISBN: 0-415-42253-1.

[13] Purcal, J. T. Rice economy: a case study of four villages in West Malaysia. Universiti Malaya Universiti Malaya Press, 1971, Kuala Lumpur, 248 p.

[14] Rigg, J. Southeast Asia: the human landscape of modernization and development. Routeledge, 1997, London and NY, 326 p, ISBN: 0-415-25639-9.

[15] Heong K. L. Rice is life: scientific perspectives for the 21st century. Int. Rice Res. Inst. 2005, ISBN: 971-22-0204-6.

[16] Maria, A. N. A. State intervention in the rice sector in selected countries, implications for the Philippines. In Dano, E.C.and Samonte, E.D. Public sector intervention in the rice industry in Malaysia, Southeast Asia Regional Initiatives for Community Empowerment (SEARICE), 2005, 187-216.

[17] Muhammad, K. B. et. al. Institutional credit and rice productivity: a case study of District Lahore, Pakistan. China Agricultural Economics Review. Emerald group publishing limited. 2010. Vol. 2 (4): 412-419, ISSN: 1756-137X.

[18] Nandhini, U. S. et. al. Economic analysis of Agriculture in Southern parts of coastal India. Agricultural Tropica Et Subtropica. 2006, Vol. 39(4): 279-284, ISSN 0231-5742.

[19] Spoor, M. et.al. Dragons with Clay Feet: Transition, Sustainable Land Use, and Rural Environment in China and Viet Nam. Lexington Books, 2010, 256 p, ISBN: 0739146564.

[20] Terano, R., Fujimoto, A. Income inequality in two villages in Malaysia. Journal of Agriculture Science, Tokyo Univ. Agric, 2010, Vol. 55(1): 1-9.