

Myanmar

South Nawin Irrigation Project

Report date: March 2001

Field survey: October 2000

1. Project Profile and Japan's ODA Loan



Site Map: Bago administrative division, Myanmar
West bank of the Irrawaddy near Pyay
(formerly Prome)



Irrigation facilities

1.1. Background

Agriculture is the most important sector of the Myanmar's economy. Rice is particularly important, and in the early 1980s, the crop accounted for 42.7% of Myanmar's total exports in terms of value. The Myanmar's government's third (1978/79-1981/82) and fourth (1982/83-1985/86) four-year plans generated certain effects in increasing productivity through the introduction of high-yielding rice varieties and agricultural machinery. Due to the delay in the improvement of agricultural production infrastructure, however, the increase in cultivated acreage and the rice planting ratio was sluggish and rice production was not necessarily increasing at a steady pace.

Of the 24,000-ha land located at the northern end of the lower Irrawaddy, which was covered by the project, 89% was paddy fields with the remaining dry fields used to produce sesame, cotton and other crops. Problems such as lack of water in the dry season and inefficient water distribution in the rainy season occurred in both paddy and dry fields, however, and in order to increase agricultural production, the installation of irrigation facilities in this area was essential. Prior to the present project, pilot farms were completed at the southern end of the area in 1982 as a terminal facility development model through grant assistance by the Japanese government.

1.2. Objectives

To irrigate and drain the 24,000-ha area, located on the west bank of the Irrawaddy, which is situated approximately 260 km north-northwest of Yangon, the capital of Myanmar, by constructing a main dam, diversion dam, irrigation and drainage

channels, and other facilities; to increase agricultural production in the area by improving terminal facilities and providing instruction in agricultural management.

1.3. Project Scope

The project consisted of the construction of a main dam, diversion dam, irrigation and drainage channels, and terminal facilities, as well as of consulting services for the construction of these facilities and the procurement of equipment.

Japan's ODA loan covered the portion of total project costs that was quoted in foreign currency (around ¥8.15 billion).

1.4. Borrower/Executing Agency

The government of the Union of Myanmar/The Irrigation Department of the Ministry of Agriculture and Irrigation

1.5. Outline of Loan Agreement

| | |
|-----------------------------------|--|
| Loan amount/Loan disbursed amount | ¥8.15 billion/¥8.148 billion |
| Exchange of notes/Loan agreement | November 1984/May 1985 |
| Terms and conditions | Interest Rate: 2.75%, Repayment Period (Grace Period): 30 years (10 years), Partially untied |
| Final disbursement date | November 1996 |

2. Results and Evaluation

2.1. Relevance

The project area suffered water shortages during the dry season as a result of the natural conditions indigenous to the area, and there was a pressing need to improve water usage through irrigation cultivation and thus to contribute to increased agricultural production in the area. In Myanmar, agriculture still accounts for 44.1% of GDP and more than 60% of the labor population, and it is a very important industry. The agricultural sector grew at an average annual rate of 4.7% throughout the 1990s and is expected to achieve a 7.6% growth under the next five-year plan for the period from 2001/02 to 2005/06. In this context, the project was highly significant and continues to maintain its relevance.

2.2. Efficiency

(2.2.1.) Implementation Schedule

The implementation schedule was substantially delayed with the project being completed approximately six years later than initially planned. This was primarily due to the occurrence of unforeseen events in Myanmar. Specifically, the political situation and public order in the country forced the Japanese government to temporarily suspend its financial assistance halfway through the project and resume

it a later date. This halted the import of equipment and delayed procurement, hampering the progress of the project in subsequent years.

(2.2.2.) Budgets

The foreign-currency portion of project costs that was covered by Japan's ODA loan remained the same as initially planned, but the portion that was quoted in local currency nearly doubled on an actual-result basis. This was due to the effect of inflation (during the period from appraisal to project completion, the consumer price index jumped by nearly 20 times) and cost revisions caused by design changes. Meanwhile, the transfer of costs (cement, diesel oil and other raw materials, which the executing agency had planned to procure in country, turned out to be in short supply and were eventually imported with the consent of Japan) from the category of those quoted in local currency to that of those quoted in foreign currency reduced costs quoted in local currency, keeping such costs at nearly twice the level initially planned.

2.3. Effectiveness

(2.3.1.) Increased Irrigation Area

The project was expected to be effective in eliminating the lack of water in the dry season, in other words, in increasing the area of irrigated fields. The area of irrigated fields in the dry season doubled in 1997/98, immediately after project completion (see Figure 1).

Of the 24,000-ha project area that could be irrigated, 22,271 ha were actually irrigated. The area of irrigated fields for the past five years alone (Figure 1) indicates that it ranged between 21,000 ha to 22,000 ha each year, almost the same as the area planned at the time of appraisal in 1984.

Figure 1 Area of Irrigated Fields (Rainy and Dry Seasons)

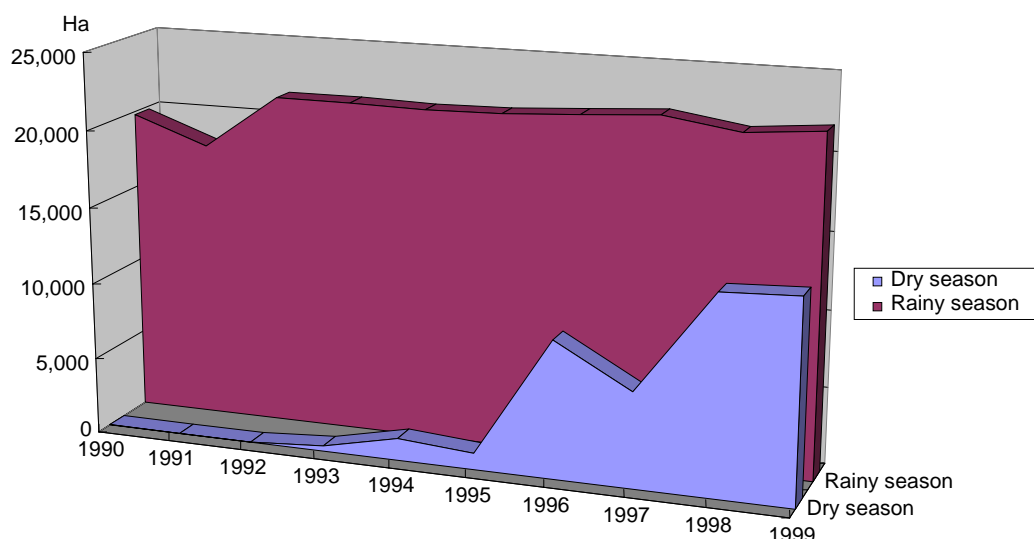
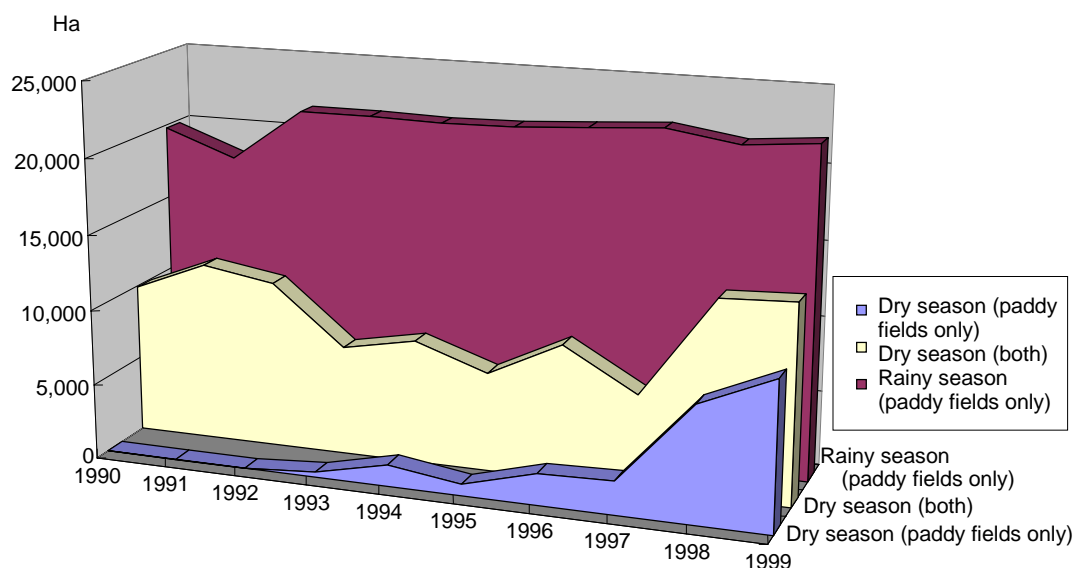


Figure 2 Area of Planted Fields (Rainy and Dry Seasons)



Source: Irrigation Department data

The area of paddy fields planted during the dry season, however, more than trebled from 2,237 ha in 1997, the year after project completion, to 7,686 ha in 1998. It further increased to 9,829 ha in 1999 (see Figure 2). The increases to irrigated areas implemented during this period were intended for paddy field usage. A certain acreage for crops other than rice, meanwhile, was maintained during the period.

At the time of appraisal in 1985, planting plans called for the acreage for crops other than rice to be increased and assumed that the area of irrigated fields for rice would be 18,530 ha and that for other crops would be 19,880 ha with the total planting ratio at 160%. The result was, however, that the increased area of irrigated fields was primarily used for rice production.

This arose from the changes in the agricultural situation that have occurred during the period of more than ten years since appraisal. In other words, at the time of appraisal, the government considered that a sufficient quantity of rice as the Burmese staple food, could be produced during the rainy season alone. For their part, farmers did not want to increase rice production because the government purchased rice at low prices. In order to increase rice exports, however, the current government encouraged rice production during the dry season as well, and its open market policy enabled farmers to sell rice at high prices, leading to the desire for rice production even during the dry season.

The actual area of irrigated fields was 28,437 ha in 1997 (planting ratio: 128%), 34,442 ha in 1998 (160%) and 35,116 ha in 1999 (160%) as compared to the planned area of irrigated fields, which was 38,410 ha annually. In terms of irrigation area, a little more than 90% of the plan was achieved and in terms of planting ratio, the planned figure was almost reached.

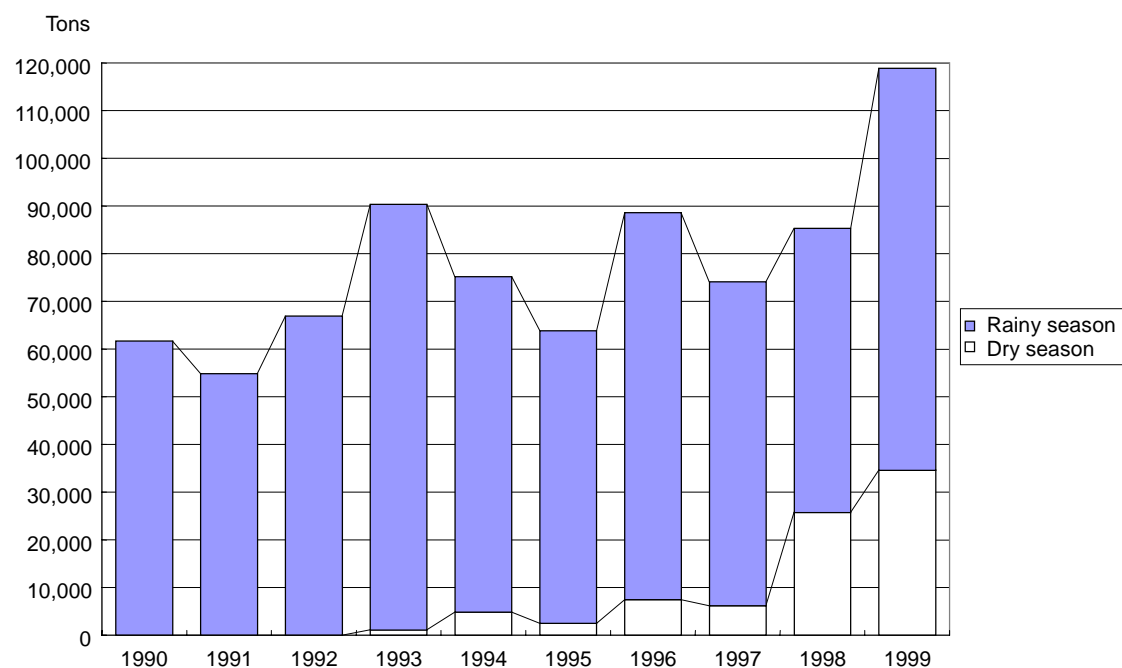
One of the major reasons such successful effects were obtained was that sufficient cooperation and discussions between Japan and Myanmar starting with the development of the project ensured appropriate planning and project implementation.

(2.3.2.) Increased Agricultural Production

Figure 3 shows the changes in annual rice production in the project area. It is remarkable that during the period from 1997 to 1998, rice production during the dry season increased rapidly by almost threefold. It also increased 1.3 fold during the period from 1998 to 1999. It is presumed that the increase in the area of irrigated fields during the same periods due to the project contributed to the increase in rice production, and it can be said that the growth in rice production during the period was an effect of the project. At the time of appraisal, the rice yield per unit area after project completion was predicted at 3.77 tons/ha. The actual figures obtained after project completion (see Table 1) indicates that the rice yield per unit area was 2.77-3.84 tons/ha for the rainy season and 2.77-3.52 tons/ha for the dry season, almost achieving the predicted yield level in some years.

The increase in productivity is attributed to the fact that the construction of irrigation facilities made it easy to secure water for agriculture and enabled planned planting. It became possible to use machines to till paddy fields in preparation for transplanting young rice plants, shortening the rice planting period, and as a result, the time required for rice growth was secured. The rice fields were fertilized at the right time, and high-yielding rice varieties started to be used. These measures, which were taken together with the securing of irrigation water, also contributed to the increase in productivity.

Figure 3 Annual Rice Production



Source: ID data

Table 1 Rice Yield Per Unit Area

| Indicator | 1995 | 1996 | 1997 | 1998 | 1999 |
|------------------------|------|------|------|------|------|
| Rainy season (tons/ha) | 2.84 | 3.71 | 3.06 | 2.77 | 3.84 |
| Dry season (tons/ha) | 3.29 | 3.57 | 2.77 | 3.35 | 3.52 |

Source: ID data

(Note) Figures represent those calculated on an unhulled-rice basis.

Major non-rice crops grown in the project area include sesame, sunflowers and peanuts, and with respect to these crops, there has been no marked change that may be attributed to the effects of the project (see Table 2).

Table 2 Production and Yield Per Unit Area for Other Crops

| Indicator | 1995 | 1996 | 1997 | 1998 | 1999 |
|-------------------------------|-------|-------|-------|-------|-------|
| Annual production (tons/year) | 2,275 | 2,902 | 1,300 | 1,830 | 2,057 |
| Yield per unit area (tons/ha) | 0.39 | 0.32 | 0.33 | 0.35 | 0.61 |

Source: ID data

(2.3.3.) Farmers Benefiting from the Project

The project has benefited farmers in four townships under the Pago jurisdiction as shown in Table 3. Actual results as of October 2000, when the field study was conducted, indicate that 75,800 persons from 15,160 households had benefited from irrigation facilities under the project. Given that the total number of active farmers in the project area is approximately 180,000, it follows that about 40% of the population have benefited from irrigation facilities under the project. Specifically,

there are many beneficiaries in the township of Thegon (85% are concentrated in this township), where some 60% of total active farmers have benefited from the project. These farmers had lived in the project areas since before project implementation, and new settlers are not included in the figures mentioned above.

Furthermore, there are fishermen around the dam, and given that these people started fishing on the shore of the lake after the project, they are considered to be among its beneficiaries.

Table 3 Agricultural Population and Number of Households Benefiting from the Project

| Township ^{Note} | 1995-96 | | 1996-97 | | 1997-98 | | 1998-99 | | 1999-2000 | |
|--------------------------|------------|----------------------|------------|----------------------|------------|----------------------|------------|----------------------|------------|----------------------|
| | Population | Number of households | Population | Number of households | Population | Number of households | Population | Number of households | Population | Number of households |
| Pyay | 1,815 | 363 | 1,815 | 363 | 1,815 | 363 | 1,815 | 363 | 1,815 | 363 |
| Paukanung | - | - | 7,125 | 1,425 | 7,350 | 1,470 | 7,870 | 1,574 | 7,995 | 1,599 |
| Paungde | - | - | - | - | 1,555 | 311 | 1,420 | 284 | 1,445 | 289 |
| Thegon | - | - | 19,860 | 9,972 | 53,960 | 10,792 | 64,495 | 12,899 | 64,545 | 12,909 |
| Total | 1,815 | 363 | 28,800 | 11,760 | 64,680 | 12,936 | 75,600 | 15,120 | 75,800 | 15,160 |

Source: ID data

Note: Myanmar is divided into 14 administrative districts (dominated by the Myanmarese) and eight states (dominated by ethnic minorities), and townships are administrative units under the administrative districts.

Table 4 Number of Farmers Involved in the Project by Scale

(Unit: households)

| Item | 1996 | 1997 | 1998 | 1999 |
|--|--------|--------|--------|--------|
| Small-scale farmers (less than 2 ha of land) | 11,572 | 12,738 | 14,922 | 14,962 |
| Medium-scale farmers (2 ha ~ 8 ha of land) | 188 | 198 | 198 | 198 |
| Total | 11,760 | 12,936 | 15,120 | 15,160 |

Source: ID data

The farmers benefiting from the project by scale indicates that 99% are small-scale farmers (owning farmland with an area of less than 2 ha) as defined by the Myanmarese government (see Table 4). The remaining 1% are medium-scale farmers owning farmland with an area of 2 ha ~ 8 ha. No large-scale farmers owning farmland with an area of 8 ha or more have benefited from the project.

(2.3.4.) Economic Internal Rate of Return (EIRR)

The EIRR calculated at the time of appraisal was 10.9%. Recalculations were made for the same items as those used at the time of appraisal. The difference was that it was predicted that the increase in the area of irrigated fields would lead to an increase in dry field farming. Actual results showed, however, that virtually the entire increase in the area of irrigated fields had led to increased rice production. The recalculation of the EIRR based on the fact that the increase in the area of irrigated

fields during the dry season exactly represented benefits from the project resulted in an EIRR of 12.0%.

Preconditions:

Project life: 50 years

Benefits: Profits from increases in agricultural production due to project implementation

Costs: Initial investment and operation/maintenance costs

2.4. Impact

(2.4.1.) Employment Creation Effects

During construction work, a total of approximately 10,000 workers were employed for each of the civil engineering work projects. With respect to agricultural work, the project enabled farmers to plant fields systematically, thereby creating new employment opportunities. Prior to project implementation, when only rainwater was used for rice production, most farmers depended solely on family members for agricultural labor. Currently, many of the farmers, excluding some mechanized farms, use seasonal workers hired on contract for rice transplantation and harvesting, which has led to an increase in seasonal employment. Moreover, rice production during the dry season increased after the project, and this also represents the creation of new work opportunities.

(2.4.2.) Farmer Income

As classified according to small- and medium-scale farmers, incomes estimated from production, costs, tax revenues and the number of farmers in the project area during the entire 2000 are as shown in Table 5.

The executing agency has indicated that one remarkable example of increased farmer incomes is that tin roofs, which are expensive in Myanmar, have replaced thatch roofs on many farm houses. In fact, when the field survey team visited the project area, they confirmed that many of the farmhouses in the project area were tin-roofed, though the time allocated to the visit was very limited. Other effects of increased farmer incomes pointed out by the executing agency included the overall improvement in the percentage of school attendance and the health and nutritional status of local residents.

If comprehensive consideration is given to these developments, it is assumed that the incomes of farmers benefiting from the project in the project area has increased.

Table 5 Comparison of Farmer Incomes

Unit: Kyat/year

| Item | 1984 (market prices) | 2000 (market prices at appraisal) | | 2000 (1985 prices) |
|--------------------------------------|-------------------------|-----------------------------------|---------|-----------------------|
| Income from agricultural products | 3,196 | (Small-scale farmers) | 230,204 | 10,608 |
| | | (Medium-scale farmers) | 964,288 | 44,437 |
| Profit from agricultural products | 2,752 | (Small-scale farmers) | 67,024 | 3,088 |
| | | (Medium-scale farmers) | 311,572 | 14,358 |

Source: MAS data

Note: The figures listed above were obtained by estimating income per farmer using the overall production cost and production volume for each year.

(2.4.3.) Impact on the Environment and Society

At the time of the field survey in 2000, no particular environmental impacts (such as changes in the ecosystem of fauna and flora due to the construction of dams) were felt in the project area and its vicinity. In Myanmar, as at the time of appraisal in 1984, there is no environmental legislation even at the time of the field survey in October 2000. The Irrigation Department is giving due consideration to possible environmental impact, but its understanding is that there have been no particular instances of serious environmental destruction.

The construction of dams necessitated the relocation of 2,754 local residents from 26 villages. According to the Irrigation Department, the residents were provided with new land and other compensation for relocation as planned and sufficient time was spent on coordination. There are no major problems in this respect.

In addition, the construction of irrigation facilities under the project resulted in a saving in water management labor. Previously, farmers had to draw necessary water manually using pumps or buckets, but the project facilities enabled farmers to close the water intake for paddy fields, remove earth or easily adjust water flow by regulating the gate, thus reducing required costs and rendering substantial labor-saving effects.

2.5. Sustainability

(2.5.1.) Management, operation and maintenance

The importance of the operations of the Ministry of Agriculture and Irrigation, the executing agency for the project, is acknowledged within the government, and the Ministry's organization and structure are strong and solid as compared to those of other ministries and agencies. The Ministry consists of 12 departments, and the Irrigation Department has a workforce of 20,313 personnel and is the largest of all. The Irrigation Department comprises four major units: the Head Office, Construction, Maintenance and Mechanical Units. Operation and maintenance under the project is undertaken by the Bago Division of the Maintenance Unit. The Bago Division employs 47 full-time personnel, or a staff of 233 if seasonal workers are included.

The current number of full-time personnel is slightly smaller than at the time of project implementation, when 57 personnel were employed. Six personnel led by an assistant engineer are assigned to each of the three townships (Pyay, Phakhaung and Thegon). The Irrigation Department is directly responsible for the maintenance of facilities leading up to secondary channels, with the maintenance of tertiary channels being undertaken by groups of beneficiaries themselves.

Although the irrigation committees and their subordinate water user groups are different organizations from those confirmed at the time of appraisal under the then socialist administration, they are well organized and cooperate closely with local organizations. A subcommittee comprising personnel responsible for a certain locality has been formed under each committee. These personnel are dispatched from irrigated agriculture-related posts, such as agricultural management instructors, canal surveyors, and settlement & land record officers, and are responsible for several water user groups.

Guidance in agricultural management is the responsibility of the Myanmar Agricultural Service (MAS), a subordinate organization of the Ministry of Agriculture and Irrigation like the Irrigation Department, and MAS officers are assigned to each of the administrative divisions. MAS instructors have been trained by Japanese experts at the training center built using Japan's grant assistance. These instructors, however, lack facilities, vehicles for movement, and the materials and equipment necessary for their actual guidance activities, and their salaries and allowances are kept low. These and other unfavorable circumstances constitute various hindrances to the adequate implementation of guidance activities. One agricultural management instructor is responsible for an average area of about 405 ha. Given that they do not have easy access to certain regions, they are not actually able to provide sufficient guidance. Interviews with representatives from the Irrigation Department revealed that in order to ensure the sustainability of the project, it is essential to increase the farmers' knowledge of agricultural technology, management and distribution, and it will be necessary to improve these aspects in the years to come.

(2.5.2.) Management, operation and maintenance budgets

Tax revenues from water utilization as well as management and maintenance costs for the project area are as shown in Table 6. Management and maintenance costs were predicted at 1% of the total project cost at the time of appraisal, and are almost on a par with initial predictions.

The water utilization tax is 10 kyats per acre and has remained unchanged since 1985. Therefore, the tax is a relatively small burden on the beneficiaries and the annual tax collection ratio is 100%. Tax revenues from water utilization are increasing as the area of irrigated fields grows, and a comparison of such revenues

with management and maintenance costs indicates that they account for around one-tenth to one-third of total annual management and maintenance costs.

Water utilization tax is paid directly to the central government, and management and maintenance budgets are allocated separately by the central government. Since greater importance is placed on the Ministry of Agriculture and Irrigation within the government, it is expected that the Ministry will continue to be assured of a certain level of budget allocation. Since more than half of the maintenance budget is allocated from the government's treasury, however, there is not necessarily any guarantee that the same level of maintenance will be ensured in the future if the government is pressed financially. There is room for increasing water utilization tax because the amount of the tax has been kept low.

Table 6 Water Utilization Tax Revenues and Management and Maintenance Costs

Unit: 10,000 kyats

| Indicator | 1996 | 1997 | 1998 | 1999 | 2000 |
|----------------------------------|-------|--------|----------|--------|-------------------------|
| Water utilization tax revenues | 61.70 | 132.30 | 178.30 | 306.80 | - |
| Management and maintenance costs | - | 350.60 | 1,677.00 | 899.60 | 593.7 ^{Note 1} |

Source: ID data

Note 1: The figure represents actual results for the period until August

Terminal channels (tertiary channels) are managed by the beneficiaries, but they are basically simple channels that do not require the payment of large sums of money. The beneficiaries mutually provide labor and work together to repair the channels, therefore, there are no major financial problems that may hamper the sustainability of the project.

Comparison of Original and Actual Results

| Item | Plan | Results |
|---|--|----------------------------------|
| 1. Project scope | (1) Main dam: Zone earth fill type | |
| · Civil engineering work | Total volume of water stored: 354-million-m ³ Height of embankment: 43 m Length of embankment: 5,082 m | Same as left |
| | (2) Diversion dam: Zone earth fill type | |
| | Total volume of water stored: 26-million-m ³ Height of embankment: 20.9 m Length of embankment: 945 m | |
| | (3) Irrigation channels | |
| | Primary channel: 51.5 km Secondary channel: 41.0 km | |
| | (4) Drainage channels | |
| | Primary channel: 16.9 km Secondary channel: 184.8 km | |
| · Procurement of construction machinery and materials | (5) Terminal facilities: water diversion facilities, adjustable water level facilities, etc. | |
| · Consulting services | A set of materials and equipment for civil engineering work Preparation of bidding documents, evaluation of bids, supervision of construction work, technical guidance and other services (260 M/M) | Same as left Same as left |
| 2. Implementation schedule | 1985 to 1990 | 1985 to 1996 |
| 3. Project cost | | |
| Foreign currency | ¥8.15 billion | ¥8.148 billion |
| Local currency | 585,095,000 kyats | 1,022,510,000 kyats |
| Total | ¥24.533 billion | ¥26.666 billion |
| ODA loan portion | ¥8.150 billion | ¥8.148 billion |
| Exchange rate | 1 kayat = ¥28 (1984) | 1 kayat = ¥18.11 |