Factors affecting productivity and profitability of sericulture-based agroecosystems

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Abstract

This appraised the farmers' sericulture practices in order to determine the factors affecting the productivity and profitability of sericulture-based agroecosystems managed by individual and cooperative farmers in Region1, Philippines. Employing various data-gathering techniques like interviews, participant-observation, surveys and case studies, the study has surfaced several problems besetting sericulture in the region. These problems pertain mainly to mulberry production, silkworm rearing, and operational financing - which altogether contributed to low quality cocoon production and, therefore, profitability. From the findings, a number of measures were identified that could possibly improve silkworm productivity and income of farmers.

Keywords: *sericulture, productivity, profitability, mulberry, silkworm, cocoon yield, agroecosystems*

Introduction

Sericulture in the Philippines has remained on a developmental stage. Production is limited to 11.02 metric tons (dry weight) of cocoons and 2.8 mt of raw silk (FIDA, 2002). World production was estimated at 121,753 metric tons where 81% is produced in China at 98,620 metric tons and India at 19,600 metric tons (DH News Service, 2010.) There is an increasing local and international demand for different product lines. Sericulture, the art and science of raising silkworm to produce cocoons, has a great potential of increasing farm productivity and income of rural communities. Since silk production is labor-intensive,

it could provide gainful employment to rural men, women, and out-of-school youth (FAO, 2001). The silk enterprise is compatible with existing farming systems. The mulberry tree (*Morus alba L.*) has multi-functions which include: food of the silkworm (*Bombyx mori L.*), animals, human, and for fuel and soil conservation (Padilla et al., 1999).

Sericulture in the Philippines has a long history. In 1593, Jesuit priest Antonio Sedeño introduced sericulture in the Visayas (Inumpa, 1996). In 1905, the Bureau of Agriculture revived the industry using silkworm eggs imported from Japan. In 1907, the Bengal-Ceylon multivoltine race of the silkworm moth was introduced in the Philippines. The industry collapsed during World War II but was revived through the Mountain Province Development Authority in La Trinidad, Benguet in 1960 (FIDA, 2002). Sericulture was revived in La Union through a PCARRD-funded project in 1980 with DMMMSU as a collaborating agency in the National Sericulture Research and Development Program.

Region 1 ranks second in cocoon and raw silk production in the Philippines (FIDA, 2002). Sericulture is practiced by upland farmers at a small scale level due to small land holdings (0.5 to 1 ha) and limited capital, and it is done as cooperative ventures supported by government, non-government organizations or foreign institutions. Low farm productivity, associated with low quality mulberry leaves and cocoons, is a common problem of sericulture. However, the factors contributing to this are not fully understood. Thus, this study aims to determine the factors affecting the productivity and profitability of sericulture enterprise in Region 1. In the main, it looks at the existing sericulture practices of individual and cooperative farmers, and identifies the problem areas and the possible measures to address these.

Methodology

The study was conducted in Region 1, Philippines covering the provinces of La Union, Ilocos Sur and Ilocos Norte (Figure 1). The research respondents are the sericulture farmers, either as individual farmers or as members of a cooperative. The individual farmer type was characterized as management done by a single farm family working in his own land and owning a rearing house. The cooperative type corresponded to management by group efforts working on farms on a lease basis. There were 28 individual farmer-respondents, one each from the towns

of Batac in Ilocos Norte; Magsingal in Ilocos Sur; and Agoo, Naguilian and San Fernando in La Union; two from Sto. Domingo, nine from Sta. Maria in Ilocos Sur; two from Tubao in La Union; three from San Juan; and seven from Bauang in La Union. For cooperative respondents, a total of 61 farmers were interviewed, 45 of which were from Sta. Maria in Ilocos Sur, four from Candon in Ilocos Sur, 10 from Lydia Marcos in Ilocos Norte, and one each from Sudipen and Bacnotan in La Union.

Both formal and informal types of data gathering were used in the study. For the informal type, a semi-structured questionnaire was used to interview the key informants such as project leaders, farmers, and barangay officials present in the area. Participant observation was also employed to elicit information. Secondary data were obtained from available records at the project sites and the government offices involved in the project. For the formal type, a structured survey questionnaire was prepared. Personal interviews were conducted to elicit information among individual farmers and farmers working in a cooperative. The case study method was used to generate information concerning the implementation of the program in a real-life setting. It used multiple sources of evidence to describe and analyze the agroecosystems (Yin, 1993). The data gathered were analyzed and fed back to the respondents for information checking and exchange of opinions.

Qualitative and quantitative data analyses were used in the study. Percentages, frequencies, and weighted means were used in the analysis. Cost and returns estimates were used to evaluate the financial performance of the farms. Measures such as net returns, return to labor, material costs and returns on investment were employed. Net return was computed as Gross Income minus Total Expenses (Variable and Fixed Cost). Fixed costs included depreciation of equipment, facilities, rentals and realty taxes, while variable costs included hired labor, family labor, materials and cost of capital involved in the operations. Data on total cost was based on the average of years farmers had conducted rearing. Farm gate price was based on the average selling price of products prevailing in the area. Productivity measures such as return on investments (ROI), returns above variable cost (RAVC), returns to material cost (RTMC), returns to labor (RTL), marginal benefit cost ratio (MBCR) were computed. ROI was computed as Average of Net Income divided by Total Investment + Working Capital. RAVC was computed as Gross Income minus Total Variable Cost. MBCR was computed as Added Return divided by Added Cost.

Results and Discussion

Sericulture practices

All the respondent farmers in cooperatives and 28% of the individual farmers produced their own saplings. They secured branches of an 8-10 month old mulberry Batac variety from SRDI. These branches were cut into pieces, each with 2-3 active buds and at 1-2 cm diameter. These were then treated with fungicide solution before they were incubated in sacks for five days, then planted in prepared seedbeds at a distance of 5 cm between hills and 5 cm between rows. All farmers irrigated their plants during the early stages of growth. Weeding and fertilizer application were started one month after planting. Only one farmer practiced mulching. Uprooting saplings was done at 4-7 months after planting. Both cooperative and individual farmers plowed and harrowed their areas using the tractor-rotavator or animal-drawn plow. Double rows of mulberry were planted at a distance of 1.5 m between double rows x 0.5 x 0.5 m between rows and between hills for cooperative farms while single rows of mulberry set at 1.5 m between rows x 0.5 m between hills were followed in individual farms. Three cooperative farms were totally rainfed while the other three cooperative farms practiced irrigation in a limited scale during the dry months. For individual farmers, 34% practiced irrigation drawn from dug wells, while 17.39% practiced furrow or flooding method. Not all areas were weeded or under-brushed in cooperative farms while majority of the individual farmers practiced weeding. Pest control was not done by majority of the farmers.

Some farmers harvested leaves 7-8 months after planting while majority did the harvesting after 11-12 months after planting. Majority of the farmers pruned their plants one year after establishment and every after harvesting at the height of 50-60 cm. Farmers no longer replant the missing hills after a year. About 33% of the cooperative farmers irrigated their farms, while majority did not irrigate their mulberry plants. Among the individual farmers, five irrigated their plants, five occasionally practiced irrigation, while 13 did not irrigate their plants even during hot summer months. This was due to drying up of rivers and creeks and the deepening of the water table. Only one farmer continued to irrigate and manage the family's mulberry and agroforestry farm.

Most sericulture farms were established in monocropping systems. Most sericulture farms, rearing houses, and family houses were adjacent to each other for easier access and mobility in harvesting leaves and feeding silkworms. It is worthy to note that one farmer in Sto. Domingo, Ilocos Sur is already practicing Fruit-Animal and Sericulture Integrated Production System. The farmer had two parcels of mulberry farm in monocrop scheme, while the other one was done in an agroforestry scheme. The family maintained a two-hectare rice farm, had large backyard planted with various fruit trees, ornamentals and some vegetables. Likewise, they raised cows, goats, pigs and native chickens. They had a rice grinding business and were engaged in buying and selling of palay and rice grains. The integration of mulberry in between rows of fruit trees made the land more productive while waiting for the trees to grow and bear fruits.

Most cooperative and individual farms had semi-permanent structures made of cement blocks and local materials. These had varying capacities: more than 10 boxes per rearing for Lydia in Marcos and Sta. Maria in Ilocos Sur; 3-4 boxes for Sapilang, Candon and Sudipen cooperatives while 1-2 boxes for San Agustin. Most individual farmers' rearing houses had a capacity of 1-4 boxes per rearing. Most of them had moderately adequate rearing facilities. Farmers had different rearing racks. All the farmers disinfected their rearing houses and implements using formalin and calcium hypochlorite at recommended rates using a power sprayer. About 33% of the cooperative members, and 9% of the individual farmers used the manual sprayers. All of the farmers washed their nets and other rearing paraphernalias, and sun-dried these to sterilize them. Rotary frames and plastic mountages were heated through a blowtorch. The surroundings were also kept clean by sweeping.

Almost all the cooperatives and individual farmers used the DMMMSU and PTRI silkworm hybrids. Most farmers brushed their worms in a young-age tray lined with a paraffin paper. Feeding was done four times a day, i.e., 5-6 AM, 9 AM, 3 PM and 5-6 PM. For young-age rearing, the harvested young leaves were chopped into small pieces. For late-age rearing, young shoots or branches were used to feed the older worms. Before the next feeding and after bed cleaning, the worms were spaced into desired spaces to avoid overcrowding and to allow the worms to freely crawl and seek their food. Undersized and/or sick worms were handpicked, placed in a container with 2% formalin solution, and

taken out then buried into the soil. All farmers cleaned their rearing beds every after moult. The waste materials were placed in a corner for decomposition while some were placed in pits. Before settling, worms were fed with leaves chopped in noodle shape. To facilitate moulting, rice hull was evenly distributed to the silkworms.

Productivity and profitability of sericulture farming

On the average, an area of one hectare had a production of 147.31 kg from rearing 6.84 boxes of silkworms for 3.87 times rearing for cooperatives (Table 1). Such production was low, as rearing 8-10 times a year using the blocking method is the optimum practice. Likewise, the number of boxes reared per operation was so small despite the possibility of rearing more than four boxes per rearing. Cooperative farmers had production per box ranging from 15.95 to 26.47 kg/box with an average of 21.65 kg/box. Only two of the cooperatives met the acceptable productivity of 25 kg/box, which is highly remunerative. With a break-even yield of 13.45 kg per box, farmers were gaining from the remaining 8.2 kg/box priced at PhP 122.65 or an income of PhP1,005.73/box.

From 1999 to 2004, 28 individual farmers were actively involved in sericulture. They operated a 0.25-hectare sericulture farm, with only 11 operating a 0.5 - 1 hectare plantation. On a per hectare basis, individual farmers had a production ranging from 80.1 to 697.78 kg or an average of 103.45 kg/ha. Average yield per box was 19.56 kg which is just 6.11 kg above breakeven yield. The bulk of cocoons was produced in Cabigbigaan and Flora, Sto. Domingo, Magsingal, and in Nagtupacan, Sta. Maria, Ilocos Sur. Areas with high production in La Union were found in Narra and Sipulo in Bacnotan where the farmers reared more frequently and have larger areas of mulberry farms. Most farmers were not rearing silkworms to their optimum potentials. The optimum capacity of rearing house at 2-3 boxes per rearing was not explored. On the average, individual farmers reared only 11.77 boxes per year (3.62 boxes x 3.25 times per year). Thus, average production resulted only in 236.71 kg for the 11.70 boxes. Since most farms are rainfed, dry season rearing was suspended as mulberry had poor growth. During the onset of rainy season, most farmers prioritized their rice farms for seedling establishment, and they started their sericulture activities only after rice crop establishment.

The income of farmers is dependent on the quantity and the quality/grades of cocoons. Class A cocoons are priced at PhP 150 /kg, PhP 130 for class B; PhP 110 for class C and PhP 45 for rejects. Most cocoons were graded B to C for the cooperative farmers. Their cocoons had an average price of PhP 122/kg, a 19% less than class A. With average production of 147.31 kg/ha, they earned a gross income of PhP 17,970 (Table 2) and net income at PhP 6,660. Most cooperative farmers had fair return on family labor, which ranged from PhP 181.35 to PhP 505.02 with an average of PhP 326.80. Return on investment ranged from –0.01 to 15.06% with an average of 7.53%.

The gross income of individual farmers in La Union ranged from PhP 12,696 to PhP 45,940 while in Ilocos Norte, it ranged from PhP 10,354 to PhP 87,048/year. The average gross income for the two sites was PhP 30,830/year. Their cocoons fetched slightly higher average price of PhP 125.25 than the cooperatives although the quality of cocoons produced were mostly Class B-C. After deducting the fixed and variable costs, their average net income was PhP 6,152/year. Some farmers earned net income of more than PhP 10,000 pesos particularly in Narra and Sipulo in La Union and in Cabigbigaan and Flora, Sto. Domingo in Ilocos Sur, Magsingal, and Nagtupacan 3, Sta. Maria in Ilocos Sur.

Returns to family labor had an average of PhP 256.28 which was 1.7 times higher compared with the prevailing wage of PhP 150 (Table 2). With sericulture, the farmers used their time wisely and earned income for the family.

Factors affecting the productivity and profitability of sericulture farming

Low quality mulberry leaf yield and low cocoon yield and quality are the twin problems of sericulture farmers in Region 1. Several factors are responsible for these. As a whole, most farmers had waning interest to venture in sericulture. Most cooperative and individual farms were neglected or not properly managed leading to abundant weed growth. Sometimes, weeds outgrow the mulberry plants. Grasses, sedges and viny broadleaves were prevalent during the rainy seasons. The weeds competed for plant nutrients and space and made harvesting difficult, thus increasing the harvesting costs. Mulberry root rot severely damaged

some portions of the mulberry plantations of Sta. Maria, Ilocos Sur, leading to reduced plant population. With limited land care and the presence of weeds, pests and diseases, plant growth and development were poor, hence, the low yields of quality mulberry leaves.

Another major problems is low soil fertility and the lack of measures to address this. Soil analysis showed that cooperative farms had 1.48 ppm OM, 44.54 ppm P, 170.63 ppm K and a pH of 6.55 while individual farms had 1.46 ppm OM, 64.02 ppm P, 259.31 ppm K and a pH of 6.4. The farmers seldom met the fertilizer requirements of their farms particularly when their subsidies were withdrawn, and they were not able to generate extra income to meet the rising costs of inputs. During the first year, the average application of fertilizer by most farmers was only 100-50-50 kg NPK/ha without organic fertilizer, while in the second year, application decreased to 150 kg NPK/ha without organic fertilizer application. This even decreased in later years. Unfortunately, green manuring or green leaf manuring as soil amendments were not tried by the farmers. Organic fertilization was not also done.

Another factor is that the mulberry farms were mostly rainfed. The rains occur mainly during July to August but cease in October or November. At this time, the water table in wells deepens further, while the creeks and rivers dry up. The drought resulted in the non-cultivation of mulberry plants and reduced rearing frequency of sericulture farmers. Farmers prioritized their meager water resource to irrigate their food crops rather than their mulberries. Thus, the potential of 5-6 times rearing was not met due to poor growth and low quality of mulberry leaves. Despite this, most farmers did not attempt to mitigate the effects of water scarcity. They did not also conserve water through mulching or organic/green manuring.

The poor performances of the existing production systems did not generate much income for farmers to buy farm implements and to finance irrigation facilities. Furthermore, when funding support was withdrawn from the cooperatives, it brought their finances further down and they were left with meager capital for their next operations. Credit sources were not sought due to high interest rates. Their average ROI was only 7.53%. Most bank lending rates averaged 14%. Most cooperative farmers had a low yield which ranged from 15.95-19.25 kg per box. Only four individual farmers had attained more than 25 kg per box while the

majority (24 out of 28 farmers) had poor production performances. One cooperative farm had obtained a high yield of 30.03 kg per box, but it was short-lived due to a tenancy problem.

Cocoon yield was also influenced by many factors. Most breeds delivered at the project sites had 85% hatching percentage which was 10% below the ideal hatching percentage of 95%. This was attributed to problematic operation of the cold storage facility of the source of eggs (SRDI). Frequent brownouts during summer caused fluctuations of temperature of the cold storage facilities and incubating rooms, hence resulting in stale eggs and weak worms. Silkworm being reared were also infected with various pests and diseases. Common diseases during summer months were grasserie and flaccherie. The outbreaks of these diseases were influenced by high temperature and humidity, poor ventilation, ineffective disinfection of rearing rooms and equipment, and excessive moisture in bed (Inumpa, 1996). Rearing houses built by the farmers were far from ideal to provide optimum environmental conditions for the silkworm.

Finally, while prices of inputs and wages were increasing, the selling price of cocoon remained constant. The farmers said that the prices of cocoons should increase to offset the rising cost of fertilizers, gasoline or crude oil. From the usual prices of PhP 8.63 pesos of diesel, PhP 20.03/li gasoline and PhP 82.20/li oil in 1999, they rose to PhP 20.33/li diesel, PhP 22.73/li gasoline and PhP 36/li oil in 2004. Likewise, the cost of complete fertilizer rose from PhP 470/bag in 1999 to PhP 660/bag in 2004 while UREA fertilizer with a price of PhP 353/bag in 1999 was priced at PhP 571.36 in 2004. The cost of hired labor also increased from PhP 120/day in 1999 to PhP 140/day in 2004. Altogether, their net income severely decreased. Compounding their difficulties was the way they were paid for their cocoons. DMMMSU-SRDI and FIDA-LACTO monopolized the buying of cocoons, and the farmers were paid only 2-3 weeks – and in checks – after selling their cocoons. This further discouraged some farmers.

Aside from these technical factors, there were also socio-economic factors which affected the productivity and profitability of the sericulture enterprise in Region 1. Most cooperative and individual farmers were male (72%) and married (90%). Most of them were 23-73 years old, and with a household size of 1-8. Due to the many field activities requiring

manual work, able bodied males are favored. Ageing farmers could no longer do the heavy activities of pruning and harvesting mulberry leaves and silkworm feeding particularly with late-age silkworms.

The tenurial status of farmers also affected sericulture production. It was noted that one farmer who had the highest production experienced a decline in yield due to the interference made by the landowner. Likewise, since majority of the cooperative farmers do not own their upland farms planted to mulberry, this prevented them from adopting soil fertility improving practices as reported earlier (Mendoza,1991;1994). Some were tilling uplands leased from other farmers, thus, land use depended on the decision of the landowners. One cooperative and four individual farms stopped operations when farmers could no longer meet the lease requirements of the landowners.

Most farmers claimed that they were neither informed nor trained on the use of ecologically sustainable technologies. Lack of awareness was one of the constraints in the non-adoption of soil testing, composting technologies, biological control of mulberry pests and diseases. Despite the presence of local materials and farm wastes for compost-making and mulching materials, as well as available seed sources/planting materials for green and green leaf manuring, farmers still cited lack of materials as reason for not adopting sustainable practices.

On general assessment, the productivity of a sericulture farm lies in the cropping systems design, practices, and the attributes of the farm operators. Individual farmers practiced monocropping systems, applied synthetic fertilizers and pesticides, while cooperative farmers used double-row planting. The low farm productivity and profitability is also traceable to the low adoption of good management practices for successful cocoon production. As a whole, farmers do not adopt bio-diverse planting as in intercropping cereals and legumes, vegetables and other cash crops which has been done by exceptional farmers without causing yield reductions on mulberry. Thus far, only one farmer practiced diversified farming systems and integrated waste recycling.

Conclusion

The productivity and profitability of sericulture in Region 1 are low. In general, the low productivity was due to the low adoption

of good management practices for successful cocoon production. The technical factors causing low yield included low soil fertility, rainfed farms, and poor agronomic practices like inadequate weeding, pruning, and low fertilizer application. Other factors include tenancy, ageing farmers, and the overall waning interests of farmers towards sericulture production.

To improve the existing sericulture-based farming systems, breeds and technologies suited to upland farms must be adopted by the farmers. In the long term, there is a need to breed and screen mulberry varieties tolerant to low fertility soils, drought or water stress conditions or have enhanced capacity to efficiently use available fertilizer. Soil fertility improving practices should also be implemented, like the use of green and green leaf manure, organic fertilization, recycling of residues/leaf prunnings, and silkworm manure. For the silkworm, it is important to breed/screen breeds or strains that have high tolerance to increasing temperature, can withstand prolonged rains and wet-feeding, are resistant to pests and diseases, and have high cocoon yields and quality. With the declining performance of hybrid mulberries, the germplasm of SRDI should be strengthened by having partnership with countries who could share their purelines. Local researchers can also do the tedious job of selecting from the segregating progenies of local hybrids.

The development of cost effective and sustainable sericulture farming systems for pilot sites such as integrated farming systems approaches, crop diversification, and the use of locally available resources and knowledge systems must be done. These should be supported with adequate promotion and dissemination of efforts through trainings, publications and other media. Finally, it is also imperative to address the non-technical factors like tenancy and the waning interest of farmers.

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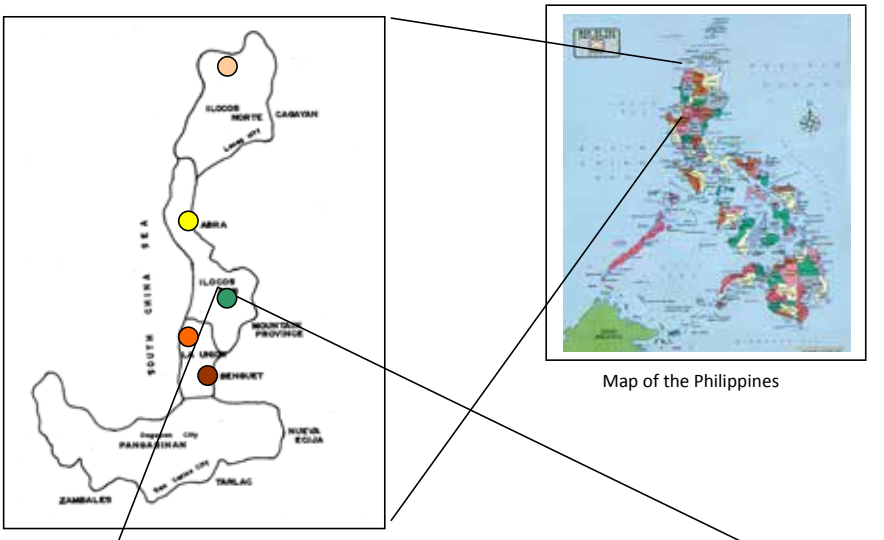
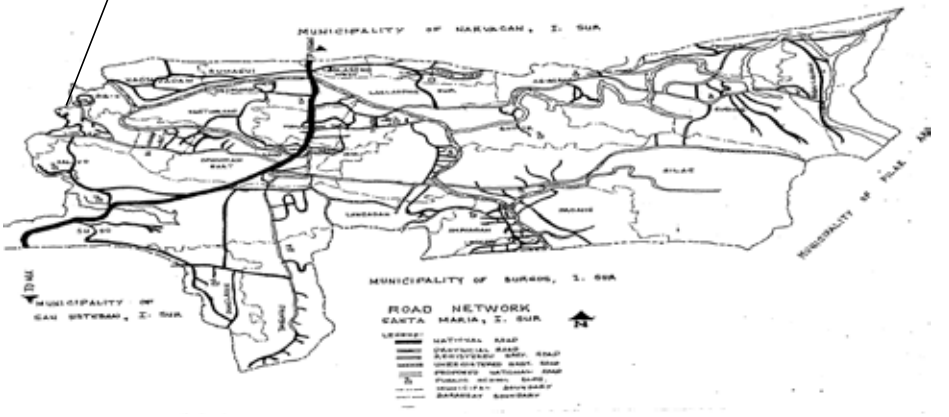
Annexes





Location of the experimental site in Sta. Maria, Ilocos Sur

*Legend

Lydia Marcos, Ilocos Norte Sto. Domigo, Ilocos Sur
Sta. Maria, Ilocos Sur Sn. Juan, La Union Bauang, La Union

Figure 1. Map showing the location of the survey area in the Philippines and the experimental site in Sta. Maria, Ilocos Sur.

Table 1. Cocoon production of sericulture farmers and cooperatives (1999-2004) based from the appraisal of existing agroecosystem practices of farmers in Region 1 conducted January 2002-December 2004.

	NO OF REARING AVE/YEAR	NO OF BOX REARED AVE/YEAR	PRODUCTION (KG)/HA AVE/YEAR	AVERAGE KG/ BOX
Cooperative farmers				
Sta. Maria Cooperative	5	8.08	128.85	15.95
Lydia Marcos Seri Cooperative	2.33	6.83	112.42	16.53
Candon Seri Cooperative	5	5.59	107.67	19.25
Lower San Agustin Cooperative	3	6.90	207.20	30.03
Sudipen Seri Cooperative	4	6.80	180	26.47
Average	3.87	6.84	147.31	21.66
Individual Farmers				
Camandingin, Ilocos Norte	3.33	16.64	338.80	20.36
Camandingin, Sto Domingo	6.67	32.62	697.78	21.39
Flora, Sto. Domingo	4	14.72	328.30	22.31
Magsingal. Seri Project	2.50	5.89	130.64	22.19
Nagtupacan 1 Seri project	4	14.13	272.52	19.29
Nagtupacan 2 Seri project	1.75	8.24	91.18	11.06
Nagtupacan 3 Seri project	4.67	18.25	364.90	20
ISPSC	3.33	11.83	245.32	20.73
Laslasong Seri project	2	5.89	80.10	13.61
Baballasioan Seri proj	3.83	16.30	245.96	15.09
Silag Seri project	1	3.60	90	25
Nalvo Seri project	2.33	13.33	119.48	8.96
Narra Seri Project	4.60	6.48	182.44	28.14
Sipulo Seri project	6.20	15.64	377.42	24.13
Cacapian 1, Sn Juan	4	20.38	378.20	18.56
Cacapian 2, Sn Juan	4	19.57	261.68	13.37
Cacapian 3, Sn Juan	2	8.85	105.80	11.95
Palugsi 1, Bauang	2	12.76	195.44	15.32
Palugsi2, Bauang	2.33	13.95	264.44	18.96
Sta. Monica, Bauang	2.33	6.60	131.30	19.89
Ballay,Bauang	2	7.94	161.40	20.34
Cadaclan, Sn. Fernando	4	18.14	146.20	8.06
Macalva-Central, Agoo	3.20	10.61	230.36	21.72
Palugsi- Bauang	3.60	16.77	328.06	19.56
Suguidan Naguilian. Seri proj	2	8.84	240.28	27.18
Amallapay, Tubao Seri proj	2	9.66	275.20	28.50
Tubao Seri project	3.50	9.43	181.04	19.20
Payocpoc Seri Project	2	5.58	108.68	19.49
Average of two sites	3.20	12.70	103.46	19.56
Standard deviation			124.87	5.46

Table 2. Income derived from the different sericulture projects of farmers and cooperatives in Region 1 (1999-2004). Based from the appraisal of existing agroecosystem practices of farmers in Region 1 conducted January 2002-December 2004.

PROJECTS	GROSS INCOME	TOTAL EXPENSES (IN PESOS)	NET INCOME	RETURN ON INVEST-MENT	RETURN TO FAMILY LABOR	BREAK-EVEN COST	BREAK-EVEN YIELD
Cooperative farmers							
Sta. Maria Seri Coop	14830.64	15510.20	-679.56	-0.01	181.85	120.37	16.68
Lydia Marcos Seri Coop	14546.20	8347.20	6199	7.01	322.55	73.97	9.49
Candon Seri coop	14006.79	7904.06	6102.73	6.93	328.31	73.41	10.86
Lower Sn Agustin Seri coop	24864	9562.53	15301.40	17.06	505.02	46.15	11.55
Sudipen seri coop	21600	15223.08	6376.92	6.69	296.76	84.57	18.66
Average	17969.53	11309.41	6660.11	7.53	326.80	79.70	13.45
Individual farmers-Ilocos Norte & Sur							
Camandingin Seri proj	42522.79	24878.68	17644.11	16.80	317.85	73.83	11.91
Cabigbigaan, Sto Domingo	87048.06	68537.59	18510.47	12.45	377.90	98.22	16.84
Flora Seri Proj.	42406.51	26791.10	15615.41	14.60	323.75	81.61	14.09
Magsingal Seri Proj	16800.30	12186.50	4613.80	5	281.85	93.28	16.10
Nagtupacan 1, Sta. Maria	30985.52	29118.02	1867.50	1.71	183.37	106.85	18.13
Nagtupacan 2, Sta. Maria	11435.80	9828.52	1607.28	1.79	215.74	107.79	9.51
Nagtupacan 3, Sta. Maria	42879.40	38075.16	4804.24	4.06	203.19	104.34	17.76
ISPSC, Sta. Maria	26278.68	17427.84	8850.84	9.07	273.38		71.04
13.75							
Laslasong	10353.73	8390.24	1963.49	2.22	213.78	104.75	11.03
Baballasioan	30169.45	29403.82	765.63	0.70	187.33	119.55	14.71
Silag	13079.70	6784.54	6295.16	7.24	432.63	75.38	12.97
Nalvo	16001.96	24718.28	-8716.32	-8.31	64.66	206.88	13.84
Average	30830.16	24678.36	6151.80	5.61	256.28	103.59	14.22

Average of six years from 1999-2004
In pesos

Table 2 continued...

PROJECTS	GROSS INCOME	TOTAL EXPENSES (IN PESOS)	NET INCOME	RETURN ON INVEST-MENT	RETURN TO FAMILY LABOR	BREAK-EVEN COST	BREAK-EVEN YIELD
La Union							
Narra, Bacnotan	23755.51	15231.40	8524.11	8.94	437.18	83.49	18.04
Sipulo Bacnotan	45939.56	18271.60	27667.96	28.11	472.26	48.41	9.60
Cacapian, Sn Juan	41806.23	31076.64	10729.59	9.65	237.84	82.17	13.80
Cacapian 2, Sn Juan	32524.21	21388.92	11135.29	10.97	368.58	81.74	8.79
Cacapian 3, Sn Juan	12696	13411.84	-5.84	-0.77	151.90	126.77	12.62
Palugsi 1, Bauang	25119.90	19434.56	5685.34	5.71	226.31	99.44	11.85
Palugsi 2, Bauang	36577.34	29549.04	7028.30	6.41	234.61	111.74	15.32
Sta. Monica, Bauang	18275.65	13750.94	4524.71	4.82	260.20	104.73	14.97
Ballay, Bauang	17347.27	13758	3589.27	3.82	229.20	85.24	16.13
Cadaclan, Sn. Fernando	17544	26606.56	-9062.56	-8.49	90.68	181.99	12.22
Macalva-Central, Bauang	28587.68	14912.64	13675.04	14.39	359.65	64.74	11.33
Palugsi-Bauang	39074.33	24027.68	15046.65	14.44	293.92	73.24	12.03
Suguidan, Naguilian	31731.38	12722.24	19009.14	20.27	476.25	52.95	10.90
Amallapay Tubao	36741.95	11654.79	25087.16	27.33	542.36	42.35	9.04
Tubao	21998.17	11409.64	10588.53	11.57	327.21	63.02	9.96
Payocpoc, Bauang	12806.85	6756.49	6050.36	6.97	321.60	62.17	10.28
Average	27657.88	17747.69	9910.19	10.27	314.36	85.26	12.30
Average of two sites	29244.02	21213.02	8031	7.94	285.32	94.43	13.26

Average of six years from 1999-2004
In pesos