India

Upper Indravati Irrigation Project

Field Survey: July 2003

1. Project Profile and Japan's ODA Loan

Site Map

Indravati Main Canal

1.1 Background

In India, expansion and improvement of irrigation facilities has been emphasized as a measure to alleviate repeatedly occurring drought damage, as a part of the country's food self-sufficiency policy. Irrigation facilities are absolutely indispensable in low precipitation regions because the amount of rainfall in India is unpredictable and varies substantially by region, season, and year. Moreover even in heavy precipitation regions, irrigation facilities are extremely important for providing water for agricultural use during the summer season when demand for water is at its peak. The total land area under irrigation in India was scheduled to increase to approximately 57 million hectares by the conclusion of the sixth 5-year plan (March 1985) and to approximately 68 million hectares by the conclusion of the seventh plan (FY 1985- FY1989).

The Orissa State Government launched the Upper Indravati Multipurpose Project in 1978 to promote the comprehensive development of the region, which tends to suffer from drought. The project was composed of three units, Unit I (dams and reservoirs), Unit II (irrigation), and Unit III (hydroelectric power). The purpose of this project was to construct a dam on the upper Indravati River, a branch of the Godavari River, discharge the water to the Mahanadi River basin, and produce 600 MW (four generators at 150 MW per generator) of hydroelectric power. In conjunction, the water used to generate the hydroelectric power would then be used for irrigation of approximately 109,000 ha. Extension of an ODA loan was requested for a portion of Unit II, and that is the project which is the subject of this report

Furthermore, if small states with populations under three million are excluded, Orissa State has the highest percentage of scheduled castes and scheduled tribes (minority tribes) [*1]. According to 1981 figures, the percentage is 37.1%, which exceeds the national average of 22.8%. Given these conditions, the project is not only a large-scale irrigation project, but it also lays emphasis on agricultural policies that stress improvement in the lives of scheduled tribes.

[1] "Scheduled caste" refers to "outcasts" who are not part of the caste system of Brahman (priests), Kshatriya (rulers, warriors, and landowners), Vaishya (merchants, agriculturists), and Shudra (artisans.)

1.2 Objectives

This project was designed to increase agricultural production and improve productivity by constructing irrigation facilities in Orissa State, where agriculture's reliance on rainwater results in unstable harvests and low productivity, and thereby contribute to the alleviation of poverty by raising the incomes of the scheduled castes and scheduled tribes who suffer social discrimination and extreme poverty, together with raising the state's food self-sufficiency rate.

1.3 Output

■ Irrigation Project Overall (Unit II)

The overall outline of the "Upper Indravati Multipurpose Project (Unit II)" is as follows. Using the water of the dam (hydroelectric) built on the Indravati River as the water source, the following four items are to be constructed, and the beneficiary area is 109,000 ha.

(1) Construction of a dam on the Hati Barrage, the lower discharge waterway（12m high×117m long）

(2) Construction of left main canal (52 km) and construction of distributary and water course field channel

(3) Construction of right Main Canal (70 km) and construction of distributary and water course field channel

(4) Construction of left pump-up waterway (56 km) and construction of distributary and water course field channel

■ ODA Loan Portion

Of the above-described Unit II, the ODA loan portion is composed of a part of "(2) Construction of left main canal (52 km) and construction of distributary and water course field channel." In detail, the following engineering works are entailed. The beneficiary area is 45,000 ha.

(1) Left main canal: 37 km

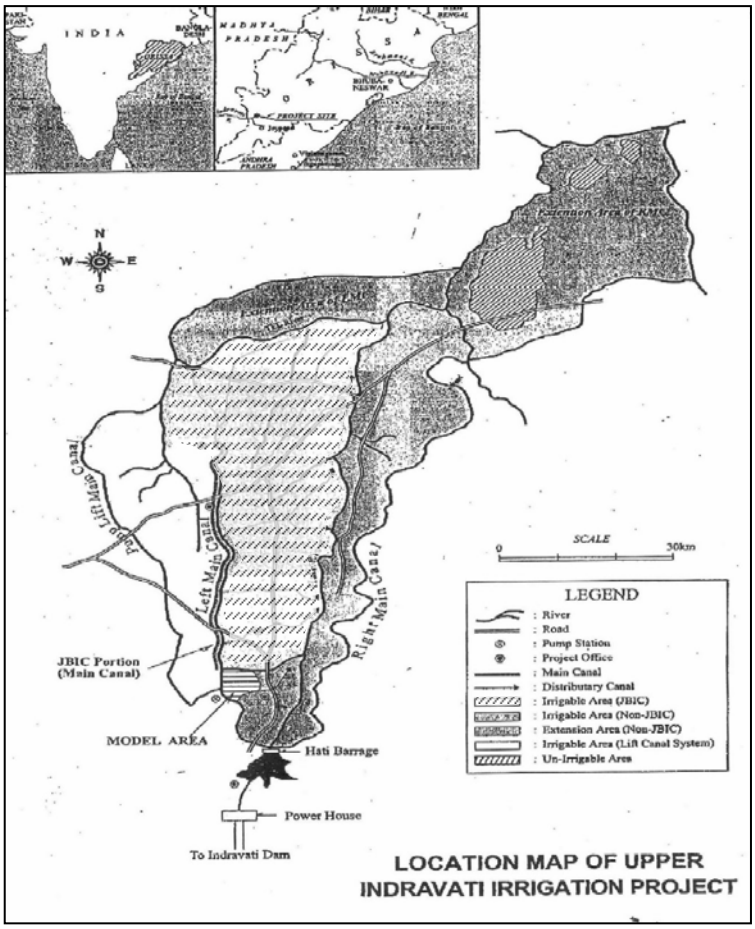
(2) Distributary for the above: 42 km

(3) Supply waterways for the above: 39 km、230 locations

(4) Water course field channel network for the above: 225 km、1,730 locations

Of the total project cost of 7,487 million yen, the ODA loan portion is 3,744 million yen, the total of the foreign currency portion (1,009 million yen) and the local currency portion (2,735 million yen). The remaining amount is supplied by the funds of the executing agency.

Unit II Location Map（central hatched-line area is ODA loan area）



1.4 Borrower/Executing Agency

Borrower: President of India

Executing Agency: Department of Water Resources, Government of Orissa*[2]

1.5 Outline of Loan Agreement

Loan Amount/Loan Disbursed Amount	3,744 million yen / 3,599 million yen
Exchange of Notes/Loan Agreement	January 1988 / December 1988
Terms and Conditions -Interest Rate Repayment Period (Grace Period)	 2.5 ％ 30 years (10 years) Partially Untied
Final Disbursement Date	January 1999

*[2] The name at the time of appraisal was “Department of Irrigation and Power.”

2. Results and Evaluation

2.1 Relevance

Since the 1970s in India, development of agricultural land has been carried out to expand acreage. With the amount of remaining developable land dwindling, further expansion of acreage is becoming increasingly difficult, and so it is becoming necessary to promote more advanced ways of using the available land, such as multiple cropping and double (semiannual) cropping. Provision of irrigation facilities is essential not only in low precipitation regions but also in heavy precipitation regions to promote more advanced land usage since the amount of rainfall in India varies constantly by large amounts depending on the region, season, and year.

Orissa State, the site of this project, has historically been an area often subject to drought damage. In 1987, a severe drought occurred where rainfall was only 69% of the annual average, and farm production suffered acute harm. In spite of this, the state's irrigation rate is 27.1% (as of 1981), below the national average of 32.1%.

Also, as stated above, Orissa is a state with numerous residents who live in extreme poverty, and the majority of the poor belongs to scheduled castes and scheduled tribes. At the time of appraisal, the population of scheduled castes and scheduled tribes comprised 37.1% of the total, which exceeds the national average (22.8%), and since 90% of them are employed in agriculture and forestry, the quality of agricultural production is a life-or-death issue for scheduled castes and scheduled tribes. Given such issues, the state's seventh 5-year plan (FY1985-FY1989) had the stated objective of expanding the irrigated land area by 2.5 million ha per year, and in particular, placing priority on implementation of projects that contribute to higher incomes for farmers in regions with a high percentage of scheduled tribes and scheduled castes. Such projects have continued to be implemented as special measures for scheduled castes and scheduled tribes, and irrigation projects are still emphasized in the ninth 5-year plan (FY1997-FY2001) which states "provision of irrigation facilities is the optimal tool for alleviating poverty in agricultural districts." Moreover, in addition to the 5-year plans that contain development plans for the state's irrigation, there is also the "State River Control Policy" drawn up by the Department of Water Resources which also clearly states the importance of providing irrigation to cope with the increasing population in the state. Consequently, at the current time it can be said that this project is consistent with all development plans, and it maintains its relevance as a project.

2.2 Efficiency

2.2.1 Output

An alteration in the output was made, from the initial cultivatable command area of 45,000 ha to 47,185 ha. This alteration was the result of detailed planning and hydrologic survey. The main waterway is 37 km as planned, but the other output (distributary, supply waterways, and water course field channel, etc.) underwent detailed design and studies were conducted for each (see table below). The alterations were appropriate in light of the changes in the cultivatable command area and the on-site conditions.

Alterations in Output

Project Item	At Time of Appraisal	After Alteration
Irrigated Area	45,000 ha	47,185 ha
Distributary of the Left Main Canal	42 km, 165 locations	48.3 km, 195 location
Supply Waterways of the Above	39 km, 230 locations	106.4 km, 434 location
Water Course Field Channel of the Above	225 km, 1,730 location	434.2 km, 2,571 locations

2.2.2 Project Period

This project was completed in December 1998, 5 years 9 months behind the original completion date of March 1993. The main reason for the delay was the time required for approval processes to acquire land for waterway construction and to remove trees.

2.2.3 Project Cost

Due to the fact that the devaluation of local currency exceeded the rate of inflation[*3], the actual project cost was 55.7% (4,173 million yen) of the amount originally planned (7,487 million yen).

Furthermore, in local currency terms, the actual project cost was 1,388 million rupees, whereas the originally planned amount was 764 million rupees (an increase of 182%). The main reasons were the rise in prices (particularly labor wages) *[4] while the project was extended and the increased in materials cost due to the effects of the Gulf War.

Project Cost Comparison（converted to yen）

（million yen）

Item		Original Plan	Actual	vs. Original Plan (%)
Engineering Works		3,993	3,342	73.0
Supplies and Materials Cost		588	（incl. above）	
Land Acquisition Cost		745	573	76.9
Consultant Hiring Cost		-	258	-
Price Escalation		1,480	-	-
Reserve Fund		681	-	-
Total	Yen	7,487	4,173	55.7%
	（in rupees）	764	1,388	181.7%

Source: Material from executing agency

2.3. Effectiveness

2.3.1 Cultivatable Command Area・Actual Irrigated Land Area

In this project, the cultivatable command area is the main index for measuring the effectiveness of the project. In this project, the terminology and numerical data related to irrigation are as follow.

[*3] The exchange rate was 1 rupee = 9.8 yen at appraisal time, and was 1 rupee = 3.0 yen at the time actual costs were calculated.
[*4] For example, the state's legal minimum wage was raised from 11 rupees to 25 rupees in 1990, and following that to 33 rupees in 1996.

(1) Cultivatable Command Area(CCA)[*5] 47,185 ha
(2) Actual Irrigated Land Area Land area (ha) actually irrigated in a particular fiscal year)

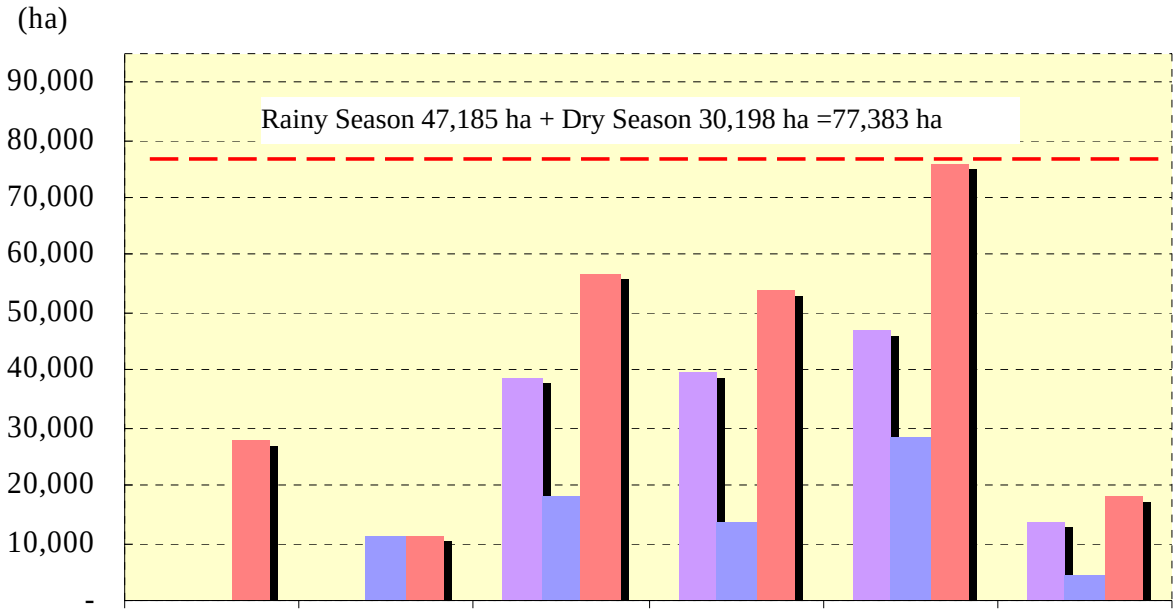
Because the only data that the executing agency has collected are the goal levels and the actual levels for Unit II overall, data was verified using figures calculated as ratios of the cultivatable command area for this project and for Unit II. Also, regarding the difference between the wet season and the dry season[*6], in the land usage plan, the planting ratio in the wet season is 100%, and the planting ratio in the dry season is 64% (producing a yearly total of 164%). The goal level (cultivatable command area) during the wet season and dry season, respectively, for this project (ODA loan beneficiary region) is calculated as follows.

Goal for ODA Loan Beneficiary Region
Dry Season : 47,185 ha
Wet Season : 30,198 ha（equiv. to 64% of cultivatable command area）

Comparison of CCA with Actual Irrigated Land Area and Actual Achievement Levels（ODA loan beneficiary region）

Fiscal Year	Actual Irrigated Land Area (% of goal level)	
	A：Rainy Season	B：Dry Season
Goal Level	47,185 ha	30,198 ha
1998 (project completion)	n.a.	11,160 ha (36.9%)
1999	38,852 ha (82.3%)	18,160 ha (60.1%)
2000	39,885 ha (84.5%)	13,887 ha (45.9%)
2001	47,185 ha (100%)	28,620 ha (94.8%)
2002	13,630 ha (28.9%)	4,433 ha (14.7%)

[*5] CCA (Cultivable Command Area) is the land area that would be cultivatable if the irrigation facilities that are provided are fully utilized.
[*6] The wet season（summer）is April through November, and the dry season（winter）is December through March.



	1988	98/99	99/00	00/01	01/02	02/03
Rainy Season			38,852	39,885	47,185	13,630
Dry Season		11,160	18,160	13,887	28,620	4,433
Year-round	27,970	11,160	57,012	53,772	75,805	18,063

Looking at the achievement level of the actual irrigated land area, the actual irrigated land area (wet season) in the year following completion of the project (1999) is 38,852 ha, which amounts to 82.3% of the CCA. Meanwhile, the actual irrigated land area in the dry season is 18,160 ha, an achievement level of 60.1% of the CCA, which produces a year-round average of 73.7%. Likewise, the year-round achievement level, which averages the achievement levels of the wet season and dry season, was 69.5% in 2000, 97.9% in 2001, and 23.3% in 2002.

Regarding the reasons why the actual irrigated area is less than the CCA following the completion of the project except for in FY 2001 and why it dropped particularly in FY2002, the executing agency believes that the following factors are interacting.

(1) Water Consumption Higher Than Planned

In the project region, the executing agency calculates the amount of water that will be consumed twice annually (at the beginning of the wet season and the dry season) based on the types of crops, etc., and draws up a water allocation plan. However, allocation is not always necessarily carried out according to plan, and this sometimes affects the size of the actual irrigated land area. For example, the executing agency may be encouraging production of crops other than rice, but the farmers may tend to favor rice planting because it is a long-standing custom, and rice is easy to store. As a result, since rice cultivation requires more water than other commodity crops, the irrigated land area is decreased.

(2) Water Allocation

Moreover, the size of the actual irrigated land area is affected by the fact that chosen water allocation plan cannot be implemented due to the behavior of farmers who live upstream (including using excess water and damming the water). According to the executing agency, there is a possibility that, when

water is not distributed as planned, the farmers may allow arable land to lie idle (during the dry season), and as a result, the size of the irrigated land area may be smaller than planned.

(3) Severe Drought in 2002

Furthermore, in newly irrigated regions such as this project region where farmers have no experience with irrigated agriculture particularly during the dry season, it is generally difficult to achieve the goal level immediately following project completion (especially in the dry season) and time is necessary to acquire agricultural experience, including how to use irrigation water. During FY1998-FY2001, it appears that the irrigated area is gradually expanding and the results of the irrigation project are gradually becoming apparent.

Detailed rainfall data for the local area and the project area was unobtainable, but for example, there is a report[*7] that rainfall in July (during the rainy season) 2002 was 40% of rainfall in an average year. It is likely that the light rainfall led to a decrease in the water level in the dam reservoir, which is the water source for irrigation, and this had an effect on the size of the irrigated land area.

2.3.2 Planted Acreage of Main Crops/Yield

The acreage of main crops planted and the yields are also important effect indices for this project. Here, data from 2001 will be utilized, when the CCA was nearly achieved, to confirm the validity of this project with regard to the acreage of main crops planted and their yields in this project region. However, since the executing agency did not collect separate data for the wet season and the dry season, the actual levels are year-round averages.

(1) Planted Land Area

Table 1 shows the planned figures and actual figures (FY2001) for acreage of main crops planted. It also includes reference information (see right side of table) concerning planted acreage prior to the project and the percentage of increase in the planted acreage, unrelated to the planned levels. Furthermore, since there are no planned levels exclusive to the ODA loan beneficiary region, a figure is substituted that is derived by multiplying the overall planned levels for Unit II by the CCA ratio (41.3%) of the ODA loan beneficiary region.

Overall, 90.3% of the planned level was actually planted, but when the planned and actual levels of planted acreage are compared for each crop, only rice is high above the planned level (at 167%). Following the project, sugar cane, vegetables, whets, and peanuts, etc., were newly planted, showing that diversification of crops is progressing to an extent, but the strong reliance on and predilection for rice is apparent.

[*7] From the official homepage of the Government of Orissa.

Table 1 Comparison of Planted Acreage of Main Crops（with planned levels and prior to project）

	Comparison with Planned Levels			Comparison with Levels Prior to Project	
	Planned Levels (ha)	FY2001 Actual Levels (ha)	% of Plan (%)	Prior to Project (ha)	% of Increase in Planted Acreage (%)
Sugar Cane	4,156	580	14.0	-	-
Rice	44,232	73,871	167.0	21,257	347.5
Vegetables	5,818	400	6.9	-	-
Potatoes	1,666	-	-	-	-
Wheat	4,156	315	7.6	-	-
Peanuts	1,871	170	9.1	-	-
Beans	11,636	284	2.4	2,543	11.2
Miscellaneous Grains	-	-	-	1,453	-
Corn	-	-	-	2,712	-
Other	10,385	185	1.8	-	-
Total	83,920	75,805	90.3	27,966	364.1

Source: Material from executing agency

Note: Boxes with no data were either “not planned” (at planning time) or “not planted” (see under “FY2001 Actual Levels”).

(2) Agricultural Yields

Through the increase in the scope of plantings, increased production of rice was achieved (184% of the planned target), and diversification of crops has also been achieved to some extent (Table 2).

Table 2 Comparison of Yield of Main Crops（with planned levels and prior to project）

	Comparison with Planned Levels			Comparison with Levels Prior to Project	
	Planned Levels (1,000 tons)	FY2001 Actual Levels (1,000 tons)	% of Plan (%)	Prior to Project (1,000 tons)	% of Increase in Yield (%)
Sugar Cane	410.6	40.6	9.9	-	-
Rice	203.6	374.8	184.1	34.0	1102.0
Vegetables	72.1	4.8	6.7	-	-
Potatoes	30.8	0.0	0.0	-	-
Wheat	12.5	1.6	12.6	-	-
Peanuts	3.7	0.2	5.9	-	-
Beans	11.6	0.2	2.0	0.9	24.9
Miscellaneous Grains	-	-	-	1.2	-
Corn	-	-	-	3.3	-
Other	49.0	0.2	0.3	-	-

Source and Note: See Table 1.

2.3.3 Internal Rate of Return (IRR)

Whereas the economic internal rate of return (EIRR) was 14.0% when calculated at the time of appraisal, it was 8.5% when recalculated based on materials provided by the executing agency. The

EIRR declined due to increases posted in operating and management expenses, but it can be said that it remains at an appropriate level.
The premises and the figures when the EIRR was calculated are as shown below. Furthermore, with regard to the benefits and costs, the figures are not those of Unit II overall but are those calculated especially for this project (ODA loan portion) using percentages of the figures for Unit II overall.

Item		Planning Time	Appraisal Time
Benefits	Increased income from crops	304.4 million rupees annually	844.4 million rupees annually
Costs	Investment cost（dam part）*	411.0 million rupees	Actual Am't 569.3 million rupees
	Investment cost（irrigation part）	920.6 million rupees	Actual Am't 1,346.8 million rupees
	Operation and Management Expense	4.5 million rupees annually （100 rupees / 1 ha）	20.6 million rupees annually （450 rupees / 1 ha）
Project Cycle		50 years[*8]	
EIRR		14.0%	8.5%

*Facility share of this irrigation project of the dam construction cost.

2.3.4 Number of Beneficiary Farm Households

The number of farm households benefiting from this irrigation project has been largely increasing. In FY2001, the figure has reached 44,000 households.

2.4 Impact

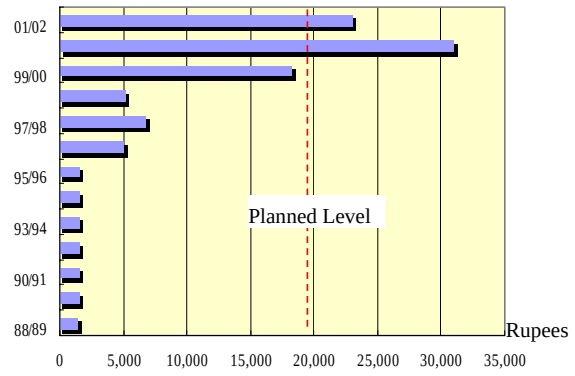
2.4.1 Improvement in Farm Households' Income

As shown in the figure below, farm households' income is in an uptrend, surpassing the planned goal (19,800 rupees) and reaching 31,000 rupees in FY2000. In real terms, it was found that farm households' income increased dramatically following the completion of the project (1998). Since according to the executing agency 95% of the income of farm households residing in the project area is farm income (and livestock accounts for the remaining 5%), it can be said that the irrigation facilities introduced by this project led to higher agricultural yields and contributed to the increase in farm households' income.
Furthermore, an inquiry was made to the executing agency concerning the decline in income in both nominal and real terms in FY2001, but a clear response was not received.

[*8] The project life of irrigation projects is ordinarily calculated at 20 to 30 years, but this time it was set at 50 years in keeping with the terms and conditions at the time of appraisal.

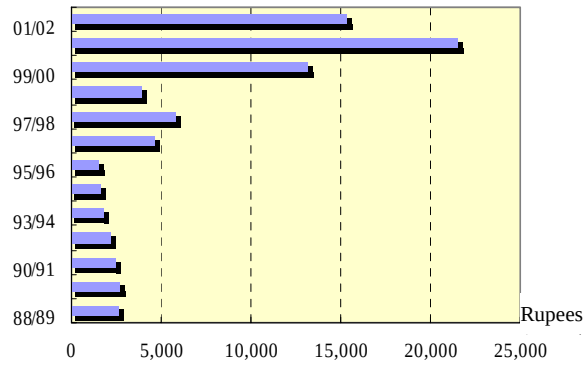
（1995 fixed prices）

Farm Income Per Household（Nominal Value）



Source: Material from executing agency

Farm Income Per Household（Real Value）



Source: Materials from executing agency; Int'l Monetary Fund data

2.4.2 Creation of Employment and Permanent Residences for Scheduled Castes and Scheduled Tribes (minority tribes)

According to the executing agency, farm employment opportunities increased particularly during the dry season due to the start of irrigation, and there are more opportunities for tenant farmers and small-scale farmers (the majority of whom are scheduled caste and scheduled tribes) to be hired as agricultural workers. Also, there are now many cases where farmers who, prior to the introduction of irrigation facilities, migrated to find employment in other states mainly during the dry season are finding employment in Orissa State and remaining there.

Consequently, this project can be considered to be making a certain contribution to employment creation in the project region. Whether scheduled tribes are settling in permanent residences[*9] is unclear at present.

2.4.3 Improvement of the Food Self-Sufficiency Rate in the State

According to the executing agency, in the state, agricultural yield has increased since irrigation is possible even in the dry season[*10], and in recent years, food surpluses have appeared. Data for many years could not be obtained, but as shown on the table below, the province has achieved self-sufficiency in rice according to FY2001 figures.

[*9] In this project, it was anticipated that small-scale farmers and tenant farmers would acquire employment opportunities as a result of the provision of irrigation facilities. Small-scale farmers in particular traveled to other regions and other stats search of employment opportunities, but it was anticipated that creation of employment in this state will encourage them to settle in permanent residences.

[*10] Since not only this project but a variety of irrigation projects are being implemented in this state, those other projects are included here.

Food Consumption in Orissa State and Amount Procured From Other States（FY 2001）

（unit: tons）

	Annual Consumption Amount	Procurement from Other Provinces
Rice	5,870,105	0
Wheat	310,813	300,000
Sugar	176,381	180,000
Beans	221,089	120,000
Cooking Oil	125,738	100,000
Potatoes	843,701	650,000
Onions	199,940	100,000

Source: Food Supplies and Consumer Welfare
Note: Total population as of FY2001 was 36.7 million people.

2.4.4 Environmental Impact

According to the executing agency, no negative impact on the environment was reported.

2.4.5 Other Social and Economic Impact

No movement of residents occurred in this project. Other secondary impact that has been confirmed includes usage by residents of the main canal for drinking water, household water, livestock drinking water, and bathing, etc. Also, when a hearing study was conducted at the irrigation associations, many said that, due to the increase in income accompanying the increased agricultural yield, some farm households can now send their children to school and can buy durable consumer goods (household electric appliances and motorbikes, etc.) that were previously unaffordable.

2.5. Sustainability

2.5.1 Current Condition of Irrigation Facilities and Operation and Maintenance System

In the JBIC survey conducted in 2001 pointed out the fact that the Operation and Maintenance of waterways was inadequate. It was confirmed by the survey site inspection (together with a specialist in the local irrigation sector) and by interviews with irrigation association members that, for the main canal and distributary canal from the minor level down, operation and maintenance measures are necessary for 1) damage of discharge outlets, 2) damage and erosion to the levees along the waterways, 3) sand deposits in the waterways, etc. According to the executing agency, although budget limitations present some difficulties, regular operation and maintenance work is being implemented within the limitations of the budget.

Operation and maintenance of the irrigation facilities is the responsibility of the Department of Water Resources and the irrigation associations. The Department of Water Resources is in charge of operation and maintenance of dams and the main canal, and upon its establishment, the irrigation association is put in charge of distributary canal from the minor level down[*11]. However, in regions where an irrigation association does not exist, the Department of Water Resources continues to handle operation and maintenance of distributary canal from the minor level down.

[*11] The scope of the irrigation association's operation and maintenance is based on Orissa State's "Pani Panchayat Act (1999).

In the above-mentioned survey and JBIC's local office survey implemented in 2003, problems were outlined and detailed measures were advised, for the realization of the project's effects in a sustainable manner, concerning the organization of the irrigation associations (the beneficiaries), the operation and maintenance system and financial status including the relationship between the irrigation association and the executing agency, and the operation and maintenance status of the facilities[*12]. Utilizing this advice, progress is being made in strengthening the irrigation associations.
Below, the following matters are verified concerning the Department of Water Resources (Upper Indravati Irrigation Project (UIIP) Office) and the irrigation associations.

2.5.2 Department of Water Resources (Upper Indravati Irrigation Project (UIIP) Office)

(1) Operation and Maintenance System and Technical Capacity

The operation and maintenance of Unit II, including that of this project, is carried out by the UIIP office that was set up in FY2001. The main activities of the operation and maintenance staff are 1) regular maintenance work for the facilities, such as removal of sediment (sand) from the waterways and repair and management of the watercourse, 2) water management operation, etc., such as head works, operation of the main canal, and flow measurements at major points.
Also, training is implemented by the Water and Land Management Institute (WALMI) for the staff to upgrade their technical knowledge regarding concentrated, diversified irrigation agriculture, etc[*13].

(2) Financial Status

■ Operation and Maintenance Cost

For the operation and maintenance cost of the UIIP office, an operation and maintenance budget has been allocated amounting to 450 rupees per 1 ha since FY2001 following the completion of the project. In FY2001 21.1 million rupees, and in FY2002 19.1 million rupees, were apportioned to the UIIP office (of which 70% was applied to personnel costs of operation and maintenance staff and the remaining 30% was applied to the cost of operation and maintenance activities). There is also the problem that budget is not adequately allocated to the Department of Water Resources since this state itself is in financial distress, and the UIIP office states that it cannot fully cover the operation and maintenance activities it is to conduct with an operation and maintenance budget of 450 rupees / 1 ha. The UIIP office is studying plans to resolve the insufficiencies in the operation and maintenance funds, such as supplementing with funds from the Indian Government or selling water from the main waterway to private companies and factories and using the proceeds to cover operation and maintenance costs

*[12] In the JBIC's local office survey, bottlenecks (in small-scale infrastructure, marketing, technology, and water management, etc.) were noted based on the social survey, and to solve those, an action plan was produced spanning all stages from preparation and implementation, to monitoring.
*[13] Training was advised by the survey implemented by JBIC in 2001.

Table 3 Trends in Operation and Maintenance Budget of UIIP Office (units: million rupees)

	FY	2000	2001	2002
Budget	1. Engineering Works	182.25	-	
	2. Office Operation Cost	77.75	-	
	3. Operation and Maintenance	0	21.1	19.1
	Total	260.00	21.1	19.1
Expenditures	1. Engineering Works	122.12	-	-
	2. Office Operation Cost	96.80	-	-
	3. Operation and Maintenance	0	15.2	15.6
	Total	218.92	15.2	15.6

Source: Material from executing agency

Note: The operation and maintenance cost for FY2000 was not budgeted. Also, the engineering works cost and the installation cost were borne locally separate from the ODA loan implemented by UIIP.

2.5.3 Irrigation Associations

(1) Operation and Maintenance System and Technical Capacity

As stated above, the irrigation associations are responsible for operation and maintenance of distributary from minor level down, and they also handle collection of irrigation costs. For the irrigation associations to actually perform operation and maintenance of facilities, after an association is registered, it is necessary for the UIIP office and the irrigation association to exchange a memorandum and to officially hand over to the irrigation association the assets of the distributary from minor level down and the authority for operation and maintenance.

Irrigation associations are classified in one of four categories, “authority transfer complete,” “registration complete,” “registration imminent/registration in progress,” and “unregistered.” In the region covered by UIIP, 13 associations had completed registration as of FY2002 (equivalent to “registration complete”) (Table 4). However, since authority is transferred after the Department of Water Resources completes maintenance of the existing irrigation facilities, at the time of this study, there were no irrigation associations which had completed authority transfer procedures.

According to the UIIP office, the organization of irrigation associations during the past two years has proceeded as a slower pace than expected, and the reasons given were that time is required for farmers to understand the significance and the merits of irrigation associations and time is also required for the staff of the Department of Water Resources (particularly at the field level) to understand the significance of forming irrigation associations and their role so that they will lend their cooperation. However, according to the Department of Water Resources the support system for registering associations of farmers is taking shape[*14].

Table 4 Formation of Irrigation Associations in UIIP Jurisdiction

FY	1998～2001	2001	2002
Authority Transfer Complete	-	0	0
Registration Complete	-	3	13
Registration in Progress	-	5	25
Unregistered	-	123	113
Total	23	131	151

[*14] Training was advised by the survey implemented by JBIC in 2001.

Furthermore, the government is implementing training for association members to gain the skills and knowledge necessary for irrigation. The technical support system is established, and in addition to training in irrigation, training related to crop diversification and marketing is being implemented.

(2) Financial Status

Irrigation associations receive a maximum of 100 rupees/ha annually from the Department of Water Resources for operation and maintenance costs, and this is the main source of revenue for the irrigation associations. However, to receive this operation and maintenance financing, a minimum membership rate of 75% must be maintained, and if membership drops below that, associations are disqualified from receiving operation and maintenance financing.

Furthermore, the amount received by associations with a membership rate over 75% varies depending on the membership rate (for example, if the membership rate is 80%, the amount is 80 rupees/ha, if the rate is 90%, the amount is 90 rupees/ha).

■ Irrigation Fees

Since irrigation fees borne by farmers are paid directly to the state government through the state revenue department, irrigation fees are not direct revenue for the Department of Water Resources. The actual irrigation fees collected in 2000 and thereafter are shown on Table 5. The average collection rate is 63.7%.

Table 5 Collection of Irrigation Costs (unit: million rupees)

FY	Appraisal Amount	Collected Amount	Collection Rate
2000	0.611	0.43	70.0%
2001	6.456	4.321	66.9%
2002	10.04	5.449	54.3%

To recapitulate the sustainability of this project, a system was set up following the project completion, including budgetary measures for operation and maintenance and formation of operation and maintenance staff. Continued attention is required for the improvement of the operation and maintenance status of the facilities and for the formation and promotion of irrigation associations

3. Feedback

3.1 Lesson Learned

In similar projects in the future, the social and economic conditions of the beneficiaries as well as the roles of related parties should be clarified, and an action plan should be created at early stage.

In irrigation projects, active participation by the farmers who are the beneficiaries is indispensable, with irrigation associations as the center of activity. Consequently, in order to strengthen the irrigation associations and promote participation by farmers, first a study should be made of the social and economic conditions of the beneficiaries, such as tribes, land ownership, and existing residents' organizations, etc., and also problems in markets, technology, and capital, etc., should be specified in

detail. Once that is done, an action plan that clarifies the roles of related parties (responsibilities and authority) should be prepared at a stage sufficiently prior to the launch of water supply.

3.2 Recommendation

-for the executing agency

Together with promoting early transfer of operation to irrigation associations, more complete support should be made available to irrigation associations.

According the JBIC survey conducted in 2001, there was no budget distribution from the state government to the UIIP office, and so repair and proper management were not performed for damaged facilities. However, after receiving the recommendation of the said survey, budget distributions have stated, and while the scope is limited, repair and proper management are being conducted.

Henceforth, so that repairs can be implement for damaged facilities in the distributary canal from minor level down by the irrigation associations, efforts should be made to transfer the assets of the said canals to the associations soon. Through that, the burden of the UIIP office, including the financial burden, will be lightened, and moreover, a farmer-led operation and maintenance mechanism for the facilities will be established.

Meanwhile, it is important to provide on-going technological support with the organized irrigation associations in order to promote self-reliance and the realization of sustainability.

Comparison of Original and Actual Scope

Item	Planned	Actual
Output (1) Engineering Works 1) Irrigation Land Area	45,000 ha, 37 km （15 km point-52 km point）	47,185 ha, 37 km （15 km point-52 km point）
2) Left Main Canal	37 km	37 km
3) Distributary for Above	42 km	48.3 km
4) Supply Waterways for Above	39 km 230 locations	106.4 km 434 locations
5) Water Course Field Channel for Above	225 km 1,730 locations	434.2 km 2,571 locations
(2) Supplies and Materials Procurement	Building Materials, etc.	As Planned
Project Period Engineering Works 1) Main Canal	April 1989-March 1993	April 1989-December 1998
2) Water Course Field Channel	April 1989-March 1993	April 1989-December 1998
3) Drainage Waterways	April 1989 –March 1993	April 1989-December 1998
4) Machinery and Materials Procurement	April 1989-March 1993	April 1989-December 1998
5) Land Acquisition	April 1988-March 1992	April 1988-December 1998
Project Cost Foreign Currency	1.009 million yen	unknown
Local Currency	6,478 million yen (661 million rupees)	unknown （1,388 million rupees）
Total	7,487 million yen	4,173 million yen
ODA Loan Portion	3,744 million yen	3,599 million yen
Exchange Rate	1 rupee ＝9.8 yen	1 rupees ＝3.0 yen

Third Party Evaluator's Opinion on Upper Indravati Irrigation Project

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Relevance

The National Policy on Agriculture[1] (for India) 'seeks to strengthen rural infrastructure to support faster agricultural development, create employment in rural areas, secure a fair standard of living for the farmers and agricultural workers and their families and discourage migration to urban areas', amongst others. The Government of India has been laying emphasis on developing irrigation infrastructure to alleviate the condition of extreme poverty in rural areas and attaining the goal of food self-sufficiency. The Government of Orissa's Agricultural Policy[2] objectives include 'doubling production of food grains and oil seed crops, providing irrigation facilities to 50% of cultivable land through completion of incomplete irrigation projects, generate adequate employment opportunities in agriculture, and make agriculture the main route for poverty eradication', amongst others. The poorest in the state of Orissa are the Scheduled Castes and Scheduled Tribes. Increasing their incomes, improving their standard of living and achieving food self-sufficiency are the stated objectives of the Upper Indravati Irrigation Project, which is consistent with the national and state policies. The project provides the farmers in the region an opportunity to do farming during dry periods, which would not have been possible without irrigation. The project, therefore, has great relevance to the region and the country.

Impact

The project has had a positive impact on the income and living standards of the Scheduled Castes and Scheduled Tribes of the region. They have been able to increase their incomes much higher than the planned target levels. The production of rice has increased significantly after the implementation of the scheme. However, crop diversification has not been fully achieved yet. This will take time, as the farmers will have to be educated on crop diversification. Irrigation has helped dry season farming which provides employment opportunities to tenant farmers and small-scale farmers. This has also helped in arresting migration to other areas during dry season. The secondary impact of the project is that the water from the irrigation canal is also being used by the households for their domestic use. Increased incomes have made it possible for the children to go to school and the family to buy consumer durables. The formation of Irrigation Associations, though the process is slow and many are still unregistered, provides a forum for the farmers to come together for maintaining the infrastructure. The government is also providing training to the association members on skills and knowledge necessary for irrigation farming and also on crop diversification.

The delay in the completion of the project has delayed the benefits of the project to the region and increased the cost considerably. However, despite the delay, the project is now benefiting the region. In order for the region to continue to be benefit from the project, the infrastructure created must be maintained in good order. For this there has to be full participation, in maintenance, from the water users of the region.

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[1] From Internet
[2] From Internet