

India

Ex-Post Evaluation of Japanese ODA Loan Project
“Chhattisgarh Sericulture Project¹”

External Evaluator: Ryujiro Sasao, IC Net Limited

0. Summary

This project aimed to increase the production of tasar silk² in the State of Chhattisgarh through the development of the sericulture infrastructure and the provision of technical guidance to sericulture farmers, thereby contributing to employment creation and poverty reduction for the poor (especially women).

Because the implementation of this project is sufficiently consistent with the Indian Government’s development plan, the target site’s development needs and Japan’s aid policy, its relevance is high. Silkworm feed trees were planted as planned initially. Regarding the initially estimated impacts, such as employment creation and an improvement in the standard of living of the poor, although each of the production of seeds³, cocoons, silk yarn and spun yarn are lower than initially planned, many poor women are able to work in sericulture and their standard of living is improving. Therefore, it can be judged that the effectiveness and the impact are fair. The efficiency is also fair, because the project costs were within the plan, while the project period was longer than planned. Although the operation and maintenance of this project is stable in terms of organization and personnel, there are problems in the technical and financial aspects. Therefore, the sustainability of the effects produced by this project is fair.

In light of the above, this project is evaluated to be partially satisfactory.

1. Project Description



Project Location



Silkworm Seed Station Established under The Project

¹ Although the title of this project was "Madhya Pradesh Sericulture Project" at first, the region that includes the site covered by this project separated from the State of Madhya Pradesh and became independent as the State of Chhattisgarh in December 2000, the title was changed accordingly.

² Four types of silkworm for sericulture exist in India: tasar, mulberry, muga, and eri. Tasar silkworms eat the leaves of trees such as Terminalia tomentosa and Terminalia arjuna, and are reared outdoors.

³ This means silkworm eggs.

1.1 Background

Sericulture was introduced into India during the prehistoric age. Recently, it has drawn attention as a rural household industry contributing to employment creation and poverty reduction, and the Indian Government has strived to develop it. The production of raw silk sharply increased from about 2,300 tons in 1970 to about 14,000 tons in 1995, which accounted for 13% of the world's total production (99,000 tons) (according to the statistics in 1994)⁴. In the meantime, India received much development assistance to increase the production and improve the quality. With the assistance of the World Bank and others, India carried out the Karnataka Sericulture Project (1980), the Tasar Sericulture Project (1981), which covered several states, and the National Sericulture Project (1989). Japan also has given assistance to India for a long time. Japanese experts have given technical guidance since the 1960s, and Japan gave project-type technical cooperation to the Central Silk Board's laboratory in the State of Karnataka in carrying out its plan to develop bivoltine sericulture technology since fiscal year (FY) 1991⁵.

The former State of Madhya Pradesh, where the target site of this project is located, is one of the poorest states in India. In FY1991, 60.1% of the state population was below the poverty line⁶ (28.9% for the whole of India)⁷. The state economy is based on monoculture rice cultivation, and there are hardly any industries that can absorb additional manpower. In this situation, the sericulture industry, which includes tasar sericulture, has great importance. The production of raw silk from tasar silkworms was 43 tons in FY1994, the second largest in India⁸.

1.2 Project Outline

In the seven districts of Bilaspur, Janjgir, Korba, Raigarh, Jashpur, Surguja and Korea of the State of Chhattisgarh⁹, this project aims to expand the production of tasar silk through the development of the sericulture infrastructure and the provision of technical guidance to sericulture farmers¹⁰, thereby contributing to employment creation and improvement in the standard of living of the poor.

⁴ Source: JICA materials for appraisal.

⁵ "Bivoltine sericulture" means sericulture of a silkworm that has two broods per year.

⁶ In FY1993, the poverty line was an income of 2,747 rupees per person.

⁷ Source: JICA materials for appraisal.

⁸ Source: JICA materials for appraisal.

⁹ When administrative districts were revised in 1998, Bilaspur, Raigarh, and Surguja, the target three districts of this project at the time of the appraisal, were divided into seven districts of Bilaspur, Janjgir, Korba, Raigarh, Jashpur, Surguja, and Korea. There was no change in the project site.

¹⁰ This project initially included "consideration of the feasibility of mulberry sericulture" (for details, see the section on "Efficiency").

Loan Approved Amount/ Disbursed Amount	2,212 million yen / 1,205 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:) (10 years) Conditions for General untied Procurement
Borrower/ Executing Agency (ies)	President of India/ Chhattisgarh Sericulture Department
Final Disbursement Date	February 2007
Main Consultant (Over 100 million yen)	Nippon Koei (Japan)
Feasibility Studies, etc.	Agriculture Finance Corporation Ltd., Bombay: F/S , 1993 JICA: Special Assistance for Project Formation (SAPROF) for the Madhya Pradesh and Manipur Sericulture Projects, 1996
Related Projects	(Japanese ODA loan) “Manipur Sericulture Project” (1997) (Technical cooperation) “Project for Promotion of the Popularization of Practical Bivoltine Sericulture Technology in India” (1997 - 2002) “Strengthening the Extension System for Bivoltine Sericulture in India” (2002 - 2007) (Other organizations’ projects) World Bank: Kartanaka Sericulture Project World Bank and Swiss Agency for Development and Cooperation: National Sericulture Project Swiss Agency for Development and Cooperation: Interstate Tasar Project * All these projects were carried out in other states.

2. Outline of the Evaluation Study

2.1 External Evaluator

Ryujiro Sasao (IC Net Limited)

2.2 Duration of Evaluation Study

Duration of the Study: August 2013 – December 2014

Duration of the Field Study: January 26 – February 1, 2014; May 5 – May 18, 2014

2.3 Constraints during the Evaluation Study

In the State of Chhattisgarh, the External Evaluator could not basically enter the project site for security reasons. As a result, the local consultant familiar with the situation in the state and sericulture carried out a survey on the beneficiaries and inspection of the facilities under the supervision of the External Evaluator, who then carried out an evaluation based on the information.

3. Results of the Evaluation (Overall Rating: C¹¹)

3.1 Relevance (Rating: ③¹²)

3.1.1 Relevance to the Development Plan of India

At the time of the appraisal (in 1994), India was the second highest producing country after China for the production of raw silk with a share of 13% of the world total production¹³. With rapid economic growth, however, the demand for silk sharply increased and domestic production could not keep up with the increase in demand, so that India imported about 4,000 tons of raw silk every year as the warp for weaving. Against this background, India placed importance on the development of sericulture mainly to meet domestic demand.

In the Eighth Five-Year Plan (1992–1996), besides the food crop production, the Indian Government mentioned sericulture as an agricultural industry that can increase incomes and employment in areas with rainfed agriculture and poor areas, in particular, those for the small-scale farmers.

At the time of the ex-post evaluation, the Twelfth Five-Year Plan (2012–2017) states that the annual production of silk should increase to 32,000 tons by 2017, assuming that it would increase by 7.14% every year¹⁴. To achieve this target, it is necessary to organize farmers' associations to create a multiplier effect between Research and Development/technical transfer and the promotion/production processes of the companies. In addition, in the 2014 annual plan,

¹¹ A: Highly satisfactory; B: Satisfactory; C: Partially satisfactory; D: Unsatisfactory.

¹² ③: High; ②: Fair; ①: Low.

¹³ India produced 14,579 tons of raw silk in 1994.

¹⁴ According to the Central Silk Board's 2013 material entitled "The Sericulture Industry in India," the provisional production of raw silk in 2011 was 23,060 tons.

the Chhattisgarh Department of Sericulture specified three objectives: employment creation through cocoon production and reeling/spinning; the supply of silk to local silk textile manufacturers; and meeting the demand for silk in India and abroad.

As described above, the Indian Government has continued to place importance on the promotion of sericulture in its development plans since the ex-ante evaluation. Therefore, this project is highly relevant to the development plan.

3.1.2 Relevance to the Development Needs of India

At the time of the appraisal, in the target seven districts in the State of Chhattisgarh, there were few industries other than those based on a single crop of rice, and the average poverty rate¹⁵ was 75%. In addition, Schedule Caste and Schedule Tribes¹⁶ accounted for about a half of the total population. Most of the households below the poverty line belonged to the Schedule Caste and Schedule Tribes. Therefore, it was highly necessary to provide the jobs for the poor people in the districts which enable them to be independent in a sustainable manner. Sericulture is particularly suitable as a means to achieve poverty reduction, because it enables the farmers to gain higher incomes with small investment, compared to other agricultural activities. In addition, it is regarded to be suitable for women because it mainly require delicate and detailed operations. At the time of the ex-post evaluation, the State of Chhattisgarh is one of the poorest states in India. Therefore, there is a great need for economic development on behalf of the poor¹⁷.

It was confirmed beforehand that, in addition to such clear development needs, there is demand for silk yarn, a precondition for the feasibility of this project. Moreover, it has been confirmed since then that this demand has continued to remain high. According to the Indian Government's statistical information, the production of raw silk from tasar silkworms in the State of Chhattisgarh increased 2.1 times between 2004 and 2012¹⁸. In India as a whole, it increased 5.4 times and imports of raw silk account for about a half of the domestic production of all types of raw silk¹⁹. Because trends in production and imports correspond to the demand, it can be inferred that the demand for tasar silk, a precondition for this project, was certain to exist.

Therefore, at the time of both the ex-ante evaluation and the ex-post evaluation, the development need for sericulture was high.

¹⁵ The ratio of population that belongs to families with annual income less than 11,000 rupee (FY 1994).

¹⁶ The Scheduled Castes are the castes authorized to be protected under the Constitution of India. The Scheduled Tribes are the indigenous people recognized under the Constitution of India. Reservation systems for the seats in the national and state assemblies, education, etc., exist on behalf of both the Scheduled Castes and Scheduled Tribes.

¹⁷ According to statistics in FY2011–2012, the ratio of poor people to the population of the State of Chhattisgarh is 39.93%, which is higher than any other state in India (Source: "Press Note on Poverty Estimates, 2011–12," July 2013, Planning Commission).

¹⁸ It increased from 145.2 tons in 2004 to 298.6 tons in 2012 (Source: Chhattisgarh Department of Sericulture).

¹⁹ It increased from 322 tons in 2004 to 1,729 tons in 2012 (Source: Central Silk Board).

3.1.3 Relevance to Japan's ODA Policy

According to Japan's policy for ODA to India established in 1995, "poverty reduction" is one of the priority fields together with "economic infrastructure development" and "environment conservation." One of the priority subfields of "poverty reduction" is agricultural and rural development, including agricultural infrastructure development. Since this project, which contributes to poverty reduction through agricultural development, is consistent with the important issues specified in Japan's policy for ODA to India, it is highly relevant to Japan's ODA policy.

This project has been highly relevant to the country's development plan, the target area's development needs, as well as Japan's ODA policy. Therefore its relevance is high.

3.2 Effectiveness²⁰ (Rating: ②)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

Although, at the time of the appraisal, clear operation and effect indicators had not been set for this project, the outcome expected under this project is "expansion of the production of tasar silk." With regard to this outcome, it was judged that it is appropriate to evaluate it using the indicators related to the production of tasar silk that have been specified in the revised Detailed Project Report (hereinafter referred to as "DPR")²¹. Table 1 shows the targets and results of the indicators. The following are the achievement rates of the initial target values of the main outcome indicators:

- Production of tasar silkworm seeds: 38%
- Production of cocoons: 17%
- Production of silk yarn and spun yarn: 49%

²⁰ Sub-rating for Effectiveness is to be put with the consideration of the Impact.

²¹ After the beginning of this project, project management consultant engaged in the project prepared a DPR in May 1999. The DPR was revised in November 2000.

Table 1: Targets and Results of Indicators Related to Production of Tasar Silk

Item	Target ^{*1} (2006: scheduled year of project completion)	Results						Perfor mance ^{*3}
		2003	2009 ^{*3} (2 years after project completion)	2010 (3 years after project completion)	2011 (4 years after project completion)	2012 (5 years after project completion)	2013 (6 years after project completion)	
1. Sericulture								
(1) Production of cocoons (000) ^{*2}	94,463	1,862	15,628	14,166	15,412	13,366	13,427	17%
2. Total production of seeds (00,000)	27.33	0	10.32	12.82	11.75	13.59	12.06	38%
3. Process after cocoon production (tons)								
(1) Silk yarn	87.04	19.23	55.84	73.23	66.71	67.51	52.47	
(2) Spun yarn	54.96	4.62	13.40	17.58	16.00	16.20	34.98	
Total	142.00	23.85	69.24	90.81	82.71	83.71	87.45	49% ^{*4}

Note: *1. Source: revised DPR.

*2. The revised DPR calculated the production of cocoons, including the impact of this project on the existing plantations. However, because data on the existing plantations is difficult to collect and is not so influential, the figures are limited to new planting.

*3. According to the Economic Cash Flow specified in the revised DPR, it was assumed that the project effects would be fully developed two years after the completion of the facilities. Therefore, the performance was calculated by dividing the results of two years after the completion (2009) by the target.

*4. The target of 142 tons is a value for the entire project area. It means that consideration was given to not only the reelers/spinners who use the machines installed under this project, but also those for traditional reelers/spinners (not using the machines installed under this project). If the target is limited to the direct beneficiaries for the purpose of the calculation of performance, the target and the result (2009) are 45 tons and 35 tons, respectively. In this case, the performance is 78%. (The source for the target is the revised DPR, while the source for the result is the results of the interviews with the executing agency.)

The following are comparisons between the plan and the results according to the basic production processes of tasar sericulture (1. Planting of trees → 2. Production of seeds → 3. Production of cocoons → 4. Production of silk yarn and spun yarn):

1. Planting of trees: Trees have been planted on 4,000 hectares by 2003 as planned. However, of the 4,000 hectares of the planted area, only 2,600 hectares remained in 2013. The loss of 1,400 hectares was mainly due to the natural death of the feeding trees and airborne ash deposition²². It is inferred that 70–80% of the lost trees were due to natural death. The main reason for this is that the Department of Sericulture's

²² According to an interview with the executing agency, the ash came from smoke emitted into the air from the chimneys of the neighboring steel plants or coal thermal power plants. Because they seem to fulfill the emissions standards in India, the executing agency has not made any special protest or proposal. As an alternative measure, the executing agency has planted trees in 1,529 hectares for tasar sericulture in areas where it is difficult for the ash to impact on these plants.

payment of maintenance expenses ended four years after the planting²³, however, the sericulture farmers could not fully pay the maintenance expenses afterwards. As a result, there was a shortage of money for fertilizers, and the necessary nourishment was not given to the feeding trees. With regard to the remaining 2,600 hectares, the quality and quantity of the feeding trees was also inadequate due to the lack of nourishment.

2. Production of seeds: The planned amount of 2.73 million seeds consisted of 1.8 million seeds for this project and 930,000 seeds for other purposes. In reality (in 2009), the production of seeds was only 1.03 million, which consisted of 570,000 for this project and 460,000 for other purposes. Only 57,000 seeds were supplied for this project because the number of seeds actually necessary for this project was far lower than planned. The reason why the number of supplied seeds was lower than planned was not because the seed station's production and supply capabilities were insufficient.

3. Production of cocoons: In 2009, the production of cocoons was 15.63 million, only 17% of the planned amount of 94.46 million. The main reasons are as follows: 1) the above-described decrease in the planting area of feeding trees for tasar silkworms; 2) a decrease in the number of seeds as input; and 3) the underdevelopment of the silkworms.

With regard to 2), although it was assumed that 450 seeds would be distributed per hectare, the actual number of distributed seeds was about 200. With regard to 3), although it was initially assumed that the production of cocoons would be "50 cocoons per silkworm seed," the actual number was only 25, a half of the assumed number. Moreover, 2) was caused by a decrease in demand for seeds because of a decrease in the amount of feeding tree leaves and the immature sericulture skills of the farmers; 3) was caused by not only the immature sericulture skills of the farmers, but also the problematic quality of the feeding tree leaves. According to a sericulture expert, both 2) and 3) were caused by the poor maintenance of the planted trees and problematic sericulture skills.

4. Production of silk yarn and spun yarn: Although the initial target was 142 tons, the production of silk yarn and spun yarn in the seven project districts was actually 69 tons in 2009. In terms of raw materials, it was estimated that 18 tons were made from cocoons produced under this project, while 51 tons were made from cocoons produced in other areas.

Given the number of reelers/spinners²⁴, their production level through the use of the machinery provided under this project was estimated to be about 35 tons. Therefore,

²³ Based on the preliminary analysis (which was carried out when the revised DPR was prepared), it was predicted that if the number of cocoons were produced as planned, the income from this would make it possible for sericulture farmers to pay maintenance expenses. According to the revised DPR, a micro-level simulation was carried out on how each farmer's income and expenditure levels would change if the Department of Sericulture paid maintenance expenses for several years just after the completion of planting until the production become stable. However, the incomes of the sericulture farmers do not seem to have increased as simulated, and confirmation as to whether the farmers had the intention to pay maintenance expenses seemed insufficient. Concretely, according to the simulation, the introduction of sericulture would increase each farmer's income by about 11,000 rupees, from which the additional cost of about 3,000 rupees for sericulture (mainly, expenses for fertilizers and pesticides) would be paid. However, because the increment was only about 8,000 rupees per farmer, the farmers hardly paid even the fertilizer expenses. According to an interview survey, one beneficiary farmer said that such a level of increment did not enable them to pay fertilizer expenses (which would require an increment of about 20,000 rupees).

²⁴ There are two types of spinning: reeling (weaving of yarn from normal cocoons) and spinning (weaving of yarn from broken cocoons). We mean either reeler or spinner by "reeler/spinner."

the production capacity of the machinery provided under this project²⁵ seems to have been sufficiently used.

In the production flow of sericulture, the causes for the differences between the initial plan and the results can be summarized as follows:

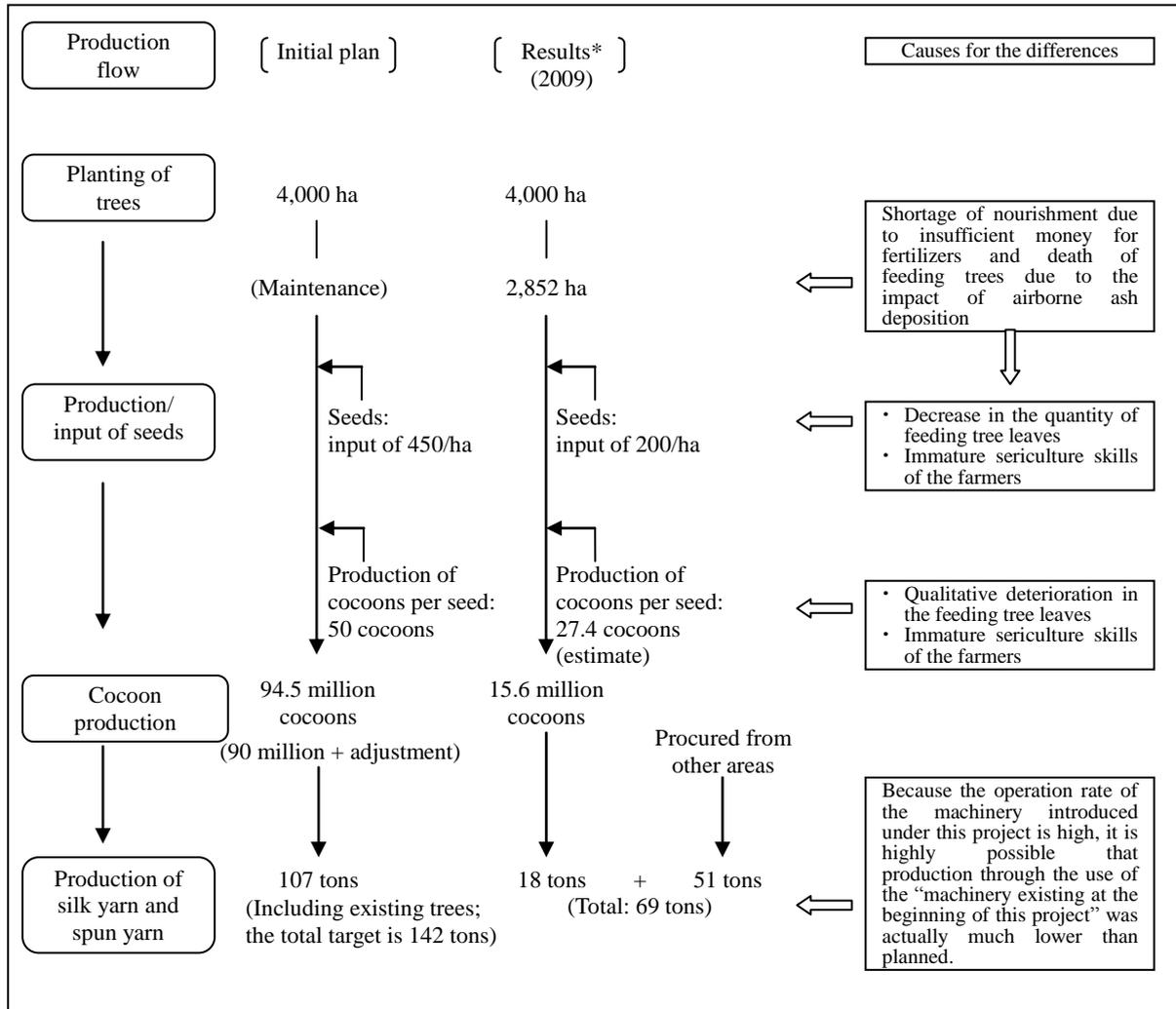


Figure 1: Explanatory Chart of the Differences between the Initial plan and Results in the Production Flow

Source: Prepared by the External Evaluator

Note: *The result in 2013 is the planting area of 2,628 (ha) × input of 200 seeds per unit hectare × 25.5 (number of produced cocoons per silkworm seed) = 13,427,000 (number of produced cocoons).

²⁵ When the revised DPR was prepared, a theoretical value was calculated at 45 tons on the assumption that all the beneficiaries (750 people) work for 300 days.

3.2.2 Qualitative Effects²⁶

Although, according to the results of the questionnaire survey on the beneficiaries carried out during this ex-post evaluation²⁷, the farmers gave a relatively high evaluation on the condition of leaves of the feeding trees for the silkworms²⁸, the condition of the leaves is not good because of the lack of nourishment, and the number of silkworms per leaf area is low, according to an Indian expert on sericulture. However, the quality of the cocoons produced by the farmers is high, and the average selling price is almost the same as the standard price for the highest-quality cocoons in India²⁹. Almost all the farmers answered that the selling price reflects the quality and is appropriate. Therefore, although there are problems in the quality of the feeding trees during the intermediate processes of the production flow, the quality of the cocoons is high as the final product.

The following summarizes an analysis of the emergence of outcomes according to cause-effect logic:

²⁶ Qualitative effects of this project other than statistical data were confirmed. Concretely, the quality of the products and the feeding trees for the silkworm was confirmed.

²⁷ During the nine days in late May 2014, five investigators, including a sericulture expert, carried out an interview survey on the beneficiary farmers in the seven target districts to investigate the effectiveness, impact, and sustainability of this project, applying random systematic sampling. The total number of samples was 211, consisting of 136 sericulture households and 75 reelers/spinners. With regard to the category of sericulture households, 32 beneficiaries (all of whom are women) are absent and male farmers responded to the questionnaire in place of the beneficiaries. The female respondents can be divided by age as follows: one woman in her 10s (1%); three women in their 20s (3%); 28 women in their 30s (27%); 43 women in their 40s (41%); 17 women in their 50s (16%); 12 women in their 60s and over (12%). Their average age is 44.9. Although all the reelers/spinners are also women, three respondents were men (surrogate respondents). The female respondents can be divided by age as follows: two women in their 10s (3%); 17 women in their 20s (24%); 31 women in their 30s (43%); 16 women in their 40s (22%); four women in their 50s (6%); two women in their 60s and over (3%). Their average age is 35.4.

²⁸ The number of respondents choosing “Highly satisfactory,” “Satisfactory,” “Improvement needed” and “Very problematic” were 43, 85, 8 and 0 respectively.

²⁹ Quality rank A (the other ranks are B, C, D and defective).

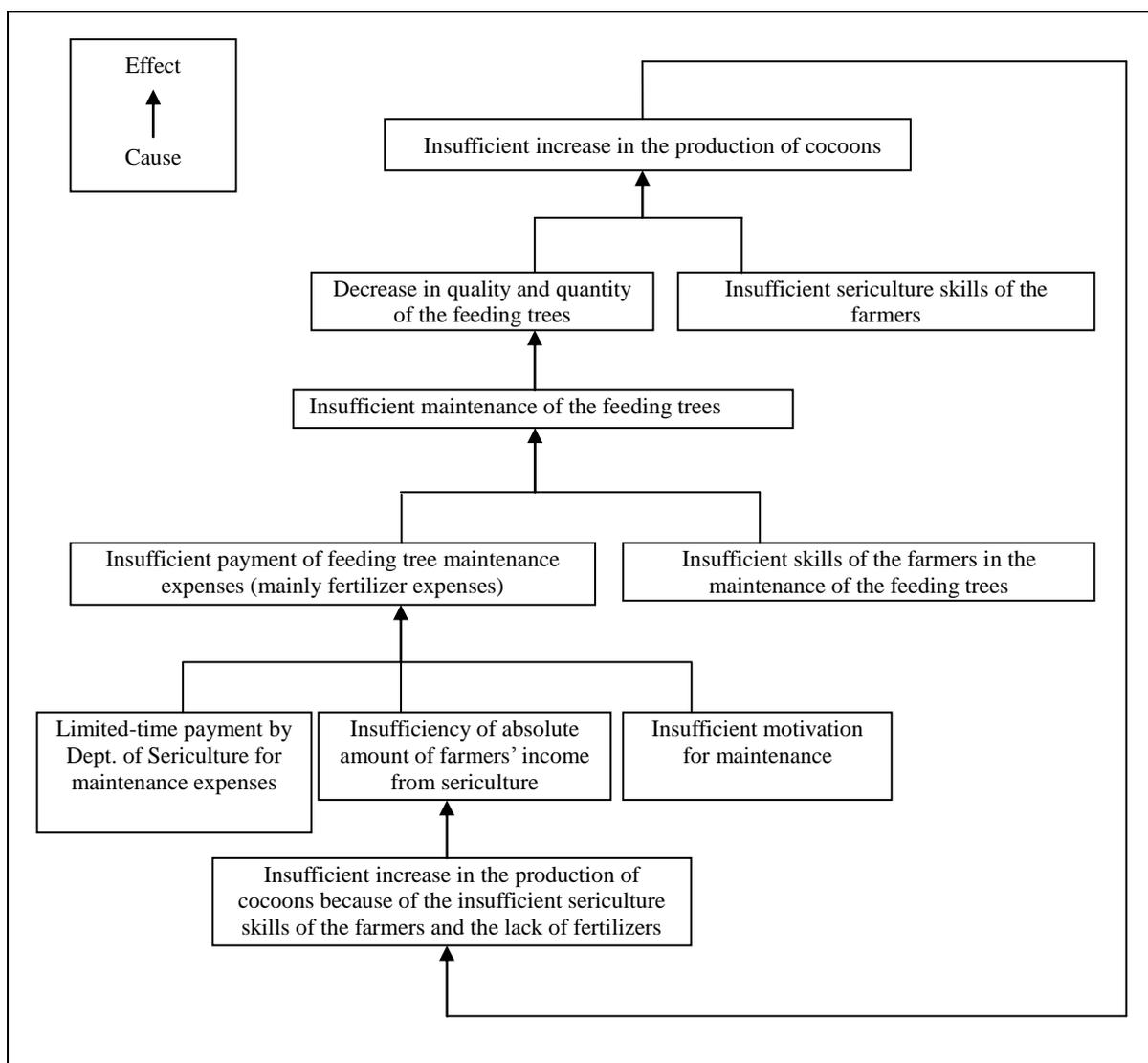


Figure 2: Analysis of the Emergence of Outcomes

3.3 Impact

3.3.1 Intended Impacts

The initially intended impact was the “creation of employment and improvement of the standard of living of the poor (especially, women).”

With regard to the “creation of employment,” according to the executing agency, all the farmers and reelers/spinners participating in this project were newcomers. Therefore, employment was created for the number of beneficiaries involved (about 3,350)³⁰. The qualifications for farmers covered by this project include the following: an income less than the poverty line; no ownership of land; and that they are female. These farmers were selected as

³⁰ Total of 2,600 new sericulture farmers and 750 new reelers/spinners.

planned initially and the sites for planting trees for tasar sericulture were selected under certain criteria³¹.

Although the target number of tasar sericulture farmers in the project districts (all of them were women) was 4,000, the actual number was 0 in 2000, 3,718 in 2001 and 4,984 in 2002 (peak year). Subsequently, the number gradually declined and was 2,604 in 2013 (see Appendix 1). Because the number of sericulture farmers should be basically one per hectare, the decrease in the number of sericulture farmers reflects the above-mentioned decrease in the area of planting trees. Although the area of planting decreased partially because the feeding trees died due to ash deposition from neighboring steel plants and power plants, the death of the feeding trees is mainly caused by the failure of the sericulture farmers to provide fertilizers or take the necessary care of them. According to an interview with a sericulture expert who interviewed the sericulture farmers and the executing agency, it can be inferred that the farmers who continued to conduct sericulture can maintain the feeding trees because they have used pesticides, paid some fertilizer expenses by managing to raise funds and take care of the feeding trees somewhat carefully under the guidance of the Department of Sericulture.

Besides environmental factors, the reasons for the decline in the number of sericulture farmers include the “failure to give fertilizers or take necessary care of them” as described above. This seems to be because of the following: (1) the motivation for maintenance among the farmers is weak because they do not own the land on which the feeding trees are grown; and (2) the farmers’ awareness of the problems and basic skills required for sericulture could not be developed fully because training for them at the first stage of this project was insufficient.

Therefore, the continuation of sericulture by the farmers requires the establishment of a system for providing a certain amount of pesticides and fertilizer, promotion of understanding by the farmers of the importance of the provision of pesticides and fertilizers, and the provision of the basic technical guidance necessary for sericulture.

Although the current number of beneficiary sericulture farmers is about 60% of the initial target, the number of sericulture farmers covered by this project has almost ceased to decline since 2009. The number of sericulture farmers does not include the number of reelers/spinners. The number of beneficiary reelers/spinners covered by this project is 750 (all of them are women), which is in accordance with the plan specified in the revised DPR (achievement rate: 100%).

³¹ The criteria include accessibility from the house of the beneficiary farmers, flat plantation land, and a sufficient amount of soil.

In regard to “improvement of the standard of living of the poor,” according to the results of the questionnaire survey on the beneficiaries, the farmers covered by this project receive benefits from this project, such as an increase in income³² and an improvement in their standard of living, as shown in the following tables:

Table 2: Sericulture Farmers – Change in the Standard of Living after Participation in This Project

Item	Highly improved	Fairly improved	No change	Worsened	Total
No. of people	61	74	1	0	136
Ratio (%)	45	54	1	0	100

Table 3: Sericulture Farmers – Concrete Items indicating an Improvement in the Standard of Living^{*1} (Top Five Items)

Item	No. of people	Ratio (%)
Purchase of more food	135	99
Receiving more medical services	129	95
Provision of better education to the children	89	65
Repair of the house	71	52
Savings	55	40

Note: **1. Multiple answers allowed.

As shown in the following tables, the results of the questionnaire survey on the beneficiaries also indicates that the beneficiary reelers/spinners of this project received benefits, such as an improvement in food consumption and the benefits of medical services:

Table 4: Reelers/Spinners – Change in the Standard of Living after Participation in This Project

Item	Highly improved	Fairly improved	No change	Worsened	No answer	Total
No. of people	49	22	3	0	1	75
Ratio (%)	65	29	4	0	1	100

³² Information was collected through the questionnaire. Although the incomes of the farmers are generally on an upward trend, the External Evaluator refrained from calculating the average income because there are clearly abnormal values (including answer and interview mistakes) and because the units of the values are sometimes not uniform.

Table 5: Reelers/Spinners – Concrete Items indicating Improvement in the Standard of Living ^{*1} (Top Five Items)

Item	No. of people	Ratio (%)
Purchase of more food	70	93
Receiving more medical services	70	93
Provision of better education to the children	49	65
Increase in entertainment expenses	42	56
Increase in the purchase of daily necessities	38	51

Note: *1. Multiple answers allowed.

3.3.2 Other Impacts

1. Impacts on the natural environment

Because negative impacts on the environment were not assumed at the time of the appraisal, an environmental impact survey was not regarded as necessary. Moreover, it can be considered that this project restored forest resources through tree planting, thereby contributing to prevention of the degradation of forest vegetation and the discharge of sediment in the rainy season.

2. Land Acquisition and Resettlement

Because the sites where tasar sericulture was planned are owned by the Department of Forests, it was not necessary to acquire private land or resettle the residents.

3. Unintended Positive/Negative Impact

At the time of the appraisal, the participation of women (consideration of gender) was assumed as another impact of this project. The revised DPR's Section 6 "Institutional and Social Development Plan" has a heading entitled "Involvement of Women in the Project³³." Under this heading, importance is placed on the role of self-help groups (hereinafter referred to as "SHG"). According to the executing agency, women's group activities had the following effects: "improvement in the sanitary condition of homes through the development of people's consciousness of public health"; "development of people's consciousness of nutrition"; "participation in health services provided by the government (such as vaccination)"; and "improvement of women's status in their home."

³³ This is virtually the same as the "Action Plan for the Consideration of Women," which was supposed to be prepared at the time of the appraisal.

According to the results of the questionnaire survey on the beneficiary sericulture farmers, almost all the respondents (135 of 136) answered that women's social standing improved. The following factors contributed to this improvement:³⁴

Table 6: Factors Contributing to the Improvement of Women's Social Standing ^{*1}

Item	No. of people	Ratio (%)
Provision of a regular job and salary	132	97
Provision of work outside the home	101	74
Acquisition of self-confidence through sericulture	95	70
Various kinds of training	46	34

Note: *1. Multiple answers allowed.

Moreover, according to investigators of the questionnaire surveys on the beneficiaries, some women commented "Although before I did not have self-confidence and could not talk with strangers, lifting my face, now I can talk, lifting my face, because I'm earning a regular income from sericulture³⁵ and contributing to the family budget" and "I have become able to talk with my husband on an equal footing."

As described above, there are three types of indicators related to the production of tasar cocoons. With regard to the rating of the project in terms of effectiveness, performance is 38% for the production of seeds, 17% for the production of cocoons and 49% for the production of silk yarn and spun yarn. Because each of the indicators is important for "the production of tasar silk³⁶," the average of the three indicators, which is 35%, is regarded as performance in terms of the quantitative effect (which falls under Rating ①³⁷). On the other hand, from the viewpoint of employment creation and poverty reduction, both of which are the ultimate objective and main impacts of this project, the results of employment creation (the total number of new sericulture farmers and reelers/spinners to whom equipment was newly provided) reached 70% of the planned value³⁸. With regard to poverty reduction, almost all the respondents to the questionnaire survey on the beneficiaries answered that their standard of living "Highly improved" or "Fairly improved." The ratio of those answering "Highly improved" is 45% for sericulture farmers and 65% for reelers/spinners. With regard to poor women, the target group of this project, almost all the respondents answered that women's social standing had improved.

³⁴ According to the results of the questionnaire survey on spinners, 72 of the 75 respondents also answered that women's social standing improved.

³⁵ According to the results of an interview with the executing agency, if a woman of an agriculture household is employed as a cleaner in a project district, she can earn about 42 rupees a day. On the other hand, if the income earned from sericulture under this project is converted into a daily wage, it becomes about 180 rupees.

³⁶ From the viewpoint of the actual inputs also, support is frequently given to activities related to the three indicators. Therefore, it cannot be said that one of them can represent the whole.

³⁷ This is evaluated as "unsatisfactory."

³⁸ The actual value (2,604 farmers + 750 spinners) ÷ planned value (4,000 farmers + 750 spinners) = 70.6%.

Taking into comprehensive consideration what has been described above, the effectiveness and the impact are fair.

3.4 Efficiency (Rating: ②)

3.4.1 Project Outputs

The plan and results of the project outputs are as follows:

The table below shows the results concerning the facilities. Although some of the result numbers are less than planned, they are not so different from the initially planned values. With regard to the consulting services, all the initially planned services were carried out, except for the detailed design for mulberry sericulture.

Table 7: Plan and Results of the Outputs

Item	Facility	Initial target (at the time of appraisal ^{*1})	Revised DPR ^{*2}	Revised target ^{*3}	Result ^{*4}	Reason for the change
1. Tasar silkworm facilities						
1) Tasar Plantation	Tasar feeding trees (ha)	4,000	4,000	4,000	4,000	None
2) Infrastructure for sericulture	Grainage (Mud House & Pairing Cage) (no.)	14	15	10	10	At the meeting in February 2002, ECC decided that the number of facilities should be reduced because the Dept. of Sericulture's existing facilities could be used.
	P2 Station (no.)	4	5	3	3	Same as above
	P3 Station (no.)	1		0	0	Because P3 station is maintained by the Central Silk Board and therefore the construction of stations was not essential for carrying out this project, it was excluded from the scope (although the initial plan aimed to establish the production flow of silkworms under this project, this change does not seem especially problematic).

	Cocoon godown for each District (no.)	3	3	3	3	Facilities were not newly established as initially planned; the Dept. of Sericulture's existing facilities were reconstructed.
	Village Cocoon Storage (no.)	30	30	10	10	Because the Dept. of Sericulture's existing facilities could be used, the number of facilities was reduced.
	Multiend Reeling Center (no.)	2 (40 machines)	500 machines	500 machines	500 machines	Although it was initially planned that 20 reeling machines would be installed at two places, the groups of reelers were unable to secure places where all the 20 machines could be installed. To improve the capacity to reel thread, 500 reeling machines were distributed to 48 women's groups in accordance with ECC's guidelines.
	Pedal Reeler (no.)	150	250	250	250	The number of machines was increased because demand for the production of silk yarn increased when the revised DPR was prepared and, as a result, it was necessary to improve the spinning capacity.
	Field Research and Training Center (no.)	1	1	1	1	None
	Project office	1	1	0	0	It was decided that the Dept. of Sericulture's existing facilities should be used.
3) Equipment	Vehicles for technology transfer (no.)	-	4	8	8	Although it was initially assumed that the project office would have one vehicle and each project district would have one vehicle, the number of vehicles was increased because the number of

						project districts increased from 3 to 7.
2. Consulting services						
2-1. Person-months	International consultants (person-months)	86	78	–	74	The total number of person-months decreased because some of the initially planned services were cancelled.
	Domestic consultants (person-months)	244	182	–	166	
	Technical support, clerical staff (person-months)	300	–	–	–	According to the executing agency, it was initially planned that staff members within the Dept. of Sericulture would be assigned to this category. Because there is no detailed record of the staff members' operations during the project period, the actual value cannot be calculated.
2-2. Operations		Plan		Result		Reason for the change
	1. Baseline survey and interviews with the people concerned			Carried out		None
	2. Review and preparation of the overall development plan and DPR for the planning of 4,000 ha of tasar and 3,000 ha of mulberry			Carried out		None
	3. Detailed design for the planting of 4,000 ha of tasar and 800 ha of mulberry			The detailed design for tasar was carried out, but that for mulberry was not carried out.		As described below in the text
	4. Assistance in bidding for the planting of 4,000 ha of tasar and 800 ha of mulberry			It was carried out for tasar, but was not carried out for mulberry.		As described below in the text
	5. Supervision of planting of 4,000 ha of tasar			Carried out		None
	6. Technical guidance and training			Carried out		None

Note: *1. December 1997.

*2. February 2007 (Because figures for the equipment (vehicles) were not written in the revised DPR, confirmation was made by an interview with the executing agency).

*3. February 2002 (set at the ECC meeting).

*4. February 2007 (source: project completion report).

In this way, the quantities decreased concerning many items. This is mainly because the Department of Sericulture's existing facilities were used. According to the executing agency,

neither the decrease in the number of seed stations nor the decrease in the number of rural silkworm warehouses had an adverse impact on this project. In contrast, to meet on-site demand, the number of spinning machines increased from the initial target set when the appraisal was carried out.

The plan (in accordance with the revised DPR) and results of the consulting service are as shown in the table above. Although most of the items were carried out according to plan, neither the detailed design for mulberry nor the supervision of the planting of the mulberry was carried out. With regard to mulberry silkworms, E/S (engineering service) was planned to be carried out. Although activities for the “formation of central seedbeds, the experimental planting of 60 ha of mulberry, and experimental breeding of mulberry silkworms” were carried out to examine the feasibility of mulberry sericulture, it was finally decided in September 2001 that the detailed design for mulberry sericulture would not be carried out, under the agreement with JICA, because it was agreed that “mulberry sericulture is not suitable for the project districts” considering the discussions at the Empowered Committee of Chhattisgarh (hereinafter referred to as “ECC”)³⁹, the agency for supervising this project⁴⁰. The executing agency’s judgment that the detailed design for mulberry silkworms should be discontinued seems reasonable also in light of the weak financial condition of the farmers covered by the project.

Although the description above mainly concerns physical outputs, excluding the consulting services described last, this project also places importance on the strengthening of the capabilities and organization of people engaged in sericulture. Such non-physical outputs will be summarized below.

During this project, training was planned and provided to the personnel of the Department of Sericulture, NGOs and sericulture farmers. The trainings conducted for each type of participant are as follows:

³⁹ In this project, the relevant agencies were coordinated by ECC, which consists of principal secretaries of the Department of Sericulture, the Department of Finance, the Department of Co-operatives, and the Department of Forests.

⁴⁰ The reasons are as follows:

- A larger amount of investment in infrastructure is necessary for introducing mulberry sericulture than for introducing tasar sericulture. This is not realistic for poor farmers.
- The nature of the soil in the State of Chhattisgarh is not suitable for feeding trees for mulberry silkworms.
- Although irrigation facilities are necessary for mulberry sericulture, they have not been established in the State of Chhattisgarh.

1. Training for the Personnel of the Department of Sericulture

Table 8: Outline of the Training for Personnel of the Department of Sericulture

Training subjects/lecturers	Detail	Plan		Results	
		No. of participants	Period	No. of participants	Period
(Subjects) • Tasar sericulture technology • Mulberry sericulture technology • Organization of farmers • Lecturers' training (Lecturers) • Staff members of public research institutes • Consultants ⁴¹	1. Overseas training	8	2 weeks	Cancelled during the process of the State of Chhattisgarh's separation and independence	
	2. Domestic training by relevant institutes in India	60	1 month	60	Unknown
	3. On-site training	80	1 week	None (Judged unnecessary)	

Training for the personnel of the Department of Sericulture was held from 1999 to 2000. Table 8 shows the subjects and lecturers. The table also shows the number of participants. The participants were field officers who supervise the field staff members directly engaged in the provision of guidance to sericulture farmers. According to an executive of the executing agency, they were highly satisfied with the training. As a result, the participants were able to use what they learned to carry out on-site activities⁴². Therefore, the training seems to have indirectly contributed to the realization of the project effects through the provision of guidance to the farmers (OJT) by the field staff members.

⁴¹ Lectures by consultants were conducted as a part of the consulting services (corresponding to Table 7, "2. Consulting Services," "2-2. Operations," "6. Technical guidance and training").

⁴² There are no detailed records on the degree of satisfaction as in the case of a questionnaire survey of the participants.

2. Training for NGOs

Table 9: Outline of the Training for NGOs

Outline of the training	Details	Plan		Results	
		No. of participants	Period	No. of participants	Period
(Subjects) • Sericulture technology • Organization of farmers • Marketing • Accounting • Management of co-operatives (Lecturers) • Consultant ⁴³ • Personnel of the Sericulture Dept. • External resource person	1. Domestic training by relevant institutes in India	21	1 month	21 ^{*1}	Unknown
	2. On-site training	60	2 weeks	60 ^{*2}	Unknown

Note: *1. NGO staff.

*2. NGOs' local coordinators.

Training for NGOs was also held from 1999 to 2000. Table 9 shows the subjects, the lecturers and the participants. According to an interview with an executive of the executing agency, the participants were highly satisfied with the training. A concrete effect of the training is the participants' use of what they learned in the workshops to provide guidance for the farmers, which contributed to the achievement of the project purpose to some extent at the early stage of the project.

3. Training for sericulture farmers

Training was planned to be given to 4,175 silkworm farmers, 250 silkworm seed farmers and 540 reelers/spinners for 45 days, 15 days and 60 days respectively. However, because construction of the technical training center at which the training was to be given was completed in September 2006, the final stage of the project period, full-scale training was hardly given to the beneficiary farmers during the period. Basically, only a two-day workshop was held at the early stage. The contents of the workshop included a summary explanation of tasar sericulture (A two-page pamphlet full of illustrations was used, because the beneficiary farmers cannot read or write much.) and encouragement of the farmers to organize themselves. In addition to the workshop, on-the-job instructions about actual sericulture activities were given by staff members of the Department of Sericulture. They have been monitoring the

⁴³ Lectures by consultants were conducted as a part of the consulting services (corresponding to Table 7, "2. Consulting Services," "2-2. Operations," "6. Technical guidance and training").

farmers' work, visiting their workplaces almost every day during the sericulture period. At the time of the ex-post evaluation, however, the technical level of the beneficiary farmers is still primitive. Therefore, it cannot be said that there was sufficient guidance given to the beneficiary farmers⁴⁴.

In summary, although training was given to the personnel of the Department of Sericulture and NGOs and has had some effects, full-scale training was not given to sericulture farmers, resulting in a lack of appropriate sericulture skills.

3.4.2 Project Inputs

3.4.2.1 Project Cost

The planned and actual project costs are as follows:

Table 10: Project Cost

(Currency unit: million)

Item	Planned cost (at the time of appraisal) ^{*1}		Actual cost ^{*2}	
	Rupee	Yen	Rupee	Yen
1-1.Tasar Plantation ^{*3}	207	705	181	485
1-2. Supporting Facilities	179	609	61	164
2.Procurement of Equipment	34	117	21	56
3.Land Acquisition	295	1,006	215	576
4.Department of Sericulture: Recurrent Cost for Project	119	406	326	874
5.Contingency	83	284	29	78
6.Price Escalation	–	–	30	80
7.Consultancy services	182	622	121	324
8.Interest during construction	72	245	30	80
Total	1,171	3,995 ^{*4}	1,014	2,718 ^{*4}

Note: *1. Conditions for the calculation are as follows (JICA materials for appraisal):

- Date of the calculation: April 1997
- Exchange rate: 1 rupee = 3.41 yen
- Contingency: 10.0%

- Price escalation: foreign currency, 2% per year; domestic currency, 8.6% per year

*2. Sources: the actual costs in rupees were provided by the executing agency; those in yen were calculated by the use of the average rate during the loan period (1 rupee = 2.68 yen).

*3. Concretely, labour cost (which accounts for about 50%), fertilizers, pesticides, etc.

*4. Figures may not match the total due to rounding off.

⁴⁴ Although JICA carried out two technical cooperation projects, “The Project for Promotion of the Popularization of Practical Bivoltine Sericulture Technology in India” and “Strengthening the Extension System for Bivoltine Sericulture in India,” JICA could not use them for supporting the capability improvement of the staff of the Department of Sericulture and the beneficiary farmers in this project. Although bivoltine sericulture technology was applied for tasar in the project, the bivoltine sericulture technology in two technical cooperation projects on the above is for mulberry, therefore it cannot be applied for tasar.

Comparing the planned cost at the time of the appraisal and the actual cost in terms of yen, the actual cost (2,718 million yen) is lower than planned and only 68% of the planned cost (3,995 million yen)⁴⁵. The reasons are as follows.

In terms of rupees, although there was an increase in the actual cost for “the Department of Sericulture’s administrative costs⁴⁶,” the total actual cost (1,014 million rupees) was lower than the initially planned total cost (1,171 million rupees) by 13% due to the following factors:

- Decrease in the cost of establishing the infrastructure for tasar sericulture⁴⁷
- Decrease in the cost of consulting services⁴⁸

Moreover, because the yen appreciated by about 21% from the time of the appraisal during the implementation of the project, the ratio of the actual cost to the planned cost further decreased in terms of yen.

3.4.2.2 Project Period

This project was scheduled for 88 months from December 1997, when the L/A (loan agreement) was expected to be signed, to March 2005, which was the scheduled date of completion⁴⁹. In reality, it took 111 months from December 1997 to February 2007. Thus the actual period was longer than planned and 126% of the planned one.

The main reasons for the prolonged period are as follows:

In November 2000, the State of Chhattisgarh, in which the project site is located, was separated and became independent from the State of Madhya Pradesh. After this, ECC was established to supervise this project, and DPR, the detailed plan for this project, was approved in February 2002. Because of this, various construction works, which was initially scheduled to start in 2000 and 2001, actually started in 2002 and 2003. Because of a delay in the approval of the detailed plan as a result of the separation and independence of the State of Chhattisgarh, there was a delay in the construction work and training activities could not be carried out in earnest, although there was no serious impact on planting activities in particular.

The construction work was delayed for six to eight months because of the above reason and also of the following reasons. Because a hike in the prices for materials caused some successful bidders to withdraw, it was necessary to hold bidding for some work again. The hiking of prices also caused a delay in some constructors’ start of the construction. There was also a delay in the supply of materials for roofs.

⁴⁵ There was a minute increase or decrease in the infrastructure costs, which accounted for only a slight portion of the project costs. In addition, some portions of the consulting services were excluded. However, neither seems to have reached a level that required adjustment, especially in the calculation of the ratios.

⁴⁶ The cost increased because it might have been underestimated and because commodity prices rose.

⁴⁷ The cost was saved because existing facilities were more actively used than initially planned.

⁴⁸ The cost decreased because consulting services (detailed design) related to mulberry sericulture was excluded.

⁴⁹ The scheduled date of completion is defined as the date when all the project facilities are completed.

In this way, the project period was prolonged mainly because of external factors, such as stagnant project activities during the process of the state's independence and the hiking of prices for materials.

3.4.3 Results of Calculations of Internal Rate of Return (Reference only)

Because the detailed process of the calculation of the economic internal rate of return (EIRR) at the time of appraisal was unknown, the EIRR was recalculated for this ex-post evaluation using the calculation method specified in the revised DPR⁵⁰.

Table 11: Results of the Calculation of the EIRR

The time of calculation	At the time of the appraisal (1997)	Recalculation at the time of the ex-post evaluation
1. Calculation method (in local currency)	Costs: construction costs, material and equipment procurement costs, consulting costs, administrative costs, contingency, maintenance costs, replanting/material and equipment renewal costs Benefits: Additional benefits from an increase in cocoon production, additional benefits from the processing of cocoons into raw silk and silk products Project life: 30 years	
2. EIRR	15.9%	Negative

The recalculated EIRR is negative and is far lower than the EIRR at the time of the appraisal or the EIRR specified in the revised DPR. This is because, although the project cost was a little lower than planned, the production of cocoons was only 17% of the target, and the benefits greatly decreased.

Although the project cost was within the plan, the project period exceeded the plan. Therefore, the efficiency of this project is fair.

3.5 Sustainability (Rating: ②)

3.5.1 Institutional Aspects of Operation and Maintenance

This project was carried out by the Chhattisgarh Department of Sericulture.

The project period can be divided into the start-up period and the production period. As planned initially, the Department of Sericulture and the consultant played central roles in the first half of the start-up period, while the Department of Sericulture, the sericulture

⁵⁰ According to the revised DPR, the EIRR is calculated at 17.4%. Because no data on the benefits related to the portion of existing trees were provided from the executing agency, the data at the time of the planning were used as they were.

co-operatives, the federation of co-operatives and NGOs supported the planting of the feeding trees and the production of cocoons and silk yarn in the second half of the start-up period and the production period⁵¹. Sericulture farmers formed the Sericulture Farmers Group (SFG) and the Self-Help Group (SHG), both of which are carrying out activities. Under this project, relevant agencies were coordinated by ECC, which consists of principal secretaries of the Department of Sericulture, the Department of Finance, the Department of Co-operatives and the Department of Forests.

Since the completion of this project, sericulture has been carried out as follows:

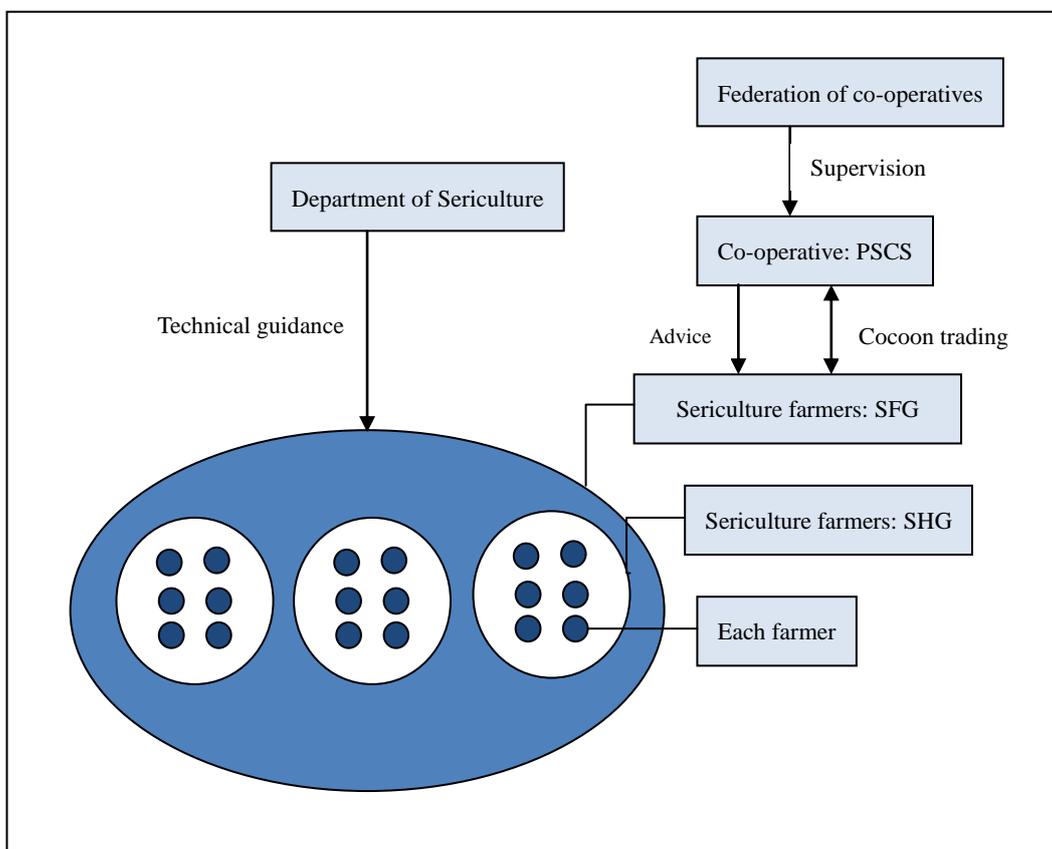


Figure 3: Relationships among Sericulture-related Organizations

The role of each agency can be described in detail as follows:

1) Department of Sericulture

The total number of personnel of the Department of Sericulture is about 1,000⁵². Under the supervision of the Joint Director of the Headquarters, the Deputy Director or the Assistant Director is in charge of the 16 districts in the state, and guidance is given to sericulture farmers

⁵¹ NGOs mainly gave guidance to the beneficiary farmers during the start-up period of this project, but were not carrying out activities at the time of the ex-post evaluation.

⁵² As of May 2014.

in each of the districts. Guidance is directly given to the farmers by field staff members of the Department of Sericulture⁵³. They monitor the farmers' work during the sericulture season, visiting fields almost every day. Because the number of field staff members is about 90 per district, each field officer is in charge of six farmers. Therefore, the number of them is sufficient. The Department of Sericulture also supports farmers in repairing spinning machines. In addition, the technical training center under the Department provides training and workshops for the personnel of the Department of Sericulture and sericulture farmers. The number of participants in training and workshops has been increasing year by year and was 1,278 in FY2012–13.

2) SFG

This is a group for the rearing of silkworms and the production of cocoons. One group is established in one site (the total number of sites is 155). The number of members of each SFG is about 17 on average.

3) SHG

This is a group for savings and other economic activities (for pooling a fixed amount of money and mutually lending money when needed). Because, in light of its economic activities, it is desirable to minimize the size of the organization, an SFG has been divided into two or three SHGs. Both the SFGs and SHGs have remained active even after the end of this project.

4) Co-operative

Aggregates of a number of SFGs form Primary Sericulture Co-operative Societies (hereinafter referred to as "PSCS"). PSCS are not organizations newly established under this project, but existing organizations in which each SFG has participated in each district. Each farmer sells cocoons to a PSCS, which then sells them to reelers/spinners in the district. The PSCS also give advice to farmers about methods of producing high-grade cocoons and provide small loans to farmers for the purchase of pesticides.

5) Federation of co-operatives

The federation of co-operatives is officially called the "Chhattisgarh Khadi and Village Industries Board." This organization's activities are limited to the supervision of the co-operatives under its control.

The following is a comparison between the sericulture system under this project and those in other regions of India:

⁵³ They are called "field men" or "operatives."

Table 12: Sericulture Systems in India

Region	Characteristics		
	Ownership of plantations	Responsibility for maintenance of the planted trees	Technical guidance to farmers
1. This project	Sericulture farmers have only the right to use the land.	Responsibility belongs to the farmers (the Department of Sericulture gives financial support only for the initial four years).	Provided by the Department of Sericulture.
2. Other sericulture in Chhattisgarh	Sericulture farmers do not have any official right to use the land, but are allowed to rear silkworms.	Responsibility belongs to the Department of Sericulture.	Somewhat compulsory guidance is provided by the Department of Sericulture.
3. Other main tasar sericulture states			
1) Madhya Pradesh	Same as 2 above		
2) Bihar, Jharkhand	Plantations: belongs to the farmers.	Responsibility for maintenance of the planted trees: belongs to the farmers.	Provided by the Department of Sericulture with the participation of local NGOs.

As shown in the table above, usually sericulture farmers who own plantations are responsible for maintaining them. If sericulture farmers do not own the plantations, the Department of Sericulture maintains them. This project is exceptional because farmers do not have ownership of plantations, but are responsible for their maintenance. According to interviews about examples in the main tasar sericulture states, the average income for sericulture farmers in the States of Bihar and Jharkhand is clearly higher than that in the project districts. The sericulture farmers in those states can use some of their income for purchasing fertilizers.

Next, with regard to the system for maintaining the sericulture facilities, a person in charge of maintenance has been appointed for each facility. The working directive/job chart has specified the missions and duties of the Department of Sericulture's officers in charge of maintenance (for details of the maintenance system, see Appendix 2). According to the executing agency, the number of people in charge of the maintenance of each facility has reached a level that is sufficient to carry out the necessary operations. In addition, according to the results of inspections by an Indian sericulture expert, there are a sufficient number of people in charge of maintenance. Although the Department of Sericulture rotates the officers in charge of maintenance every three to five years, the number of them is stable. With regard to the management of each facility, there are simple guidelines, and there is no problem in the procurement of spare parts.

With regard to the organizational aspects, as shown in Figure 3 and the description thereafter, the roles of the agencies related to sericulture farmers are clear and the necessary functions have been performed. However, this project's method whereby "farmers do not have the ownership of the plantations, but are responsible for the maintenance" seems to lack fairness somewhat and makes it difficult for the farmers to develop their motivation to maintain the planted trees.

3.5.2 Technical Aspects of Operation and Maintenance

According to the executing agency, training and OJT at the Central Silk Board and the Field Research and Training Center have made it possible to maintain the sericulture facilities using appropriate techniques. Inspections by sericulture expert in four districts have also confirmed that sericulture facilities have been maintained by appropriate techniques. There is no special problem in the actual management of the facilities. However, the skills of sericulture farmers are still primitive. For example, although it is usual that "at the initial stage of silkworm rearing, the trees should be covered by nets to prevent the larvae from being eaten by birds or from being washed off by the rainwater," only about 20% of the farmers seem to take such measures⁵⁴. While co-operatives give advice about the quality of the cocoons, the federation of co-operatives does not give technical guidance.

Therefore, there are some technical issues to be improved and it is necessary to strengthen the guidance to sericulture farmers.

3.5.3 Financial Aspects of Operation and Maintenance

According to the executing agency, the budgets for the maintenance of the facilities are as follows⁵⁵:

⁵⁴ This inference was made by the sericulture expert who inspected the districts, accompanying the beneficiary survey.

⁵⁵ Because the maintenance costs limited to the facilities established under the project were not calculated after the completion of this project, it was difficult to extract information on the cost of maintaining the project facilities. The maintenance costs for sericulture facilities for the whole state have been on an upward trend for the past three years.

Table 13: Budgets for the Maintenance of the Facilities

Facilities	Four-grade evaluation of budget sufficiency *	Measures in case of insufficient budget
Tasar Plantation	1	There is room for the use of government support measures.
Grainage (Mud House & Pairing Cage) (10)	3	Not applicable
P2 Station (3)	3	Not applicable
Cocoon godown for each District (3)	3	Not applicable
Village Cocoon Storage (10)	3	Not applicable
CSTRI Reeling machines (500)	3	Not applicable
Pedal Reeler (250)	3	Not applicable
Field Research and Training Center (1)	4	Not applicable

Note: * “4: Sufficient to maintain the facilities; 3: Minimum required level for maintenance; 2: Not very sufficient; 1: Not sufficient at all.”

Although there is no special problem in the budgets for the maintenance of the facilities, the budget for maintaining the feeding trees for tasar silkworms is clearly insufficient. Therefore, it is necessary to secure the budget.

The financial condition of each organization is as follows:

1) Farmers

According to an interview with the executing agency, a typical beneficiary farmer earns an annual income of about 29,000 rupees. Of this amount, about 8,000 rupees are from sericulture (this can be said to be the net income increment produced by this project). All the income (29,000 rupees) is said to be used for consumption. As described above, farmers are responsible for the maintenance of trees planted for tasar sericulture. However, farmers cannot afford to maintain them. In reality, benefits are paid to farmers for four years during the planting period, and the farmers were required to save 25% of these benefits. The saved money becomes a fund for the maintenance of the plantations and the interest is used for maintenance. The amount of annual interest is about 700 rupees per hectare, which can be used only for purchasing pesticides. As farmers neither have enough money nor land ownership, they lack the motivation to maintain the plantations and have not purchased sufficient fertilizers to maintain them.

2) Co-operative (PSCS)

There is no problem in particular, but the co-operatives cannot financially afford to support maintaining the planted trees.

With regard to budgets for the maintenance of the feeding trees for tasar sericulture, availability of the government's support measures for two schemes to plant trees for sericulture was confirmed during the study for this ex-post evaluation. One of them is called MG NREGA (Mahatma Gandhi National Rural Employment Guarantee Act), utilizing which the government can give financial support for wages for the replanting of trees during the first three years. The other scheme is the Central Silk Board's CDP (Catalytic Development Program). This financial support program is applied not only to the replanting of trees, but also to the maintenance of existing trees. Although the executing agency of this project has already applied for MG NREGA and replanted trees on 1,359 hectares, it will be possible to apply for CDP to support the maintenance of trees planted under this project.

The entire financial condition can be summarized as follows: although the maintenance of sericulture facilities has no problem in particular, the financial conditions require remedies that enable sericulture farmers to appropriately maintain the plantations for tasar sericulture.

3.5.4 Current Status of Operation and Maintenance

A four-grade evaluation⁵⁶ of the operation of the facilities (eight types) was conducted by the executing agency. Because all are evaluated as 2nd or higher, there is no serious problem. In addition, appropriate maintenance of the sericulture facilities was confirmed through the above-described inspection of four districts by the sericulture expert. With regard to the feeding trees for tasar silkworms, more than six years have already passed after the completion of this project, and the area of feeding trees has ceased to reduce and is on a stable trend, but the quality of the feeding trees is still problematic due to the insufficient use of fertilizers.

Under such circumstances, with regard to the three preconditions for the maintenance, the organization and personnel of the sericulture facilities are stable. The number of sericulture farmers is also stable, although the number has not reached the peak level. With regard to techniques, the sericulture techniques of the farmers in particular have room for improvement. However, this problem is not so serious as to threaten the sustainability, because the production of cocoons has been generally stable for the six years since the completion of this project. With regard to the financial aspects, although the maintenance of the sericulture facilities has no problem in particular, the farmers' lack of funds for maintaining their plantations (especially funds for purchasing fertilizers) is problematic. However, in spite of the lack of funds for maintaining them, the sericulture business conditions for the farmers are not so unfavorable as to threaten sustainability in the near future⁵⁷.

⁵⁶ The four grades are "4: Highly satisfactory," "3: Satisfactory," "2: Not especially problematic" and "1: Problematic."

⁵⁷ According to the results of the questionnaire survey on the beneficiaries, 105 respondents (77%) answered that tasar sericulture will be "Sustainable" in the future, followed by 25 respondents answering "Don't know" (18%) and six respondents answering "Not sustainable" (4%).

Therefore, although the operation and maintenance of the facilities established under this project are stable in terms of the organizational and personnel aspects, they have minor problems with regard to the technical and financial aspects. In addition, although the facilities have been maintained appropriately and the area of feeding trees for tasar silkworms has ceased to decline and has been stable, the quality of the feeding trees is still problematic. The sustainability of the effects produced by this project is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

Because the implementation of this project is sufficiently consistent with the Indian Government's development plan, the target site's development needs and Japan's aid policy, its relevance is high. Silkworm feed trees were planted as planned initially. Regarding the initially estimated impacts, such as employment creation and an improvement in the standard of living of the poor, although each of the production of seeds, cocoons, silk yarn and spun yarn are lower than initially planned, many poor women are able to work in sericulture and their standard of living is improving. Therefore, it can be judged that the effectiveness and the impact are fair. The efficiency is also fair, because the project costs were within the plan, while the project period was longer than planned. Although the operation and maintenance of this project is stable in terms of organization and personnel, there are problems in the technical and financial aspects. Therefore, the sustainability of the effects produced by this project is fair.

In light of the above, this project is evaluated to be partially satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

Figure 2 shows the causes for the insufficient emergence of outcomes under this project. Because the provision of financial support to the farmers for planting ended when the production of cocoons had still not reached a sufficient level, and because the weak motivation of the farmers to carry out maintenance due to their insufficient incomes and their lack of ownership of the planting sites, maintenance budgets became insufficient, resulting in a decrease in the quality and quantity of the feeding trees. The inadequate skills of the farmers due to a lack of training also resulted in sluggish growth in the production of cocoons. In states other than project ones, however, there are cases where sericulture farmers own the plantations, earning higher incomes and managing to purchase fertilizers. Moreover, according to the sericulture expert, an increase in the investment per hectare by only 2,000 rupees will have a considerable effect. Thus, the potential for the expansion of production seems great in the project site. It is therefore desirable to improve technical guidance to the farmers by introducing

government financial support for maintenance, such as CDP, standardizing the minimum necessary maintenance operations in the form of a checklist and thoroughly teaching how to use the checklist through training or on-the-job instruction.

4.2.2 Recommendations to JICA

JICA should encourage the Department of Sericulture to provide government support for the maintenance budget.

4.3 Lessons Learned

1) Necessity for the establishment of effective maintenance systems at a planning stage

The reasons for an insufficient maintenance budget for feeding trees in this project are “farmers’ insufficient incomes owing to sluggish growth of cocoon production”, “weak motivation of the farmers due to their lack of ownership of the planting sites,” “inadequate skills of the farmers,” as well as the Department of Sericulture gave financial support for the maintenance of feeding trees for only limited time.

Therefore, at the stage of preparing the detailed plan in the future projects in sericulture sector, it is necessary to consider how the parties concerned should share responsibilities over a certain period, taking into consideration the situation of plantation and land ownership, capability of cost shouldering, technical guidance and also cases in other states.

2) Necessity of training of new sericulture farmers

At the early stage of this project, the initially assumed full-scale training was not given to the farmers. Only two-day workshops and OJT after tree planting were conducted. Therefore, newcomer sericulture farmers only partially carried out the basic operations needed for sericulture. Because such insufficient technical guidance seems to have impeded the realization of the effects, it will be necessary to strengthen the training of farmers (especially at the early stage) when a similar project is carried out in the future.

Appendix 1

The following table shows the trends in the number of beneficiary sericulture farmers (tasar) and the number of sericulture farmers in the whole of the state (tasar):

Table: Trends in the Number of Tasar Sericulture Farmers

Year	Number of tasar sericulture farmers in the project site	Number of tasar sericulture farmers in the State of Chhattisgarh	Ratio of sericulture farmers in the project site to the state total
2000	0	4,965	0%
2001	3,718	6,811	55%
2002	4,984	8,430	59%
2003	1,582	7,832	20%
2004	3,047	9,098	33%
2005	2,735	9,124	30%
2006	3,320	9,709	34%
2007	3,503	11,604	30%
2008	3,103	8,057	39%
2009	2,754	7,434	37%
2010	2,567	6,881	37%
2011	2,278	8,179	28%
2012	2,606	8,729	30%
2013	2,604	n.a.	n.a.

Source: Chhattisgarh Department of Sericulture

According to the executing agency, the number of sericulture farmers changed frequently and has not become stable because of the following (the numbers of farmers in the table are not annual averages, but numbers counted at specific points in time):

- People left their homes to work in factories.
- Withdrawal from sericulture because of the weather. (If the monsoon season begins earlier or ends later than normal, the sericulture period may overlap with the cultivation season for other farm products and it is necessary to decide between the two.)
- Participation in rituals (to which farmers sometimes give priority over sericulture).

Appendix 2: Details of the Maintenance Systems

The following table shows each facility's person/department in charge of maintenance, use of a manual, and difficulties in the procurement of spare parts:

Table: Maintenance Systems for the Facilities

Facility	Person in charge of maintenance	Use of a manual	Procurement of spare parts
Tasar Plantation	Sericulture farmers (SHG)	Yes	N/A
Grainage (Mud House & Pairing Cage) (10)	Dept. of Sericulture's field officer/senior sericulture inspector	Yes *	No problem
P2 Station (3)	Dept. of Sericulture's field officer/senior sericulture inspector	Yes *	No problem
Cocoon godown for each District (3)	Dept. of Sericulture's District Sericulture Officer	Yes *	No problem
Village Cocoon Storage (10)	Dept. of Sericulture's District Sericulture Officer	Yes *	No problem
CSTRI Reeling machines (500)	Each group (reelers)	Yes *	No problem
Pedal Reeler (250)	Each reeler	Yes *	No problem
Field Research and Training Center (1)	Dept. of Sericulture's Joint Director	Yes *	No problem

Note: If * is attached, simple guidelines are used instead of a manual.

Comparison of the Original and Actual Scope of the Project

Item	Plan *1		Actual
	Appraisal Record (Dec. 1997)	Revised DPR (Nov. 2000)	
1. Project Outputs			At the time of completion of this project
1) Tasar sericulture: Facilities and equipment			
Tasar plantation (ha)	4,000	4,000	As planned
Grainage (Mud House & Pairing Cage) (no.)	14	15	10
P2 Station (no.)	4	5	3
P3 Station (no.)	1	–	0
Cocoon godown for each District (no.)	3	3	As planned
Village Cocoon Storage (no.)	30	30	10
CSTRI Reeling machines (no.)	40	500	500
Pedal Reeler (no.)	150	250	250
Field Research and Training Center (no.)	1	1	As planned
Project office (no.)	1	1	0
Vehicles for technology transfer	–	4	8
2) Consulting services			
International consultant (M/M)	–	78	74
Domestic consultant (M/M)	–	182	166
2. Project Period	December 1997 - March 2005 (88 months)		December 1997 - February 2007 (111 months)
3. Project Cost			
Amount paid in Foreign currency	867 million yen		405 million yen
Amount paid in Domestic currency	3,128 million yen (Local currency) 917 million rupees		2,313 million yen (Local currency) 863 million rupees
Total	3,995 million yen		2,718 million yen
Japanese ODA loan portion	2,212 million yen		1,205 million yen
Exchange rate	1 rupee = 3.41 yen (As of April 1997)		1 rupee = 2.68 yen (Average between 1997 and 2007)

Note: *1. Because the plan for this project was frequently revised, this table shows two versions of the plan.