

People's Republic of China

Ex-Post Evaluation of Japanese ODA Loan

Shanxi Loess Plateau Afforestation Project

External Evaluator: Nobuyuki Kobayashi, OPMAC Corporation

0. Summary

Based on farmers' voluntary participation, the purpose of this project is to prepare economic, timber and protection forests in 30 counties/county-level cities/city districts¹ of the Loess Plateau area within the Shanxi province. The background of this project originates from the 1998 Yangtze River Floods, which raised awareness for improving the water holding capacity in the upper and middle river basins of major rivers by expanding forest areas.

The implementation of this project was in line with Chinese forestry sector's policy and development needs as well as Japan's ODA policy on China to support activities in the environmental field, therefore its relevance is high. As the area afforested by this project from the time of appraisal to ex-post evaluation accounts for an approximately 20% increase in forest land in the project area, this project has contributed to the improvement of the forest coverage ratio. After afforestation, soil erosion was improved as the age of forest increased. For the above reasons, the project's effectiveness and impact are high. As for the project's efficiency, severe growth conditions necessitated supplemental planting and replanting and the project's period was significantly exceeded the plan. The project cost also exceeded the plan due to the weakening of the Japanese yen to Chinese RMB from the time of project appraisal. In regards to the project's sustainability, forest maintenance activities are the responsibility of the forestry department of the county-level local government and the farmers, and neither showed any significant problems.

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

¹ Within Chinese administrative division, there are counties, county-level cities and city districts under prefecture-level cities. In this report, the local government of the counties, county-level cities and city districts is mentioned as county-level local government.

1. Project Description



Project Location



Chinese Arborvitae and Peking Willow
in Protection Forest

1.1 Background

At the time when the People's Republic of China was established (1949), the country's forest coverage rate was less than 10%. Ever since then, the Chinese government has been promoting improvement in afforestation. At the beginning of 2000, although China possessed one of the world's largest forest areas, its forest coverage rate was below 20% and China has yet to reach the forest coverage rate of other vast countries (with various natural environments) such as the United States, Canada and Russia. China's low forest coverage had caused many natural disasters including the 1998 Yangtze River Floods. Such large-scale floods had resulted in 1,300 deaths and 2,300 million victims. Excessive disafforestation resulting in the weakened capacity of water holding was considered one of the primary causes of such disasters. In addition, more floods are now more likely to occur during rainy season as the river bottoms have been raised by the inflow of sand at the Loess Plateau basin. This has caused a phenomenon in which a river has dried up (shear flow) during dry seasons. In addition, sandstorms occurring in areas affected by desertification were increasing, including a severe sand storm in March 2000 which caused 13 deaths in the Shanxi province.

After the Yangtze River Floods in 1998, the Chinese government introduced a forestry sector policy that focused more on environmental aspects, and set a major policy goal of expanding the forest areas in the upper and middle river basins of major rivers. This project was based on farmers' voluntary participation in the forestation activities at Loess Plateau in the upper and middle river basins of Huanghe River to improve forest cover and it was positioned to support the Chinese government's activities to improve natural environments. With this background, the loan agreement for this project was signed in 2001. During the same period, JICA has provided ODA loan projects to expand the forest areas of Loess Plateau including the "Shaanxi Loess Plateau Afforestation Project" and the "Inner Mongolia Loess Plateau Forestation Project".

1.2 Project Outline

The objective of this project is to increase forest cover, prevent soil erosion, and improve incomes of farmers by afforestation of Loess Plateau area within Shanxi province in 30 counties/county-level cities/city districts, thereby contributing to improve the social and economic stabilities of the said regions, and the living environments of the local residents and those in the lower river basin of Huanghe river, as well as China's natural environments².

Loan Approved Amount/ Disbursed Amount	4,200 million yen / 4,080 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March 2001 / March 2001
Terms and Conditions	Interest Rate: 0.75% Repayment Period: 40 years (Grace Period: 10 years) Conditions for Procurement: Bilateral tied
Borrower / Executing Agency(ies)	The Government of the People's Republic of China / Shanxi Provincial People's Government
Final Disbursement Date	July 2010
Feasibility Studies, etc.	Shanxi Provincial Forest Survey and Design Institute, "Feasibility Study on Loan Afforestation from Japan Bank of International Cooperation", June 2000
Related Projects	- JICA "Shaanxi Loess Plateau Afforestation Project" (ODA loan, 2000) and "Inner-Mongolia Loess Plateau Afforestation Project" (ODA loan, 2000) - World Bank "Loess Plateau Watershed Rehabilitation II" (1999) - KfW "Afforestation Shanxi" (1995)

2. Outline of the Evaluation Study

2.1 External Evaluator

Nobuyuki Kobayashi, OPMAC Corporation

2.2 Duration of Evaluation Study

Duration of the Study: August 2012 – September 2013

Duration of the Field Study: March 3 – March 19, 2013 and June 4 – June 21, 2013

² Although the project sites were expediently divided into 7 regions in the appraisal document, this ex-post evaluation report does not use the same 7 region division because the Chinese project related documents did not use the same divisions which could be confused with administrative divisions.

2.3 Constraints during the Evaluation Study

The project effects during the project implementation period were not adequately assessed because sufficient detailed information on the inspection of planted areas after three growing seasons could not be obtained. In addition, this project's budget and head count data were not available for the county-level governments' forestry departments related to this project. For this reason, evaluation results regarding "Sustainability" are based on data covering the whole Shanxi province.

3. Results of the Evaluation (Overall Rating: B³)

3.1 Relevance (Rating: ③⁴)

3.1.1 Relevance to the Development Plan of China

At the time of project appraisal (2001), the long-term plan for the recovery and protection of the environment was the National Program for the Construction of an Ecological Environment (approved in 1999). The plan pursued the protection of an ecological environment and aimed for a more than 26% forest coverage rate by 2050. At the time of ex-post evaluation (2013), the National Program for the Construction of an Ecological Environment remained as an important policy in the forestry sector and long term forestry rehabilitation has been undertaken. The National Afforestation Plan (2011-2020) was another long-term plan established within the policy of Loess Plateau regions. The policy goals were: (1) expansion of the forest areas through plantation, regeneration by enclosures and aerial sowing (tree species to include black locusts, Manchurian black pines, etc.), and (2) afforestation of economic forests specializing in certain species such as apple and Sichuan pepper trees.

At the time of the project appraisal, the 10th Five Year Plan and the mid-to long-term plan for the forestry sector (2001-2005) aimed at a forestry coverage rate of 18.2% by 2005 and 19.4% by 2010. For the economic and timber forests, the policy focused on fast growing tree species in the state forests of northeast and inner Mongolian regions as well as the mid river basin of Huanghe River and the southern regions and emphasized the afforestation of timber forests for industrial raw materials (plywood and wood pulp manufacturing). For the protection forest, the upper stream of the Yangtze River and upper/middle stream of the Huanghe River were designated as the primary target regions. At the time of ex-post evaluation, the 12th Five Year Plan for the forestry sector (2011-2015) was a mid-term sector plan. During the planned period, this mid-term sector plan proposed planting trees over an area of approximately 30 million ha to achieve a forest coverage rate of 21.7% by 2015. Projects to accelerate harvesting as well as to construct a base for plywood and wood pulp manufacturing are an on-going part of the forestry sector's promotion policy, and there is no significant change in the focus of the

³ A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

⁴ ③: High, ②: Fair, ①: Low

policy. The Shanxi province 12th Five-year Plan for the Forestry Sector Development regards achievement of two major tasks by 2015 as core of the sector policy. Two major tasks are to raise forest coverage rate to 23% and the growing stock of trees to 130 million m³.

During the period of project implementation, new regulations for natural environment protection were enacted. In 2002, for example, the Law on Prevention and Control of Desertification was put into effect. The Law stipulated that the local government would now be in charge of establishing a soil erosion control plan, implementing afforestation according to the plan, and carrying out forestry management to regulate logging. The Law on Water and Soil Conservation to prevent or control such soil erosion was revised in 2010, and the roles of the government were broadened to include: appraisal, selection of target regions, establishment of a soil erosion control plan and development regulations, protection construction and planting.

Afforestation implemented by this project is in line with the forest rehabilitation policy objectives and its relevance remains intact. Some of the tree species used in this project (black locusts, Manchurian pine trees, apple and Sichuan pepper trees, etc.) are the same species that are emphasized in the National Afforestation Plan. The needs for nurturing and protecting forests to improve the natural environment have been strongly reflected in the laws and regulations.

3.1.2 Relevance to the Development Needs of China

Although the forest coverage rate in China has improved from 8.6% in 1949 (immediately after the establishment of the People's Republic of China) to 13.9% in 1999, insufficient forestry resources has been the cause for various environmental issues. At the time of the project appraisal, the Loess Plateau regions, in particular, had some of the lowest forest coverage rates in China (6%), and showed significantly poor forestry resources.

Shanxi province, the project site of this project, was exposed to the menace of soil erosion and desertification. The Huangje river flows near the province's west and south boundaries and the Loess Plateau is located in the province's western and southern regions. Intensive rain combined with soil that has little tolerance to erosion has caused severe drain off of surface soil in Loess Plateau, and is one of the main causes of soil runoff into the Huanghe River. At the time of appraisal, the amount of soil runoff into Loess Plateau was 14 billion tons and it was estimated that approximately 0.2-2 cm of Loess Plateau surface soil was lost annually. Although vegetation could contribute to the formation of more erosion resistant soil, Loess Plateau (including Shanxi province) exhibited a low forest coverage rate. For this reason, the needs for expanding forest coverage in order to prevent soil erosion and desertification were high in Shanxi province. Such soil erosion and desertification were mostly caused by severe natural conditions, and as such there was no significant change observed from the time of appraisal to the ex-post evaluation.

In regards to forest rehabilitation, it is a crucial challenge that the farmers who are in charge of the forest administration gain sufficient incomes so that they do not carry out exploitative use of the forests. This project adopted a forest administration scheme in which the farmers that afforested economic and timber forests could harvest from their woodland. At the time of the appraisal, net income per capita in the rural area of the Shanxi province (1998: RMB 1,858) was lower than the national average in rural areas by 14%. In 2011, net income per capita in the rural area of the Shanxi province (RMB 5,601.40) remained lower than the national average for rural areas (RMB 6,977.29) by 20%. At the time of ex-post evaluation, the farmer's incomes are still below the national average, and it was still necessary to improve farmer's incomes by introducing value-added farm products.

3.1.3 Relevance to Japan's ODA Policy

Japan's former Official Development Assistance Charter (former ODA charter), which had been approved by the cabinet in 1992, referred to the close relationship between Japan and East Asia and emphasized assistance to the Asian region. In addition, the charter had the policy of supporting the effort of developing countries in the field of environmental protection. The Japan's ODA White Paper in 1999 regarded the environmental sector as a priority for China's loan assistance, and in particular, pointed out the inland areas where non-governmental financial support is hard to reach. Furthermore, the Japan Bank for International Cooperation's (at that time) Medium-Term Strategy for Overseas Cooperation Operations (approved in 1999) stated solving global issues including environmental issues as one of its basic policies, and assistance for China in such field was considered to have a higher priority.

Through assistance for Shanxi province's afforestation, this project contributed to forestry development located in the inland part of China, and thus it was consistent with Japan's ODA policy.

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

3.2 Effectiveness⁵ (Rating: ③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

(1) Forest Cover Ratio

Analysis of effectiveness/impact was based on the forest coverage rate for the following reasons: (1) It was basis for the project appraisal decision and the target ratio was clearly set at the time of appraisal, and (2) Project's attribution to the project effect was clearly shown by this indicator. Based on the latest forest data obtainable at the ex-post evaluation, the forest cover

⁵ Sub-rating for Effectiveness is to be put with Impact.

ratio has improved significantly and has achieved its target (see Table 1). As the afforestation area by this project (approximately 100,000 ha) accounts for an approximately 20% of an increase of forest land in the project area (approximately 553,000 ha) from appraisal to ex-post evaluation, this project has contributed to the improvement in the forest cover ratio. In addition to the Grain for Green Project, which is explained in a later section, three national projects (the Natural Forest Protection Project, the Beijing-Tianjin Sandstorm Source Control Project and the Three-North Shelter Forest Project) have significantly contributed to the improvement in the forest cover ratio. Given its percentage of afforested area, this project also played an important role in an increase in forest cover ratio in the project area.

Table 1: Increase of Forest Cover Ratio in the Project Site

	Basis (At Project Appraisal)	Target (At Project Completion)	Actual (At Ex-post Evaluation)
Forest Area	656,133 ha	774,363 ha	1,209,102 ha
Forest Cover Ratio	17.3%*	20.4%**	31.9%***

Source: Appraisal documents, Shanxi Forestry Department

Note: * (Forest + Shrubbery) ÷ Total area of countries/county-level cities/districts under the project

** (Forest + Shrubbery + Young Afforested Land) ÷ Total area of countries/county-level cities/districts under the project⁶

*** (Forest + Shrubbery) ÷ Total area of countries/county-level cities/districts under the project

(2) Survival Rate

At the time of project appraisal, the Chinese afforestation standard required supplemental planting and replanting in areas with a survival rate under 70%. After one growing season, 98% of the planted area passed inspection (see Table 2). The planted area was continuously monitored during the project implementation and, if necessary, supplemental planting was conducted. The project area's climate was arid and had difficult growth conditions. Furthermore, wild rabbits caused feeding damage. It was difficult to completely prevent feeding damage, even though traps and rabbit repellent were used. The data obtained from the Shanxi Forestry Department shows that supplementary planting and replanting were conducted on 7,013.1 ha.

Table 2: Survival Rate by Type of Forest

	70% or More	Below 70% and Above 41%	40% or Less
Economic Forest	24,759.7 ha	0.0 ha	138.7 ha
Timber Forest	10,982.7 ha	0.6 ha	187.0 ha
Protection Forest	34,388.9 ha	0.0 ha	874.6 ha
Total	70,131.3 ha	0.6 ha	1,200.7 ha

Source: Shanxi Forestry Department

Note: Survival rate after one growing season (Planted in spring and inspected in autumn or winter of the same year)

⁶ As young afforested land at the time of appraisal was expected to be forest land at post-implementation period, the area of young afforested land was included in the target forest land area at project completion.

In the monitoring study commissioned to the Shanxi Forest Research Institute, approximately 10% of the project area was chosen and monitored in six counties. In September 2012, the survival rate was 74.4% in the planted area (Economic Forest: 76.7%, Timber Forest: 75.2%, Protection Forest: 72.4%). In all types of forest, the survival rate remained above 70%. A 70% level is considered “passing” inspection and infers that the plantation by this project has at an adequate level of density after the completion of the project.

As low forest coverage and little rainfall resulted in dry soil and prevented germination, areas suitable for aerial sowing was limited in the project site. For this reason, aerial sowing was replaced by artificial sowing (sowing uniformly from standing position or seeding to a small hole on soil) except in Yuci and Guijiao (among the 13 counties/county-level cities/districts). Despite this change, total sowing area was as planned (10,000 ha).

(3) Area of Grain for Green Project

Since cultivation of inclined land causes soil erosion, the project by the Shanxi Forestry Department to make farmers abandon cultivation and convert the farmland into planted forest (Grain for Green Project) was implemented at the time of project appraisal. Although this project did not directly support the Grain for Green Project, a 5,000 ha target area was set for afforestation of land with an incline greater than 25 degree. As the implementation of this project may have interfered with the Grain for Green Project area and furthermore the counties/county-level cities/districts may have included this project’s afforestation area in achievement of the Grain for Green Project, the target area for the Grain for Green Project was set and monitored. In the counties/county-level cities/city districts under this project, the Grain for Green Project converted 50,033 ha from cultivated land to forest land became included in during the project implementation, and the above target was achieved. The Grain for Green Project gave sufficient economic incentives to participating farmers and also contributed to the achievement of the goal.

(4) Prevention of Soil Erosion

Environmental monitoring of this project was commissioned to the Shanxi Forest Research Institute and was carried out in six sites. Monitoring posts were selected so that they covered geographic locations, levels of rainfalls, types of forest (economic, timber, and protection) in an unbiased manner. At each of the monitoring posts, treatment groups (tree species and densities were the same conditions as that of the protection forest planted by this project) and a control group (with the same conditions as that of the treatment group except plantation) were established. To estimate the effects from plantation, soil in tanks from both groups were compared and a decrease of soil erosion was measured. After afforestation, an improvement in soil erosion was confirmed as the age of the forest increased and tree canopy became denser.

Table 3: Amount of Soil Erosion

	2007	2012
(A) Treatment Group	1.385 t/ha	0.664 t/ha
(B) Control Group	1.965 t/ha	1.508 t/ha
(B)-(A) Decrease of Soil Erosion	0.580 t/ha	0.844 t/ha

Source: Shanxi Forest Research Institute

3.2.2 Qualitative Effects

(1) Harvesting of Economic and Timber Forests

This project adopted a scheme in which farmers carried out voluntary afforestation receiving financial support, and eventually those who owned the economic and timber forests could harvest. The ex-post evaluation conducted a questionnaire survey to the farmers in order to confirm the beneficiary's actual benefit⁷. On economic forest, approximately 70% of the participating farmers replied "Some Income" and this result suggests that income from the economic



Photo 1: Economic forestry (Jujube orchard)

forest is now materialized (see Table 4). Based on interviews with farmers who made economic forest such as apple and jujube, economic forest made by this project contributes to an increase of income because before plantation these areas had been waste land or cropland generating low income per unit area (i.e. wheat and maize). On timber forest, the farmers replying "Little Income" accounts for a larger portion. Interviews with timber forest farmers shows that harvesting of timber forest is slower than that of economic forest as timber forest requires more growing period. Furthermore, interviews reveals that larger size of forest land resulted in cost reduction of collection and shipping and stimulated purchase by brokers and establishment of processing workshops.

Table 4: Harvesting of Plantation (Results of Questionnaire Survey)

Type of Forest	"Some Income"		"Little Income"		"No Income"		No Answer		Total	
	Number	%	Number	%	Number	%	Number	%	Number	%
Economic	35	66.0%	18	34.0%	0	0.0%	0	0.0%	53	100.0%
Timber	1	14.3%	4	57.1%	2	28.6%	0	0.0%	7	100.0%

⁷ The questionnaire survey was conducted on the 99 project participating farmers from Xia county, Youyu county, Liulin county, Hongtong county, and Taigu county (7 participants for Timber Forest, 53 participants for Economic Forest, 39 participants for Protection Forest). The Survey period was from March to April 2013.

(2) Farmers' Use of Knowledge from Training

Many of the participating farmers also participated in training for pruning, fertilization, and selection of seedlings. In the questionnaire survey, all of the farmers replied either "Utilized knowledge" or "Utilized knowledge to some extent" at the time of plantation (see Table 5). Similarly, all of the farmers replied either "Utilize knowledge" or "Utilize knowledge to some extent" at the time of ex-post evaluation (see Table 6).

Table 5: Use of Knowledge from Training at Plantation (Results of Questionnaire Survey)

Answer	Number	%
"Utilized knowledge"	59	59.6%
"Utilized knowledge to some extent"	40	40.4%
"Utilized knowledge very little "	0	0.0%
"Did not utilize knowledge"	0	0.0%
No answer	0	0.0%
Total	99	100.0%

Table 6: Use of Knowledge from Training at Ex-post Evaluation
(Results of Questionnaire Survey)

Answer	Number	%
"Utilize knowledge"	63	63.6%
"Utilize knowledge to some extent"	36	36.4%
"Utilize knowledge very little "	0	0.0%
"Do not utilize knowledge"	0	0.0%
No answer	0	0.0%
Total	99	100.0%

3.3 Impact

3.3.1 Intended Impacts

(1) Environmental Improvement Effects within Project Sites

The project sites were located in the inland area of arid regions where severe damages were caused by strong wind and dust. The questionnaire survey to the participating farmers assessed the decrease in damage caused by strong wind and dust as a result of the project's afforestation. All of the respondents felt some improvement in both strong wind and dust (see Table 7 and Table 8). In addition to noting less damage from strong wind and dust, respondents referred to an increase in green coverage, a decrease in soil erosion, and prevention of river erosion as examples of improvement in environmental conditions. Based on an interview with one Qingxu farmer, poplar forest reduced dust and residents could enjoy recreational activities such as walking and jogging.

Table 7: Damage Caused by Strong Wind (Results of Questionnaire Survey)

Answer	Number	%
“Decrease”	56	56.6%
“Decrease to some extent”	43	43.4%
“Decrease very little”	0	0.0%
“Do not decrease”	0	0.0%
No Answer	0	0.0%
Total	99	100.0%

Table 8: Damage Caused by Dust (Results of Questionnaire Survey)

Answer	Number	%
“Decrease”	58	58.6%
“Decrease to some extent”	41	41.4%
“Decrease very little”	0	0.0%
“Do not decrease”	0	0.0%
No Answer	0	0.0%
Total	99	100.0%

(2) Prospective Harvest and Intention for Expansion of Forest Area

This project adopted a scheme in which farmers carried out voluntary afforestation in return for receiving financial support, and eventually those who owned the economic and timber forests could harvest.

Of the farmers who responded to the questionnaire survey: out of the 53 economic forest farmer households approximately 70% expected “Some Income” for the next 10 years and 30% expected “Little Income” (see Table 9 and Table 10). Out of the 7 timber forest farmer households, 70% expected “Some Income” for the next 10 years but at the same time 60% replied that they did not expand forest land. Based on the questionnaire survey, it is presumed that economic forest reached a new phase from harvesting to reinvestment: participating farmers have a more conservative attitude towards investment in timber forest because it requires a longer period before harvesting.

Table 9: Income Outlook over the Next 10 Years (Results of Questionnaire Survey)

Type of Forest	“Some Income”		“Little Income”		“No Income”		No Answer		Total	
	Number	%	Number	%	Number	%	Number	%	Number	%
Economic	36	69.9%	16	30.2%	0	0.0%	1	1.9%	53	100.0%
Timber	5	71.4%	2	28.6%	0	0.0%	0	0.0%	7	100.0%

Table 10: Expansion of Forest Land (Results of Questionnaire Survey)

Type of Forest	“Expand Much”		“Expand”		“Do not Expand”		No Answer		Total	
	Number	%	Number	%	Number	%	Number	%	Number	%
Economic	26	49.1%	17	32.1%	10	18.9%	0	0.0%	53	100.0%
Timber	1	14.3%	2	28.6%	4	57.1%	0	0.0%	7	100.0%

3.3.2 Other Impacts

(1) Impact on Investment in the Forestry Sector in the Shanxi Province

The National Forestry Department Forest Survey and Design Institute was commissioned by Japan Bank for International Cooperation (at that time) to conduct a study⁸. According to the survey, in the Shanxi province during the period of afforestation from 2001 to 2005, the output of this project accounted for 5% of afforested land, 3% of plantation, 3% of aerial sowing and 6% of regeneration by enclosure. In terms of investment amount, this project also accounted for 5% of fixed investment in the forestry sector of the province. The study mentioned that the size of this project was relatively large and complementary to other projects and that the implantation methods (such as farmers’ voluntary participants, inspection-based stepwise payment of afforestation costs) could be utilized for afforestation projects in the future. According to the Provincial Forestry Department, this project’s innovative methods (such as clear implementation arrangements before the commencement of afforestation projects and the establishment of a training system to support project implementation) were applied to afforestation projects at the time of the ex-post evaluation.

(2) Negative impacts on the natural environment

During the site survey of the ex-post evaluation, there was no significant negative impact on the natural environment observed. According to the Shanxi Forestry Department, there was no disafforestation during the project implementation. This project constructed forest roads for the delivery of materials for afforestation. Cutting down forest was not required because unpaved roads were constructed in bare lands which were to be afforested. At the time of plantation, methods to preserve natural environments (such as small planting holes and the establishment of areas to prevent rain ditches) were utilized.

(3) Land Acquisition and Resettlement

According to the Shanxi Forestry Department, there was no land acquisition and resettlement. Neither land acquisition nor resettlement was necessary because farmers’ participation was voluntary and the possession of land to be afforested was required in advance

⁸ Upon implementation of this project, a project supervision manual on a forestry sector for those who are in charge at both JICA and the project executing agency was established, and a close inspection was conducted by the National Forestry Department Forest Survey and Design Institute during project implementation in order to confirm the validity of above manual.

as a criterion for participation in the project. As described above, the construction of forest roads did not require land acquisition. The interview with the project’s personnel during the site visit at the time of ex-post evaluation confirmed that no land acquisition or resettlement was undertaken.

This project has largely achieved its objectives, therefore its effectiveness and impact is high.

3.4 Efficiency (Rating: ①)

3.4.1 Project Outputs

The project output was “To carry out afforestation activities in 30 counties/county-level cities/city districts within Loess Plateau region of Shanxi province”, and, to put it concretely, afforestation or equipment used for afforestation. This project has achieved most of the outputs as they were originally planned (See Table 11). Although there were some changes in the administrative divisions after the project was launched, there was no change in the project sites. In order to maintain output, supplemental planting and additional afforestation of 7,013.1 ha was implemented.

As aforementioned in “3.2.1 Quantitative Effects (Operation and Effect Indicators)”, aerial sowing was changed to artificial sowing due to the limitation of suitable land in the project area but the size of sowing area remained as planned.

The construction of forest roads were implemented by other projects and construction costs exceeded the expected amount at the time of the appraisal. For these reasons, the length of forest road was shorten and constructed with higher technical specifications in some sections.

Although there was an increase in the number of training participants, the interview with the Provincial Forestry Department stated that there was no change in the training policy and contents. There were more participants than originally planned, because all government officials and neighborhood farmers could freely participate in the open-air training sessions. Such open participation resulted in the large increase in the number of the training participants.

Table 11: Comparison of Outputs (Plan and Actual)

Plan	Actual
Afforestation total 100,000 ha	Afforestation total 100,060 ha
- Plantation 70,045 ha (economic forest 23,846 ha, timber forest 11,847 ha, protection forest 34,352 ha)	- Plantation 70,102.4 ha (economic forest 24,760.1 ha, timber forest 10,954.2 ha, protection forest 34,388.1 ha)
- Regeneration by Enclosures* 19,955 ha	- Regeneration by Enclosures 19,957.6 ha
- Aerial Sowing 10,000 ha	- Aerial Sowing/Artificial Sowing 10,000 ha
Rebuilding/Expansion of Nurseries: 7 places	Rebuilding/Expansion of Nurseries: 7 places
Construction of Forest Road 8,000 km Rehabilitation of Forest Road 2,000 km	Construction of Forest Road 1,000 km

Plan	Actual
Forest Protection (construction of fire tower, etc.)	Forest Protection (construction of fire tower, etc.)
Environmental Monitoring (Monitoring equipment, etc.)	Environmental Monitoring (Monitoring equipment, etc.)
Vehicles	Vehicles
Others (PC, office facilities)	Others (PC, office facilities)
Training (participating farmers: 44,000, employees of forestry departments of province/cities/prefectures /districts: 7,000)	Training (participating farmers: 114,000, employees of forestry departments of province/cities/prefectures /districts: 11,890)

Source: Appraisal documents, Shanxi Forestry Department

Note: * "Regeneration by Enclosures" entailed building fences to control access to forest land but it did not entail carrying out plantation.

3.4.2 Project Inputs

3.4.2.1 Project Cost

The project cost was slightly higher than planned (108% of the original plan). Although the project's planned cost was JPY 5,863 million, the project's actual cost was JPY 6,327 million. For the total loan amount, the actual loan amount was JPY 4,080 million whereas the planned amount was JPY 4,200 million (97% of the original plan).

Afforestation, which was the project's main output, was almost as planned, the project cost; however, was increased primarily due to the lower Japanese yen exchange rate as the Japanese yen depreciated by 10% against the Chinese RMB from the time of project appraisal.

At the time of the project appraisal, unpaid mandatory labor at property with no usufruct was converted into a monetary value and counted as a part of the project cost. According to the Shanxi Forestry Department, such unpaid mandatory labor at property with no usufruct was abolished, and compensation for labor undertaken at collectively-owned forest was to be provided.

Table 12 Comparison of Project Cost (Plan and Actual)

Unit: JPY million

	Plan			Actual		
	Foreign Currency	Local Currency	Total	Foreign Currency	Local Currency	Total
Total cost of the project	241	5,622	5,863	110	6,217	6,327
for afforestation	0	4,565	4,565	0	5,182	5,182
for nurseries-	0	105	105	0	110	110
for forest roads	0	313	313	0	279	279
for facilities and vehicles	241	17	257	110	139	248
for training	0	228	228	0	93	93

Source: Shanxi Forestry Department (Project Progress Report as of March 2012⁹)

⁹ In this ex-post evaluation, project costs data could not be obtained directly from the executing agency. Based on the latest progress report submitted to JICA by the time of the ex-post evaluation, evaluation results were made.

3.4.2.2 Project Period

The project period was significantly longer than planned (183% of the original plan). The original project period was 58 months from March 2001 to December 2005; however the actual project period was 106 months from March 2001 to December 2009¹⁰.

At the time of the appraisal, the project was to be completed by spring 2003 (after the completion of planting) followed by the final inspection of the third growth period in 2005 to confirm the approval of its designated area (100,000 ha). The climate of the project area was very arid and wild rabbits caused feeding damaged. For these reasons, the actual project period was extended to undertake supplementary planting and replanting in order to enhance sustainability¹¹. The project was completed in December 2009 when the completion of supplemental planting was confirmed¹².

For the Statement of Expenditure (SOE) method of loan disbursement¹³, it was required to adjust the format of SOE form and auditing scheme, and it took four month from the loan agreement signing (March 2001) to its activation (July 2001). As a result, the first disbursement was made in March 2002. As described above, the end of the loan disbursement period was extended from July 2008 to July 2010 to accommodate the need for supplemental planting and replanting due to harsh growth environment.

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

Financial Internal Rate of Return (FIRR) and Economic Internal Rate of Return (EIRR) were not utilized for the appraisal of the project as no common method was established to estimate the economic benefits of environmental improvement among the afforestation projects. In addition, sufficient data on the amount of harvested forest products attributed to the project has not been collected, and it is difficult to accurately estimate the benefit which was necessary for recalculation. Thus, the internal rate of return was not calculated. Reliable data for estimating economic benefits could not be obtained and therefore calculating IRR with high accuracy was not possible.

The project period was exceeded the plan, while the project cost was slightly exceeded the plan, therefore efficiency of the project is low.

¹⁰ The relevant agency in China recognized that the project completion date was December 2005. Supplemental planting and replanting were carried out due to incidents (such as natural conditions) which the project could not directly control and the ODA loan was disbursed for these activities. For this reason, it is concluded that the project completion date is December 2009 when the completion of these activities was confirmed.

¹¹ Supplemental planting and replanting were carried out in the areas with under 70% of survival rate according to the Chinese afforestation standard.

¹² According to Shanxi Forestry Department, plantation was ended in December 2005 and its inspection was conducted by the end of 2006.

¹³ A method that accepts a payment list (SOE table) as an evidence document for loan disbursement

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

There was no factor found that could interfere with the project impacts from an institutional point of view. On forestry management, establishing the Provincial Forestry Department is responsible for forestry management policies, plans and goals, the county-level local government forestry departments for pest control, forest fire prevention, setting countermeasures for illegal disafforestation and arranging training sessions targeting farmers, and the local farmers for routine maintenance activities (pruning, mowing and fertilization). However, in the case of protection forests, if the forest was owned by a state-owned forest farm, the forestry department of the local government which owned the forest would be responsible for maintenance activities. The Shanxi province started the implementation of forestland tenure reform in 2008 and by the end of 2010, forestland tenure was established in approximately 70% of the province's collectively-owned forestland. There were some changes seen before and after the project implementation and each farmer has both forest usufruct and responsibilities for maintenance, therefore it is clearer who is responsible for the maintenance of forestland.

For the timber and protection forests, state-owned forest farms also participated in afforestation, and especially for the protection forest, state-owned forest farms conduct both afforestation and forest maintenance in many areas.

Upon implementation of pest control, forest fire prevention and setting countermeasures for illegal logging by forestry departments of county-level local governments, forest rangers are hired to patrol protection forest and inspect entry of vehicles into the forests. Staffing in the governmental units relevant to forest maintenance (state-owned forest farms, forestry work stations, and forest pest control stations) was stable after the project completion. The number of staff in these units was 13,746 in 2010 and 13,225 in 2011¹⁴.

In the areas covered by the site survey, the forest departments of the county-level governments maintained facilities and infrastructure such as fire towers and forest roads. Environmental monitoring was commissioned to the Shanxi Forest Research Institute until the end of 2012. Monitoring was discontinued in 2013. For this reason, equipment for environmental monitoring was not used and the Shanxi Forest Research Institute kept the equipment.

3.5.2 Technical Aspects of Operation and Maintenance

While the project was implemented based on the project area's technical level, there were training opportunities for both government officials and farmers to maintain and improve their skills at the time of the ex-post evaluation. Most of the tree species introduced by this project have been cultivated in the past, and both the government officials and farmers had accumulated

¹⁴ Based on State Forestry Administration "China Forestry Statistical Yearbook 2010" and "China Forestry Statistical Yearbook 2011"

relevant experiences. Materials in use that could be obtained domestically included; ground film, humectant, rooting stimulant, manure, and fertilizer.

From the interviews with the afforestation department staff, staff confirmed that during the project implementation there were trainings for the governmental officials on project administration (fund management, account statement, etc.) and afforestation techniques (site preparation, cultivation, fertilization, fruit quality improvement, etc.). Many of the highly-demanded training courses addressed activities to improve the profitability of forestry products such as the classification of fruits, branding, and improving timber quality.

There was no technical difficulty in O&M of the equipment for environmental monitoring as the equipment was manufactured in China, and procured and used in the Shanxi province.

Based on the interview with the project's participating farmers, they participated in the training (in cultivation techniques, fertilization, etc.) held by the forestry departments of the county-level local government. Providing trainings is one of the main tasks of the county-level local government's forestry department, and trainings are continued throughout the ex-post evaluation. The training needs of the farmers on pruning and fertilization in the economic forest are especially high and the forestry department provides guidance periodically.

3.5.3 Financial Aspects of Operation and Maintenance

Forestry departments of county-level governments and farmers are in charge of on actual implementation of forest maintenance and in terms of finance no serious problem to jeopardize sustainability was found on them. In the Shanxi province, the budget on forest maintenance (total of forest nursing, forest fire prevention, and pest control) was increased from RMB 96.5 million in 2009 to RMB 228.56 million in 2011¹⁵.

For the selection of participating farmers, there were certain requirements (voluntary participation, property usufruct of owned forests) to account for the necessary burden for forestry management in the future. At the point of ex-post evaluation, there were increased number of farmers with forest usufruct due to the forestry tenure reform, and they could harvest from the forest in which they have the property usufruct. Harvesting statuses are as follows:

- (1) Economic Forest: Although the area per household is small, income per area unit is high and harvesting for the main tree species (jujube, apple, etc.) have started. Mending of the trees can influence harvests and therefore the incentive for maintenance of the forest is high.
- (2) Timber Forest: As in the case of economic forests, mending of the trees can also influence timber forest harvests; therefore the incentive to maintain a timber forest is also high. As a

¹⁵ Based on State Forestry Administration "China Forestry Statistical Yearbook 2009" and "China Forestry Statistical Yearbook 2011"

timber forest requires a longer period before harvesting than an economic forest, farmers with larger-sized farms who have higher capacities to handle higher maintenance costs tended to participate.

- (3) Protection Forest: Although there is no harvest from this type of forest at the time of ex-post evaluation, the forest management cost and the work volume was relatively low. There is also a regulation on pruning and disafforestation for the purpose of nature protection. The protection forest prepared by this project includes locally-appointed forestland for public purpose and this type of forestland was subsidized at RMB 5 per Chinese acre. There is penalty for illegal disafforestation and accidental fire.

From the results of the questionnaire survey, 60% of the respondents replied that expenses for maintenance of forest land are “Often Insufficient” or “Insufficient”. Of respondents that chose “Insufficient”: 7 were timber forest farmers, 30 were economic forest farmers, and 9 were protection forest farmers. Compared to economic forest farmers, farmers who owned timber forest were more likely to feel that they lacked enough budget, presumably due to the fact that harvests from



Photo 2: Timber forest (Poplar forest)

an economic forest can be procured earlier than harvests from timber forests. However, timber farmers have a greater financial ability to bear maintenance expenses (compared to economic farmers) and they are also motivated by incentives and the possibility for punishment. For these reasons, forest maintenance is not seriously affected in the short run.

As shown in Table 4, economic forest farmers do have harvests and the lack of budget for maintenance of forest land is not chronic. However, economic forest farmers also indicated that they intend to expand forest land and such an aggressive stance on farming might cause working capital shortages in the future.

Both economic forest and timber forest farmers borrow from agricultural credit unions with collateral such as their houses and their rights to use forestland or by having guarantors and as such can deal with periodic shortages of working capital.

Table 13: Expenses for Maintaining Forest Land (Results of Questionnaire Survey)

“Enough”		“Almost Enough”		“Often Insufficient”		“Insufficient”		Total	
Number	%	Number	%	Number	%	Number	%	Number	%
17	17.2%	20	20.2%	16	16.2%	46	46.5%	99	100.0%

In this project, the province loaned the cost of seedling and materials to the finance departments of county-level local governments, then the farmers made payments to the financial departments. Local governments decide whether its finance department claims payments from the farmers. There were several counties where the county-level local governments bore all the expenses and there were no payments from the farmers. In the questionnaire survey, no farmer replied that the repayment is “very heavy” or “heavy” (see Table 14). Most farmers do not feel the burden of the loan.

Table 14: Repayment of Seedlings and Materials (Results of Questionnaire Survey)

Very Heavy		Heavy		Little		Very Little		No Answer		Total	
Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
0	0.0%	0	0.0%	33	33.3%	66	66.7%	0	0.0%	99	100.0%

3.5.4 Current Status of Operation and Maintenance

In the areas of the project site in which the site survey was conducted during the ex-post evaluation, the afforested areas were maintained appropriately. In five economic forests, three timber forests, and five protection forests in five counties/districts (Yuci district, Taigu county, Qingxu county, Liulin county, and Hongtong county), there were no sites in which dying seedling and thin density over a wide area were observed. Particularly in economic forests where farmers have property usufruct, as mending of



Photo 3: Forest patrol

the trees could influence the harvests, farmers continuously work on pruning and fertilization. On protection forest, a county forest department supported supplementary planting in the area with harsh growing conditions. During the project implementation, there was feeding damage caused by wild rabbits, and some traps and chemicals were used to avoid such damage. The need for such measures; however, have decreased as the forests have grown and they have become less likely to be influenced by the feeding damage by rabbits. In the area with many protection forests, the forest rangers controlled entry of vehicles and conducted patrol activities to prevent forestry fires and illegal disafforestation. During the springtime when the weather

becomes arid, the forestry departments of the county-class local governments spend most of their hours in fire prevention and fire extinguishing.

Of all of the inspected forest roads and fire towers, no severe infrastructure damage which could prevent realization of project effects was uncovered.

No major problems have been observed in the operation and maintenance system, therefore sustainability of the project effect is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

Based on farmers' voluntary participation, the purpose of this project is to prepare economic, timber and protection forests in 30 counties/county-level cities/city districts of the Loess Plateau area within the Shanxi province. The background of this project originates from the 1998 Yangtze River Floods, which raised awareness for improving the water holding capacity in the upper and middle river basins of major rivers by expanding forest areas.

The implementation of this project was in line with Chinese forestry sector's policy and development needs as well as Japan's ODA policy on China to support activities in the environmental field, therefore its relevance is high. As the area afforested by this project from the time of appraisal to ex-post evaluation accounts for an approximately 20% increase in forest land in the project area, this project has contributed to the improvement of the forest coverage ratio. After afforestation, soil erosion was improved as the age of forest increased. For the above reasons, the project's effectiveness and impact are high. As for the project's efficiency, severe growth conditions necessitated supplemental planting and replanting and the project's period was significantly exceeded the plan. The project cost also exceeded the plan due to the weakening of the Japanese yen to Chinese RMB from the time of project appraisal. In regards to the project's sustainability, forest maintenance activities are the responsibility of the forestry department of the county-level local government and the farmers, and neither showed any significant problems.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

Since the project sites are located in arid regions, more efficient forest fire prevention and extinguishing are the most important issues for forestry management. Forest fires not only destroy the forest, but may also be fatal to humans.

Simple hazard maps which show where wildfire occurred were prepared. Nevertheless, it is desirable to enhance such hazard maps by: adding more information (such as place of fire outbreak, frequency, time and areas in which are difficult to extinguish), identifying and prioritizing the points and seasons for prevention activities, and sharing the hazard maps with local residents to promote understanding of such prioritized regions and seek for cooperation in prevention activities.

4.2.2 Recommendations to JICA

None.

4.3 Lessons Learned

(1) Scheduling the Project Period in a Severe Growth Environment

The project was implemented in a severe growth environment for trees, therefore there was a need for attentive care in order to maintain the afforestation area. From the sustainability point of view, a project period extension was needed for supplemental planting.

Upon scheduling the project period, it is desirable to examine the growth conditions as well as the needs for supplemental planting, the estimated supplemental planting area and the workloads for supplemental planting. If necessary these considerations should be reflected in the project period at the time of appraisal.

(2) Establishing a Project Supervision Manual and Interim Appraisal

In the implementation of this project, a project supervision manual in the forestry sector for those who are in charge at both JICA and the project executing agency was prepared because the executing agency did not have enough experience with ODA projects. In order to prove the validity of the aforementioned manual, an extensive assessment was conducted by the National Forestry Department Forest Survey and Design Institute during project implementation. The project carried out systematic and comprehensive project supervision, and information on project implementation and the incidence of effects were collected.

For a similar case in which an executing agency does not have sufficient ODA loan project experience, especially when project supervision is difficult due to a vast project area, it is desirable to prepare a project supervision manual in advance and conduct an extensive assessment through interim review work in order to objectively review the project status.

(3) Support for Marketing and Technical Assistance Focusing on Specific Species

The interviews with timber forest farmers revealed that reaching a certain forest area size stimulated purchases by brokers and establishment of processing workshops. In order to

improve project effects, it is necessary to scale the production of forest products to reach a certain level.

In China, under the guidance of the provincial government, county-level governments support marketing and technical assistance focusing on specific products. When afforestation projects funded by ODA loans expect to obtain economic benefits, it is desirable to select tree species for each area and assess the support for marketing and technical assistance.

End

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Project Outputs	See Table 11	See Table 11
2. Project Period	March 2001 – December 2005 (58 months)	March 2001 – December 2009 (106 months)
3. Project Cost		
Amount paid in Foreign currency	241 million yen	110 million yen
Amount paid in Local currency	5,622 million yen (RMB 433 million)	6,217 million yen (RMB 434 million)
Total	5,863 million yen	6,327 million yen
Japanese ODA loan portion	4,200 million yen	4,080 million yen
Exchange rate	1 RMB = 13.0 yen (As of July 2000)	1 RMB = 14.3 yen (Average of the period between March 2001 and December 2009)