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The World Bank

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Report No. 11511

PROJECT COMPLETION REPORT

PHILIPPINES

**MEDIUM SCALE IRRIGATION PROJECT
(LOAN 1809-PH)**

DECEMBER 30, 1992

**Agriculture Operations Division
Country Department I
East Asia and Pacific Regional Office**

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CURRENCY EQUIVALENTS

(Pesos per US\$)

<u>Year</u>	<u>Exchange Rate</u>
1979 (Appraisal Year)	₱7.4
1990 (Completion Year)	₱25.5

WEIGHT AND MEASURES

Metric System

Abbreviations

BOD	Board of Directors
DA	Department of Agriculture
ERR	Economic Rate of Return
FIG	Farmer Irrigator Group
IA	Irrigator Association
IBRD	International Bank for Reconstruction and Development
IDD	Institutional Development Department
IOSP	Irrigation Operations Support Project
ISF	Irrigation Service Fee
LBP	Land Bank of the Philippines
MOH	Ministry of Health
MRDP	Mindoro Rural Development Project
NIA	National Irrigation Administration
NFA	National Food Authority
O&M	Operation and Maintenance
PCR	Project Completion Report
SAR	Staff Appraisal Report
SPR	Slide Productivity Rate
WOP	Without Project
WP	With Project

FISCAL YEAR OF BORROWER

Republic of the Philippines: January 1 to December 31

THE WORLD BANK
Washington, D.C. 20433
U.S.A.

Office of Director-General
Operations Evaluation

December 30, 1992

MEMORANDUM TO THE EXECUTIVE DIRECTORS AND THE PRESIDENT

**SUBJECT: Project Completion Report on the Philippines
Medium-Scale Irrigation Project (Loan 1809-PH)**

Attached is a copy of the report entitled "Project Completion Report on the Philippines--Medium-Scale Irrigation Project (Loan 1809-PH)" prepared by the FAO/CP with Part II contributed by the Borrower.

The project to develop seven irrigated rice perimeters and to control malaria on Palawan and Mindoro, the country's poorest areas, was unsatisfactory overall. Design, preparation and appraisal were poor, leading to uneconomic irrigation. Realizing and sustaining benefits from these sunk costs would require major system redesign and beneficiary participation, which are unlikely.

The two percent of project costs spent on malaria control led to excellent and apparently sustainable results. Also, institutional support for the National Irrigation Administration produced substantial results.

The Project Completion Report is satisfactory. No audit is planned.



Attachment

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PROJECT COMPLETION REPORTPHILIPPINESMEDIUM SCALE IRRIGATION PROJECT

(LOAN 1809-PH)

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MAPS: IBRD 14589, 14590

PROJECT COMPLETION REPORT

PHILIPPINES

MEDIUM SCALE IRRIGATION PROJECT

(LOAN 1809-PH)

PREFACE

This is the Project Completion Report (PCR) for the Medium Scale Irrigation Project in the Philippines, for which the International Bank for Reconstruction and Development (IBRD) Loan 1809-PH in the amount of US\$71 million was approved on March 13, 1980. The project was restructured during implementation and the Loan was reduced to US\$33 million (by cancelling US\$34 million on April 1, 1985 and US\$4 million on January 24, 1989). The last disbursement was made and the Loan was closed on April 2, 1991, with full disbursement of the revised loan amount of US\$33 million.

Parts I and III of the PCR are based on a report by an FAO/World Bank Cooperative Programme mission which visited the Philippines in February/March 1992. It reflects a review of all relevant project documents, field visits to selected project areas and discussions with the Borrower's project staff and associated Bank staff. Part II was prepared by the National Irrigation Administration (NIA) on behalf of the Borrower.

The Bank wishes to thank the management and staff of NIA and other involved Government agencies for their cooperation and assistance in preparing this PCR.

PROJECT COMPLETION REPORT

PHILIPPINES

MEDIUM SCALE IRRIGATION PROJECT

(LOAN 1809-PH)

EVALUATION SUMMARY

Objectives

1. The main objective of the project was to increase rice production in the three least developed provinces of Mindoro Oriental, Mindoro Occidental and Palawan in the Philippines, by financing irrigation development to benefit about 37,800 ha which were rainfed or previously had only limited irrigation. This was to be achieved over a six-year period (1980-1985) by: (a) constructing irrigation and drainage facilities and roads for seven irrigation systems including six river diversion dams; (b) providing consulting services to assist the National Irrigation Administration (NIA) in engineering design and training; (c) improving Operation and Maintenance (O&M) by NIA of all national irrigation systems through a project-supported study to evaluate the present position and develop a plan of action complemented by training of NIA staff in O&M and monitoring; (d) monitoring and evaluation; and (e) strengthening of the malaria control unit in Palawan.

2. The total project cost including physical and price contingencies, estimated at US\$118.5 million, was to be financed by a Bank loan of US\$71 million (60% of the cost) and Government annual budget allocations of US\$47.5 million. The Bank loan became effective on June 25, 1980,

Implementation Experience

3. The project as prepared by NIA's Project Development Department and further processed by Bank pre-appraisal and appraisal missions was overly optimistic in scope. Inadequate attention was given at the design stage to: (a) the absence of some basic data, particularly on hydrology; (b) difficulties of working on relatively remote islands; (c) the characteristics of participating farmers and their needs; and (d) the experience of problems encountered in implementing the Bank-funded Mindoro Rural Development Project (Ln. 1202-PH) The lack of hydrological data led to over-estimation of service areas and caused difficulties in the operation of four of the six completed systems.

4. Project implementation was much slower than anticipated at appraisal, because of the remote location and difficult access to project work sites; overly

staff; lengthy procurement procedures; lack of capable contractors and poor contractor performance; shortages of cement; and severe shortage of local funds, especially during the early to mid-eighties. By April 1985, that is near the completion of the original project period, physical achievements were just 17% and loan disbursements constituted only 25% of the total loan.

5. Due to the slow pace of implementation and the continuous unavailability of adequate counterpart funds, the project was restructured and reduced in scope in April 1985. This included the deletion of the Bongabong system, both because of its relatively low economic viability and the fact that very little work had been done on it by that time, and the redesigning of major structures of three other systems. These changes also resulted in the elimination of 3 out of 5 remaining diversion dams. The restructuring scaled down the appraisal service area by about 40%, from 37,800 ha to 23,000 ha. The loan was closed on April 2, 1991, after four one-year extensions, with a total loan disbursement of US\$33 million.

6. Implementation performance improved moderately during the extended project period (1987-1990). Problems encountered were: (a) the continuing shortage of local funds; (b) poor performance of contractors; (c) unfavorable weather; (d) sporadic law and order problems; (e) shortage of construction materials; and (f) the reorganization of NIA.

7. It has taken about 11 years to complete three out of six irrigation systems retained after the 1985 project restructuring, and it will probably take another 3-4 years to complete the remaining three schemes. The irrigation and drainage works for Dulangan, Malatgao and Caguray irrigation systems were fully completed by 1990, while only 10-25% of the works for the Mag-Aswang-Tubig, Mongpong and Batang-Batang systems remained to be completed by the time of PCR mission in February/March 1992. The present schedule is to complete the works by 1994, with an estimated additional cost of US\$3.6 million. Total cost of the project, including completion of the remaining works for the above three irrigation systems, is estimated at about US\$58 million. This would be 104% of the cost as estimated at the time of the project's restructuring and 49% of the total project cost estimated at appraisal. In the 1990/91 crop season, a total service area of about 17,200 ha had been generated but, of this, only about 7,100 ha during the wet season and 4,300 ha during the dry season were actually irrigated due to water shortages, and incomplete land clearing and land preparation.

8. In contrast to the unsatisfactory irrigation components, which accounted for over 80% of the total base cost at appraisal, the other components (malaria eradication in Palawan, training of NIA staff and farmers, O & M study, and monitoring and evaluation) were satisfactorily implemented.

Results

9. General: At full development in the year 2000, the project is expected to generate a total service area of 19,160 ha, which would be 83% of the area estimated at project restructuring and 51% of the original appraisal estimate of 37,800 ha. Based on the results of monitoring and evaluation surveys, irrigation intensity increased by 109% from 26% in the without project situation (WOP) to 135% with the project (WP), or about 30% lower than the

increase of 140% estimated at appraisal. The SAR assumed that the whole rainfed area would be fully irrigated in both seasons with the project, whereas the PCR estimates that 100% of the area in the wet season and only 36% in the dry season can be irrigated due to limited water supply. The cropping intensity increased by 30%, from 116% in WOP to 146% in WP, compared to an increase of 54% estimated at SAR. Overall yields of irrigated paddy increased by 1 t/ha, from 3.1 t/ha in WOP to 4.1 t/ha in WP, or about 40% less than the incremental yields of 1.7 t/ha estimated at SAR. This reduction is due to under-estimated yields in the WOP assumed at appraisal. Total annual incremental production is estimated at 54,200 tons, or about two-thirds lower than the appraisal estimate of 166,000 tons.

10. Economic Rate of Return (ERR). Separate ERR estimates were undertaken for the overall project and for individual irrigation systems. The re-estimated ERR for the overall project, calculated in 1991 constant prices over a 40-year project life, is 6% assuming the import parity price of paddy in calculating the economic benefits, compared with 18% estimated at appraisal. The lower ERR is due to the significantly reduced benefitted areas, lower incremental cropping intensities, lower yields and price of paddy, delayed benefits and project cost over-run. In the case of the Dulangan system, the benefitted area was reduced by 70% from 1,400 ha estimated at appraisal to 400 ha at project completion.

11. Per Capita Incomes. The annual per capita income has been re-estimated to increase sixfold from the average of US\$37 in the pre-project period to US\$216 in WP for the owner-operator farms and fivefold from the average of US\$29 before the project to US\$148 in WP for the leaseholder farms. The per capita income of the owner-operator farms, accounting for two-thirds of the total 6,700 farmers, are slightly above the absolute poverty income level, while the leaseholder farms are about 25% below it.

Sustainability

12. If the project is to be self-sustaining the water distribution system will need to be maintained in a satisfactory condition so that tail-end farmers are able to enjoy conditions comparable with those upstream. In general, system O&M has been inadequate due to NIA's difficult financial situation (insufficient income from the collection of irrigation service fees, and a decrease of NIA's other earnings). As a result, the systems have already deteriorated from the "as new" condition. However, with the assistance of the Bank under the Irrigation Operations Support Project (IOSP, Loan 2948-PH), NIA has set out to increase its ISF recovery and to progressively transfer responsibility for maintenance below the main canals to the beneficiaries. In the case of the smaller systems and similarly separable portions of larger systems, a longer term goal is for the beneficiaries to assume part of the amortization of the capital cost, following the Communal Irrigation Systems model. Early indications are positive, but progress is slow. If NIA succeeds in reversing the slow deterioration of the distribution system through improved maintenance by the beneficiaries, the prospects of the project becoming self-sustaining are good. On the other hand without the cooperation of users, the result would be the familiar rehabilitation at regular intervals of 5-7 years. This underlines the importance of continuity of the IOSP program.

Findings and Lessons Learned

13. The project suffered from a number of shortcomings from the design stage through implementation. The most important were technical and funding constraints. The technical weaknesses at the design and implementation stages have substantially reduced the viability of the project. A lack of hydrology data at project design resulted in considerable reductions in the service areas and caused difficulties in system operation. The funding constraints severely affected overall progress and are currently threatening project sustainability by deferring necessary maintenance.

14. The implementation experience suggests a number of lessons. The most important are:

- (a) In designing a project, the problems of executing construction works in remote areas should be given due weight.
- (b) To ensure timely and successful project implementation, it is essential to tailor the construction work to the practical resources of the Government, with generous allowance for the time required for the start-up and procurement procedures.
- (c) If there is need for land clearing and land preparation, funds or credit should be adequately provided in parallel with irrigation development.
- (d) The funding demands on Government, taking into account concurrent projects, must be kept within its realistic capacity.
- (e) Collection and generation of reliable hydrological data is essential for proper planning and implementation of irrigation projects.

PROJECT COMPLETION REPORT

PHILIPPINES

MEDIUM SCALE IRRIGATION PROJECT

(LOAN 1809-PH)

PART I: PROJECT REVIEW FROM BANK'S PERSPECTIVE

1. Project Identity

Project Name : Medium Scale Irrigation Project
Loan No. : Ln. 1809-PH
RVP Unit : East Asia and Pacific
Country : Philippines
Sector : Agriculture
Subsector : Irrigation

2. Background

2.1 The Bank's agricultural sector strategy for the Philippines in the early 1970's included supporting the Borrower's objectives of attaining self-sufficiency in grain production, particularly rice and corn, and strengthening the sector's supporting institutions. Self-sufficiency in grain production was considered important to raise farm incomes and strengthen the balance of payments position. In support of this strategy, the Bank approved a series of irrigation development projects from December 1969 to March 1980. This project, approved in March 1980, was the eleventh in the series. Subsequently, in 1982, the first Communal Irrigation Development Project (Loan 2173-PH) was approved, followed by the two most recent loans, the Irrigation Operations Support Project (IOSP, Ln. 2948-PH) in June 1988 and the Second Communal Irrigation Development Project (Ln. 3261-PH) in October 1990.

3. Project Objectives and Description

3.1 The project was designed to increase rice production by about 166,000 tons per year, and farm incomes of about 12,000 families, of which about 60% were within the poverty target groups, through utilization of the potential water and land resources in the three least developed provinces of Mindoro Oriental, Mindoro Occidental and Palawan (see Map). It was intended to finance a six-year (1980-1985) development program, incorporating the following elements: (1)

rained or previously had only limited irrigation; (ii) construction of three new divisional and three new field offices, and extension of two existing divisional and two field offices for the National Irrigation Administration (NIA); (iii) provision of consulting services to assist NIA in the design of major hydraulic structures and in training personnel to prepare detailed topographic maps based on aerial photography; (iv) procurement of vehicles and equipment for project implementation, operation and maintenance; and (v) strengthening the malaria control unit of the Ministry of Health in Palawan. The project also provided for strengthening NIA's existing monitoring system and expanding it to cover the national irrigation system under the Mindoro Rural Development Project (MRDP) (Ln. 1102-PH) and the proposed project area; and financed consulting services to evaluate the present position of the operation and maintenance (O&M) aspects of all national irrigation systems and to develop a plan of action for their improvement, complemented by O&M training of NIA staff.

3.2 The total project cost was estimated at US\$118.5 million. Bank Loan 1809-PH, of US\$71 million, was intended to finance all the foreign exchange costs (47%) and about 24% of local costs. The Government was to finance the balance of the cost, equivalent to US\$47.5 million, through annual budget appropriations to NIA. NIA bore overall responsibility for project implementation, with the Ministry of Health (MOH) supporting the non-civil works activities of the malaria eradication component. A project manager (initially the director of MRDP) handled day to day implementation and was responsible to NIA's Assistant Administrator for Project Development and Implementation.

4. Project Design and Organization

4.1 The project had a clear conceptual foundation which fitted well with the Government's development goals of increasing food production, improving farm incomes of the rural poor and supporting the policy of a more geographically balanced development program. However, due to overly-optimistic programming and severe shortage of local funds, the project had to be restructured and reduced in scope in April 1985 (para. 5.1).

4.2 The project was prepared in 1978/79 by NIA's Project Development Department. Two successive Bank missions pre-appraised and appraised the project in 1979. In general, the quality of project preparation was poor. The design focussed principally on the creation of physical irrigation facilities and did not give sufficient weight to the lack of basic data, particularly on hydrology; difficulties of working on relatively remote islands; the characteristics of participating farmers and their needs; and the experience with problems encountered in the implementation of the earlier Bank-assisted MRDP (Ln. 1202-PH) in Mindoro Oriental province.

4.3 There were no dry-weather discharge records available for four of the six river systems; data generated from neighboring rivers or from those on other islands assumed to be similar, were used for the hydraulic design. In the case of the Caguray system, though discharge records were available, they were not used because the flows were thought to be too low. This led to over-estimated service areas and caused difficulties in system operation.

4.4 The structural design was in general adequate. However, the design of the manually operated floodgates was poor at Caguray, and thus they proved very difficult to operate. It was noted that the omission of diversion dams for three systems at project restructuring had not unduly affected their performance, although in one case (Mag-Asawang-Tubig) the irrigated area was substantially reduced (para. 5.19).

4.5 Throughout the implementation period, land development lagged far behind irrigation development; presently about 3,600 ha of idle and brushland remains to be developed. Though the needs for land clearance (2,500 ha in Mindoro) and removal of coconut stumps (3,200 ha in Palawan) were identified at project preparation and appraisal, neither a land development plan nor financial support for land development was provided in the project.

4.6 The proposed organizations for construction and O&M of the systems were good. However, there was a lack of formal linkages between NIA, Department of Agriculture (DA), Land Bank of the Philippines (LBP) and the National Food Authority (NFA) to provide necessary supportive services, including credit and storage facilities to farmers. This was evident from difficulties encountered by farmers, such as ineffective use of irrigation water, lack of access to institutional credit and drying and storage facilities.

5. Project Implementation

5.1 Critical Variances in Project Implementation. Due to low physical achievements, the project was restructured and reduced in scope in April 1985. Total project cost was re-estimated at about P870 million (US\$56 million) and implementation was re-scheduled for completion in 1994. The Bank Loan was reduced to US\$33 million, by cancelling US\$38 million (US\$34 million on April 1, 1985 and US\$4 million on January 24, 1989). The project as restructured included: (i) the completion of three on-going systems (Dulangan, Caguray and Malatgao) in each of the provinces; (ii) deletion of the Bongabon system (inclusive of the diversion dam) on grounds of low economic viability; and (iii) construction of the redesigned three remaining systems (Mag-Asawang-Tubig, Mongpong and Batang-Batang) by eliminating the corresponding three diversion dams. Consequently, the re-estimated total irrigable area of the six systems was reduced by about 40% from 37,800 ha to 22,950 ha as follows: Dulangan 1,400 ha and Mag-Asawang-Tubig 5,300 ha in Mindoro Oriental; Caguray 3,310 ha and Mongpong 2,100 ha in Mindoro Occidental; Malatgao 6,840 ha and Batang-Batang 4,000 ha in Palawan. The potential irrigable area of the Mag-Asawang-Tubig included 500 ha of land of an existing communal irrigation system, 3,700 ha of rainfed land in Pinagsabangan municipality, and a rainfed area of 1,100 ha in Magatoc municipality.

5.2 Despite the severe shortage of local funds, over 50% of the canals were lined, although the SAR proposed that most canals be unlined. This resulted in expensive development costs (see Part III, Section 5A).

5.3 Because of the relatively poor performance of contractors and in order to allow NIA to carry out more construction, the percentage of force account works was increased from 40% of the total civil works' costs to 60%. The actual

force account in the project works amounted to about 62% of the total civil works' costs.

5.4 The five divisions proposed to be established in five municipalities, were reduced to four divisions in four municipalities (see Figures 1 and 2), due to the proximity of sub-projects. In Mindoro Oriental, the two divisional offices proposed to be located in Roxas municipality were omitted and all activities and responsibilities were assumed by the divisional office in the provincial capital of Calapan. The proposed divisional offices in Mindoro Occidental were actually located in San Jose and Sablayan municipalities, while in Palawan the divisional offices were located in Narra municipality.

5.5 General. Overall, project implementation was inadequate, because of the unsatisfactory performance in carrying out the irrigation components which formed the core of the project. It took about 11 years to complete three out of the six irrigation systems retained after the 1985 project restructuring, and it will probably take another 3-4 years to complete the remaining three irrigation systems. The present schedule is to complete the remaining works by 1994, with an additional cost of US\$3.6 million (1992-1994). Total irrigable area is now estimated at 19,160 ha (Attachment 1), or 83% of the revised targets estimated at project restructuring, and only 51% of the appraisal estimates.

5.6 Project implementation was much slower than anticipated at appraisal, because of the remote location and difficult access to project work sites; over-optimistic work schedules; delays in finalizing engineering designs; shortage of staff; lengthy procurement procedures; lack of capable contractors, poor contractor performance; shortage of cement; and severe shortage and late release of local funds, especially during the early to mid-eighties. By the time of the restructuring of the project in April 1985, physical achievements were only 17% and disbursements totalled about 25% of the original Loan.

5.7 Implementation performance improved moderately during the extended project period (1987-1990). Problems encountered were the continuing shortage of local funds, poor performance of contractors, unfavorable weather, sporadic law and order problems, shortage of construction materials and changes in the management of NIA and the reorganization of its staff.

5.8 In contrast to the irrigation works, which together accounted for over 80% of the total project base cost at appraisal, the other components (malaria eradication in Palawan, organization of Irrigator Associations (IAs), training of NIA's staff and farmers, O&M study for national irrigation system and project monitoring and evaluation) were implemented satisfactorily and as planned at appraisal.

5.9 Irrigation Systems. Brief descriptions of the seven irrigation systems proposed at appraisal and the actual implementation and achievements are presented below:

5.10 Design. The SAR provided for about 25 man-months of consultant services to: (i) review hydrology and diversion dam foundation data and advise

on their locations; (ii) assist NIA in major hydraulic designs; and (iii) prepare topographic maps of irrigation areas from aerial photographs.

5.11 These services were performed satisfactorily and within the budget between 1980 and 1983. Adequate documentation was left. The six diversion dams were located and designed, but only two were built because of the 1985 project restructuring. The two dams which were built (Malatgao in Palawan and Caguray in Mindoro Occidental) have both withstood post-typhoon floods successfully. One criticism is that the very large sluice-gates on these dams are impracticably heavy for manual operation, even through gearing, and in consequence are simply left shut. Thus the investment in these gates and indeed the two diversion dams themselves are not being exploited and the main canal intake water-level is not optimized.

5.12 The 1980 consultants' review of NIA's hydrology study identified correctly the over-estimate of the dry-weather flow in three schemes (Caguray, Malatgao and Batang-Batang) which the Bank's 1979 appraisal mission had used. Following the review, no action appeared to have been taken.

5.13 Construction. Construction of three systems (Malatgao in Palawan, Dulangan in Mindoro Oriental and Caguray in Mindoro Occidental) started in 1980-81 and was completed in 1990, largely in accordance with the appraisal proposal except for additional canal lining. Details of construction are provided in Attachment 2.

5.14 The potential irrigable area of the Dulangan system is just about 30% of the original proposal of 1,400 ha, due to high ground and tree plantations. Diversion works of the Dulangan system were already constructed under MRDP up to the siphon. Construction of the siphon and distribution was done under this project. Unfortunately parts of canals in the Baco Bucayao River system which supply the siphon have been washed out by flooding, and water cannot be diverted to the Dulangan system until they are repaired.

5.15 The Caguray system was built with a diversion dam serving a single left bank intake which feeds the main canal. A small check dam additional to the appraisal proposal was constructed on the Inanggihian River, a tributary of the Caguray to augment the dry season flow. Because the sluice-gates were not opened, this dam was overtopped by floods following the 1991 typhoon and the right bank training wall breached so that the dam is out of action until it can be repaired. Modification of the sluice-gate operating gear will be required.

5.16 The Caguray dam flood sluice-gates were increased, apparently hurriedly, in August 1981, to almost three times the original area to pass the same design flood. This has made it virtually impossible to raise these gates manually and they remained closed during the 1991 flood because of lack of available operators to move them (about a dozen men are required). Sedimentation upstream presently prevents operation of the gates, but the diversion dam structure itself withstood the flood.

5.17 Construction of the other three systems (Batang-Batang in Palawan, Mag-Asawang-Tubig in Mindoro Oriental and Mongpong in Mindoro Occidental) started

in 1984-86 and was 75%-90% completed by February 1992. Completion is scheduled for 1994.

5.18 The Batang-Batang system was modified by the 1985 project restructuring. The dam was eliminated and replaced by a simple intake with two metering gates and two sluice-gates. The approach channel has to be remodelled in most years by bulldozer after the floods, but otherwise the intake-only arrangement fulfills its function adequately. The main canal serves 10 lateral canals, of which 6, started in 1984, were constructed to bring the system to 75% completion by February 1992.

5.19 The Mag-Asawang-Tubig system was the most seriously affected by the 1985 project restructuring. The service area was reduced from over 14,600 ha to 5,300 ha as a result of elimination of the diversion dam and long canals. Presently the system diverts water from the Macatoc River to irrigate an area of about 1,600 ha north of the Municipality of Victoria. A separate system irrigates a further 3,700 ha on both right and left banks of the Mapalo/Pinagsabagan River. Water is diverted from the Mag-Asawang-Tubig River by an intake and short canal into the Mapalo/Pinagsabagan system, where a second check-dam serves two canals. This requires several details for completion but diversion is possible and overall this system, which started in 1986, is presently 90% completed.

5.20 The Mongpong system was about 86% completed in March 1992. The 1985 project restructuring replaced the diversion dam by three simple intakes on the main river and one check-dam on a tributary.

5.21 Training. The project was to provide: (i) local training to NIA's staff and farmers; and (ii) thirty study tours and short training scholarships of three to five weeks in neighboring countries and six post-graduate scholarships for NIA's staff working on design, construction, O&M, monitoring and evaluation and agricultural aspects of the irrigation project.

5.22 The training effort was in general satisfactory. The implementation of this component went beyond the scope anticipated at appraisal. Local training was provided to NIA's staff from 1983 to 1988 in 28 seminars and workshops on a wide range of subjects held in Manila and in each of the provinces concerned. The emphasis was on management and operational procedures, acknowledged as the most important of NIA's functions requiring reinforcing. Some 800 participants attended these meetings.

5.23 The overseas study tours and training program involved 12 engineers in technical and management training for a total of 14 man-months ranging from one- to two-months. Three persons went to India, one to Italy and the remainder to Bank's courses in Washington. The proposed six post-graduate scholarships were eliminated due to the country's tight financial situation.

5.24 Approximately 1,440 members of IAs' Boards of Directors and farmers attended one to two weeks training on water-system management, financial management systems and basic leadership. The importance of O&M was stressed, but its effect on project system operation is still not evident.

5.25 Input-Output Monitoring. The input-output monitoring program previously established for service areas developed under other projects, with a view to monitoring the flow and build-up of farm inputs and the size of benefit flows to recipients, was to be extended to the systems of MRDP as well as to the seven irrigation systems under the project.

5.26 A Monitoring and Evaluation Unit (M & E) was established and training of staff of the unit was completed in 1981 by NIA's Institutional Development Department (IDD). By mid-1982, a five-year agricultural development plan for the MRDP area was prepared and endorsed for implementation by the MRDP's Agricultural Development Council. One input-output monitoring survey for the 1982 dry season was also conducted.

5.27 However, under the project, NIA found that impact monitoring and evaluation, rather than the input-output monitoring proposed at appraisal, would prove more useful and it was accordingly adopted for implementation. General household surveys were conducted in mid-1981 in all the proposed sub-project areas, followed by benchmark surveys which were conducted for the 1981 wet season and the 1982 dry season. Seasonal farm management surveys, using about 20-30 farmer samples in each sub-project area, were conducted for wet and dry seasons, covering the periods 1982-1991 for sub-projects in Mindoro Occidental, 1983-1991 for sub-projects in Palawan and 1984-1991 for sub-projects in Mindoro Oriental. Due to staff re-organization during 1986-1987, most of the monitoring staff were laid off and further works were carried out by the Regional Irrigation Office staff under the newly introduced Irrigation Management Information System. Despite the shortage of staff and funds, the performance of the M&E unit was generally satisfactory and adequate data were collected for the project's impact evaluation.

5.28 O&M Study. The project financed 45 man-months of consulting services for a study to evaluate the present position and develop a plan of action for the improvement of O&M in all national irrigation systems.

5.29 The study, completed by a USA/ Philippine consultant consortium in 1985, actually represented the third phase, and built on the analytical work undertaken by NIA in the course of the two earlier phases to produce a costed proposal for a medium-term nine-year Irrigation O&M Improvement Program for NIA. The Bank used this study as the basis for formulating and appraising the on-going Irrigation Operations Support Project (Ln. 2948-PH). The study was completed within the time limit and the budget. The performance of the consultants was good and their report provided a useful framework for transforming NIA into an irrigation management, rather than a construction, agency.

5.30 Strengthening of the Malaria Control Unit in Palawan. The project included a provision of US\$600,000 (including physical and price contingencies) to strengthen the Malaria Control Unit in Palawan over five years. To achieve this, the unit was to concentrate its operations in the municipalities of Narra and Aborlan, where the two project irrigation systems are located.

5.31 The program started promptly in 1980 and proceeded well throughout the implementation period (1980-1987). Staff were recruited on time, and materials,

equipment, vehicles and buildings were purchased or constructed as anticipated. Major activities undertaken were: residual spraying of houses, fortnightly fogging (ULV Malathion) of villages and campsites, biological measures including construction of bio-ponds, seeding of streams with larvivorous fish and clearing of stream banks, intensified surveillance operations including taking of blood smears, preventive treatment, radical treatment and follow-up of positive cases, malariometric surveys and investigation of positive cases, and entomological control and evaluation. As a result of the intensive malaria control program, positive malaria cases dropped from 1,025 cases (or a slide positivity rate (SPR) of 35.8%) in 1980 to 10 imported cases (or SPR = 0.6%) and zero indigenous cases in 1987. Regular activities have been carried out by MOH since 1988.

5.32 Farmer Irrigator Groups (FIGs) and Irrigator Associations (IAs). Although not originally included under the project, during its implementation a total of 6,700 farmers were organized into 414 FIGs covering a total irrigable area of about 19,160 ha, about 50 ha per irrigation unit. These FIGs were affiliated with 37 Irrigator Associations (IAs) with each IA covering about 400-500 ha. Thirty-three IAs have been formally registered with the Securities and Exchange Commission. However, a few farmers have not become members of IAs, although they do participate in O&M organized by FIGs and IAs and paid for the irrigation service fee (ISF) at the rate of 150 kg paddy per ha for the dry season and 100 kg per ha for the wet season, to cover NIA's O&M costs. As already noted (para. 5.24), training was provided to about 1,440 members of the Boards of Directors (BOD) of IAs and farmers. However, because of frequent changes in members of IAs' BODs, many newly elected members have never received the above training. Generally, therefore, the performance of FIGs and IAs needs to be improved through further follow-up training of new members of BODs and farmers in water management in order to ensure effective use of irrigation water at the field level. Other difficulties encountered by irrigators were lack of credit and storage facilities.

5.33 Irrigation Service Fee (ISF). Except for the Dulangan, Mongpong and Batang-Batang systems, which suffered flood damage and/or water shortage, the average annual collection rate of ISF for the three remaining systems has been good at 75-90%, compared with the average of 50% for all national irrigation systems. ISF has been collected mostly in kind in the form of paddy, which poses storage and marketing problems for NIA. There is an understanding that the National Food Authority (NFA) would procure NIA's in-kind ISF collections, but this does not always happen because NFA is often very short of funds.

5.34 Total cost of the project, including the costs for completion of the remaining works for the above three irrigation systems, is estimated at about US\$58 million. This would be 104% of the cost as estimated after the project's restructuring and 49% of the total project cost estimated at appraisal.

Project Results

5.35 Impact. At full development in the year 2000, the project is expected to generate a total service area of 19,160 ha, which would be 83% of the area estimated at project restructuring and 51% of the original appraisal estimate of 37,800 ha. The reasons for the service area being substantially lower than that

estimated at appraisal are the elimination of major irrigation facilities and optimistic estimates made at appraisal. Based on the results of the monitoring and evaluation surveys, irrigation intensity increased by 109%, from 26% in the Without Project Situation (WOP) to 135% in the With Project Situation (WP), or about 30% lower than the increase of 140% estimated at SAR. The SAR assumed that all the rainfed area was to be fully irrigated in both seasons in WP, whereas the PCR estimate is that 100% of the area in the wet season and only 35% in the dry season can be irrigated due to limited water supply. The cropping intensity increased by 30%, from 116% in WOP to 146% in WP, compared to an increase of 50% estimated at SAR. Overall yields of irrigated paddy increased by 1 t/ha from 3.1 t/ha in WOP to 4.1 t/ha in WP, or about 40% lower than the incremental yields of 1.7 t/ha estimated at SAR. This reduction is due to the under-estimated yields in the WOP assumed at appraisal. Total annual incremental production is estimated at 54,200 tons, or about two-thirds lower than the appraisal estimate of 166,000 tons.

5.36 Economic Rate of Return (ERR). Separate ERR estimates were calculated for the overall project and for the individual irrigation systems. The re-estimated ERR for the overall project, calculated in 1991 constant values over a 40-year project life, is 6% assuming import parity prices of paddy in calculating the economic benefit, compared with 18% estimated at appraisal. The latter was, however, based on export parity prices which are no longer relevant as the Philippines has become essentially a net importer of rice and will likely remain in that situation in future years. For comparative purposes, using current export parity price projections, the re-estimated ERR for the overall project would be only 2.3%; if the export parity price of paddy projected in the SAR (for 1990, expressed in 1991 constant value) were used, the re-estimated ERR would be about 10%. The lower re-estimated ERRs are due to the significantly reduced benefitted areas, lower incremental cropping intensities and yields and price of paddy, delayed benefits and project cost over-run. In the case of the Dulangan system, the benefitted area was reduced by 70% from 1,400 ha estimated at appraisal to 400 ha at project completion.

5.37 Farm Incomes. Farm incomes resulting from the impact of irrigation development in the three provinces have been re-estimated. Two farm sizes of 2.5 ha in Mindoro and 5 ha in Palawan, accounting for two-thirds of owner-operators and one-third of leaseholders have been analyzed. Because of the old resettlement area, there are a few amortizing farmers and they have been excluded from the analysis. Incomes from other off-farm activities were taken at about one-third of the farm incomes.

5.38 At full development, the annual per capita income has been re-estimated to increase sixfold from the average of US\$37 in the pre-project period to US\$216 in WP for the owner-operator farms, and fivefold from the average of US\$29 before the project to US\$148 in WP for the leaseholder farms. The low farm incomes are due to the reasons given in para. 5.35 and the high prices of fertilizers resulting from removal of subsidies. The incomes of the owner-operator farms, accounting for two-thirds of the total 6,700 farmers, are slightly above the absolute poverty income level of US\$200, while the leaseholder farms are about 25% below it.

6. Project Sustainability

6.1 The Bank recognized the importance of regular maintenance of the distribution systems to the project's sustainability by providing for a consultant study to develop an action plan for the improvement of the O&M of all national irrigation systems by NIA. The results of this study became the basis of the IOSP (see para. 5.29). If the project is to be self-sustaining, the water distribution system will need to be maintained in the "as new" condition so that tail-end farmers can enjoy conditions comparable with those upstream and all may be able to exploit the facility to the optimum. System O&M in the Philippines has been inadequate due to NIA's difficult financial situation (insufficient income from the collection of ISF and decrease of NIA's other earnings). As a result, the systems have already deteriorated from the "as new" condition. However, with the support of the Bank through the IOSP, NIA has set out to increase its ISF recovery and to progressively transfer responsibility for maintenance below the main canals to the beneficiaries. In the case of the smaller systems and similarly separable portions of larger systems, a longer term goal is for the beneficiaries to assume part of the amortization of the capital cost following the Communal Irrigation Systems model. Early indications are positive but progress is slow.

6.2 If NIA succeeds in reversing the present slow deterioration of the distribution system through improved maintenance by the beneficiaries, the prospects of the project being self-sustaining are good. On the other hand, without the cooperation of users, the result would be the familiar and costly one of rehabilitation at regular intervals of 5-7 years. This underlines the importance of continuity of the IOSP program.

7. Bank Performance

7.1 The Bank's performance was weak in project design, but it was generally satisfactory during implementation. The SAR proposed an overly optimistic physical construction program and failed to identify the major risks of the non-attainment of the proposed irrigated areas and cropping intensities, given that no data on river flows existed for four of the six rivers concerned (para. 4.3). This lapse was highlighted in the Consultant's review of the project hydrology (para. 5.12), published within six months of the start-up of the project, but there is no record of any action having been taken. On the agricultural development aspects, though the needs for land development were identified, financial support for this purpose was not included under the project, which resulted in a slow rate of land development during the project period (para. 4.5).

7.2 The Bank's performance was stronger during project implementation. Of the 13 supervision missions over 11 years, 12 missions had at least one irrigation engineer as a member. However, the frequency of the missions was inadequate considering the problematic nature of this project and the fact that two or three projects were supervised per visit. Staff continuity was maintained and the quality of advice was sound. When the financial constraints became very critical, the Bank was flexible and helpful in re-structuring the scope of the

project and re-scheduling its implementation period, as well as in increasing the share of the force account works.

7.3 The most important lessons of experience for the Bank are:

- (a) In designing a project, the problems of executing construction works in remote areas should be given due weight.
- (b) To ensure timely and successful project completion, it is essential to tailor the construction work to the practical resources of the Government, with generous allowance for the time required for the start-up and procurement procedures.
- (c) If there is need for land clearing and land development, funds or credit should be adequately provided in parallel with irrigation development.
- (d) The counterpart funding requirements, taking into account concurrent projects, must be kept within Government's realistic capacity.
- (e) Collection and generation of reliable hydrological data is essential for proper planning and implementation of irrigation projects.

8. Borrower Performance

8.1 The Borrower's chief weakness was the inability to fund the counterpart contributions when required. This was perhaps due to overoptimism at appraisal, but mainly to the country's economic recession in the early and mid-eighties, accompanied by the change of the Government, which could not reasonably have been foreseen in 1979. Another demonstrated weakness was the lack of a good data base, particularly river discharges and rainfall records, for project design. It is regrettable to note that the river-flow readings, which were started on the project rivers in 1980, have been allowed to lapse since 1986 and that there was a general lack of rainfall data within the catchments. Such data are not expensive to collect and are a very worthwhile investment.

8.2 The Borrower substantially complied with the loan covenants. There were delays in respect of the submission of Audit Reports for some years. However, this was attended to and all reports have been submitted.

8.3 In other aspects, the Borrower demonstrated considerable strength. NIA, though with delay, is now adequately staffed with qualified and competent professionals. Project management is generally satisfactory and good records are being kept.

8.4 The main lessons to be learned from the Borrower's performance are: (a) that government's ability to provide counterpart funding should be realistically assessed at appraisal; (b) collection and generation of reliable hydrological data is essential for proper planning and implementation of

irrigation projects; and (c) the problem of correcting watershed deterioration should be addressed before embarking on irrigation projects.

9. Project Relationship

9.1 The relationship between the Bank and Borrower was satisfactory throughout the project period. This was particularly important in successfully maneuvering the project through times of severe budget constraints, in reducing the scope of the project and in extending the implementation period by four years in order to achieve important targets. In a wider sphere, cooperation between NIA and other Government agencies (DA, Land Bank and NFA) could have been better in relation to the provision of agricultural support services.

10. Consulting Services and Procurement

10.1 The performance of the Design and O&M Consultants, already described in paras. 5.11-5.29, was satisfactory. Procurement was in general satisfactory as a result of NIA's familiarity with Bank procedures. However, some local civil engineering contracts were late or had to be abandoned completely due to financially unsound contractors being permitted under procurement procedures. A future improvement would be to raise the award ceilings for provincial offices and to adjust these for inflation.

11. Project Documentation and Data

11.1 The SAR provided a satisfactory implementation framework for the Bank and Borrower. However, because of the lack of detailed engineering design for the proposed irrigation systems, coupled with unforeseen severe budget constraints, the usefulness of the SAR as a yardstick to measure the achievement of physical and financial targets was reduced.

11.2 The provisions of the loan agreement were generally observed. The project maintained proper accounting and generated a good data base for the purposes of impact evaluation.

PART II: PROJECT REVIEW FROM BORROWER'S PERSPECTIVE

1.1 The National Irrigation Administration (NIA), the statutory corporation that implemented the irrigation component (accounting for over 80% of the total base cost at appraisal), agrees in general with the findings and assessment of the PCR mission.

1.2 Implementing a project stretched/scattered over two islands comprising three provinces is considerably more difficult than implementing a project which is contiguous or at least located in just one province. In fact, a project which is scattered over just one province could equally prove to be difficult if the geography is similar to that of Mindoro or Palawan. But, surely, the problems/risks inherent to this project situation must have been apparent to the planners. The ideal approach in implementing such a project would be to establish fully equipped construction offices in each sub-project area. However, due to funding constraints, this approach could not be effected as it would only serve to stretch the limited resources too thinly, leading to overruns in administrative costs.

1.3 NIA is now beginning to see the usual 5-year project implementation period as an arbitrary figure not based on careful and conscientious planning. This is especially so if we consider past experiences and the fact that detailed engineering/design is undertaken within the first two years of the 5-year implementation period. It is now, therefore, prudent to recommend that the Bank considers extending project loans in two tranches. The first tranche would cover the detailed engineering/design and the procurement of consultants, equipment and major civil works packages. The second tranche would cover actual construction.

1.4 Ideally, if there is a need for land development, funds or credit should be adequately provided in parallel with irrigation development. The issue that must be properly addressed in this regard, however, is whether to include the cost of land development in the determination of the total project cost, since to include it may make the project less economically viable.

1.5 Since experience had already established the inability of the Borrower to provide adequate counterpart funding on a timely basis during project implementation, the Bank should consider providing within the Loan Agreement of future projects a Working Fund facility and a higher financing rate.

1.6 It is rather difficult now to establish what had happened to the Consultant's hydrologic study which confirmed the inadequacy of river flow on some of the rivers at the early stage of project implementation. We can only assume that project implementation was all geared up by then and that nobody was ever really bothered by the results of the study. Nevertheless, the issue is said to properly addressed under the World Bank-assisted CIDP II.

1.7 The Bank supervision missions were, in general, helpful and useful, especially during project reformulation. However, we agree with the PCR Mission that these supervision missions should have been more frequent when the project

started becoming problematic; and the supervision missions' workload should not have been overcrowded with two or more projects within a very short duration.

1.8 Not even the presence of a dependable hydrologic data (actual measurement of river flows) could ensure a good calculation of the service area if we take into account the rate of deterioration Philippine watersheds are undergoing. Perhaps, we should try to address first the problem of watershed deterioration before embarking on irrigation projects.

1.9 Dependable availability of irrigation water should ensure increase in production. However, water is but one of the basic inputs for increased productivity. Proper application of fertilizers and pesticides and the use of high yield varieties play a major role in increasing production. Credit could also be considered a major input; for without credit, most the farmer-beneficiaries could hardly afford to finance procurement and application of appropriate amount of fertilizers and pesticides. Given their current capacities, farmers would be inclined to use the traditional varieties, which are cheaper to grow but hardly approach production performance of high yielding varieties. The PCR Mission failed to provide an evaluation in this respect to explain the shortfall in the yields per hectare.

PART III
STATISTICAL INFORMATION

1. RELATED BANK LOANS

Loan No.	Project	Year of Approval	Status
637-PH	Upper Pampanga River	1969	PPAR # 3063 6/1/80
984-PH 472-PH	Aurora - Penaranda	1974	IER # 8494 3/1/90
1080-PH	Tarlac Irrigation System Improvement	1974	PPAR # 5969 12/1/85
1227-PH	Chico River Irrigation	1976	PPAR # 7923 6/1/89
1367-PH	Jalaur Irrigation	1977	PPAR # 5969 12/1/85
1154-PH	Magat River - Stage I	1976	PPAR # 7923 6/1/89
1567-PH	Magat River - Stage II	1978	PPAR # 7923 6/1/89
1639-PH	Magat River - Stage III Irrigation	1978	PPAR # 7923 6/1/89
1414-PH	National Irrigation System Improvement I	1977	PPAR # 8390 2/1/90
1526-PH	National Irrigation System Improvement II	1978	PPAR # 7820 6/1/89
2173-PH	Communal Irrigation Dev.	1982	PCR under preparation
2948-PH	Irrigation Operation Support	1988	Ongoing
3261-PH	Second Communal Irrigation Development	1990	Ongoing

FOLLOW-ON PROJECT

Name: Irrigation Operations Support
Loan Number: 2948-PH
Loan Amount: US\$23.5 million (amended 8/18/89)
Date of Board Approval: June 2, 1988

Comments: To strengthen the institutional and technical capacity of the National Irrigation Administration and Irrigator Associations to enable them to maintain the efficiency of existing National Irrigation Systems (NIS) and to improve the performance of NIS through minor rehabilitation and through increases in the annual funding to support improved levels of O&M services.

2. PROJECT TIMETABLE

	Date Planned	Date Actual
Preparation		1978-1979
Pre-Appraisal		May/June 1979
Appraisal		Sept./Oct. 1979
Negotiations		February 1980
Board Approval		March 13, 1980
Loan Signature		March 28, 1980
Loan Effectiveness	June 25, 1980	June 25, 1980
Completion	December 31, 1985	December 31, 1990
Closing	December 31, 1986	April 2, 1991

3. LOAN DISBURSEMENTS

CUMULATIVE ESTIMATED AND ACTUAL DISBURSEMENTS (US\$ MILLION)

	FY81	FY82	FY83	FY84	FY85	FY86	FY87	FY88	FY89	FY90	FY91
Appraisal Estimate	0.2	8.0	21.0	39.0	55.0	66.0	71.0				
Revised (04/85)					19.0	24.0	31.0	35.0	37.0		
Revised (01/89)										31.0	33.0
Actual		5.2	11.1	15.9	18.3	20.4	21.5	23.5	27.8	30.2	33.0
Actual as % of Appraisal Estimates	0	65	53	41	33	31	30	33	39	43	47
Actual as % of Revised Estimates	-	-	-	-	96	85	69	67	75	97	100
Date of Final Disbursement	April 2, 1991										

Comments: Total amount cancelled was US\$38 million (US\$34 million, effective April 1, 1985 and US\$4 million, effective January 24, 1989). From FY 1985 and thereafter, actual loan disbursements have been compared with the revised estimates.

4. PROJECT IMPLEMENTATION

KEY INDICATORS AS OF DECEMBER 1991

Irrigation Systems	Appraisal	Revised ^{1/}	Actual	Actual as % of Revised Targets
Number of systems	7	6	6	100
Service area (ha)	37,800	22,950	19,160 ^{2/}	83
Dam/weir (No.)	6	2	2	100
Intake structures (No.)		13	9	69
Main canal (km)	145	116	98	84
Lateral canal (km)	415	177	140	79
Main structures (No.)	417	310	288	93
Lateral structures (No.)	1,437	487	388	80
Lining (km)		58	55	95
<u>R O A D S:</u>				
-Access (km)	70	43	30	70
-Service (km)	710	273	192	70
-Structures (No.)		109	98	90
<u>D R A I N A G E:</u>				
	202			
-Canals (km)		60	47	78
-Structures (No.)	129	168	130	77
-Flood dike (km)		11.5	10.1	88
<u>F A R M L E V E L F A C I L I T I E S:</u>				
-Turnouts (No.)		568	493	87
-Main ditches (km)	361	325	236	73
-Supplementary ditches (km)	1,967	379	379	100
-Drains (km)	970	12.6	12.6	100
-Structures (No.)		559	473	85
<u>F I E L D O F F I C E S:</u>				
-New	6	4	4	100
-Rehabilitated	4	4	4	100

^{1/} The project was restructured in April 1985.

^{2/} Estimates at full development in Year 2000.

5. PROJECT COSTS AND FINANCING

A. PROJECT COSTS

	S A R ^{1/}		P C R	
	₱ Million	US\$ Million	₱ Million	US\$ Million
Irrigation Systems	846.80	114.60	884.86 ^{2/}	56.53
Input-output monitoring	11.20	1.50	1.08 ^{3/}	0.07
O&M study & training	13.30	1.80	15.17	0.96
Strength. of the Malaria Control Unit in Palawan	4.20	0.60	2.19	0.14
TOTAL	875.50	118.50	903.30	57.70 ^{4/}

^{1/} Including physical and price contingencies.

^{2/} Higher development costs in Pesos reflected the increased costs of construction material and labor; moreover, over 50% of canals were concrete-lined. Including ₱100 million for completion of remaining works (FY 1992-1994).

^{3/} No local consultants were hired.

^{4/} Lower project costs in US dollars reflected the devaluation of the Peso.

B. FINANCING (US\$ MILLION)

	S A R		P C R	
	(US\$ Million)	Percentage	(US\$ Million)	Percentage
IBRD	71.0	60	33.0	57
GOP	47.5	40	24.7	43
TOTAL	118.5	100	57.7	100

6. PROJECT RESULTS

A. DIRECT BENEFITS

	Appraisal Estimate	Actual/PCR Estimate
Incremental paddy production (tons/year)	166,000	54,200
Beneficiaries (No.)	12,000	6,700
Annual incremental farm employment (man-day million)	3	1.5

Comments: Total service areas were reduced by about 50%, while numbers of farm families were reduced by about 40%.

B. ECONOMIC IMPACT

	Appraisal Estimate	Actual/PCR Estimate
ERR (Percentage)	18	6
Assumptions		
Project Life (years)	40	40
Full development (years)	1990	2000
Standard Conversion Factor	0.82	0.83
Farm Labor Conversion Factor	0.52	0.60
Benefitted Area (ha)	37,000	19,160
Incremental Cropping Intensity (%)	50	30
Incremental Yield of Irrigated Paddy (tons/ha)	1.5-2.6	1.0

C. FINANCIAL IMPACT

Per Capita Income ^{1/} (US\$)	Appraisal Estimate ^{2/}		Actual/PCR Estimate ^{3/}	
	PP	WP	PP	WP
MINDORO ORIENTAL (2.5 ha)				
Owner-operator	60	295	38	275
Amortizing-owner	35	270		
Leaseholder	40	195	14	173
MINDORO OCCIDENTAL (2.5 ha)				
Owner-operator	60	295	60	209
Amortizing-owner	35	270		
Leaseholder	40	195	41	142
PALAWAN (5 ha)				
Owner-operator	80	510	13	164
Amortizing-owner	40	295		
Leaseholder	35	475	31	130

^{1/} Approximately 6 persons per family.

^{2/} In 1980 constant prices and at the average official exchange rate of US\$1 = ₱7.4.

^{3/} In 1991 constant prices and at US\$1 = ₱27.5.

PP = Pre-Project Situation.

WP = With the Project Situation.

D. STUDIES

STUDIES	PURPOSE AS DEFINED AT APPRAISAL	STATUS	IMPACT OF STUDY
Organization and Maintenance (O&M)	To evaluate the present position of Organization and Maintenance and develop a plan of action for the improvement of O&M of all national irrigation systems	Completed	NIA and the Bank used this study as a basis for formulating and appraising the ongoing Irrigation Operations Support Proj. (Ln. 2948-PH).

7. STATUS OF COVENANTS

Loan Agreement Covenant	Appraisal Report Paragraph	Subject	Action	Deadline	Status
3.01 (b)	3.28	Malaria eradication component	Agreement between NIA and MOH.	12/80	Done 08/80.
3.02 (a)	3.20	Design consultants	Appointment.	-	Started 1980. Completed 1983.
3.02 (b)	3.25	O&M studies	Consultant's terms of reference.	-	Started 1980 and completed 1983.
3.05 (a)	3.16	Water rights	To be vested in NIA.	-	Done 1980.
4.03	3.36	Accounts and audit	Annual audited accounts and audit report to be submitted within 6 months of FY end.	-	1989 reports received.
4.04 (b)	6.13	Water rates	NIA to levy and collect water charges.	-	Complied. Started 1981.

8. USE OF BANK RESOURCES

A. STAFF INPUTS

Stage of Project Cycle	Actual (Staff Weeks)
Pre-appraisal (LENP)	100.0
Appraisal through Board Approval (LENA + LENN)	38.1
Supervision	73.9
P C R	10.0 ^{a/}
TOTAL	222.0

^{a/} Estimate

B. MISSIONS

Stage of Project Cycle	Month/Year	No. of Persons	Days in Field	Specialization ^{a/}	Performance Rating ^{b/ c/}				Trend ^{d/}	Types of Problems ^{d/}
Preparation	7-8/79									
Pre-Appraisal	5-6/79	5	90	A,2B,2C						
Appraisal	9-10/79	5	95	A,2B,2C				1		
Supervision:								1		
I	9/80	1	7	B				2	1	
II	6/81	1	7	B				2	1	T
III	6/82	2	14	A,B				2	2	M,T
IV	6/83	1	7	B				2	1	M,T
V	1-2/84	2	10	2B				3	2	F
VI	10-11/84	1	31	B					2	F
VII	10/85	1	8	B	A	B	C	D	2	F
					2	1	1	2		
VIII	11/86	2	16	B,C	2	1	2	2	2	F,M
IX	9-10/87	1	8	B	2	1	1	2	2	F,M
X	11-12/88		11	B	2	1	1	2	2	F
XI	7-8/89	2	26	A,B	2	1	2	2	2	F
XII	8/90	1	6	A	3	1	3	3	2	F
XIII	1-2/91	1	7	B	2	1	2	2	2	F
P C R	2-3/92	3	42	B,2C	2	2	2	2	2	F
TOTAL			383							

^{a/} A = Agriculture; B = Engineers; and C = Economics.

^{b/} Performance Rating: 1 = Problem-Free or Minor Problems; 2 = Moderate Problems; and 3 = Major Problems.

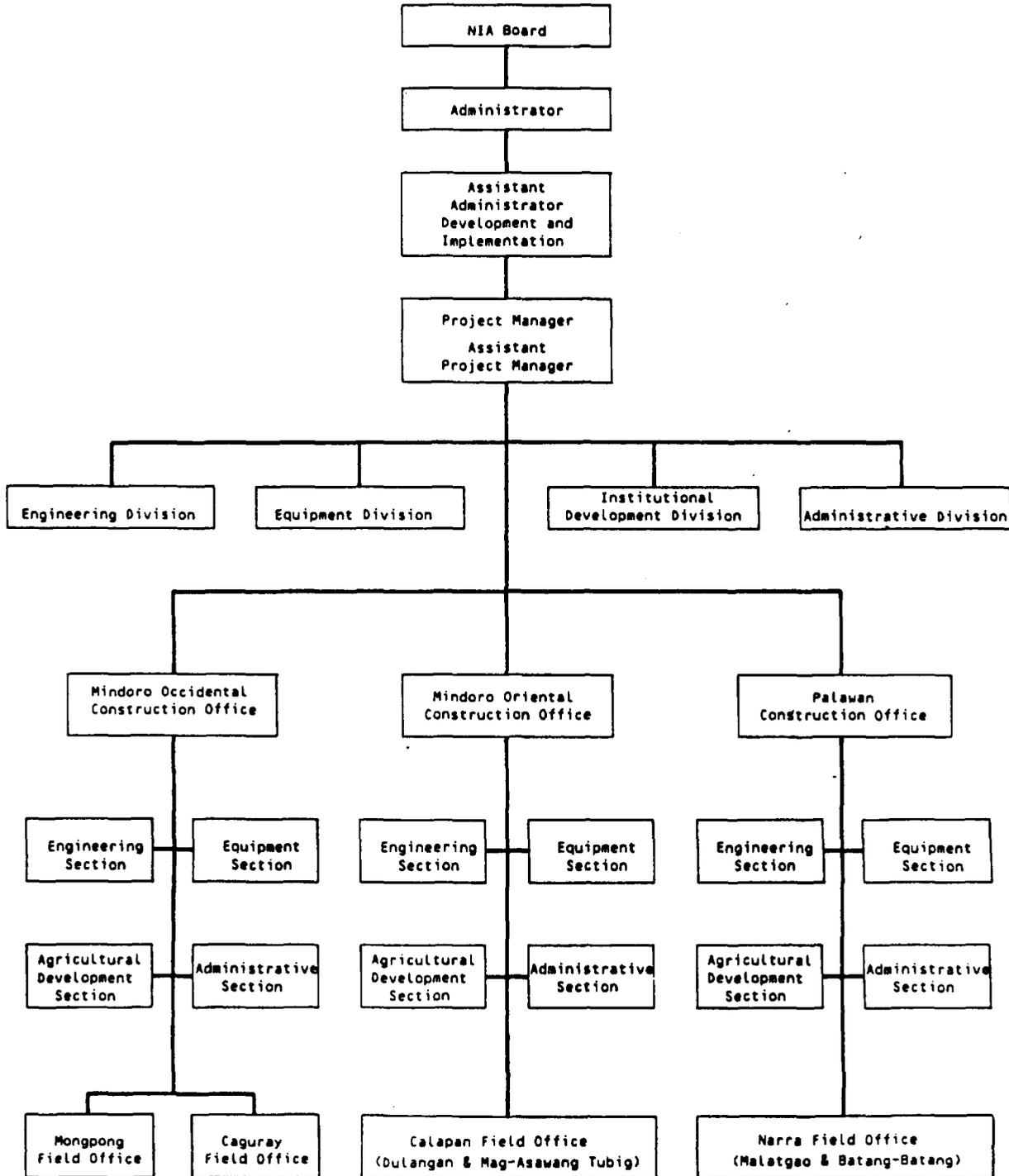
^{c/} Trend: 1 = Improving; 2 = Stationary; and 3 = Deteriorating.

^{d/} Type of problems: F = Financial; M = Management; and T = Technical.

^{e/} Revised Performance Rating: A = Availability of Funds; B = Project Management; C = Development Impact; and D = Overall Status.

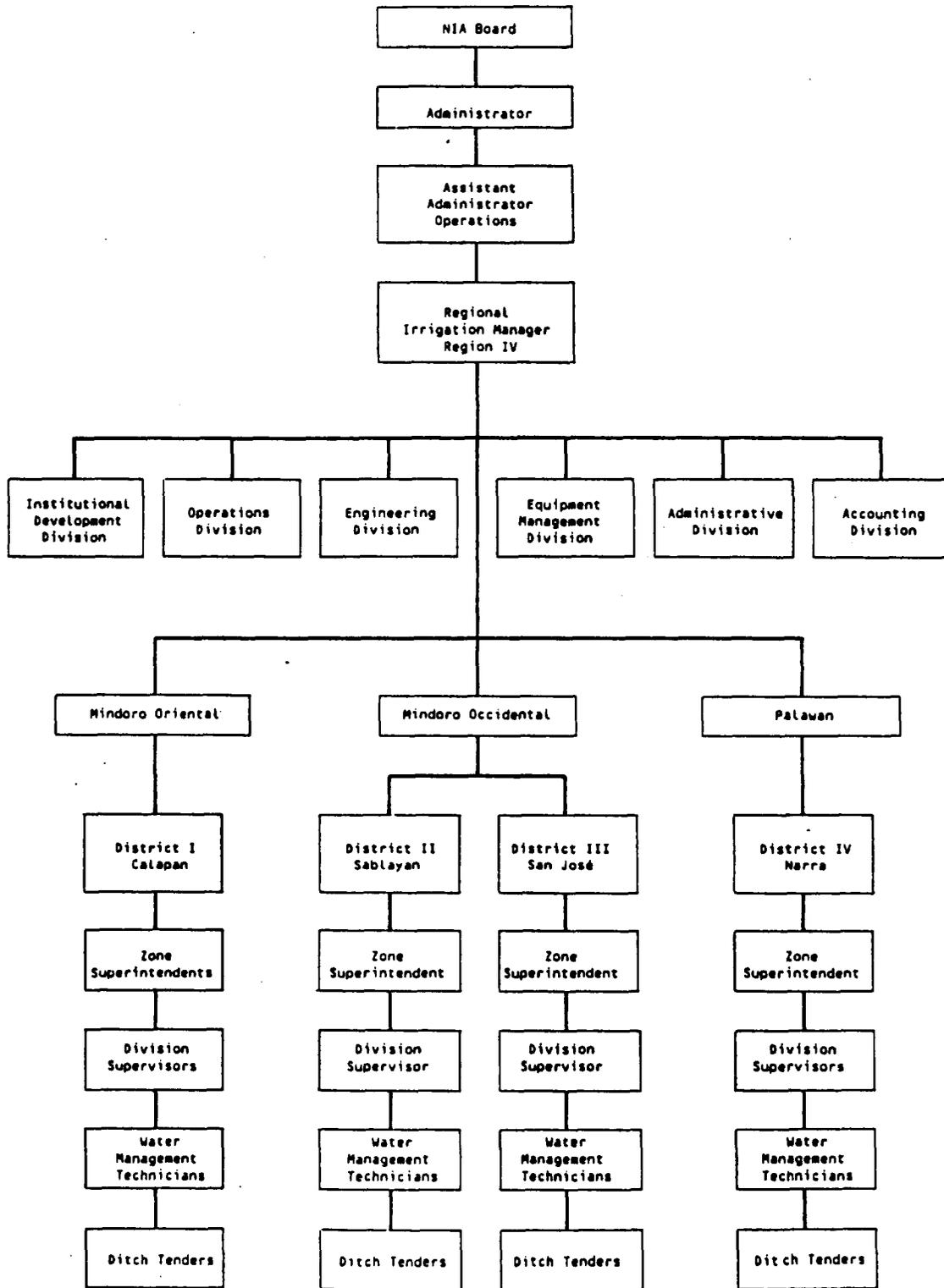
PHILIPPINES
MEDIUM SCALE IRRIGATION PROJECT

Organisation for Project Construction



MEDIUM SCALE IRRIGATION PROJECT

Organization for Operation and Maintenance



Attachment 1**Potential Irrigable Area Estimated at SAR and PCR (ha)**

	Full Potential Irrigable Area (ha)				1990/91 Irrigated Area (ha)	
	SAR		PCR		WS	DS
	WS	DS	WS	DS		
PALAWAN						
Malatgao	6,000	3,600	5,360	1,800	2,145	1,510
Batang-Batang	4,000	2,400	3,360	800	1,630	800
Sub-Total:	10,000	6,000	8,720	2,600	3,775	2,310
MINDORO ORIENTAL						
Dulangan	1,400	675	400	300	-	-
Bongabon	6,000	2,880	-	-	-	-
Mag-Asawang-Tubig	14,600	7,020	5,040	3,150	1,160	1,280
Sub-Total:	22,000	10,575	5,440	3,450	1,160	1,280
MINDORO OCCIDENTAL						
Caguray	3,400	2,176	3,060	400	1,350	400
Mongpong	2,400	1,536	1,940	500	820	350
Sub-Total:	5,800	3,700	5,000	900	2,170	750
TOTAL:	37,800	20,275	19,160	6,950	7,105	4,340

Irrigation Systems

1. Irrigation Systems. Brief descriptions of the seven irrigation systems proposed at appraisal and the actual implementation and achievements are presented below:

2. Design. The SAR provided about 25 man-months of consultant services to: (i) review hydrology and dam foundation data and advise on their locations; (ii) assist NIA in major hydraulic designs; and (iii) prepare topographic maps of irrigation areas from aerial photographs.

3. These services were performed satisfactorily and within the budget between 1980 and 1983. Adequate documentation was left. The six dams were located and designed, but ultimately only two were built because of the 1985 project restructuring. The two which were built (Malatgao in Palawan and Caguray in Mindoro Occidental) have both withstood post-typhoon floods successfully. One criticism is that the very large sluice-gates on these dams are impracticably heavy for manual operation, even through gearing, and in consequence are simply left shut. Thus the investment in these gates, and indeed the dam itself, is not being exploited and the main canal intake water-level not optimized.

4. The review of hydrology completed in 1980 correctly identified the over-estimate of dry-weather flow in three schemes, Caguray, Malatgao and Batang-Batang in the 1979 appraisal.

5. Malatgao. This system was designed to have a 200 m long dam serving canals on both banks of the Malatgao River to irrigate 6,000 ha.

6. Construction of this system started in 1981 and was completed in 1990, largely as planned at appraisal, with a diversion dam across the Malatgao River and two intakes to serve each bank. A greater proportion of canals was lined than anticipated at appraisal. On-farm development by farmers is in progress. The total area served includes some 600 ha originally irrigated by the Taritien-Malatgao communal irrigation system (CIS). The full potential irrigable area is 5,360 ha for wet season ^{1/} and 1,800 ha for dry season ^{2/}. In 1990/91 crop season, the system irrigated about 2,145 ha in wet season and 1,510 ha in dry season.

1/ Area measured in field after construction of canals and after deducting areas not irrigable because of unsuitability (high ground, residential, tree crops) or for social reasons. See Attachment 1.

2/ Probable area 8 years out of every 10.

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7. Batang-Batang. The Batang-Batang River system was to comprise a 115 m long dam to serve a single main left bank canal to irrigate 4,000 ha.

8. The design of this system was modified by the 1985 project restructuring. The dam was eliminated and replaced by a simple box-structure intake with two gates to meter the canal discharge and two sluice-gates to scour the approach channel. The approach channel has to be remodelled most years by bulldozer after the floods, but otherwise the intake-only arrangement fulfills its function adequately. The main canal of 15 km, serves 10 lateral canals, of which 6 started in 1984, were constructed to bring the system to 75% completion by February 1992. About 10 km of canal is already concrete lined and the intention is to continue this treatment. The full potential irrigable area is 3,360 ha in wet season and 800 ha in dry season. In 1990/91 crop season, the system irrigated about 1,630 ha in wet season and 800 ha in dry season.

9. Caguray. The Caguray River system was to consist of a 140 m long dam to serve a single, left bank, canal and irrigate 3,400 ha.

10. Construction of this system, started in 1980, was completed in 1990 generally in accordance with the appraisal proposal. There is a dam with a total crest length including sluiceways of about 200 meters serving a single intake on the left (south) bank which feeds water to the 15 km main canal. A small check dam additional to the appraisal proposal was constructed on the Inanggihian River, a tributary of the Caguray to augment the dry season flow. Because the sluice-gates were not opened, this dam was overtopped by floods following the 1991 typhoon and the right bank training wall breached so that the dam is out of action until it can be repaired. Modification of the sluice-gate operating gear will be required.

11. The main difference compared with the appraisal proposal is that the Caguray dam flood sluice-gates were increased, apparently hurriedly in August 1981, to almost three times the original area to pass the same design flood. This has made it virtually impossible to raise these gates manually and they remained closed during the 1991 flood. Sedimentation upstream presently prevents operation of the gates but the dam structure itself withstood the flood. The full potential irrigable area is 3,060 ha in wet season and 400 ha in dry season. In 1990/91 crop season, the system irrigated about 1,350 ha in wet season and 400 ha in dry season.

12. Mongpong. The Mongpong River System foresaw a dam of 175 m length feeding a single intake on the right bank. From the main canal an important lateral was to cross under the river in a siphon to serve the left bank. Total irrigable area was estimated at 2,400 ha.

13. Construction of this system started in 1984 and has presently (March 1992) reached about 86% completion. The system was considerably modified by the 1985 project restructuring. The dam has been omitted and one simple intake was constructed on the right bank at the dam location to serve 400 ha. A second simple intake was constructed 4 km downstream on the left bank to service some 900 ha on the left bank. A further 5 km downstream a third simple intake was constructed on the left bank to irrigate an additional 300 ha. Finally a fourth

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check structure is presently being constructed on a right bank tributary which drains the Tabtaban lake to the Mongpong River and this will add 400 ha of service area to the right bank when it is completed later this year (1992). The middle intake (i.e. the upstream, left bank, intake) was found to dry out completely in the dry season because the river subsided below its permeable bed for some 6 km of its length between the upstream and downstream intakes. No dry season crop of paddy is therefore possible for the 900 ha of the left bank served by this intake. The full potential irrigable area is 1,940 ha in wet season and 500 ha in dry season. In 1990/91 crop season, the system irrigated about 820 ha in wet season and 350 ha in dry season.

14. Dulangan. The intake arrangements for this system had been built under MRDP up to Dulangan River right bank. The project was to construct a siphon under the Dulangan River and a canal on its left bank to irrigate 1,400 ha.

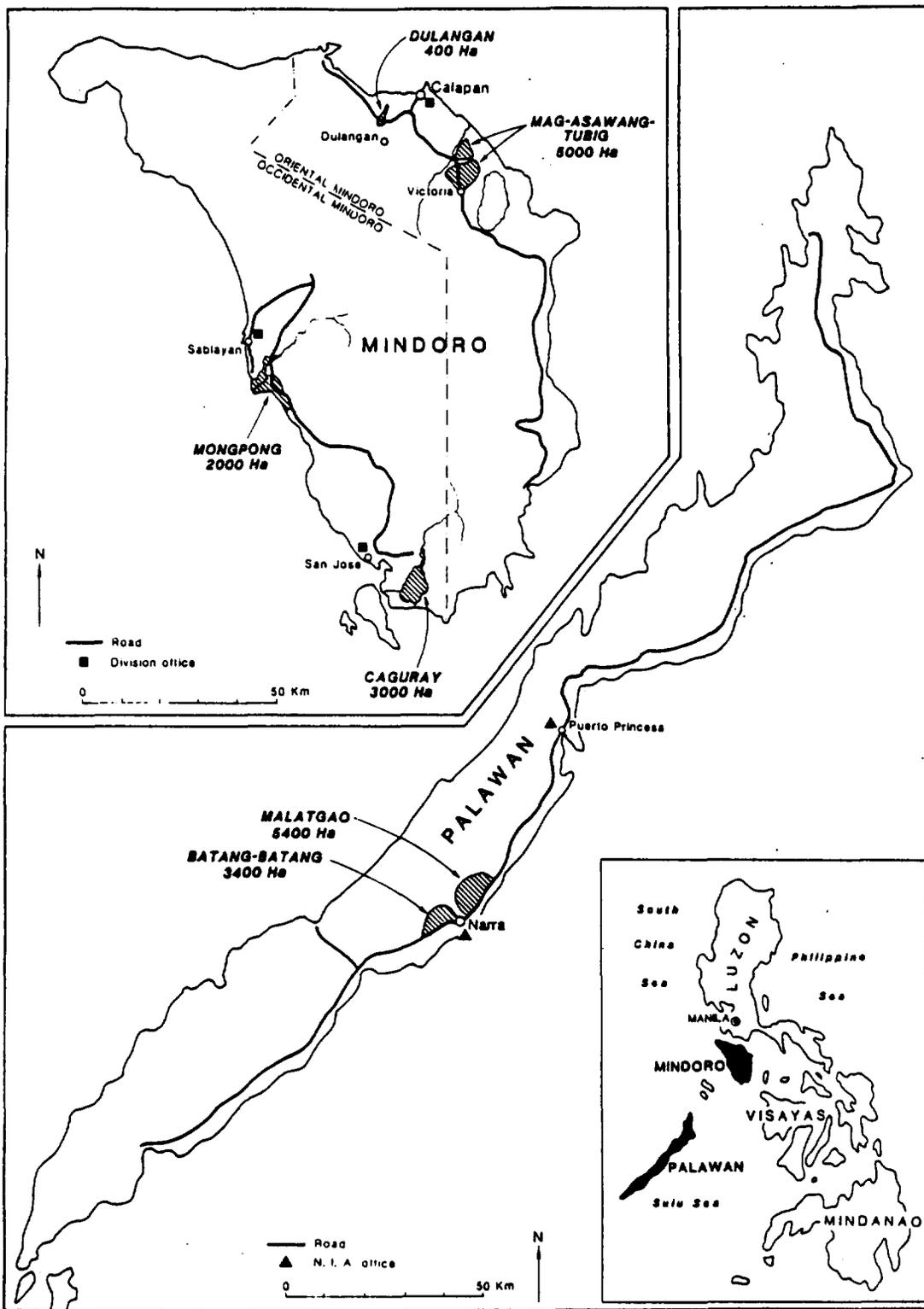
15. Construction of this relatively small system started in 1980 and was completed in 1990. It followed generally the appraisal proposal, except that the potential irrigable area has in the event turned out to be less than half the original proposal as a result of high ground and tree plantations. Diversion works for the system were already constructed under MRDP up to the entrance to siphon crossing of the Dulangan River. Construction of the siphon and the distribution systems were done under this project. The main canal was concrete lined for all its length of 4 km. Unfortunately parts of canals in the Baco Bucayao River system, which supply the siphon have been washed out in flooding and until they can be repaired water cannot be diverted to the Dulangan system. The full potential irrigable area is 400 ha in wet season and 300 ha in dry season. In 1991 crop season, the siphon was damaged by flood and the system was not in operation.

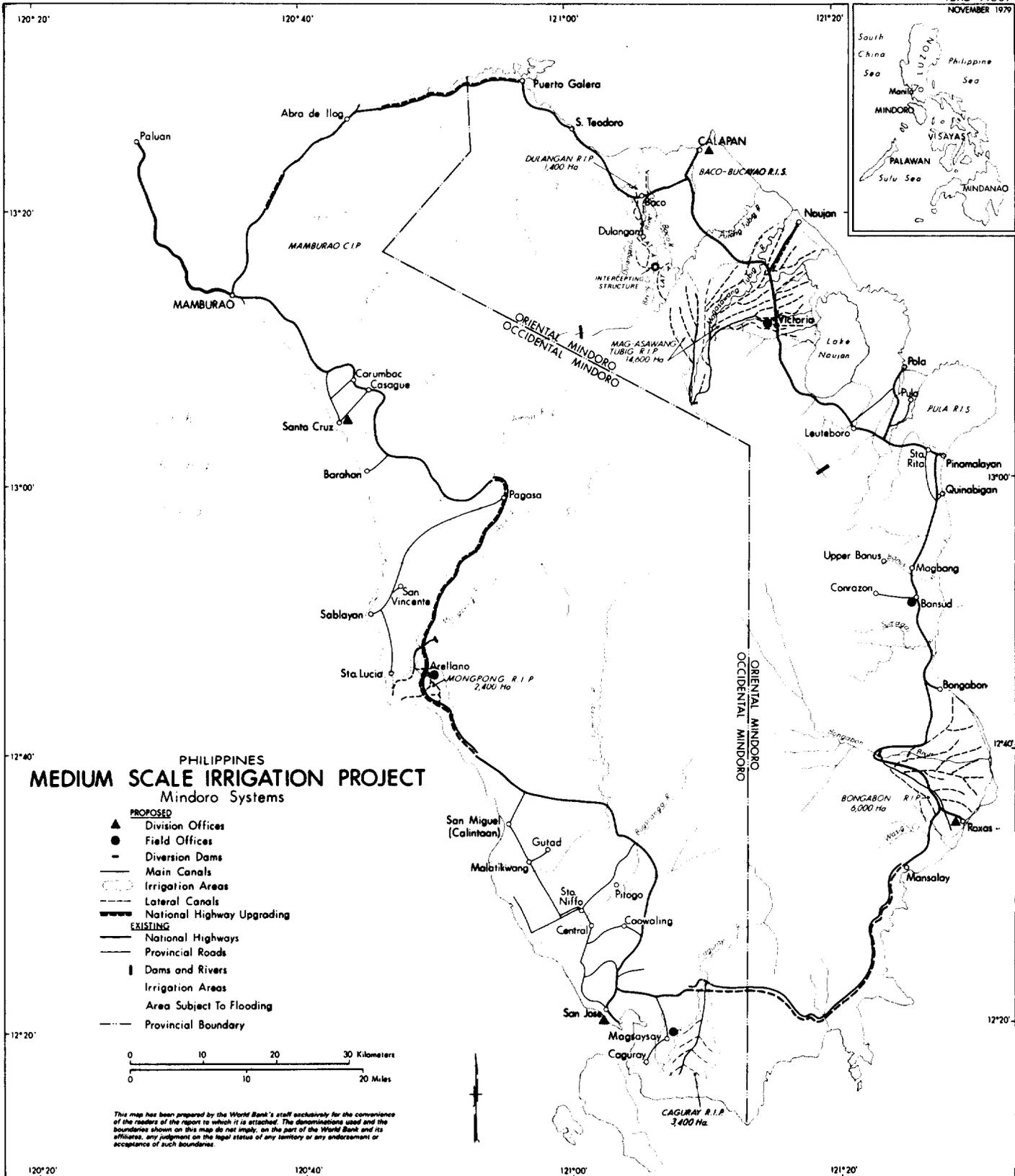
16. Mag-Asawang-Tubig. This system was to have a 600 m long dam incorporating a road bridge, situated about 10 km upstream of the existing developments on the Mag-Asawang-Tubig River. It was to serve two long canals, both falling 70 m over their first 11 km so requiring drop structures. The irrigable area was estimated at 14,600 ha.

17. This system suffered the greatest change from its appraisal concept as a consequence of the 1985 project restructuring. It dropped its service area from over 14,600 ha to 5,040 ha as a result of abandoning the dam and long canals. Presently the system diverts water from the Macatoc River to irrigate an area north of the Municipality of Victoria of about 1,300 ha. A separate system irrigates a further 3,700 ha on both right and left banks of the Mapalo/Pinagsbagan River by means of two main canals. Water is diverted from the Mag-Asawang-Tubig River by an intake structure and by a short canal into the Mapalo/Pinagsbagan system where a second check-dam serves the two canals. This check-dam requires several details for completion but diversion is possible and overall this system, which started in 1986, is presently 90% completed. The full potential irrigable area is 5,040 ha in wet season and 3,150 ha in dry season. In 1990/91 crop season, the system irrigated only 1,160 ha in wet season due to drainage problems and 1,280 ha in dry season.

Medium Scale Irrigation Project
(Ln. 1809-PH)

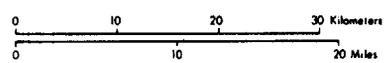
LOCATION OF IRRIGATION SYSTEMS





PHILIPPINES
MEDIUM SCALE IRRIGATION PROJECT
Mindoro Systems

- PROPOSED**
- ▲ Division Offices
 - Field Offices
 - Diversion Dams
 - Main Canals
 - Irrigation Areas
 - Lateral Canals
 - ▬ National Highway Upgrading
- EXISTING**
- National Highways
 - Provincial Roads
 - ▬ Dams and Rivers
 - Irrigation Areas
 - Area Subject To Flooding
 - Provincial Boundary



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