SERICULTURE TECHNOLOGY OF FARMER NETWORK UNDER COMMUNITY REELING FACTORY

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ABSTRACT

Community reeling factory has been established to solve the problems of reeling labors and improve the quality of Thai hybrid silk yarn in weaving industry. To find the fact of farmer network's sericulture technology under community reeling factory is important to increase the chances of successful management. Research questionnaire data were collected from 180 farmers in Khon Kaen and Mahasarakarm provinces. The data were analyzed by descriptive statistics and t-test. The findings reveal that the majority of farmers were female, planting recommended mulberry variety namely Burirum 60 at the average production of 1,791.11 kg/rai/year, rearing silkworm variety namely Dogboe at the average of 6.22 crops/year and the average cocoon production of 183.20 kg/year. All farmers cultivated mulberries in their own lands at the average of 2.01 rai with 1,573.68 plants/rai. The majority of silkworm rearing technologies were at moderate level. Furthermore, the results between farmer network from Khon Kaen and Mahasarakarm provinces showed that there were highly significant differences in farmer age, land occupation, sericulture experience, number of mulberry plants/rai, mulberry age, mulberry production, rearing cycle and cocoon production/year.

KEYWORDS: sericulture technology, farmer network, community reeling factory

1. INTRODUCTION

The main problem of silk handicraft cottage industry is un-uniform quality of local silk yarns. Most of yarns are produced by individual farmer, so the yarn quality depends upon his/her skill and knowledge, which leads to various quality of silk yarn. These are more difficult for enterprises to control their production level, quality and quantity as well as quick responding to customers' needs. Moreover, un-uniform silk yarn increased production costs of silk handicrafts [1-2]. Therefore, in 1999 Thai Government issued a policy to enhance silk yarn production through "Development of Silk Production in the Northeast (DEVSILK)". This project was facilitated and supported by Thai Government in cooperation with European Union. Community reeling factory has been established to solve the problems not only for silk yarn production but also for reeling labors and improving the quality of Thai hybrid silk yarn for weaving industry. Most of community reeling factories are managed in term of farmer groups and community enterprises which

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had their network members support Thai hybrid cocoons or poly-bivoltine cocoons to them [3]. At present, there are 17 community reeling factories in Thailand and 12 factories are 89in the Northeast. Khon Kaen and Mahasarakarm provinces are predominant areas of community reeling factories. Fresh cocoons are bought from members before sorting and eliminating bad cocoons from good cocoons. Then these cocoons are managed through the process of imple multi-ends reeling machine which was supplied by motor less that 0.50 HP. This reeling machine helps farmers produce the better quality of silk yarn which is suitable for weaving factories. Generally, the price of silk yarn grade 1, which is produced from this reeling machine, is always 10-20 percent higher than hand reeled yarn [4].   The regular cocoon supply was the main factor affecting the successful operation of community reeling factory. It was consensus with the case of community reeling factory in Mahasarakarm province which suffered from cocoon supplying due to low cocoon production at farm level [5]. The quantity and quality of cocoons are directly affected by farmer technologies [6].

The objectives of this research are to examine sericulture technology of farmer network who produces cocoons for community reeling factory and to compare sericulture technologies between farmer network in Khon Kaen and Mahasarakarm provinces.

2. MATERIALS AND METHODS

2.1 Location of the study
Khon Kaen and Mahasarakarm provinces

2.2 Respondents
180 farmers from Khon Kaen and Mahasarakarm provinces (100 from Khon Kaen and 80 from Mahasarakarm) served as respondents. The multi-stage sampling technique was used in this research. Sample size is computed by Yamane formula [7].

$$n \quad = \quad \frac{N}{1 + Ne^2}$$

$$N = 330, \qquad e = 0.05$$

2.3 Instrument
Structured interview and questionnaire consisted of profile of   respondents   and   sericulture technology of farmers are used.

2.4 Data analysis
The data were analyzed by descriptive statistics and t-test.

3. RESULTS AND DISCUSSION

3.1 Profile of respondents
Farmers were dominate by female (93.30 percent). A mean of age was 51.43 years, ranged from 30.00 to 84.00 years. In terms of educational attainment, a majority of the respondents (90.00 percent) obtained primary school level. Most of them (34.40 percent) opined that better benefit from cocoon production was the main factor to motivate them to join this career. The average holding land was 22.85 rai and all of them were land owners. Average family members were 4.00 with 2 of them working permanently for sericulture. Their experiences in mulberry cultivation and

silkworm rearing were similarity with the average of 23.94 years and 23.63 years respectively. However, the range of experience in mulberry cultivation was the same as silkworm rearing, with the range between 2.00 to 70.00 years (Table 1).

Table 1 Profile of respondents

Variables	n	Percentage (%)	Remark
1. Sex			
Female	168	93.30	
Male	12	6.70	
2. Age (year)			
26 - 45	56	31.10	Max = 84
46 - 65	106	58.90	Min = 30
66 - 85	18	10.10	Average = 51.43
3. Education level			
Primary school	162	90.00	
Secondary school	14	7.80	
Vocational education certificate/	2	1.10	
Technical education diploma			
Others	2	1.10	
4. Motivation to be sericulturist			
Better income	62	34.40	
Follow their ancestors	40	22.20	
Neighbor	36	20.00	
Advice of agriculture extension	32	17.80	
officer	6	3.30	
Advice of reeling factory	4	2.20	
Others			
5. Land occupation (rai/household)			
1- 25	116	64.40	Max = 102
26 – 50	54	30.00	Min = 1
51 – 75	4	2.25	Average = 22.85
76 – 100	4	2.25	
101 – 125	2	1.10	
6. Family member (person)			
1 – 5	140	77.80	Max = 9
6 - 10	40	22.20	Min = 1
			Average = 4
7. Family member who permanently work on sericulture (person)			Max = 5
1 – 5	180	100.00	Min = 1
6 - 10	0	0.00	Average = 2.11
8. Experience on mulberry cultivation (year)			Max = 70
1- 20	109	60.50	Min = 2
21 – 40	37	20.60	Average = 23.94
41 – 60	27	15.00	
61 – 80	7	3.90	
9. Experience on silkworm rearing			
1- 20	109	60.50	Max = 70
21 – 40	39	23.63	Min = 2
41 – 60	25	13.90	Average = 23.63
61 – 80	7	3.90	

3.2 Sericulture Technology
3.2.1 Mulberry cultivation

All farmers planted mulberry on their own lands with the average mulberry field of 2.01 rai. The maximum area of mulberry field was 20.00 rai and the minimum was 0.25 rai. There were 1,573.68 plants/rai in average. It was found that majority of farmers planted recommended mulberry variety namely Burirum 60 at the average production of 1,791.11 kgs./rai/year. The average age of mulberry plots was 7.20 years with the maximum age of 15.00 years and the minimum age of 1.00 year. Most of them (62.90 percent) produced enough mulberry leaves (Table 2). The result showed that some farmers faced root rot disease which seriously infected mulberry field as well as drought condition which prevented the growth of mullbery.

3.2.2 Cocoon production

The finding reveals that the majority of farmers used Dogboe variety (recommended silkworm variety) for their rearings. The average rearing cycle was 6.22 crops/year with the range of 1.00 to 12.00 crops/year. The average number of silkworm eggs was 8.62 boxes/year with cocoon production of 183.20 kgs/year (Table 2). The main reason for low cocoon production in some area resulted from grassery disease.

Table 2   Sericultural technologies

Variables	n	Percentage (%)	Remark
1. Size of mulberry field (rai)			
1 – 5	170	94.44	Max = 20
6 – 10	5	2.78	Min = 0.25
11 – 15	0	0.00	Average = 2.01
16 - 20	5	2.78	
2. Number of mulberry plant per rai (plant)			
1 – 1000	10	5.60	Max = 6400
1001 –2000	156	86.70	Min = 200
2001 – 3000	4	2.20	Average =1573.68
3001 - 4000	8	4.40	
4001 – 5000	0	0.00	
5001 – 6000	0	0.00	
6001 - 7000	2	1.10	
3. Mulberry variety			
- Burirum 60	176.00	97.80	
- Nakhon Ratchasrima 60	2.00	1.10	
- Others	2.00	1.10	
4. Source of mulberry			
- Government agency	174.00	96.70	
- Neighbor	6.00	3.30	
5. Mulberry leaf production (kg./rai/year)			
1 – 1000	38	21.10	Max = 3200
1001 –2000	90	50.00	Min = 200
2001 – 3000	20	11.10	Average = 1791.11
3001 - 4000	32	17.80	
6. Production of mulberry leaf			
- Enough for their rearing	113	62.90	
- Not enough for rearing	67	37.10	

Table 2 Sericultural technologies (Con.)

Variables	n	Percentage (%)	Remark
7. Mulberry age (year)			
1 – 5	82	45.60	Max = 15
6 – 10	86	47.80	Min = 1
11 – 15	12	6.60	Average = 7.20
8. Silkworm variety			
- Dogboe	124	68.89	
- Jimthomson	12	6.67	
- DOAE	30	16.67	
- Nang-noi	14	7.77	
9. Source of silkworm egg			
- subsidised by the government	88	48.90	
- bought	84	46.70	
- produced by themselves	8	4.40	
10. Rearing cycle (crop/year)			
1 – 5	70	38.90	Max = 12
6 – 10	98	54.40	Min = 1
11 – 15	12	6.70	Average = 6.22
11. Number of silkworm egg (box/year)			
1 – 10	127	70.60	Max = 40
11 – 20	41	22.80	Min = 1.50
21 – 30	9	5.00	Average = 8.62
31 - 40	3	1.60	
12. Cocoon production (kg./household/year)			
1 –250	150	83.34	Max = 960
251 – 500	20	11.11	Min = 18
501 – 750	6	3.33	Average =183.20
751 - 1000	4	2.22	

3.2.3 Rearing practice
The results showed that the farmers who followed the recommendation on cocoon production technologies were in moderate level (Table 3). The recommended cocoon production technologies were as follows:
- Isolated rearing house that suited for rearing scale
- Conditions of rearing house
- Rearing house disinfection
- Appropriate age of mulberry leaf for feeding silkworm in each instar
- Suitable size of mulberry leaf for feeding silkworm in each instar
- Lime/burned rice hush application
- Netting application before and after molting
- Eventually spacing for good silkworm rearing condition
- Collecting of mature worm for cocoon spinning
- Appropriate number of mature worm/mountage
- Management of mounting condition
- Period of cocoon harvesting
- Cocoon sorting and floss removing
- Cocoon packaging for transportation

Table 3 Level of rearing technology adoption

Rearing technology	Perfect adoption		Moderate adoption		Low adoption	
	n	Percentage (%)	n	Percentage (%)	n	Percentage (%)
1. Isolated rearing house	20.00	11.10	112.00	62.20	48.00	26.70
2. Rearing house suited for rearing scale	16.00	8.90	118.00	65.60	46.00	25.60
3. Condition of rearing house	16.00	8.90	128.00	71.10	36.00	20.00
4. Disinfection of rearing house before rearing	14.00	7.80	113.00	62.80	53.00	29.40
5. Fumigation of rearing house before rearing	2.20	12.20	122.00	67.80	36.00	20.00
6. Appropriate age of mulberry leaf for feeding - young silkworm rearing (1- 3 instars)	12.00	6.70	126.00	70.00	42.00	23.30
- grown silkworm rearing (4 -5 instars)	2.00	1.10	140.00	77.80	38.00	21.10
7. Suitable size of mulberry leaf for feeding in each instar	8.00	4.40	132.00	73.30	40.00	22.0
8. Application of lime burned rich hush, chemical during molting	4.00	2.20	138.00	76.70	38.00	21.10
9. Netting application before and after molting	4.00	2.20	134.00	74.40	42.00	23.30
10. Eventually spacing for good silkworm rearing condition	2.00	1.10	140.00	77.80	38.00	21.10
11. Collection of mature worm for cocoon spinning	2.00	1.10	142.00	78.90	36.00	20.00
12. Appropriate number of mature worm per mountage	2.00	1.10	146.00	81.10	32.00	17.80
13. Management during cocoon spinning period	10.00	5.60	136.00	75.60	34.00	18.90
14. Right time for cocoon harvesting	4.00	2.20	136.00	75.60	40.00	22.20
15. Cocoon sorting before selling	6.00	3.30	136.00	75.60	38.00	21.10
16. Floss removing before selling	6.00	3.30	138.00	76.70	36.00	20.10
17. Packaging of cocoon in ventilated material for transportation	6.00	3.30	138.00	76.70	36.00	20.00

3.3 Comparison of respondent profile and sericulture technologies in Khon Kaen and Mahasarakarm provinces

The results between farmer network from Khon Kaen and Mahasarakarm provinces showed highly significant different in farmer age, land occupation, experience in mulberry cultivation and silkworm rearing, number of mulberry plants per rai, mulberry age and production, rearing crops

and cocoon production per year, as well as showing significant difference in family member who joined sericulture work and family member who joined sericulture work temporarily (Table 4).

Table 4 Means of comparison between respondent profile and sericulture technologies in Khon Kaen and Mahasarakarm provinces by T-Test

Variables	Khon Kaen		Mahasarakarm		Sig (2-tailed)
	$\overline{X}$	N	$\overline{X}$	N	
1. Age (year)	54.28	100	47.86	80	0.000**
2. Land occupation (rai)	26.53	100	18.26	80	0.001**
3. Family member (person)	4.30	100	4.08	80	0.375 ns
4. Family member who worked on sericulture (person)	2.16	100	2.45	80	0.034*
5.Family member who permanently worked on sericulture (person)	2.12	100	2.10	80	0.874 ns
6.Family member who temporarilyworked on sericulture (person)	2.00	100	1.35	80	0.012*
7. Mulberry cultivation experience (year)	29.18	100	17.05	80	0.000**
8. Silkworm rearing experience (year)	28.68	100	16.97	80	0.000**
9. Size of mulberry field (rai)	2.26	100	1.68	80	0.084 ns
10.Number of mulberry plant per rai (plant)	1,422.00	100	1,763.28	80	0.002**
11. Mulberry age (year)	9.28	100	4.40	80	0.000**
12. Mulberry leaf production (kg./rai/year)	2,203.80	100	1,275.25	80	0.000**
13. Rearing cycle (crop/year)	6.62	100	5.73	80	0.007**
14. Cocoon production (kg./year/household)	218.30	100	139.31	80	0.002**
15. Percentage of bad cocoon (%)	13.72	100	10.47	80	0.308 ns

** = highly significant
* = significant
ns = not significant

It is interesting to find the difference in most sericulture technologies between farmer network in Khon Kaen and Mahasarakarm provinces. The age of farmer in Khon Kaen was older than in Mahasarakarm as well as their experiences in mulberry cultivation and silkworm rearing. In addition, the results also showed that land occupation in Khon Kaen was bigger than Mahasarakarm. In terms of work experience, we found that farmers in Khon Kaen had more over 10.00 years experience more than Mahasarakarm province. This factor was directly related to mulberry leaf as well as cocoon production with the higher productions of 1.73 times and 1.57 times, respectively. According to long experience more in mulberry cultivation of farmers in Khon Kaen, they had capabilities to manage their mulberry plots for longer utilization. The results reveal that farmers in Khon Kaen strongly followed recommendation concerning numbers of mulberry plant per rai (1,400.00 plants/rai). Hence, this technology directly affected their convenience practices and resulted in higher mulberry production.

4. CONCLUSIONS

The major findings from this research are summarized below.
1. Most of the sericulturists are female.
2. All of farmers own their lands.
3. All of them use recommended mulberry varieties (Burirum 60 and Nakonratchasrima 60).
4. The majority of farmers rear recommended silkworm varieties which are produced by the government centers.
5. The majority of farmers both in Khon Kaen and Mahasarakarm adopt recommended cocoon production technologies in moderate level.
6. Highly significant difference in farmer age, land occupation, sericulture experience, number of mulberry plants/rai, mulberry age, mulberry production, silkworm crops/year and cocoon production/year between farmer network in Khon Kaen and Mahasarakarm province.

5. ACKNOWLEDGEMENTS

REFERENCES

[1] Department of Agricultural Extension **2002** Thai Silk. Bangkok, Ministry of Agriculture and Cooperatives.
[2] Office of Agricultural Economics **2004** Draft sericulture development strategy. Bangkok, Ministry of Agriculture and Cooperatives.
[3] Development of Silk Production in the Northeast Project **2000** Introduction to Development of Silk Production in the Northeast. Khon Kaen, DEVSILK Project Management Unit, European Union.
[4] The Queen Sirikit **2006** Institute of Sericulture, Thai Sericulture, Bangkok, Ministry Agriculture and Cooperatives.

[5]   Setho, S. **2003** Report on Silk Production of Farmer in Mahasarakarm Province: Case Study of Community Reeling Factory, Bannoonngarm. Mahasarakarm, Provincial Agricultural Extension.

[6]   Miura Mikihiko. **2005** Present world silk situation and some comments on Thai silk. Shinshu, Shinshu university.

[7]   Yamane, T. **1973** Statistics: An Introductory Analysis. Tokyo, Harper.