

India

Ex-Post Evaluation of Japanese ODA Loan Project

Manipur Sericulture Project

External Evaluators: Yuko Kishino and Yumiko Onishi, IC Net Limited

0. Summary

In Manipur, one of the poorest States in India, sericulture is a local industry with a long history. Since the 1970s, it has been promoted as an industry to help generate employment and alleviate poverty. The Manipur Sericulture Project (the project) aimed to increase cocoon production and productivity through sericulture in an organized manner and thereby respond to the demand for raw silk in the State. At the same time, it provided employment opportunities and the promise of improving the living standard of the poor. Given this background, the relevance of the project is high. However, the detail plan of the project was overhauled in the fourth year of the project, causing the project's costs and time period to exceed the original target. Although the beneficiary survey confirmed improvement in living standards, cocoon production, raw silk production and employment generation remained at 50 to 60% of the target in 2010 resulting in the effectiveness and impact to be rated as fair. The main reason behind the low level of cocoon production is that nearly 40% of the beneficiaries have reduced or stopped sericulture activities; even those farmers who are continuing sericulture activities have been rearing lower than the target number of silkworms because of an overall lack of knowledge in mulberry production and silkworm rearing, as well as improper rearing practices due to a lack of rearing skills and necessary equipment. Inadequate institutional support to the sericulture farmers has also affected the overall level of achievement. Currently, there is no mechanism to secure the economic independence of the farmers and cooperative societies, and there remain many issues. By securing various funds for improvement of the project, the executing agency is embarking on operationalizing the project facilities that are yet to be functional and expansion of services to the sericulture farmers. Revitalization of sericulture activities at the farmers' level and strengthening the implementation structure would require other initiatives and a certain amount of time, and therefore, further effort would be expected.

In light of the above, the project is evaluated to be unsatisfactory.

1. Project Description



Figure 1: Project Location



Figure 2: Textile made of mulberry silk

1.1 Background

The state of Manipur is located in the north eastern part of India, and consists of plain and hill areas. At the time of the appraisal, the primary industry accounted for 45% of the State's GDP, and most of the arable land has been already developed, leaving little opportunity for agricultural expansion. There is no other major industry besides agriculture. Twenty-six percent of the State's population was unemployed and approximately 47% was living below the poverty line¹. Thus Manipur is one of the poorest States in India. The poor mostly live in hilly areas and engage in slash and burn cultivation and firewood collection. Given such conditions, diversifying the livelihood of low income households was essential in alleviating the poverty.

Sericulture in Manipur started in the 2nd century B.C. Weaving is also considered an important industry in the State. In 1995, the demand for raw silk in the State was 363 tons; however, due to pre-modern and inefficient sericulture and textile production practices, production was only 202 tons, causing a large gap between supply and demand. Since it was predicted that the State's raw silk demand would exceed 500 tons in 2002, there was room for sericulture development and it was expected to grow by leaps and bounds.

1.2 Project Outline

The objective of this project was to increase cocoon and raw silk production by promoting sericulture in an organized and planned manner, thereby contributing to the improvement of the living standards of the poor.

Loan Approved Amount/ Disbursed Amount	3,962 million yen / 3,941 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	October 1997 / December 1997
Terms and Conditions	Interest Rate: 2.3% Repayment Period: 30 years (Grace Period: 10years) Conditions for Procurement: General untied
Borrower / Executing Agency	President of India / Department of Sericulture, the Government of Manipur
Final Disbursement Date	March 2008
Main Contractor (Over 1 billion yen)	National Building Construction Corporation Ltd (India)
Main Consultant (Over 100 million yen)	Nippon Koei (Japan)

¹ Data from 1991. The population below poverty line in India was 28.9% in the same year.

Feasibility Studies, etc.	“Special Assistance for Project Formulation (SAPROF) for Manipur Sericulture Project in India.” OECF, May 1997
Related Projects (if any)	<p><Technical Cooperation></p> <ul style="list-style-type: none"> • Bivoltine Sericulture Technology Development Project (1991–1996) (Karnataka) • The Project for the Promotion of Popularizing Practical Bivoltine Sericulture Technology (1997–2002) (Karnataka) • Project for Strengthening the Extension System for Bivoltine Sericulture in India (2002–2007) (Karnataka, Andhra Pradesh and Tamil Nadu) <p><ODA Loan Project></p> <ul style="list-style-type: none"> • Chhattisgarh Sericulture Project <p><Other international donors></p> <ul style="list-style-type: none"> • Karnataka Sericulture Project (the World Bank, 1980–present) • National Sericulture Project (donor collaboration of the World Bank and the Swiss Agency for Development and Cooperation , 1989–present)

2. Outline of the Evaluation Study

2.1 External Evaluators

Yuko Kishino and Yumiko Onishi, IC Net Limited

2.2 Duration of Evaluation Study

Duration of the Study: December 2011 – September 2012

Duration of the Field Study: March 7, 2012 – May 23, 2012

2.3 Constraints during the Evaluation Study

Due to Manipur State’s unstable security situation and the activities carried out by extremist groups, the External Evaluators were not able to visit the project area. Thus, the beneficiary survey and project site visits were conducted by local consultants, who are familiar with the situation in the State and who have expert knowledge on sericulture, under the supervision of the External Evaluators. The External Evaluators only carried out the hearings from the executing agency in safe locations within India. The movement of the local consultants was also restricted due to the project sites being scattered across the State, and especially in the hill areas where the security situation was not favourable. Because the information was not properly managed or organized from the levels of the executing agency to the farmers, the data provided were sometimes inconsistent. This ex-post evaluation was

conducted with whatever information could be collected within these constraints. Thus it does not necessarily provide a full comprehensive picture of the situation in the entire project area.

3. Results of the Evaluation (Overall Rating: D²)

3.1 Relevance (Rating: ③³)

3.1.1 Relevance with the Development Plans of India

3.1.1.1 Relevance at the time of appraisal

India is the world's second largest silk producer after China. Due to rapid economic growth in recent years, the demand for silk was increasing quickly while domestic production was falling short. To meet the growing domestic demand for silk, the Government of India focused on sericulture promotion and clearly stated in the Eighth Five Year Plan (1992-1996) that it would increase the employment and income of impoverished and rain fed agricultural areas. In addition, the promotion of sericulture was pointed to as suitable rural industry to promote the employment of small scale farmers. At the same time, it set the goal of producing 21,000 ton of mulberry silk by the Ninth Five Year Plan (2002) ⁴. Since the Fifth Five Year Plan (1977-1981), the State of Manipur has also been promoting sericulture as a key to economic development. In 1991, the Division of Sericulture under the Department of Industry was upgraded to the Department of Sericulture (DOS) and more effort has been put into promoting sericulture.

3.1.1.2 Relevance at the time of ex-post evaluation

In India, more than half of the work force continues to engage in agriculture. Since sericulture is a stable source of income, it is seen as a rural industry that provides employment opportunities particularly in impoverished areas. Sericulture is still regarded as remunerative even at the time of the ex-post evaluation. Thus it is a suitable occupation for enhancing the income of the poor. India has thus far relied on imports from China for high quality bivoltine silk⁵ that is suitable for textile. In order to increase self-sufficiency in the production of bivoltine silk and gain the edge over export competitiveness on textile silk, bivoltine sericulture was to be strengthened in the Tenth Five Year Plan (2003–2007). In the Eleventh Five Year Plan (2008-2012), the productivity of the mulberry cocoon was to be increased from 85 kg/ha in 2007 to 100 kg/ha by 2012 and to increase employment from 6 million in 2007 to 7.7 million by 2012. The growth of the sericulture industry is expected to grow in Manipur as well, and the State Eleventh Five Year Plan spells out its expectations for providing employment opportunities for women and the poor. Raw silk production in the State, which was 1,071

² A: Highly satisfactory; B: Satisfactory; C: Partially satisfactory; D: Unsatisfactory

³ ③: High; ②: Fair; ①: Low

⁴ The production target of non-mulberry silk is 1,790 tons. In the project, the target is the mulberry silkworm, domesticated and reared inside the house, it feeds on mulberry leaves. There are other non-mulberry silkworms such as eri (domesticated), tasar and muga (wild) that feed on plants like the sal tree that are not mulberry. The production share of non-mulberry silk in India is about 10%.

⁵ There are bivoltine and multivoltine silk. Raw silk made from bivoltine cocoons are longer, yarn thickness is uniform and stronger, compared to multivoltine, and thus suitable for warp. Cocoon price for 1kg of bivoltine is also higher than that of multivoltine.

tons at the end of the Tenth Five Year Plan, is targeted to increase to 2,833 tons by the end of the Eleventh Five Year Plan⁶.

As described above, the project has high relevance towards the development policy of the country and the State both at the time of the appraisal and the ex-post evaluation.

3.1.2 Relevance with the Development Needs of India

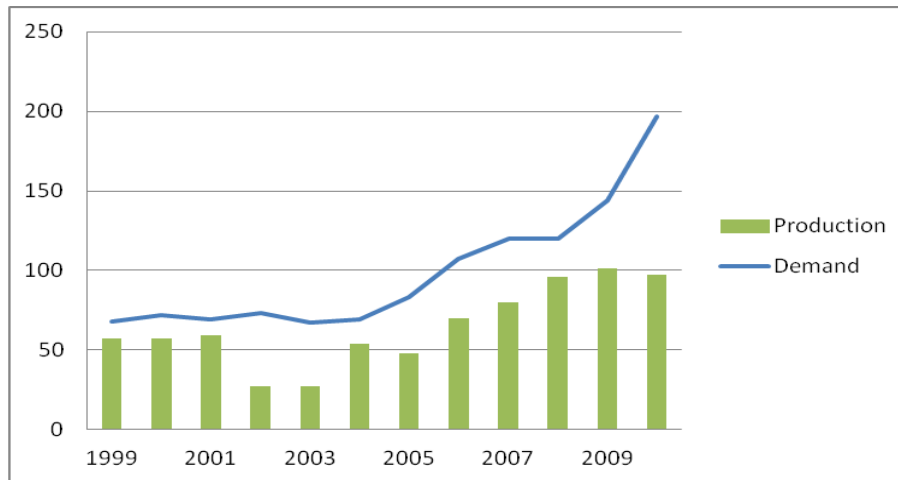
Silk production in Manipur is sixth in the country behind advanced sericulture States like Karnataka and Andhra Pradesh. Manipur as a State is not ranked very high in Indian sericulture; however, sericulture is regarded as an important industry for employment since Manipur is a poor State. According to the executing agency, the raw silk imported from other States is mostly twisted yarns and is used as warp for weaving textiles. While raw silk produced in Manipur is used as weft for typical Manipuri handloom saris, it is also used for making men's traditional attire and there has been a high demand for raw silk made in Manipur from the time of the project appraisal. Particularly, mulberry silk with higher denier reeled from traditional manual reeling machines is preferred in Manipur. Since saris woven from high denier mulberry silk have a unique coarse texture, it has not been replaced by raw silk from other States. To meet the fast growing demand for raw silk, it was necessary to expand cocoon and raw silk production in the State. Reeling and weaving industries do exist in the State. Since cocoon production has been low, some reeling machines are unused; however, as the cocoon production increases in the State, these machines are expected to be utilized.

In Manipur, the demand for traditional silk products continues to be high even at the time of the ex-post evaluation. According to the executing agency, there was a demand for 197 tons of mulberry silk in 2010; however, only 97 tons were produced within the State⁷. As shown in Figure 3 below, the changes in the demand increase is remarkable in Manipur while the demand and supply gap has widened from 2010 onwards. The executing agency has forecast that, by 2020, the demand for mulberry silk will be three times more than that of 2010. Thus the development needs for sericulture is also high at the time of the ex-post evaluation.

⁶ The provisional raw silk production target for the 12th Five Year Plan is 2,836 tons out of which 785 tons are mulberry silk.

⁷ The State's annual total raw silk demand is 520 tons and production is 322 tons.

(Unit: ton)



Source: DOS

Figure 3: Demand and supply of mulberry raw silk in Manipur

3.1.3 Relevance with Japan's ODA Policy

The improvement of poverty conditions and environmental issues were identified as two of the main objectives of Japan's Official Development Assistance (ODA) to India in 2006. In JICA's Rolling Plan to India (June 2011), poverty alleviation is listed as a priority area for assistance with a specific emphasis on employment generation in rural areas. Considering these policies, the project has been highly relevant with the country's development plan and development needs, as well as Japan's ODA policy; therefore its relevance is high.

3.2 Effectiveness⁸ (Rating: ②)

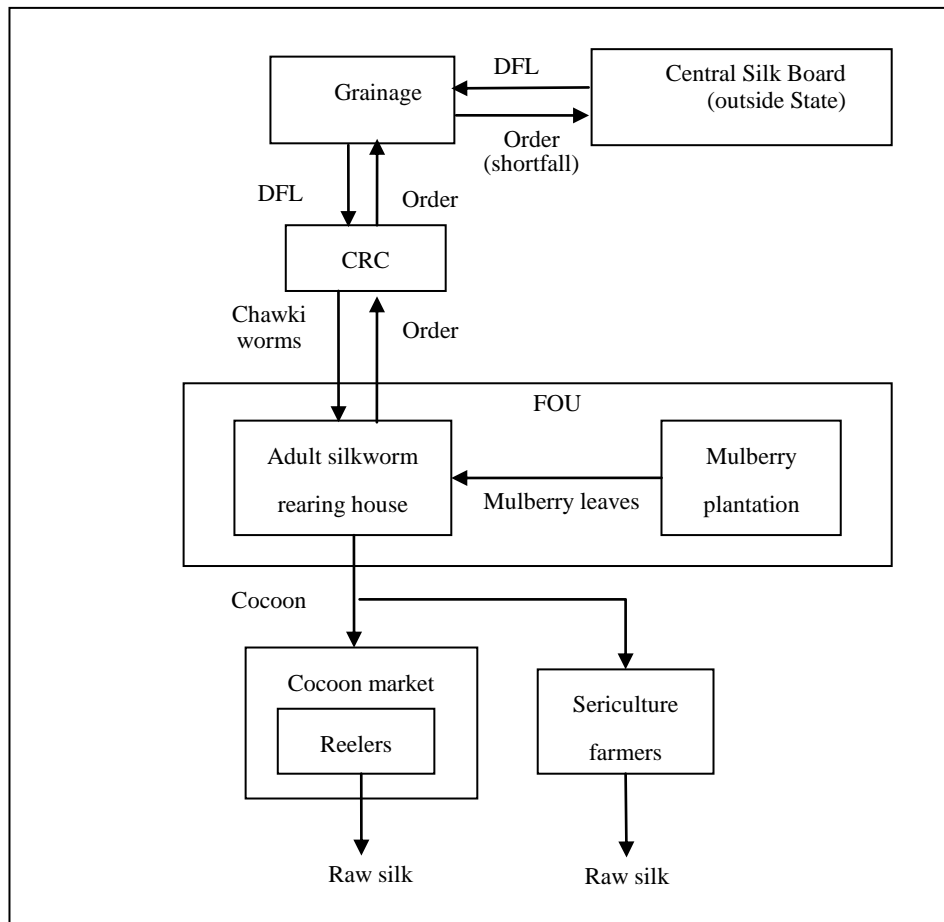
The project is intended to support the entire process of sericulture from the planting of mulberry trees, and silkworm rearing to cocoon and raw silk production. A broad process of sericulture is described below.

To produce the cocoons, silkworm eggs known as Disease Free Laying (DFL)⁹ are produced by the Mulberry Industrial Grainage (MIG) operated by the Department of Sericulture (DOS). The DFL produced at the MIG are supplied to Chawki Rearing Centres (CRC) which will serve as a distribution channel to the farmers. At the CRC, the silkworm eggs are hatched and turn into juvenile silkworm called *chawki*, and then distributed to the groups of sericulture farmers, known as the Field Operation Unit (FOU). The FOU rears the silkworms in an Individual Adult Silkworm Rearing House (IARH), where mulberry trees are cultivated adjacently or in close proximity. The silkworms grow feeding on the mulberry leaves and eventually form cocoons. The harvested cocoons are sold to the reelers at the cocoon market. Some sericulture farmers retain a portion of their harvested cocoons, reel

⁸ Sub-rating for Effectiveness is to be put with consideration of the Impact.

⁹ Disease Free Laying

them at home, and produce textiles. Figure 4 below shows the process from the supply of silkworm eggs to raw silk production.



Source: External Evaluators

Figure 4: Flow process of DFL supply and raw silk production

In the project, the consultants have prepared a detailed project plan (Definite Overall Development Plan: DODP) targeting the poor beneficiaries at the beginning of the project in 1999. However, DODP was revised according to the instructions of the Ministry of Textiles, the Government of India, in 2003 and the project approach, outputs and even the beneficiaries have been significantly modified¹⁰. It is believed that underlying the modification was a plan to further expand cocoon production by focusing on the development of the sericulture industry. The area of mulberry plantation was increased from the original target of 1,020 ha to 1,700 ha. With more mulberry plantations, more mulberry leaves were harvested and thus it was possible to rear a larger number of silkworms. Accordingly, the target cocoon production has been revised from 612 tons to 680 tons. The number of sericulture farmers to be included in the project has been increased from 3,000 to 5,000 and the selection criteria have also been revised. It was concluded that the original plan of giving preferential selection to low income

¹⁰ For details on changes in project plan, see the section on efficiency.

households and landless farmers, and providing them with the equipment and facilities necessary for sericulture would make the beneficiaries overly dependent and would not nurture their sense of ownership towards the project. Therefore, it was decided to give priority to those who had prior sericulture experience or those who own the land suitable for sericulture activities. Since it became apparent that employing the project approach and beneficiary selection criteria¹¹ established at the time of appraisal would not lead to a successful implementation of the project, the attempt to promote sericulture by revising the beneficiary selection criteria is considered reasonable. As a result of modifying the selection criteria, the majority of the beneficiaries selected were actually much better off compared to what was originally considered poor households. Nevertheless, the beneficiaries are still relatively poor. With respect to the project approach, it was originally planned to separately cultivate mulberry plants depending on the varieties. Additionally, in order to efficiently feed mulberry leaves to the silkworms in a way that coincides with their growth stages, chawki worms and adult silkworms were to be reared collectively by the FOU. Later, it was decided that adult silkworms should be reared by individual farmers. Accordingly, the number of IARH to be constructed by the project was increased from 600 to 4,000.

3.2.1 Quantitative Effects (Operation and Effect Indicators)

3.2.1.1 Cocoon production

As mentioned above, the cocoon production target at the time of appraisal was 612 tons with 1,020 ha of mulberry plantations. At that time, it was estimated that 20 kg of mulberry leaves would be required to produce 1 kg of cocoons¹². However, the mulberry leaves requirement was revised to 30 kg per 1 kg cocoons when the DODP was revised considering the environmental conditions of Manipur. As the mulberry plantation area expanded to 1,700 ha, cocoon production was revised to 680 tons. The changes in the amount of cocoons produced in the project area are shown in Figure 5.

Table 1: Cocoon production in the project area

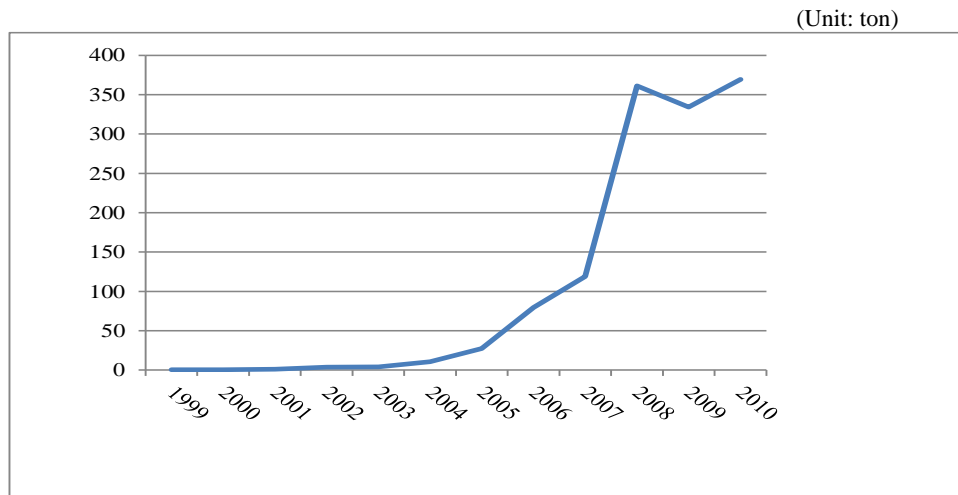
(Unit: ton)

(1) Target (Appraisal, 1997)	(2) Target (Revised, 2003)	(3) Actual (2010)	(4) Achievement (3)/(2)x100
612	680	369	54%

Source: DOS

¹¹ Households below the poverty line, landless, marginal farmers and giving due consideration to social, cultural and religious background (SAPROF, 1997).

¹² Standard requirements in South India where sericulture industry is advanced.



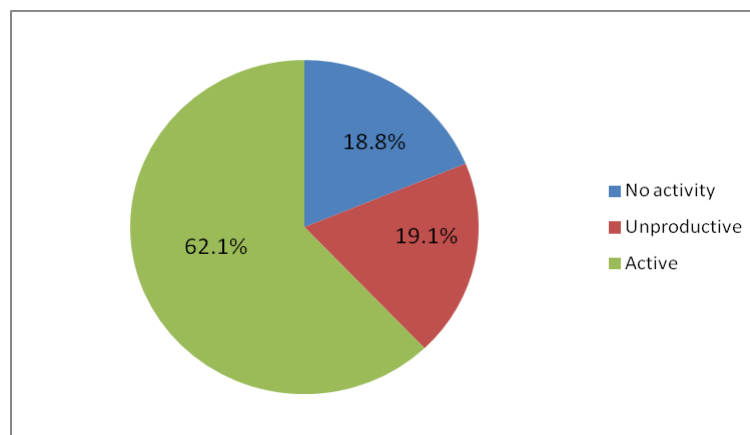
Source: DOS

Figure 5: Changes in cocoon production in the project area

Cocoon production began to increase from 2006, four years after the preparation of mulberry plantations started. In 2008, the amount had doubled from the previous year. Cocoon production increased because 1,350 ha of mulberry plantations that were established by 2005 became ready for harvest and most of the IARH started functioning in 2008. Although 1,700 ha of mulberry plantations were established as per the plan, there was no substantial increase until 2010 and 369 tons of cocoons were produced in the same year, making it a 54% achievement against the target of 680 tons. Various factors contributed to the substantially low production levels of cocoons. One of the fundamental problems lies with the sluggish activity of the FOU. A few other bottlenecks have also been observed throughout the process of sericulture as described below.

(1) Status of FOU

In the project, 1,000 FOU each comprising five sericulture farmers were to be formed and each FOU were to take responsibility of the operation and maintenance of 1.7 ha of mulberry plantations and IARH. However, according to the District Offices of the DOS at the time of the ex-post evaluation, approximately 38% of the FOU had either reduced or completely stopped sericulture activities.



Source: DOS

Figure 6: Current status of the FOU

As shown in Figure 6 above, approximately 19% of the FOU has stopped sericulture activities completely. Accordingly, at least 320 ha of mulberry plantations are not in use, reducing 130 tons of cocoon production annually. One of the reasons behind the ceasing of sericulture activities is that the farmers do not fully understand the meaning of collective work and thus were not able to coordinate effectively among the members and eventually some quit from the group. Another reason is that the land the FOU's used were taken on leases for specific periods from the State government or from village communities and some of that land has been diverted to other purposes such as for use as a sewage treatment plant.

(2) Bottlenecks in the sericulture process

1) Mulberry cultivation

According to the sampling of mulberry plantations conducted by the executing agency¹³, the mulberry leaves harvested in the project area in 2010 was 12,784 tons against the target of 20,400 tons (63% achievement) and the average per hectare yield was 12 tons. The beneficiary survey conducted in the ex-post evaluation which interviewed 60 FOU leaders in six Districts¹⁴ revealed that, among the mulberry plantations established by the project, only 54% are presently effective, and the average per hectare yield is 6,360 kg. The cause of the difference between the two seems to be that the data on the mulberry harvest from the executing agency was estimated based on the performance of one acre from a sample farm. Mulberry harvests falling short of the target are probably caused by not replacing the dead mulberry plants after planting and that plantations are susceptible to damage from livestock and wild animals due to a lack of fences around the plantations.

Table 2: Mulberry plantation and its production

	(1) Target (Appraisal, 1997)	(2) Target (Revised, 2003)	(3) Actual (2010)	(4) Achievement (3)/(2)x100
Effective area (ha)	1,020	1,700	1,054	62%
Production (ton)	12,240	20,400	12,784	63%
Average production (ton/ha)	12	12	12	100%

Furthermore, the amount of mulberry leaves actually fed to silkworms is less than the harvested amount. The calculations based on the beneficiary survey reveals that the amount supplied is 71% of the harvested leaves¹⁵, indicating that the mulberry leaves harvested are not being utilized effectively. The FOU's estimate the number of chawki worms they are capable of rearing based on the forecasts for

¹³ Estimated based on data from 1 acre of a sample mulberry plantation.

¹⁴ Surveyed area includes the valley Districts of East Imphal, West Imphal, Bishnupur and Thoubal and the hill Districts of Chandel and Churachandpur. In the beneficiary survey, an additional 123 beneficiaries were interviewed.

¹⁵ The annual average cocoon production per farmer is 151 kg. Considering 30 kg of mulberry leaves are required for producing 1 kg of cocoons, the total requirement becomes 4,530 kg.

mulberry production and they place orders to the CRC operated by the Primary Sericulture Cooperative Society (PSCS), a village-level sericulture cooperative¹⁶. However, according to the executing agency, the prediction of mulberry harvests is difficult and, since most of the farmers have only a few years of experience in sericulture, they have not been able to forecast the amounts properly. By predicting the mulberry production on the lower end, the number of chawki worms ordered also becomes smaller, leading to a situation where not all the harvested mulberry leaves are consumed.

Considering the above, mulberry plantation operations and management, and the resulting inadequate chawki demand forecast have adversely affected cocoon production as a result.

2) Silkworm rearing

a. Temperature control in IARH

At the time of project formulation, a simple structure using locally available materials was considered for the IARH design. However, once the project started, two different types of IARH were constructed; one prefabricated and the other which was made with bricks. The prefabricated structures which account for 70% of all IARH, have had problems with the temperature rising too high inside and also with bad ventilation. In some cases, the farmers are not practicing proper ventilation and cocoon productivity has been lower compared to that of the brick structures. In the beneficiary survey, it was found that an average of 40 kg of cocoons are produced per 100 DFL in the brick structure while in the prefabricated ones, it was 33 kg. In the prefabricated structures, adjustments like making false ceilings from the available materials and putting sunshades on the windows and doors are required to prevent the room temperatures from rising too high; however, such adjustments have not been made in most places. In the CRC made of prefabricated structures, the higher temperatures are suitable for chawki worms unlike the adult silkworms; thus the problem of temperature does not arise.

b. Chawki worm rearing

The CRC stocks silkworm eggs from the MIG and supplies them to the FOU. As mentioned earlier, the amount of silkworm eggs to be reared in the CRC are determined by the demand for chawki worms from the FOU. At the time of the ex-post evaluation, only 49 out of the 60 CRC established in the project are operating since the demand for chawki worms has not been high. According to the executing agency, the amount of chawki worms reared in 2010 is 64% of the target. At the time of the appraisal, the annual rearing capacity of 30,000 DFL (4,500 to 5,000 DFL per rearing and six rearings per year) per CRC was estimated. However, the average annual rearing was 5,650 DFL (1,596 DFL per CRC per rearing, three to four rearings per year) according to the beneficiary survey. As mentioned earlier, inappropriate demand forecasts for chawki worms from the FOU is the main reason for the CRC's significantly low rearing capacity. Furthermore, chawki worms reared in a congested state in the rearing tray is thought to affect the quality of silkworms and in turn the project's performance. According to a sericulture expert, 160 trays are required for rearing about

¹⁶ The CRC is operated under the guidance of the DOS. For details see the section on sustainability.

1,600 DFL, but the CRCs established under the project have only 125 trays as per the original plan, indicating that the plan itself may not have been appropriate.

3) Production of silkworm eggs



Figure 7: Cocoon spinning



Figure 8: Silk yarn reeled on khere

During the project, two MIGs were constructed that were meant to supply silkworm eggs to the CRCs. The MIGs, operated by the executing agency, are supposed to produce 2 million DFLs annually. Out of the two MIGs, one is currently not operational and only one is undertaking production activity. The one MIG which is currently functioning has produced a per facility target of 1 million DFLs in 2010. However, the demand for silkworm eggs in the project area is 1.1 million DFLs; therefore, the shortfall has to be ordered from the Central Silk Board (CSB), located outside the State. The MIG prepares silkworm eggs based on the level of demand from the CRCs, and in light of the current level of cocoon production, there seems to be no particular problem associated with arrangement of the DFL supply. The MIG not yet producing DFLs seems to have the minimum required number of staff and equipment. To increase cocoon production to the target level in the future, it is important to operationalize both MIGs. Only one of two P_2 stations, which supply silkworm eggs to the MIGs, is functioning at present. The P_2 station faces no problem given the current level of cocoon production; operationalizing both P_2 stations will be required for increasing cocoon production.

3.2.1.2 Raw silk production

Normally, the portion of cocoons produced by the FOU is traded in the cocoon market while some are kept by the farmers for reeling at home and are made into raw silk. There are different types of reeling machines and the traditional manual reeling equipment called khere is the kind most widely used in Manipur. Raw silk quality is classified by rendita, a form of measurement in which the weight of the cocoons used for producing 1 kg of raw silk is expressed¹⁷. At the time of appraisal, the target was to produce 61 tons of raw silk using 612 tons of rendita 10 cocoons. As a result of the revised plan,

¹⁷ For example, 8 kg of cocoons will be consumed for the production of 1kg of rendita 8 raw silk. It is considered to be higher quality when the rendita number is smaller.

it was observed that 680 tons of cocoons would improve the quality up to rendita 8; thus the revised target for raw silk production became 85 tons. Since cocoon production has not reached the target, raw silk production is at 46 tons, making it a 54% achievement against the target. These raw silks are produced from existing khare, charkha and cottage basin that were not procured under the project. Reeling activities have not been undertaken directly by the project since the majority of reeling related components were dropped from the project when the DODP was revised¹⁸. Additionally, the multiend reeling factory established using the ODA Loan is not operational due to delays in electricity connection. According to the executing agency, a substation has already been constructed and the multiend reeling factory is scheduled to begin its operations in 2012. Once the multiend reeling factory begins operating, three tons of raw silk will be produced annually from the facility.

Table 3: Production of raw silk from cocoons produced from the project
(Unit: ton)

(1) Target (Appraisal, 1997)	(2) Target (Revised, 2003)	(3) Actual (2010)	(4) Achievement (3)/(2)x100
61	85	46	54%

Source: DOS

3.2.1.3 Employment generation

Employment generation from the project was expected to include the sericulture farmers who are the direct beneficiaries and those who are involved in chawki rearing, reeling and weaving activities. According to the target set at the time of the appraisal, the total employment generated from the project was estimated at 5,833 persons¹⁹ which includes the employment in chawki worm rearing, reeling and weaving based on direct beneficiaries of 3,000 persons and 612 tons of cocoon production. Based on the revised target, the employment generation target was 8,233 persons while the actual number at the time of the ex-post evaluation was 5,271 persons (64% achievement) calculated using the same method as was the time of the appraisal²⁰. Considering the size of the project costs, the number of beneficiaries is rather limited, but at the same time, employment opportunities for more than 5,000 people have been generated through the project, and as cocoon production increases, more employment is expected in the future.

¹⁸ Some of the facilities have been established using a central government scheme, Catalytic Development Programme.

¹⁹ Calculation for employment generation: ① Sericulture farmers+②Workers at CRC (DFL x 9 person/day/100 DFL/250 working day per year) +③Reelers (raw silk production/0.8kgp per day production/annual working day x indirect employment 1.85) + ④Weavers (raw silk production/2.5 ton per day production/raw silk input 55g /ton /300 working day per year x indirect employment 1.25).

²⁰①5000× (1−0.38) + ② (1,158,607×0.09/250) + ③(46,180/0.8/300×1.85) + ④(46,180/0.055/2.5/300×1.25)

Table 4: Employment generation from the Project

(Unit: ton)

(1) Target (Appraisal, 1997)	(2) Target (Revised, 2003)	(3) Actual (2010)	(4) Achievement (3)/(2)x100
5,833	8,233	5,271	64%

Source: DOS

3.2.2 Qualitative Effects

3.2.2.1 Improvement in cocoon quality

According to the executing agency, the percentage of defective cocoons was around 13% after the project. When raw silk production is calculated by eliminating the defective cocoons, it shows an improvement from rendita 10 to rendita 7.5, from before and after the project respectively. Since 2004, the project beneficiaries have been using the variety of silkworm developed by the CSB under the guidance of Japanese experts in the “Bivoltine Sericulture Technology Development Project,” a JICA Technical Cooperation project, and more than 90% of silkworms reared are now bivoltine. Quality improvements related to sericulture technology such as uniformity in cocoon size and ease of unravelling have not been reported by the farmers. Thus the quality improvements in cocoons are limited to improvements of rendita attributed to the introduction of a superior variety of silkworm.

3.2.2.2 Sericulture technology and rearing skills



Figure 9: Mulberry plantation and prefabricated IARH



Figure 10: Adult silkworms reared in an overcrowded manner

In the project, the introduction of a package of new technologies appropriate for mulberry silk production was planned. The package included silkworm rearing technology such as the cultivation of a high yielding variety of mulberry, separation of chawki and adult silkworm rearing²¹ and shoot

²¹ In older practices, a sericulture farmer would rear the silkworms from the chawki to cocoon stage. Since the rearing environments and practices differ depending on the growth stages of silkworms, it was recommended by the project to rear chawki and adult silkworms separately. Chawki worms are reared in a different facility run by the PSCS who caters to the farmer members.

feeding²²; and preventing and controlling silkworm diseases by keeping the rearing houses strictly hygiene and applying the appropriate amount of disinfectant. Currently, except for some of the FOU, chawki rearing is conducted separately from adult silkworms, and in the beneficiary survey it was found that about 80% of the FOU had adopted shoot feeding and regularly apply disinfectant in the rearing houses. On the other hand, many incidents of silkworms being reared in an overcrowded manner, where the silkworms are on top of each other in the rearing shelves, were observed during the site survey. In the prefabricated IARH, there are windows that can help to ventilate, but there are many farmers who do not understand that the temperature can be controlled if the windows are opened, making it clear lack of knowledge among the farmers.

The project beneficiaries have attended training courses on an average of twice²³ during the project period. However, probably due to a lack of interest in sericulture, a low level of awareness and a lack of knowledge, appropriate sericulture technology and rearing methods have not been practiced. The frequency of on-site extension services to the farmers by the executing agency varies from place to place. According to the beneficiary survey, the services from the Technical Service Centre (TSC), where the extension staff is stationed, are provided to FOU which are nearby two to three times during each rearing season while the same services are provided only once to the other FOU that make up 80% of all the beneficiaries, indicating that most of the FOU have not been able to receive adequate services.

The farmers' limited awareness, poor silkworm rearing practices and unsuitable sericulture technology are severely affecting cocoon production; and in order to increase the production and productivity of the cocoons, these issues must be resolved.

3.2.2.3 Increase in income for the poor farmers

At the time of the appraisal, the average annual income for Manipur's sericulture farmer was estimated at INR 12,500 and was expected to increase to INR 27,900 after the project²⁴. According to the beneficiary survey, the project beneficiaries' average income before the project was INR 64,000 and increased to INR 144,100 after the project. The substantial difference in income level is thought to be caused by changes in the selection criteria of the beneficiaries which took place during the revising of the DODP in 2003 and replacing inactive farmers with new beneficiaries in 2007. As a result of these changes, the beneficiaries have shifted from what was originally considered to be the poor and landless to those who are comparatively better off. Although the average income of the beneficiaries has increased significantly, 53% of them practice sericulture as a secondary occupation, and the annual income from sericulture is INR 15,700, comprising only 11% of their total income. Considering these facts, the effects of the project at the time of the ex-post evaluation is limited.

²² A method of feeding mulberry leaves with branches. It reduces labor since the frequency of feeding is less; however, a rearing shelf with ample space is required. Previously, mulberry leaves were chopped and fed to the silkworms.

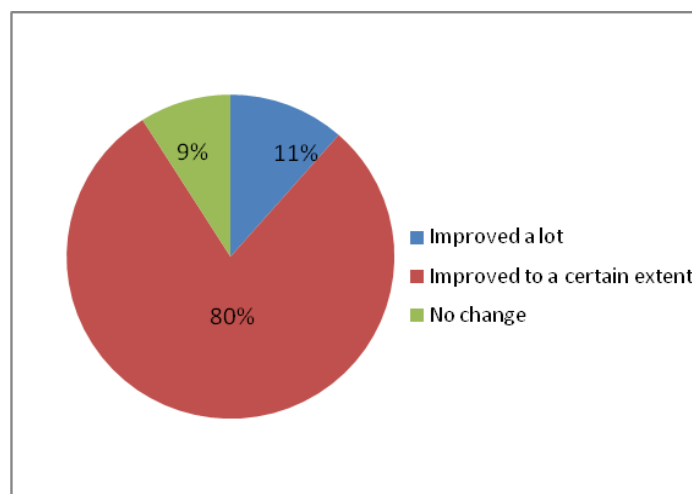
²³ Beneficiary survey finding. According to the Executing Agency, the beneficiaries have attended trainings 3 times during the project.

²⁴ Based on the assumption that the average mulberry plantation per farmer is 0.34 ha.

3.3 Impact

3.3.1 Intended Impacts (improving the standard of living for the poor)

In the project, improving the living standards of the poor was expected through employment generation in sericulture. To confirm the degree of impact brought by the project, a beneficiary survey was conducted interviewing 123 sericulture farmers in six Districts at the time of the ex-post evaluation. Using a questionnaire, questions were asked including the changes in living standards, income and spending compared to before and after the project. About 90% of the famers responded that their living standard had improved due to the income derived from sericulture.



Source: Beneficiary survey

Figure 11: Changes in living standards reported by the beneficiaries

The project beneficiaries were asked to identify the changes in their standard of living which were due to participating in the project. More than 50% responded that there were improvements in basic needs such as in terms of food, medical care and children's education.

Table 5: Increases in expenditures due to increases in income from sericulture

(Unit: %)

Expenditure item	Respondents
Food	65
Medical care	66
Children's education	55
Consumer items	34
Saving	23
Personal and entertainment	24
Fixed assets	10
Home improvement	12

Source: Beneficiary survey

Since sericulture is considered suitable employment for women as it involves detailed work and the women have been the main workforce in the first place, the project expected that by promoting women's participation, it would contribute to uplifting the social status of women. In the beneficiary survey, about 90% of the beneficiaries felt that the women's social status had improved through the project because of regular income, the opportunity to work outside the home, and gaining self-confidence through sericulture training.

When the project started, a detailed action plan for women in development was supposed to be formulated, but no plan was made. It was not explicit in the selection criteria of the beneficiaries to give priority to women, but about 70% of the beneficiaries ended up being women since sericulture is a suitable occupation for women.

3.3.2 Other Impacts

According to the executing agency, the forest area had not been selected for the project as planned at the time of the appraisal. Resettlement associated with land acquisition has also not occurred. Also according to the executing agency, turning wasteland into green cover as mulberry plantation and introducing sericulture as cash crop in the areas where sericulture has not been practiced traditionally have also brought about positive impact to the lives of the poor.

As described above, the living standards of the beneficiaries have improved. However, as described in Section 3.2.2.3, the annual income from sericulture which was expected to increase to INR 27,900, remained at INR 15,700 after the project. Taking this into account, it cannot be determined that the project has improved the beneficiaries' standard of living.

In rating the effectiveness of the project, a degree of achievement for each of the operation and effect indicators was taken using a weighted average²⁵. Using this method, the achievement of quantitative effect is 59% (rating ②). Sericulture industry as a whole is on a growing trend, but the trend is not attributed to the expected qualitative effects such as improvements in cocoon quality and farmers' rearing skills, and as a result, the increase in income is also limited. Taking into account the impact from the project as well, the effectiveness and impact of the project can be said to be fair.

3.4 Efficiency (Rating: ②)

3.4.1 Project Outputs

As mentioned earlier, the DODP was revised in 2003. In 2005, the Action Plan was revised in order to complete the project before the Loan Agreement closure (March 2008). Table 6 shows the changes in the target set at the time of the appraisal, the revised DODP, the revised Action Plan and the actual outputs.

²⁵ Weighted mean value of 0.45 for cocoon production, 0.1 for raw silk production and 0.45 for employment generation have been assigned. Accordingly, the achievement of the quantitative effect becomes 59%. (Cocoon production 54% x 0.45) + (raw silk production 54% x 0.1) + (employment generation 64% x 0.45) = 59%. The weighted mean value of 0.1 has been assigned to raw silk production since the ratio of reeling related components in the project is less than 10%.

Table 6: Project output (target vs. actual)

No.	Output	Target (Appraisal , 1997)	Target (Revised, 2003)	Target (Revised, 2005)	Actual	
					2010	Ex-post evaluation ²⁶
1	Mulberry plantation (ha)	1,020	1,700	1,700	1,700	1,054
2	Chawki rearing centre	30	100	60	60	49
3	Individual adult silkworm rearing houses	600	4,000	4,000	4,000*	2,480
4	MIG	2	1	1	2	1
5	P ₂ station	2	1	0	2	1
6	P ₃ station	2	0	0	0	-
7	Multiend reeling factory	2	12	1	1**	0
8	Cottage basin	2	0	0	0	-
9	Improved charka (no.)	80	100	100	0	-
10	Twisting unit	4	0	0	0	-
11	Technical service centre	4	15	15	15	15
12	Farmer training centre	2	—	0	0	-
13	Sericulture training school	1	1	—	1	1
14	Cocoon market	3	—	—	1	1
15	District storage	5	6	6	6	0
16	Silk conditioning and testing unit	1	0	0	1	0
17	Field research and experiment station	1		0	1	0
18	Project office	1	1	0	1	1
19	Consulting services					
	Foreign consultants	111 MM	—	—	87.5MM	—
	National consultants	250 MM	—	—	237.24 MM	—

Source: DOS

Note: *2,900 prefabricated structures, 1,100 brick structures

**Attached to Post cocoon technology training cum production centre

3.4.1.1 Major changes in Revised DODP

(1) Number of beneficiaries, mulberry plantation and IARH

As described in section 3.2, anticipating the further development of the sericulture industry, the size of mulberry plantations were increased when the DODP was revised. Since the area of plantation that can be managed by one farmer was considered to be 0.34 ha, as the total plantation increased, the

²⁶ This excludes non-operational facilities. Items 1 and 3 have been calculated using 62% of the active FOU as a base.

number of beneficiaries has also increased from 3,000 to 5,000. At the same time, the method used for silkworm rearing has changed from a common rearing having 5 farmers to individual one and thus, the number of rearing houses has increased from 600 to 4,000²⁷.

When the Action Plan was revised in 2005, for providing IARH to as many farmers as possible with limited funds and within the project period, most of the IARH were changed from the recommended simple brick structures to the prefabricated ones. However, the manufacturing of prefabricated structures took more time than was expected and it also took longer than expected for them to be delivered at the project areas since the manufacturing site was located far away from Manipur. Compared to the brick IARH, when using the prefabricated IARH it is difficult to control the rearing environment and this has led to a lowering of cocoon production and productivity. Some of the farmers who are currently rearing in prefabricated IARH have observed higher cocoon productivity in the brick structures, and have become discouraged. As seen above, some of the decisions made for revising the DODP have negatively impacted the efficiency and effectiveness of the project.

(2) Technical Service Centres

Taking into consideration that extension services and technical guidance to the sericulture farmers should be provided in close proximity to the farmers, the construction of a Farmer Training Centre was cancelled. Instead, the number of Technical Service Centres has been increase to 15.

(3) Post cocoon technology related facilities

At the time of appraisal, the construction of reeling facilities (item no. 7 to 10 in Table 6) was initially planned with a capacity to handle 70% of the cocoons produced from the project. In the revised DODP, the reeling related components have been significantly reduced. At the same time, the plan was changed to take full advantage of local individual reeling agents and to procure reeling machineries using other sources of funding. Construction of a twisting unit and the procurement of improved charka were made possible by using the Catalytic Development Programme, a central government sponsored scheme started in 2002. The cottage basin has been dropped from the project and only the multiend reeling factory has been retained in the project as a reeling component.

(4) Other changes

Since the P₃ station is meant for research purposes, it has been excluded from the project. The MIG, P₂ station, field research and experiment station, and the project office were temporally dropped from the project components since they do not directly affect the outcome and sustainability of

²⁷ Only 4000 IARH were planned under the project against 5000 beneficiaries since some of the farmers already owned the rearing houses and additional 573 IARH were to be constructed by other than the project fund. At the time of the appraisal, it was planned to rear 2500 DFL annually in a common rearing house (5 times a year with 500 DFL/crop). If the rearing took place as per the plan, it was estimated to produce approximately 600 tons of cocoons. After revising the DODP, 100 DFL/crop was to be reared in each of individual rearing house. When the Action Plan was revised in 2005, it was planned that each farmer rear 340 DFL annually and with 5000 beneficiaries, 680 tons of cocoon was to be produced. Although the total number of IARH is less than 5000, since the number of active beneficiaries is less than 5000 at the time of ex-post evaluation, it has not affected the cocoon production.

sericulture activities and thus were set aside to be taken up later. These facilities were taken up in 2006 towards the end of the project using the project fund savings derived from exchange fluctuations. Nevertheless, there were not enough funds to procure the necessary equipment, and only the building was constructed for the field research and experiment station²⁸. Similarly, the equipment for the silk conditioning and testing units are to be procured in the future and the facility is currently not in use. Due to delays in electricity connection and shortages in equipment, only one out of two facilities is functional in both the MIG and P₂ stations.

3.4.1.2 Relevance of changes made and their impact on the project

It was the right decision to benefit more farmers by expanding the project since the changes made to the project were based on the expectation of a rapid development of sericulture. However, the mechanisms to secure project sustainability were not considered, and the project was expanded before the three-tier institutional arrangement of the DOS, cooperatives and FOU as shown in Figure 12 was established. Consequently, it has brought down the efficiency of project implementation. Some of the changes made are hampering the ability of the project's effects to become materialized. Such examples include the Ministry of Textiles' decision to procure a large number of prefabricated IARH with the intention of saving time and constructing only the buildings towards the end of the project by utilizing the project's savings which ended up not being utilized. The major changes made in respect to the DODP have not always been appropriate and careful considerations are necessary when looking at the long term development of sericulture.

3.4.1.3 Impact of interrupted consulting services

In the project, all the beneficiary farmers were supposed to be organized into new cooperative societies. To do so, technical training for sericulture and the cooperatives' capacity building by international consultants and support from NGOs on cooperative formation and operation were planned. However, the security situation in Manipur deteriorated due to rebel movement during the project, and the international consultants were forced to evacuate from the state, making them unavailable for a long time. In addition, the Ministry of Textiles suspended the project temporarily and the consultancy service term came to an end while it was still on hold. The re-appointment of international consultants did not materialise afterwards. When the project was in full swing from 2004 onwards, the project was implemented by the executing agency without the involvement of international consultants or any NGOs. Technical training courses for sericulture farmers were carried out at 60% of what was originally planned and the technical support for cooperatives including their formation was insufficient. The interruption of consulting services negatively affected project management, the technical capacity of sericulture farmers and the cooperatives alike.

²⁸ The necessary equipment is to be procured separately.

3.4.2 Project Inputs

3.4.2.1 Project Cost

The actual total project cost was JPY 4,417 million (out of which JPY 3,941 million was an ODA Loan) against JPY 4,958 million (the ODA Loan portion of JPY 3,963 million) as planned at the time of appraisal (89% achievement). Out of the ODA Loan portion, JPY 444 million was foreign currency and INR 1,228 million was local currency. The reason for the project cost being lower than what was projected in the original plan was due to the falling rate of the Indian Rupee against the Japanese Yen during the project period²⁹. When the components which were dropped from the project are excluded from the project cost, the achievement becomes 116 %, making it slightly higher than the original target.

3.4.2.2 Project Period

The actual project period was from December 1997 to December 2008 (133 months)³⁰ against the target of December 1997 to March 2005 (88 months), making it longer than it was originally planned (151% of the target). Considering that full scale implementation of the project started from 2003 onwards and that the project area and number of beneficiaries increased 1.7 times, it was commensurate with the changes. Among the various causes for the project's delay, the central government's intervention in the DODP and it taking more than three years to approve the plan were the biggest reasons. Practically, the project implementation did not take place until 2004. Apart from the project, frequent strikes and road blockages triggered by the State's deteriorating security situation affected the project's progress. Because of the delays in project implementation, the Loan Agreement period was extended from July 2005 to March 2008. At one point in the project, the State government's financial crunch posed a concern on the project; however, the issue was resolved by changing the disbursement procedure from reimbursement to a transfer procedure.

3.4.3 Results of the Calculations of the Internal Rates of Return (IRR)

The result of the recalculation of the Economic Internal Rate of Return (EIRR) was 4.25% for the project. At the time of appraisal, an EIRR of 12.6% was calculated using 1997 as the base year and a project life of 30 years, with assumptions that project costs, operation and maintenance (O&M) costs and replacement costs would be described as "cost," and cocoon production and value addition from raw silk production and other silk products would be described as "benefit." For the ex-post evaluation, 2011 is the base year and the project life is 30 years. For "cost," project costs, O&M costs and replacement costs were taken into consideration. For "benefit," since the details of the calculation methods used in the appraisal were not available, the benefit from increased production of raw silk³¹

²⁹ INR 1 = JPY 3.41 at the time of appraisal, INR 1 = JPY 2.6 an average during 1998 to 2008.

³⁰ Project completion was not defined at the time of project formulation and it was not clear from interviewing the executing agency. Disbursement was completed at the end of the Loan Agreement; however, some facilities were not handed over from the contractors to the executing agencies. December 2008 has been taken as project completion since there has been explanation from the executing agency that all construction and contract closures had taken place by this said date.

³¹ This refers to the amount of raw silk production that is processed using khere and other reeling machines that were idle

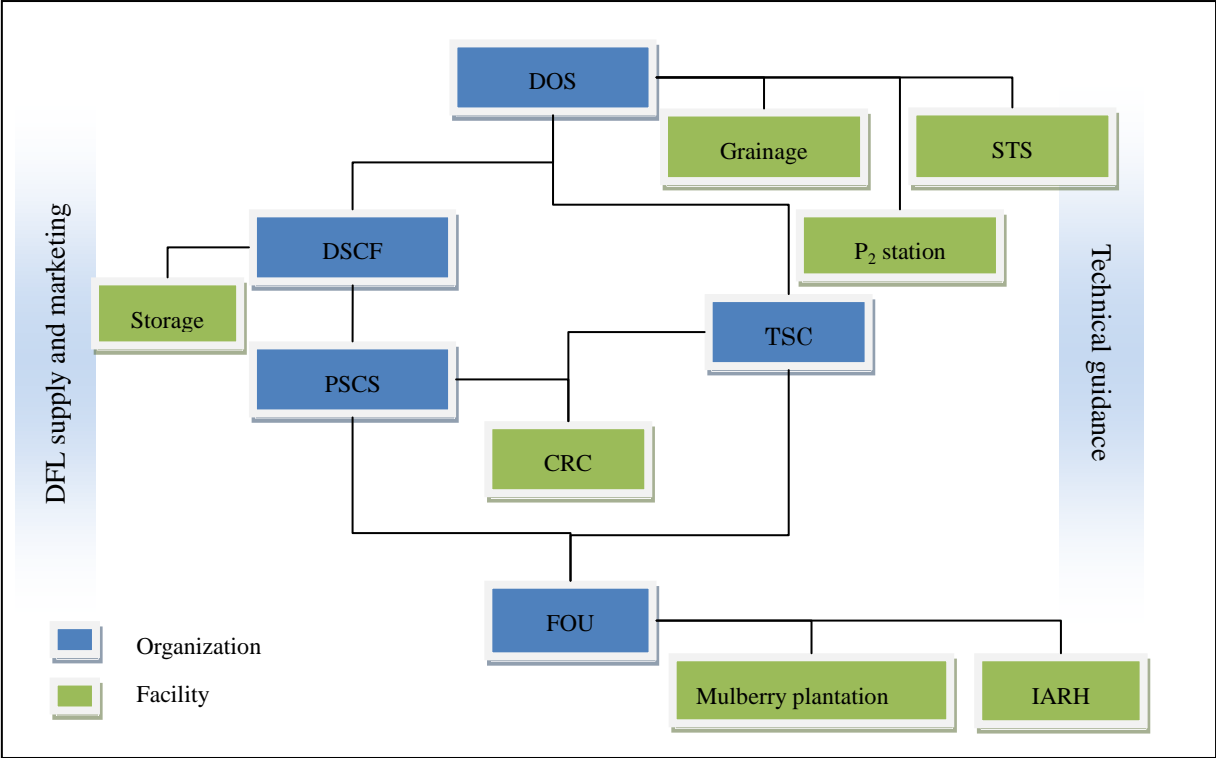
and cocoons³² was used taking the difference between “with” and “without” the project. Since the calculation methods are different, they should not be simply compared; however, the reasons for the lower EIRR comparing the appraisal and the ex-post evaluation time are that the project costs have increased about 1.5 times more than that of the appraisal time at the 2011 price and the fact that cocoon production is 54% of the target.

Both the project costs and the project period slightly exceeded the plan; therefore the efficiency of the project is fair.

3.5 Sustainability (Rating: ①)

3.5.1 Structural Aspects of Operation and Maintenance

At the time of appraisal, it was the responsibility of the DOS to manage the project while the O&M of the facilities such as the mulberry plantation, the IARH, cocoon market and reeling facilities were the responsibility of the newly created FOU and the cooperative societies under the supervision of the DOS. For the cooperatives, it was planned that once the FOU were formed, the village level PSCS would also be formed. The PSCS were further formed into the District Sericulture Cooperative Federations (DSCF), and DSCF were to be affiliated with the existing Manipur State Sericulture Cooperative Federation (MSSCF) at the State level. The fundamental institutional arrangement for O&M is seen in Figure 12 and it remains the same as the original plan.



Source: External Evaluators

Figure 12: O&M arrangement for the Project

before the project.
³² Excess cocoons produced by the project, which equal to the amount more than what is required to produce the raw silk.

Table 7 below shows the organizations responsible for the O&M of each facility at the times of appraisal and the ex-post evaluation. According to the original plan, the cocoon market, district storage facilities and the reeling related facilities were to be operated jointly by the DOS and the cooperatives that would then transfer them wholly to the cooperatives after the project. At the time of the ex-post evaluation, the facilities had not been transferred, there is no concrete plan for the transfer and the manual related to O&M has not been prepared. As described in a later section, the major issue is O&M institutional arrangements such as staff shortages at the DOS, the sluggish activity of the FOU and delays in the formation and registration of the cooperative societies.

Table 7: Organization responsible for O&M

Facility	Organization	
	Appraisal	Ex-post evaluation
Mulberry plantation	FOU	
CRC	Cooperative societies	
IARH	FOU	
MIG	DOS	
P ₂ station	DOS	
Multiend reeling factory	Cooperative societies	DOS
Technical service centre	DOS	
Cocoon market	Cooperative societies	DOS
District storage	Cooperative societies	
Sericulture training school	DOS	
Silk conditioning and testing unit	DOS	
Field research and experiment station	DOS	
Project office	DOS	

Source: DOS

Note: The CRC is currently operated by the cooperative societies under the guidance of DSO. Since the multiend reeling factory is attached to post cocoon technology training cum production centre, its O&M responsibilities have been changed from the cooperative society to DOS. The cocoon market is planned to be transferred to the existing State level sericulture federation. Since district storages are not yet functional, the facilities have not been transferred to the cooperative societies.

3.5.1.1 Executing agency

The Monitoring and Evaluation Section of the DOS is in charge of project management while the O&M of the facilities is looked after by the Technical Service Section. According to the DOS, as of 2010, the DOS faces acute shortages of staff where 295 out of 615 technical posts were vacant. The reason behind the staff shortage is the restrictions on permanent staff recruitments across India due to the financial deficit. From 2012 onwards, the DOS plans to recruit 210 contractual employees in order to tackle the problem of aging staff members and mass retirement which will be occurring over the

next several years. In addition, a special training course is planned at the Sericulture Training School (STS) to fill the experience gap of young recruits. According to the executing agency, the Technical Support Service Center has been established within the headquarter of the DOS in September 2011. The Center monitors sericulture programme and makes recommendation of extension of good practices among other activities.

The TSC is positioned under the District Office of the DOS and provides extension services and technical guidance to the sericulture farmers as an extension office. The TSC is also responsible for providing guidance to the CRC. Each TSC is staffed with five personnel as was envisaged originally and where the TSCs are located comparatively close to the sericulture farmers, they are performing their expected roles. In contrast, the TSCs located at a distance from the farmers and the TSCs that have other assigned responsibilities, such as the operation of mulberry plantations and the P₁ farm attached to it, have been falling short of providing adequate services to the farmers and improvements will be required in the future. According to the executing agency, the Customer Support Center is attached as a separate cell in each TSC since 2011. In addition to disseminating sericulture as in the case of the TSC, the Customer Support Center also acts as grievance cell and resolves dispute and other issues.

3.5.1.2 Cooperative societies

Several FOU are grouped together to form PSCS at the village level and further form DSCFs. Besides being responsible for the O&M for the CRC, the PSCSs undertake cocoon marketing activities. The formation and registration status of the DSCFs and PSCSs at the time of ex-post evaluation are show below.

Table 8: Registration status of DSCF and PSCS

	Formed	Registered	Registration under process	Not yet formed
DSCF	8*	4	3	1
PSCS	72	46	11	15

Source: DOS

Note: *There are nine Districts in Manipur; however, there are only a few FOU in the Tamenglong District and thus it has been decided not to form a DSCF.

The delay in the formation and registration of cooperative societies is mainly due to the cooperative activities not being in full swing and the members of the cooperatives not recognizing the advantages of having more access to financial loans by having the societies registered. Initially, the formation and strengthening of cooperatives was to be carried out by an NGO, but NGO involvement in the project was discontinued at an early stage. Additionally, inadequate support for the cooperatives led to delays in the formation of cooperatives and to over all institutional weakness. The DSCF was expected to be affiliated with the existing MSSCF and at the same time, the MSSCF was to take over the O&M of the cocoon market established in Imphal. However, the cocoon market has not been

transferred to the MSSCF and although the DSCF's affiliation has been discussed among the stakeholders, no substantive procedures have been initiated.

3.5.1.3 Sericulture farmers

The FOU is at various levels of activity, and as mentioned earlier, there are 188 FOU that have completely stopped sericulture activity and an additional 191 that have been conducting sericulture at a reduced scale. Initially, the sericulture farmers with similar socioeconomic backgrounds were expected to distribute the silkworms and market the cocoons collectively as the FOU. Adult silkworm rearing was expected to be carried out individually. In practice, however, many FOU members share the tasks of the entire sericulture activity. In some cases, a FOU leader manages the mulberry plantation and the IARH and the other members are "hired" by the leader. In some other cases, the relatives of the FOU members are engaged since other members have dropped out of the FOU. The individual farmers, unfortunately, do not understand well how collective activities can greatly improve the efficiency of the operations of mulberry plantations, cocoon harvesting and marketing, and are not accustomed to group activities. These seem to be the reasons behind why individual and collective activities have not been carried out properly.

Utilizing the quota for contractual employees to the extent possible and working out the operational plan in line with the staff's strengths of the DOS is desirable although they will not solve the problem of the staff shortage completely. Since strengthening the FOU and cooperative societies directly relate to the level of sericulture activities, revitalizing the unproductive FOU is essential in order to increase the cocoon production in the project area. Once the field level activities become vigorous and cocoon production increases, the necessity of cooperative societies will also increase. An effort should be made to revitalize unproductive FOU at the earliest possible.

3.5.2 Technical Aspects of Operations and Maintenance

The technical skill level of DOS officials is judged to be sufficient. Those who are in technical positions have experience studying sericulture at the university level and have taken training courses on chawki rearing, extension and accounting during the project. As new technologies and varieties of silkworm are introduced, the opportunity to learn these subjects needs to be provided as and when necessary.

For the PSCS and DSCF, even the members who hold executive positions are not engaged in the actual duties of the cooperatives since the cooperative activities are limited. As the cooperative activities have not taken off fully, no issues have been observed as regards to the cooperatives at present. However, the continuous training of cooperative members is required, particularly in accounting and procurement rules since they are revised frequently.

As described in 3.5.1.3, in order to increase cocoon production in the project area in the future, strengthening of cooperatives is essential. Moreover, the cooperatives must continuously train and grow personnel for the O&M of facilities that are their responsibility. For instance, during the site

survey, a few CRCs still operating under the guidance of the DOS were observed. Some of these CRCs have been conducting training on O&M for cooperative members. To make the cooperatives self-sufficient, it is necessary to conduct training courses and other similar initiatives in a planned manner.

The executing agency has ten Cooperative Inspectors, one of whom has been assigned to the DSCF in Churachandpur. Under the guidance of the Cooperative Inspector, the members of the cooperatives are learning organizational management and bookkeeping skills. It is recommended for the other cooperative societies to also utilize the service of the Cooperative Inspectors.

The area with the most technical concerns is the sericulture farmers. Estimating the required amount of chawki based on the mulberry harvest and managing the rearing environment inside IARH have much room for improvement. Particularly in silkworm rearing, rearing under inappropriate conditions leads to disease and starvation of silkworms, and affects cocoon production. In addition to the low level of awareness and interest towards sericulture, the technical issues at the level of sericulture farmers are thought to be attributed to the frequency and quality of technical guidance provided by the TSC. According to the executing agency, the TSC itself does not have problems with staff shortages and insufficient budget. Therefore, the difference in frequency and the content of the extension services seems to be caused by the physical distance between the TSC and the farmers. The DOS has started various initiatives like the Customer Support Center that provides technical support to the farmers as well as resolving problems. Effective use of these available services is expected.

3.5.3 Financial Aspects of Operation and Maintenance

3.5.3.1 Executing agency

Sericulture is an important industry for the Government of Manipur. Since 2004, additional INR 50 million has been appropriated annually by the state government to the project for O&M purposes³³. In addition to the above mentioned fund, according to the executing agency, the State government has sanctioned INR 13 million and the CSB has provided INR 35 million for the project to procure necessary equipments for the facilities that are yet to be functional³⁴. Facilities under the DOS, such as the MIG and P₂ station, are not meant to make a profit; thus there is no mechanism to cover the costs of O&M from the sales of silkworm eggs. Silkworm egg production is considered a public service, and as expansion of sericulture is included in the State policy, the allocation from the State budget for the required expenses is expected to continue.

³³ Includes the O&M subsidy for the FOU.

³⁴ By using INR 13 million sanctioned by the State, tender procedure has been initiated in September 2009 to procure some of the equipments needed in MIG, P₂ station and TSC. The CSB fund of INR 35 million has been released by the CSB in 2012 and it is expected to be utilized for upgrading of MIG, supply of rearing equipments, construction and maintenance of rearing houses and farmer empowerment programme.

3.5.3.2 Cooperative societies

According to a survey conducted after the start of the project, the regular monitoring of cooperatives' financial indicators is expected in order to facilitate financial independence. The MSSCF, DSCF and PSCS are expected to secure funding for operating the cocoon market, district storages and the CRC respectively. At the same time, an agreement has been made for the DSCF and PSCS to repay a portion of project costs to the executing agency. The PSCS are supposed to collect annual membership fees from its members and to collect 10% of cocoon sales as a sales commission. However, according to the beneficiary survey, those who are paying the annual fee are very rare and all of the cooperative societies are considered not financially viable at the moment. Record keeping is practiced only by a few cooperatives and auditing is not conducted regularly. Some are meeting the O&M costs by utilizing government subsidies. CRCs operated by PSCSs are supposed to split the cost of silkworm eggs with the executing agency. However, it was confirmed in the beneficiary survey that the PSCS' share has not been paid and payment to the executing agency is backlogged. Moreover, in many cases, the expenses related to the supply of silkworms from the CRC to the farmers have not been collected. Some cooperative members have raised concerns about the lack of funding and management capacity, emphasizing the weak financial condition of the cooperatives.

3.5.3.3 Sericulture farmers

The first three years of O&M costs for mulberry plantations and IARH have been covered by the project costs. To secure future O&M costs, the farmers provided the labour during the construction of the mulberry plantations and IARH, and in return, received wages of INR 10,000 in the FOU's bank account with a condition that 25% of the capital can be used as a revolving fund for the FOU. To prevent the unnecessary withdrawal of funds from the account, a mechanism has been worked out to make the withdrawal possible only with the counter signature of the bank's branch manager. Nevertheless, due to the lack of O&M funds for mulberry plantations and IARH, INR 10,000 is still being provided annually from the executing agency for the purpose of covering the cost of necessary materials and labour. According to the executing agency, the average O&M costs for mulberry plantations and IARH per FOU is INR 15,800³⁵. Based on the beneficiary survey, INR 11,200 has been reported as the average O&M cost per FOU and the annual average revenue from the cocoon sales is INR 37,800; thus FOUs are not expected to fall short of O&M costs³⁶. According to the executing agency, the subsidy for O&M is expected to be secured by the State budget over the next few years, although it is not clear on how long it will continue. During the beneficiary survey, 60% of the farmers answered that the silkworms are distributed at no cost. Among the sericulture farmers, many are not aware of the necessary costs for the O&M of mulberry plantations and IARH and about half of the farmers responded that they did not know what their annual expenditures on silkworm rearing was, or that there were not expenditures involved in the maintenance of mulberry plantations,

³⁵ For an average mulberry plantation of 1.7 ha and 4 IARH.

³⁶ Per FOU annual average cocoon production is 151 kg. The average traded price of cocoons is INR 250 per 1 kg.

indicating that sericulture activity is not carried out for commercial purposes. It is difficult to imagine that the subsidy to the FOU's will continue in the long term. Therefore, it is necessary to improve both the profitability of cocoons and the farmers' proper understanding concerning the financial situation.

3.5.4 Current Status of Operation and Maintenance

In the project, several facilities are not yet operational or have not been utilized at the time of the ex-post evaluation. The share of non-operational facilities is approximately 18% of the total project cost³⁷. Making the currently non-operational CRC and IARH operational at the earliest possible time and operationalizing the MIG and P₂ station would increase cocoon production in the medium term.

3.5.4.1 Facilities under the DOS

Out of the two MIGs, the currently operating facility is located on the same premises as the project office. In this MIG, production activity is taking place, but due to delays in connecting electricity, cold storage has not been set up. The multiend reeling factory located on the same premise has not been made functional also due to delays in electricity connection. Only the buildings have been constructed for the silk conditioning and testing units and the field research and experiment station; and the necessary equipment is expected to be procured by the prospective Manipur Sericulture Project Phase 2.

At the Sericulture Training School, renovated under the project, a record shows that training courses for sericulture farmers have been offered in 2008 and 2009. These training courses are not regular ones. No regular training program has been conducted since 2000 due to a lack of lecturers and operational funds.



Figure 13: Project office



Figure 14: Storage at Bishnupur District

3.5.4.2 Facilities under the cooperative societies

Out of the 60 CRC constructed, 49 are currently in use. According to the executing agency, the

³⁷ Estimated from the construction costs of 11 CRC, 1520 IARH, 1 MIG, 1 P₂ station, 6 District storages, multiend reeling center, silk conditioning and testing unit and field experiment and research center.

reasons for 11 CRC not being utilized are low demand for chawki silkworms from farmers and a lack of equipment for chawki rearing. In order to increase cocoon production in the future, the CRC needs to be prepared in order to meet the increasing demand from the farmers. There is also the problem of the number of trays owned by each CRC in meeting the maximum rearing capacity. Thus the procurement of equipment matching the rearing capacity is also required.

District storages constructed in six Districts have cocoon drying facilities attached; however, the dryers have not been procured and the cocoon storage facilities themselves have not been used at all. The necessity of cocoon storage will not arise unless there is a significant production increase in cocoons; thus utilizing the storage remains an issue.

3.5.4.3 Facilities under the sericulture farmers

There is no problem with the maintenance of the prefabricated IARHs; however, as mentioned earlier, it is difficult to control the temperature inside these rearing houses compared to the IARHs made of bricks, and this has resulted in lower cocoon productivity. In order to control the rising temperature inside, an effort to consciously ventilate the IARH is required. Mulberry plantations are maintained relatively well. However, due to the lack of fences around the plantations, damage from livestock has been reported.

As described above, there are problems with the structural arrangements of the O&M of the project including shortages of staff in DOS, sluggish activities among FOU and delay in formation and registration of the cooperatives. There are no concrete plans to transfer the facilities from the DOS to cooperatives and O&M manuals have not been prepared. Technical and financial improvements are still possible at the level of cooperatives and farmers. Major problems have been observed with the O&M of project facilities also. Thus the sustainability of the project effect is low.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

In Manipur, one of the poorest States in India, sericulture is a local industry with a long history. Since the 1970s, it has been promoted as an industry to help generate employment and alleviate poverty. The project aimed at increasing the cocoon production and productivity through sericulture in an organized manner and thereby responding to the demand for raw silk in the State. At the same time, it provided employment opportunities thereby improving the living standards of the poor. Considering such background, the relevance of the project is high. However, the details and plans of the project were overhauled in the fourth year of the project, resulting the project costs and period to exceed the original target. Although it was confirmed in the beneficiary survey that there has been an improvement in the living standard, the cocoon production, raw silk production and employment generation remained 50 to 60% of the target in 2010, resulting the effectiveness and impact to be fair. The main reason behind the low level of cocoon production is that nearly 40% of the beneficiaries

have reduced or stopped sericulture activities; even the farmers who are continuing sericulture have been rearing at levels lower than the target level of silkworms because of a lack of knowledge in mulberry production and silkworm rearing, and improper rearing practices caused by a lack of rearing skills and equipment. Inadequate institutional support to the sericulture farmers has also affected their levels of achievement. Currently, there is no mechanism to secure the economic independence of the farmers and cooperative societies, and there remain many issues. By securing various funds for improvement of the project, the executing agency is embarking on operationalizing the project facilities that are yet to be functional and expansion of services to the sericulture farmers. Revitalization of sericulture activities at the farmers' level and strengthening the implementation structure would require other initiatives and a certain amount of time, and therefore, further effort would be expected.

In light of the above, the project is evaluated to be unsatisfactory.

4.2 Recommendations

In order to increase cocoon production and productivity in Manipur, the executing agency should try to resolve the issues made apparent by the ex-post evaluation rather than trying to expand mulberry plantations and promoting eri silk since the agency faces an acute shortage of staff. Once there is prospect for improvement, it is desirable plan for new activities and scale of operations matching the staff strength and capacity. Below are specific recommendations to the executing agency.

4.2.1 Recommendations to the Executing Agency

(1) In the project, approximately 40% of the FOU has either reduced or stopped sericulture. This is affecting the level of cocoon production. Thus it is essential to revitalize the FOU activities. Together with increasing the farmers' awareness, it is necessary to start with making sure that they understand the purpose of collective work as FOU members. Inappropriate sericulture technology and rearing practice also cause the low productivity of the cocoons. Therefore, it is necessary to strengthen their technical capacity until the farmers can practice the sericulture technology as a package. Since the project area is 1,700 ha, instead of taking up all of the farmers at the same time, it would make sense to select highly motivated FOU as model farmers and concentrate on improving their technical capability. When the other farmers can see that the model farmers are generating profits by applying the appropriate sericulture technology, the others will also get motivated.

(2) To revitalize the FOU and improve the technical level of farmers as mentioned in (1) above, strengthening the system for extension and technical guidance services is required. Specifically, enabling an extension system for the DOS staff to provide extension service using the TSC as a base; providing continuous training for the sericulture farmers at the Sericulture Training School and developing manuals are some of the possibilities. Improving the ventilation in the prefabricated IARH, implementing appropriate space utilization for silkworm rearing, and aligning chawki worm demand

with the mulberry production are some of the measures that can be expected to promote the project effect in a relatively short-term. Furthermore, in order to ensure sustainability, it is necessary to conduct training for strengthening O&M. To deal with the shortages of staff at the DOS, it may be worthwhile to consider bringing instructors from the CSB, including the counterpart of the JICA technical cooperation project.

(3) It is desirable to operationalize the unused facilities and make use of mulberry plantations and IARH of the FOU who has stopped sericulture at the earliest possible. Therefore, The MIG and P₂ stations which affect cocoon production in the medium-term need to be prepared to meet the increasing demand for DFL. Measures to improve the current situation like improving the rearing environment in prefabricated IARHs and protecting mulberry plantations are also necessary. In a prefabricated IARH, the room temperature can be controlled by making false ceilings and sunshades over doors and windows from locally available materials. If possible, a six-foot-wide veranda should be added as in the case of the brick IARHs and one corner of the veranda can be used as a storage space for mulberry leaves which will increase the efficiency of silkworm rearing. As for the mulberry plantation, besides protecting it, gaps filling of mulberry plants where the plants have been dead and where the plantation is located on slopes, an effort may be required to prevent the soil from eroding and also, harvesting the rainwater for reuse.

(4) Together with the revitalization of the FOU, it is desirable to activate the PSCS in stages. The cooperatives' finances and capacity should be strengthened by way of ensuring the collection of annual membership fees and deputing the Cooperative Instructor on a regular basis to help them with book keeping practices. The PSCS and DSCF are supposed to repay the portion of the project costs to the executing agency. A consideration for the repayment plan in line with the cooperatives' financial capacity is also required.

(5) To monitor the changes in the extent of the project's effects in the future, maintaining proper records from the level of the executing agency to the farmers is essential. Particularly, the amount of the cocoon harvest and the O&M costs of the FOU at the FOU level, the number of DFL reared at the CRC and the number of DFL produced at the executing agency. For the executing agency, it is particularly important to regularly monitor the information and data, check the progress, find any issues and, if necessary, take corrective measures.

4.2.2 Recommendations to JICA

Considering the security situation in Manipur, it may be difficult for the JICA India Office to monitor the implementation directly. If required, local consultants should be hired to monitor the changes in impact of the project such as volume of cocoon production. Furthermore, if the security situation in Manipur improves, it may be worthwhile to consider conducting Special Assistance for

Project Sustainability (SAPS) to resolve the issues related to the project's sustainability such as strengthening O&M institutional arrangement, strengthening FOU, improving the awareness and technical level of farmers and preparing manuals. If Phase 2 of the project is considered for the ODA Loan, the new project should include components to resolve the sustainability issues mentioned above.

For the facilities constructed under the project which are not functioning currently, the schedule for operationalizing them should be checked and its implementation should be monitored.

4.3 Lessons Learned

(1) For the project, the project's completion was not defined between the executing agency and JICA. Since the executing agency planned to implement Phase 2 by using some of the funds, they thought it was appropriate to construct only the buildings and procure the necessary equipment to operate the facilities in Phase 2. However, a concrete operational plan has not been prepared and some of the facilities have been left unused for a long period of time. It is important to have a clear understanding of completion target and plan for the operationalization of the facilities that were either not completed or not made functional at the time of Loan Agreement closure.

(2) It is desirable to determine the selection criteria of beneficiaries and operational mechanism with due consideration to the local circumstances and the characteristics of the project. In the project, the beneficiary selection criteria were established for the purpose of improving the standard of living of the poor. However, for the poor who have little experience with sericulture, the time taken to obtain cash income was too long. Therefore, without financial assistance, it was difficult to make sericulture a main source of income. However, microfinance for the poor is not very popular in the north eastern part of India. Thus this aspect of the project may not have been realistic. The plan made at the time of the appraisal did not give sufficient consideration to the additional support that was going to be required in order to select the poor as beneficiaries. Considering the potential for sericulture expansion, the project has made a compromise by selecting the farmers who have sericulture experience or those who can provide private land or labour by eventually changing the selection criteria.

As for the implementation structure, sericulture activity on the FOU basis was planned and carried out; however, since the beneficiaries had no prior experience with collective activities, when they were conducting the collective activities themselves they faced many difficulties such as a lack of ownership and an inability to coordinate among the FOU members. This has decreased the farmers' interest towards sericulture and caused some of the FOU to stop sericulture activities. Therefore, when designing the implementation structure that would affect the effectiveness and sustainability of the project, a correct assessment of local circumstances and characteristics is required.

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Project Outputs	a) Mulberry plantation: 1,020 ha b) Chawki rearing centres: 30 c) Individual adult silkworm rearing houses: 600 d) Grainages: 2 e) P ₂ stations: 2 f) P ₃ stations: 2 g) Multiend reeling factory: 2 h) Cottage basin: 2 i) Improved charkha: 80 j) Twisting units: 4 k) Technical Service Centres: 4 l) Farmer training centres: 2 m) Sericulture Training Schools: 1 n) Cocoon markets: 2 o) District storages: 5 p) Silk conditioning and testing units: 1 q) Field research and experiment stations: 1 r) Project offices: 1	a) Mulberry plantation: 1,700ha b) Chawki rearing centres: 60 c) Individual adult silkworm rearing houses: 4,270 d) Grainages: 2 e) P ₂ stations: 2 f) P ₃ stations: 0 g) Multiend reeling factory: 1 h) Cottage basin: 0 i) Improved charkha: 0 j) Twisting units: 0 k) Technical Service Centres: 15 l) Farmer training centres: 0 m) Sericulture Training Schools: 1 n) Cocoon markets: 1 o) District storages: 6 p) Silk conditioning and testing units: 1* q) Field research and experiment stations: 1* r) Project offices: 1
2. Project Period	December 1997 – March 2005 (88 months)	December 1997 – December 2008 (133 months)
3. Project Cost		
Amount paid in Foreign currency	635 million yen	444 million yen
Amount paid in Local currency	3,952 million yen (1,159 million Indian Rupee)	3,193 million yen (1,228 million Indian Rupee)
Total	4,958 million yen	4,417 million yen
Japanese ODA loan portion	3.962 million yen	3,941 million yen
Exchange rate	1 Indian Rupee = 3.41 yen (As of April 1997)	1 Indian Rupee = 2.6 yen (Average between January 1998 and December 2008)

*Only the buildings were constructed.

District-wise Project Facilities

District	Mulberry Plantations (ha)	IARH	CRC	TSC
Imphal East	853.4	2133	30	5
Imphal West	62.9	178	2	2
Chandel	36.6	81	5	1
Ukhrul	129.2	304	5	1
Tamenglong	5.1	11	0	0
Thoubal	108.8	546	8	2
Bishnupur	102.0	264	3	1
Churachandpur	139.4	320	5	1
Senapati	268.6	360	60	2

Location Map of the Major Project Facilities

