

## 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 (DEVSIK)". 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 89 in 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 than 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].

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

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

### 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 dominated 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/<br>Technical education diploma | 2   | 1.10           |                 |
| 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<br>officer                       | 32  | 17.80          |                 |
| Advice of reeling factory                                        | 6   | 3.30           |                 |
| Others                                                           | 4   | 2.20           |                 |
| 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<br>on sericulture (person) |     |                |                 |
| 1 - 5                                                            | 180 | 100.00         | Max = 5         |
| 6 - 10                                                           | 0   | 0.00           | Min = 1         |
|                                                                  |     |                | Average = 2.11  |
| 8. Experience on mulberry cultivation<br>(year)                  |     |                |                 |
| 1- 20                                                            | 109 | 60.50          | Max = 70        |
| 21 - 40                                                          | 37  | 20.60          | Min = 2         |
| 41 - 60                                                          | 27  | 15.00          | Average = 23.94 |
| 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 mulberry.

#### 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 grassy disease.

**Table 2** Sericultural technologies

| Variables                                    | n      | Percentage (%) | Remark                                       |
|----------------------------------------------|--------|----------------|----------------------------------------------|
| 1. Size of mulberry field (rai)              |        |                |                                              |
| 1 – 5                                        | 170    | 94.44          | Max = 20<br>Min = 0.25<br>Average = 2.01     |
| 6 – 10                                       | 5      | 2.78           |                                              |
| 11 – 15                                      | 0      | 0.00           |                                              |
| 16 – 20                                      | 5      | 2.78           |                                              |
| 2. Number of mulberry plant per rai (plant ) |        |                |                                              |
| 1 – 1000                                     | 10     | 5.60           | Max = 6400<br>Min = 200<br>Average = 1573.68 |
| 1001 – 2000                                  | 156    | 86.70          |                                              |
| 2001 – 3000                                  | 4      | 2.20           |                                              |
| 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 Ratchasima 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<br>Min = 200<br>Average = 1791.11 |
| 1001 – 2000                                  | 90     | 50.00          |                                              |
| 2001 – 3000                                  | 20     | 11.10          |                                              |
| 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<br>Min = 1<br>Average = 7.20    |
| 6 – 10                                     | 86  | 47.80          |                                          |
| 11 – 15                                    | 12  | 6.60           |                                          |
| 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<br>Min = 1<br>Average = 6.22    |
| 6 – 10                                     | 98  | 54.40          |                                          |
| 11 – 15                                    | 12  | 6.70           |                                          |
| 11. Number of silkworm egg (box/year)      |     |                |                                          |
| 1 – 10                                     | 127 | 70.60          | Max = 40<br>Min = 1.50<br>Average = 8.62 |
| 11 – 20                                    | 41  | 22.80          |                                          |
| 21 – 30                                    | 9   | 5.00           |                                          |
| 31 – 40                                    | 3   | 1.60           |                                          |
| 12. Cocoon production (kg./household/year) |     |                |                                          |
| 1 –250                                     | 150 | 83.34          | Max = 960<br>Min = 18<br>Average =183.20 |
| 251 – 500                                  | 20  | 11.11          |                                          |
| 501 – 750                                  | 6   | 3.33           |                                          |
| 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)      |
|-----------------------------------------------------------------|-----------|-----|--------------|----|---------------------|
|                                                                 | $\bar{X}$ | N   | $\bar{X}$    | 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 <sup>ns</sup> |
| 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 <sup>ns</sup> |
| 6. Family member who temporarily worked 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 <sup>ns</sup> |
| 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 <sup>ns</sup> |

\*\* = 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.

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