

BIBLIOGRAPHY

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ABSTRACT

The study was conducted to determine the developments of the Sericulture industry in Kapangan that was revived in December 2004 by the initiative of the Fiber Industry and Development Authority.

There is only one organization that caters the production of silk in Benguet and this is the Kapangan Livelihood Multipurpose Cooperative - Sericulture, composed of thirty-three (33) members and ten (10) reelers.

The Sericulture Industry covers the mulberry production, silkworm rearing, cocoon processing and marketing of their product.

There are problems on the maintenance and establishment of the mulberry plantation, on the strains of the silkworms and the proper timing of harvesting of the cocoons that led to more waste during processing.

The various agencies extending support are the Fiber Industry Development Authority (FIDA), Local Government Unit of Kapangan, Department of Labor and Employment (DOLE), Dangerous Drug Board (DDB), Department of Tourism - Cordillera Administrative Region (DOT-CAR), Department of Trade and Industry (DTI), Department of Agrarian Reform (DAR), Philippine Textile Research and Industry (PTRI)

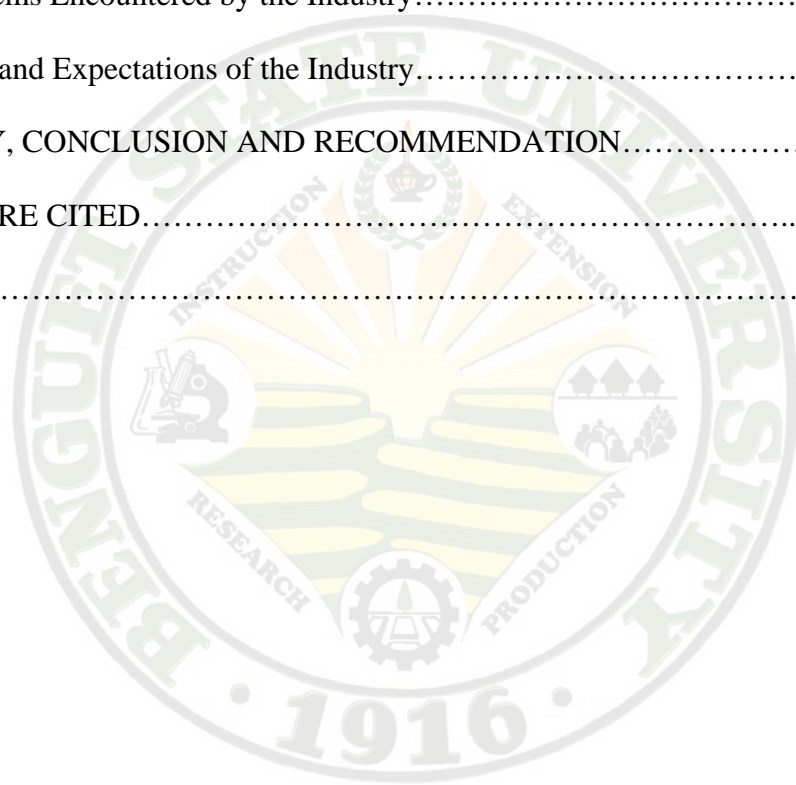
and the Provincial Government of the Province of Benguet. Through them, the industry is hoping that it will prosper to meet the demand of their products and will serve as a livelihood for the people not only in Kapangan but in the entire Province of Benguet.



TABLE OF CONTENTS

	Page
Bibliography.....	i
Abstract.....	i
Table of Contents.....	iii
INTRODUCTION	
Background of the Study.....	1
Statement of the Study.....	3
Objective of the Study.....	3
Significance of the Study.....	4
Scope and Limitation of the Study.....	4
REVIEW OF LITERATURE.....	5
METHODOLOGY	
Locale and Time of the Study.....	8
Respondents of the Study.....	8
Data Collection.....	8
Data Gathered.....	9
Data Analysis.....	9
RESULTS AND DISCUSSION	
Personal Background of the Members.....	10
Technical Aspects.....	14
Marketing Aspects.....	23

Financial Aspects.....	24
Evaluation.....	25
Activities on Mulberry Production.....	26
Cocoon Production Activities.....	29
Cocoon Silk Processing.....	32
Agencies that Renders Assistance.....	38
Problems Encountered by the Industry.....	40
Plans and Expectations of the Industry.....	42
SUMMARY, CONCLUSION AND RECOMMENDATION.....	43
LITERATURE CITED.....	49
APPENDIX.....	50



INTRODUCTION

Background of the Study

Sericulture is an art of rearing silkworm for the production of cocoons which is the raw material for the production of silk. It is considered as an agro-based cottage industry since it involves mulberry cultivation

According to the Sericulture Research and Development Center, sericulture promises to be a profitable industry for the Philippines because of the country's favorable climate for year-round mulberry production. Further, a country report on sericulture prepared by 22 Filipinos who were trained in South Korea in 1996 cited a number of opportunities for industry development. One is that, silk consumption in developed countries seems to be on the rise owing to the growing popularity in the use of natural fibers. In contrast, silk production in Japan and Korea is decreasing because of industrialization. Being labor intensive, sericulture has become too costly in these countries that they prefer importing of silk rather than producing it themselves.

In the Philippines, Benguet was chosen as the best site for sericulture since it possesses the right agro-climate that is favorable for the mulberry plants for successful rearing of silkworms. That is why; Benguet today is called the pioneer and cradle of Sericulture. These can be one of the promising livelihood for the people within the province particularly in the Municipality of Kapangan.

Sericulture started in the Municipality of Kapangan in the late 1980s when five farmers from the said municipality attended a seminar on Sericulture production conducted by the Philippine Textile Research Industry (PTRI) and the Benguet State



University (BSU). These farmers encourage other farmers to attend similar training and this led to the organization of the Kapangan Sericulture Farmers Association. In the 1990s, the production of cocoons declined until the operation stopped. The reason behind was due to financial constraints. However, in 2004, the industry was revived through the efforts of Philippine Textile and Research Institute (PTRI) in coordination with the Masa Company of Japan. As a result, the Kapangan Ecological and Livelihood Multi-Purpose Cooperative (KELMPC) was organized and registered as a legal entity and was tapped to produce the demand of the cassava silk or the flatsilk for the Masa Company. However, due to limited time and resources, the KELMPC could not meet the demand of the company, so the Masa Company looked for another supplier. This did not discourage the association to continue their production because the Fiber Industry and Development Authority (FIDA) entered and offered their assistance in reviving the Industry. They introduced the mulberry silk. Through the joint effort of the FIDA, the Local Government Unit of Kapangan and the PTRI, the Sericulture Project was launched last December 18, 2004. By close supervision and assistance rendered by FIDA, the cooperative was properly registered and it was named as Kapangan Environmental Livelihood Multipurpose Cooperative - Sericulture (KELMC-Sericulture) which is the only organization that caters the production of cocoon silk within the province. The FIDA agreed to help the farmers regarding the marketing of their produce. Through a Memorandum of Agreement (MOA) agreed to continually assist the farmer beneficiaries by providing the needed technology through seminars and trainings. The LGU of Kapangan and other agencies also extended their help for the development of the Sericulture Industry.



In July 2005, the LGU - Kapangan and FIDA agreed that sericulture would be the official entry during the One - Town One - Product (OTOP) seminar/workshop by the Department of Trade and Industry (DTI) that was held at the Capitol Auditorium, La Trinidad, Benguet. Thus, the DTI identified it as the OTOP of the municipality.

Statement of the Problem

1. Who are the Sericulturists in Kapangan, Benguet?
2. What are the activities performed in the mulberry production, silkworm rearing, processing of cocoons and marketing of their products?
3. What are the facilities used in the rearing of silkworm and processing of cocoons?
4. What are the problems encountered within the Industry?
5. What are the agencies that render assistance and intervention to the Industry?
6. What are the plans and expectations of the Industry in the future?

Objectives of the Study

1. To determine who are the Sericulturist in Kapangan, Benguet.
2. To describe the activities performed in the mulberry production, cocoon production (silkworm rearing), processing the cocoon and marketing of their products.
3. To determine the facilities used by the Sericulturist in the production and processing of cocoons.
4. To determine the problems encountered within the Industry.
5. To determine the agencies rendering assistance and intervention to the Industry.



6. To know the plans and expectations in the Industry in the future.

Significance of the Study

This study shows the profile of the Sericulture Industry in the Municipality of Kapangan. It describes the various activities performed as well as the developments in the industry. In addition, interested farmers and other people who want to venture into sericulture may gain sufficient idea through this study.

This is also equally important for succeeding researchers who will conduct a research that is related to the topic. This study may be use as a basis and guide on where to acquire some of the information needed regarding the topic.

Scope and Limitation of the Study

This study is about the profile of the players of the Sericulture Industry of Kapangan, Benguet; the development in the industry; and the activities being done, from the mulberry production, silkworm rearing, cocoon processing and marketing of the products. The respondents were the members of the Kapangan Environmental Livelihood Multipurpose Cooperative-Sericulture (KELMC-Sericulture), the reelers and the Provincial Fiber Officer of the Benguet Fiber Industry and Development Authority.

The study was conducted from January to February, 2008.



REVIEW OF LITERATURE

Production of Silk

Silk production today is a blend of ancient techniques and modern innovations. The first stage of silk production is hatching the silkworm eggs, which have been previously examined and shown to be free from disease. Larvae are then fed cut-up mulberry leaves and after the fourth molt climb a twig placed near them and spin their silken cocoons. The silk is a continuous-filament fiber consisting of fibroin protein secreted from two salivary glands in the head of each larva, and a gum called sericin, which cements the two filaments together. Pupae within cocoons are killed by steam or fumigation to prevent adult emergence, which would cut and tangle the silk filaments. Cocoons are later softened in hot water to remove the sericin, thus freeing silk filaments for reeling. Single filaments are drawn from cocoons in water bowls and combined to form yarn. This yarn is drawn under tension through several guides and eventually wound onto reels. The yarn is dried, packed according to quality, and is now raw silk ready for marketing (Cherry, 1993).

The Secret of Rearing Silkworm

Production of cocoons is a lengthy process and demands constant close attention. To produce high quality silk, there are two conditions which need to be fulfilled- preventing the moth from hatching out and perfecting the diet on which the silkworms should feed. Chinese developed secret ways for both.

The eggs must be kept at 65 ° F, increasing gradually to 77 ° F at which point they



hatch. After the eggs hatch, the baby worms feed day and night every half hour on fresh, hand-picked and chopped mulberry leaves until they are very fat. Also a fixed temperature has to be maintained throughout. Thousands of feeding worms are kept on trays that are stacked one on top of another. A roomful of munching worms sounds like heavy rain falling on the roof. The newly hatched silkworm multiplies its weight 10,000 times within a month, changing color and shedding its whitish-gray skin several times.

The silkworms feed until they have stored up enough energy to enter the cocoon stage. While they are growing they have to be protected from loud noises, drafts, strong smells such as those of fish and meat and even the odor of sweat. When it is time to build their cocoons, the worms produce a jelly-like substance in their silk glands, which hardens when it comes into contact with air. Silkworms spend three or four days spinning a cocoon around them until they look like puffy, white balls.

After eight or nine days in a warm, dry place the cocoons are ready to be unwound. First they are steamed or baked to kill the worms, or pupas. The cocoons are then dipped into hot water to loosen the tightly woven filaments. These filaments are unwound onto a spool. Each cocoon is made up of a filament between 600 and 900 meters long! Between five and eight of these super-fine filaments are twisted together to make one thread.

Finally the silk threads are woven into cloth or used for embroidery work. Clothes made from silk are not only beautiful and lightweight, they are also warm in cool weather and cool in hot weather (Silkroad foundation).



Definition of Terms

1. Bad Cocoon. Cocoons that is defective but reelable.
2. Cocoon. An enveloped of the largely of silk which an insect larva forms by itself as it passes the pupa stage.
3. Cocoon Shell Percentage. The ratio of the cocoon shell to that of the whole cocoon weight.
4. Denier. The thickness of a filament.
5. Good Cocoons. These are perfect cocoons with normal pupa inside, no stain, no deformity, with thick cocoon shell and usually uniform in size.
6. Moriculture. The cultivation and production of mulberry leaves.
7. Mulberry. A tree which its leaves is used as a food for the silkworm
8. One box. A group of at least 20,000 young silk worm larvae
9. Sericulture. An art of rearing silkworm for the production of cocoons.
10. Silk. A fine continuous protein fiber produced by silkworm used to build cocoons.
11. Silk reeling. Extraction of silk filament from cocoons by employing a set of processes.
12. Silkworm. A worm that is being reared for the production of cocoons.
13. Silkworm rearing. Caring of silkworm in their larval stage until they spin their cocoons.
14. Waste Cocoon. Cocoons that is defective and unreelable.



METHODOLOGY

Locale and Time of the Study

The study was conducted from January to February, 2008 in Kapangan, Benguet specifically in barangays namely, Cuba, Labueg, Pudong, Pungayan, Taba-ao and Datakan where the members of the KELMC-Sericulture are located.

Kapangan is located at the Western portion of the Province of Benguet. It is bounded by the Municipality of Kibungan on the North, the Municipality of Atok on the East, the Province of La Union on the West and the Municipality of Tublay and Sablan on the South. It is composed of fifteen (15) barangays.

The place is thirty-five (35) kilometers away from the city of Baguio and twenty-nine (29) kilometers from the Provincial Capitol of Benguet. It can be reached by two hours ride from the city of Baguio.

Respondents of the Study

The respondents were the thirty-three (33) members of the cooperative, the reelers and the Provincial Fiber Officer of the Benguet Fiber Industry and Development Authority.

Data Collection

A prepared interview schedule was used by the researcher in interviewing the respondents. Documentation on the Sericulture Industry was also done to support the data. Some secondary data were obtained through internet searching, literary research,



training manuals, and other resource materials that contain information that is related to the study.

Data Gathered

The information gathered were the profile of the Sericulture Industry of Kapangan; demographic profile of the members of the industry; and the various activities performed from the mulberry production, silkworm rearing, cocoon processing to marketing of the products.

Data Analysis

The data gathered were analyzed through simple statistical treatments such as percentages and frequencies.



RESULTS AND DISCUSSION

Personal Background of the Members

Table 1 shows the general information about the members of the Kapangan Environmental Livelihood Multipurpose Cooperative - Sericulture in terms of sex, age, educational attainment, marital status, number of years engaged in Sericulture and type of sericulture farming the farmers are involved.

Sex. There is no slight difference in terms of the number of female and male members of the cooperative. This shows that both males and females can engage in sericulture as long as they are interested to join.

Age. The ages were ranged based on the lowest (34 years old) to the highest (73 years old) ages of the members. Results show that there are no significant differences on the numbers of members that fall between each age brackets although it can be noted that more (27.27%) falls under 58 to 65 years old. These indicate that age is not a hindrance to engage in Sericulture as long as they can work.

Educational Attainment. Most of the members are literate, with a significant 12.12% even finished college. It shows that membership in such organization does not require high level of education as long as members have the willingness and ability to learn.

Marital Status. Most (72.73%) of the members are married, 18.18% are single, 6.06 % are widow/widower and 3.03 % separated.

Number of years engaged in Sericulture. Most (75.76 %) members are engaged in Sericulture for three years, indicating they constitute the original membership of the



cooperative. Considering the information gathered, there is no late or early membership in Sericulture as long as you are willing to cope up with the membership requirements.

Type of sericulture farming they are involved. Majority (63.64%) of the members are engaged on mulberry production while 36.36% are in both mulberry production and silkworm rearing. It does not mean that they only focus on mulberry production since they already experience rearing during the training and by grouping themselves into two to three members per group to rear silkworm, because their mulberry leaves is not enough for feeding. Indicates that members of the industry have the plantation but they are not ready to rear the worms because their plants are not totally productive to be able to rear silkworms individually. Others also are waiting for their rearing house to be finished before they will start to rear.

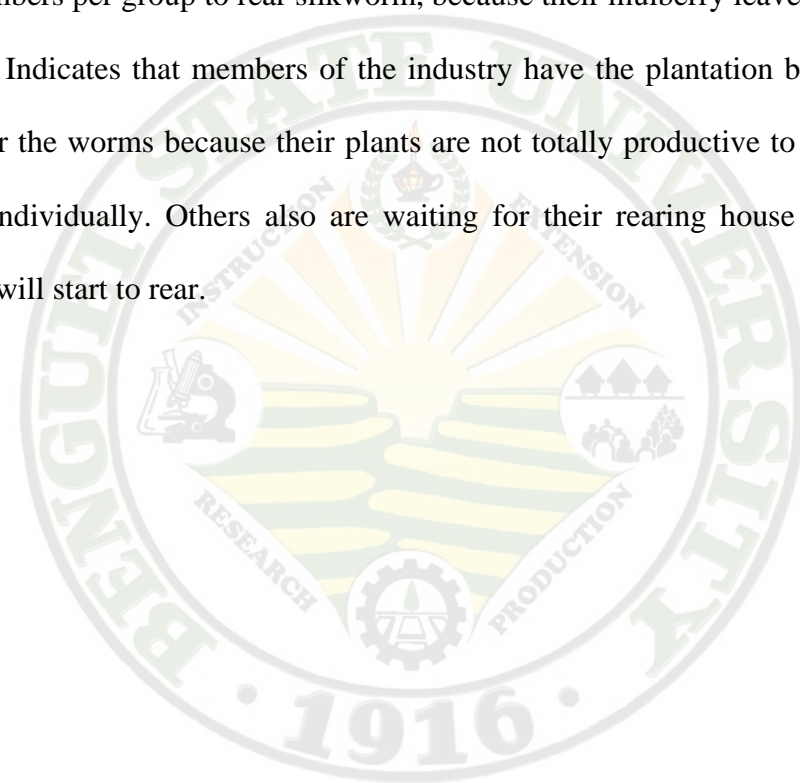


Table 1. Personal background of the members

CHARACTERISTICS	FREQUENCY	PERCENTAGE
Gender		
Male	17	51.52
Female	16	48.48
TOTAL	33	100
Age		
34 to 41	6	18.18
42 to 49	6	18.18
50 to 57	7	21.21
58 to 65	9	27.27
66 to 73	5	15.15
TOTAL	33	100
Educational Attainment		
No formal schooling	3	9.09
Elementary undergraduate	9	27.27
Elementary graduate	5	15.15
High school	2	6.06
High school graduate	8	24.24
College undergraduate	2	6.06
College graduate	4	12.12
TOTAL	33	100



Table 1. Continued...

CHARACTERISTICS	FREQUENCY	PERCENTAGE
Marital Status		
Single	6	18.18
Married	24	72.73
Widow/Widower	2	6.06
Separated	1	3.03
TOTAL	33	100
Number of Years Engaged in the Project		
3 years	25	75.76
2 years	2	6.06
1 year	1	3.03
Less than 1 year	5	15.15
TOTAL	33	100
Type of Activity Engaged in		
Mulberry Production	21	63.64
Mulberry production and cocoon production	12	36.36
TOTAL	33	100



Technical Aspects

Mulberry production. The mulberry plantation in Kapangan has a total land area of 8.25 hectares however, only six hectares is productive; the others need rehabilitation. The areas are located at Barangay Cuba (sitio Nalbengan and Proper), Taba-ao (sitio Bolinsak, Abiang, Daklan and Legwe), Pudong (sitio Cabilisan and Bacatey), Datakan (sitio Poking and Tacal), and Pungayan (sitio Sagapa).

On the onset of rainy season, the farmers can directly plant the mulberry cuttings to their field but during dry season, they have to prepare a nursery bed for the cuttings then transplant it after 3 to 4 months old (called as saplings).

The farmers make use of the Batac variety of mulberry since this is adoptable to locality and good food for the silkworm. They source out their planting materials from the old mulberry plant that was planted before and from their co-members who has enough cuttings.

Table 2 shows the area of mulberry farm planted by each farmer; it was ranged from below 2500 sq. m ($\frac{1}{4}$ hectare) up to 10000sq. m (1 hectare) and above. Majority (57.58%) of the farmers' area of plantation is in the range of 2501 to 5000 sq. m followed by below 2500 sq. m. Only 3.03% among the members have an area of above one hectare.



Table 2. Land area planted with mulberry by the farmers

PARTICULAR	FREQUENCY	PERCENTAGE
Area Planted with Mulberry		
Below 2500 sq. m	8	24.24
2501 to 5000 sq. m	19	57.58
5001 to 7500 sq. m	2	6.06
75001 to 10000 sq. m	3	9.09
10000 sq.m & below	1	3.03
TOTAL	33	100



Figure 1. Mulberry plantation



Table 3 shows that most (90.91%) of the mulberry farmers are not applying any of fertilizers to their farms because their areas are still rich in organic matters and the fact they were not utilized for several years. Only 9.09% are applying fertilizer. This indicates that farmers save much in terms of inputs costs.

Table 3. Frequency of farmers' applying fertilizer

RESPONSE	FREQUENCY	PERCENTAGE
No	30	90.91
Yes	3	9.09
TOTAL	33	100

Table 4 shows the sources of water used by the farmers to irrigate their farms. Results indicate that most (81.82%) of the farmers rely on rain for their irrigation. This affects the numbers of silkworm they may rear since the mulberry plant is less productive if they lack water. It can be noted however that a significant 18.18% have other sources of irrigation aside from the rain, so this farmers are able to rear more silkworms.

Table 4. Types of mulberry farm in terms of irrigation

SOURCE OF WATER	FREQUENCY	PERCENTAGE
Rain fed	27	81.82
Irrigated	6	18.18
TOTAL	33	100



Silkworm rearing. The silkworm rearers are ordering the worms from the Philippine Textile Research Industry and Technology Center at La Trinidad, Benguet. They get the worms just after incubation. They are buying the worms at Php.230 per box, which contains approximately 20,000 worms. The rearers based their orders on the productivity of their mulberry plantation.

They are feeding the silkworms according to the standard ration of 3 to 4 times a day. In the evening, they give more leaves to the silkworms and that is good for overnight meal. During the fifth instar of the larvae they need to consume more mulberry leaves in preparation of spinning.

Improvised rearing houses were used by the rearers in the past years, but today, there are already 20 rearing houses provided by the Dangerous Drug Board.

The rearers has to dig a hole where they dispose the waste produced during rearing period and this serves as a compost pit as well. The compost then is used as fertilizer to their mulberry plant.

The following are the rearing facilities used by the farmers:

1. Rearing Stand – used as a bed of the worms; where they eat, excrete wastes and molt
2. Ant well – placed at the bottom of the stand to prevent the ant from climbing.
3. Leaf basket – where the leaves are temporarily placed during harvest to ease transport of leaves; can also be used as storage facility
4. Chopping board – used in chopping the young leaves to be fed to the young worms
5. Chopping knife – used in chopping leaves
6. Mountage – where the ripe worms are placed to build their cocoons
7. Cleaning nets – used in bed cleaning





Figure 2. Improved rearing house



Figure 3. Semi-concrete rearing house





Figure 4. Rearing of young age silkworm during the training

Processing of Cocoons. The cocoons produced by the farmers will be processed into rawsilk by the reelers. There are ten reelers who are household members of the cooperative members. Some are the members of the cooperative and at the same time reelers.

Eight kilograms of fresh cocoons when reeled will become a kilogram of rawsilk. Combination of eight (8) to ten (10) pieces of cocoon makes twenty-one (21) denier or rawsilk.

During the reeling process, any of the class of the cocoons can be reeled but the unreelable cocoons will be processed into cocoon crafts. The undeveloped pupa that was extracted from the cocoons are used as feeds for the fishes and domesticated animals of the members. The developed pupa which is a good source of protein are being cooked and eaten. This indicates that none will be wasted from the cocoon harvests.



The following are the equipments/facilities used by the reelers during processing of the cocoons:

1. Reeling Machine – use to unwind the cocoons just after cooking to the small reels
2. Rereeling Machine – use to unwind the silk from the small reels
3. Cocoon Dryer – machine that is use for drying the fresh cocoons
4. Ladle – use during cooking
5. Pale – serve as acotainer of water which will be use during processing
6. Scissors – use for cutting the filaments and the coons during processing
7. Crochet Hoe – it is use during lacing
8. Strainers – use to set aside the cocoons from the water just after cooking
9. Basin – where to place the cocoons after straining
10. Big and Small Reels – where the unwind silk from the cocoons are being wind





Figure 5. Cocoons for processing



Figure 6. Rereeling process





Figure 7. Raw silk produced



Figure 8. Laced raw silk for market



Marketing Aspects

The farmers are the ones who deliver their own produced cocoons through the public utility jeepneys or buses to the Kapangan Environmental Livelihood Multipurpose Cooperative (KELMC) located at Lomon, Paykek, Kapangan for the reelers to process into rawsilk. The cooperative will then pay the farmers in cash based on the class of the cocoons they had produced. The price of a kilogram of class A is Php.130, class B is Php. 100, and class C is Php. 80.

During the transportation of the cocoons, they usually use sacks or cartoons as packaging materials.

The rawsilk is being sold to Benguet local weavers; in Kalibu, Aklan; and in Hungduan, Ifugao. Said rawsilk will then be blended with other fibers to improve its quality. The price of a kilogram of rawsilk before is one thousand nine hundred fifty pesos (P1, 950.00) but at present, it is two thousand one hundred pesos (P2, 100). The price is being based on the prevailing market price.

In the process of their marketing, middlemen are eliminated because the cooperative serves as the marketing arm of the members.

The recent promotion of products and exposure of the sericulture farmers done and sponsored by the Department of Tourism (DOT-CAR) under Director Pura S. Molintas through the third WOW Philippines at SM Baguio City last November 27 to December 2, 2007 and the live interview of ABS-CBN with Ms. Winnie Cordero under the Umagang Kay Ganda last December 3, 2007, were of great help to the Industry. They also joined the trade fair during the Adivay Festival and the First Benguet Silk Fashion





Figure 9. Exhibit during the WOW Philippines at SM Baguio

Show held at the BSU enclosed gym last November 2006 and Adivay Festival last November 2007.

Financial Aspects

The donation (called as soft loan) of sixty thousand pesos (P60, 000) from the Local Government Unit of Kapangan to the KELMC-Sericulture plus the capital share of each members are being used as the cooperative's fund. Said funds are being use to pay the cocoons of the farmers and as operational expense to reelers.

On the other hand, the farmers themselves make use of their own money in the establishment and maintenance of their mulberry plantation and in buying silkworms.

Currently, the cooperative does not offer loan to any of the members.



Evaluation

The members underwent trainings in all aspects of sericulture from mulberry production, silkworm rearing, cocoon silk processing, and book keeping and accounting given by the supporting agency.

The members said that Sericulture is a good livelihood because of the stability of price. It is profitable as long as they will care and manage their mulberries and silkworms so that they will rear more, since the effort in rearing one-fourth box is the same as the effort in rearing one box.

Monitoring is being conducted by the Provincial Fiber Officer, FIDA - Benguet in the person of Mrs. Fe G. Donato in coordination with the LGU-Kapangan.

In 2005, the farmers were able to produce 265 kilograms of fresh cocoons that were sold at DMMMSU-SRDI and local cocoon crafters. In 2006, 391.5 kilograms of fresh cocoons were produced of which majority were used during the First Benguet Silk Fashion Show, the rest were sold at SRDI and local crafters. In 2007, the farmers were able to produce 401.6 kilograms of fresh cocoons. Part of the output was used during the training for the processing of cocoons conducted at Lomon. Paykek, Kapangan.

The Industry is employing a capital build-up strategy to accumulate funds by deducting 3% from the payments of the cocoons sold by every member.

The reelers of the cooperative work on a part time basis because they will work only depending on the availability of cocoons.



Activities on Mulberry Production

Mulberry production is the first activity to consider in venturing to sericulture because the mulberry leaves are the only food for the silkworms. From the planting until harvesting, proper management must be observe in order to produce good quality of leaves for silkworms food so that they can also produce good quality of cocoons.

Mulberry plants are ready for harvesting after eight to twelve months from planting. It can be productive four times a year if it is well cared and managed.

The mulberry plant is productive for twenty (20) to twenty-five (25) years depending on the management of the farmers.

Establishment of mulberry plantation is the most costly and difficult part of moriculture while maintenance is a continuing process or activity.

Site selection. Site for mulberry plantation should be given with utmost importance. The criteria or basis in selecting the site should be strictly followed since the improvement of a farm with poor condition is an additional cost to be shouldered by the sericulture farmers.

Mulberry plants thrive best on flat areas, but sloping land could be considered too, provided that is not more than 25 degrees gradient and should be terraced. It is most productive in areas where the soil is fertile or rich in organic matters. Soil should be porous or having a texture of sandy loam, clay loam and loam.

The growth and quality of mulberry leaves are usually and directly affected by the environmental conditions of the plantation area. The plantation should not be established near buildings, vicinity of factories, near tobacco farms, vegetable farms and along major roads so that the plants may not be contaminated with toxic chemicals. Within forested



area is also not required because the plant needs an adequate exposure to sunlight. That is why the plantation of the farmers in Kapangan, is far from the residential area and from the garden areas.

Land preparation. After selecting the site, the farmers clear the area for easier working condition and cultivation of the soil.

Preparation of planting materials (cuttings). According to the farmers, the ideal stems for planting material is the Batac variety. Their optimum age is about six to eight months old. The cutting must be from the basal to central portion of the plant. Cut the stems at an angle of 45 degrees and should be neatly cut without split or bark peeling. It must be 10 to 15 cm long, pencil sized (1 to 2 cm) with three to four active buds.

During rainy season, direct planting can be done but planting materials must be stored for about five to seven days in a cool and dry place, so that the end points of the cuttings will be dried. They are doing this to prevent it from rotting when it is already planted.

During dry season, they are incubating first the cuttings for three to five days then plant it in a nursery bed. Care and management are being observed, until they are ready to be transplanted.

Planting and maintenance. Planting should be done at the onset of rainy season (can be from April to July) especially in rain fed areas, but planting can be done anytime in a year in irrigated areas. The cuttings can be directly planted vertically at the area that was prepared. Transplanting of the saplings can be done in the field after 3 to 4 months of nursery establishment.

Weeding is very important to obtain optimum leaf yield. The farmers are cleaning



their plantations at least four (4) times a year or every after harvest to prevent competition in the absorption of nutrients and exposure to sunlight for photosynthesis. Accordingly, fully exposed mulberry leaves to sunlight are better than those that are not in terms of leaf nutrient contents.

Application of fertilizer is done best just after pruning. Adding nutrients for the mulberry plant produces good quality of leaves for a successful cocoon production.

Pruning is the cutting of branches and the top portion of the mulberry plant at desirable height, in order to produce the optimum quantity and better quality of mulberry leaves that is appropriate for silkworm rearing. The farmers usually do the pruning every after harvest or four times a year. First pruning is done when the mulberry is more than one year old, second is done every three months from last pruning, third pruning is cutting the stems at 5 to 10 cm above the previously left stem during the second pruning and fourth to the succeeding months, cut the stems at 5 to 10 cm cm above the previously left during the last month of pruning.

Pruning is use to removed the dead, crossing branches and serve as pest and diseased control. The farmers are also doing it to control the height of the trees and create thicker hedges by heading back long branches half way.

Harvesting. The farmers do the harvest in their plantation after 8 to 12 months from planting if it is well maintained. It depends on how they care and manage their plants. Leaf plucking method should be employed during the first harvesting to give time for the mulberry plants to fully develop at a desirable stem diameter, then a stem cutting methods for the succeeding harvesting every 2 to 3 months interval.



During the rearing of silkworm, the best time of harvesting leaves is early in the morning and late in the afternoon.

Cocoon Production (Silkworm Rearing) Activities

Silkworm rearing deals mainly on the vegetative stage of silkworm. The goal is to produce good cocoons for silk fabrics. Thus, to obtain a good quality of silk, proper care and management should be given emphasis.

Before the arrival of the worms to be reared, the room is totally cleaned and disinfected. Sanitation is fully observed during the rearing period to prevent the worms from sickness because they are very sensitive.

The larval life of the silkworm is divided into two stages: young larval stage which covers the first, second and third instars while grown age stage covers the fourth and fifth instars.

Rearing of young silkworm. After the incubation, the larvae started to emerge from their egg shell. The process of separating the newly-hatched larvae from the egg shell or egg sheets is brushing. The newly-hatched larvae are called ants, they are collected and transferred to the trays and fed with mulberry leaves, called the Ant collection. This is the beginning of silkworm rearing.

The mulberry leaves are chopped at the required size before spreading on the net to attract the larvae. Silkworms are being fed with the kind of leaves that are tender, succulent and dark green in color which is from the most full blown leaves in the branches. Standard sizes for leaves are observed for easy consumption by the larvae at various stage of development.



Optimum spacing and optimum quantity are being ensured during the feeding. Worms are uniformly distributed over the bed to ensure their uniform and healthy development because, well-fed worms grow and develop rapidly.

If the farmers wish to store or preserve leaves for later use, they put in a store room where evaporation is not high or sprinkle it with water, then cover with wet cloth and cellophane. The length of period when preserving the leaves, must not take a long time because it affects the nutrients of the leaves.

The appropriate temperature and humidity for young silkworms must be observed because it will affect the growth and larval duration of the worms. The farmers must do some of the remedy in order to meet the desired temperature and humidity.

Even distribution of light is important and air composition and circulation in the rearing room.

Space for the worms should be considered while they are growing, so that they will not be crowded in an area. During cleaning, be sure that the worms will not be injured. Bed cleaning can be done before molting, after molting and at an intermediate period during the instar.

Maintain dry environment and dry rearing bed before molting and keep the room dark to obtain uniform molting. First feeding after molting should be sufficient to satisfy appetite completely and use soft leaves.

Rearing of grown age silkworm. Silkworm can survive at 7 to 40 °C, but the optimum temperature requirement for normal growth is from 20 to 30 °C. The ideal temperature for grown silkworm is from 23 to 26 °C. Humidity affects the feeding ability of the worms thus, affects the growth so it must be observe carefully.



Ventilation is more helpful for silkworm growth when the humidity of rearing rooms is higher than the standard (70 to 75%). Harmful gas is generated from silkworm respiration, mulberry leaf and silkworm feces that can poison the worm. That is why; windows should be kept open for air current to move freely.

Balance light condition must be maintained because they are very sensitive to too much light, they prefer less bright area.

Grown age silkworms are fed by branch, so harvesting by branch is employed which require less labor compared to leaf plucking. The branch can be stored starting at a place where the lowest temperature is possibly take place, sprinkled with water and the covered with wet cloth and cellophane to minimize evaporation.

Silkworms eat much in the middle of each instar and eat less at the start and at the end of each instar. During the fifth instar, this has the highest consumption of leaves.

Bed cleaning is also being carried out once on the fourth instar and once on the fifth instars after the first feeding and just after moulting but it can be done as long as the bed is already full with silkworm litters.

It is necessary to enlarge the space of bed that will correspond to their growth. During its larval stage, they grow very fast for about 7,000 times in size and 10,000 times in body weight.

Moulting or the casting out of their old skin happens four times during their larval stage, thrice at young age and once at grown age. Moulting silkworms can be distinguished through their characteristics. This is the sensitive period for the silkworm because they do not eat, but just try to wriggle out from their old skin. The timing of



giving the last feed and the first feed is very critical as this affect their uniformity of growth.

During the fourth moulting, this will take about two days (48 hours) from the last feeding to first feeding. Application of lime or rice hull charcoal is when all the worms are asleep to lower the humidity in the bed, and do not disturb the worms while casting out their skin.

Mounting is the time/period when the worm begins to spin. It starts spinning on the seventh to eight day of the fifth instars. Matured larvae can be distinguished through its yellowish color.

There are two method of mounting: the selective mounting, wherein the only ripe worms are picked up and transferred to a cocooning frame and the mass mounting when about fifty (50) percent is ripe, where in all worms are collected and placed in the cocooning frame with 156 holes. The number of worms placed in one cocooning frame is 120 - 130 to avoid overcrowding. Room must be well ventilated and silkworm cocoons should be handled gently in three days after spinning period so that spinning worms will not be disturb.

After spinning, the larvae undergo metamorphosis inside the cocoons and become pupa, before the moth will come out harvesting must be done.

Cocoon Silk Processing

The income of the farmers may not stop on the production of cocoons only. Since sericulture is a multi-disciplinary industry that consist not only on moriculture and silkworm rearing but also on the processing of cocoons into rawsilk and weaving into



fabrics that could be utilize into various finish products that may increase the further the farmers' income.

In cocoon silk processing, the silkworm rearers do the harvesting up to the delivery of the cocoons and the rest of the activities are the releers'.

Harvesting of cocoons. Cocoons harvesting is being done only when the pupa inside the cocoon is already matured or brownish in color, probably at their 6 to 8 days after mounting.

Harvesting of cocoons with immature pupa is not advisable because there is a great risk of damage during handling or delivery as the skin is still delicate to friction due to shock that can cause staining on the cocoon shell. Cocoons that are harvested too early (less than 6 days) has a very low CSP (cocoon shell percentage) as the amount of moisture in the pupa is still very high but late harvesting (more than 8 days) resulted to lower cocoon weight and have a tendency that the moth will emerge and will damage the cocoon shell. It is also advisable to cut /open some of the cocoons and check the pupation conditions before harvesting.

During harvesting, the cocoons with stain or dead pupa should be removed first from the cocooning frame to avoid contamination with the good cocoons.

Preliminary sorting of cocoons. Preliminary sorting should be done immediately by removing first the cocoons with stained followed by the unreelable cocoons such as the double cocoons, flimsy, those with bed marks, thin ends and deformed cocoons. Second, separate the thin from that of the thicker cocoons because they have a wide difference in CSP (cocoon shell percentage) which is the preliminary basis in the determination of their classification.



Handling of good cocoons after harvesting. The cocoons are spread thinly to a cool and dry place with good ventilation after sorting. Pack only the cocoons at the time of delivery to avoid overheating and possible staining too due to faster decomposition or melting of the dead pupa inside the cocoons that may cause unreelability.

Cartoons or sacks can be use as packaging materials but preferably is the gunny sack or cloth, because of their capability to absorb the excess moisture of the cocoons. They limit the volume of fresh cocoons to 10 kilograms per sack and do not pile to more than four sacks to avoid damage due to compression by the weight of the cocoons at the upper stock.

Delivery of cocoons. Deliver the cocoons immediately after packing to minimize loss of weight and damage. Care of the cocoons during delivery should be given with importance, because delivery is one of the most critical parts in handling the cocoons that might greatly affect the quality.

Do not give a strong shock during carrying of fresh cocoons, because cocoons might be crashed; also do not direct to sunlight and rain. Within two to three (2 to 3) hours are favorable for transportation.

Weighing of cocoons. The cocoons should be weighed immediately upon delivery at the processing center to determine the fresh weight as basis of payment.

Cocoon quality determination. The primary way of evaluating the quality or classification of the cocoons is the cocoon shell percentage (CSP) determination method. This will be done by randomly taking twenty-five (25) pieces of cocoons samples (top, middle, and bottom of the bulk of cocoons) from every batch of cocoons. Every batch of cocoons that was reared from different rearing house should have separate cocoon



samples.

Drying of cocoons. Drying of cocoons should be done immediately after weighing and taking of samples for CSP determination. Because the fresh cocoon contains live pupa which will become moth after 13 to 16 days after mounting the silkworms, then the moth will emerge by making hole in the cocoon shell.

Drying the cocoons will reduce the moisture content of the cocoon to 40 percent for longer storage life and to kill the pupa to prevent it to undergo metamorphosis into moth that may emerge and destroy the cocoon shell (by making hole) that cause it to be unreelable.

The purpose of cocoon drying is to prevent the emergence of maggots and moths, removes the moisture contained in the cocoon shell and pupae, and the make cocoons capable of being preserved for a long time under normal temperature and humidity.

Drying temperature affects the cocoon shell. When the temperature exceeds the highest limits, sericin is sharply degenerated so that in the reeling process, the grouping ends efficiency and reelability decline, with resultant decrease in raw silk percentage of cocoons. It is advisable therefore, to limit the highest temperature to 110 ± 5 degrees Celsius for dryer with heat generated by electricity.

The drying duration should be exceeds to 6 hours and the temperature should gradually lowered from the start of drying to the finishing drying period.

The thickness of the cocoon heap should not exceed three pieces vertical filing to have a uniform and efficient drying. After drying, check the pupa that is inside of the cocoons, if it is crispy when crush and if it weighs 37 to 42 percent from its original weight which is the indication of properly dried cocoons.



Deflossing of cocoons. After harvesting, the cocoons are surrounded by a floss cover. The floss is the loose filament attached to the cocoons as anchorage of the silkworm during spinning. If the floss remains on the cocoon; it absorbs moisture and lower the cocoon quality. Deflossing or the removal of the floss of the cocoons can be done either before or after drying. It is necessary to be removed because it will affect the reelability of the cocoons and the quality of the raw silk.

Cocoons with floss may stick to one another and cause difficulties in handling. Moreover, as it is impossible to appraise the quality of cocoons still covered with floss it is necessary to remove the floss right after harvesting by using floss remover. The device may drive by hand, treadle or electric power.

Storage of cocoons. Cocoons can be stored up to 6 months without deterioration if the storage room cannot be influence by outside temperature and humidity. However, 1 to 3 months period of storage is the most ideal duration to ensure the higher reelability and quality of cocoons to be processed due to molds or insect damage.

Long period of storage is apt to deteriorate cocoon quality also affected by the storage condition. Bad and unsatisfactory storage may bring about the development of molds or damage due to insects and rats, so we should take especial care.

Cocoon final sorting. After drying or storing, the cocoons for reeling should be sort again to remove all defective or unreelable cocoons that will greatly affect the reeling process.

Cocoon cooking. It is the process of subjecting the cocoons to a hot water to soften the sericin of the cocoon shell that binds together the filament or fibrin in preparation for the reeling process.



The purpose of cocoon cooking technique is to perform the cocoon cooking suitable to the reeling process so that the raw silk of objective size and quality may yielded from fix amount of cocoons much and effectively. The condition to satisfy the aim is optimum cooking.

Good cocoons should be cooked for 10 minutes, fair cocoons for 12 minutes and inferior cocoons for 15 minutes.

The process of cocoon cooking has a great influence on the reeling result. Both the undercooked cocoons have low rawsilk percentage. Because undercooked cocoons have a high groping end waste due to serious broken cocoon ends. Likewise, overcooked cocoons will leads to higher groping end waste too at the outer layer of cocoons and much lost of sericin during cooing process resulting to higher breaks too.

Cooked cocoons should be placed in a cocoon tub with ideal water temperature of 30 to 40 degrees Celsius. High temperature of tub decreases rawsilk percentage of cocoon by the increased lost of sericin, but low temperature of the tub bath decreases the reelability by hardening the sericin.

Cooked cocoons should not be exposed to air. It must be reeled as fast as it can be because long stand-by after cooking, the temperature of the tub bath decreases and the acidity increases from the soluble components of pupa which causes acidity that affect reelability.

Reeling of cocoon. Silk reeling is the process wherein the cocoons filament will be unwind. The individual filament of a certain number of cocoons will be wound together to a small reel to produce rawsilk.



During reeling, in case that any of the filament will be broken down, it should be replace immediately and maintain the required number of cocoons filament ends for about 8 to 12 cocoons are fed throughout the reeling process to avoid uneven thickness of the rawsilk.

Rereeling. This is to rewind the rawsilk from the small reels of the reeling machine to the bigger reels of the rereeling machine. The process will correct any breakage of the raw silk (by tying together), the thin part of the filament that makes the uneven thickness of the rawsilk and the entangled part will be removed in this process.

Prior to rereeling, the rawsilk on the small reels should moisten to soften the gummy sericin to improve the unwinding efficiency of the rawsilk and to prevent the skein/hank from being disturbed. The method of supplying moisture on the raw silk is soaking, wherein the rawsilk on the small reels will be soaked in warm water (40 to 45 degree Celsius) for 10 to 30 minutes.

Skein lacing and twisting. Prior to the removal of the rawsilk from the big reels, the skein will be laced with cocoon yarn at four section to maintain the skein shape undisturbed. Then the skein will be twisted for easier booking and transporting.

Agencies that Renders Assistance

The Fiber Industry Development Authority (FIDA) through Mrs. Fe G. Donato, the Provincial Fiber Officer of the Benguet FIDA, is helping the industry through linking to the market, promoting, conducting training with the help of other supporting agencies, assessing the farmers and monitoring of the project. They also provided two hundred (200) sets of cocooning frame.



The Local Government Unit- Kapangan provides a soft loan from Municipal Social Welfare and Development (MSWD) through the sake of twenty thousand pesos (P20,000) and the Office of the Municipal Agriculture through the MRAF with fifty-five thousand pesos (P55,000) for the screened Sericulture farmers to construct/build their rearing house with five thousand pesos (P5,000) each. This was then availed by at least eleven (11) identified/ prioritized Sericulturist. They also provide a soft loan of sixty thousand pesos (P60, 000) which is being used as revolving fund. They funded the construction of Young-Age Rearing Center at Bolinsak, Taba-ao, Kapangan with a project cost of four hundred twenty thousand pesos (P420, 000).

The Department of Labor and Employment (DOLE) extended more or less five hundred thousand (P500, 000) from the one million (P1, 000,000) they promised to give under the “Poverty Freezone Program” of their agency for the purchase of 8 village type reeling machine, 3 village type rereeling machine and top loading balance which was designed by FIDA, trainings (on bookkeeping and accounting and processing of the cocoons) and other materials used in the production of raw silk.

Again, due to the full support and cooperation shown by all concerned agencies, the Sericulture farmers through the initiative and leadership of Mayor but now Board member, Hon. Rogelio P. Leon, continues assistance of FIDA in making project proposals and the full support of the present energetic Mayor of Kapangan, Hon. Roberto K. Canuto, thus the one million (P1, 000,000) worth of twenty (20) units rearing house (7 units at Cuba, 6 units at Labueg, 1 unit at Pungayan, 2 units at Pudong, 2 units at Paykek and 1 unit at Taba-ao) from the Dangerous Drug Board (DDB) through Usec. Romeo Vera Cruz was released and now the entire rearing house is under construction



and being closed supervised and monitored by FIDA and LGU- Kapangan.

The Department of Tourism - Cordillera Administrative Region also extended their support through sponsoring the industry to attend trade fairs in promoting the products and for the exposure of the Sericulture farmers.

The Department of Trade and Industry and Department of Agrarian Reform funded training on cocoon flower making, which was conducted by FIDA.

The Philippine Textile Research Institute-Technology Center serves as the supplier of viable silkworm eggs.

On the other hand, Honorable Governor of Benguet, Governor Nestor B. Fongwan gives also his full support to the industry by looking for some ways and means to help the coop and the Sericulture farmers as a whole.

Problems Encountered by the Industry

Under the mulberry production, the farmers' major problem is on the maintenance of their farms since, weeding the area is costly and requires much time and attention. According to the farmers, they can able to finance their plantation once they are on the mass production. Another major concern is the source of irrigation, especially during summer. Water is not enough to irrigate their farms that often lead to limited productivity of the plants (fewer leaves) and in return it affects the rearing of worms since the leaves are not enough to feed them. In addition, although disease of the mulberry is seasonal and can be prevented through pruning still this affect the volume of silkworm they must rear.

On silkworm rearing, the rearers identified that strain of the silkworms is their primary problem since others are susceptible to diseases and they produce low quality of



Table 5. Problems encountered by the industry

PARTICULAR	FREQUENCY	PERCENTAGE
Problems on Mulberry Production		
Maintenance of the plantation	17	51.52
Source of water during summer	9	27.27
Fertilizer for the plant	3	9.09
Source of cuttings	2	6.06
Diseases of the mulberry	6	18.19
Problems on Silkworm Rearing		
Disease	2	16.67
Unpredictable weather	5	41.67
Strain of the silkworm	6	50.00

* Multiple response

cocoons, even the farmers had tried their best in rearing them. Sickness of the silkworm is another problem because once they are affected; the quality cocoons that will be produced will also suffer but according to some co-members these will not happen when sanitation is strictly observed. The weather will also affect the silkworms since sometimes they are not adoptable to it.

Reelers also said that early harvesting of cocoons is one of the problems because during the processing more cocoons are stained especially just after cocoon drying.

The management need assistant about the packaging of the rawsilk especially during delivery so that it will be accessible to the buyers and to be more attractive.



Plans and Expectation of the Industry

The Industry is planning to have a board meeting every first and last Thursday of the month. They will make a resolution that the share capital (P5000/ share) will be use for payment of the cocoons that will be produce by the farmers while the soft loan (P60, 000) will be use as a revolving fund for the reelers (cocoon processor).

The cooperative will be having training on incubation to be sponsored by the Cooperative, LGU and FIDA. Through MSWD-TESDA is the upgrading of the cocoon processing. There will be also training on making of cocoon crafts on where the unreeled cocoons will be used in it.

They will also ask the Provincial Government Office-Tourism to sponsor a training/seminar on “How to deal/entertain visitors?”

They will seek help from the Government or Non-government Agencies to grant some of the machines needed in the processing of cocoons. They will make a Memorandum of Agreement (MOA) that they will use the processing center at Wangal, La Trinidad, in case the reelers in Kapangan cannot process all the cocoons that were produced since the capacity of the machine is limited.

The Sericulture Industry will serve as a supplemental livelihood for the Province of Benguet but it will serve as expansion area for the KELMC-Sericulture.

They are expecting that the area of mulberry plantation will increase this coming planting season coming May, 2008 and the production of cocoons will also increase with the use of the twenty (20) rearing house from the Dangerous Drug Board.

The management will increase the percentage of the capital build up that is being deducted from the sales of cocoons sold by the rearers, from 3% to 5%.



SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

This study was conducted to determine the profile of the Sericulture Industry in Kapangan, Benguet that was launched last December 18, 2004 through the joint effort of the Fiber Industry Development Authority (FIDA), the LGU-Kapangan and the Philippine Textile Research Institute (PTRI). It was conducted from January to February, 2008 with the help of the members of the Kapangan Environmental Livelihood Multipurpose Cooperative - Sericulture, their reelers and the Provincial Fiber Officer (Benguet-FIDA) who all served as the respondents of the study.

Sericulture Industry in Kapangan, Benguet is basically the Kapangan Environmental Livelihood Multipurpose Cooperative - Sericulture (KELMC-Sericulture) itself. There are no individual firms in Kapangan that is into Sericulture except for the said organization. The industry is composed of thirty-three (33) members of the cooperative and ten (10) reelers. The reelers are also family members of the said cooperative members.

Activities in the industry include mulberry production, cocoon production and processing, and marketing.

In terms of the cooperative's membership profile, results reveal that in terms of sex, the numbers of male and female members are almost the same. For the members' ages, the youngest is thirty-four (34) years old while the oldest is seventy-three (73) years old. Although there are no significant differences on the number of members falling under specific age range, more falls under 58 to 65 years old (27.27%). In terms of level



of education, most are literate with a significant 12.12% even finishing college; this is of course advantageous to every organization for according to study, literate members are more receptive. Majority (72.73%) of the members are married. Similarly, majority (75.75%) of the members are into sericulture already for around three years (the cooperative is also three years old), indicating that they are the original members of the cooperative. In addition, more and more are venturing into sericulture as marked by the increase in the number of members from year to year. As to the type of activity engaged in, majority (63.64%) is into mulberry production while the rest is both into mulberry and cocoon production. The reason on why the former group is into mulberry production only is because some are still establishing and developing their mulberry plantation. Some have no rearing houses for silkworm yet, although said rearing house were already started to be built, courtesy of the Dangerous Drug Board (DDB).

Mulberry plantation in Kapangan has a total land area of eight and one-fourth (8.25) hectares but the productive area is only six (6) hectares. The rest are under the developing stage. The plantation areas are found at Barangay Cuba (sitio Proper and Nalbengan), Taba-ao (sitio Bolinsak, Legwe, Abiang and Daklan), Pudong (sitio Cabilisan and Bacatey), Datakan (sitio Poking and Tacal) and Pungayan (sitio Sagapa). Majority (57.58%) of the members have plantation areas that are above 2500 sq.m to 500 sq.m. Most (90.91%) of the mulberry farmers were not applying fertilizers for their plantations because the area was not being utilized for several years so organic matters are still present. These shows that farmers save much in terms of inputs costs. Most (81.82%) of the farmers rely on rain to irrigate their farms, that is why they usually plant mulberry during the onset of rainy season.



Silkworm rearing is another activity under Sericulture Industry. This depends on the mulberry plants (leaves productivity) that a farmer has because this serves as the only food for the silkworm. The PTRI is the supplier of the silkworm for the farmers, which cost them two hundred thirty pesos (P230) per box.

Processing of the cocoons is being done in order to produce raw silk. This processing is being done by the reelers that were trained. Processing area is located at Lomon, Kapangan, Benguet wherein the cooperative is located.

The cooperative serves as the market outlet for the producers so the prices of the cocoon and the raw silk are somehow stable because no middlemen to intervene, although price of each product still depends on the prevailing market price. The cooperative usually sell the raw silk at Aklan and at Benguet to the local weavers. Promotion is being done through attending local trade fairs and through the help of the supporting agencies.

In 2005, the farmers were able to produce two hundred sixty-five (265) kilograms of fresh cocoons. In 2006, they produced three hundred ninety-one and fifty (391.50) kilograms while in 2007, they were able to produced four hundred one and sixty (460) kilograms.

The farmers use the equipment that are required during rearing like the cocooning frame or the mountage, rearing bed, cleaning nets, knife and others. In the processing of the cocoons the reelers make use of the eight reeling machines, three rereeling machines and other equipments needed during processing.

The agencies that render assistance to the Industry are, Fiber Industry Development Authority, Local Government Unit of Kapangan, Dangerous Drug Board,



Department of Labor and Employment, Philippine Textile Research Institute, Department of Tourism (DOT-CAR), Department of Trade and Industry and Department of Agrarian Reform and the Provincial Government of the Province of Benguet.

The problems that most of the farmers encountered are on the maintenance of the mulberry plantation, the bad strain of the silkworm that they bought since this has an effect to the quality and the volume of cocoons they will produce.

The Industry is planning to have a board meeting every first and last Thursday of the month. They will make a resolution that the share capital (P5000/ share) will be use for payment of the cocoons that will be produce by the farmers while the soft loan granted (P60, 000) will be use as a revolving fund for the reelers (cocoon processor).

The cooperative will be having training on incubation, upgrading of the cocoon processing, making of cocoon crafts and training/seminar on “How to deal/entertain visitors?” through the help of supporting agencies.

They will seek help from the Government or Non-government Agencies to grant some of the machines needed in the processing of cocoons. They will make a Memorandum of Agreement (MOA) that they will use the processing center at Wangal, La Trinidad, in case the reelers in Kapangan cannot process all the cocoons that were produced.

The Sericulture Industry will serve as a supplemental livelihood for the Province of Benguet but it will serve as expansion area for the KELMC-Sericulture.

They are expecting that the area of mulberry plantation will increase this coming planting season coming May, 2008.



Conclusion

Sericulture Industry in Kapangan, Benguet is basically the Kapangan Environmental Livelihood Multipurpose Cooperative - Sericulture (KELMC-Sericulture) itself. There are no individual firms in Kapangan that is into Sericulture except for the said organization. The industry is composed of thirty-three (33) members of the cooperative and ten (10) reelers. The reelers are also family members of the said cooperative members.

Engaging in Sericulture business does not require any profession, age, sex and status as long as they have the willingness to engage and the ability to work in order to cope with the requirements.

Establishment of mulberry plantation is the first thing that must be done in venturing to Sericulture. During maintenance, care and management must be observed since this is the basis of kilograms of silkworms that a farmer must rear.

Sanitation and special care and management must be observed during the rearing of silkworms because they are very sensitive that will affect the quality of cocoons that will be produced.

Government and Non-Government agencies are playing an important role in helping the Industry by sponsoring and conducting trainings, providing financial aids to the Industry and other support that they are extending for the reviving of the Industry.

Mass production of cocoons is the answer to the farmers' problem on where they will source out financial that is needed in the maintenance of their mulberry plantation.

The plans and expectation of the Industry indicates that it has a future.



Cooperative has a great help to the farmers because they really care to the farmers welfare not the profit they earn.

Recommendation

The rearers must observe sanitation during rearing period to avoid the occurrence of sickness. Proper timing of mounting the larvae and in harvesting the cocoons to lessen waste cocoons during processing.

The members must increase the area of their mulberry plantation to meet the standard rearing volume of silkworm in a year.

Cooperation from the members together with the supporting agencies is needed in order for the industry to be successful.

Improve of the packaging of the raw silk so that it will look more attractive and must be accessible to the buyers.

More encouragement and close supervision to farmers must be observed by the supporting agencies so that they will not give up instead they will encourage other farmers to venture in it.



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INTERVIEW QUESTIONNAIRE (FOR THE FARMERS)

I. Personal Background

1. Name: _____
2. Gender: ____ male ____ female
3. Age: ____
4. Level of highest education

____ no formal schooling	____ high school graduate
____ elementary undergraduate	____ college undergraduate
____ elementary graduate	____ college graduate
____ high school undergraduate	
5. Marital Status

____ single	____ separated
____ married	____ widow/widower
6. Year of involvement in Sericulture

____ 3 years	____ less than one year
____ 2 years	
7. Type of sericulture farming

____ mulberry production
____ both mulberry production and cocoon production

II. Technical Aspect

A. Mulberry production

1. Approximate area of mulberry plantation

____ below 2500 sq. m	____ 2501 to 5000 sq. m
____ 5001 to 7500 sq. m	____ 7501 to 10 000 sq. m
____ 10000 sq. m & above	
2. What is the best month for planting?

____ January to April	____ May to August
____ September to December	____ others (specify) _____
3. What is the required variety of mulberry for silkworms' food? _____
4. How many months does it take the plants before it is ready to be feed to silkworm?

____ 6 to 8 months	____ 9 to 12 months
____ 1 year and above	____ others (specify) _____



5. Are you applying fertilizer to it?

yes no

6. If yes, how often and when? _____

7. What kind of fertilizer?

commercial non commercial

8. Source of water for the plants.

rain irrigation

B. Silkworm rearing

1. Where do you acquire the silkworm that you rear? _____

2. What stage you start to rear the worms? _____

3. How often do you feed the worms in a day?

3 times a day 4 times a day
 5 times a day 6 times and above

4. What instar has the highest consumption of leaves?

1st to 2nd instar 3rd to 4th instar
 5th instar others (specify)

5. Where do you rear the silkworms?

improvised rearing house
 concrete rearing house
 others (specify)

6. How many rearing did you observe as of last year?

once twice
 thrice four times and above

7. How many boxes of worms did you rear as of last year?

below 1 box 1 to 2 boxes
 2.1 to 3 boxes 3.1 boxes and above

8. How many kilograms of fresh cocoons were produced as of last year?

1 to 10 kilograms 10.1 to 20 kilograms
 20.1 to 30 kilograms 30.1 kilograms and above

9. What class of cocoons has the highest kilograms did you produced as of last rearing?

class a class b
 class c



III. Marketing aspects

1. What kind of packaging materials used in transporting the cocoons?

Sacks cartoon

others (specify) _____

2. Methods of delivery/marketing

delivered personally delivered by the cooperative

others (specify) _____

3. To whom do you market? _____

4. How much is the selling price of cocoon per kilograms?

Class A Class B

Class C

5. Methods of payment by the buyers.

cash basis credit

others (specify) _____

IV. Financial Aspects

1. what are the source of funds used in the operation?

own money grants and donations

loans from the cooperative

Others (specify) _____

2. In what terms are funds granted?

cash in kind

others (specify) _____

3. What is the method of repayment employed?

full cash through deducting from payment of cocoons

installment others (specify) _____

4. How much is the Interest? _____

V. Evaluation

1. Where did you acquire the knowledge in Sericulture?

through experience

through actual training given by the supporting agencies

through observation

others (specify) _____

2. What are the help extended to you by your cooperative?

marketing of the cocoons

others (specify) _____



3. How do you evaluate the Sericulture as your source of income?
 good not good

4. Why it is not good/ not good? _____

5. What can you say about the profitability of the project?
 profitable not profitable

VI. Problems Encountered by the Farmers

1. Mulberry production

- laborious during weeding
- water supply during summer
- lack of fertilizer to apply
- supply of cuttings
- sickness of the mulberry
- others (specify) _____

2. Silkworm rearing

- silkworm disease
- lack of tools and equipment
- others (specify) _____

3. Marketing

- low cocoon price
- delayed payment of cocoon
- high cost of transportation
- lack of choice of market outlet
- others (specify) _____

4. Financial

- insufficient fund to use
- slow release of loans
- high interest of loans
- others (specify) _____

5. Management

