CONTRACT FARMING:
A SHORT CASE STUDY OF SILK
WORM PRODUCTION IN LUNDU
DISTRICT

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CHAPTER 2 : LITERATURE REVIEW

CHAPTER 3 : RESEARCH METHODOLOGY

CHAPTER 4 : FINDINGS (ANALYSIS AND EVALUATIONS)

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I certify that I have supervised and read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a research paper for the Degree of Corporate Master in Business Administration.

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I hereby declare that this research is the result of my own investigations, except where otherwise stated. Other sources are acknowledged by footnotes giving explicit references and a bibliography is appended.

Signature

Date: 30 August 2002
This piece of work is dedicated to my family especially my new born baby, Markclarrentine Ingai. Your undivided sacrifices and supports have made this work possible.
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ABSTRACT

This short field investigation will assess the Contract Farming of silk worm production in Lundu District, Sarawak with the general objective to assess the income contribution of the project to the household of those participants. The study will also examine the level of participation of those farmers as far as their involvement in the project is concerned. This mean to say whether they are employed as merely workers per se, or are actively participated in the market economy.

The method used here is a one-shot cross-sectional analysis which is qualitative in nature. Sources of the data are mainly that of a secondary data (published report on the project), personal interview and personal observation.

From the study, it can be concluded and summarised that, the contract farming is not the major contributor to the participants’ household income. As far as the farmers are concerned, they are benefited from the project. Apart from that, the participants also enjoy some other benefits such as a good infrastructure, public utilities and some extra income when the tourists visit the project as well as their villages who come and buy their locally made handicraft.

As far as this project is concerned, it does benefit the participants. However, this does not mean that any contract farming will be beneficial to the participants, it will depend on the type of the project, commitment from all parties involved and some support from the Government through its policy, legal framework and so on to make the project a success.
1.1 Introduction

In much of Malaysia especially Sarawak, agriculture is still considered as a subsistence activity and normally engage in a traditional and seasonal cultivations like paddy, pepper, cocoa and some other cash crops. This agricultural activity is carried out, controlled and owned by their family members or community rather than a commercial one. This type of approach to agriculture nowadays is seen as uneconomical or diseconomies of scale because the market is not only limited to the State but could be that of this region.

Realizing the fact that the State still rely very much on the import or supply of food either from West Malaysia or neighbouring countries like Thailand, Indonesia and others, the State Government takes a drastic step to develop its own agriculture sectors through its development agencies like SEDC, SALCRA, LCDA, Department of Agriculture and others, and start to move toward a more integrated and commercialised agriculture activity through the concept of contract farming.

The concept of contract farming is that the cultivation or production of crop is being contracted out to the local farmers or participants who act as producers who then will sell or supply the crop or raw material to the firm that manages the project and act as processors. The two parties are brought up to work together through contract arrangement that might include amongst other things like marketing arrangement, price, farm input, assistance, finance or credit facilities and so on. Ideally these are amongst the features of contract farming whereby both parties are binding by this contractual agreement and supposed to have mutually benefited both.
Today we can see some changes in the Government policy by promoting and supporting the idea of contract farming especially in the production of food and some other cash crops which not only cater for the local markets but for export too. The State Government takes a step further by introducing some designated areas as food producing region, for example like the case of Kota Samarahan.

This shift from traditional to so-called contract farming is the latest trend in our agricultural scene. Being a new idea in our context, obviously there tend to be challenges in front of us. Therefore, in order to succeed we need to identify and formulate strategies and priorities for supporting development of market-oriented agriculture, with emphasis on improved production-market coordination including that of participant's involvement in the project. We need to examine how far these participants are involved in term of their level of participation pertaining to product marketing, product improvement in term of quality produced, and so on.

When the project was first implemented in Lundu District, its primary objective was to bring the development and probably employment to the economically potential area for the local farmers. After more than ten years in operation we need to evaluate whether the participants really benefit from the project. One way to assess this aspect is by examining their level of participation, whether they are employed merely as workers or are they actually actively involved in a participatory market economy. Being new and unfamiliar with the concept of contract farming, very often people have a general opinion that the participants are economically “exploited” and do not get what they supposed to get compared to their counterparts in some other sectors of economy with the same nature of operation.

This is the problem that this case study will address, that is, whether the contract farming will work as to what have been planned or at least what the theory says by evaluating the benefits of contract farming to the local participants in term of income contribution from the project. The study will also assess the relationship between the participants and the firm as the project manager pertaining to agreement, facilities and other aspects of economic contribution of the project to both parties.

1. Government's Role

Attempts of the Government’s role in promoting and supporting the idea have tended to generate much concern for rural people. To address this issue by way of Measures, the project was implemented in the case of Kota Samarahan.

Past studies on contract farming tend to be limited in several aspects; firstly, fruits partly because the contract farming is an integrated strategy and secondly, the role played by the Government’s role in fostering the development of the contract farming in our country as the small-scale and medium-scale farmers rely heavily on the services provided by the Government. However, that does not mean that the Government should be the one to control the contract farming activity. Contract farming can encourage the farmers to be more motivated and may be the right decision for the Government to make.

1.3 Problem Statement

The issue of contract farming is not only limited to Kota Samarahan District. Do they work as well in the market economy?
1.2 Government’s Efforts

Attempts by Government and its development agencies to realize the Government’s objective as far as its community development is concerned have tended to emphasize the identification of “income generation” activities for rural people. This study will assess the Government’s efforts in tackling this issue by examining specifically the contract farming that being implemented in Lundu District, whether such projects have borne fruits (to both the farmers and the investor(s)).

Past studies have shown little evidence that such attempts have borne fruits partly because the necessary backward and forward market linkages are rarely in place that is, rural farmers and a small-scale entrepreneur lack both reliable and cost-efficient inputs such as extension advice, mechanisation services, seeds, fertilizers and credit and guaranteed and profitable markets for their output. In most cases, contract farming schemes typically involve the cultivation of non-traditional crops. These crops are generally riskier than traditional crops both because of higher yield variability due to their not being developed under local conditions, and because of their higher price variability due to poorly developed markets for the product (Runsten and Key, 1996).

The approach would appear to have considerable potentials in our country as the small-scale agriculture continues to be widespread, as in many cases small-scale farmers can no longer be competitive without access to the services provided by the contract farming companies. It must be stressed, however, that the decision to use contract farming modellity must be a commercial one. It is not a development model to be tried by aid donors, government or non-governmental organisations (NGOs) because other rural development approaches have failed. In other words, the projects should be motivated and more concerns on the economic and technical realities.

1.3 Problem Statement

The issue that this study will assess is the level of participation of those local farmers in such project of silkworms production in Lundu District. Do they participate as a “partner” to the firm and actively involved in the market economy or are they merely employed as labourers or workers.
In most projects if not all, the local participants are merely employed as workers and paid a fixed salary or allowances. In the case of silkworms production in Lundu, such project to a certain extend have been designed in such a way that the participants are given the opportunity to become the entrepreneurs themselves. This is definitely a good opportunity for the farmers to earn more and at the same time having a basic knowledge of how to run a project systematically applying a commercial approach.

Nevertheless, this particular project does have its own “problem” that is the farmers as participants and the firm on one hand, do not have a proper written agreement pertaining to the control and guidelines on activities being carried out the farmers. Without any established agreement exist, both parties can almost make any decision and free to set the desired term or condition of employment. In this particular project, the agreement between the two parties is mainly either verbal or by letter as a form of contractual agreement.

With the absence of a proper and written agreement in governing the activity may complicate the matter should any misunderstanding and unsatisfaction among the farmers concerned. To worsen the situation, the farmers could not act within the legal arbitration for solution because there is none at the moment. In order not to upset any party, the Government should provide such guideline so that any party directly affected by this industry know clearly their rights and obligations. At least the aggrieved party is given an opportunity to express their grievances that could lead to other problems.

It would be easier too for the authorities concerned to monitor any activities or incidents that are under the purview of the Government. Such environment will be more conducive for the project and the Government’s set objective in bringing the economic activities to the people in its effort to improve the standard of living of those rural people especially.

Without such agreement in force makes the farmers at the “losing” side term of bargaining power pertaining to the price of output in particular and the necessary aid which could directly increase the productivity of each farmers involved. Once again the participants are at the “mercy” of the firm because there is no proper and clear framework as to what extent they can act in fighting for their rights. Of course the Government does not want to see a lot of disrespect for this in the sense that such rights are not being exercised properly, either being communicated or not.
merely employed case of silkworms been designed in the opportunity for the knowledge of how.

In "problem" that have a proper activities being exist, both parties or condition of the two parties "losing" in particular...the VIT...the...of each of the firm properly, either because these rights and the manner they should are not communicated effectively to the farmers.

One may ask why this problem happens in the first place? Probably because this is very much the culture of our people for not being sensitive enough when it comes to our rights. Another probability is the fact that they are not properly represented by not having the union or body which could and should look and fight for their welfare and right as far as their participation is concern.

1.4 Research Objectives

The general objective of this case study is to examine the benefits and advantages of contract farming in Lundu District to the local participants particularly the household income generation and entrepreneurial effects of the project.

With that general objective in mind, I would like to set the research objectives as follows:

(a) To evaluate the contribution of contract farming to the farmers' household income, and

(b) To examine the level of participation of the farmers and their relationship with the project manager (firm).
CHAPTER 2
LITERATURE REVIEW

2.1 Background Study

This section of the report will review some theoretical approaches and debates on the issue of contract farming and try to analyse it whether it is relevant in our context.

Around the world a growing number of peasant and small-farm enterprises are being integrated into expanding agroindustrial sectors through the use of production contracts (Collins 1993; Glover and Kusterer 1990; Key and Runsten 1999; Murray 1997; Raynolds 1994a). Farmers and agribusinesses are linking up in mutually beneficial contracting arrangements that offer producers lower market risk and greater access to inputs and financing, and ensure processors a guaranteed supply of farm produce (FAO Agriculture 21, 1998).

In our context, self-sufficient and small-holders farming are more dominant. However, for certain type of crops or products, the Government through its development agencies like the Agriculture Department, Sarawak Economic Development Corporation (SEDC), SALTU, STIDC and others do introduce and invite some potential investors to implement this contract farming like silkworms (mullbery tree planting), crab rearing, aquaculture (tiger prawn), inland fish, tea and coffee plantation and so on.

2.2 Some Debates on the Issue

We can model a contract farming scheme as a principal-agent game in which a firm (the principal) works with the grower (the agent) to produce a crop. The firm chooses growers with whom it would like to contract and sets the contract terms. The growers in turn, choose whether to participate. The combination of these choices describes the selection process for the contract farming scheme. The benefits participants accrue will depend on the terms of the contract and their own characteristics (Warning and Soo Hoo 2000).

While contract farming has undergone substantial expansion has critics of contract farming (Schejman 1996; Collins 1993). In the wake of the global economic disengages from supports, privatization efforts to be effective. Critics see contract farming as an enabling them to implement their goals.

Critics of contract farming relationship and small-holders farming. Contract farming enables them to disengage from their existing household food and typically unprofitable.

The advantages of contract farming will vary depending on the specific context, the availability of necessary support agencies, the availability of all which relevant to the region.

Many authors argue that contract farming that accelerates the growth of their existing household food and typically unprofitable enterprises may (Poulton, C; Donaldson, P.D. And Watts 1994).
While contract farming dates back to the 19th century in the United States and at least 1940s in Latin America, in recent years the practice has undergone substantial expansion throughout the developing world. This expansion has brought considerable attention from both supporters and critics of contract farming. From one perspective (i.e., Dirven 1996; Schejtmann 1996), contract farming has the potential to substitute for the state in the wake of neoliberal reforms in the agrarian sector: as the state disengages from the provision of inputs, extension services, credit and price supports, private firms can enter to fill the same roles, and do so more effectively. Critics (e.g., Glover and Kusterer 1990; Little and Watts 1994) see contract farming, however, as a tool through which multinational agroindustrial firms can exploit unequal power relationships with growers (Warning and Soo Hoo 2000).

Critics of contract farming tend to emphasize the inequality of the relationship and the stronger position sponsors with respect to that of growers. Contract farming is viewed as essentially benefiting sponsors by enabling them to obtain cheap labour and to transfer risk to growers (Little, P.D. And Watts, M.J., eds., 1994).

The advantages, disadvantages and problems arising from contract farming will vary according to the physical, social and environments. More specifically, the distribution of risks will depend on such factors as the nature of the markets for both the raw material and the processed product, the availability of alternative earning opportunities for farmers, and the extent to which relevant technical information is provided to the contracted farmers (Poulton, C; Dorward, A and Kydd, J, 1997).

Many authors suggest that it is in fact the household basis of contract farming that accounts for its prevalence, since contracting with household enterprises may be cheaper than in-house production by large firms. Peasant household may produce more cheaply than enterprises hiring labour because of their existing land holdings, their ability to subsidize production through household food provisioning, and their exploitation of flexible, dedicated, and typically unpaid family labour (Baxter and Mann 1992; Collins 1993; Watts 1994).
Understanding the nature of contracting requires that we investigate the power relationships between contracting firms and growers as well as the process through which contracts are negotiated. Some authors assume that small scale producers are likely to benefit from contract relations (Key and Runsten 1999); others find that contract farming often has negative repercussions for peasant producers (Porter and Phillip-Howard 1997). Existing asymmetries between contractual parties are likely to become embedded within the contract, to be revealed most clearly in the distribution of profits and risks. For Watts (1994:65) notes, “contract functions simultaneously as both a means of subordination and a point of resistance”. Struggles over the contract focus on both the material conditions of the contract and the ideological representation of the contract-grower relation.

2.3 Hypothetical of Contract Farming Framework

Figure 2.1 shows diagrammatically a hypothetical contract farming framework. It sets out those aspects that must be considered when planning and implementing a venture. This section will discuss briefly the major advantages of contract farming and the problems associated with it to both farmers and sponsors (firms).
we investigate the risks as well as the authors assume that relations (Key and often has negative Guip-Howard 1997) are likely to become part of the distribution contract functions joint point of resistance". In conditions of the farmer-grover relation.

Contract farming is often considered when planning briefly the major associated with it to both

Figure 2.1
A Contract Farming Framework

**FARMERS**

**SPONSORS**

**Preconditions**
- Markets
- Environment
  - physical
  - social
- Land tenure
- Financing
- Infrastructure
- Materials
- Communications

**The Contract**

**Management and Administration**

**The Project**

**Production performance**

**Monitoring**

**Feedback to farmers and sponsors**
- Price adjustments and contract amendments
- Innovations and adaptations
- Quota allocation and distribution

Source: Based on Eaton, C.S., 1998b: 274
From the point of view of farmers, contractual arrangements can provide them with access to production services and credit as well as knowledge of new technology. Pricing arrangements can reduce risk and uncertainty. Some contract farming ventures give farmers the opportunity to diversify into new crops, which would not be possible without the processing and/or marketing facilities provided by the company. Offsetting these benefits, however, are the risks associated with the cultivation of a new crop, the fact that the company may fail to honour its commitments and the danger of indebtedness if the problems arise.

From the point of view of the sponsoring companies, contract farming may in many cases be more efficient than plantation production, and will certainly be more politically acceptable. It can give them access to land that would not otherwise be available and the opportunity to organise a reliable supply of products of the desired quality, which probably could not be obtained on the open market. On the other hand, from the companies' perspective contract farming is not without difficulties. On occasion farmers may sell their outputs to outsiders, even though they were produced using company-supplied inputs. Conflicts can also arise because the rigid farming calendar required under the contract often interferes with social and cultural obligations.

This chapter attempts to provide a data collection methodology. The secondary study will be carried out. The participants concerned, the Series of one will record them.

The participants will be analysed. On the economic activities, this will help us to economic main indicator for this project for a particular period.

Observations collection by experience also record down whether they have...
CHAPTER 3

RESEARCH METHODOLOGY

This chapter deals with methods that will be used in the study with an attempt to provide an answer to the research question. It will also discuss the data collection method, instrumentation, sampling, the procedures of the study that will be adopted and the limitations of the study in adopting this methodology.

The study employs a cross-section approach, which mainly analysing the secondary data as well as the feedbacks from the field work that being carried out. The source of the data will be from the government agency concerned, the firm and from the participants or the farmers themselves. Series of one to one or group interviews were conducted with the local participants to get the first hand respond, feedback and explanation from them.

The personal interviews were conducted by having some preset questions that are intended to gather the required informations which then will be analysed and studied. The sample of the questions is attached as Appendix III.

The participants are not only asked on the project they are working on during the time of study, but informations also being gathered on other economic activities whereby their family members are directly involved. This will help us to see and compare whether this contract farming is their economic mainstay and contribute most to their household income. One indicator for this is the amount of income they earn from participating in the project for a particular period of time. For details please refer to Table XX.

Observation on the ground by the researcher also form part of data collection by examining the reaction from all those involved. The research also record down the type of development of the area before and after the project being implemented in their area as this is one of the indicators whether they have benefited (indirectly) or otherwise.
3.1 Locality Background

For the purpose of this study, Lundu District has been selected as an area of study because currently there is one contractual project that was first initiated by the state government and developed by its development agency, that is the Sarawak Economic Development Corporation (SEDC). For locality of the project and the area of State Land that being used as a site for this project are annexed as Appendixes I and II.

The district is connected by a tar-sealed road with a distance about 110 kilometres from Kuching. Lundu is the district capital and surrounded by mostly Bidayuh and Malay villages of which some of these villages happen to be the participants of the project. The project is suitably located on the undulating mountain for the mulberry and silkworm production activity.

The Project

The selected project for the purpose of this study is the Sematan Silk Farm which is located about 110 kilometres by road from Kuching city. This is one of the pioneer and the only silk farm still operating in Malaysia. Start in operation more than ten (10) years ago and wholly owned by Eastern Empress Silk Sendirian Berhad, a subsidiary of the Sarawak Economic Development Corporation (SEDC). The local company, Zuhrah Pelangi Sendirian Berhad has been entrusted to fully manage the centre since March 1999.

The company's mission and aspiration are to set up a silk textile industry in Sarawak. In developing the agriculture and textile industries, eco-tourism is another aspect of development which the company has now undertaken and offers both educational and nature tourism to the visitors.

The Participants

There are forty-one (41) participants who are actively participated in the project, of which thirty-three (33) are males and the remaining are females. The participants come from fourteen (14) surrounding villages which are all of Lundu District like Biawak, Pueh, Siru, Sebiris, Sedaing, Serayan and others.

These participants would work in shifts of two weeks, and then they return home with an average of five to six (5 to 6) miles away from their respective villages. The company would supply them with their daily needs, while they would return the farmels (mulberry trees) with an agreed price, the rate adopted is based on the respective village.

Under a contract, the farmers were provided a form of roofing for their indirect convenience. The farmers would trim the trees and harvest to feed the silkworms, which normally occur in cycles of rearing which will be repeated within the same cycle. In one cycle, the farmers will be paid a rate adopted is based on the respective village.

Apart from their daily activities, the farmers have their own project area where they can grow their own crops like rice and others. These plots of land are owned by the company and the farmers are provided with the necessary equipment and materials.
These participants are actually work on their Native Customary Land with an average of one and half (1.5 hectares) per participant at their respective villages. The basic requirement is that the land must be accessible by road so that the company can send the young worms to the farmers prior to the starting of the rearing period and collect the cocoon from the farm after harvesting.

**Contract Farming Activities**

The participants are getting some aids and support from both the Agriculture Department Sarawak and the company itself which come in different forms. The participants get aid from Agriculture Department in the form of roofing for the rearing hut, netting and fertilizers. At the same time the company will provide them with young worms, mulberry tree seeds (varieties) and train them in term of technical knowledge and supervision on their daily activities pertaining to keeping and maintaining of their farm (mulberry trees) and worms until the harvesting period is over.

All these aids and services are provided free of charge with the objective to improve the farmers’ standard of living and at the same time their indirect contribution to the economic well being is much needed too. In return the farmers are required to sell their output (cocoon) to the company at an agreed price for respective period which according to the company the rate adopted is based on the world’s rate or price.

Under a direct supervision by a trained employees of the company, the farmers were asked to plant a mulberry trees on their on land or plot which normally take about two and half months before it is ready for harvesting to feed the worms. At the end of the harvesting period they will trim the trees and apply some fertilizers to make it ready for the next rearing cycle. In one calendar year the farmers can expect between three to four cycles of rearing or harvesting. The worms will be fed three times a day which will be ready for harvesting in three weeks time from the time the company supply the young worms which aged ten days.

Apart from the participants (farmers) the company also have their own project area which covers about 128 hectares of land at Kampung Pueh, Sematan where the usage breakdowns are as follows: mulberry plantation 50 hectares, factory and administration site 18 hectares and the remaining 60 hectares are steep and rocky area which practically of little use.
The company is concentrating on the expansion of mulberry farmland in order to get sufficient supply of mulberry leaves for rearing 8,000 to 10,000 boxes of silkworm per year. At the same time they engaged some experts from China, Japan, India and Thailand who are assigned to train the company's employees on various aspects of silkworm farming who will then train and supervise the farmers.

### Production Capacity

Based on the current area that being utilised by the company, they will be able to produce the following production capacity which is calculated for a period of six months.

\[
\begin{align*}
&12,000 \text{ mulberry trees planted per hectares} \times 50 \text{ hectares} \\
&= 600,000 \text{ trees} \times 0.32 \text{ kg branch/leaf per tree per harvesting} \\
&= 192,000 \text{ kg per harvesting} \times 2.5 \text{ times harvesting (half year)} \\
&= 480,000 \text{ kg} \times 1,200 \text{ kg (for rearing one box of silkworm)} \\
&= 400 \text{ boxes silkworm} \times 30 \text{ kg (raw cocoon production per box)} \\
&= 12,000 \text{ kg raw cocoon} \times 2.7 \text{ (raw/dry cocoon ratio)} \\
&= 4,364 \text{ kg dry cocoon}
\end{align*}
\]

From the above simple calculation it is obvious that the production of dry cocoon is too little and uneconomic for the company to cultivate only on the usable 50 hectares of land. It is rather impossible for them to produce enough leaves to cope with their target of rearing 8,000 boxes silkworm per year. Therefore, the company is in need of an additional area for this purpose. Another possible solution to this is by engaging more contract farmers who are interested in this activity.

### The Profitability Level

In order to be economic and profitable from the project, an additional area is required. Say if the company have a net area for mulberry plantation of 200 hectares, then the company will be able to produce enough leaves to cope with their target. As one mulberry tree requires an average of 0.39 square metre land, (1.3m line distance x 0.3m each tree distance), one hectare of land is capable for planting of 25,641 mulberry trees. If this is the case, then the following calculation shows how the ideal cocoon and silk yarn production could be achieved:

\[
\begin{align*}
&25,000 \text{ trees} \\
&= 2,000,000 \text{ trees} \\
&= 10,000 \text{ trees} \times 30 \text{ kg silkworm} \\
&= 8,333 \text{ kg} \\
&= 266,650 \text{ kg (half year)} \\
&= 98,761 \text{ kg (for rearing one box)} \\
&= 32,920 \text{ kg (per year)}
\end{align*}
\]

### 3.2 Population

In this study of the project, let it be agreed that the company's employees' impact of the project and social benefits were considered.

As for sampling, out of the company involved with the project, interviewed to get their views.

For convenience of data analysis, divided and categorized as follows:

(a). Subject
(b). Instruction
(c). Procedures

(a). Subject

For this case, the focus of the discussion will be on the farmers, the most important role of course the focus of the discussion.
For this contractual project, clearly the population of interest would be the farmers, the government, the firm, the buyers of the crops or products and of course the general population of the nearby villages. However, the focus of the discussion would be the participants and the firm too.

3.2 Population and Sampling

In this study people who are directly and indirectly affected by the project, let it be the participants and their immediate family members, company’s employees and people from Lundu District who also feel the impact of the project. The impact of the project could be in term of financial and social benefits which equally felt and enjoyed by them all.

As for sampling, since the subject of the study is the participants of the project, out of forty-one (41) only twenty-five (25) of them were directly involved with the interview. These twenty-five were specifically picked and interviewed to get some required informations.

For convenience, the informations on the research methodology are divided and categorised into:

(a). Subjects
(b). Instruments
(c). Procedures

(a). Subjects

For this contractual project, clearly the population of interest would be the farmers, the government, the firm, the buyers of the crops or products and of course the general population of the nearby villages. However, the focus of the discussion would be the participants and the firm too.

25,000 trees x 200 hectares = 5,000 trees x 0.40 kg/tree
= 2,000,000 kg x 5 times harvesting
= 10,000,000 kg branch/leaf  1,200 kg (for rearing one box silkworm)
= 8,333 boxes silkworm x 32 kg (raw cocoon production per box)
= 266,656 kg raw cocoon  2.7 (raw/dry cocoon ratio)
= 98,761 kg dry-cocoon  3 (dry cocoon/silk yarn ratio)
= 32,920 kg silk yarn (32.92 metric tons)