Impact of Different Educational Provision for Increasing the Production Efficiency of Paddy Cultivators

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ABSTRACT

The objectives of this study were to study the educational effects and production efficiency of participant peasants in educational provision of the governmental and non-governmental organizations, to identify an influence of educational effects and other variables on production efficiency of peasants, and to suggest guidelines for educational provision to increase production efficiency of peasants in a sustainable agriculture. The analytical tools included descriptive statistics and OLS estimates applied on data collected from 209 sampled peasants during 2006/2007 farming season. Content analysis, applied on classified information was also obtained from the key informants. The result showed that most peasants were not different in their knowledge, use of knowledge and their paradigms were in the medium level. Their production efficiency had increased after the participation in training and all ending the lectures conducted by the governmental and non-governmental organizations. This was one major variable which had an influence on their production efficiency along with other variables as the OLS had revealed. Most variables had positive coefficients which implied that if peasants could make use of these variables appropriately in both quantities and qualities, it would result in increasing production efficiency. The characteristics of educational provision approaches should be appropriate for peasants, namely participation and learning by doing. In addition, the governmental and non-governmental organizations should have policies on educational provision extension for peasants simultaneously. Because of the appropriate educational provision, it could increase production efficiency of peasants in sustainable agriculture.

***Keywords**: Educational provision guideline; Production efficiency; Sustainable agriculture*

Thailand's agricultural sector continues to be a vital cog to the country's economic vista. It has generally contributed between 20 to 25 per cent to 5 the GDP. Over the years, rice has been eminent in terms of foreign currency generation. So agricultural extension is often equated with technology transfer including the additional functions of input supply and agricultural service such as chemical fertilizers, pesticides, herbicide and irrigation facilities. This is the old or traditional agricultural extension approach, based on the "Trickle Down" strategy of diffusion theory. This approach is operated under the assumption that technology and information are always available, but peasants are not making adequate use of it. If these knowledge could be communicated to peasants, paddy farming may be improved and profit could be maximized. Low rice production efficiency of rice seems to be largely due to a poor agro ecosystem management. Peasants are short of knowledge and skills resulting in production efficiency improvement. Some peasants have adjusted themselves to do paddy farming in sustainable agriculture.

Sustainable agriculture is a dynamic proposition, it focuses not only on production efficiency but also on the ecological sustainability of the production system. Peasants must adapt themselves to change. So they should be educated in sustainable agriculture and get to practice the knowledge in order to do paddy farming productively and efficiently. *Appleton and Balihuta (1996)* said that education may have both cognitive and non-cognitive effects upon labor production efficiency. Cognitive outputs of education include the transmission of specific information as well as the formation of general skills and proficiencies. Education also produces non-cognitive

changes in attitudes, beliefs and paradigms.

In the past, in Thailand, we found that agricultural extension was often provided as packages from the governmental organization which was hoping that peasants would follow. On the other hand, these extensional approaches aren't what the peasants required, and it overlooked the economics principle about production. The principle shows that fixed inputs may not be increased in the short run period but variable inputs namely, modern tool and machine, new seed, chemical fertilizer, pesticide and herbicide, be increased continuously. So, it resulted in unbalanced inputs using and the sluggish output growth rate.

However, the agricultural extension organizations are not only of the governmental but also of non-governmental organizations which are interested in agricultural extension by educational provision for peasants, namely compost and organic fertilizer technique training, IPM project, and farmer field school project. Educational provision have a goal to promote the sustainable agriculture, to reduce external chemical inputs which damage ecological system. In addition, Educational provision of the organizations gives a chance for peasants to learn external paddy farming knowledge. Given the perceived importance of education in increasing production efficiency, the researcher is interested in studying educational provision of the organizations in Suphanburi province in the central region of Thailand, mainly in the area of paddy farming as well as how their use of chemicals is affected. The objectives of this study were as follows:

1. To study educational effects and production efficiency of participant peasants in educational provision of the governmental and non-governmental organizations;
2. To Identity influence of educational effects and other variables on production efficiency of peasants;
3. To suggest guidelines of educational provision to increase the production efficiency of peasants in sustainable agriculture.

METHODOLOGY

The study was conducted in Suphanburi province, located in the central region of Thailand. There are approximately 853 villages which commit themselves in paddy farming. The study covered 209 households in eight villages drawn from seven districts. Purposive sampling technique was used in selecting the peasant samples. The samples included those farmers who participated in educational provision of the governmental and non-governmental organizations in 2005 - 2006 and had done paddy farming in sustainable agriculture. There were 88 households which participated in educational provision of the governmental organization and 121 households participated in educational provision of the non-governmental organization. The study covered 27 key informants who gave information about educational provision for peasants in sustainable agriculture. The key informants consisted of 8 peasants, with production efficiency higher than mean, and 8 peasants with production efficiency lower than mean, 2 extension staffs, 8 directors general of the agricultural extension organizations, and 1 community leader. The primary data were obtained from two sectors. Firstly the peasants' data were obtained from questionnaires based on 2006/ 2007 farming season (May 2006 to June 2007). The data consisted of physical inputs of production, peasants characteristic, agricultural information sources, supports from the organizations, educational effects after participation in educational provision of the governmental and non-governmental organizations.

Secondly, key informants' data were obtained from interviews. The data consisted of policy on the educational provision extension and characteristics of educational provision approaches. Similarly, secondary data about peasants information before participation in educational provision of the governmental and non-governmental organizations were obtained from extension staff of districts in Suphanburi province, based on 2003/2004 farming season. The collected data were analyzed by using descriptive statistics, OLS and content analysis. The basic concept used in the analysis of production efficiency is the Cobb-Douglas production function form: (*Jamison and Lau, 1982*)

$$y = A\, x^{\beta} \,.\, e^{\alpha E}$$

Where y is the production efficiency, x is a vector of quantities of variable and fixed inputs, and E is a vector of characteristic variables of the farm household, which includes location, education, age, sex, availability of credit. By assuming an algebraic from for the

production function, it can be econometrically estimated from data on the variables.

For the empirical analysis the production function is further specialized to the Cobb - Douglas form, so that

$$y = (A) \left(\sum_{j=1}^{m} x_j^{\beta j} \right) \left(\sum_{i=1}^{n} e^{\alpha i E i} \right) \quad ....(2)$$

Taking the natural logarithms of both sides of equation (2), we have

$$\ln y = \ln A + \sum_{j=1}^{m} \beta_j \ln x_j + \sum_{i=1}^{n} \alpha_i E_i \quad ....(3)$$

Equation (3) is the basic estimating form used in the production function analysis, although subsequently we also allow the possibility that there may be interaction effects among the variables in equation (3). The β_i and α_i have the interpretation of the percentage changes in production efficiency in response to unit changes in the x_j and E_i. The functions are estimate by the Ordinary Least Squares (OLS) (*Jamison and Lau, 1982*).

In this study, production efficiency in sustainable agriculture of peasants can be described by calculating change in the net paddy farming profit. It is calculated from the difference between before and after participation in educational provision of the organizations This confirms with the finding of *Barnett (1995) Olaf and Zita (2003) Preston (2003) and EU Commission (2001*), said that economic sustainability could be described by calculating the profit of different production process, by establishing contribution margins and the optimum specific intensity. The data base at farm level could be considered to be basically good.

The natural logarithms of Cobb – Douglas production function in the present study was written as

$$\ln y = b_o + \sum_{j=1}^{10} b_j \ln x_j + \sum_{i=1}^{6} \alpha_i \, socio_{g\,(g=1,..,6)} + \alpha_7 \, inform + \sum_{i=8}^{10} \alpha_i \, support_{k\,(k=1,..,3)} + \sum_{i=11}^{13} \alpha_i \, know_{m\,(m=1,..,3)} + \sum_{i=14}^{16} \alpha_i \, apply_{n\,(n=1,..,3)} + \sum_{i=17}^{19} \alpha_i \, paradi_{t\,(t=1,..,3)} + e \quad ....(5)$$

Where :

Production efficiency in sustainable agriculture;

y is the value of change in the net paddy farming profit (baht/rai/time) (It is calculated from the difference between before (2003/04) and after (2006/07) participation in educational provision of the governmental and non-governmental organizations.

Physical inputs of production

x_1 is area for paddy farming (rai)
x_2 is paddy seed (kg/rai/time)
x_3 is hired labor (person/time)
x_4 is tool and machine (piece/time)
x_5 is family and exchanged labor (person/time)
x_6 is fertilizer (kg/rai/time)
x_7 is nourishment (liter/rai/time)
x_8 is pesticide and herbicide (liter /rai/time)
x_9 is water (source)
x_{10} is capital (source)

Peasant characteristics

$socio_1$ is remained debts
$socio_2$ is household head sex
$socio_3$ is household head age
$socio_4$ is household head experience
$socio_5$ is household head education
$socio_6$ is proprietary right on area
inform is agricultural information sources

Supports from the organizations

$support_1$ is knowledge support (time)
$support_2$ is inputs support (kind)
$support_3$ is other supports (type)

Educational effects

knowledge (scores)
$know_1$ is insect management knowledge
$know_2$ is soil improvement knowledge
$know_3$ is paddy seed selection knowledge
use of knowledge for paddy farming (mean level)
$apply_1$ is insect management knowledge
$apply_2$ is soil improvement knowledge
$apply_3$ is paddy seed selection knowledge
paradigms (mean level)
$paradi_1$ is change in belief and thinking
$paradi_2$ is change in production process
$paradi_3$ is change in life-style

e is error term

b_j and ai is standardized coefficients

RESULTS AND DISCUSSION

1. Peasant characteristics: The age of household head was approximately 53 years old with average experiences of 39 years. Most of them had education level was 4 years. They knew agricultural information approximately from six different sources such as TV, radio, extension staffs, newspaper and other peasants. Most peasants were used to knowledge training or visual education of the organizations

approximately 2 times and never got inputs support. There were 2 other things which supported peasants to sustainable agriculture such as decreasing or stopping chemical substances in paddy farming policy of Suphanburi province and sustainable economy system promoting.

Table 1. Summary mean of peasant characteristics

Peasant Characteristics	GOs (n = 88)	NGOs (n = 121)	Total (n=209)
Household head			
1. Age (yrs)	52.00	54.50	53.25
2. Experience (yrs)	37.80	40.50	39.15
3. Education (yrs)	4.70	4.40	4.55
4. Remained debts (baht)	158, 345.00	138,161.00	148,253.00
5. Agricultural information (sources)	5.52	6.72	6.12
Supports from the organizations			
6. Knowledge support (times)	1.42	1.64	1.53
7. Inputs support (kinds)	0.28	0.49	0.39
8. Other supports (types)	2.35	2.48	2.42

2. Educational effects of participant peasants in educational provision of the governmental and non-governmental organizations: Educational effects are presented in Table 2. We found that peasants who participated in educational provision of the governmental and non-governmental organizations, were not different from one another in the knowledge.

Then, educational effects on the use of knowledge for paddy farming of participant peasants in educational provision of the governmental and non-governmental organizations were not different for insect management knowledge ($\overline{X}$ = 1.80), soil improvement knowledge ($\overline{X}$ = 2.02), paddy seed selection knowledge ($\overline{X}$ = 1.79). Use of knowledge for paddy farming was at the medium level.

In addition, according to the results, peasants who participated in educational provision of the governmental organization, were adjusted to the change in paradigms only at the medium level. However, peasants who participated in educational provision of the non-governmental organization had change in belief and thinking at the highest level ($\overline{X}$ = 2.36), but change in production process ($\overline{X}$ = 2.32) and life-style ($\overline{X}$ = 2.19) were at the medium level.

Table 2. Summary mean of educational effects

Educational effects	GOs (n = 88)	NGOs (n = 121)	Total (n=209)
Knowledge (scores)			
1. Insect management knowledge	14.70	18.00	16.35
2. Soil improvement knowledge	15.20	16.30	15.75
3. Paddy seed selection knowledge	7.20	3.40	5.30
Use of knowledge for paddy farming (mean level1)			
4. Insect management knowledge	1.67	1.93	1.80
5. Soil improvement knowledge	1.94	2.09	2.02
6. Paddy seed selection knowledge	1.81	1.77	1.79
Change in paradigms (mean level1)			
7. Change in belief and thinking	1.98	2.36	2.17
8. Change in production process	1.90	2.32	2.11
9. Change in life-style	2.01	2.19	2.10

Note: 1. is 2.34 – 3.00 the highest level, 1.67 – 2.33 the medium level and 1.00 – 1.66 the lowest level.

3. Production efficiency of peasants: Production efficiency of peasants in this paper is a change in the net paddy farming profit. It is calculated from the difference between before and after participation in educational provision of the organizations. Production efficiency of peasants are presented in Table 3.

When the net profit from paddy farming between groups was compared, it was found that educational provision of the governmental organization was higher than others. In 2006/2007 farming season, it showed that participant peasants in educational provision of the governmental and non-governmental organizations had cost and net profit lower and higher respectively than control group.

4. Influence of educational effects and other variables on production efficiency of peasants : The Ordinary Least Square (OLS) estimates of the parameters of the trans-log and production function given by equations (5) are presented in Table 4.

Table 3. Summary paddy farming cost, paddy farming income and net paddy farming profit (baht/rai/time[1])

Items	GOs (n = 88)		NGOs (n = 121)		Total (n=209)		Control[4]
	Before[2]	After[3]	Before[2]	After[3]	Before[2]	After[3]	
Variable cost							
1. seed	291.40	172.30	304.00	215.00	297.70	193.65	375.04
2. fertilizer	773.50	192.70	839.90	520.60	806.70	356.65	620.12
3. pesticide and herbicide	222.40	79.00	217.00	121.90	219.70	100.45	300.20
4. hired labor	686.00	1,007.40	688.70	896.80	687.35	952.10	750.31
5. oil	152.70	244.70	112.40	312.40	132.55	278.55	264.09
6. fixed and other cost	270.90	550.90	215.20	65.40	243.05	308.15	235.72
Total cost	2,396.90	2,247.00	2,377.20	2,132.10	2,387.05	2,189.55	2,545.48
Income	3,941.60	4,434.90	3,561.20	4,021.30	3,751.40	4,228.10	4,050.96
Net profit	1,184.10	1,889.30	1,544.70	2,187.80	1,364.40	2,038.55	1,505.48

Note: 1. is 2 times in farming season.
2. is before peasants participated in educational provision from the organizations, the secondary data based on 2003/ 2004 farming season.
3. is after peasants participated in educational provision from the organizations, the primary data based on 2006/ 2007 farming season.
4. is control group, the secondary data obtained from extension staff of districts based on 2006/2007 farming season.

4.1 Parameters estimate of participant peasants in educational provision of the organizations (n=209) : In Table 4, The result shows that educational effects and other variables effected on production efficiency were approximately 51 per cent, (F – value = 19.031 and D.W. = 1.98). Variables were significant at 5 per cent level. The estimated coefficients for area (x1), tool and machine (x4), pesticide and herbicide (x8), water (x9), inputs support (support2), other supports (support3), paddy seed selection knowledge (know3), use of soil improvement knowledge for paddy farming (apply2), use of paddy seed selection knowledge for paddy farming (apply3), and change in production process (paradi2) were all positive. The positive coefficients imply that if peasants increased appropriately in quantities of inputs, namely area, tool and machine, pesticide and herbicide, and sufficient water, would result in increasing production efficiency, 32, 24, 19 and 14 per cent approximately, respectively. Then, if the organizations increase in their inputs and support, it would result in increasing production efficiency about 27 and 24 per cent, respectively.

Moreover, if peasants had more paddy seed selection knowledge (know3), use of soil improvement knowledge for paddy farming (apply2), use of paddy seed selection knowledge for paddy farming (apply3), and change in production process (paradi2), it would result in increasing production efficiency, 25, 19, 25 and 29 per cent approximately. On the other hand, the estimated coefficients for hired labor (x3) and remained debts (socio1) were negative. The negative coefficients imply that if peasants increased in quantities of hire labor and remained debts, would result in decreasing production efficiency, 39 and 13 per cent approximately.

4.2 Parameters estimate of participant peasants in educational provision of the governmental organization (n=88) : In Table 4, The result shows that educational effects and other variables affected production efficiency approximately by 48 per cent, (F – value = 11.036 and D.W. = 2.44). Variables were significant at 5 per cent level. The estimated coefficients for area (x1), inputs support (support2) and other supports (support3), soil improvement knowledge (know2), paddy seed selection knowledge (know3), and change in production process (paradi2) were all positive. The positive coefficients imply that if peasants increased appropriately in quantities of area, it would result in increasing production efficiency by 51 per cent approximately. Then, if the organizations increased input supports, and other kinds of supports, it would result in an increased production efficiency of about 17 and 18 per cent, respectively.

And if peasants had more soil improvement knowledge (know2), paddy seed selection knowledge (know3), and change in production process (paradi2), it would result in increasing production efficiency (26 and 20 per cent approximately). However, the estimated coefficients for tool and machine (x4) and proprietary right on area (socio6) were negative. The negative coefficients imply that if peasants exceeded the use of tool and machine, and rent or proprietary right on

unproductive area, it would result in decreasing the production efficiency by 21 and 25 per cent respectively.

4.3 Parameters estimate of participant peasants in educational provision of the non-governmental organization (n=121) : In Table 4, the result show that educational effects and other variables affected the production efficiency approximately by 55 per cent, (F – value = 17.543 and D.W. = 1.942). Variables were significant at 5 per cent level. The estimated coefficients for area (x1), pesticide and herbicide (x8), inputs support (support2), other supports (support3), paddy seed selection knowledge (know3), use of soil improvement knowledge for paddy farming (apply2), and change in production process (paradi2) were all positive. The positive coefficients imply that if peasants increased appropriately in quantities of inputs, namely area (x1), pesticide and herbicide (x8), it would result in increasing production efficiency by 22 and 21 per cent approximately, respectively. Then, if the organizations increased input in support (support2), other supports (support3), it would result in increasing production efficiency about 29 and 27 per cent, respectively.

Table 4. Estimation parameters of models

Governmental Organization (n = 88)		Non-Governmental Organization (n = 121)		Total (n=209)	
Standardized coefficient*	t-ratio	Standardized coefficient*	t-ratio	Standardized coefficient*	t-ratio
0.513 ln x_1	4.064	0.222 ln x_1	3.055	0.319 ln x_1	4.876
-0.213 ln x_4	-2.085	-0.316 ln x_3	-4.417	-0.389 ln x_3	-6.107
-0.253 $socio_6$	-2.452	0.209 ln x_4	3.209	0.243 ln x_4	3.590
0.172 $support_2$	1.684	0.208 ln x_8	2.823	0.187 ln x_8	3.283
0.183 $support_3$	2.098	0.293 $support_2$	4.192	0.137 ln x_9	2.661
0.260 $know_2$	2.206	0.268 $support_3$	3.815	-0.133 $socio_1$	-2.549
0.264 $know_3$	3.271	0.214 $know_3$	2.627	0.265 $support_2$	4.814
0.203 $paradi_2$	1.825	0.300 $apply_2$	3.642	0.240 $support_3$	4.365
		0.379 $paradi_2$	3.737	0.253 $know_3$	4.186
				0.189 $apply_2$	1.829
				0.246 $apply_3$	2.404
				0.287 $paradi_2$	3.997
Adjusted R2 = 0.480		Adjusted R2 = 0.554		Adjusted R2 = 0.510	
F-value = 11.036		F-value = 17.543		F-value = 19.031	
D.W. = 2.444		D.W. = 1.942		D.W. = 1.985	

Note: Single (*) asterisk denote significance at 0.05 levels.

Furthermore, if peasants had more paddy seed selection knowledge (know3), use of soil improvement knowledge for paddy farming (apply2), and change in production process (paradi2), it would result in increasing production efficiency, 21 30 and 38 per cent approximately. On the other hand, the estimated coefficients for tool and machine (x4) were negative. The negative coefficients imply that if peasants exceeded the use of tool and machine, peasants might have high paddy farming cost, it would result in decreasing production efficiency, 32 per cent approximately. According to the result of OLS estimate, it was found that it influenced the educational effects on peasants' production efficiency.

CONCLUSION

1. Peasant' participation in educational provision of the governmental and non-governmental organizations, showed that educational effects on peasants are not vary much. Most peasants' ways of using the knowledge and adaptability to changes in paradigms were at the medium-level. These influences were:
   * Peasants characteristic: curiosity to learn, determination, etc;
   * Structural condition: markets, input, output, price, infrastructure, resource base, etc;
   * Environment policy: laws, regulations, incentives, etc;

* Political and bureaucratic structure.

Therefore, the organizations should take the above-mentioned influences into consideration for the educational provision. Because of a good and appropriate educational provision, it can change permanently in paradigms of peasants and their use of knowledge to work in paddy farming in every farming season.

2. In this study, production efficiency of peasants was analyzed by the use of net profit in paddy farming. It was found that the net profit increased after peasants participated in educational provision from the governmental and non-governmental organizations. Because paddy farming process has focused on reducing cost by reducing purchased external inputs. Some peasants can produce natural fertilizers by themselves, such as fish manure, cow manure, compost and other organic fertilizers. However, at present, peasants have to confront the economic limitations, namely: more expensive inputs, rising oil price and rising labors' wages. As a result, to accomplish the objective in high cost reduction may be difficult.
3. According to the estimated coefficients by OLS, it was revealed that most input variables had positive. The positive influence coefficients imply that if peasants increase appropriately in quantities and qualities of the inputs, it would result in increasing production efficiency. Moreover, if the organizations provide non-chemical inputs at lower price and promote sustainable agriculture to peasants who are in need of encouragement to improve their production efficiency. Educational effects have been identified as a contributing factor to the peasants' increasing production efficiency.

In addition to characteristics of educational provision approaches, the organizations should have suitable policies on educational provision extension. However, the researcher thinks that the essential development actions leading to increased production efficiency of peasants, can be contributory depending on how well the organizations function, how efficient policy makers, education specialists, and other partners are, as well as how strong a community is. Hence some of the specific recommendations could be suggested as follows:

1. Community learning centers and community technology-transfer centers must be established and developed in order to motivate and to inspire peasants to be able to learn;
2. The governmental and non-governmental organizations should use mass media, e.g. radio and television, to educate about non-chemical inputs technique and other essential information for increasing production efficiency in the sustainable agriculture.
3. The governmental and non-governmental organizations should provide education to peasants in a way that cultural norms and social values of peasants of the community could be taken into consideration.

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