India

FY2017 Ex-Post Evaluation Report of Japanese ODA Loan Project
"Tamil Nadu Afforestation Project (II)"

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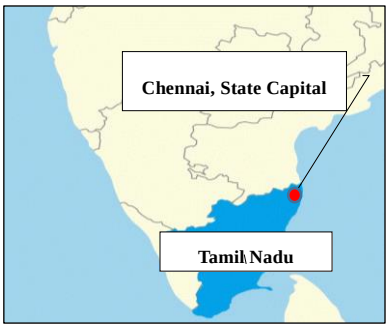
0. Summary

This project was implemented with the aim to regenerate forests and improve the standard of living of local residents by afforestation and livelihood improvement activities using the community participatory method at the village level[1] in the state of Tamil Nadu in the south-east of India, thereby contributing to the improvement of the local socio-economic situation.

This project is highly relevant, as it is consistent with priority areas in the development policy of India's and Japan's ODA policy, and also with development needs. The efficiency is high, as its cost and duration were within the plan. The afforestation was implemented mostly according to the plan, with a high survival rate of planted trees and forest regenerated. In addition, it is recognized that the annual income of the targeted villages has increased because of income gained from small scale business using micro credit implemented through this project at least for a certain period. Therefore, the effectiveness is high. The rise of the groundwater level has been confirmed by survival of planted trees and improvements of the soil conservation facilities, and the impact such as the diversification of the cropping items emerged. Residents' awareness of forest protection and nature conservation also increased, forest fires decreased, and trees are being protected through appropriate management of livestock. Social fencing, which monitors illegal grazing and felling trees, has also been established. As such, the effectiveness and impact of the project are both judged as high. The operation and maintenance system of the executing agency is well established; there is no problem with technical capabilities and the project is mostly maintained. Although there are a few issues remaining with the financial sustainability of village forest councils, the sustainability of the effects emerged by this project is high.

In light of the above, the evaluation result of this project is highly satisfactory.

1. Project Description



Project Location

Workshop on Effect of Afforestation
Vellore District

[1] In this context, the "village" of village forest councils is often not the same as the administrative village. This refers to villages consisting of one or several settlements.

1.1 Background

The state of Tamil Nadu is located in south-east India facing the Indian Ocean, with an area of 130,000 km^2 and a total population of 72.13 million.[2] It is an industrial state that is representative of South India. The western part of the state is a mountainous area in the Western Ghats, while it has a wide plain spreading to the Bay of Bengal of the eastern part. The western mountainous area is warm year-round with an annual mean temperature of 20 to 24°C. Since the eastern plain is in the subtropical zone, it is hot year-round, with temperatures around 30°C. The annual mean precipitation of the state is 925 mm[3] and it is affected by the Northeast Monsoon.

Tamil Nadu began the Tamil Nadu Afforestation Project in 1997, planting trees in 430,000 ha of scrub. However, cutting of fuel trees and grazing by free-range livestock put a burden on forests, and about 130,000 ha of the 270,000 ha remaining scrub that were not covered in Phase I, needed afforestation and regeneration of forest through Phase II by the ODA loan.

1.2 Project Outline

The objective of this project is to regenerate forests and improve the standard of living of local residents in the state of Tamil Nadu in the south-east of India by afforestation and livelihood improvement activities using a community participatory method at the village level, thereby contributing to the improvement of the local socio-economic situation.

Loan Approved Amount / Disbursed Amount	9,818 million yen / 9,199 million yen	
Exchange of Notes Date /Loan Agreement Signing Date	March 2005/ March 2005	
Terms and Conditions	Interest Rate	0.75%
	Repayment Period (Grace Period)	40 years (10 years)
	Conditions for Procurement	General Untied
Borrower/Executing Agency	The President of India/ State Government of Tamil Nadu, Forest Department	
Project Completion	March 2013	
Main Contractor	No	
Main Consultant	No	
Related Study	"Tamil Nadu Afforestation Project(Phase II)" State Government of Tamil Nadu, Forest Department (February 2001)	
Related Projects	Japanese ODA Loan Project "Tamil Nadu Afforestation Project" (1997)	

[2] 2011 census.
[3] The annual mean precipitation from 2005 to 2015 (India Meteorological Department).

2. Outline of the Evaluation Study

2.1 External Evaluator

Noriyo Aoki (Alfapremia Co., Ltd.)

Miwa Hayashi (Alfapremia Co., Ltd)

2.2 Duration of Evaluation Study

This ex-post evaluation was conducted during the following schedule.

Duration of the Study: August 2017 - January 2019

Duration of Field Study: November 26 - December 8, 2017, April 8 - May 12, 2018

3. Results of the Evaluation (Overall Rating: A[4])

3.1 Relevance (Rating: ③[5])

3.1.1 Consistency with Development Policy of India

The government of India aimed to achieve 25% of forest and tree cover rate[6] by the end of the *10th five-year plan (2002–2007)*, and 33% by the end of the *11th five-year plan (2007–2012)*. In *the 10th five-year plan*, the focus was on the regeneration of scrub and sustainable forest management through the promotion of Joint Forest Management (herein after referred to as "JFM").[7] Support for alternative ways to earn a living for those dependent on forests was also proposed.[8] The government of India announced the *National Forest Action Program (NFAP)* in 1999 as a comprehensive implementation plan to tackle issues identified by the *1988 National Forest Policy*. The NFAP addressed: 1) protection of existing forests, 2) strengthening restoration potentials of scrubs, 3) restriction on felling, 4) enhancement of policies and organizations, and 5) expansion of the area of forests.[9] In *Tamil Nadu's 10th five-year plan (2002–2007)*, scrub renewal was one of the highest priorities.[10] Furthermore, the government of India promoted afforestation in areas outside of forest reserves and conservation areas to increase forest and tree cover rate in the *11th five-year plan (2007–2012)*.

In the ex-post evaluation, the government of India did not set a goal for forest or tree cover rate in the *12th five-year plan (2012–2017)*. However, it addressed enhancement of forest

[4] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[5] ③: High, ②: Fair, ①: Low

[6] A set of tree crowns with the crown rate of 0.1 (10%) or higher and an area of 1 ha or larger is called a forest. Tree crowns refer to branches and leaves. When the crown rate is less than 0.1, the area is called scrub, which is not considered a forest. When the crown rate is 0.1 or higher but less than 0.4, it is called open forest. At the appraisal, a crown rate of 0.4 or higher was called dense forest, but at the time of the ex-post evaluation, classification of dense forest was subdivided, and a crown rate of 0.4 or higher but less than 0.7 was called moderately dense forest, while 0.7 or higher was called very dense forest. Forest cover is obtained by dividing the sum of open forest, moderately dense forest, and very dense forest by the geographic area. Crown rate is obtained by dividing the area of lush trees within 1 ha by the geographic area. Therefore, crown rate and forest cover rate are different. Forest and tree cover rate is calculated by combining the forest cover rate with a crown rate of less than 0.1.

[7] A scheme that was implemented in the 1990s to conserve and regenerate forests by people participations, in which highly dependent on forests around the target area are encouraged to participate in forest projects to achieve both recovery of forests and improvement in livelihood of the poor. Residents create VFC, and with the support of the Forest Department and NGOs, afforestation of the target area and the forest management "microplan" are formulated. The Forest Department provides seedlings to VFC based on the same plan, and performs afforestation and conservation jointly.

[8] Materials provided by JICA.

[9] Materials provided by JICA. As a comprehensive implementation plan to tackle issues identified by the *1988 National Forest Policy*, the government of India launch the *National Forest Action Program (NFAP)* in 1999, but the 1988 National Forest Policy became the major sector policy again.

[10] Materials provided by JICA.

management and greening through village forest council (herein after referred to as "VFC") of JFM and enhancement of forest management at the state level.[11] The *11th five-year plan (2007–2012) of Tamil Nadu* addressed afforestation by the federal government and the state, including afforestation by this project, enhancing afforestation of areas outside of forests to preserve livelihood, and increasing forest cover rate. In the following *12th five-year plan (2012–2017)*, the aim was to restore scrub, promote afforestation outside of forest areas, and increase forest cover rate.[12]

In light of the above, this project is consistent with development policies of the governments of India and the state of Tamil Nadu both at the time of appraisal and ex-post evaluation.

3.1.2. Consistency with Development Needs of India

The forest cover rate in Tamil Nadu in 2001 before the start of this project was 16.5%, which was lower than the average forest cover rate in India (20.1%). Therefore, improving the quality of forest (decreasing areas of scrub and open forest) and expanding the area of forest became major issues.[13]

Many people, including the poor, depend on forests as means for livestock feed, fuel, and income, and the burden on forests was increasing with population growth. As a result, deterioration of the quality of forests and decline in soil and moisture conservation function became serious, and the underground water table dropped. This led to an insufficient agriculture water and drinking water, putting pressure on the livelihood of the poor. The vicious cycle, which caused using excessive forests exceeding allowable amount to maintain sustainable forest conservation, occurred. Therefore, with the expansion of the area of forests, improving the standard of living for people who were dependent on forests became an important issue.[14]

In Tamil Nadu, before the start of this project, forests had deteriorated and scrub requiring immediate measures had spread to about 700,000 ha.[15]

At the ex-post evaluation, forest cover rate in India had increased to 21.3% in 2015 from 20.6% in 2005.[16] The forest cover rate in the state of Tamil Nadu was 17.7% in 2005, increased to 20.3% in 2015,[17] which was below the national average in India, but did show an increasing trend.

Many people, including the poor, had depended on forests as their only means of acquiring livestock feed, fuel, and income. However, as will be discussed in the section on effectiveness and impact, dependence on forests has decreased, and other means to improve livelihood and diversification of cropping items became possible as a result of this project. In view of the above the recovery of forests, improvements in soil and moisture conservation function of forests, and a positive impact on the supply of agricultural and drinking water can be inferred.

Illegal forest felling mostly disappeared[18], and the vicious cycle identified at the time of the

[11] Results of interview survey to the executing agency.
[12] Responses to the executing agency questionnaire.
[13] Materials provided by JICA. *India State of Forest Report*.
[14] Materials provided by JICA.
[15] 1995 The Forest Department. Materials provided by JICA.
[16] *India State of Forest Report*.
[17] *India State of Forest Report*.
[18] According to the interview survey in 24 villages, 22 villages including afforested areas and surrounding forests are answering that illegal logging has ceased.

appraisal as stated above was eliminated. Thus, not only did the forests expand in area but the amount of forests with a higher crown rate also increased. People who previously relied solely on forests for their livelihood were now less dependent on forests, at the same time the living standards improved.[19]

According to *India's State of Forest Report*, based on satellite data of India, in the case of targeted districts of Integrated Watershed Conservation Afforestation Program (hereinafter referred to as "IWDP") of this project, the area of scrub was 177,700 ha in 2005, which decreased by136,800 ha to 40,900 ha in 2015. In contrast, the area of open forest was 9,404 ha in 2005 but increased by 1,941 to 11,345 ha in 2015. Area of dense forest was 1,076,900 ha in 2005, and increased by 87,000 ha to 1,163,900 ha in 2015.[20] Such achievements as the decrease in scrub and increase in the area of open and dense forests can not necessarily be said to be the result of this project given that seedlings planted during this project had different growth rates depending on tree species, that young seedlings had few branches, and the growth in the "Tamil Nadu Afforestation Project" started in 1997, (hereafter it is referred to as "Phase I") trees became visible. Still, this information does indicate that the forests of the state of Tamil Nadu are in good regeneration status.

The Phase I, and this project (Phase II) targeted different VFC. "Tamil Nadu Biodiversity Conservation and Greening Project (herein after referred to as TBGP)," which began in 2011, is different from both Phase I and Phase II which focused on planting in state properties, and TBGP promotes afforestation in private property. Each phase has different duties and roles.

In light of the above, the development needs that were urgent at the time of appraisal were fulfilled at the time of the ex-post evaluation. Both the prioritization of this project and selection of the target area are considered to be highly relevant.

3.1.3 Consistency with Japan's ODA Policy

In the *Medium-Term Strategy for Overseas Economic Cooperation Operations (2002)* out of the priority areas of support for India, this project was designed to contribute to "regional development to benefit the poor" and "environmental improvement."[21] In the *Country Assistance Strategy for India (2004)*, the forestry sector is positioned as a major sector to support India. Besides improving the amount and quality of forests through expansion of forest area and reduction of open forest rate, the project promotes sustainable supply of forest products to the poor who are highly dependent on forest resources and earn income without relying on forests by supporting the acquisition of alternative income measures, which contributes not only to preserving the natural environment and water resources but also to making the lives of local residents stable and improved. The urgency and importance of this project are considered high from the viewpoint of poverty alleviation.[22]

[19] Responses by the executing agency and field survey results.
[20] *India State of Forest Report* and responses from the executing agency.
[21] Materials provided by JICA.
[22] Materials provided by JICA.

3.1.4 Appropriateness of Project Plan and Approach

This project was a community participatory afforestation plan that catered to the afforestation situation of the state of Tamil Nadu, and afforestation was implemented in accordance with village development activities and livelihood improvement activities at the initial introductory stage. As a result, forests were regenerated, and the residents' standard of living and poverty conditions improved. Therefore, as the solution measures against the issues, this project plan and its approach can be considered relevant.

3.2 Efficiency (Rating: ③)

3.2.1 Project Outputs

Some of the project outputs exceeded the planned values, since afforestation was performed by the state government funds within the overall project cost, but the other outputs mostly met the planned values. The plan and actual are described in the section "Comparison of the Original and Actual Scope of the Project" at the end of this report.

3.2.1.1 Afforestation Program

There are two types of afforestation programs, the Integrated Watershed Development Program (IWDP) and the Integrated Tribal Development Program (ITDP), and both were implemented.

IWDP is divided into an upper zone and a lower zone, where the upper zone refers to an area within a small watershed with a steep gradient, and 100 ha of afforestation was implemented for each VFC. In the lower zone, having a gentle slope adjacent to villages, 150 ha of afforestation was implemented for each VFC. Planted items under IWDP included native species that are in high demand for daily needs, such as fuel wood, fruits, and materials for crafting.

On the other hand, ITDP is not divided into upper and lower zones, and 100 ha of afforestation was undertaken for each VFC. The afforestation tasks, such as planting seedlings and initial watering, were performed by residents of VFC. Residents also provided labor for soil and moisture conservation construction related with afforestation, such as creating infiltration trenches, check dams, and percolation pond.

Table 1　Comparison of Plan and Actual Related with Outputs [Note 1)]

Items	Plan	Actual
IWDP		
Afforestation Area	162,500 ha	189,250 ha
(Scrub Area Within)	125,000 ha	147,250 ha
Number of Implemented Villages	650 villages in 23 districts	757 villages in 25 districts [Note 2)]
ITDP		
Afforestation Area	15,000 ha	19,300 ha
Number of Implemented Villages	150 villages in 13 districts	193 villages in 16 districts [Note 2)]
Farm Forestry[23]		
Seedlings	N/A	1,025,000
Grafts	N/A	69,000
Labor by Residents (Planting Seedlings, Soil and Moisture Conservation Work)	16,591,000	20,440,000
Soil and Moisture Conservation		
Check Dams	4,152 facilities	5,271 facilities
Percolation Pond	1,177 facilities	2,026 facilities

Source: Responses to the executing agency questionnaire.
Note 1) Since the additional afforestation budget was allotted by the executing agency within the total project cost, the actual area of afforestation and the number of villages were larger than that originally planned. Due to fluctuations in the exchange rate during the project implementation period, additional afforestation became possible.
Note 2) Increasing number of the districts is due to a separation of some districts implemented for administrative strengthening.

3.2.1.2 VFC Formation

Guidelines for VFC (*Guidelines for Implementation of Joint Forest Management in Tamil Nadu*) were revised in 2005 and new VFCs were formed based on this guideline. VFC is an organization newly established by the Tamil Nadu Society Act (1975).[24] For VFC formation and microplan preparation, 480 NGOs held participatory orientations at target villages.

Requirements for VFC establishment are different between IWDP and ITDP. VFC selection requirements for IWDP mandate that the village is within 5 km of scrub, there exists vicious cycle (damage to forest due to felling, leading to decline in the standard of living, and further felling), one female and one male from each household participate as members, and the total number of participants be 60% or more of the village population. VFC selection requirements of ITDP are that 80% or more of the population of the target village is part of the Schedule Tribe (herein after referred to as ST), and that the target village is 5 km or more from the closest city.

Table 2　Comparison of Plan and Actual Related with VFC Formation [Note 1)]

Classification	Plan	Actual
IWDP		
Number of VFC	650	757
ITDP		
Number of VFC	150	193
Total	800	950

Source: Responses to the executing agency questionnaire.
Note 1) Since the afforestation budget was allotted by the executing agency within the total project cost, the actual number of VFC were larger than that in the originally planned.

[23] The Forest Department grew seedlings and sold them to farmers. The cost of these seedlings farmers bear was determined to be 50% through discussion with the JICA India office and the Forest Department at the start of the project. Responses to the executing agency questionnaire.
[24] Responses to the executing agency questionnaire.

3.2.1.3 Livelihood Improvement Activities

In this project, to reduce the burden on forests by local residents who belong to the poor, the project developed infrastructure and implemented activities to improve income in the target villages. The project refers to these livelihood improvement activities as Buffer Zone Activity.

1) Community Development Works

Community Development Works were implemented by both IWDP and ITDP villages. Facilities that are important for villages, such as water tanks, community facilities, VFC offices, threshing floors, roads, toilets, and food distribution centers, were constructed. These were entry activities conducted before starting the afforestation.[25] The works were implemented in corporation with other departments,[26] and the number of village infrastructure development facilities constructed was 4,393.[27]

2) Income Generation Activity

A Guidebook on Income Generating Activities (2005) was formulated, and activities were implemented accordingly. For each targeted VFC of IWDP villages, 1,075,000 rupees on average was granted through the authorization by the Forest Department, and for each targeted VFC of ITDP villages, 700,000 rupees on average was granted. From these funds, 10,000 rupees per head was given to individuals or members of Self-Help Group (hereinafter referred to as "SHG") as loans. Interviews revealed that the interest on the loan for SHG was 12%.[28] The number of micro credit recipients comprised 41,688 males and 117,553 females, a total of 159,241.[29] The interest repayment of this micro credit was collected by VFC and became a revolving fund.

3) Establishment of SHG

SHG was established in accordance with the SHG guidelines proposed by Tamil Nadu Corporation for the Development of Women.[30] One SHG organization consists of 15 to 20 members. The requirements for membership included being a member of VFC, being part of a household living below the poverty line, and having an annual income of 12,000 rupees or less. Basically, the target group included residents 18 to 60 years of age. SHG members share a similar economic status, especially women, forest dependents, ST, Scheduled Caste (hereinafter referred to as "SC"), people without a spouse who is able to earn income, and landless farmers, but if the above conditions are met, males can be members as well. According to the final evaluation performed by the executing agency,[31] SHG members were 75% female and 25% male.

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[25] These activities were performed to build relationships between residents of target VFC and government departments. As confirmed by the Forest Department Headquarters, the budget of construction etc. was handed over from the Forest Department to other administrative bureaus, but since the responsible office was the department in charge of each facility, it was supposed not to report the repair situation and so on. If anything is needed for repair, the chairperson of VFC is to issue a letter directly to the administrative bureau or department in charge, and request repair. According to the request, repair costs are to be secured by each administration bureau or department in charge.

[26] Twenty-four departments, such as the Ministry of Rural Development, Department of Agriculture, Ministry of Social Justice and Empowerment, and Department of Animal Husbandry, Dairying & Fisheries, cooperated.

[27] Materials provided by JICA.

[28] Measures and penalties for failure to repay loans were to be determined by each group.

[29] Materials provided by JICA. The information on attributes of micro credit recipients such as caste and social class, or the amount of loans from VFC to SHG were unable to obtain.

[30] *Handbook for Self-Help Groups by Tamil Nadu Corporation for Development of Women, 2003.*

[31] *Terminal Evaluation Study of the Tamil Nadu Afforestation Project (TAP)-Phase II, 2015*

Table 3　Comparison of Plan and Actual Related with the Formation of SHG [Note 1)]

	Plan	Actual
Number of SHG Established	1,600	3,283

Source: Responses to the executing agency questionnaire. Materials provided by JICA.
Note 1) This includes newly established SHG and existing SHG that began to receive loans with permission from VFC and the Forest Department. The number of newly established SHG and other SHG were unable to be confirmed.

3.2.1.4 Strengthening of Forest Management Capacity

1) Construction of the Forestry Extension Center

There are 11 facilities constructed by this project as the Forestry Extension Center.[32] There was one facility constructed in each of the 11 districts. If Forestry Extension Centers constructed in Phase I are included, there is one facility in every district of Tamil Nadu.[33] After the start of this project, in 2005, 2006, and 2007, six facilities, four facilities, and one facility were constructed, respectively. They were established in the early stage after the start of this project. The Forestry Extension Centers were used for training of farmers and VFC.

2) Training

Since the training was prioritized by the project, not only forest management field staff, but VFC representatives and members, SHG members, and NGO staff all received training.[34] The total number of trained participants through this project was 83,875 staff from the Forest Department who instructed VFC were trained at the Tamil Nadu Forest Academy, the National Institute of Rural Development, the Indian Institute of Forest Management, and nearby Forestry Extension Centers. The contents of training included the objectives and activities in framework of JFM, afforestation technical guidance, promotion of female participation, micro credit and business, dealing with forest fires, and soil and moisture conservation.[35]

Table 4　Actually Trained Stakeholders　(unit: number of person)

	Actual
Senior Staff of the Forest Department, Forest Officer	737
Field Staff of the Forest Department, Forest Subordinate Service [Note 1)]	9,891
Office Staff of the Forest Department, Forest Ministerial Service [Note 2)]	875
NGO	515
VFC	2,629
SHG	11,017
Farmers	37,037
Other (Village Administrative Staff, etc.)	21,174
Total	83,875

Source: Responses to the executing agency questionnaire.
Note 1) Forest staff in the field, rangers, forester, and watcher.
Note 2) Office administrative staff.

3) Expanded Use of Geographical Information System (GIS)

To process and analyze topographic and administrative area data, and to create a database and websites, GIS software was installed at the Forest Department Headquarters. The software was provided to 15 forest circle offices[36] so they could access the Headquarters' database in real time. Also, 329 GPS devices were introduced for field staff to survey the area of forests and afforestation planned areas. To foster staff necessary to build GIS, trainings were held both in India and overseas. Instructions on how to use GIS during Phase I were provided during the

[32] Materials provided by JICA.
[33] Materials provided by JICA. This means it was constructed in all districts at the time of appraisal.
[34] Materials provided by Implementing Agency.
[35] Responses to the executing agency questionnaire.
[36] A higher supervising office that supervises 3-4 districts.

trainings in India. Sessions of these trainings operated mostly according to the plan at the time of appraisal.

3.2.2 Project Inputs

3.2.2.1 Project Cost

The total project cost planned was 13,618 million yen, and the Japanese ODA loan was 9,818 million yen. The executing agency was responsible for 3,800 million yen. The actual total project expense was 13,198 million yen, but it was impossible to obtain separate information for foreign and local currencies. The actual total amount of the Japanese ODA loan was 9,129 million yen;[37] which was 93% of the planned Japanese ODA loan of 9,818 million yen. The total project cost was planned to be 13,618 million yen, and the actual was 13,198 million yen (97%), which was within the plan.

Comparison of the breakdown of the plan and actual shows that those portions of the ODA loan stipulated for livelihood improvement activities, physical contingency, and interest were unused. In addition, fluctuations in currency exchange practically reduced the cost.

The allocation by the executing agency was 3,800 million yen at the time of appraisal, but it came to 4,069 million yen (107%). For afforestation activities, 55 million yen was newly allocated. Therefore, more afforestation and supplementary planting were performed than planned. The 5 million yen surplus was spent on income improvement activities.

Table 5 Comparison of Plan and Actual Related with Project Expenses (unit: million yen)

	Plan		Actual	
Items	ODA Loan	Paid by the Executing Agency Note 1)	ODA Loan	Paid by the Executing Agency Note 2)
Afforestation	4,975	0	5,270	55
Livelihood Improvement Activities	1,929	0	1,871	5
Strengthening Forest Management Capacity	1,543	0	1,641	143
Price Escalation	517	0	0	0
Physical Contingency	448	0	0	0
Tax	0	4	0	0
General Management	0	3,796	0	3,866
Interest Rate during Construction	406	0	347	0
Total	9,818	3,800	9,129	4,069
Total Project Budget	13,618		13,198	

Source: Materials provided by JICA. Responses from the executing agency.

Note 1) Currency exchange rate: US$ 1 = 109 yen, local currency 1 rupee = 2.40 yen. Rate of price escalation: foreign currency 1.4%/year, and local currency 1.8%/year. Physical contingency rate: 5.0%. Cost estimation period: August 2004.

Note 2) Currency exchange rate: (actual) US$ 1 = 100.1 yen (March 2005 to March 2013 average exchange rate), local currency 1 rupee = 2.15 yen (March 2005 to March 2013 average exchange rate).

[37] Responses to the executing agency questionnaire. Document(s) provided by JICA.

3.2.2.2 Project Period

The project duration was 97 months, from March 2005 (L/A signing) to March 2013 as planned. The definition of completion was not described in the official documents. However, based on the materials provided by JICA and the testimonies of related stakeholders, the definition of completion was assumed to be the completion of the activities of afforestation, seedling planting and plantation maintenance activities, livelihood improvement activities, and strengthening forest management capacity.

Table 6 Comparison of Plan and Actual with Project Duration

	Plan	Duration (months) Note 1)	Actual	Duration (months) Note 1)
■ Afforestation				
Tree Planting	2005/4 - 2010/3	60	2005/4 - 2009/3	48
Supplementary Planting	2006/3 - 2013/3	85	2006/4 - 2013/3	84
■ Livelihood Improvement Activities	2005/4 - 2013/4	97	2005/4 - 2013/3	96
■Strengthening of Forest Management Capacity				
Monitoring and Evaluation	2005/4 - 2013/2	95	2005/4 - 2013/3	96
Training	2005/3 - 2009/3	49	2005/4 - 2009/3	48
Expansion of the GIS System	2005/4 - 2010/3	60	2005/4 - 2013/3	96

Source: Materials provided by JICA. Responses from the executing.
Note 1) Rounded.

3.2.3 Results of Calculations Internal Rate of Return (Reference Only)

Financial internal rate of return and economic internal rate of return of the afforestation project were calculated by external experts at the time of the appraisal, and calculated items, such as profit, were in accordance with calculation methods at the time of appraisal. As for environmental impacts, the figures were calculated following the estimation items used by external experts.

Table 7 Internal Rate of Return of Project

	Financial Internal Rate of Return (FIRR)	Economic Internal Rate of Return (EIRR)
At Appraisal	1.3%	11.6%
At Ex-Post Evaluation	1.1%	11.9%
Cost	Afforestation and soil conservation, forest management, improvement of the Forest Department infrastructure, extension and training, maintenance management cost	Afforestation and soil conservation, forest management, improvement of the Forest Department infrastructure, extension and training, maintenance management cost
Benefits	Sales income from forest products	Increase in forest products, water source protection, agricultural profits, environmental impacts
Project Life	30 years	30 years

Source: Materials provided by JICA. Responses from the executing agency.
Note) At planning, the project cost is calculated without accounting for any increase in prices; thus, the present calculation does not include such increases either.

The financial internal rate of return was 1.1% since the profit allocation ratio of the Forest Department and VFC keeps profits small. The economic internal rate of return shows an increase in the project expenses compared to the time of appraisal since it was calculated in the local

currency, and the total maintenance management required also increased. As profits, agricultural profits are expected through water source conservation and soil and moisture conservation, leading to an economic internal rate of return of 11.9%.

As the described above, the project cost and duration remained within the plan limits. The efficiency is high.

3.3 Effectiveness and Impacts (Rating:③)

3.3.1 Quantitative Effects (Operation and Effect Indicators)

3.3.1.1 Afforestation Area, Number of Seedlings Planted, and Survival Rate (Operation Indicators)

As seen in Table 8, the afforestation area and the number of seedlings planted in the project mostly met the goal as shown by the indicators.

Table 8 Comparison of the Afforestation Plan and Actual for Target Villages

Indicator Name	Target (2015)	Actual (2015)	Level of Achievement
	2 years after project completion	2 years after project completion	
Afforestation Area (ha)	177,500	208,550 Note 1)	118 %
Seedlings Planted (No.)	34,150,825	39,991,825	117 %
Seedlings Planted in Supplementary Planting (No.)	6,550,000	9,808,682 Note 2)	150 %

Source: Ex-ante evaluation sheet, materials provided report, and responses to the executing agency questionnaire.
Note 1) The target was exceeded because of funds from the executing agency allowing for 31,050 ha of afforestation.
Note 2) The number of seedlings that died or were damaged within two years of afforestation were replaced. The number of seedlings planted in supplementary planting with the funding by the executing agency was 2,356,806.

The survival rate of planted trees is an important indicator that confirms the effectiveness of afforestation, but such an indicator was not set at the time of the appraisal. In the ex-post evaluation, we use it as one of the alternative indicators to confirm effectiveness. It was 70% in 2015, meaning growing conditions after afforestation has been favorable.

Table 9 Actual Survival Rate of Planted Trees in Target Villages Note 1) (Alternative Indicator)

Program Name	2015（Actual）
	2 years after project completion
IWDP	69 %
ITDP	71 %

Source: Responses to the executing agency questionnaire.
Note 1) Trees planted as part of supplementary afforestation are counted in the survival rate. The five-year survival rate of planted trees was determined to be an important indicator from an expert viewpoint by the executing agency. Since afforestation began in April 2005 and ended in March 2009, the survival rate in 2015 was obtained through the executing agency.

3.3.1.2 Changes in Forest Cover Rate and Crown Density in Target Districts (Reference Indicator)

At the time of appraisal, it was assumed that the change in crown density of the afforestation target area would be examined as follows.

Table 10　Target Values Related with Crown Density (At Appraisal)

Indicator	Target Value(2019)
	6 years after completion of project
Crown Density	Scrub (less than 0.1) →Open forest (0.1 or over 0.1-less than 0.4)
	Open forest →Dense forest (less than 0.4)
	Dense forest → Dense forest with higher crown density[note1)]

Source: Ex-ante Evaluation Sheet of the project. Materials provided by JICA
Note1) Describe the description of the materials provided by JICA at appraisal as it is.

Target values related with crown density were set as per Table 10 according to the Ex-ante Evaluation Sheet and the plan at the time of appraisal. However, the changes in crown density of the target afforestation area or surrounding forests could not be obtained even by satellite data.

The evaluator used two indicators such as "forest cover rate in IWDP target districts" and "changes in the area by crown density in IWDP target districts" only as reference indicators for evaluation and did not consider them in sub-rating judgement. The reason for that is as follows. For example, Table 11 shows the forest cover rate of IWDP target districts which was cited from the *India State of Forest Report*. However, it is calculated from satellite data in which the factors such as loss of forests due to urbanization and the 2004 Indian Ocean Tsunami, commercial plantation not related with this project, the agricultural crops that appear as forests from the satellite, and decrease in the burden on forests owing to LPG distribution are not comprehensively investigated and adjusted in the data.

Table 11 Forest Cover Rate in IWDP Target Districts[38] (Reference Indicator)

Indicator	Plan (2005)	Actual (2015)
	At start	2 years after completion of project
Forest Cover Rate	18.3%	22.9%

Source: *India State of Forest Report*

Table 12 also shows changes in crown density in IWDP target districts. The data shows scrub decreased, and open and dense forests increased in IWDP target districts at the time of 2015. However it is not possible to measure the effects on afforested plantations only by this project. Therefore, the changes in crown density is regarded as a reference indicator and is not used for the evaluation.

Table 12　Changes in Area by Crown Density in IWDP Target Districts [Note 1)] (Reference Indicator)

Indicator		Plan (2005)	Actual (2015)	Change in Area, %
		At start	2 years after completion of project	
Classification by Crown Cover	Scrub	177,700 ha	40,900 ha	1.6 % ⇒ 0.4 %
	Open Forest	9,404 ha	11,345 ha	0.08 %⇒ 0.10 %
	Dense Forest [Note 2)]	1,076,900 ha	1,163,900 ha	9.8 % ⇒ 10.6 %

Source: *India State of Forest Report*
Note 1) IWDP target district area: 11,016,000 km^2 = 111,016,000 ha. This is the area of IWDP target districts at the time of the plan. Administratively, districts are divided into two, increasing the numbers. These new districts are included in the count.
Note 2) Dense forest referred to the crown rate of ≥0.4 at the time of the appraisal but by the ex-post evaluation, dense forests were sub-divided. According to crown rate, ≥0.4 to <0.7 is called Moderately Dense Forest, and ≥0.7% is called Very Dense Forest. In this report the evaluator refer to both classifications of dense forests.

[38] At the ex-post evaluation, 25 out of 30 districts in the state were IWDP target districts.

Though it is a reference indicator which is not reflexed in the evaluation, when comparing the change in the ratio of forest in IWDP target districts, scrub would not be included as forests based on the definition of forests; thus, if comparing the overall area of forests, the evaluator compared the changes by combining open forest with dense forest. Changes in forest areas are shown in Table 13.

Table 13 Changes in Forest Area in IWDP Target Districts (Reference Indicator)

Indicator		Plan (2005)	Actual (2015)	Change in Area, %
		At start	2 years after completion of project	
Forest Area	Open Forest	9,404 ha	11,345 ha	0.08 % ⇒ 0.10 %
	Dense Forest	1,076,900 ha	1,163,900 ha	9.8 % ⇒ 10.6 %
Total		1,086,304 ha	1,175,245 ha	9.9% ⇒ 10.7%

Source: *India State of Forest Report*

3.3.1.3 Improved Effects on the Standard of Living

Improved effects on the standard of living of residents in target VFC by the project were qualitatively confirmed, as will be discussed later. It was difficult to quantitatively measure the improvements since it is impossible to identify what kind of factors contributed the improvement of standard of living. It is not clear whether or not they are these improvements brought by this project, income improvement due to increase of regional gross production due to economic growth, or income increase from household member's employment in neighboring cities. The goal set at the time of the appraisal was a 10% increase in household income for farmers in target villages,[39]but according to Table 14, though there was a change immediately after the start of the project in the annual income in 2015, it was assumed that the 10% increase in household income of farmers of the target villages was achieved, and according to interviews conducted with the concerned parties, improving effects on livelihood through introduction of infrastructure in this project have been confirmed.

Table 14 Changes in Annual Income Right after Start of Project (Reference Indicator)

Program	Target Surveyed Villages	Annual Income Baseline (2005) (unit: rupees)	Annual Income (2015) (unit: rupees)	Rate of Increase (%)
IWDP (less than 0.4)[note)]	35	12,649	19,076	51
IWDP (0.4 or over 0.4– less than 0.6)	30	11,899	17,258	45
ITDP	15	13,138	17,156	31

Source: *Terminal Evaluation Study of the Tamil Nadu Afforestation Project (TAP)-Phase II, 2015*
Note): () indicates crown density

[39] We will discuss issues related to setting the indicators of the standard of living in the "Lessons Learned" section.

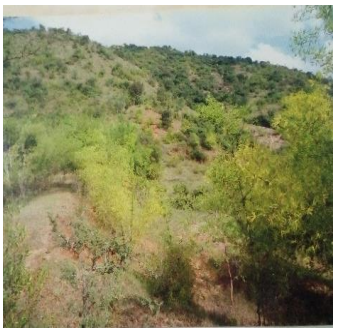
3.3.2 Qualitative Effects

3.3.2.1 Forest Regeneration

The field survey mainly visited sites where afforestation in the scrub area was conducted and forest regeneration was taking place., which was also verified by satellite data.[40] Therefore, the survey sites are not necessarily the representative VFC villages of this project.

In IWDP with small basins, residents of VFC managed livestock appropriately to protect forests,[41] and protected seedlings by prohibiting access to afforestation areas several months after planting in order to promote regeneration of the afforestation areas. When residents discovered forest fires and illegal felling, they were instructed to report this to the Forest Department. As shown in Table 15, LPG was distributed by the state government policies after 2012, which reduced felling of fuel materials and accelerated forest regeneration in the scrub area.

Pudur VFC, Vellore District
Plantation Area, November 2006
(Photograph from a microplan)



Pudur VFC, Vellore District
Plantation Area, November 2012
(Photo provided by the range office)

Pudur VFC, Vellore District
Field Survey, November 2017
(Photo by the evaluator)

Table 15 Fuel for Cooking (unit:%)

Kind of Fuel	2007/08		2012/13	
	Rural	Urban	Rural	Urban
LPG	**14.9**	53.2	**37.7**	72.5
Electricity	0.1	0.1	0.3	0.4
Kerosene	1.7	8.0	1.5	2.8
Wood	**81.6**	36.1	**56.6**	14.9
Other	1.7	2.6	3.9	9.4
Total	100	100	100	100

Source: *Tamil Nadu District Level Household and Facility Survey 2007-08 & 2012-13* （Ministry of Health & Family Welfare, Govt. of India）[42]

[40] The four VFC villages in the Vellore and Tiruvannamalai districts were visited.

[41] The activities include making fodder and leashing cattle to protect forests, and limiting the grazing areas for goats and sheep.

[42] In addition, National Family Health Survey (NFHS-3) India 2005-06: Tamil Nadu; Ministry of Health and Family Welfare, Government of India statistically analyzed fuel materials, but statistical analysis of the household survey at the district level is more consistent with field survey results; thus, the table was prepared on the basis of the household survey at the district level. The latest household survey results at the district level in Tamil Nadu have not yet been published.

3.3.2.2 Improvement in the Standard of Living

In terms of effects of small scale income generation activities by micro credit from VFC to SHG, specific examples of activities and their effects have been reported in the mid-term and final reports prepared by the executing agency. Diverse activities conducted through the use of micro credit included dairy businesses, small scale sale of goods, breeding of goats, management of small shops, leasing of tamarind trees, machine sewing, breeding of sheep, chai shops, load carriage by ox car, sale of Palmyra palm leaves, and sale of fruits, coconuts and so on.[43] As shown in the change of annual income right after the start of the project (Table 14), a certain degree of contribution is recognized to the improvement of household income.

According to results of the interviews conducted in Pudur village and Oorgoundanur village in Vellore district, sources of household income were mushroom cultivation, candle making, incense making, compost making, poultry farming and so on. According to micro credit records of each target village, the debt repayment rate was good for two to three years after the start of the loans, and they were confirmed to be a source of household income. However, subsequent continuous profitability was different depending on fund management by each VFC group.[44] Even in the field survey, the degree of effect that small income generation activities by micro credit had on household income could not be specifically and numerically clarified.

Field surveys conducted in four villages in the Vellore and Tiruvannamalai districts showed that most of the households below the poverty line (BPL) in target villages climbed above the poverty line (APL), but since the state government is supplying products related with household goods and food, and promoting policies on subsidies to raise the standard of living for the poorest, the degree to which this project had an effect on improvement of the standard of living could not be confirmed.

As such, though there are diverse factors contributing to improving the standard of living, it is recognized that impact surveys and field surveys confirmed that annual income of target villages did increase from profits of small scale businesses by micro credit for a certain period. Since the effect of this project on the standard of living exceeds the target value, its effect is judged mostly high.

The planned afforestation was mostly achieved with a good survival rate of planted trees, and forest regeneration was mostly promoted by this project. As for the improvement of standard living, though there exist other factors, in most cases it was limited to a certain period of time, there was an increase in the annual income of target villages due to profits of small scale businesses through micro credit; thus, the effectiveness of this project is high.

3.4 Impacts

3.4.1 Intended Impacts

3.4.1.1 Rise in Ground Water Table and Soil Conservation

The Forest Department surveyed the benchmark water table at the start of this project and

[43] *Socio Economic Studies, Final Report – TAP Phase II, 2011*.
[44] Results of detailed village surveys conducted in the districts of Vellore and Tiruvannamalai.

measured the water table of wells in villages every month until the end of the project. According to the shallow well water table report published in 2011,[45] among 27 villages sampled by climate zones, 24 villages saw an increase in the water table of 1 to 4 meters. The field survey also confirmed that the water table increased by 4.6 m compared to levels at the start of the project.[46] According to interviews with VFC members conducted during the field survey, in these villages, an increased water table allowed the use of shallow wells that were formerly dry. It was confirmed, as a result, the farmers could start using irrigation for agriculture, and that paddy field and upland field increased.[47]

		
Rise in Water Table Level of Shallow Well, Vellore District	Check Dam, Vellore District	Leashed Cattle Tiruvannamalai District

In this project, the pH and soil carbon contained amount were measured before starting of afforestation, but these values were not measured after completion of the project; thus, specific changes in soil could not be compared. According to the field staff of the Forest Department, improvements in water and soil conservation facilities and survival of planted trees suppressed the nutrient outflow of the soil, and preventing soil erosion during rainy seasons.

3.4.1.2 Increased Awareness of Forest Conservation among VFC Residents

Residents contributed to improvement of their natural environment through afforestation and forest conservation activities and received practical benefits like an increased standard of living. This led to residents playing a role in social fencing, in which they monitor illegal grazing, felling, and poaching, through VFC activities.[48]

3.4.1.3 Decreased Number of Forest Fire Incidences

VFC members and neighborhood residents began to employ agricultural methods that prevent fires, and they began to immediately report fires to staff of the Forest Department when they spotted them. This led to a reduction in damages from forest fires.[49] The Forest Department reported that the number of forest fire cases decreased, as shown in Table 16, demonstrating that this project increased the awareness of forest and nature conservation in

[45] *Water Table Status Study Report, 2011*, Geofiny Technologies Private Limited. Please see Appendix 1 for details.
[46] Pudur village in Vellore district.
[47] Results of interviews with VFC members conducted as part of the field survey. Besides, the cases of a remarkable rise in the groundwater level were frequently observed in the cases of IWDP, and a rise in the groundwater level in more than 80% of villages in the lower agricultural land was determined by measurement. (The second field detailed survey results)
[48] Results of the interview conducted with the Vellore District Forest Department staff.
[49] Results of interview conducted with the Vellore District Forest Department staff.

residents.

Table 16　Number of Forest Fire Incidences

Category	Number of Cases (2005)	Number of Cases (2015)
	At start	2 years after completion
IWDP Districts	384	157
ITDP Districts	366	137

Source: Responses to the executing agency questionnaire.

3.4.1.4 Impact on Agriculture／Diversification of Income Acquisition Measures

Surveys conducted in Velleri and Oorgoundanur villages in Vellore district showed that micro credit and revolving funds allowed villages, where much previous income came from cultivation of rice, peanuts, and millet, to begin planting coconuts, cotton, sugar palm, bananas, papayas, flowers, capsicum, beans, and medicinal plants. The number of items planted increased both during the rainy and dry seasons. According to the survey of water tables, usable agricultural water increased due to a rise of water tables; thus, seven out of 27 villages cultivating rice changed from single to double crops.[50] Since irrigation possibilities create more agricultural land, the price of this land increased by two to five times in some VFC villages.

3.4.1.5 Impact on Wildlife

According to the interview survey conducted with VFC members and range office staff of Velleri village in Vellore district, animals and birds become commonly observed in watersheds within afforestation zones as compared to before the project. The wild boars, porcupines, peacocks,[51] and jungle fowl[52] inhabit the watersheds, while slender loris and hare inhibit the forests. According to staff of the Forest Department, although conflicts between humans and wildlife still remain where killing of animals is prohibited in India, there is a positive impact on animal protection.

3.4.1.6 Changes in Social-economic Activities due to Women's Participation in VFC and SHG

According to the interview survey with female VFC members of Darbadpalayam Village in Chengam sub-district of Tiruvannamalai district, women previously never left their homes without permission from their husbands. However, since this project required that one male and one female from each household participated in VFC, participation of women in training to improve livelihood and opportunities to visit towns through SHG activities increased.

There were also reports that women became more active in economic activities such as income improvement and participation in decision-making[53].

In addition, with the improvement of the economic situation in households, it was confirmed by interview survey in the visited VFC villages that the nutritional situation improved[54].

3.4.2 Other Positive and Negative Impacts

3.4.2.1 Impacts on Natural Environment

1) Impact on Environment

In view of sector characteristics, project characteristics, and regional characteristics stipulated in "*JBIC Guidelines for Confirmation of Environmental and Social Considerations*" *(April 2002)*, the undesirable influences on the environment are judged not to be serious.

[50] *Water Table Status Study Report, 2011*, Geofiny Technologies Private Limited.
[51] The peacock is the national bird of India.
[52] These animals are designated as protected animals by the Wildlife Protection Act (1972).
[53] Survey results through group interviews conducted with SHG members who belong to VFC.
[54] Interview results in Pudur village and Oorgoundanur village in Vellore district.

2) Environmental Permits:

This project was not obliged to prepare an environmental impact assessment report based on the Indian domestic law, and no environmental license was required. Since indigenous species were selected for afforestation, it is assumed that there was no additional burden on the natural environment.[55]

3.4.2.2 Resettlement and Land Acquisition

There was no resident relocation or land acquisition through this project.[56]

To evaluate effectiveness and impacts of this project, we weighted among evaluation items such as operation indicators, effective indicators, and impacts by 40%, 40%, and 20%, respectively. Among operation indicator, effect indicator, and impact, indicators that are judged as especially important were attempted to judge evaluations by putting higher weight within each evaluation item.

Table 17 Attempt to Determine Effectiveness and Impacts

Evaluation Items (weight portion)	Indicator Name (items set at the time of appraisal)	Achievement Rate %	Weight within Each Evaluation Item	Results Note 1)	Evaluation Points	Evaluation Points×Weight portion
Operation Indicators (40%)	Afforestation area	118	0.2	3	0.6	
	Number of trees planted	97	0.2	3	0.6	
	The amount of supplementary planting	150	0.2	3	0.6	
	Survival rate of planted trees	Good	0.2	3	0.6	
	Number of VFC (SHG) established Note2)	116	0.1	3	0.3	
	Number of jobs created	123	0.1	3	0.3	
				Evaluation Point in Total	**3.0**	**1.20** Note 3)
Effect Indicators (40%)	Forest regeneration in the afforestation target area	N.A.	0.5	2Note6)	1.0	
	Income per household of farm forestry as target beneficiary (reference indicator)	Achieved in most households	0.5	3	1.5	
				Evaluation Point in Total	**2.5**	**1.00**Note 4)
Impacts (20%)	Water table and soil conservation	Effective	0.2	2	0.4	
	Increased awareness of forest conservation (social fencing)	Effective	0.2	3	0.6	
	Impact on agriculture	Effective	0.1	2	0.2	
	Reduced number of forest fires	Effective	0.1	3	0.2	
	Impact on wildlife	Effective	0.1	3	0.3	
	Diversification of livelihood measures	Effective	0.1	3	0.3	
	Improvement of nutritional standard	Effective	0.1	3	0.3	
	Promotion of women's social participation	Effective	0.1	3	0.3	
				Evaluation Total	**2.6**	**0.52**Note 5)
				Comprehensive Evaluation		**2.72**

Note 1) The criteria was set as follows: "③high: 80% or more of the plan (2.4), ②moderate: 50% or more but less than 80% of the plan (1.5 or higher but less than 2.4), and ①low: less than 50% of the plan (less than 1.5)."
Note 2) Since we were unable to grasp the number of newly established SHG, we measured the achievement rate of VFC.
Note 3) 3.0×0.4 (weight among evaluation items of operation indicators).
Note 4) 3.0×0.4 (weight among evaluation items of effect indicators).
Note 5) 2.4×0.2 (weight among evaluation items of impacts).

As a result of the evaluation of this comprehensive viewpoint, the effectiveness / impact of

[55] Responses to the executing agency questionnaire.
[56] Results of the interview survey with the executing agency.

this project is judged to be high because the overall evaluation score is 2.72, which is 80% (2.4) or more of the plan.

3.5 Sustainability (Rating: ②)

3.5.1 Institutional /Organizational Aspect for Operation and Maintenance

3.5.1.1 State Forest Department

The State Forest Department is the executing agency of this project and performs the maintenance management of afforestation areas and monitoring of the VFC management.

For the monitoring system at the time of the ex-post evaluation, range offices send monthly reports to district offices, circle offices, and state executing units. The monitoring was performed by the circle office with jurisdiction down to the field. Written reports are required monthly according to the regulations, but there are also weekly reports, and most recently, reports can be prepared any time on illegal activities associated with fires and forests using videos and mail through SNS.

The Formulation Evaluation Monitoring and Statistics (FEMAS) was established as an internal monitoring team at the state level, performing field surveys at irregular intervals to confirm current conditions and preparing reports. It surveyed, especially focusing on micro credit and the survival rate of planted trees, and prepares survey reports separately from regular monitoring and reports.

The Forest Department of the Tamil Nadu State takes on all responsibilities of the project activities, and the organizational system has not changed from the appraisal to ex-post evaluation. The division of tasks for each position is clear, and cooperation system from the top level, the Forest Department, to the field level is strong. Close commutations and reports are maintained.

At the ex-post evaluation, the number of staff at the Forest Department was 10,603,[57] but in the future the number is to be reduced due to budget austerity. To cope with this, the Forest Department plans to strengthen the function of VFC as a forest protection agent[58]

Table 18 Stakeholders and Responsibilities &Duties (Actual)

Administrative Level	Responsibilities &Duties	Main Supervisors	Document Report System
The State Forest Department	State-wide Supervision	Principal Chief Conservator of Forest Additional Principal Chief Conservator of Forest	
Circle Offices	Supervision of multiple districts	Chief Conservator of Forest	Quarterly reports to the State Forest Department
District Offices Division Offices Note 1)	In charge of afforestation and forest conservation of overall districts and divisions	Deputy Conservator of Forest Assistant Conservator of Forest	Quarterly reports to the circle offices
Range Offices	In charge of afforestation and forest supervision in the range	Ranger Forester	Monthly report to the division offices
Beat Office Note 2)	In charge of forests across multiple administrative villages (24-hour system)	Forest Guard Watcher	Monthly report to the range offices

Source: Prepared from the results of the interview survey with the Forest Department.
Note 1) One office might play roles of both district and division offices.
Note 2) Beats offices monitor watchers who work in peripheral villages.

[57] Responses to the executing agency questionnaire.
[58] Results of the interview survey with the Forest Department.

3.5.1.2 VFC

VFC are an organization based on the Tamil Nadu Society Act as described above and are audited every year. Five to 15 at maximum members are selected for the executive committee of VFC, and one male and one female shall be selected from the same village. The term of each committee member is five years, and the same member can be elected up to two terms. The executive committee holds a meeting every month, and VFC members hold one meeting every quarter on principle. Members attend one meeting every six months. Topics of VFC meetings include allocation and recovery of loans, afforestation, prevention measures of livestock entering forests, and so on. At the time of ex-post evaluation, a microplan was being renewed.

Regarding the revolving fund, when averaging the data submitted from each circle at the time of the ex-post evaluation, the repayment rate of micro credit was 78% and the revolving rate of micro credit funds was 2.45 times.[59]

The surplus of the revolving fund[60] is being used as the village forest fund for welfare of VFC villages (educational fund support, infrastructure repairs in villages, etc.).[61]

Since VFC are in a position as society, the Forest Department has a plan to establish a federation so that members would be able to trade Non-Timber Forest Products (NTFP) such as fruits, spices, fiber, resin, and so on, at the scale of a larger organization, and to act collectively.

3.5.1.3 SHG

SHG organizations consist of 15 to 20 members. Reasons for inability to repay the micro credit included a lack of money due to issues of income, high interest, and intentionally not paying since there were other members who were not repaying, in hopes that the loan might be cancelled.[62] At the time of ex-post evaluation, the evaluator were unable to confirm the ratio of SHG that were continuing income generating activities.[63]

In relation to the organizational activity system of VFC and activities of SHG at the time of ex-post evaluation, since there are various cases as to the actual condition of micro credit, and there are cases in which it is at least financially dormant there remain issues. The system of operation and maintenance at each level of the executing agency is established. Therefore it is judged that there is almost no problem.

3.5.2 Technical Aspect of Operation and Maintenance

In terms of technical knowledge of Forest Department staff, training was provided to suit individual levels to strengthen technical and management skills of staff.[64] Training assessments were conducted to implement training, and based on such assessments, specialized agencies developed educational materials and provide actual training. According to interviews conducted at each level of office in the Forest Department, management of resident participation and micro

[59] The revolving ratio is the ratio of the total amount of refinancing amount to the amount of funds created.
[60] Surplus funds of a certain amount not used for micro credit.
[61] Responses to the executing agency questionnaire.
[62] *Tamil Nadu Afforestation Project, Socio Economic Studies, Final Report – Phase 2 by Economic Perspectives*. Information from VFC members of 27 villages through proportional sampling of climate zones.
[63] Responses to the executing agency questionnaire. SHG formed by this project (SHG of VFC) has been formed. There are also SHG which has dissolved due to the difficulty of fund management and business ups and downs, but there are also SHG which is continuing. In addition, SHG formed by other projects may be permitted to newly enter the lending of this project, and these SHGs are formed separately by age group, caste class, residential area, etc. These SHGs, which is not SHG of VFC, may be continued in some cases. Even in the visited village, the evaluator could not grasp the total number of SHG.
[64] The result of the interview survey with the executing agency staff.

credit was performed with the corporation of NGO in relation to guidance and facilitations, by instructing activities of VFC with NGO, the Forest Department staff had an opportunity to have conversations with local residents and gained an attitude of encouragement to facilitate participation in VFC[65]. Manuals below were prepared through this project and were used in the training described above:

・*A comprehensive training manual on gender mainstreaming, micro finance and micro credit, and poverty alleviation*

・*Training Manual for the Trainers' Training Program*

TBGP uses these manuals prepared for TBGP.

In Phase I, the forest area where afforestation was done in extensive areas, so intensive care was not given for planting trees. Given that, Phase II training provides detailed and practical contents, such as handling and planting of seedlings and prevention of livestock and people from entering forests after planting, allowing for learning more concrete implementation methods of JFM.[66] The Tamil Nadu Forest Academy has prepared and organized manuals for afforestation and forest conservation, and provides training of trainers (TOT) according to the level of knowledge and technical skills of individual staff. Since Phase I and the present project have been continuously executed for about 20 years, field staff were mostly aware of forest management techniques that focused on residents and developed a good relationship with VFC in terms of forest management. Therefore, there is no technical problem with operation and maintenance of afforestation.[67]

3.5.3 Financial Aspect of Operation and Maintenance

3.5.3.1 The State Forest Department

The finance of the State Forest Department is made of fixed cost and personnel cost from the state government, state government project cost, central government project cost, and state/central government joint project cost. With the austerity finance, personnel cost is scheduled to be reduced. Other project costs were being reduced every year, as well, and the total budget was decreasing. Since the number of field staff in charge in the Forest Department was to be reduced, a policy was set up to enhance VFC instead of relying on the Forest Department. A budget of 98,495,000 rupees was set aside for this purpose for the 2017-2018 fiscal year.

Table 19 Annual Budget Status of the State Forest Department Note 1) (unit: 100,000 rupees (lakhs Rs))

	2014/15	2015/16	2016/17	2017/18Note 2)
Fixed Cost/Personnel Cost Note 3)	35,508.97	42,744.45	43,134.53	33,924.44
State Government Project Cost	26,479.03	19,293.43	13,579.08	13,049.15
Central Government Project Cost	2,184.62	3,070.95	2,452.94	3,497.55
State/Central Government Project Cost	820.03	1,610.85	1,294.91	1,355.51
Total	64,992.65	66,719.68	60,461.46	51,826.65

Source: The State Forest Department.
Note 1) The Indian fiscal year is from April to the next year March.
Note 2) Requested budget for 2017/2018.
Note 3) Materials provided by the state government.

[65] The result of interviews with the Forest Department staff.
[66] The result of interview survey with Forest Department staff.
[67] The result of interview survey with Forest Department staff.

Table 20 Maintenance Budget Secured for Project (FY 2017/2018) (Unit: 100000 rupees (lakhs Rs))

Details	2017/18
[Strengthening of JFM Organization for Phase 1 and this Project] ・Organization of federation that includes expansion of VFC office functions. ・Preparation of updated microplan.	318.70
[Increasing NTFP Profits] ・Survey on NTFP and medicinal plant resources, a management plan that is linked to the market. ・The marketing department was established in the Forestry Extension Center, and NTFP resources are managed and utilized.	87.00
[Maintenance of Community Assets] ・Repair to check dams and percolation ponds built in this project.	579.25
Total	984.95

Source: Responses to the executing agency questionnaire.

The allocation of profits (actual) was the same as that assumed at the appraisal, according to the allocation principle shown in Table 21. Since planted trees were young, except for thinned wood from some trees and green leaves after pruning, there was hardly profit from planted trees yet. Regarding the collection of NTFP, permission was supposed to be issued based on judgment of the forest situation by the range office, but it was confirmed that some VFC villages collected NTFP.

Table 21Allocation of Benefits between the Forest Department and VFC (Policy) (unit: %)

Items	Forest Department	VFC
Fuel Wood	0	100
Livestock Feed, Green Leaf Manure	0	100
Timber	10	90
Poles, Bamboo	10	90
Non-Timber Forest Product(NTFP)	0	100

Source: Responses to the executing agency questionnaire.

3.5.3.2 VFC

VFCs were being audited every year based on the Tamil Nadu Society Act. As discussed above, regarding the revolving fund, the repayment rate of micro credit was 78% and the revolving rate of small funds was 2.45 times, based on the average of documents submitted from each circle office at the time of ex-post evaluation.[68]

The surplus of the revolving fund was being used for welfare of VFC villages as village forest funds (education support, repair of village infrastructure, etc.), but some VFC defaulted funds due to non-payment from SHG or individuals, which became dormant funds at a bank.[69]

The Forest Department, considering future financial sustainability, made a plan that allows for establishment of a federation and collective activities, so that VFCs that play a role in society can trade NTFP as a larger organization. This plan will allow members of VFCs to routinely receive profits after a certain period. The measures are being considered including the option that VFCs can trade nuts, oil (wax, lacquer, etc.), medicinal trees and herbs, bamboo materials, vines, tree barks, and saps jointly without a commodity broker so that they can receive practical

[68] Results of the executing agency's questionnaire.
[69] Results of the field survey interview.

profits when trees grow and mature.[70]

As mentioned above, although the staff tends to be reduced due to austerity finance as the budget of the State Forest Department, in response to the decline of the staff who supervises the on-site, a policy was set up for VFC staff to take over monitoring by strengthening the role of the VFC, and a budget was put aside for this purpose. However, there were some issues with the financial sustainability of VFC, and the State Forest Department was attempting to strengthen their finances by forming a federation and increasing profit from NTFP. Though issues remained, since the Forest Department understood the issues and was searching for solutions, financial sustainability is considered moderate.

3.5.4 Status of Operation and Maintenance

Each division office was supposed to conduct management and maintenance of afforestation areas based on the working plan.[71] For VFC, microplans were formulated with residents in the beginning, but at the time of the ex-post evaluation, NGOs were appointed to follow up on the project, and microplans were being renewed jointly with VFC.

Seedlings that died or were injured within two years of planting were replaced in the supplementary planting. Watering depended on the amount of precipitation in the community, but was usually performed continuously for three months following planting and supplementary planting. For three months after the planting of trees, access to afforestation areas was prohibited. Since afforestation areas required professional protective surveillance, watchmen of the Forest Department cooperated with forest guards to conduct 24-hour monitoring. These staff and those of range offices corresponded to the protection and control of pests.

The Forestry Extension Center was being used for training in afforestation and compost making for farmers and residents as part of the present project of TBGP, and there is a budget put aside to reinforce the facility building.

Soil and moisture conservation facilities were being repaired by the Forest Department. For repair of small infrastructure facilities by other departments, VFC applied for the departments in charge and requested for repair.[72]

During Phase 1, a forest cover rate map was prepared, which clearly displayed reforestation and reduction of forest, showing issues for each district. In this project, a map of forest types was prepared, and another map was created to show forest vegetation across the state. Though not for this project specifically, a geographical map of forest fire conditions was also developed, which can be confirmed on the Geomatic Center page of the state Forest Department website.

In light of the above, duties and roles for positions that perform maintenance of afforestation are clear, and a collaboration system is established from the Forest Department Headquarters to the field. From a technical perspective, training is provided according to needs, and technical skills required for each task are being strengthened. From a financial perspective, although the

[70] The assumption on how many years later NTFP will be harvested depends on the type and growth situation of NTFP.

[71] The project plan was approved for 10 years of forest conservation, plant regeneration, and tree planting by the state Forest Department after its approval by circle offices.

[72] A report to the executing agency is not required for repairing village infrastructure; thus, we were unable to understand the present condition of facilities and their state of repair (responses by the executing agency).

staff of the forestry department tends to be reduced, by strengthening the VFC, the budget is secured so that the forest preservation policy can be continued without delay. Budgets are also secured by state government that emphasizes forest preservation. The income improvement activities of SHG are conducted by funds provided by the VFC Fund and the VFC Fund remains as issues. The situation of management related to forests and afforestation is almost favorable. Judging comprehensively, the sustainability is high.

4. Conclusions, Lessons Learned, and Recommendations

4.1 Conclusions

This project was implemented with the aim to regenerate forests and improve the standard of living of local residents by afforestation and livelihood improvement activities using the community participatory method at the village level in the state of Tamil Nadu in the south-east of India, thereby contributing to the improvement of the local socio-economic situation.

This project is highly relevant, as it is consistent with priority areas in the development policy of India's and Japan's ODA policy, and also with development needs. The efficiency is high, as its cost and duration were within the plan. The afforestation was implemented mostly according to the plan, with a high survival rate of planted trees and forest regenerated. In addition, it is recognized that the annual income of the targeted villages has increased because of income gained from small scale business using micro credit implemented through this project at least for a certain period. Therefore, the effectiveness is high. The rise of the groundwater level has been confirmed by survival of planted trees and improvements of the soil conservation facilities, and the impact such as the diversification of the cropping items emerged. Residents' awareness of forest protection and nature conservation also increased, forest fires decreased, and trees are being protected through appropriate management of livestock. Social fencing, which monitors illegal grazing and felling trees, has also been established. As such, the effectiveness and impact of the project are both judged as high. The operation and maintenance system of the executing agency is well established; there is no problem with technical capabilities and the project is mostly maintained. Although there are a few issues remaining with the financial sustainability of village forest councils, the sustainability of the effects emerged by this project is high.

In light of the above, the evaluation result of this project is highly satisfactory.

4.2 Recommendations

4.2.1 Recommendations for the Executing Agency

None.

4.2.2 Recommendations for JICA

None.

4.3 Lessons Learned

<u>Setting Appropriate Effectiveness Indicators</u>

Effectiveness indicators was set "forest cover rate (crown density) in the afforestation target area" at the time of the appraisal of this project according to JICA provided materials. However, the forest cover rate and the crown rate were monitored only at the district unit and the effect

emergence could not be sufficiently confirmed. It is desirable to accurately represent the effectiveness of the project objectives and to set indicators that can be monitored by the executing agency.

As the indicators on living standards, at the time of appraisal, an income increase by 10% for target households on average was set as a target to be achieved two years after completion of the project. However, there are other factors affecting on the increase other than the project. At the time of appraisal it was required to set the indicator properly (considering other influencing factors) and to clearly indicate the measurement method.

For the appropriate ex-post evaluation, the validity of operation and effect indicators should be discussed at the time of the appraisal with experts and measurement methods for indicators should be clarified. It is important to keep records on those indicators and the measurement methods in the agreement document at appraisal. Since the target indicators for the effectiveness are also referred for monitoring during implementation and post-monitoring and are keys to overall project management, the sufficient and appropriate investigation of those indicators by stakeholders at the time of planning and appraisal is required.

Financial and Organizational Sustainability of VFC and Necessity to Examine Future Direction of JFM.

In this project, with the support of the Forest Department and NGOs, a VFC consisting of settlements living around afforested areas was formed and most of VFCs consisted of the settlements include SC and ST. VFC was formed on condition that it was affected by living and agriculture due to deforestation and deforestation of forests. Though VFC is an organization based on the Society Act, at the time of ex-post evaluation, it is planned to upgrade VFC as a part of administrative organization in the administrative village, and establish a VFC federation in order to sell forest products and non-timber forest products etc. Such a plan to strengthen VFC institutionally and financially is proposed by the Executive Agency.

At the time of ex-post evaluation, economic status had changed notably, compared to 10 years ago when VFC were established. A rapid economic growth of the state of Tamil Nadu activated seasonal labor and migrant labor, leading to VFC in which members are absent for a long period of time. In addition to profits from forests and micro credit, income from migrant labor of family members makes up a large portion of household income. Micro credit is at a turning point in which their value must be further examined through future surveys. This evaluation did not make specific and empirical comparisons of these micro credit with those of other organizations. However, since the repayment rate of micro credit is low, and some VFC and SHG are dormant, considering the future direction of JFM, micro credit that had previously been an incentive to residents must be reconsidered. While doing so, some members of target villages in Tamil Nadu were utilizing micro credit from NGOs. The amount of loans are large and the repayment rate is also high with the framework of this loan under strict regulations. Thus, it would be necessary to make a comparative examination on micro credit with those of the other organizations.

Comparison of the Original and Actual Scope of the Project

Items	Plan	Actual
1.Project Outputs	(1) Afforestation project 1) Afforestation area IWDP 162,500 ha ITDP 15,000 ha 2) Number of trees planted 34,150,825 3) Number of supplementary trees planted 6,550,000 4) Number of Employers (day/number of people) 16,590,000 5) Soil and moisture conservation activities a. check dams 4,152 b. percolation ponds 1,177 (2) Number of VFC established 800 (3) Number of SHG established 1,600 (4) Community development water tanks, roads, VFC offices, etc. 3,657 (5) Forest management facilities 1) Field staff dorms 575 2) Field staff offices 61 3) Rest Houses 29 (6) Forestry Extension Center 11 (7) GIS 1) GPS 300 2) Computers for training 6 3) Topographic data purchased 22 4) GIS software 13	(1) Afforestation projects 1) Afforestation area IWDP 189,250 ha ITDP 19,300 ha 2) Number of trees planted 39,991,825 3) Number of supplementary trees planted 9,808,682 4) Number of Employers (day/number of people) 20,440,000 5) Soil and moisture conservation activities a. check dams 5,271 b. percolation ponds 2,026 (2) Number of VFC established 950 (3) Number of SHG established 3,283 (4) Community development water tanks, roads, VFC offices, etc. 4,393 (5) Forest management facilities 1) Field staff dorms 575 2) Field staff offices 61 3) Rest Houses 29 (6) Forestry Extension Center 11 (7) GIS 1) GPS 329 2) Computers for training 6 3) Topographic data purchased 23 4) GIS software 15
2.Project Duration	March 2005–March 2013 (97 months)	March 2005–March 2013 (97 months)
3.Project Cost Foreign Currency Local Currency Total (ODA Loan) Exchange Rate	450 million yen 13,169 million yen (5,487 million rupees) 13,619 million yen 9,818 million yen 1 rupee ＝2.40 yen (August 2004)	(N/A) (N/A) (N/A) 13,198 million yen 9,199 million yen 1 rupee ＝2.15 yen (average from March 2005 to March 2013)
4.Final Disbursement	July 2015	

Appendix 1. Water Table Data

Climate zone	Annual mean precipitation (2006-2010)	Name of villages	Rise in water table
Cauvery Delta Zone	696 mm	Osarapalli Nagar Mahilampadi Kancherimalai	4 m 1 – 2 m 1 – 2 m
North Eastern Zone	882 mm	Kumaramangalam 3 Villages Keel Kottaiyur	3 m 1 m 0
North Western Zone	844 mm	Kollankuttai Paithur Pappanaikkanpatti Chinnerikkadu Kalrampatti	3 m 3 m 1 m 1 m 0
High Altitude Zone	813 mm	Beeranapalli Achampatti	3 m 1 m
Western Zone	844 mm	Goundanpalayam Pudukkadu Indiranagar Masagoundanur Masakalipatti Periyakalipatti	3 m 1 m 1 m 0 0
Southern Zone	990 mm	Chinamuliyur Pillayarnatham Tkolingipatti Karuppanadhi Palayar Kudiyiruppu TNadar Sanga Theru Rajapalayam Samathuvapuram	3 m 1 m 1 m 1 m 1 m 1 m
High Rainfall Zone	1,986 mm	Vellambi	1 m
		Total number of villages, 27	The number of villages that experienced rise, 24

Source: *Water Table Status Study Report, 2011*

Note) Water tables in 135 wells in 27 villages were measured every month. The sampling method of 27 villages was not clearly stated in the report.