The Republic of the Philippines

Ex-Post Evaluation of Japanese ODA Loan
Central Luzon Irrigation Project

External Evaluator: Haruko Awano, IC Net Limited

## 0. Summary

This project was conducted to increase agricultural production in the Central Luzon Region of the Philippines, by rehabilitating the existing facilities of the Upper Pampanga River Integrated Irrigation Systems (hereinafter the "UPRIIS") and by revitalizing the Tarlac Groundwater Irrigation System, thereby contributing to the improvement in the livelihoods of the local farmers.

Since this project consists of two components, the Casecnan Multipurpose Irrigation and Power Project-Irrigation Component (hereinafter the "CMIPP-IC") and the Tarlac Groundwater Irrigation System Reactivation Project (hereinafter the "TGISRP"), an evaluation was done first separately for each component and the whole project was then evaluated.

This project is fully consistent with the development policies and development needs of the Philippines and Japan's aid policy to support agriculture and rural development; therefore its relevance is high. The actual planted areas and yield were 103% of the planned ones; hence the overall effects and impacts of the project were high. The project's costs slightly exceeded the plan while the project period significantly exceeded the plan. Therefore the efficiency of the project was low. With regard to sustainability, although no major problems have been observed in the operation and maintenance of the CMIPP-IC component, major problems have been observed in terms of the structural and financial aspects of the operation and maintenance of the TGISRP component. Therefore the sustainability of the effects of the whole project is fair. In light of the above, this project is evaluated to be partially satisfactory.

## 1. Project Description


Project Location

Super Diversion Canal of CMIPP-IC

Canal of TGISRP

At the time of the appraisal in 1998, agriculture in the Philippines was an important industry, which accounted for 20% of GDP and employed nearly 50% of the labor force. However, demand for rice, the staple food, was higher than the domestic supply due to the high population growth rate, which forced the country to import rice. In addition, two-thirds of the poor were farmers and fishermen in rural areas. Hence an increase in food production and the improvement of the livelihoods of farmers had become an urgent and important task in order to achieve a stable supply of food, the eradication of poverty, and the establishment of social justice. Faced with this situation, the government set priority areas for increased food production and took measures with a focus on constructing and improving irrigation facilities. However, due to frequent natural disasters and improper maintenance, the irrigation facilities were damaged or become obsolete.

The Central Luzon plains are the largest grain basket in the Philippines and are expected to play an important role in supplying food to the surrounding areas, including Metro Manila. The two components of this project are located in the provinces of Nueva Ecija and Tarlac in Central Luzon Plains. (See Figure 1 on the next page.)

The UPRIIS, which is the target system of the CMIPP-IC component, is the largest national irrigation system in the center of the grain basket of the Central Luzon plains. However, there were problems of water shortages in the reservoir of Pantabangan, the major water source, and damaged and obsolete facilities caused by natural disasters and improper maintenance. All this resulted in the irrigation system that was not fully functional. For water resources, it was expected that the government plan of Casegunan power generation would supply additional water to the reservoir of Pantabangan and it was needed to rehabilitate the damaged facilities to maximize the effective use of irrigation water in order to expand rice production.

On the other hand, in Tarlac province and the surrounding areas, many deep wells were built through various forms of assistance such as yen loans in the 1970s. However, since the electricity cost soared due to the oil crisis and the burden of operating costs put pressures on farmers, operation and maintenance had become difficult. Farmers in the region had been craving for irrigation water for many years and it was decided to reactivate the deep wells using diesel-powered pumps.

### 1.2 Project Outline

This project was conducted to increase agricultural production in the Central Luzon Region of the Philippines, by rehabilitating the existing facilities of the UPRIIS and by revitalizing the Tarlac Groundwater Irrigation System, thereby contributing to the improvement of local farmers' livelihoods.

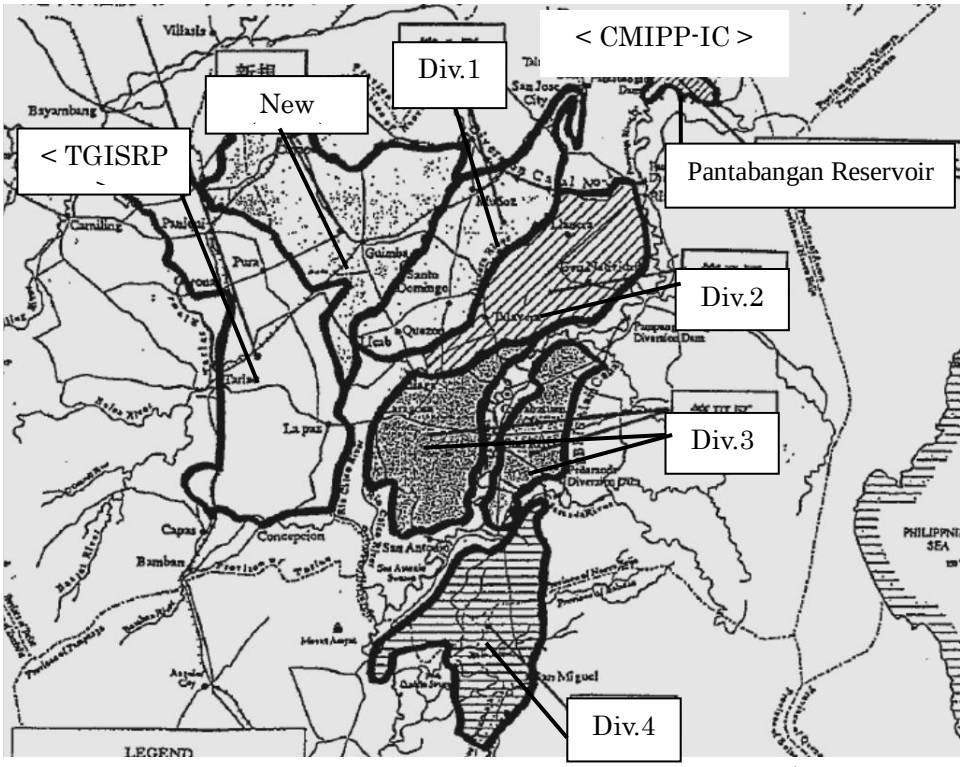


Figure 1: Layout of Central Luzon Irrigation Project [1]

| | |
|---|---|
| Loan Approved Amount / Disbursed Amount | 14,136 million yen / 11,590 million yen |
| Exchange of Notes Date / Loan Agreement Signing Date | September 1998 / September 1998 |
| Terms and Conditions | (Civil Works)<br>Interest Rate 2.2%, Repayment Period 30 years (Grace Period 10 years), General Untied<br>(Consulting Service)<br>Interest Rate 0.75%、Repayment Period 40 years (Grace Period 10 years), Partially Untied |
| Borrower / Executing Agency | The Government of the Republic of the Philippines / National Irrigation Administration (NIA) |
| Final Disbursement Date | January, 2009 |
| Main Contractor | Obayashi Corporation (Japan) / Ube Industries, Ltd.(Japan) / Toyo Construction Co., Ltd. (Japan) (JV),<br>China Geo Engineering Corporation (China),<br>China State Construction Engineering Corporation (China),<br>China International Water & Electric Corporation (China) |

[1] The CMIPP-IC Component is composed of five divisions of UPRIIS: Div. 1 to 4 where the facilities were rehabilitated and Div. 5 where the facilities were newly constructed. The TGISRP is located adjacent to the west side of Div. 5 of the CMIPP-IC.

| | |
|---|---|
| Main Consultant | Nippon Koei Co., Ltd. (Japan) / Sanyu Consultants Inc. (Japan) |
| Feasibility Studies, etc. | F/S (1984) by Yen Loans, F/S (1996) by Philippine Government, SAPS (1996) by Yen Loans |
| Related Projects (if any) | "Tarlac Groundwater Irrigation Project" JICA ,1974<br>"Casecnan Multipurpose Irrigation and Power Project" Philippine Government , 1994 – 2000,<br>"Research and Development Project on High Productivity Rice Technology", JICA, August 1997 – July 2002<br>"Project on the Development and Promotion of Location - Specific Integrated High - Yielding Rice Technologies", JICA, November 2004 – November 2009 |

## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Haruko Awano, IC Net Limited

### 2.2 Duration of Evaluation Study

Duration of the Study: November 2011 – October 2012
Duration of the Field Study: February 3 – 12, 2012, March 3 – 24, 2012, May 20 – 31, 2012, July 17 – 20, 2012

### 2.3 Constraints during the Evaluation Study

Since there was a significant change of scope in the CMIPP-IC component from the time of the appraisal to the time of the loan agreement, the evaluation of the component was done based on the plan which was agreed upon based on the detailed design conducted after the loan agreement. However, since a certain period of time had passed after the project's completion, information on the scope and project period was insufficient at the time of ex-post evaluation. In addition, the Communal Irrigation System (CIS) and the Small Water Impounding Ponds (SWIPs), which were rehabilitated under the CMIPP-IC, were under the supervision of private organizations and information on the effects and operations and maintenance (O&M) could not be obtained.

## 3. Evaluation Results (Rating: C[2])

### 3.1 Relevance (Rating: 3[3])

3.1.1 Relevance with the Development Plan of the Philippines

At the time of the appraisal, the National Mid Term Development Plan of 1993-1998 was aimed at the expansion of irrigated areas by improving irrigation facilities in order to promote food security. The Development Plan of the National Irrigation Authority (NIA) of 1990 – 2000 envisaged an increase in irrigated areas from 1.469 million ha out of a 3.126 million irrigable areas in 1989 to 2 million ha by 2000. In Tarlac Province where TGISRP was conducted, the NIA planned the Balog-Balog Multipurpose Project (BBMP) which will irrigate 4 million ha.

At the time of the ex-post evaluation, the National Mid Term Development Plan in the

[2] A: Highly satisfactory; B: Satisfactory; C: Partially satisfactory; D: Unsatisfactory
[3] 3: High; 2: Fair; 1: Low

Philippines (2011 – 2016), is aiming at inclusive growth and infrastructure development; and the improvement of local irrigation systems was cited as one of the strategies. In the area of agricultural development, improved agricultural productivity and income has become a priority, and measures included the promotion of irrigation systems. The Food Staples Sufficiency Program (2011 – 2016) of the Department of Agriculture aims at increasing planted areas, yields and the production of rice to reduce dependence on imported rice. In order to expand irrigated areas, the program focuses on the rehabilitation of existing irrigation facilities and the construction of new facilities. With regard to the region-wise rice production, since Region 3 is the largest rice producing region, which accounts for 20% of the total rice production in the country, the program set as a target that rice production in the region would increase by 19% per year.

The Six-Year Irrigation Plan of the NIA starting from 2012 plans to construct new irrigation facilities for 166,671 ha and to rehabilitate 284,399 ha in the initial three years. The provinces of Nueva Ecija and Tarlac, where the project is located, state in their development plans from 2011 and 2008, respectively, that agriculture is a key strategic sector.

As above, the project is highly consistent with the policies of the national government and the NIA which have been addressing the expansion of irrigation facilities to increase rice production both at the time of the appraisal and at the ex-post evaluation. In addition, it was confirmed that the project is in line with the current policies of the provincial governments which emphasizes agriculture.

### 3.1.2 Relevance with the Development Needs of the Republic of the Philippines

At the time of the appraisal, demand for rice was greater than the domestic supply due to the high growth rate of the population which was at 2.3% (average from 1990 to 1995). This lead to an increase in imports from 1995 to 1998 and the reduction of the self-sufficiency rate of rice production to 71%. Therefore, the increase of rice production was an urgent and important issue.

Region 3, where the project was conducted, is adjacent to Metro Manila and the important supplier of rice to it. The Provinces of Nueva Ecija and Tarlac where this project is located produced 10.7% of the rice of the country at the time of the appraisal in 1998. However, the largest national irrigation system of the UPRIIS in Nueva Ecija province had problems with insufficient water in the major source of water, i.e., the reservoir in Pantabangan. Damaged and obsolete irrigation facilities also lead to insufficient rice production in the region, and the rehabilitation of the facilities became an urgent need. Against this background, it was expected that additional irrigation water would be supplied to the major source of the reservoir by the national program of the Casecnan Power Generation Project[4]. On the other hand, in Tarlac province which has abundant groundwater, groundwater irrigation systems were built in the 1970s with support from sources such as yen loans. However, it became difficult to operate and maintain the systems due to the rising cost of electricity, and many facilities became un-operational. The lahar from Mount Pinatubo that erupted in 1991 buried intake facilities of the national irrigation systems in the target area and the water supply to the paddies was suspended. This had a significant impact on the livelihoods of thousands of farmers and restoration of irrigation facilities was needed. Farmers were planting rice and corn using rain water and shallow tube wells (STWs). However, in the dry season when the aquifers were low,

[4] It was expected that the amount of reserve water would increase from 1.3 billion tons to 2.1 billion tons in 2000.

areas irrigated by STWs were reduced. Hence, farmers in the region had been craving for water for irrigation for many years.

The self-sufficiency ratio of rice had increased to an average rate of 90.6% during the period of 1999 – 2003, but decreased to an average of 84.7% during the period of 2004-2010, and the need to increase rice production was high even at the time of the ex-post evaluation. In Region 3, the largest rice producing region in the country, rice production by the provinces of Nueva Ecija and Tarlac accounted for 10.6% of the entire production in the country and played an important role in supplying surplus rice to Metro Manila and other regions[5].

As stated above, at the time of the appraisal and the ex-post evaluation, the need to rehabilitate and restore the irrigation facilities in Central Luzon Region was high.

### 3.1.3 Review Process of the Project

The Philippine government conducted a Feasibility Study (F/S) in 1996 for the CMIPP-IC. The scope at the time of the appraisal focused only on the rehabilitation of existing facilities, and included detailed designs for the new irrigation areas without the construction of new facilities[6]. However, the NIA requested to add the construction of facilities in new areas, which was included in the Loan Agreement.

For the TGISRP, a study of the Special Assistance for Project Sustainability (SAPS) was conducted in 1996 for the groundwater irrigation systems built in the early 1970s. The study concluded that the reactivation and sustainable operation of the systems would be possible using diesel-powered pumps as a power source[7]. Shallow tube wells (STWs) for irrigation were prevalent in the target area[8] but the SAPS concluded that the STWs were used for the purpose of supplying irrigation water to add to rain water in the wet season and the supply of irrigation water during the dry season was not enough. The SAPS plans to introduce profitable cash crops in the dry season and proposed the establishment of a model farm to promote the cash crops. Finally, it was decided that the CMIPP-IC and TGISRP should be combined and implemented as the Central Luzon Irrigation Project.

However, the review processes of the two components had the following problems.

#### (1) CMIPP-IC

At the time of appraisal, the rehabilitation of existing facilities was the center of the project scope. Although there was a request from the NIA to construct the facilities and add new irrigated areas, JICA did not include it in the project scope as a detailed study was needed. However, at the time of the conclusion of the Loan Agreement (L/A), new irrigation facilities were added based on the adamant request of the NIA. At that time, the project scope such as the irrigated areas was to be confirmed during the project period and the economic benefit was not re-calculated. It can be said that the process to get consensus before concluding L/A with the

[5] Based on the data of from the Department of Agriculture. The self-sufficiency rates of the provinces are high at 317% and 233% in 2010.

[6] Based on the Minutes of Discussion(M/D) between JICA and the Philippine government in October 1997

[7] Out of the 53 deep wells constructed in the 1970s, three had converted the power source to a diesel engine with the assistance of the NIA. The SAPS found that these wells were available for irrigation and the economic effects of using the diesel engine was recognized, which lead to the proposal to reactivate the deep wells using the diesel engine instead of electricity. For the costs of diesel fuel, the study on the willingness to pay was conducted for the target farmers and it was analyzed that the farmers could afford the diesel fuel price at the time. (For the fluctuation of diesel fuel prices, refer to the Figure 5 on effectiveness.)

[8] The SAPS confirmed that about 900 pumps for STWs had been granted by the Japanese and Philippine governments since 1994 and farmers themselves had purchased 2,724 pumps.

NIA was not enough. The detailed design was carried out after the start of the project but since the budget was significantly increased, it took a longer time to coordinate with JICA and the relevant agencies in deciding the scope. It was the end of 2001 when the project scope was finally agreed upon, about two years behind the plan at the time of the appraisal. This resulted in a significant extension of the implementation period.

(2) TGISRP

The SAPS reviewed the BBMP in which the NIA planned to construct irrigation facilities in Tarlac Province and judged that the BBMP would not duplicate the efforts of this project. However, even at the time of the appraisal, it was confirmed that the BBMP would cover the same areas as this project. According to the NIA, the implementation of the BBMP was not guaranteed. It also seemed that it would take a long time for the BBMP to be implemented, and that it was also necessary to reactivate the ground water irrigation system to meet the urgent needs of farmers after the eruption of Mt. Pinatubo. It was expected that this project would complement the BBMP since deep wells would be utilized to meet the needs for sufficient irrigation water in the downstream area even after the BBMP would be implemented.

At the time of the ex-post evaluation, the BBMP was waiting for approval by the Cabinet. Once the BBMP is carried out, there is a possibility that the utilization rate of the deep wells constructed by this project would be reduced since farmers would use the gravity irrigation system provided by the BBMP where it is available, which may affect the O&M of the deep wells.

3.1.4 Relevance with Japan's ODA Policy

The "Overseas Economic Cooperation Policy" issued by JICA (former JBIC) in 1999 intended to help reduce poverty in the recipient countries. The Country Assistance Program for the Philippines in 2000 aims to reduce poverty and regional disparities, and puts importance on the improvement of rural infrastructure for agricultural and rural development.

From the above, this project is fully consistent with the development policies and needs of the Philippines which are to increase rice production by improving the irrigation facilities, and also Japan's aid policy which focuses on agricultural and rural development. However, the processes to review the two components were not sufficient in terms of consensus building with the NIA (for the CMIPP-IC) and the study of a possibility of duplication with another project (for the TGISRP).

### 3.2 Effectiveness[9] (Rating: 3)

＜CMIPP-IC Component＞

3.2.1 Quantitative Effects (Operation and Effect Indicators)

(1) Irrigated and planted area

The table below shows the Firmed Up Service Areas (FUSA), the areas that can be provided with irrigation water, and the irrigated and planted areas, the areas which are actually irrigated and planted, at the time of the appraisal, at the time when the scope of the project was agreed on after the detailed design, and the actual performances. The main target of this project is the rehabilitated and new area of the UPRISS which the NIA operates as part of a national irrigation system. However, at the time of the agreement on the scope of the project, the small-scale

[9] The sub-rating for impact is to be taken into consideration in the effectiveness.

rehabilitation of the Community Irrigation Systems (CIS) and the Small Water Impounding Ponds (SWIPs), which would be operated by farmer organizations, were added as new areas[10].

Table 1: FUSA, Irrigated and Planted Areas of the Project Target Area of the CMIPP-IC[11]

(Unit: ha)

| Items | | Appraisal | Agreement of Scope (Planned Value) | Actual[12] (2011) | Actual / Planned |
|---|---|---|---|---|---|
| FUSA | Total | 82,000 | 82,018 | N/A | N/A |
| | Total UPRIIS(Rehabilitated + New areas) | 82,000 | 71,864 | 75,744 | 105% |
| | Rehabilitated area (UPRIIS) | 82,000 | 55,100 | 58,865 | 107% |
| | New area (UPRIIS) | - | 16,764 | 16,879 | 101% |
| | New area (CIS/SWIP) | - | 10,154 | N/A | N/A |
| Irrigated and planted area of rice (Wet) | Rehabilitated area (UPRIIS) | N/A | 55,100 | 54,936 | 100% |
| | New area (UPRIIS) | - | 16,764 | 13,201 | 79% |
| | New area (CIS/SWIP) | - | 10,154 | N/A | N/A |
| Irrigated and planted area of rice (Dry) | Rehabilitated area (UPRIIS) | N/A | 54,100 | 57,038 | 105% |
| | New area (UPRIIS) | - | 14,469 | 14,253 | 99% |
| | New area (CIS/SWIP) | - | 10,154 | N/A | N/A |
| Irrigated and planted area of rice (Annual) | Total | N/A | 160,741 | N/A | N/A |
| | Total UPRIIS(Rehabilitated New areas) | N/A | 140,433 | 139,428 | 99% |
| | Rehabilitated area | N/A | 109,200 | 111,974 | 103% |

[10] For CIS/SWIP, only the data for 2008 could be obtained from the NIA. The irrigated and planted areas for rice were 10,041 ha in the wet season and 2,800 ha in the dry season, and the annual irrigated and planted area in total was 12,841 ha. Due to the shortage of irrigation water in the dry season, diversified crops were planted in some areas. The data after 2008 could not be obtained from the project office or the provincial office of the NIA. Therefore, the rate of actual / planned was estimated excluding the data of CIS/SWIP. However, the rating of the effectiveness of this project remains unchanged even if assumed that the same areas the one in 2008 planted in CIS/SWIP, or in the case of excluding CIS/SWIP area from the actual performance against the total areas planned, as explained by the footnote 13.

[11] Since the data on irrigated and planted areas were not available for the areas rehabilitated by this project, the areas were estimated using the cropping efficiency (irrigated and planted area/ FUSA) of Div. 1 to 4 in the dry and wet season, which are 92.3% and 96.4% respectively.

[12] When the scope of the project was agreed upon, it was assumed that the benefits of 100% of the plan would start three years after the completion of the project. Thus the ex-post evaluation used the data of 2011 only when three years passed from the project's completion, and did not use the averages of recent years (same for Table 2). The average annual irrigated and planted areas of rice of the UPRIIS from 2009 and 2011 were 138,119 ha and were slightly less than the actual values of 2011.

| | | | | | |
|---|---|---|---|---|---|
| | (UPRIIS) | | | | |
| | New area (UPRIIS) | - | 31,233 | 27,454 | 88% |
| | New area (CIS/SWIP) | - | 20,308 | N/A | N/A |
| Irrigated and planted area of cash crops (dry)* | Rehabilitated area (UPRIIS) | N/A | 2,630 | N/A | N/A |
| | New area (UPRIIS) | - | 2,295 | 152 | 7% |

Source: Appraisal documents, documents on the changes of the scope of the project after the detailed design, JICA internal documents, NIA documents

Note: * It was planned that rice would be planted in all the FUSA and no cash crops would be planned in the wet season.

When the scope of the project was agreed upon, the FUSA of the rehabilitated area was reduced and new areas were added compared to the scope at the appraisal, but the total planned FUSA was 82,018 ha which was almost the same as the one at the time of the appraisal. It was planned to irrigate and plant rice in 160,741 ha (140,433ha for the UPRIIS) during the year because of double cropping. At the time of the ex-post evaluation, the irrigated and planted areas of the UPRIIS were 139,428 ha which accounted for 99% of the plan for UPRIIS[13].

In the rehabilitated areas of the UPRISS, the FUSA at the time of the ex-post evaluation was 58,865 ha which was larger than the planned area of 55,100 ha. The annual irrigated and planted areas of rice exceeded the plan (103% of the plan). On the other hand, the annual irrigated and planted areas of rice for the new UPRIIS areas were 88% of the plan. The data of CIS/SWIPS could not be obtained.

As stated above, the rehabilitated area of the UPRIIS has achieved the target in planted areas of rice. However, in the new areas of the UPRIIS, the irrigated and planted areas for rice in the wet season were 13,201 ha, and 14,405 ha (a total of 14,253 ha of rice planted areas, and 152 ha of cash crop areas) in the dry season; the remaining 3,678 ha in the wet season and 2,474 ha in the dry season were not planted, although the actual FUSA was 16,879 ha. The main reasons for the gaps are as follows.

① In an area, canals were included in the plan but could not be constructed and planted. However, the area was included in the FUSA at the completion of the project[14].

② The areas that the farmers applied to the NIA to get irrigation services were less than the FUSA. The NIA has reason to believe that farmers may be using irrigation in areas other than the areas they claimed, but does not grasp the exact data for the irrigated and planted areas. The Division 5 of the UPRIIS office plans to conduct parcellary mapping

[13] Since the data of CIS/SWIP was not available at the time of the ex-post evaluation, an evaluation on the effects of the overall component could not be made. However, if the same areas as in 2008 were irrigated and planted for CIS/SWIP, the total irrigated and planted areas would be152,269 ha (＝139,428 + 12,841), which is 101% of the plan. When the areas of CIS/SWIP are not included, the achievement ratio of the plan for total irrigated and planted area is 87% (=139,728/160,741).

[14] According to the CMIPP-IC Office of the NIA which was responsible for the implementation of the project, the area where the canals were not constructed was included in the FUSA with the assumption that the area could be irrigated by constructing on-farm facilities by farmers. Upon completion of the project, the UPRIIS office, and the central office of the NIA agreed on the FUSA submitted by the CMIPP-IC office but a detailed check was not carried out in the field. The Division 5 of the UPRIIS Office which is responsible for O&M of the area is of the opinion that the area should not have been included in the FUSA. At the time of ex-post evaluation, the Division 5 plans to construct the necessary facilities in the area and includes them in the action plan.

in order to examine whether there is underreporting by farmers and to identify the exact extent of the FUSA.

③ A part of the downstream area of the Chico River cannot be planted in the wet season due to inadequate drainage[15].

With regard to the FUSA, upon completion of the project, it was necessary to not just verify the documents but to examine and agree in the field with the office of the UPRISS, which is responsible for O&M. In order to expand the planted area, the Division 5 of the UPRISS plans to construct additional canals, conduct parcellary mapping to get the exact extent of the FUSA and planted areas, and conduct the rehabilitation of drainages, which are included in the action plan for the year 2012[16].

It was also planned that cash crops were to be planted in the dry season for 2,630 ha of the rehabilitated area and for 2,295 ha of the new area. While the data of the rehabilitated area at the time of the ex-post evaluation was not available, the planted area of cash crops in the new area was 7% of the plan. According to the beneficiary survey, the reasons not to introduce cash crops were unsuitable weather and soil, the lack of funds and labor, the lack of a market, and that it was more time-consuming and labor intensive than rice. In the target area, research and training for rice production have been actively promoted and the rice yield is high. According to the beneficiary survey, factors such as the high market price of rice and the good post-harvest facilities have contributed to increased rice production. The relatively good environment, which is suitable for rice production, seems to be an incentive for farmers to continue rice production rather than to tap into new cash crops.

(2) Yield of rice (ton/ha)[17]

As shown in the table below, the yield and production of rice in the project areas of the UPRIIS exceed the plan, with an average yield of 113% of the plan throughout the year and an annual production of 111% of the plan. Yields in the wet season are lower than in the dry season due to frequent typhoons and floods in the downstream areas[18].

Table 2: Yield and Production of Rice in the Project Area of CMIPP-IC

| Items | | At Appraisal | Agreement on Scope (Planned) | Actual (2011) | Actual /Planned |
|---|---|---|---|---|---|
| Yield of rice (ton/ha) (Wet) | Rehabilitated area (UPRIIS) | 5.0-5.5 | 4.3 | 4.3 | 100% |
| | New area (UPRIIS) | - | | 4.1 | 95% |

[15] To address the problem, the Division 5 dredged the drainage facilities downstream, constructed additional drainage facilities, and advised farmers to delay the planting period for the wet season.

[16] The construction of additional canals was partly budgeted for, but the Central Office of NIA has yet to approve the budget for the parcillery study and repair of the drainage.

[17] According to the CMIPP-IC office, the average value of the yield of the CIS/SWIP was 4 tons for the wet season and 4.4 tons for the dry season in 2008. This was lower than the yield of the UPRIIS. However, the data at the time of the ex-post evaluation was not available.

[18] The average yield of the wet season was 4.0 tons per hectare in 2010. The data prior to 2010 could not be obtained but the available data of the Divisions 1 and 2 in 2008 and 2009 were 4.1 tons and 3.0 tons respectively, which are much lower than the average of 6.25 tons in the dry season. The yields of the Division 5 in the wet season increased from 4.2 tons in 2009 to 5 tons in 2010 but decreased to 3.7 tons in 2011 due to typhoons. There were destructive typhoons of Ondoy and Pepeng in 2009, Juan in 2010, and Pedring in 2011 in the target area.

| | | | | | |
|---|---|---|---|---|---|
| | CIS/SWIP | - | | N/A | N/A |
| Yield of rice (ton/ha) (Dry) | Rehabilitated area (UPRIIS) | 5.0-5.5 | 5.3 | 6.3 | 119% |
| | New area (UPRIIS) | - | | 6.8 | 128% |
| | CIS/SWIP | - | | N/A | N/A |
| Annual average | UPRIIS | 5.0-5.5 | 4.8 | 5.4 | 113% |
| Annual production of rice (estimate ton) | Rehabilitated area (UPRIIS) | - | 523,660 | 595,564 | 114% |
| | New area (UPRIIS) | - | 148,771 | 151,045 | 102% |
| | Total (UPRIIS) | - | 672,431 | 746,609 | 111% |
| | CIS/SWIP | - | 97,478 | N/A | N/A |
| | Total | - | 769,909 | N/A | N/A |

Source: Documents of the appraisal, documents on the scope of changes after the detailed design, JICA internal documents, NIA

### 3.2.2 Qualitative effect

To evaluate the effects and impact of the irrigation projects, a beneficiary survey was conducted for farmers using the irrigation facilities in the target area[19].

(1) Satisfaction with water the supply

The figure below shows the level of beneficiary farmers' satisfaction with the supply of irrigation water. The beneficiary farmers' satisfaction improved significantly compared to before the project. Before the project, 31% of the respondents answered that in the dry season there was no water and 47% responded that it was insufficient, while even in the wet season 42% said the water was insufficient. After the project, 95% in the dry season and the 89% in the wet season responded that water was sufficient.

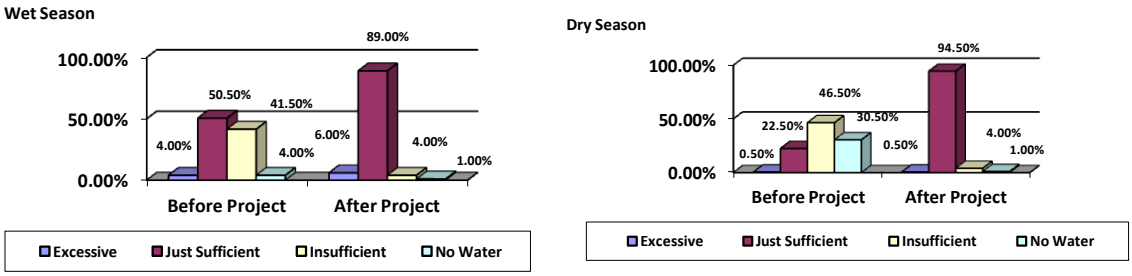



Figure 2: Satisfaction with Water Supply

(2) Planted area and yield of rice

According to the beneficiary survey, 47% of the respondents introduced double cropping of rice because the supply of irrigation water in the dry season became sufficient. Figure 3 shows the average planted areas and irrigated areas before and after the project. Although the average

[19] The beneficiary survey was conducted for 200 samples consisting of 152 farmers of 19 IAs in rehabilitated areas and 48 members of 6 IAs in new areas which were randomly selected from the list of IAs of the UPRIIS. By stream, there are 16 farmers in upstream areas (Div. 5), 96 farmers in mid-stream areas (Div. 1 - 5), and 88 farmers in downstream areas (Div. 2 - 5). This distribution was decided, based on the discussion with local experts and UPRISS, considering the planted area of each target area. Farmers of the CIS/SWIP are not included due to the unavailability of information for those farmers.

planted area have not changed much, irrigated areas increased by about 60% after the project, and the ratio of irrigated areas to planted areas increased from 64% to 99%. Additionally, 63% of the farmers reported an increase in rice yield in the wet season and 36% in the dry season[20].

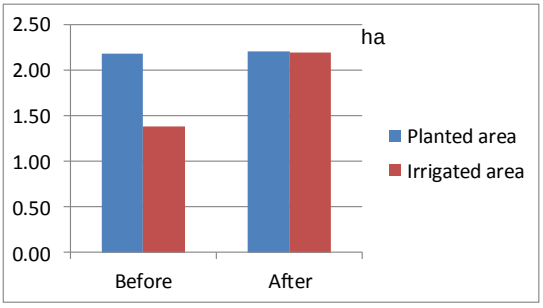



Figure 3: Changes of Ave. Irrigated Areas for Rice (Before and After the Project)

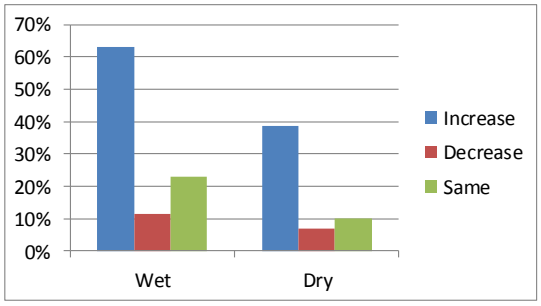



Figure 4: Changes of Average Yield of Rice (Before and After the Project)

44% of those surveyed have received training on the monitoring method for rice production[21] introduced by PhilRice[22] which was supported by JICA, and 73% of those have applied the methodology. It is thus fair to say that the effects of this training have contributed to the increase in yield.

＜TGISRP Component＞

3.2.1 Quantitative Effects (Operation and Effect Indicators)

(1) Irrigated and planted area, yield and production of rice

For the TGISRP, it was planned to construct 52 deep wells and organize 52 Irrigation Service Cooperatives (ISCs) which would cover the FUSA of 2,500 ha. During project implementation, the number of wells and ISCs increased to 72 and the FUSA was expanded to 3,372 ha at the time of the ex-post evaluation. However, due to the high cost of diesel fuel and other problems with the facilities, the number of ISCs utilizing deep wells decreased to 53 in 2007 two years after the completion of the component, and the number was further reduced to 41 at the time of the ex-post evaluation[23]. Hence, the average of the total annual planted area from 2009 to 2011 was 3,145 ha, which was 63% of the planned 5,000 ha. Since the yield is 88% of the plan[24], the rice production is estimated to be at 55% of the plan.

[20] 2.5% of farmers in the wet season and 44.5% of farmers in the dry season, respectively, did not plant rice before the project. Since their yields cannot be compared with the data from before the project, the figures do not include these farmers.

[21] The method is called “palay check” and shows the items and technology to be observed according to the stages of rice production. Farmers are trained to check each item.

[22] PhilRice is the Philippine Rice Research Institute of the Department of Agriculture and the Japanese government assisted them from 1991 to 2009 in various ways such as the construction of a research facility, and technical cooperation projects for research development, and dissemination of technology for small farmers. PhilRice is operated in the province of Nueva Eja where this project is located and is committed to the dissemination of the Palay Check method for monitoring rice production stages in the country.

[23] The data of 2006 could not be obtained.

[24] The yield in the wet season has been lower than the one in the dry season, probably due to typhoons and floods. For example, the yield in 2009 was 4.0 tons for the wet season and 5.0 tons for the dry season, while the yield in 2010 was 4.0 tons for the wet season and 5.5 tons for the dry season.

Table 3: Irrigated and Planted Areas, Yield and Production of Rice of the TGISRP

| | Plan at Appraisal | Actual | | | | Actual / Plan |
|---|---|---|---|---|---|---|
| | | 2009 | 2010 | 2011 | Average | |
| FUSA (ha) | 2,500 | 3,500 | 3,372 | 3,372 | 3,415 | 137% |
| Irrigated & Planted Area of Rice (ha) (Wet) | 2,500 | N/A | 1,550 | 1.603 | 1,577 | 63% |
| Irrigated & Planted Area of Rice (ha) (Dry) | 2,500 | 1,015 | 1,455 | 1,631 | 1,367 | 55% |
| Irrigated & Planted Area of Rice (ha) (Annual) | 5,000 | N/A | 3,055 | 3,234 | 3,145 | 63% |
| Irrigated & Planted Area of Cash Crops (ha) | N/A | N/A | N/A | 164 | 164 | N/A |
| Yield of Rice (Wet) Ton/ha | Annual 10.8 | N/A | 4.0 | 4.0 | 4.0 | 88% |
| Yield of Rice (Dry) Ton/ha | | N/A | 5.5 | 5.5 | 5.5 | |
| Annual production of rice estimated* (Ton) | 27,000 | N/A | 14,203 | 15,355 | 14,779 | 55% |

Source: Documents of the appraisal, NIA

Note: *Estimated by multiplying rice yield with the planted area

There were damages on agriculture caused by the recent typhoon as follows. Ondoy and Pepeng in 2009, Juan in 2010, and Pedring in 2011.

The following table explains the utilization of deep wells at the time of the ex-post evaluation. Even in 2007 when the O&M of this project was transferred to the Tarlac Zambales Irrigation Management Office (TZIMO) of the NIA, 19 deep wells (26% of the total) had not been used. However, that situation has not been reflected in the project completion report produced by the project office of the NIA in 2008. This seems to have delayed an understanding of the issues by the related organizations.

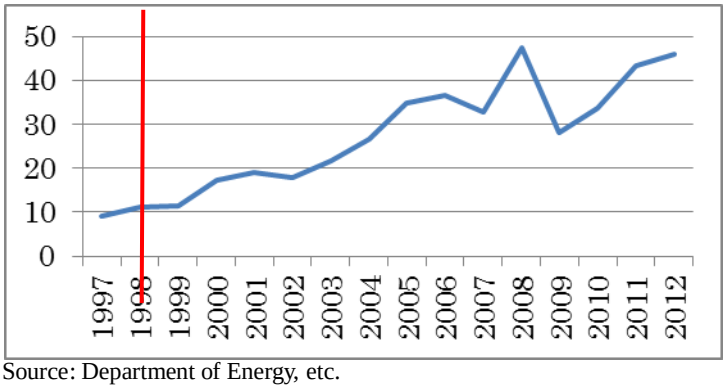
Table 4: Utilization Status of the Deep Wells

| Utilization Status | No of ISCs | FUSA | Reasons |
|---|---|---|---|
| Utilized throughout the year | 16 | 772 ha | Many members use the system and costs can be covered; other water sources are limited, which seems to promote the use of deep wells |
| Utilized partially for such purposes as planting preparation | 25 | 1,179 ha | Partial use to save diesel fuel costs and the use of shallow tube wells for other needs |
| Not utilized although pumps are operational | 9 | 404 ha | Inadequate canal system; insufficient discharge capacity of pumps; high cost of diesel fuel |
| Pumps are not operational | 12 | 536 ha | Breakage or stolen parts; engines were withdrawn by the NIA due to non-utilization |

| | | | |
|---|---|---|---|
| Not utilized since the areas were integrated into the UPRIIS | 10 | 481 ha | Use of gravity irrigation by the UPRIIS |
| Total | 72 | 3,372 ha | |

Source: NIA

The major reason that 21 ISCs do not use deep wells or do not repair the facilities which have problems is the rising cost of diesel fuel. From 1998 when this project was planned, to the time of the ex-post evaluation, the diesel fuel price increased by about 350% (about 100% taking the inflation rate into account)[25].




Source: Department of Energy, etc.

Figure 5: Fluctuation of Diesel Fuel Prices (Price in Pesos per Liter)

The prevalence of shallow tube wells (STWs) in the target areas also seems to have affected the utilization of deep wells. Here are a few reasons that farmers in the focus group discussions cited for not using deep wells: it is easier for them to use STWs individually than organizing an ISC to operate a deep well, and it is difficult to bear the operating costs when only some of the members use a deep well. Farmers who do not use a deep well plant rice in the wet season using rain water and STWs, while farming rice or corn which needs less water by also using STWs or water from nearby creeks in the dry season. However, STWs have problems, namely that groundwater sources will decrease when there is a long draught since the sources are shallow. Deep wells have advantages over groundwater sources, such as that they are established in deep aquifers and are dependable, and that they can be operated at a lower cost than STWs when they are used by many farmers. However, nine ISCs opted to not use deep wells and 25 ISCs used deep wells only partially due to the high cost of diesel fuel and other operational problems, even if the irrigation water supply by STWs is insufficient.

The TGISRP component constructed two model farms to promote profitable cash crops in order to reduce the cost burden of farmers operating deep wells. However, the planted areas of cash crops at the time of the ex-post evaluation were only 164 ha. Although training courses for several cash crops were provided to farmers at the model farms, cash crops were not introduced extensively. In the beneficiary study, farmers cited inappropriate soil and weather, and lack of capital and markets as the primary reasons for not introducing cash crops. It is also likely that the high and stable market price for rice may have discouraged the introduction of cash crops.

[25] The average inflation rate from 1998 to 2011 was 5.4%. Even if the rate of inflation is taken into account (by adjusting the diesel fuel price in 2011 to the 1998 price), the price in 2011 is about double the one in1994.

The component also planned to establish a Groundwater Irrigation Development Fund that would provide credit to farmers for agricultural inputs such as fuel costs and seeds, and carried out training programs for farmers for this purpose. However, since the government enacted a law that prohibits financial services by non-financial institutions, and the Department of Finance did not approve the loan program by the NIA, the Fund has subsequently not been set up. This seems to be affecting the outcome of the component[26]. The beneficiary study showed that 58% of the respondents borrowed money for agriculture, but 45% did so from friends, relatives, money lenders and traders while only 13% got loans from financial institutions such as the Land Bank.

### 3.2.2 Qualitative effect

In order to measure the impact and effect of the component, a beneficiary survey was conducted for ISC members who use a deep well in the target areas[27].

#### (1) Utilization of deep wells

The following table shows how farmers use deep wells constructed by this project and the STWs which are prevalent in the target area. In the dry season, 93% use deep wells but 51% also use STWs in order to save on diesel fuel costs. In the wet season, over 40% do not use deep wells nor STWs since they can use rain water.

Table 5: Utilization of Deep Wells and STWs

| Season | Use of Deep Wells | | | Use of STWs | | |
|---|---|---|---|---|---|---|
| | Use | Partially Use | Do Not Use | Use | Partially Use | Do Not Use |
| Wet | 32% | 25% | 43% | 14% | 21% | 65% |
| Dry | 78% | 15% | 7% | 24% | 27% | 49% |

Note: "Use" means the utilization throughout the cropping season. "Partially Use" means utilization during a limited period such as for planting preparation.

#### (2) Satisfaction with the Water Supply

Many reported that irrigation water was sufficient after the project both in the wet and dry seasons, while 22% responded that water was excessive in the wet season. There are cases that farmers cannot plant during the wet season because excess water remained for about one month due to flooding but the NIA advised them to delay the planting period so that they would be able to crop in that season.

[26] Source: Interviews with the NIA and ISCs, internal documents of JICA and documents of NIA

[27] For the beneficiary survey, 100 samples from 12 ISCs were randomly selected from the 41 ISCs which are utilizing the facilities.

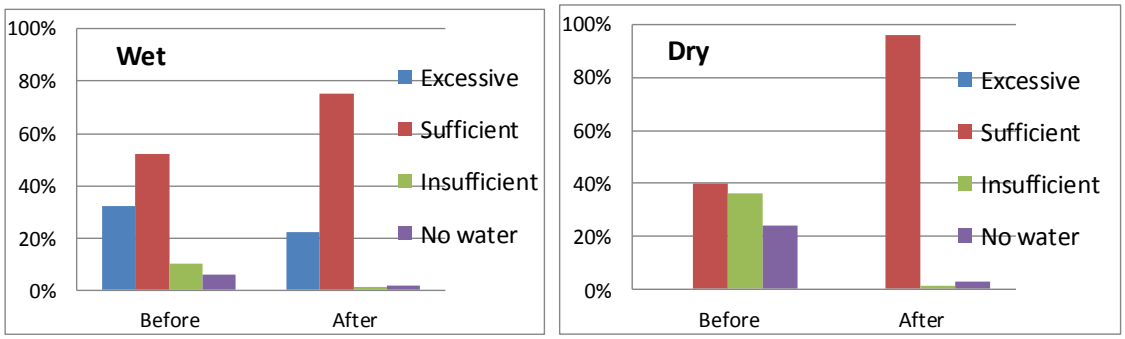



Figure 6: Satisfaction with Water Supply by Beneficiaries of the TGISRP Component

(3) Cropping Patterns, planted areas and yield

44% of the farmers have introduced double cropping of rice after the project, but only 1% has introduced cash crops. Although the average planted area for rice is almost the same as before the project, the irrigated area has increased by about 50% and the percentage of irrigated areas to the total planted area increased from 57% before the project to 86% after the project. 34% of the farmers reported an increase in the yield of rice in the wet season, and 33% an increase in the dry season[28]. In the target areas, about half the respondents had planted rice in the dry season using STWs before the project. However, many of them have increased their yields by using deep wells. 39% of the farmers were trained on the monitoring method of PhilRice for planting rice and 21% had adopted the method, which seems to have contributed to the increase in yields.

### 3.3 Impact

＜CMIPP-IC Component＞

3.3.1 Intended Impacts

(1) Improved living standards for the local beneficiaries

During the beneficiary survey, all the farmers in the rehabilitated and new areas of the UPRIIS replied that they experienced an increase in income compared to before the project. Their net agriculture income became more than four times on average. In addition to the introduction of double cropping and increased yields, several issues were cited as contributing factors; the high and stable market price for rice, the lower transport costs thanks to the construction of rural roads and the improved post-harvest facilities of rice such as paddy dryers and warehouses which are leading to better quality of rice. As shown in the figure below, 93% of the respondents reported that the standard of living has improved due to improved income. Examples are securing food, better education for children, improved housings and acquiring electric appliances.

[28] Farmers who did not plant rice before the project (23% in the wet season, 45% in the dry season) were not included in this answer.

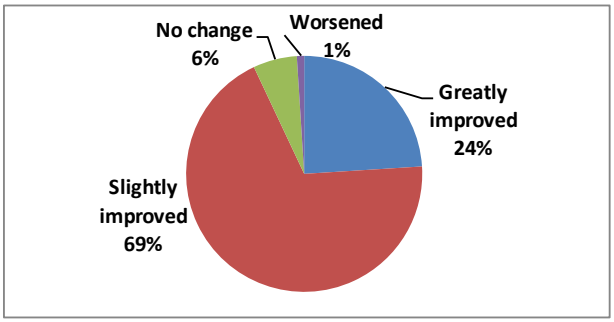



Figure 7: Changes in the Standard of Living (CMIPP-IC Component)

3.3.2 Other Impacts

(1) Impact on the natural environment

For the CMIPP-IC, an Environment Compliance Certificate (ECC) was issued in 1998 and ten conditions towards project implementation were presented, such as the stabilization of soil and waste treatment. The project office took appropriate actions on all of the ten items. For example, the conditions included addressing the problems cited by the community, and the project office improved community roads used by the construction vehicles and constructed temporary drainages to prevent floods during civil works. This was done in order to address the issues raised by IAs and local governments. The project office conducted environmental monitoring during the civil works period and checked the status of soil erosion and stabilization, waste management, and soil and air pollution. In addition, the NIA implemented controls on illegal logging, and planted trees in 900 ha, resulting in the reforestation of the target area. The NIA has reported no major negative impacts on the environment during and after the construction works. The site visit at the time of the ex-post evaluation revealed a decrease in the water level of the downstream part of the Talavera River Irrigation Dam. With regard to the environmental impact of the decrease in the water level of the river, the Department of Energy and Natural Resources (DENR) inspects and analyzes water quality every quarter and has analyzed that there are no negative impacts. In the beneficiary survey, 6% of the respondents reported negative effects such as the deterioration of water quality, but no serious problems were reported. It is thus fair to say that the project in the CMIPP-IC component has had no major negative impact of on the natural environment.

(2) Land Acquisition and Resettlement

No resettlements were planned for the CMIPP-IC, but the plan included acquiring 272 ha of land to construct canals for the UPRIIS. During project implementation, the land acquired increased to 501 ha due to changes in the scope of the project, and compensation was paid to land owners based on the national policy and the standards of the NIA. The project office worked with IAs and the local government and assigned officers for this purpose. However, in some lands, the NIA was unable to gain approval of land owners, and changed the arrangement of canals or filed a suit. The trial lasted for 24 months in court but the owners finally entered into an amicable settlement and accepted the proposed compensation from the NIA.

(3) Unintended Positive/Negative Impacts

No other impacts were observed.

＜TGISRP Component＞

3.3.1 Intended Impacts

(1) Improved living standards of local beneficiaries

In the beneficiary survey of the TGISRP, the respondents reported that their average net income from agriculture became 2.5 times compared to before the project. Just as in the CMIPP-IC the high market price for rice, reduced transportation costs thanks to rural roads constructed, were contributing factors in addition to the introduction of double cropping and increased yield. As shown in the following figure, 89% responded that the standard of living had improved compared to before the project due to increased income. Examples of improved living standards are better food security, better access to education for children, improved housing, and the procurement of electric appliances.

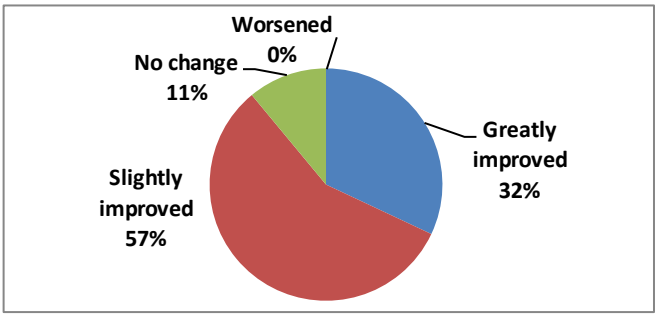



Figure 8: Changes in the Standard of Living (TGISRP)

The TGISRP constructed a domestic water supply system for three ISCs in addition to the irrigation water supply using deep wells. However, at the time of the ex-post evaluation, two ISCs did not operate because of floods in the wet season and difficulties in operation and management. One ISC provided domestic water only to its members. On the other hand, one ISC constructed a domestic water system, which was not part of this project, but did so with the support of the local government and is currently providing water services to more than 1,000 residents. Based on this success, the NIA has approached several local governments inquiring about the possibility of utilizing a deep well constructed by this project for use in the domestic water supply.

3.3.2 Other Impacts

(1) Impact on the natural environment

For the TGISRP, an ECC was issued in 1996. No conditions were attached, but the project office and consultants conducted monthly environmental monitoring, such as checking the status of fuel utilization and disposal, operational safety and work standards, noise, and water and air pollution. The NIA reported no negative impact on the environment during or after the construction. During the site visit at the ex-post evaluation, no problems were observed. In the beneficiary survey, 7% of the respondents cited negative impacts on the environment, but there have been no serious problems. It is thus fair to say that the project in the TGISRP component has had no major negative impact on the natural environment.

(2) Land Acquisition and Resettlement

Land for the construction of wells and canals for the TGISRP was to be donated by farmers. Thus, land acquisition and resettlement has not been performed. However, the construction site of a deep well had to be changed when the consent of the landowners could not be obtained[29].

(3) Unintended Positive/Negative Impacts

According to the beneficiary survey, the ISC members in the area where domestic water services are provided have reported that safe drinking water has been secured.

＜Overall evaluation of the effectiveness and impact of the project＞

For the CMIPP-IC, effectiveness is evaluated using the data from the UPRIIS, which are the major facilities of this project, since the data from the CIS/SWIP is not available. The irrigated and planted areas are at 99% of the target, the annual yield is at 113% of the target, rice production is estimated at 111% of the target, and the overall achievement rate is calculated at 106% which is the average of the achievement rates for irrigated and planted areas and yield. On the other hand, the irrigated and planted areas of the TGISRP is 65% of the target, the yield is 88%, the estimated production is 57%, and the overall achievement rate is calculated to be 76.5%. The overall rate of achievement of the project is calculated to 103%, by using the average of the achievement rates of the two components and weighting by project costs[30].

On the other hand, the beneficiary survey on farmers revealed the effects of their satisfaction with the water supply, the introduction of double cropping of rice, and increased irrigated area and yield. Net agriculture income was increased by 300% for the CMIPP-IC and 150% for the TGISRP compared to before the project, which lead to the desired impact of improved living standards such as improvements in food, children's education, and housing.

Based on the above, it is evaluated that this project has largely achieved its objectives. Therefore its effectiveness and impact are high.

### 3.4 Efficiency (Rating: 1)

＜CMIPP-IC Component＞

3.4.1 Output

For the CMIPP-IC component, a new area was added to the scope during the period between the project appraisal and the conclusion of L/A. Then, when the scope was agreed upon, the rehabilitated area was reduced and the construction of water intake facilities and canals in the new area was added. This change was appropriate in terms of effective use of additional supply of irrigation water and project funds to provide irrigation services in the irrigation potential area. There was no significant change from the agreed scope to the actual one.

(1) Civil Works

The following table shows the major outputs at the time of the appraisal, at the time when the scope was agreed upon, and actual.

[29] In the target area, the design of the canals has been changed. However, since the arrangement of the canals does not meet the needs of the target farmers, the deep well constructed has not been used.

[30] The ratios of the project costs (excluding CIS/SWIPS) are 89.4% for the CMIPP-IC and 10.6% for the TGISRP. The average of the two components weighted by the cost is calculated as follows: 106 % x 0.894 +76.5% x 0.106 = 94.8% + 8%=102.8%。

Table 6: Major Planned and Actual Outputs of CMIPP-IC Component

| Outputs | At Appraisal | At Scope Agreement (Planned) | Actual |
|---|---|---|---|
| FUSA | 82,000 ha | 82,018 ha | 85,780 ha |
| Rehabilitated Area (UPRIIS) | 82,000 ha | 55,100 ha | 58,865 ha |
| Rework on intake facilities | 3 places | 3 places | 3 places |
| Main canals concrete lining[31] | 42 km | 21.1 km | 27.6 km |
| Drainage improvement | 98 km | Deleted | Deleted |
| River improvement (Taravera River) | 44 km | Deleted | Deleted |
| Rework on main canals/ laterals/ sub-laterals | 836 km | N/A | 992 km |
| Related canal and drainage structures | 1,608 units | N/A | 80 units |
| New Area (UPRIIS) | - | 16,764 ha | 16,879 ha |
| Addition and rework on intake facilities | - | N/A | 8 new places; reworking on 10 places; 22 movable gates; 1 scouring sluice; 1 emergency power supply |
| Main canals expansion and rework | - | 2.8 km | 3.27 km |
| Head gates | - | N/A | 7 (new), 4 (replacement) |
| Super Diversion Canals (SDC) | - | 29.2 km | 20 km (Concrete lining), 19.2 km (Earth canal), related structures |
| SDC laterals & sub-laterals | - | N/A | 241 km |
| On-farm facilities and related structures | - | N/A | 481 km、602 turn outs |
| Drainage systems | - | N/A | 260 km |
| Project facilities | N/A | N/A | 1 Project Office, 12 IA Offices |
| New Areas (CIS/SWIP) | - | 10,154 ha | 10,036 ha |
| Repair of CIS (Communal Irrigation System) | - | N/A | 8 |
| Improvement of SWIPs (Small Water Impounding Ponds) | - | N/A | 51 |

Source: Appraisal documents, documents at the agreement on the scope, JICA internal documents, NIA documents

The following significant changes were made to the scope during the period between the appraisal and the agreement on the scope.

[31] Concrete lining is to cover the sides and bottom of canals with a fixed lining of concrete.

① Addition of new irrigated areas: The detailed design (D/D) planned a new UPRIIS area of 37,200 ha, but the target area was reduced to 16,764 ha due to budget constraints. Meanwhile, the rehabilitation of CIS/SWIP of 10,154 ha was added as a new area. The remaining 20,436 ha is scheduled to be constructed in Phase 2[32].

② Addition and rehabilitation of water intake facilities and construction of the Super Diversion Canal (SDC)[33]: For the additional UPRIIS area, necessary water intake facilities and the SDC were constructed.

③ Reduction of rehabilitated area: Rehabilitation focused on the reworks of major facilities such as water intake facilities and the total rehabilitated area was reduced. Some of other reworks were implemented by the NIA budget and the remaining works will be done in Phase 2.

④ Deletion of improvement of Talavera River and construction of drainage facilities in the rehabilitated area: In order to improve Taravera River, substantial flood control measures in the downstream area by other organizations were a prerequisite[34]. Therefore, the improvement of the river was deleted because the flood control measures were not implemented. Major drainage facilities were constructed with the NIA budget and the remaining works will be done in Phase 2.

These changes were appropriate in terms of effective use of additional supply of water for irrigation services and project funds. On the other hand, it is difficult to measure the differences in the scope between the one at the agreement after D/D and the one actually implemented, because the detailed scope at the time of the agreement is not available. However, major facilities were constructed as planned as at the agreement and it is considered that there is no significant change.

(2) Procurement

Since the documents on the agreed scope do not show details of the procurement of machines and equipment, it is difficult to compare the planned and actual procurement. However, the budget for procurement was cut in half when the scope was agreed compared to the time of the appraisal. As well, the number of actually procured machines and equipment was reduced from 105 at the appraisal to 66. At the appraisal, it had been planned to procure the equipment for O&M but the project focused on the necessary equipment for civil works and the number of equipment was reduced. The equipment items that were significantly reduced in number include backhoes which the UPRIIS office currently needs for dredging works.

### 3.4.2 Input

#### 3.4.2.1 Project cost

The table below shows the project cost of the CMIPP-IC component. When the scope was agreed, a new area was added, and the cost of civil works was increased from 10,069 million yen to 10,490 million yen (percentage of the new regions is 68%). However, the other costs

[32] The NIA plans to implement Phase 2 of CMIPP-IC with the assistance of China.

[33] In the new UPRIIS area, the irrigation water is drawn from the existing PRIS Dam through a new intake and provided by the diversion canal. This diversion canal runs parallel to the existing main canals upstream but is divided at some point to provide water to the new area. This diversion canal is called the Super Diversion Canal (SDC).

[34] Dredging works by the Department of Public Works and Highways (DPWH) and reforestation works by the Department of Energy and Natural Resources (DENR).

decreased due to yen appreciation, and the total cost of the CMIPP-IC component decreased from 17,370 million yen to 15,232 million yen. The actual total cost is 16,180 million yen, which is 106% of the planned cost of 15,232 million yen. Here are the major reasons for the cost increase: (1) a 13% increase in the cost for civil works (increase in the construction cost for water intake facilities and SDCs in the new area which consists of 72% of the total civil works cost); (2) increase in the cost of consulting services due to the extension of the project period; (3) a 101% increase in the institutional development cost; and (4) a 110% increase in the administrative costs due to the extension of the project period. The actual project cost in peso is 6,862 million pesos which is 115% of the planned cost of 5,950 million pesos. Due to the yen appreciation, the increase rate against the plan in peso is larger than the one in yen.

Table 7: Planned and Actual Project Cost of CMIPP-IC Component

| Items | At Appraisal | | At Scope Agreement | | Actual | | Actual / Plan | |
|---|---|---|---|---|---|---|---|---|
| | Mil Yen | Mil Peso | Mil Yen | Mil Peso | Mil Yen | Mil Peso | Mil Yen | Mil Peso |
| Total Cost | 17,370 | 4,373 | 15,232 | 5,950 | 16,180 | 6,862 | 106% | 115% |
| Loan Portion | 12,249 | 3,062 | 12,249 | 4,785 | 11,590 | 4,915 | 95% | 103% |
| <Breakdown> | | | | | | | | |
| Civil Works | 10,069 | 2,517 | 10,409 | 4,066 | 11,771 | 4,992 | 113% | 123% |
| Procurement | 566 | 142 | 207 | 80.8 | 156 | 66 | 75% | 82% |
| Consul Services | 2,022 | 506 | 960 | 375 | 1,181 | 501 | 123% | 134% |
| Institution Dev. | - | - | 128 | 50 | 257 | 109 | 201% | 218% |
| Land acquisition | 68 | 17 | 325 | 127 | 323 | 137 | 99% | 108% |
| Administration | 1,024 | 256 | 896 | 350 | 1,884 | 799 | 210% | 228% |
| Env. Monitor | - | - | 138 | 54 | - | - | - | - |
| Contingency | 1,159 | 290 | 1,306 | 510 | 21 | 9 | 2% | 2% |
| Price increase | 982 | 246 | 868 | 339 | - | - | - | - |
| Tax | 1,480 | 370 | - | - | - | - | - | - |
| Preparaory works | - | - | - | - | 387 | 164 | - | - |
| Others | - | - | - | - | 203 | 86 | - | - |

Source: Appraisal documents, documents on the agreement on the scope, JICA internal documents, NIA documents
Note: Since the documents on the agreement on the scope show the cost only in peso, the value in yen is calculated using the exchange rate as of December 2001, which is when the agreement was made.

3.4.2.2 Project period[35]

The table below shows the planned and actual project period of the CMIPP-IC component.

Table 8: Planned and Actual Project Period of CMIPP-IC Component

| At Appraisal | At Scope Agreement (Planned) | Actual | Actual / Planned |
|---|---|---|---|
| July 1997 - June 2004 (84 months) | July 1997 - Dec. 2004 (90 months)* | July 1997 - Dec. 2008 (138 months) | 153% |

Source: Appraisal documents, documents on the agreement on the scope, JICA internal documents, NIA documents
Note: *Documents when the scope was agreed upon do not show the target completion time and no information on

[35] Prior to the signing of L/A, the Philippine government used its own funds to formulate a detailed design for the CMIPP-IC and establish a demonstration farm for the TGISRP; Minutes of Discussions sets the start of these initiatives as the start of the project period. Therefore, in the ex-post evaluation, the project period is the one from the start of the works by the Philippine government to the completion of the civil works.

the project period was available. Therefore, December 2004, which is when the final project cost was set in EIRR calculation in the scope agreement as well as the target completion date set found in the JICA internal documents, is used as the end of the project period.

At the time of the appraisal, the detailed design was scheduled to be completed by October 1999. However, the scope was changed substantially and the final scope was agreed upon in December 2001, two years behind schedule, through a consensus building processes with the National Economic Development Agency and JICA.

However, even when the scope was agreed upon, it seemed that the component was to be implemented within 90 months, which was essentially the same duration as the one at the time of the appraisal. In reality, it took 138 months, which was 153% of the plan. Here are the reasons for the longer period: (1) delays in procurement due to changes in the scope such as the addition of irrigated areas (12-month delay in the pre-construction process, six-month delay in civil works); (2) six-month delay in civil works due to flush floods; (3) 12-month suspension of civil works in the rainy season due to clay-rich soil; (4) four-month delay of execution of the government budget; (5) 20-month extension of the process to clarify bidding qualification; (6) prolonged negotiation on land acquisition (24 months for the court trial); and (7) four-month delay in quarry permit by local government.

3.4.3 Results of calculations of the Economic Internal Rates of Return (EIRR)

The table below shows the results of re-calculation of the EIRR of the CMIPP-IC component using the same pre-conditions and method as those at the time of the appraisal. The recalculated EIRR is 13.5%, which is slightly lower than the one at the time of the scope agreement. The main reason for the lower EIRR is the increased cost in peso, while there is no significant change in benefits from the agreement.

Table 9: EIRR of CMIPP-IC[36]

| At Appraisal | At Agreement of Scope | Ex-Post Evaluation |
|---|---|---|
| 16.2% | 15.2% | 13.6%[37] |

＜TGISRP component＞

3.4.1 Output

In the TGISRP component, the number of deep wells was increased from 52 to 72 to meet the needs of local farmers and to take advantage of surplus funds in peso due to the yen appreciation. However, when the deep wells were added, six out of the 18 wells constructed at that time were not utilized. The wells should be added after reviewing the status of these facilities.

[36] Here are the preconditions: project life of 50 years; benefits are an increase in net agriculture income and income from the NIA's sales of electricity to an electricity company; and costs are project costs and an increase of the O&M cost by this project, and the fees of water and electricity to be paid to the BOT company. The NIA purchases irrigation water and power from the BOT company operating the power project, and sells the power to the electricity company. .

[37] Since the data of CIS/SWIPs targeting 10,041 ha is not available, the cost of civil works of CIS/SWIPs (1.4% of the total project cost of CMIPP-IC) and its benefits are deleted in EIRR re-calculation.

(1) Civil works

At the time of the appraisal, 52 deep wells planned to be constructed[38]. During the implementation, 20 wells were added in order to meet the needs of local farmers by utilizing surplus funds in pesos due to the strong yen. Three domestic water supply systems utilizing pumps of deep wells were also added.

However, in 2002 when additional wells were applied, six deep wells out of the 18 wells constructed so far were not used because of availability of other water sources such as creeks and shallow tube wells (STWs) and lack of discharge capacity of pumps. Out of the 20 pumps added, two were not used also for lack of discharge capacity of pumps and ten were used only partially while STWs and creeks were used. Application and approval processes should be made after fully reviewing the reasons of the deep wells that were not used at that time and possible countermeasures[39].

It is appropriate that the domestic water supply systems were added, because the systems were based on the local needs such as securing safe drinking water, facilitated the efficient use of deep wells, and improved sustainability of the deep wells. However, in two places, the water systems were not utilized due to floods in the wet season and difficulties in management, while one ISC was providing the water service only to its members at the time of the ex-post evaluation. During project implementation, confirmation on the flood status of the target area in the wet season and advice on management of the system should have been made.

Table 10: Planned and Actual Output of TGISRP Component

| Output | At Appraisal | Actual |
|---|---|---|
| Construction and rehabilitation of deep wells | 52 | 72 |
| (Details) Drilling works of deep wells (180 m) | 40 | 53 |
| Construction of exploratory/production wells | 10 | 10 |
| Demonstration farms including deep wells (50 ha) | 2 | 2 |
| Rehabilitation of deep wells | (1)* | 7 |
| Establishment of groundwater table monitoring system (Drilling of shallow wells) | 10 units | 0 |
| Establishment of groundwater table monitoring system (Installation of automatic water level recorders) | 10 units | 10 units |
| On-farm irrigation system development | 50 sites (2,500 ha) | 70 sites (3,500 ha) |
| Access roads | — | 9 units |
| Rural water supply system | — | 3 systems |

Source: Appraisal documents and internal documents of JICA

Note: *The rehabilitated deep well is one of the two wells in the demonstration farms.

[38] Include the deep wells for demonstration farms at two sites.

[39] At that time, the NIA project office knew that these wells were not utilized. However, the NIA decided to add wells to meet the demand from different places in the hope that the wells would improve agriculture productivity. The NIA did not study the reasons for non-use of the wells or reflect them into the revised plan. At the time of the ex-post evaluation, six wells that had not been used in 2002 and four out of the 20 wells added were not utilized. Here are the reasons of non-use of the four wells: low discharge capacity of pumps (two wells) and a component failure (one well), etc.

(2) Procurement

At the time of the appraisal, the purchase of 50 pumps and engines was planned, but 46 pumps and 65 engines were actually procured. 20 deep wells were added and necessary numbers of pumps and engines also increased. However, the project utilized the existing pumps and engines and the numbers of additional pumps and engines to procure were decreased.

3.4.2 Input

3.4.2.1 Project cost

The table below shows the project cost of the TGISRP. The actual cost in yen is 1,913 million yen, or 77% of the plan. However, the cost in peso is 802 million pesos, which is 129% of the planned 624 million pesos. The major reasons for the increase in pesos are addition of deep well facilities and higher costs of consulting services and administration due to the extension of the project period. The difference of ratios of the actual cost to the planned one between yen and peso is attributed to the yen appreciation during the period.(average rate of 2.39 pesos/yen during the project period as opposed to 4 pesos/yen at the time of the appraisal)

Table 11: Planned and Actual Project Cost of TGISRP

| Items | At Appraisal | | Actual | | Actual / Plan | |
|---|---|---|---|---|---|---|
| | Mil Yen | Mil Peso | Mil Yen | Mil Peso | Mil Yen | Mil Peso |
| Total Cost | 2,496 | 624 | 1,913 | 802 | 77% | 129% |
| Loan Portion | 1,887 | 472 | 1,306 | 550 | 69% | 117% |
| <Breakdown> | | | | | | |
| Civil Works | 1,153 | 288 | 1,236 | 572 | 107% | 155% |
| Procurement | 325 | 81 | 154 | | 47% | |
| Consulting Services | 373 | 93 | 311 | 140 | 83% | 151% |
| Administration | 148 | 37 | 206 | 86 | 139% | 232% |
| Contingencies | 161 | 40 | - | - | - | - |
| Price Increase | 124 | 31 | - | - | - | - |
| Tax | 212 | 53 | 0 | 0 | - | - |
| Others | - | - | 7 | 3 | - | - |

Source: Appraisal documents, JICA internal documents, NIA documents

3.4.4.2 Project period[40]

The table below shows the project period of the TGISRP. Although the planned period was 64 months at the time of the appraisal, the actual one was 76 months excluding 24 months to add deep wells; the percentage of the actual period to the planned one is 119%. The main reason is a one-year extension of the civil works, which were meant to last 35 months.

Table 12: Planned and Actual Project Period of TGISRP Component

| At Appraisal | Actual | Actual / Plan |
|---|---|---|
| Sept.1997 - Dec. 2002 (64 months) | Sept. 1997 - Dec. 2005 (76 months)* | 119% |

Source: Appraisal documents, JICA internal documents, NIA documents

Note: *Exclude 24 months of the extended period to expand the scope.

[40] As explained in the footnote 35, the project period is calculated from the start of the works by the Philippine government prior to signing of L/A to the completion of the civil works.

3.4.4.3 Results of calculations of the EIRR

The table below shows the results of re-calculation of the EIRR of TGISRP using the same pre-conditions and method as in the time of the appraisal. The re-calculated EIRR is 5.7%, which is less than the one at the time of the appraisal. The main reason for the lower EIRR is the decreased benefit due to planted area reduced to 65% of the plan, and the increased cost in peso.

Table 13: EIRR of CMIPP-IC[41]

| At Appraisal | Ex-Post Evaluation |
|---|---|
| 18.7% | 5.7% |

<Evaluation of the efficiency of the project as a whole>

The following table shows the total project cost. At the time of the appraisal, it was 19,866 million yen including the yen loan portion of 14,136 million yen. Since the scope of the CMIPP-IC was changed substantially and the total cost of the CMIPP-IC in yen decreased, the total cost became 17,728 million yen, which is the planned value for evaluation. The actual total cost is 18,093 million yen, which is 102% of the plan and slightly higher than the plan.

Table 14: Total Project Cost of Central Luzon Irrigation Project

| | Plan | Actual | Actual / Plan |
|---|---|---|---|
| Total cost (million yen) | 17,728 | 18,093 | 102% |

Source: Appraisal documents, documents on the scope agreement of the CMIPP-IC, JICA internal documents, NIA documents

The table below shows the total project period. The project actually lasted 138 months[42], which is 153% of the plan and much longer than the planned 90 months.

Table 15: Total Project Period of Central Luzon Irrigation Project

| Plan | Actual | Actual / Plan |
|---|---|---|
| July 1997 - Dec. 2004 (90 months) | July 1997 - Dec. 2008 (138 months) | 153% |

Source: Appraisal documents, documents on the scope agreement of the CMIPP-IC, JICA internal documents, NIA documents

As shown above, the project cost slightly exceeded the plan while the project period exceeded the plan significantly. Therefore the efficiency of the project is low.

### 3.5 Sustainability (Rating: 2)

< CMIPP-IC component>

3.5.1 Structural aspects of operation and maintenance (O&M)

The table below shows the operation and maintenance system of the UPRIIS.

[41] The preconditions are as follows: 30 years of the project life; benefit is an increase in net agriculture income; and cost is the total project cost as well as an increase in the O&M cost by the project.

[42] The planned and actual start dates of the CMIPP-IC component are earlier than the ones for TGISRP, and the component's planned and actual completion dates are later than those of the TGISRP. Thus the project period of the CMIPP-IC component is used for evaluation of the project as a whole.

Table 16: O&M System of UPRISS Facilities at Ex-Post Evaluation

| Irrigation facilities | Organization in charge and contents of major O&M activities |
|---|---|
| Diversion dam & intake facilities | UPRIIS office: Supply of irrigation water and regular check of equipment |
| Main canals, drains, laterals | UPRIIS office: Major dredging works<br>Irrigation Associations (IAs): Small-scale dredging works and cleaning, overall O&M activities of laterals when registered as Model 2 of IMT |
| Sub-laterals, on-farm facilities | IAs: Dredging and cleaning of sub-laterals, O&M activities of on-farm facilities |

Source: NIA

The UPRIIS facilities built under this project were transferred to the UPRIIS office in December 2008. The office has been conducting O&M with Irrigation Associations (IAs) since then. It is comprised of five departments that are in charge of O&M of five districts and the O&M department that oversees the entire O&M of the system. The office had more than 1000 staff members in the 1990s but reduced the number to 550 by 1999 under the policy of the Philippine government. The number of the full-time staff members was further reduced to 386 under the subsequent rationalization policy of the NIA. However, to make up for the smaller staff size, the office has hired contract personnel. The current total number of staff members in the UPRIIS office including the contract ones is 868.

To improve the performance of the national irrigation systems, the NIA started the Irrigation Management Transfer Program (IMT) in 2008 to transfer O&M activities of irrigation systems to IAs. The IMT classifies IAs into model 1 to 4 (4 is the highest-capacity model) and transfers the O&M of facilities and water fee collection to IAs in phases.[43]

The UPRIIS has 386 IAs in which 59 are model 1, 12 are model 2, and 290 have signed the contract on O&M with the NIA under the old system[44]. In the Division 5 of the new area, all the IAs has become model 2[45]. The Divisions 1 to 4 plan to transfer all the IAs to the IMT by 2013.

For the CIS and SWIP, which were rehabilitated by this project, 56 IAs which were formed by the project are responsible for the O&M of the facilities. Since most of the IAs use the system originally constructed by private owners, the NIA is not responsible for monitoring them.

[43] Here are the responsibilities of the models. (Source: IMT Manual of NIA 2009）
Model 1: The NIA is responsible for O&M of the entire irrigation system, while some O&M activities for sub-laterals and on-farm ditches, monitoring of irrigation water, production of the list of irrigated and planted area, and promotion of water fee payments are commissioned to IAs. The NIA pays the corresponding remuneration to IAs.
Model 2: IAs are responsible for O&M of facilities under laterals, collection of irrigation fees from members, and financial management of the fees. The NIA pays the IA a certain percentage of the water fees collected, depending on the collection rate.
Model 3: In addition to the responsibilities of model 2, IAs conduct partial O&M of main canals except those main canals from dams to the first lateral.
Model 4: IAs are responsible for O&M of all the facilities, collection and management of water fees, and management of funds for O&M and construction of facilities. The NIA conducts monitoring and evaluation of the system and provide technical support to IAs when necessary.
As of November 2011, there were 2,446 IAs in the country. Among them 463 IAs, or 19% of all the IAs, are registered as model 1, 270 (11%) as model 2, 30 as model 3, and two as model 4. Other IAs are in the process to be registered in the IMT. In Region 3, no IAs are registered as model 1, but 26% are registered as model 2, and 8% as model 3. (Source: NIA documents)

[44] The remaining 21 IAs have not concluded a contract with the UPRIIS even under the old system.

[45] Under IMT, when the collection rate of water fees is more than 50%, a part of the fees is paid to IAs, which is an incentive for IAs to collect the fees. It is likely that the collection rate of the Division 5 is higher than the other divisions because of this factor.

Thus the information on all the IAs could not be obtained. However, two out of the three IAs visited did not operate as an association because the irrigation facilities were not operational due to breakages.

As for the CMIPP-IC component, the UPRIIS office which is responsible for O&M employs necessary personnel including contract staff and the transfer of O&M to IAs has been promoted steadily. Therefore, no major problems have been observed in the structural aspect of O&M.

### 3.5.2 Technical aspects of operation and maintenance

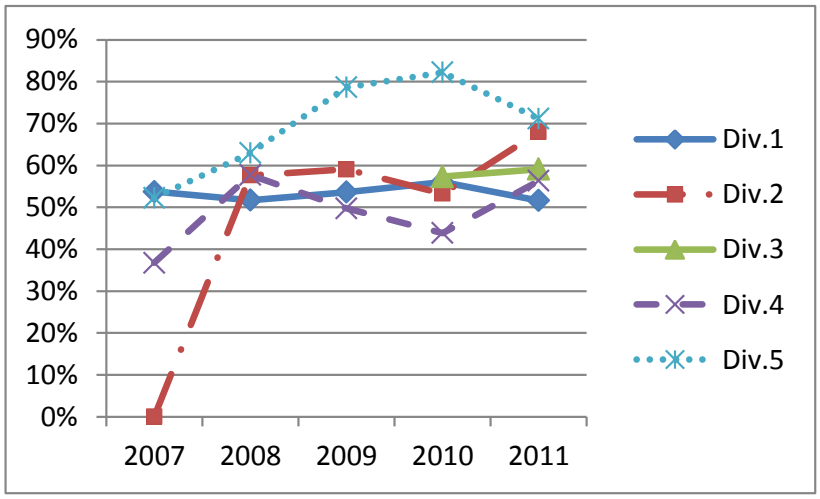
The NIA reported that the guidance and training by the consultants for this project have improved the capacity of the NIA staff on study, design, construction and management for the development of irrigation. The UPRIIS office has deployed technical staff members with expertise on civil engineering and agriculture engineering: 19 in the UPRIIS office itself and 22 to 38 in each division. They use the O&M Manual which has been used by the office since the time before the project, and the methodology and frequency of O&M activities are clearly defined and conducted accordingly in the diversion dam[46]. The staff in charge of O&M has been trained and no technical problems have been observed. However, due to lack of maintenance equipment such as backhoes, dredging work of major canals has been delayed.

As for IAs, the project conducted capacity building on O&M to 32 IAs including 12 in the new area. After the project, all the 12 IAs were transferred to the IMT as model 2; the capacity building by the project seems to have contributed to this outcome. One of the IAs in the new area was awarded as the most outstanding IA in the country. In order for all the IAs to be transferred to the IMT by 2013 as model 2, the UPRIIS office plans to conduct intensive training to its staff and IAs in 2012. According to the beneficiary survey, 31% of the respondents evaluated the capacity of IAs on water management and coordination as very high and 66% as slightly high.

### 3.5.3 Financial aspects of operation and maintenance

The figure below shows the collection rates of water fees by the five UPRIIS divisions. Although the rates as a whole tend to improve, the average was 57% in 2011. In the Division 5 of the new area, the collection rate decreased in 2011 due to lower rice yield caused by typhoons but remained above 70%.

[46] As for the O&M Manual produced by this project, the management members of the UPRIIS Office including the five divisions do not know of its existence and do not use it.




Source: NIA

Figure 9: Water Collection Rate of UPRIIS

Meanwhile, as shown in the table below, the ratio of income versus O&M cost[47] of the UPRIIS has been high at 157% in 2010 and 148% in 2011. Although the water fee collection rate has not been high, the divisions attained a high ratio of income versus O&M cost because they have controlled the O&M cost[48].

Table 17: Ratio of Income Versus O&M Cost of UPRIIS

| | Div.1 | Div.2 | Div.3 | Div.4 | Div.5 | Total |
|---|---|---|---|---|---|---|
| 2010 | 157% | 187% | 228% | 140% | 138% | 157% |
| 2011 | 128% | 161% | 221% | 165% | 118% | 148% |

Source: NIA documents

As shown above, the water fee collection rate by the UPRIIS office has improved, the ratio of income versus O&M cost has also been high, and no major problems are observed in the financial aspect of O&M of the UPRIIS office.

### 3.5.4 Current status of operation and maintenance

The following problems were observed for the CMIPP-IC component. Many of them are to be addressed by the divisions of the UPRIIS office under their action plans. The main canal of the SCD (earth canal) will be concrete-lined under Phase 2 of the CMIPP-IC. However, the delay in dredging works due to lack of equipment has to be reviewed urgently, including such aspects as outsourcing the works. As a whole, the impact of these problems is small, and the overall status of O&M of the facilities constructed by the project is generally good.

(1) PRIS Dam: Silting at intake outlets (1.5 m) because of the delay in dredging affected by the lack of equipment

[47] JICA uses the Sufficiency Rate of Operation and Maintenance Cost (Actual O&M cost divided by planned O&M cost) as the Operation and Effect Indicator. However, since the data for the indicator was not available, alternative indicators were used to show how much of the O&M cost was covered by the income from the project and by the collected water fees. This was done because the NIA adopted a policy to cover the O&M cost by the income from water fee collection.

[48] Based on the interviews with each of the UPRIIS divisions

(2) TRIS Dam: Requires continuous dredging; Water shortage in the dry season due to decreased water flow of Talavera River[49]
(3) Some sections of the main canal of PBRIS: Collapsed concrete lining due to slope erosion
(4) Part of the main canal of SDC (earth canal): Intermittent erosion along canal slopes
(5) Gate and outlets of DC1: Breakages of lifting structures of the gate

As stated above, no major problems have been observed in the structural, technical and financial aspects of O&M of the CMIPP-IC component.

< TGISRP component >

3.5.1 Structural aspects of O&M

The deep wells constructed by the TGISRP were to be operated and maintained by 72 Irrigation Service Cooperatives (ISCs). The supervision of ISCs was transferred from the NIA project office to the NIA Tarlac Zanmbales Irrigation Management Office (TZIM Office) in 2007. However, three staff members in charge of the project are contract ones and work mainly on other assignments. Thus it is difficult for them to monitor and supervise the ISCs. In addition, out of the 72 ISCs, ten will be transferred to the UPRIIS in 2013 and 21 out of the remaining 62 do not use deep wells due to the high diesel fuel cost and deficiencies in equipment and do not operate as cooperatives. Hence, 41 ISCs are managing the deep well facilities at the time of the ex-post evaluation. Under the project, ISCs are required to pay 30% of the construction cost of the facilities over a five-year period in a contract with the NIA in order that the ownership of the facilities would be subsequently transferred from the NIA to ISCs. However, as explained later, only three ISCs have paid the equity. The delayed transfer of the ownership of the facilities to ISCs seems to have led to a weak O&M system by ISCs in such aspects as lack of capacity to bear the cost to repair deficient facilities.

As discussed above, the TGISRP faces shortage of staff at the local office that monitors and supervises the ISCs and delayed transfer of the facilities to ISCs.

In addition, as mentioned in the section on relevance, gravity irrigation by the NIA's Balog-Balog Multipurpose Project (BBMP) will be implemented for most of the target areas of the TGISRP. According to the NIA, even after the BBMP has been introduced, it is expected that the deep wells constructed by this project would be utilized to complement the BBMP because the target areas are located in the downstream areas and the supply of irrigation water by the BBMP may be insufficient in the dry season. However, the implementation of the BBMP may further decrease the utilization rate of the deep wells as well as the incentives for ISCs to maintain the deep well systems.

3.5.2 Technical aspects of operation and maintenance

The TZIM Office uses a maintenance manual produced by this project in 2005 to advise ISCs. The TZIM staff members in charge of this project have the expertise in agriculture and receive support from an in-house mechanic to advise ISCs in repairing their facilities. In the beneficiary survey, 26% of the respondents said that the capacity of ISCs to supply irrigation water and coordinate ISC members was very high and 64% said slightly high.

[49] To address the shortage of irrigation water, the project office provides water from the other main canal of DC1.

3.5.3 Financial aspects of operation and maintenance

ISCs and the NIA have concluded a contract that requires the ISCs to pay 30% of the construction cost of the deep wells in five years. However, only three ISCs have paid all the cost so far. The recovery rate of the cost is only 19.6%, and about 37 million pesos (69 million yen) have not been paid. Since part of the payment would be used for supervision activities of ISCs by the TZIM Office, it is fair to say that the low repayment rate has affected these activities[50].

As explained before, 25 out of the 42 ISCs use the facilities partially and there are many ISCs in which only some of the members use the facilities. Since the members' utilization rate of the facilities is low, it is difficult for ISCs to collect the payment for the construction cost from the members. Most of the ISCs do not save the O&M cost and many cannot pay for repair when there are deficient parts[51]. It is also difficult for them to secure the cost for future replacement of pumps and engines.

3.5.4 Current status of operation and maintenance

15 out of 72 deep wells are not operational due to damaged facilities or removal of the engine. Three out of 15 have problems of discharge capacity of pumps and three had problems of canals. The TZIM Office worked out the action plan to grasp the utilization status of pumps and engines as well as to carry out reworking and construction of necessary canals[52].

As discussed above, for the TGISRP, only 41 ISCs, or 57% of the 72 ISCs established, use the facilities and operate as cooperatives. The TZIM Office, which is responsible for supervising ISCs, faces shortage of staff as well as delayed transfer of the facilities to ISCs. In addition, ISCs cannot save the funds for the O&M cost. When the BBMP is implemented, the utilization rate of deep wells may decrease even further and affect O&M of the facilities. Thus major problems have been observed in terms of structural and financial aspects of O&M of the TGISRP component, which poses concerns on the future O&M of the facilities.

< Evaluation of the sustainability of the project as a whole>

As discussed above, although no major problems have been observed in the operation and maintenance of the CMIPP-IC component, there are major problems in structural and financial aspects of O&M in the TGISRP component. In the project as a whole, some problems have been observed in terms of structural and financial aspects of O&M. Therefore the sustainability of the project effect is fair.

## 4. Conclusion, Lessons Learned and Recommendations

### 4.1 Conclusion

This project is fully consistent with the development policies and development needs of the Philippines and Japan's aid policy to support agriculture and rural development; therefore its relevance is high. The actual irrigated and planted areas and yields were 103% of the planned

[50] Budget for activitiess by the TZIM Office for the project in 2012 is 1 million pesos, which is about 1.88 million yen.

[51] When major repair is necessary, the TZIM Office takes necessary parts from the engines and pumps that are not being used and provide them to the ISCs. When such parts are not available from the engines and pumps at the office, the office instructs ISCs to collect the necessary cost from their members because the office has no such funds. However, as the diesel fuel is expensive and many ISCs use the facilities at a limited level, it is difficult for ISC members to pay for repair.

[52] Pumps and engines that are not being used but are operational are to be removed and used as spare parts for other ISCs. A mechanic of the TZIM Office repairs damaged equipment if at all possible.

ones; hence the overall effects and impact of the project are high. The project cost was slightly above the plan, while the project period exceeded the plan significantly; thus the efficiency of the project is low. With regard to sustainability, although no major problems have been observed in the operation and maintenance of the CMIPP-IC component, major problems have been observed in terms of structural and financial aspects of operation and maintenance of the TGISRP component. Therefore the sustainability of the project effects as a whole is fair. In light of the above, this project is evaluated to be partially satisfactory.

### 4.2 Recommendations

4.2.1 Recommendations to the executing agency

(1) CMIPP-IC component

① There are gaps between FUSA and irrigated and planted areas in the new area of the UPRIIS: the gaps are 3,678 ha in the wet season and 2,474 ha in the dry season. To expand the planted area, the Division 5 of the UPRIIS should promote its action plan including necessary reworking of the facilities and parcellary mapping to define FUSA.

② With regard to the issue of delayed dredging works at water intake outlets and canals, which is explained in the sustainability, each UPRIIS division should consider outsourcing dredging works and taking measures to secure minimum equipment for such works.

(2) TGISRP component

Only 41 out of the 72 deep wells constructed by this project are being used, and the sustainability of the deep wells is highly questionable. It is recommended for the NIA to carry out the following for effective use of the deep wells and improving sustainability.

① Strengthen the capacity of the TZIM Office to monitor, advice, and support ISCs.

② Secure subsidies on diesel fuel cost to ISCs that use the deep wells.

③ The TZIM Office should implement its action plan on construction and repair of the facilities.

④ The TZIM Office will formulate and implement a plan to collect the construction cost to be paid by ISCs in consultation with the central office of NIA. The TZIM office will consider the possibility of payment collection from the ISCs whose facilities are not operational or who have not used the facilities. Then the office will review if they can transfer the major facilities which are not used but operational to other areas and collect the cost of those facilities from those who would receive the facilities.

⑤ Introducing a domestic water supply system utilizing deep wells has a merit of promoting the use of deep wells and using the income from the water supply system for maintenance of the facilities. The TZIM Office has already consulted with several local governments to introduce such water supply system and it is expected that the system to be promoted. However, it is necessary to review possible impacts on such system by the natural environment such as flood as well as the management capacity of ISCs. It should also be noted that the supply of irrigation water will not be affected by the introduction of the domestic water supply system.

Many of the target areas of this component are to be covered by the BBMP which is in the

approval process. It is recommended that the TZIM Office consult the BBMP office and the central office of NIA to review how to provide irrigation services in the target areas and implement the recommendations above. In the review process, the NIA does not have to delete the target areas from the BBMP but explore measures for the deep wells and the BBMP to complement each other. Then, the NIA should review the recommendations above for the target areas including those that will not be covered by the BBMP. Among the factors that should be taken into account are as follows: years of operation and service life of pumps and engines; number of members who use the deep wells and the frequency of use; planned completion date of the BBMP; and the BBMP's capacity for irrigation water supply as compared to the demand.

#### 4.2.2 Recommendations to JICA

(1) As for the TGISRP component, JICA should keep monitoring the approval process of the BBMP and consult with the NIA on measures for effective use of the deep wells. Then, JICA should continue to monitor the implementation status of the action plan of the TZIM Office.

### 4.3 Lessons Learned

(1) Thorough consultation and review at the stage of project formulation

For the CMIPP-IC component, the original scope was substantially changed after the project appraisal based on the strong request from the Philippine side and L/A was signed without a definite scope, which became a major cause of the extension of the project period. It is important to conduct sufficient consultation with the implementing agencies at the appraisal and agree on the scope.

For the TGISRP component, higher diesel fuel cost and the prevalence of shallow tube wells were major factors that reduced the utilization of the deep wells. In addition, as the target area is overlapped with another irrigation project, the utilization of the deep wells may decrease even further if that project is implemented. In the project formation stage, it is necessary to examine the possibility of overlapping with other projects or facilities in the target area. When multiple irrigation methods are expected such as deep wells and shallow tube wells, it is necessary to analyze operational aspects such as ease of O&M and management by farmers, in addition to the methods' functions and costs.

(2) Consideration for risks of fluctuations in fuel costs

The TGISRP component was formulated to activate the deep wells which had not been used due to the high electricity cost by utilizing diesel fuel which was much cheaper than electricity. To cover the diesel fuel cost, water fees were estimated, and economic analysis was done utilizing the diesel fuel price at the time of the SAPI. However, the risk of changes in the diesel fuel cost has not been studied. For deep wells, it is necessary to carefully examine the risk that facilities will not be utilized because of the rising fuel cost for pumps.

(3) Securing O&M equipment

In the CMIPP-IC component, if the planned O&M equipment had been procured, the situation of delayed dredging works could have been avoided. For a large-scale project, it is important to procure necessary equipment for O&M after project completion, through sufficient coordination with agencies that are responsible for O&M.

(4) Agreement on the completion status of facilities with agencies that are responsible for O&M and improvement of the quality of project completion reports

In the CMIPP-IC component, the project office and the office in charge of O&M had different understanding on the completion status on some facilities and FUSA. For the TGISRP component, the project completion report has not reflected the actual status of the constructed deep wells and their utilization, which seems to have affected O&M and monitoring activities after project completion. When facilities are transferred to an organization responsible for O&M, the facilities should be inspected and verified with the organization on the project site based on documents that describe the facilities in detail.

(5) Promotion of coordination with financial institutions to meet farmers' demands for funds

In the TGISRP component, it was planned to establish a fund to provide loans for payment of the construction cost and for agriculture input, and training to farmers was conducted. However, due to the policy of the Philippine government which prohibits non-financial organizations such as the NIA from providing financial services, it was not possible to set up the fund. When the policy became clear, it should have been reviewed to promote loan services by financial institutions such as the Land Bank of the Philippines to target farmers, in addition to the suspension of setting up the fund.

Since financial activities by non-financial institutions such as the Ministry of Agriculture met many failures and such activities are often restricted by government in other countries, projects are recommended to facilitate financial services by financial institutions for farmers and not have irrigation agencies provide such services

Comparison of the Original and Actual Scope of the Project

< CMIPP-IC Component >

| Item | | Plan (Agreement after D/D) | Actual |
|---|---|---|---|
| **1.Outputs** | | | |
| (1) Civil Works | FUSA | 82,018 ha | 85,780 ha |
| | Rework on intake facilities | 3 places | 3 places |
| | Main canals concrete lining (km) | 21.1 | 27.6 |
| Rehabilitated Area | Rework on main canals/ laterals/ sub-laterals | N/A | 992 km |
| | Related canal and drainage structures | N/A | 80 unites |
| New Area | Addition and rework on intake facilities | N/A | 41 places, 1 emergency power supply |
| | Main canals expansion and rework | 2.8km | 3.27 km |
| | Head gates | N/A | 11 |
| | Super Diversion Canals (SDC) | 29.2 km | 39.2km & related structures |
| | SDC laterals & sub-laterals | N/A | 241 km |
| | On-farm facilities & related structures | N/A | 481km, 602 turn outs |
| | Drainage systems | N/A | 260 km |
| | Project facilities | N/A | 13 |
| | Repair of Communal Irrigation System | N/A | 8 |
| | Improvement of Small Water Impounding Ponds | N/A | 51 |
| 2) Procurement | Construction Equipment | N/A | 30 |
| | Trucks, Jeeps, Motorbikes | N/A | 37 |
| 3) Consulting Service | International (MM) | 185 (Estimate) | 227 |
| | National (MM) | 355 (Estimate) | 453 |
| **2. Project Period** | | July 1997～ December 2004 (90 months) | July 1997～December 2008 (138 months) |
| **3. Project Cost** | Amount paid in Foreign currency | 8,973 million yen | 10,538 million yen |
| | Amount paid in Local currency | 6,259 million yen (2,445 million pesos) | 5,642 million yen (2,393 million pesos) |
| | Total | 15,232 million yen | 16,180 million yen |
| | Japanese ODA loan portion | 12,249 million yen | 11,590 million yen |
| | Exchange rate | 1peso＝2.56 yen (As of Dec. 2001) | 1 peso＝2.36 yen (Weighted average) |

< TGISRP Component >

| Item | | Plan | Actual |
|---|---|---|---|
| **1.Outputs** | | | |
| (1) Civil Works | Drilling works of deep wells (180 m) | 40 | 53 |
| | Construction of exploratory/production wells | 10 | 10 |
| | Demonstration farms including deep wells (50 ha) | 2 | 2 |
| | Rehabilitation of deep wells | 1 (included in the model farms) | 7 |
| | Establishment of groundwater table monitoring system (Drilling of shallow wells) | 10 | 0 |
| | Establishment of groundwater table monitoring system (Installation of automatic water level recorders) | 10 | 10 |
| | On-farm irrigation system development | 50 (2,500ha) | 70 (3,500ha) |
| | Access roads | — | 9 |
| | Rural water supply system | — | 3 systems |
| 2) Procurement | Pumps | 50 | 46 |
| | Engines | 50 | 65 |
| 3) Consulting Service | International (MM) | 55 | 58 |
| | National (MM) | 174 | 205 |
| **2. Project Period** | | September 1997～December 2002 （64 months） | September 1997～ December 2005（100 months） |
| **3. Project Cost** | Amount paid in Foreign | 1,500 million yen | 1,307 million yen |
| | Amount paid in Local currency | 996 million yen (249 million pesos) | 606 million yen （252 million pesos） |
| | Total | 2,496 million yen | 1,913 million yen |
| | Japanese ODA loan portion | 1,887 million yen | 1,306 million yen |
| | Exchange rate | 1 peso＝4 yen （As of October 1997） | 1peso＝2.39 yen（Weighted average） |