Factors Affecting Lotus Rhizome Production in Nakhon Ratchasima Province and Roi Et Province

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ABSTRACT

This study focused on growers' knowledge and socio-economic situations affecting lotus rhizome production in Thailand. The objectives of the study were: 1) to examine the present state of lotus rhizome production; 2) to determine the production knowledge of lotus rhizome growers and the factors affecting lotus rhizome production; and 3) to determine the socio-economic factors that affect lotus rhizome production.

Population of the study was 46 families of lotus rhizome growers in Nakhon Ratchasima and Roi Et provinces.

Data were collected through the personal interview method using open-ended and close-ended questionnaires and analyzed by using statistical procedures including arithmetic mean, percentage and correlation.

This study revealed that the socio-economic factors such as growing experience, group membership, and total family income derived from lotus rhizome production were affecting lotus rhizome production at the significant levels of .05, .01 and .05 respectively. The production knowledge was found very highly significant relationship with lotus rhizome production at .001 level.

Key words: lotus rhizome production, socio-economic factors, knowledge

INTRODUCTION

Studies show that lotus rhizome production in China and Japan have contributed to their agricultural economic development. In Thailand, lotus market is large and has an important place in people's lifestyle, but mostly this is concentrated on lotus flowers and seeds. Majority of the lotus rhizome products available in the market are imported from China. This indicates the very limited lotus rhizome production in Thailand. Increasing production yield may activate the lotus rhizome market. Consequently, the lotus

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rhizome producers' economic conditions may also be improved. This study examines the present lotus rhizome production in Thailand and identifies factors affecting its improvement.

Thailand is also famous for lotus and produces a large amount of lotus flowers and seeds, but a large majority of lotus growers harvest only flowers and seeds and leave rhizomes. Rhizome production in Thailand holds problems of lack of skills, knowledge, information, and environmental constraint such as irrigation.

There are few researches or studies on lotus rhizome production conducted in Thailand. Recognition of the significance of the medicinal values may make more and more Thai people be concerned about lotus rhizome production. The study on factors affecting lotus rhizome production will be beneficial to future growers.

The lotus rhizome growers are in collective groups which are active in exchanging the basic growing and marketing information. The lotus rhizome growing areas in Thailand are scattered throughout the country and it is difficult to find growers who are located in groups like in Nakhon Ratchasima and Roi Et provinces. Therefore, this study addressed only the lotus rhizome production in Nakhon Ratchasima and Roi Et provinces in Thailand.

Review of related literature

Knowledge and agricultural production

'*The application of scientific knowledge of farming accelerates agricultural production*' (Stevens and Jabara, 1988).

'*Yield is a direct estimation of production*' (Idaikkadar, 1979).

Stevens and Jabara (1988) mentioned that the farm production in traditional agriculture is almost completely dependent upon the available natural resources.

The biological basis of agricultural production, and its exposure to the elements, pose special problems in attempting to forecast yields; they are affected not only by extremes of weather but also by damage caused by pests and diseases against which farmers have only limited defenses. The defenses are, in a sense, the knowledge. Knowledge and to defend yields against problems are obviously related (Ghatak and Ingersent, 1984).

Socio-economic factor and agricultural production

Stevens and Jabara (1988) concluded '*placing agricultural development in the wider framework of socio?economic change.*' To raise and change socio?economic variables to serve social needs is influenced by elements of culture, including resources, technology, and beliefs and values. Those who desire to accelerate agricultural production need to know how to use both social and economic analysis tools. They need as much knowledge as possible of the processes of both agricultural production and more general socio?economic variables.

The need to identify socio-economic constraints to increase production was emphasized by Ruttan (1982) as higher yielding crops is produced on experiment stations and adopted by farmers, the yields obtained by farmers are often half or less than that obtained under the more controlled conditions on

experiment stations. Researchers identified the yield gap causing by resources in farmers' fields. The gap results from (1) experiment stations, such as technology and environmental differences; (2) biological constraints present on farms, such as disease, soil fertility, or water conditions; and (3) socio?economic constraints facing farmers.

Research objectives

The objectives of the study are as follows:

1. To examine the present state of lotus rhizome production;

2. To determine the production knowledge of lotus rhizome growers and the factors affecting lotus rhizome production; and

3. To determine the socio-economic factors that affect lotus rhizome production.

Definition of terms

Lotus refers to *Castalia* group of *Genus Nelumbo nucifera*, called '*Hardy type*' or '*Hardy water lily*'.

Lotus rhizome refers to the rhizome of lotus of *Castalia* group.

Conceptual framework

The framework indicates factors of growers' knowledge and socio-economics that may affect lotus rhizome production (Figure 1).

Hypotheses

1. There is a relationship between knowledge and lotus rhizome production.

2. There is a relationship between socio-economic factors and lotus rhizome production.

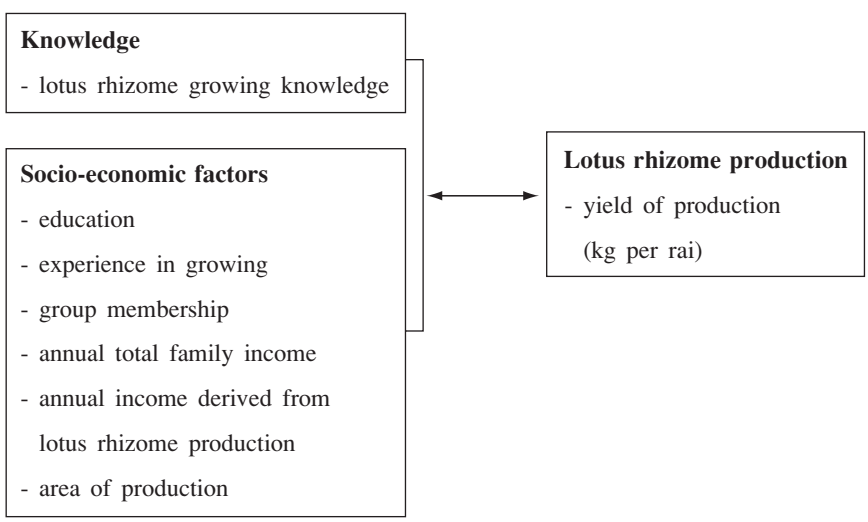

Figure 1 Conceptual framework showing variables of the study.

METHODOLOGY

Data collection

As the number of population was small, the personal interview method using close-ended and open?ended questionnaires was applied for each family. This prevented biased data occurring from little formal education and misunderstanding the objectives of each question. Twenty-three families were interviewed and the results were reflected in improving questionnaires.

Data analysis and statistical instruments

Data were analyzed by using Statistical Package for the Social Sciences (SPSS) for Windows version 8.0, included arithmetic mean and percentage, and computed for a two-way table. Data of close?ended questionnaires were in ordinal and nominal scales, and they were divided into two categories by the mean, high and low. Fisher's Exact Test was used for testing hypothesis because the table might have a cell with an expected count of less than 5. Fisher's Exact Test directly computed the probability of existence of systematic association between two variables with following formula.

		A		
		A1	A2	Total
B	B1	a	b	a+b
	B2	c	d	c+d
	Total	a+c	b+d	N=a+b+c+d

$$P = \frac{(a+b)!(c+d)!(a+c)!(b+d)!}{N!a!b!c!d!}$$

A, B = variables

A1, A2, B1, B2 = levels of variables

P = probability

level of significance: $\alpha = .05$

RESULTS AND DISCUSSION

Socio-Economic Situations of Lotus Rhizome Growers

The respondents comprised 47.8 percent male and 65.2 percent was 20-39 years of age. Forty-three point five percent had not completed elementary school. Sixty-three percent had 3-6 years of experience in production. Sixty-three percent belonged to groups of rhizome growers. Around 48 percent owned production area of less than 1 rai (Table 1).

All respondents had other main occupations such as rice farming, tobacco leaf farming and fish farming. Some were government officers and store or shop owners and workers. The annual total family income of 26.1 percent of the growers was less than 30,000 Baht, 47.8 percent earned 30,000-69,999 Baht, and 26 percent earned more than 70,000 Baht. As to annual total family income derived from lotus rhizome production, 41.3 percent earned less than 1,000 Baht, 32.6 percent earned 1,000-1,999 Baht and 26.1 percent earned more than 2000 Baht. This meant that the ratio of income from lotus rhizome production to total family income was low and the growers considered the production as an extra source of income.

Lotus rhizome production

An annual yield of 100kg or less was produced by 41.2 percent of the respondents and 32.6

Table 1 Socio-economic factors on lotus rhizome production.

n=46

Socio-economic factors		Number	Percent
Gender			
	Male	22	47.8
	Female	24	52.2
Age(yrs)			
	≦19	3	6.5
	20-29	15	32.6
	30-39	15	32.6
	40-49	7	15.2
	≧50	6	13.0
$\bar{X}$=39.57			
Education			
	Not completed elementary school	20	43.5
	Completed elementary school	8	17.4
	Completed junior high school	10	21.7
	Completed high school	7	15.2
	Completed Bachelor's degree	1	2.2
Group membership			
	Yes	29	63.0
	No	17	37.0
Experience in lotus rhizome production(yrs)			
	≦2	3	6.5
	3-6	29	63.0
	7-10	11	23.9
	≧11	3	6.5
$\bar{X}$=5.83			
Annual total family gross income(Baht)			
	≦29999	12	26.1
	30000-49999	11	23.9
	50000-69999	11	23.9
	70000-89999	6	13.0
	≧90000	6	13.0
$\bar{X}$=42608.69			

Table 1 (continued)

n=46

Annual total family gross income derived from lotus rhizome production(Baht)		
≦499	4	8.7
500-999	15	32.6
1000-1499	8	17.4
1500-1999	7	15.2
≧2000	12	26.1
$\bar{X}$=1342.39		
Area of production(rai)		
≦0.9	22	47.8
1-1.9	12	26.1
2-2.9	7	15.2
≧3	5	10.9
$\bar{X}$=1.13		

percent produced 101-200kg. Those who produced more than 350kg yield was 19.6 percent. The mean of annual yield was 206.52kg (Table 2). An annual yield per 1 rai of 151-200kg was produced by 56.5 percent of the respondents. The mean of annual yield per 1 rai was 181.05kg (Table 3).

Diffusion of practical knowledge

It was found that the practical knowledge which each respondent held were generally similar. The six categories of knowledge i.e., water management by fish feeding, fertilizer application, knowledge of common pest, worm and disease and particular storage had variance in numbers of adoption while the rest of the categories had zero variance (Table 4). The six categories which showed variance were obviously categorized as basic knowledge for production, so most technical and technological factors were not adopted by the growers. These results revealed that lotus rhizome production was still carried with simple tools using empirical knowledge and practices.

Factors affecting lotus rhizome production

Analysis showed that there were three levels of significant relationship between lotus rhizome production and knowledge and socio?economic factors such as: 1) Experience and annual total family income derived from lotus rhizome production had significant relationship with annual yield per rai at

Table 2 Annual yield.

n=46

Yield(kg)	Number	Percent
≦50	6	13.0
51-100	13	28.2
101-150	7	15.2
151-200	8	17.4
201-250	1	2.2
251-300	1	2.2
301-350	1	2.2
≧351	9	19.6

$\bar{X}$=206.52

Table 3 Annual yield per rai.

n=46

Yield per rai (kg)	Number	Percent
≦100	5	10.9
101-150	9	19.6
151-200	26	56.5
201-250	3	6.5
251-300	2	4.3
≧301	1	2.2

$\bar{X}$=181.05

.05 level; 2) Group membership had highly significant relationship with annual yield per rai at .01 level (Table 5); 3) Knowledge had very highly significant relationship with annual yield per rai at .001 level (Table 6). 1) and 2) supported the hypothesis 2, and 3) supported the hypothesis 1.

Knowledge and socio-economic factors such as experience, group membership and annual total family income derived from lotus rhizome production were found to be those affecting present lotus rhizome production. The other socio-economic factors such as education, annual total family income and area of production were not those affecting it (Table 5).

Problems of lotus rhizome production

Lack of cultivation knowledge was indicated by 63 percent of the respondents and growing difficulties were indicated by 54.3 percent as the problems encountered in lotus rhizome production (Table 7). It is clear that improving and adopting knowledge which growers need may decrease difficulties in growing. Awareness of these problems is positively correlated to the improvement and development of production with growers' intentions. Most of the problems were caused by lack of informal education, information sources, marketing assistance and infrastructure supply. Small and independent growers' groups in one community, district and province should assist each other in expanding information and knowledge, also in labor supply during busy production period.

Suggestions to improve lotus rhizome production

Growers' suggestions clearly expressed their intentions in increasing production and sales. Capital, production area and implements and machinery needed to be provided to increase production. Increasing knowledge was needed to raise production efficiency and capacity. Marketing channel support was needed by 37 percent of the respondents for more sales (Table 8).

Table 4 Diffusion of practical knowledge of lotus rhizome growing.

n=46

Practical knowledge	Adopted		Not adopted	
	Number	Percent	Number	Percent
Soil management	0	0.0	46	100.0*
Water management				
Fish feeding	24	52.2	22	47.8
Others	0	0.0	46	100.0*
Plant material selection	0	0.0	46	100.0*
Particular planting method	0	0.0	46	100.0*
Fertilizer application	13	28.3	33	71.7
Weeding	0	0.0	46	100.0*
Knowledge of common pest, worm and disease				
'Mud Snail'	35	76.1	11	23.9
Plant louse	2	4.3	44	95.7
Rot	35	76.1	11	23.9
Prevention and control pest, worm and disease				
'Mud Snail', plant louse and rot	0	0.0	46	100.0*
Others	0	0.0	46	100.0*
Particular storage	33	71.7	13	28.3
Breeding	0	0.0	46	100.0*
Implements				
For harvesting	46	100.0	0	0.0*
Others except hoes and spades	0	0.0	46	100.0*
Machinery	0	0.0	46	100.0*

* Factor has zero variance

Table 5 Relation between socio-economic factors and annual yield per rai.

n=46

Socio-economic factors	Annual yield per rai			
	Low		High	
	Number	Percent	Number	Percent
Education				
Low	13	28.3	15	32.6
High	9	19.6	9	19.6
p=1, a=.05				
Experience				
Low	5	10.9	14	30.4
High	17	37.0	10	21.7
p=.01877 *, a=.05				
Group membership				
No	13	28.3	4	8.7
Yes	9	19.6	20	43.5
p=.00532 **, a=.01				
Annual total family income				
Low	9	19.6	14	30.4
High	13	28.3	10	21.7
p=.37622, a=.05				
Annual total family income derived from lotus rhizome production				
Low	16	34.8	9	19.6
High	6	13.0	15	32.6
p=.02104 *, a=.05				
Area of production				
Small	17	37.0	16	34.8
Large	5	10.9	8	17.4
p=.52068, α=.05				

* Showed significant relationship

** Showed highly significant relationship

Table 6 Relation between knowledge and annual yield per rai.

n=46

	Annual yield per rai			
	Low		High	
	Number	Percent	Number	Percent
Knowledge				
Low	19	41.3	6	13.0
High	3	6.5	18	39.1

p=.00003 ***, a=.001

*** Showed very highly significant relationship

Table 7 Problems of lotus rhizome production.

n=46

Problems[1/]	Percent	
Lack of growing knowledge		63.0
Difficulties in growing		54.3
Soil and water management	47.8	
Prevention and control pests, worm and disease	15.2	
Lack of implements and machinery	13.0	
Usage of fertilizers	4.3	
Low selling price		39.1
Difficulties in harvesting		37.0
Lack of labor		30.4
Small market channel		26.1
Difficulties in storage		10.9

1/ Multiple answers were allowed

CONCLUSIONS AND RECOMMENDATIONS

This study revealed that growers held only fundamental and empirical knowledge of growing and applied their own methods of production due to absence of extension services, non-formal educational support provided by government and research institutions. A large number of growers recognized the importance and necessity of increasing practical knowledge and information, and demanded the assistance from those reliable sources. It meant that the growers had strong attitude to improve and develop production. They expected to increase their income by better production and marketing systems.

Based on the research results obtained, the followings are recommended to improve lotus rhizome production in Thailand:

1) Growers survey research should be done by official research stations and organizations so that production and marketing situations will be known;

2) Group meetings of growers and extension officials should be held for technology transfer and supply of useful information;

Table 8 Suggestions to improve lotus rhizome production.

n=46

Suggestion[1/]	Percent	
Marketing channel support		37.0
Capital supply		28.3
Increasing knowledge of growing		21.7
Soil and water management	28.2	
Planting method	26.1	
Prevention and control pest, worm and disease	13.0	
Usage of implements and machinery	13.0	
Planting materials	6.5	
Weeding	4.3	
Usage of fertilizers	2.2	
Storage	2.2	
Breeding	2.2	
Harvesting	2.2	
Increasing the size of production area		19.6
Labor supply		17.4
Implements and machinery supply		13.0

1/ Multiple answers were allowed

3) Regular assistances from extension officials should be provided to help growers better co-operate and generate information;

4) Growers' organization with representative from growers' groups existing in the whole province should be established to exchange knowledge about production and marketing. It is also effective to encourage their participation;

5) Governmental support systems in terms of inputs and equipment supply and capital loan should be provided; and

6) Governmental or institutional support systems to develop and promote lotus rhizome as a trading product should be provided. It is recognized that lotus rhizome has potential for traditional medicine, organic health foods and cosmetics in other countries such as China and Japan. These various usage of lotus rhizome contribute to develop the production and the market.

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