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INDONESIA: SEDERHANA (SIMPLE) IRRIGATION PROJECT

INTENSIVE REVIEW REQUEST

Prepared by:
USAID/Jakarta
23 May 1974

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SEDERHANA (SIMPLE) IRRIGATION PROJECT

A. Intensive Review Request.

AID/W approval is requested to proceed with intensive review of a GOI proposal that AID finance engineering services, including consultants and training, required to improve the institutional capability of the Ministry of Public Works, Directorate General Water Resource Development (DGWRD), in Jakarta and various Provincial Public Works offices to implement primarily the GOI's Sederhana (Simple) Irrigation Program, but also including other small- and medium-scale irrigation programs. The GOI proposal also includes AID reimbursement of a portion of the local currency cost to complete projects in the Sederhana (Simple) Irrigation Program scheduled for completion in the second and third years of the Program. In addition, survey, hydrology and maintenance equipment would be provided to various Provincial Public Works offices. The loan amount would be approximately \$22.6 million. The Sederhana (Simple) Irrigation Program will be coordinated by the DGWRD and executed primarily by various Provincial Public Works offices.

B. Objective.

The principal objective of the GOI's Sederhana (Simple) Irrigation Program is to rapidly increase rice production through expansion of both dependably irrigated and cultivable land. Secondary crops may also be grown in areas dependably irrigated as a result of the Program. The objective of the AID project is to support this Program nationwide through: (1) improving the institutional capability of GOI implementing agencies and (2) financing a portion of the local currency cost to complete projects planned for completion in Indonesian FY's 1976 and 1977.

C. Background.

The Government's Sedang-Kecil (Small- and Medium-Scale) Irrigation Program included rehabilitation of existing and design and construction of new technical irrigation projects totaling 220 thousand hectares in 19 provinces during Repelita I (Indonesia's First Five Year Plan extending from 1969 to 1974). Projects up to 7000 hectares in size were included in this program. Provincial Public Works offices were the primary implementing agencies for these projects.

The GOI plans to continue the Sedang-Kecil (Small- and Medium-Scale) Irrigation Program during Repelita II (Indonesia's Second Five Year Plan extending from 1974-1979). This program should not be confused with the Sederhana (Simple) Irrigation Program.

The Sederhana Irrigation Program was proposed by President Suharto himself. He saw the objective of the Program as increasing food production through undertaking projects which could be simply and rapidly executed.

In response to the President's initiative, the DGWRD requested Provincial Public Works offices to submit a lists of small- and medium-scale irrigation projects in their areas suitable for implementation during Repelita II. Information requested included a short project description, a sketch map of the area and answers to a short questionnaire. This questionnaire is included as Annex B to the Intensive Review Request.

The projects submitted in response to the DGWRD request totalled about one million hectares. These projects were originally screened down to about 683 thousand hectares and then to 550 thousand hectares for inclusion in Repelita II. Two set of criteria were used in this

screening; general criteria applicable to all new irrigation projects to be implemented in Repelita II and special criteria applicable only to the Sederhana (Simple) Irrigation Program. General criteria included:

1. Suitable soil.
2. Suitable quality and quantity of water.
3. Adequate manpower (farmers and construction workers available in area).
4. No land status problems.
5. Proximity to market.
6. Physical accessibility.

The following items were included among the special criteria for the Sederhana Program:

1. Simple to design and construct, including low equipment requirements.
2. Capable of rapid execution.
3. Relatively inexpensive.
4. Area 2000 hectares or less.

An additional criterion, cost less than Rp. 100 thousand (\$241) per hectare, was used to choose projects for implementation during the first two years of the Program.

The DGWRD sent appraisal teams to the provinces in December 1973 to fill out another questionnaire on projects which had been tentatively selected for inclusion in the Program in Repelita II. This questionnaire contained fairly detailed questions on the capability of Provincial Public Works offices and private contractors to execute various phases of the program. More detailed questions on hydrology, meteorology, soils,

manpower available, land and sea communications links and the state of project preparation were also included in the questionnaire. This questionnaire has been included as Annex C to Intensive Review Request. Answers to the questions contained in this second questionnaire have not yet been compiled and analyzed.

D. Description.

1. Sederhana (Simple) Irrigation Program.

Any AID project, to be of real assistance to the GOI, must take the basic focus of the Sederhana Program fully into account. The major characteristic which differentiates this Program from other irrigation programs in Indonesia is the simple nature of the projects to be undertaken. Projects included in the Program are visualized as simple to design, simple to construct, capable of rapid execution and relatively inexpensive. These projects are expected to have a quick impact in terms of greater rice production.

Sederhana projects are planned as a transitional phase in the development of the water resources of a particular area. All projects will be gravity fed without provision for water storage. In most cases, diversion will be achieved through the use of less permanent structures such as gabion or other type run-of-the-river weirs. Permanent diversion structures will only be built where the capital cost of such a structure is only somewhat higher than that of a less/permanent structure and the internal rate of return (IRR) is greater.

The majority of Sederhana projects involve the rehabilitation, improvement and/or extension of existing projects. GOI plans call for construction of projects with a total area of 550 thousand hectares under the Program during Repelita II. The breakdown of this total by year of completion is set out in Table 1 below:

Table 1

Project Area Planned for Completion
During Each Year of Repelita II.

Indonesian Fiscal Year	Area (Hectares)	Percent of Total	Cumulative Percent of Total
1974-75	40226	7.3%	7.3%
1975-76	60319	11.0%	18.3%
1976-77	100169	18.2%	36.4%
1977-78	150000	27.2%	63.7%
1978-79	200000	36.3%	100.0%
Total	550714	100.0%	-

Note: See Table A3 for complete presentation with notes.

On the basis of cost estimates submitted in response to the first questionnaire, the total construction cost of the Sederhana Program will exceed \$75 million during Repelita II.

Most Sederhana projects range in size from 100 to 2000 hectares. However, a few projects of less than 100 hectares and of 2500 hectares are included in the Program.

Sederhana projects are located in 17 provinces, but about one-quarter of the area involved is in South Sulawesi and 10% each in the provinces of North Sumatra, Jambi, South Sumatra and Bengkulu. Table 2 below shows the percentage of the total Program area located in the nine provinces where the Program is/ concentrated:

*See also
Purley &
Lewis*

Table 2

Area Included in Sederhana (Simple) Irrigation Program by Province - Repelita II (percent)

Province	Percent of Total	Cumulative Percent of Total
1. South Sulawesi	25.8%	25.8%
2. North Sumatra	11.1%	36.8%
3. Jambi	10.8%	47.7%
4. South Sumatra	9.6%	57.3%
5. Bengkulu	8.9%	66.1%
6. Lampung	7.6%	73.7%
7. West Sumatra	6.8%	80.5%
8. Southeast Sulawesi	4.8%	85.3%
9. West Java	3.2%	88.5%

*July 1967
Out of 100
more 12%
No.*

Note:

1. See Table A4 for complete presentation with notes.
2. Based on 683 thousand hectare total Program.

Almost 90% of the total Program area is included in these 9 provinces.

2. AID-financed Sederhana (Simple) Irrigation Project.

The Project consists of engineering services, including consultants and training, required to improve the institutional capability of primarily the Ministry of Public Works, Directorate General Water Resource Development (DGWRD), in Jakarta and various Provincial Public Works offices to implement primarily the GOI's Sederhana Irrigation Program, but also including other small- and medium-scale irrigation programs. The Project also includes AID reimbursement of a portion of the local currency cost to complete projects in the Sederhana Irrigation Program scheduled for completion in the second and third years of the Program. In addition, survey, hydrology and maintenance equipment would be provided to various Provincial Public Works offices.

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Table 3

Sederhana Projects Planned for Completion
in IFY's 1976 and 1977 by Size

Size (hectares)	Number of Projects	Percent	Cumulative Percent
50- 99	41	9.3%	9.3%
100-199	127	28.8%	38.1%
200-299	80	18.1%	56.2%
300-399	45	10.2%	66.4%
400-499	24	5.4%	71.9%
500-599	41	9.3%	81.2%
600-699	18	4.1%	85.3%
700-799	19	4.3%	89.6%
800-899	11	2.5%	92.1%
900-999	2	0.5%	92.5%
1000-1499	21	4.8%	97.3%
1500-2500	12	2.7%	100.0%
Total	441	100.0%	-

Note: See Table A5 for complete presentation by province with notes.

Sederhana projects scheduled for completion in IFY's 1976 and 1977 are located in 17 provinces. The distribution of these projects by province is not very different from the distribution of the Repelita II Program as a whole. Almost one-third of the projects are located in South Sulawesi and about 10% each in Bengkulu, Lampung and Jambi. Table 4 below shows the percentage of the total area scheduled for completion in FYs 1976 and 1977 which is located in the ten provinces which have the greatest project area:

Table 4

Area Included in Sederhana (Simple) Irrigation Program
by Province - IFYs 1976 and 1977 (percent)

Province	Area (Thou. hectares)	Percent of Total	Cumulative Percent of Total
1. South Sulawesi	52.9	33.0%	33.0%
2. Bengkulu	14.5	9.0%	42.0%
3. Lampung	13.4	8.4%	50.3%
4. Jambi	13.0	8.1%	58.4%
5. South Sumatra	9.7	6.0%	64.5%
6. South Kalimantan	9.3	5.8%	70.3%
7. Southeast Sulawesi	9.1	5.7%	76.0%
8. West Sumatra	7.6	4.7%	80.7%
9. North Sumatra	7.2	4.5%	85.1%
10. West Java	6.4	4.0%	89.1%

Note: See Table A4 for complete presentation with notes.

Projects in these 10 provinces account for almost 90% of Sederhana projects for these two years. The top 9 provinces for the Repelita II Program are the same as the top 10 provinces for the Program in IFY's 1976 and 1977 with the exception that South Kalimantan is included in the latter group.

E. Justification.

1. Relation to U.S. Assistance Strategy

Current U.S. assistance strategy in Indonesia is to support the economic development strategy of the GOI as set out primarily in the Repelitas (Five-Year Plans), particularly in the areas of (1) food and nutrition, (2) family planning and health and (3) education and manpower. AID is also particularly interested in rural development projects and projects that will materially improve the well-being of people in

the lower 40% of Indonesia's income distribution. The project closely fits these elements of U.S. assistance strategy in Indonesia.

The overall objective of the Indonesian Government's Repelita II is to achieve a balance between (1) production, (2) distribution and (3) employment creation. Agriculture was the top priority sector during Repelita I and will remain in this position during Repelita II. The GOI's overall objectives in the agricultural sector are: (1) income growth, (2) employment creation and (3) income redistribution.

The first two of six specific objectives in the agriculture sector and the first two of five objectives in the food subsector are: (1) increased productivity and (2) rice self sufficiency. Basic policies to increase rice production include: (1) intensification of cultivation on existing rice land and (2) extension of rice cultivation. Increasing intensified rice production^{partially} depends on rehabilitation of existing and construction of new irrigation schemes. Extension of rice cultivation depends on construction of new irrigation schemes.

The first two of five basic policies for water resource development during Repelita II are (1) continuation of rehabilitation and improvement of the existing irrigation network and (2) construction of new irrigation systems. Within the proposed new irrigation^{system construction}/program the Sederhana Irrigation Program will be given highest priority.

A recent IBRD irrigation project appraisal team recommended a similar set of priorities for water resource development in Indonesia

during Repelita II. They recommended (1) finishing the rehabilitation of existing irrigation systems, (2) providing water storage for existing systems where economically feasible and (3) constructing new systems.

In addition to high Repelita II priority, the Sederhana Program enjoys the continuing interest and support of President Suharto, who initiated the development of the program. This virtually ensures full GOI support for the Program.

The Program clearly falls within one of AID's areas of concentration. The objective of the Program is a rapid increase in rice production.

Sederhana projects have an important role to play in rural development in Indonesia, particularly on the outer islands. These projects are concentrated in some of Indonesia's least developed provinces such as Bengkulu, Jambi, South Sumatra and Southeast Sulawesi. The projects will be the catalyst for rural development in these provinces as well as many less-developed areas of the more developed provinces in the outer islands. Rural development on Java and in better developed areas of the outer islands will be enhanced. Not only will the AID Project support the provision of infrastructure in rural areas; it will also provide assistance in the development of water user groups, local institutions in which farmers participate in development.

The Program will improve the well-being of people in the lower 40% of Indonesia's income distribution. Sederhana projects will be concentrated in (1) areas close to consumption centers, (2) transmigration

areas and (3) densely populated areas. Transmigrants are normally drawn from the ranks of landless laborers, urban poor or retired enlisted members of Indonesia's armed forces. Densely populated areas growing rainfed rice are among the poorest in Indonesia.

Sederhana projects will significantly increase the income of farmers and transmigrants. They will also provide a large number of employment opportunities in constructing irrigation works using labor-intensive methods, in working newly irrigated land and in operation and maintenance.

2. Availability of Financing from Other Donors.

No other donor is currently interested in supporting the Sederhana Program. A recent IBRD irrigation project appraisal team indicated that the Program was worthy of our support.

F. Estimated Cost.

1. Cost.

USAID estimates the total cost of the Project to be \$41.9 million including \$4.6 million in foreign exchange. A breakdown of this cost estimate is set out in Table 5 below:

Table 5

Cost Estimate for Sederhana (Simple) Irrigation
Project (Thousand U.S. \$ Equivalents)

Item	Foreign Exchange	Local Currency
<u>Engineering Services</u>		
Consultants (Long-Term)	1,888	612
Consultants (Short-Term)	75	25
Training	300	-
Total Engineering Services	<u>2,263</u>	<u>637</u>
<u>Cost to Complete</u>		
DGWRD Estimate	-	22,766
Tertiaries	-	4,012
Items Left Out (10%)	-	2,277
Total Cost to Complete	<u>-</u>	<u>29,055</u>
<u>Equipment</u>		
Survey and Hydrology	225	25
Maintenance	1,215	135
Total Equipment	<u>1,440</u>	<u>160</u>
Subtotal	3,703	29,852
Contingency (25%)	926	7,463
Total	<u>4,629</u>	<u>37,315</u>
Grand Total	<u>41,944</u>	

The total cost of engineering services, including consultants (long-term and short-term) and training, is estimated to be \$2.9 million of which \$2.3 million or about 78% will be foreign exchange. This amounts to 10% of the cost to complete the projects planned for completion in IFY's 1976 and 1977.

Long-term consultant costs are figured on the basis of 18 consultants for a basic period of 2½ years (1 April 1975 to 1 October 1977) at a cost of \$50 thousand per man-year. The team leader is assumed to arrive in Indonesia on 1 July 1974 and the core advisory staff (seven consultants) is assumed to arrive on 1 October 1974. Except for the first year of the team leader's services which would be grant-funded

and is assumed to be all foreign exchange, the cost of long-term consultant services is assumed to be split 75% foreign exchange and 25% local currency.

The cost estimate provides for 16 man-months of short-term consultant services at a cost of \$6000 per man-month. A 75-25 foreign exchange local currency split is assumed for these services.

The training cost estimate is based on 6 to 8 participants each from various Provincial Public Works offices and between 10 and 15 participants from DGWRD/Jakarta. It is assumed that one group of senior participants from Provincial Public Works offices would go to the U.S. for training and that about two-thirds of the remainder would go to Malaysia with the rest going to Taiwan, the Philippines and Thailand. The assumption used for DGWRD/Jakarta participants is that about two-thirds will go to the U.S. and the remainder will go to Taiwan.

The DGWRD estimate of costs to complete the projects planned for completion in 1FY's 1976 and 1977 is based on estimates submitted in response to question 17.3 of the first questionnaire. These estimates include survey, planning, design, construction, and construction supervision of the irrigation works and related access roads. However, in some cases they do not make any provision for tertiary and drainage works.

The cost estimate for tertiaries assumes that the cost of completing these works will be \$50 per hectare and that they were left out of project cost estimates covering one-half of the total area of the Project. This per hectare cost includes the cost of mapping, design, supervision, structures and farmer organization. Farmers who will benefit

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from an individual tertiary system customarily provide required construction labor without compensation. The recent IBRD irrigation project appraisal team confirmed that \$50 per hectare is a good estimate of the cost of tertiary works in Indonesia. The total additional allowance for tertiaries in the cost estimate is about \$4.0 million.

An allowance of 10% of the DGWRD estimate of cost to complete the IFY 1976 and 1977 projects has been made to cover the cost of drainage works and other items left out of this estimate. This allowance amounts to about \$2.3 million.

Survey, hydrology and maintenance equipment would be provided to various Provincial Public Works offices. The total cost of survey and hydrology equipment is estimated at \$250 thousand. The corresponding estimate for maintenance equipment is \$1.5 million. Equipment purchases are assumed to be 90% foreign exchange.

A 25% contingency allowance has been provided. This contingency provision is considered adequate to cover the engineering services and equipment cost categories.

One of the attractions of the Sederhana Project is that there is no possibility of an overrun in the cost to complete category. The Project is designed to support the GOI's entire Sederhana Program, not a specific list of individual projects. The Project cost estimate contained in Table 5 is designed to cover the costs to complete the

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Sederhana projects planned for completion in IFY's 1976 and 1977. AID would reimburse the GOI for a certain percentage of the cost to complete individual projects meeting AID reimbursement criteria until funds allocated for this purpose in the AID Loan run out. If implementation of individual projects proceeds as scheduled and all projects completed meet AID reimbursement criteria, but the 25% proves to be too low to cover actual contingencies, AID funds allocated to the reimbursement of cost to complete would cover less than two years of the Program. On the other hand, if the 25% contingency proves adequate but implementation of individual projects is delayed and/or some completed projects fail to meet reimbursement criteria, AID cost to complete funding will be spread over more than two years of the Program.

2. Proposed Sources of Financing.

Total AID financing would be \$22.827 million or about 54% of estimated total Project costs. It is proposed that AID finance all foreign exchange costs of the Project plus reimburse 50% of pre-determined local currency cost to complete projects scheduled for completion in IFYs 1976 and 1977.

Table 6 below summarizes proposed sources of AID financing:

Table 6

Proposed Sources of AID Financing for Sederhana
(Simple) Irrigation Project (Thousand US \$)

Source	Amount
Grant	63
Loan 027	164
New Loan	22,600
Total	22,827

The first year (1 July 1974 to 1 July 1975) of the team leader's services would be grant financed. The core advisory staff (seven consultants) would have to be financed under Loan 027 until funds from the new loan were ready for disbursement. It is anticipated that the period of Loan 027 financing for core advisory staff would extend from 1 October 1974 to 1 April 1975. Required new loan financing for the Project, therefore, would amount to \$22.6 million.

After reimbursement had taken place, the GOI contribution to the Project would amount to \$19.1 million in local currency equivalent. All GOI financing would be from the Development Budget.

3. Proposed Sources of Procurement.

It is proposed that procurement under the foreign exchange component of AID financing be limited to AID Geographic Code 941.

G. Technical Considerations.

The Sederhana Program is designed only as a step toward modern irrigated rice cultivation. Sederhana projects are expected to have a quick impact in terms of greater production. They cover small areas and involve irrigation structures which are technically simple to design and easy to construct using mainly labor-intensive methods. Construction of the water development and control structures will require minimal equipment and short periods of time, with little technical input. Generally, structures would include a simple diversion weir with a control headgate, a small main canal, a few secondary and tertiary conveyance ditches, small division and turnout structures, and a simple waste or drainage system. The diversion dam or weir

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is completed, but that farmers in upland and uncultivated areas will not produce their first irrigated rice crop until the third and fourth years, respectively, after project completion.

The entire Project area will receive dependable wet season irrigation after Project completion. However, since Sederhana projects are based on run-of-the-river irrigation, dependable dry season irrigation will be limited to an average of 25% of the project area.

The benefits of dependable water supply in terms of increased rice yields are considerable, even where the BIMAS package of agricultural supporting services is not made available. See Table 7 below.

Table 7

Yield of Dry Stalk Paddy--Effect of Various Combinations of Inputs

Input Combination	MT/ha.
Rainfed	1-1/2
Village Irrigation	2- 2-1/2
Village Irrigation plus Ordinary BIMAS	3
Dependable Water Supply	3- 3-1/2
Dependable Water Supply plus New BIMAS	5-7
Dependable Water Supply plus On-farm Water Management	4-6

Source: Recent IBRD irrigation project appraisal team. Team found various sources asked about yields with various input combinations to be quite consistent.

Notes:

1. Conversion factor from dry stalk paddy to milled rice is .476.
2. Ordinary BIMAS uses improved local rice varieties. New BIMAS uses new high-yielding rice varieties. See implementation section for description of BIMAS program.

These yield figures were used in the cost-benefit analysis, along with the assumption that 90% of the dependably irrigated area in each season is harvested, to estimate incremental rice production resulting from the Project.

The IBRD has received assurances from the GOI that BIMAS will be provided to farmers served by irrigation systems rehabilitated with IDA financing. According to the recent IBRD irrigation project appraisal team, new BIMAS now covers 30 to 40% of the area where rehabilitation work has been completed. As explained in the implementation section, the GOI is planning a major expansion of the BIMAS program during Repelita II. The IBRD team felt that AID can expect new BIMAS to be made available to almost all of the area of individual Sederhana projects within 5 years of project completion. Therefore, an assumption that 15, 35, 55, 75 and 90% of the area of a Sederhana project will receive new BIMAS services in the first through fifth years after project completion does not seem unreasonable.

Gross value of production was calculated using a value of Rp. 30 thousand per MT for dry stalk paddy at the farm gate. This was based on a relatively conservative price for 35% broken milled rice FOB Bangkok of \$175 per MT or \$210 per MT CIF Indonesian port of entry. In the calculation of the net value of production, the cost of purchased inputs (seed, fertilizer, pesticides, etc.) was estimated to amount to 25% of the gross value of production.

Secondary crops such as maize, cassava, sweet potatoes, etc. will probably be grown on some of the area dependably irrigated by Sederhana projects. Since this is unlikely to occur unless the net production value per season per hectare for these crops exceeds the net production value for rice, the growing of secondary crops would only increase the IRR of the Project.

The cost of the following items was included in the analysis:

1. Consultant services (long-term and short-term).
2. Training
3. Costs to complete including:
 - a. Survey.
 - b. Planning.
 - c. Design.
 - d. Construction.
 - e. Construction supervision.
4. Survey and hydrology equipment.
5. Maintenance equipment.
6. Contingency.
7. Operation and maintenance.
8. Tertiary unit water management.
9. Administrative cost of BEMAS supporting services.

Diversion structures were estimated to amount to 15% of cost to complete, have a useful life of 7 years and be replaced at the end of their useful life.

Only economically feasible projects will be certified for AID reimbursement. An outline of the simplified procedure for determining the economic feasibility of individual projects is included in the implementation section of this Intensive Review Request.

I. GOI Budget Considerations.

The GOI Repelita II budget, which includes foreign aid funds, contains an allocation of \$579.0 million for new irrigation projects. Part of this allocation is for the Sederhana (Simple) Irrigation Program. Table 8 below presents the broad outlines of the GOI agriculture and irrigation sector budget for IFY 1975 and Repelita II:

Table 8

Budget Item	GOI Agriculture and Irrigation Sector Budget - IFY 1975 and Repelita II					
	IFY 1975			Repelita II		
	Rp.bil.	\$ mil.	% total	Rp.bil.	\$ mil.	% total
Agriculture and Irrigation Sector	120.8	291.1	100%	1001.6	2413.5	100%
A. Agriculture Subsector	76.1	183.3	63%	504.9	1216.6	50%
B. Irrigation Subsector	44.7	107.8	37%	496.7	1196.9	50%
1. Rehabilitation and Improvement	14.9	35.9	12%	90.3	217.6	9%
2. New Construction	15.6	37.6	13%	240.3	579.0	24%
3. Rivers and Swamps Control/Management	11.7	28.3	10%	105.7	254.7	11%
4. Water, Soil and Forest Conservation	2.5	6.0	2%	60.4	145.6	6%

Source: GOI.

The DGWRD IFY 1975 budget for the Sederhana Program is Rp. 3.3 billion (\$7.95 million). This amount is planned to cover construction of the 40 thousand hectares of projects scheduled for completion during the fiscal year and design of the 60 thousand hectares of one-year projects

scheduled for completion in IFY 1976 as well as some of the 66 thousand hectares of two-year projects scheduled for completion in IFY 1977.

J. Income and Employment Effects.

Employment generation and income growth and redistribution are important areas of emphasis in Repelita II. As indicated previously, the GOI's three overall objectives in the agriculture sector are: (1) income growth, (2) employment creation and (3) income redistribution.

Elimination of actual and disguised unemployment in the rural areas is the fourth of six specific Repelita II objectives in the agriculture sector. The fourth and fifth of five objectives in the food subsector are to expand employment opportunity and to increase farmer income and decrease the seasonal nature of this income.

The Sederhana Program is particularly well-suited as a vehicle to carry out Repelita II income and employment objectives. As Table A6 shows, incremental milled rice production resulting from the AID Sederhana Project is expected to amount to about 440 thousand metric tons per year by 1985 with a net production value of Rp. 20.8 billion (\$50.2 million). Estimating an average of one hectare of land dependably irrigated in the wet season per farmer, the Project will increase the income of about 160 thousand farmers by an average of about Rp. 130 thousand (\$313) per year. Using an estimated average family size of 5, this implies a per capita income increase of \$63 per year affecting about 800 thousand people.

A substantial percentage of this increase in income will accrue to the lower 40% of Indonesia's income distribution. Sederhana projects will be concentrated in (1) areas close to consumption centers, (2) transmigration areas and (3) densely populated areas.

Almost all transmigrants come from Java and Bali. Most of them are either landless laborers, urban poor or retired enlisted members of Indonesia's armed forces.

Transmigration programs have been resettling people in the outer islands since the Dutch period. Very few transmigrant settlements have been provided with irrigation and other rural infrastructure, so most transmigrant farmers have slipped back to subsistence agriculture after the first couple of years.

The DGWRD has been unable to plan and build irrigation schemes in transmigration areas fast enough to keep up with the demand. Initially the Sederhana Program will concentrate on areas where transmigrants have been settled without dependable irrigation for 10 to 15 years. Even with the rapid expansion of the Program for Repelita II, the DGWRD cannot keep up with the irrigation needs of the old transmigration settlements, much less plan and build irrigation systems in new transmigration areas, as the Directorate General Transmigration would like.

Densely populated areas growing rainfed rice are among the poorest in Indonesia. The Java portion of the Sederhana Program seeks

to provide dependable irrigation to many areas in this category.

Most beneficiaries of the Project will be small farmers, whether they have been established in the area for a long time or transmigrants. Currently transmigrants are being allocated one hectare of land with paddy potential and one hectare of upland and home yard. Landholdings of this size are typical of Project beneficiaries.

The Sederhana Program has a large employment generation potential. Construction will be labor-intensive since the works involved are not well adapted to the use of heavy equipment. It is estimated that the construction of individual projects will require about 110 thousand man-years of direct and indirect labor during the first year of the Project. This will increase to 180 thousand man-years in the second year.

The Project will also create a large number of employment opportunities in working newly irrigated land. As indicated in Table 9 below, the Project is expected to result in about 260 thousand new wet season agricultural jobs per year and almost 100 thousand new dry season jobs:

Table 9

Additional Employment Opportunities in Working Newly Irrigated Land Expected to be Generated by AID Sederhana Project

	Wet Season Irri. - Now Rainfed Rice	Wet Season Irri. - Now Upland/Un- cultivated	Dry Season Irri. - Now Upland/Un- cultivated
Additional Work Days per ha.	150	400	400
Total ha. (thou.)	80.2	80.2	40.1
Cropping Intensity	90%	90%	90%
Area Cropped (thou. ha.)	72.2	72.2	36.1
Total Additional Work Days Required (mil.)	10.8	28.9	14.4
Work Days per Season	150	150	150
Additional Workers (thou.)	72.2	192.5	96.3

Notes:

1. Same basic assumptions as cost-benefit analysis.
2. Additional work days per ha. derived from NEDECO estimate in Jragung Dam Flood Control and Irrigation Project Feasibility Study, August 1973.

In addition about one worker for each 25 hectares will be required to carry out the operation and maintenance of Sederhana projects. For the total Project area of 160 thousand hectares, this amounts to about 6400 additional workers.

The above provides a rough picture of the income and employment effects of the Project. During the intensive review Mission economists will work out the income and employment effects of the Project more thoroughly.

K. Implementation.

1. General.

a. GOI Organization

The Directorate General Water Resource Development (DGWRD) of the GOI Ministry of Public Works is responsible for overall planning, organization and coordination of the Sederhana Program. A new division is being formed in the Directorate General Irrigation of the DGWRD specifically to handle the Sederhana Program. This division is called Irrigation Development II and will be headed by an experienced irrigation engineer.

The DGWRD will develop (1) standards, (2) specifications, (3) procedures, (4) design manuals and (5) typical designs for small- and medium-scale irrigation projects. They will also provide (1) survey, (2) planning, (3) design, (4) construction and (5) operation and maintenance assistance to Provincial Public Works Offices to deal with difficult, complex and/

or unusual problems which arise during implementation of individual projects. Specialists and/or specific services in the areas of (1) survey, (2) mapping, (3) hydrology, (4) geology, (5) soils analysis, (6) water quality, (7) agronomy, (8) economics, and (9) operation and maintenance will be provided to Provincial Public Works offices as required.

The primary implementing organizations for Sederhana projects will be the Provincial and Section (kabupaten) Public Works offices. They will carry out the (1) survey, (2) planning, (3) design, (4) construction including contracting and supervision, and (5) operation and maintenance of individual projects. The Chief of Provincial Public Works reports directly both to the Provincial Governor and the Central Minister of Public Works. The Chief of the Irrigation Department of Provincial Public Works and the Section Public Works offices report directly to him.

Provincial Public Works offices are only responsible for irrigation systems from the source of water down to the end of the secondary canals plus the first 50 meters of tertiary canals downstream of tertiary outlet structures. The primary responsibility for construction, operation and maintenance of tertiary systems rests with village officials who are responsible ultimately to the Ministry of Internal Affairs through the subdistrict (kecamatan), district (kabupaten) and provincial governments. The Ministry of Agriculture is responsible for organizing farmer water user groups and providing extension services in on-farm water management.

b. Implementation Capability

1). General

The DGWRD is one of the most effective and well-organized agencies in the GOI. They have a small number of well-qualified technical employees in Jakarta and Bandung. Typically Provincial Public Works offices only have a few well-trained, experienced technicians. Much of DGWRD staff and most of Provincial Public Works Office staffs are young and enthusiastic, but inexperienced.

The GOI plans to increase the area of Sederhana projects completed from about 40 thousand hectares in IFY 1975 to 200 thousand hectares in IFY 1979, an annual compound growth rate of almost 50%. Other GOI irrigation programs are also planned for rapid expansion during Repelita II. DGWRD and Provincial Public Works office staffs must be greatly expanded and upgraded to enable them to handle this

affected
but limited
staff -
This is what
is needed
capacity

increased workload.

Currently certain disciplines such as agricultural soils technology and operation and maintenance are not adequately represented on the DGWRD staff. People will have to be hired and trained in these areas, as well as in others.

The capabilities of Provincial Public Works offices vary from province to province. Some are weak in survey, planning and design capability; others are weak in construction including contracting and supervision; and still others are weak in both areas. These offices vary in depth of staff also. The DGWRD's second questionnaire seeks to determine the capabilities of Provincial Public Works offices in some detail.

2). Survey, planning and design.

In general, Provincial Public Works office staffs will survey, plan and design Sederhana projects themselves. However, where a Provincial Public Works office staff cannot be expanded and upgraded rapidly enough to handle the increased workload, contractors will be used.

Expansion of Provincial Public Works office capabilities to survey, plan and design Sederhana projects will require additional trained personnel and equipment. These offices will seek to obtain additional personnel for their staffs from the DGWRD in Jakarta and through hiring graduates of the Bandung Institute of Technology (ITB).

Possible local sources of trained personnel include universities, academies, institutes and technical high schools. The second questionnaire seeks to obtain information on the availability of graduates from these educational institutions in the various provinces. The AID Project will supply various Provincial Public Works offices with consultant services in the areas of surveying, planning and design as well as survey and hydrology equipment.

Some provinces will have to contract with P.T. Indah Karya, a consulting engineering firm owned by the GOI, to provide some or all of the survey, planning and design services required for Sederhana projects. Jambi Public Works Department has already signed a Rp. 23.1 million (\$55.6 thousand) contract with Indah Karya to do all survey and design work on 70 Sederhana projects in the province. The management of Indah Karya feels that they can provide similar services to other provinces with large Sederhana programs nationwide, if they are given adequate notice of requirements.

Indah Karya dominates ^{the} consulting engineering ^{field} in Indonesia. However, a few universities, academies, institutes or private contractors may also be capable of providing consulting services for irrigation projects. Inquiries about the capabilities of these other possible sources of consulting services are made in the DGWRD's second questionnaire.

3). Construction.

Wherever possible, local construction contractors will be used. Most provinces have a few to many local contractors capable

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contractors from their inventory. They will also provide equipment for force account work. Funds will be provided from the GOI Development Budget to expand the equipment inventories of Provincial Public Works offices to meet the demands of the Sederhana Program as well as other Repelita II irrigation and road programs. The second questionnaire seeks to determine the equipment availabilities of Public Works and local construction contractors in the various provinces.

The AID project will supply various Provincial Public Works offices with consultant assistance in contracting, construction and construction supervision. Equipment operation and maintenance training will be provided to Provincial Public Works personnel under Project training programs.

4). Tertiary systems and on-farm water management.

In order to properly carry out their responsibilities under the Sederhana Program, the Agricultural Inspector's offices in various provinces will have to expand their staffs working on the organization of farmer water user groups and providing extension services in on-farm water management. Most of the required personnel will be recruited from agricultural high schools. The DGWRD will provide a portion of the \$50 per hectare allocation for tertiary units included in the cost to complete individual Sederhana projects to the Ministry of Agriculture to cover the costs of organizing farmer water user groups.

c. Consulting Services

1). Number, discipline and location of consultants.

The AID loan would finance a team of 18 consultants.

The Central Consultant Team would be made up of 6 members located at the DOWRD in Jakarta. The Central Team would be made up of a team leader and individual consultants qualified in: (1) design/construction of small/medium irrigation systems, (2) irrigation training (3) agronomy/land use/soils, (4) economic/financial analysis, (5) operation and maintenance.

Four regional consultant teams of three members each would be located at Ujung Pandang, Palembang, Medan and Bandung. The regional team leader would be qualified in design/construction of small/medium irrigation systems. An irrigation/drainage engineer and a land use/on farm water management planner would also be included on each regional team. Either the design/construction engineer or the irrigation/drainage engineer would be qualified in operation and maintenance. The composition of these regional teams could be varied to meet the particular needs of the provinces within the region. Full job descriptions for the Consultant Team are included in Jakarta 2367 and the draft PIO/T for consulting services.

The DGWRD has requested that the bulk of the Consultant Team be recruited under a PASA arrangement with the Bureau of Reclamation (BUREC) and the Soil Conservation Service (SCS) because of (1) the tendency of government to government advisors to relate better, (2) the good record of BUREC in institution building, (3) the excellent backstop capabilities of BUREC and (4) the availability at BUREC of established standards, design manuals and typical designs which may be able to be adapted to Indonesia's needs. AID/W has suggested in STATE 055153 that the team leader and Core Consultant Team be recruited from BUREC/SCS, but that private sector firms, as well as these two positions on the USG agencies, be considered in filling the other/Consultant Team. The DGWRD has accepted this suggestion.

The team leader would arrive to take up his duties on 1 July 1974, or as soon thereafter as possible, and remain until about 1 October 1977, a period of 3½ years. The Core Consultant Team would include among its seven members the Central (1) design/construction, (2) irrigation/^{training} and (3) agronomy/soils consultants as well as all four regional team leaders. The Core Team would arrive on 1 October 1974 or approximately three months after the team leader, and stay until about 1 October 1977, a period of 3 years. The remaining members of the Consultant Team would serve from 1 April 1975, or as soon thereafter as possible, to 1 October 1977, a period of 2½ years.

At the annual reviews of the Project to be held once a year in October, the need for the services of each member of the Consultant Team would be reviewed. If any consultant had accomplished his job well enough so that he was no longer needed, he would return to the U.S.

2). Scope of services.

The objective of the consulting services would be to upgrade the capability of the DGWRD and Provincial Public Works offices to plan and implement primarily the GOI's Sederhana (Simple) Irrigation Program, but also including other small- and medium-scale irrigation programs. The scope of services of the team leader, Central Team and Consultant Team as a whole in carrying out this objective would be somewhat different.

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The consultant Team as a whole would advise and assist the DGWRD and Provincial Public Works offices in (1) survey, (2) planning, (3) design, (4) construction including contracting and supervision, (5) evaluation and (6) operation and maintenance of primarily Sederhana projects. Another assignment of the Team would be to advise and assist the DGWRD and various Provincial Public Works offices in organizing and supervising a training program for their personnel in these areas of project implementation. Advice and assistance to the DGWRD and various Provincial Public Works offices in determining their requirements for loan-financed survey, hydrology and maintenance equipment would be another function of the Team. In addition, Team members would certify/approve various check lists required for AID reimbursement of individual projects as requested by the DGWRD.

3). Organizational relationships.

The team leader would directly advise the Director General, Water Resource Development, and the Chief, Sederhana Program. He would also be responsible for the overall coordination and supervision of the activities of the Central Consultant Team and the four regional consultant teams.

Each Central Team member would have a DGWRD counterpart. He would also assist the team leader in coordinating and supervising the activities of the regional teams in his area of expertise. The counterpart assigned to the Central Team agronomy/land use/soils advisor would be the DGWRD official responsible for the coordination of the Sederhana Program with the Ministry of Agriculture. This advisor would also have a Ministry of Agriculture counterpart.

Long-term consultant assistance would be concentrated in 9 provinces which account for almost 85% of the area of Sederhana projects planned for completion in IFY's 1976 and 1977 and almost 90% of the area included in the Repelita II Program (See Table A4). The Ujung Pandang regional team would concentrate its efforts on the provinces of South and Southeast Sulawesi; the Palembang team would concentrate on Jambi, South Sumatra and Bengkulu; the Medan team would concentrate on North and West Sumatra; and the Bandung team would concentrate on Lampung and West Java. South Kalimantan was left off this list of selected provinces because, even though it ranks 6th in total area of projects planned for completion in IFY's 1976 and 1977, it only ranks 13th in area in the Repelita II Program. In addition, almost all projects scheduled for completion in the province during IFY's 1976 and 1977 are very small, having a service area of 299 hectares or less (See Table A5).

The Ministry of Public Works does not have regional organizational units. The Chief of each Provincial Public Works office reports directly to the Minister/ and the Provincial Governor. The choice of Ujung Pandang, Palembang, Medan and Bandung as the bases of operation for the four regional consultant teams has no organizational significance whatever.

The consultant teams which will provide assistance directly to various Provincial Public Works offices have been organized on a regional basis only for the sake of convenience. This arrangement allows consultants with different backgrounds to work with and exchange

ideas on the irrigation problems of an individual province without requiring a full consulting team for each selected province. Advantages of the dormitory cities chosen, from the point of view of the consultants, include (1) a relatively high level of development, (2) a substantial expatriate community and (3) easy access to Jakarta and provinces in their region by air.

Each regional team leader would directly advise the Chief of Public Works and the Chief of the Irrigation Department of Public Works in each of the selected provinces in his region. He would also coordinate and supervise the activities of his regional team.

Each regional team member would have a counterpart in the Public Works office in each selected province in his region. The land use/on-farm water management planner would have two additional counterparts in each selected province, one in the Provincial Agriculture Inspector's office and one in the Governor's office. The counterpart in the Governor's office would be a senior official reporting to the Ministry of Interior Affairs who was responsible for district (kabupaten), subdistrict (kecamatan) and village government administration.

Other categories of assistance financed under the loan would naturally be concentrated in the 9 selected provinces with the largest Sederhana programs. Such categories would include short-term consultant services; overseas training; and survey, hydrology and maintenance equipment.

The regional teams would provide assistance to Public Works offices in other provinces in their region with a smaller Sederhana

program as required. However, the first priority of these teams would be to provide assistance to selected provinces in their region.

4). Short-term consultants.

AID assistance would include 16 man-months of services of short-term consultants. These consultants would provide services in disciplines such as survey/mapping, hydrology and geology not adequately covered by the qualifications of the long-term consultants. They would be made available for short periods of time to solve specific problems.

d. Training.

As indicated previously, the Consultant Team would advise and assist the DGWRD and various Provincial Public Works offices in organizing and supervising training programs for their personnel in the areas of (1) survey, (2) planning, (3) design, (4) construction including contracting and supervision, (5) evaluation and (6) operation and maintenance. These programs would include lecture, as well as on-the-job, training. Personnel who had returned from training overseas would provide the lecture training. The Consultant Team, as well as returnees from overseas training and other qualified Indonesian personnel would provide on-the-job training.

Engineering services financed under the loan would contain a substantial overseas training component to support these training programs. Overseas training would be provided to the personnel of both the DGWRD and various Provincial Public Works offices.

Six to eight personnel from each of the selected Provincial Public Works offices would receive overseas training. The duration of training would be about 4 months and only one staff member from each selected Provincial Public Works office would be overseas on training at a given time.

Training would be provided to groups composed of one trainee from each of the 9 selected provinces. One group, consisting of a senior official such as the Chief of Public Works or the Chief of the Irrigation Department of Public Works from each selected province, would go to the U.S. for training. About two-thirds of the other groups would go to Malaysia for training and the rest would go to Taiwan, the Philippines or Thailand. One or more groups would go abroad for training in each of the following areas: (1) survey, (2) design, (3) construction including contracting and supervision and (4) operation and maintenance.

Overseas training would be provided to 10 to 15 DGWRD personnel. The duration of training would generally be about 4 months as in the case of Provincial Public Works personnel, but two DGWRD staff members would usually be absent on training at any given time.

About two-thirds of DGWRD personnel would go to the U.S. for training and the rest would go to Taiwan. Training would be provided in disciplines such as agriculture soils technology and operations and maintenance were DGWRD capabilities need upgrading. Emphasis would also be given to BUREC/SCS organization and procedures.

The above description of Project training programs is only suggestive. The Central training advisor will advise and assist the DGWRD and

Provincial Public Works offices in assessing training requirements and developing training programs to meet these requirements. The DGWRD second questionnaire seeks to obtain information on training requirements of existing and required future staff of the various Provincial Public Works offices.

e. GOI Support.

The DGWRD will provide the Consultant Team with the support items usually provided to loan-funded AID consultants. These items would include, but not be limited to, housing, motor vehicles, secretarial and office personnel and assistance in obtaining permits, as well as local currency costs such as transportation, per diem, etc. AID would provide some of these items to the Team Leader during the period when he would be grant funded.

Each selected province would provide its regional consultant team with office space. The DGWRD would ensure that specialists and/or specific services from other Indonesian organizations in the areas of (1) mapping, (2) hydrology, (3) geology, (4) soils analysis and (5) water quality would be made available to Provincial Public Works offices as required on a timely basis.

2. Specific Problems.

a. Tertiary Systems.

As indicated earlier, village officials are primarily responsible for the construction, operation and maintenance of tertiary systems. The Provincial Agricultural Inspector's office is responsible

for organizing farmer water user groups and assisting in the construction, operation and maintenance of these systems. The provision of the mapping, planning, design and technical assistance required to construct tertiary systems is the responsibility of the DGWRD. Funds for the organization of farmer water user groups and construction of tertiary systems are included in the DGWRD budget.

When an irrigation system is completed or rehabilitated, the Provincial Agricultural Inspector's office sets up demonstration plots in the service area. Farmers included within these plots receive assistance in forming farmer water user groups and constructing tertiary systems. DGWRD funding normally does not extend beyond these demonstration plots, which rarely cover more than 10% of a service area.

The construction of tertiary systems in the remainder of the area and operation and maintenance of such works is normally left to the villages. Farmers traditionally contribute their labor to the construction and maintenance of tertiary systems. However, since village revenue sources are limited, this is often not enough to ensure that required tertiary systems are constructed, operated and maintained.

The GOI has agreed to the inclusion of all required tertiary systems in the AID Sederhana Project. The Project cost estimate contains an allowance of approximately \$50 per hectare for these systems. This amount is meant to cover the cost of mapping, design,

supervision, structures and farmer organization. Farmers will contribute the labor required to construct tertiary systems.

The land use/on-farm water management planner assigned to each regional team would advise and assist appropriate local officers of the Ministries of Agriculture and Internal Affairs in the formation of farmer water use groups. He would also advise and assist these officials in the construction, operation and maintenance of tertiary systems.

b. Agriculture Supporting Services.

The GOI's BIMAS (mass guidance) rice intensification program provides improved seed, other modern inputs, credit and extension services to farmers who have dependable irrigation. The Ordinary BIMAS Program provides improved local varieties of rice while the New BIMAS Program provides new, high-yielding varieties of rice. Credit is extended at an interest rate of 1% per month. Generally about two-thirds of a BIMAS loan is provided as urea, triple superphosphate (TSP), insecticide and rodenticide in kind and one-third is provided for consumption purposes in cash. Recent production results of the BIMAS Program have been very encouraging.

The GOI has provided assurances for all IBRD irrigation projects that the BIMAS package would be made available for the first wet season crop after rehabilitation or construction of an irrigation system was completed. BIMAS would be made available for each succeeding crop season to farmers receiving a dependable water supply during that season.

The recent IBRD irrigation project appraisal team found that the New BIMAS package was actually available in 30 to 40% of areas where rehabilitation or construction had been completed. As indicated in the economic considerations section, the team felt that AID could count on the same New BIMAS coverage within one to two years of completion of individual

Sederhana projects. They also expressed the opinion that almost all of these projects would receive New BIMAS within 5 years of completion.

The GOI's plans to rapidly expand the BIMAS Program during Repelita II support this projection. These plans call for an increase in the area covered by New BIMAS from 3.3 million hectares in 1974 to 4.8 million hectares in 1978, a compound annual growth rate of about 10%. During this period the area receiving Ordinary BIMAS is expected to decline slightly from its 1974 level of one million hectares.

Under these circumstances, the availability of the New BIMAS package to the service areas of completed Sederhana projects is unlikely to be an important problem. However, it is proposed to include an appropriate covenant in the Loan Agreement requiring the provision of New BIMAS to these areas.

c. On-Farm Water Management

As discussed previously, village officials are primarily responsible for operation of tertiary systems. However, the Provincial Agricultural Inspector's office is responsible for providing extension services in on-farm water management.

On Java the village water distributor normally controls the distribution of tertiary unit irrigation water to village rice fields. He reports directly to the village chief.

This water distribution system has serious disadvantages. Tertiary units often cross village and other political boundaries. When a tertiary unit is shared by two or more villages, disputes often arise between their village water distributors, as each one tries to secure water for his village at the expense of the others.

A village water distributor may be responsible for water distribution in several tertiary units or parts of units, particularly in the case of larger villages. Since one man can only handle water distribution on about 400 hectares effectively, this situation often results in inefficient water management.

In some areas of Java tertiary unit water distributors have been introduced to replace village water distributors. Tertiary unit water distributors are chosen and paid by the farmers in their unit and are responsible to them. They also report directly to local Public Works officials. This water distribution system has proven far superior to the usual system in areas where it has been tried.

Farmer water user groups also play an important role in effective water management at the farm level. These groups consult with the village or tertiary unit water distributor on water requirements and distribution problems as well as provide the labor required to construct and maintain the tertiary systems.

The economic returns to improved on farm water management are high. The introduction of efficient water management practices can increase the average yield ^{within} a tertiary unit by 50% or more (See Table 7).

The tertiary unit water distributor system would be used for all the Sederhana projects and an effort would be made to

introduce this system in the case of rehabilitation and extension projects also. As indicated previously, the land use/on farm water management planner would help local agriculture and local government officials form farmer water user groups.

Ministry of Agriculture

The / plans to implement a project designed to improve on farm water management during Repelita II. The project would include the development of demonstration plots and provision of extension service on more efficient use of irrigation water. GOI Plans call for this project to be implemented in ten provinces including four selected provinces; North, West and South Sumatra and West Java.

d. Operation and Maintenance.

mentioned previously,
As/ operation and maintenance responsibility of Provincial Public Works offices for specific irrigation systems extends from the source of water down to the end of the secondary canals plus the first 50 meters of tertiary canals downstream of tertiary outlet structures. Operation and maintenance of irrigation systems has been a problem in the past in Indonesia, principally because of lack of trained staff and inadequate financing.

The recent IBRD irrigation project appraisal team felt that Indonesia had shown great improvement in the operation and maintenance of irrigation systems over the last 4 years. However, they still saw O&M as the biggest problem in the irrigation sector.

The Netherlands Engineering Company (NEDECO) has made a number of proposals for improvement of the maintenance of irrigation systems in Indonesia in its draft report, Proposal for an Improved Maintenance Organization in the Jratunseluna Area, dated July 1973. The DGWRD is currently considering implementing some of these proposals.

Operation and maintenance would be an important focus of AID assistance to the Sederhana Program. An operation and maintenance consultant is included on the Central Team. He would help the DGWRD develop operation and maintenance standards and procedures as well as provide assistance to Provincial Public Works offices on special O&M problems. Either the team leader/design engineer or irrigation/drainage engineer of each regional team would be able to provide O&M assistance of a more routine nature.

Operation and maintenance training would constitute an important part of the DGWRD and Provincial Public Works office training programs. Several of the DGWRD overseas training places would be used for O&M training and at least one, but possibly two or three, of the groups from selected Provincial Public Works offices would go abroad for O&M training.

An allocation of \$1.5 million for maintenance equipment would be made in the AID loan. This equipment would be purchased for the use of various Provincial Public Works offices.

In addition, one of the checklists required for AID reimbursement of the cost to complete individual Sederhana projects would be an operation and maintenance plan including personnel, equipment and funding requirements with proposed source. Also, it is proposed to include an appropriate covenant in the Loan Agreement requiring adequate maintenance of completed Sederhana projects for which reimbursement was received from AID.

e. Financing Operation and Maintenance.

Provision of required funding for operation and maintenance of irrigation systems is the responsibility of the Provincial Government concerned. The principal source of revenues for provincial governments is the IPEDA (regional development contribution), a type of land tax. The IPEDA is a flat rate per hectare which varies with the use of the land.

In the past the IPEDA has proved an unreliable source of funds for the operation and maintenance of irrigation systems. The total IPEDA due in a province is difficult to estimate. In addition, only a portion of the IPEDA due is actually collected. Collection percentages vary from province to province. From 50 to 60% of the IPEDA due is generally collected in Central Java, while the collection rate may be as little as 30% in South Sulawesi.

Moreover, few provinces make a specific allocation of IPEDA revenues to the operation and maintenance of irrigation systems.

If no specific allocation of IPEDA is made, irrigation O&M must compete with all other possible uses of funds at the district (kabupaten) government level. The outcome of such competition is uncertain at best. A recent decree of the Governor of South Sulawesi increased the IPEDA in his province by 1% of net production value per crop (Rp. 1800 or \$4.34 per hectare) and specifically allocated this increase to irrigation O&M. Lampung and West Java have also allocated a portion of their IPEDA revenues, to irrigation system O&M.

The GOI is aware of the problems involved in financing the operation and maintenance of irrigation systems. The Government is currently considering a presidential decree which would provide for a Central Government contribution to the provinces for irrigation O&M for a five-year period. The Central Government contribution for the first year would be 100% of an estimated O&M cost of Rp. 2000 (\$4.82) per hectare. This contribution would be decreased by 20% in each succeeding year until it fell to zero. At the end of the five-year period, each province would be expected to finance irrigation O&M from its own revenues.

As indicated in Table A6, Rp. 2000 (\$4.82) may be a low estimate of irrigation O&M costs per hectare. It is proposed to put an appropriate covenant in the Loan Agreement requiring the Central Government to make a budgetary contribution to the provinces

for irrigation O&M sufficient to ensure the adequate operation and maintenance of completed Sederhana projects for which reimbursement was received from AID.

f. Water Charges.

The best way to ensure adequate funding for the operation and maintenance of irrigation systems is to introduce water charges. GOI policy is to eventually impose such charges on irrigation system beneficiaries. Such charges would be most effective if they were collected and disbursed by farmer water user groups.

However, several impediments to the implementation of this GOI policy exist. Water charges require accurate water measurements which, in turn, require a smoothly functioning O&M system. Therefore, the imposition of water charges will probably not be possible until sometime after the completion of individual Sederhana projects.

In addition, the idea that water is free has deep roots on Java. This should not affect the imposition of water charges on the outer islands. Even on Java, water charges should be less difficult to introduce in an area receiving new dry season irrigation.

The IBRD has received assurances from the GOI that water charges would be imposed on the beneficiaries of the irrigation projects they have financed, starting two years after project completion. Since no IBRD water projects have been completed, no water charges have been introduced so far.

The GOI has not seriously considered setting water charges high enough to recover a portion of the capital cost, as well as

the operation and maintenance cost, of irrigation systems. Possibly, as has been suggested, not attempting to set water charges high enough to recover any of the capital cost of irrigation systems is one way of redistributing Indonesia's oil revenues to the inhabitants of rural areas.

It is proposed to put an appropriate covenant in the Loan Agreement requiring the imposition of water charges on the beneficiaries of Sederhana projects for which reimbursement was received from AID. These water charges would begin two years after project completion and would be sufficient to finance the O&M of the project concerned.

g. Watershed Management.

Deforestation and accompanying erosion of watershed areas is common in Indonesia. This condition often results in sedimentation and flooding problems in the service areas of irrigation projects downstream.

One of the basic Repelita II policies in the forestry sub-sector is to intensify reforestation, rehabilitation and greening activities to combat this problem. Two of the objectives of the GOI's reforestation, rehabilitation and greening program are (1) intensification of water, soil and forest conservation and (2) protection of existing irrigation development.

The Repelita II budget allocation for the reforestation, rehabilitation and greening program is quite large. The total

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proposed to put an appropriate covenant in the Loan Agreement requiring adequate labor to be provided to construct and farm Sederhana projects for which reimbursement was received from AID.

i. Land Titles and Land Fragmentation.

The status of land titles in the service area has been a problem for some irrigation projects located on the outer islands. Often the claims of mineral and forest concessionaires as well as the traditional claims of local slash and burn cultivators have conflicted with the claims of transmigrant cultivators.

The GOI recognizes this situation as a problem. Repelita II indicates that a land management policy for the provinces should be prepared as soon as possible. During Repelita II the Government also plans to implement a regulation concerning the status of transmigrants on land, which would give them clear title to land they cultivate in most cases.

The status of land titles should not be a problem for Sederhana projects. One of the criteria used in selecting these projects was no land status problems.

Fragmentation of land is often a problem in irrigation service areas in Indonesia, particularly on Java and Bali. Excessive fragmentation of land reduces the ability and willingness of farmers to pay water charges. However, the one hectare of land suitable for paddy rice plus one hectare of upland and home yard currently being allocated to transmigrants appears adequate.

g. Coordination between GOI Agencies.

Successful implementation of the Sederhana Program as a whole and individual Sederhana projects requires coordination between various GOI agencies. The DGWRD is the primary implementing agency and would be the designated beneficiary of the AID Loan. Local government organizations reporting ultimately to the Ministry of Internal Affairs are primarily responsible for the construction, operation and maintenance of tertiary systems. The Ministry of Agriculture is responsible for organizing farmer water user groups, providing extension services in on-farm water management and providing the New BEMAS package of agricultural services. The availability of adequate labor for construction and farming of Sederhana projects is the responsibility of the Directorate General Transmigration. Plans call for the Repelita II reforestation, rehabilitation and greening program to be implemented by the Directorate General Forestry of the Ministry of Agriculture.

In many areas irrigation committees, which provide coordination between various GOI agencies concerned with irrigation, have been established at the district (kabupaten), subdistrict (kecamatan) and village level. Each of these committees includes the chief of the local government as chairman, a local representative of Provincial Public Works as secretary-member and a local representative of the Agricultural Extension Service of the Provincial Agriculture Inspector's office as member.

The GOI would make an effort to establish irrigation committees in areas where Sederhana projects are located and such committees have not yet been established. The Government would also make an effort to increase the effectiveness of these committees as coordinating bodies.

The regional consultant teams, particularly the land use/on-farm water management planner, would encourage coordination between the various GOI agencies concerned with irrigation projects at the provincial level. The Central Team would perform this function at the national level.

3. AID Reimbursement Procedure.

a. Eligibility Date for Reimbursement

Construction of a Sederhana project would have to begin after the AID loan authorization date for the project to be eligible for AID reimbursement. AID reimbursement criteria would also have to be met as indicated below.

b. Reimbursement Criteria.

As indicated in the cost estimate section, the Project is designed to support the GOI's entire Sederhana Program, not a specific list of individual projects. Since there will be no list of projects designated in advance for possible AID reimbursement, AID involvement in and/or approval of the process of selection of individual projects in the Sederhana Program will not be necessary.

Reimbursement would be made for Sederhana projects constructed after the Loan was authorized which met AID reimbursement criteria until loan funds allocated for this purpose were exhausted. If, for various reasons, the GOI wanted to include projects in their Sederhana Program which did not meet these criteria, AID would not reimburse the cost to complete these projects.

AID reimbursement criteria would be embodied in a series of nine short, simple checklists. Reimbursement for individual projects would require certification/approval of all of these checklists. No checklist would be more than a page or two long. Each one would be written in simple English, so that it could be easily translated into Indonesian and understood by junior professional personnel in Provincial/Section Public Works offices. The Central Team would develop these checklists during the early stages of their work in developing (1) standards, (2) specifications, (3) procedures, (4) design manuals and (5) typical designs for small- and medium-scale irrigation projects generally. All checklists would be subject to approval by both the DGWRD and AID. Checklists would be developed covering (1) economic analysis, (2) technical soundness, (3) survey, (4) planning, (5) design, (6) final cost estimate, (7) environmental effects, (8) project completion and (9) operation and maintenance plan.

In the paragraphs below the contents of each checklist is discussed in general terms. Illustrative questions for the checklist are also included in some cases.

1). Economic analysis.

The purpose of this checklist would be to determine the economic feasibility of Sederhana projects. This checklist would be a detailed outline of a simplified procedure for carrying out an economic analysis of a project with blanks to be filled in with required information and computations to be made. One of the first duties of the Central economic/financial analyst after his arrival in Indonesia would be to develop this checklist.

As a way of simplifying the economic analysis of Sederhana projects, the Central economic/financial analyst would develop standard benefits per hectare of increased production net of inputs for various before and after cropping situations (uncultivated to wet season irrigated rice without New BIMAS; rainfed rice to wet and dry season irrigated rice with New BIMAS; etc.) for various provinces. These standard net benefits per hectare would be used along with the number of hectares in each cropping situation in a project service area to calculate net benefits for all Sederhana projects in a province unless the local agricultural authorities determined that the conditions in a particular project service area were substantially different from the province average. Standard net benefits per hectare would be reviewed and revised periodically to take account of changed conditions and inflation.

The economic analysis of individual Sederhana projects should include the following cost items in addition to construction:

1. Survey.
2. Planning.
3. Design.
4. Operation and maintenance.
5. Tertiary unit water management.
6. Administrative cost of BIMAS supporting services.

Benefits other than increased production which can be easily quantified should be included in the economic analysis also.

The Central economic/financial analyst would recommend a minimum internal rate of return (IRR) required for individual Sederhana projects to qualify for AID reimbursement. This minimum IRR would be set high enough so that the most attractive projects would be implemented first. A lower minimum IRR would be appropriate for projects which had unusually large employment generation effects or provided unusually large benefits to the lower 40% of Indonesia's income distribution.

2). Technical soundness.

The technical soundness "checklist" would actually be a certification. It might be worded as follows: "I hereby certify that, in my best professional judgment, this project is technically sound in all respects." The (1) survey, (2) planning, (3) design, (4) final cost estimate and (5) environmental effects checklist would provide part of the basis for a finding that a particular project was technically sound.

3). Survey.

The purpose of this checklist would be to ensure that the project had been adequately surveyed prior to the commencement of design work. Among questions which would be included on this checklist are:

1. Topographic map of area completed? Scale?
Contour interval?
2. Soil tested?
3. Type soil?
4. Soil suitable for irrigated agriculture?
5. Water quality tested?
6. Water suitable for irrigated agriculture?
7. Estimates of river flow made. Dry season? Wet season?
8. Basis of river flow estimates?
9. Water supply estimates made?
10. Water supply estimates based on enough data to give reasonably firm assurance of an adequate supply?
11. Water supply estimates allow sufficiently for existing water users and for maintaining minimum river flows required for fisheries and village domestic water and sanitation?
12. Estimated return period for design flood?
13. Any special topographic, soil bearing or excavation problems?
14. Period of easy access to site?

4). Planning.

The purpose of this checklist would be to ensure adequate planning of the project. Adequate planning means that the system when built will probably be successful because all needs have been considered and nothing critical has been left to chance. Illustrative checklist questions include:

1. Water diversion method(s) and location evaluated?
2. Preliminary canal routing completed?
3. More permanent features such as primary canals located to be compatible with longer term development?
4. Drainage requirements determined?
5. Construction material locations determined?
6. Construction materials tested. Quality? Quantity?
7. Farmer water user groups organized? Groups have accepted responsibility for operation and maintenance of tertiary systems?
8. Project planning coordinated with Agricultural Extension Service? Local government? Farmer groups?

5). Design

The purpose of this checklist would be to ensure that the project was adequately designed. Illustrative questions include:

1. Weir and canal sizes calculated?
2. Drainage requirements calculated?
3. Land preparation and leveling requirements determined?
4. Embankment requirements calculated?

5. Gating and water flow apparatus determined?
 6. General layout drawings completed?
 7. Detailed design drawings of construction work completed?
 8. Materials required and specifications determined?
 9. Required work units calculated?
 10. Sequence of construction determined?
 11. Equipment requirements determined?
 12. Manpower requirements determined?
- 6). Final cost estimate.

A reasonably firm cost estimate completed before project construction began would provide the basis for AID reimbursement. In order to simplify the preparation of cost estimates, the regional teams would advise and assist various Provincial Public Works offices to establish standard unit construction costs for their province. These standard unit costs would be used in estimating the construction costs of all Sederhana projects in a province, unless the Provincial/Section Public Works project engineer determined that the conditions at a particular project site were substantially different from the province average. Standard unit costs would be reviewed and revised periodically to take account of changed conditions and inflation. The following items should be included in all project construction cost estimates:

1. Weir.
 2. Primary and secondary irrigation canals.
 3. Other irrigation structures such as gates, turnouts, drops and checks.
 4. Tertiary units.
 5. Drainage canals, including cross-drainage.
 6. Drainage structures.
 7. Service and access roads.
 8. Right-of-way acquisition.
 9. Construction supervision.
- 7). Environmental effects.

The purpose of the environmental checklist would be to ensure that whatever adverse environmental effects might result from Sederhana projects would be recognized and minimized as much as possible. The draft Report on Methodology for Making Assessments of Environmental Impact of Irrigation Projects under the Sederhana Irrigation Loan dated 22 April 1974 by John Neave, SER/ENGR, contains an illustrative environmental checklist.

A special health impact study would be needed for all Sederhana projects on Sulawesi due to the presence of isolated pockets of schistosomiasis there. Submission of this study with the environmental checklist would be a requirement for AID reimbursement of Sederhana projects located on Sulawesi.

8). Project completion.

The project completion "checklist" would be a certification. It might be worded as follows: "I hereby certify that I have personally inspected this project and that, in my best professional judgment, construction has been completed, is in accordance with the plans and specifications and is of acceptable quality."

9). Operation and maintenance plan.

The purpose of this "checklist" would be to have Provincial/Section Public Works plan for adequate operation and maintenance of completed Sederhana irrigation systems. This plan would include personnel, equipment and funding requirements with proposed source.

c. Certification/Approval Procedure

All checklists would be signed by the Provincial/Section Public Works staff member who prepared the checklist and/or performed the actual work concerned. The checklists would be certified by both the Provincial/Section Public Works project engineer and the Chief of Provincial Public Works. The only exceptions would be the technical soundness and project completion certifications which would be signed in the first instance by the Provincial/Section Public Works project engineer and certified by the Chief of Provincial Public Works. The checklists would then be forwarded to the DGWRD for approval.

After all checklists required for reimbursement had been approved, the DGWRD would prepare a fixed cost reimbursement (FCR) report for submission to AID via the Ministry of Finance. This report would be certified by the Chief, Sederhana Program.

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f. AID monitoring.

Since 441 Sederhana projects are currently scheduled for completion in FYs 1976 and 1977 and many of these projects are located in remote areas, which will take a day or more to reach from the provincial capital and much longer to reach from Jakarta, it is obvious that the Sederhana Project cannot be monitored in the traditional way. AID monitoring would be directed toward the GOI implementation and monitoring system, instead of toward individual projects. By maintaining a close association with DGWRD and Provincial/Section Public Works staff involved in implementation of the Sederhana Program and the Consultant Team, the USAID direct hire irrigation engineer would be able to gain an intimate knowledge of the status of individual projects. Monthly reports on the status of each project (see below), completed checklists, design drawings, contractor bids, contracts, and operation and maintenance activity would all facilitate this effort.

In addition, the USAID irrigation engineer, assisted by a local staff of two people with previous experience in monitoring AID procurement (probably from the Supply Management Division), would make regular visits to Provincial/Section Public Works offices for discussions of progress and would monitor a sufficient number of projects to satisfy themselves that checklist requirements were generally being met for Sederhana projects planned for reporting/reported for AID reimbursement. AID monitoring would concentrate on verification of the cost estimate and project completion checklists. Other checklists would be verified less frequently.

4. Reports.

The Consultant Team would submit a monthly report to the DGWRD and AID which, in addition, to usual requirements, would list

all Sederhana projects planned for reporting/reported for AID reimbursement with their (1) completion status (survey/planning/design/construction in process/completed), (2) the status of each checklist (prepared/certified/approved) and (3) FCR report status (prepared/certified/transmitted to Ministry of Finance/transmitted to AID/authorized/paid). The Team would also prepare an annual report for submission 6 weeks before each scheduled annual review of the Project discussing progress and problems and recommending actions to improve Project implementation. Annual reviews would be held once a year in Jakarta in October for the duration of the project and would include representatives of the DGWRD, selected Provincial Public Works offices, the Consultant Team, BUREC/SCS, engineering firm(s) providing consultant team members and USAID. The Consultant Team would also submit other reports normally required of AID loan-financed engineering services contractors.

5. Implementation Plan.

A simplified implementation plan for the Project follows:

1. ASAP-Recruitment of PASA Team Leader and remainder of Core Consultant Team from BUREC/SCS.
2. 1 July 1974 -- Solicitation of proposals for provision of remaining members of Consultant Team.
3. 1 July 1974 or as soon thereafter as possible -- Team Leader arrives in Indonesia.
4. 15 August 1974 -- PASA agreement signed.
5. 1 October 1974 or as soon thereafter as possible -- Remainder of Core Consultant Team arrives in Indonesia.

6. 15 October 1974 -- CAP transmitted to AID/W.
7. 15 December 1974 -- Loan authorized.
8. 15 January 1975 -- Loan Agreement signed.
9. 1 February 1974 -- Engineering Services contract signed.
10. 1 April 1975 or as soon thereafter as possible -- remaining members of Consultant Team arrive in Indonesia.

Table A1

Sederhana (Simple) Irrigation Program - FYs 1975-76 and 1976-77 (2 Years)

	1 Yr. 1975-76			1 Yr. 1976-77			2 Yr. 1976-77			Tot. 1975-76 & 1976-77							
	#	Ha.	Cost Rp./Ml.	#	Ha.	Cost Rp./Ml.	#	Ha.	Cost Rp./Ml.	#	Ha.	Cost Rp./Ml.	Cost \$ Thou.	Avg. Cost Rp./ha.	Avg. Area/Project ha.	Avg. Cost/Project Rp./Thou.	Avg. Cost/Project-\$
S. Sulawesi	88	28329	983.9	32	15570	1023.9	13	9000	452.0	133	52900	2464.8	5939	46594	398	18532	44655
SE. Sulawesi	3	3009	300.0	-	-	-	3	5160	510.0	6	9100	910.0	2193	100000	1517	151667	365463
W. Sulawesi	10	2335	134.1	-	-	-	7	2770	150.0	17	5155	284.1	685	55112	303	16712	40270
C. Sulawesi	-	-	-	-	-	-	5	2300	210.0	5	2300	210.0	506	91304	460	42000	101205
Tot. Sulawesi	101	33723	1478.0	32	15570	1023.9	28	20170	1422.0	161	69455	3868.9	9323	55704	431	24030	57704
Aceh	-	-	-	-	-	-	9	4875	137.0	8	4875	137.0	330	28103	609	17125	41265
W. Sumatra	-	-	-	1	1400	28.0	16	7165	365.0	16	7165	345.0	880	50942	448	22813	54971
M. Sumatra	-	-	-	-	-	-	10	6150	296.7	11	7550	324.7	782	43007	686	29518	71128
Bina	-	-	-	-	-	-	7	700	58.0	7	700	58.0	140	82857	100	8286	19966
E. Y. Sumatra	-	-	-	1	1400	28.0	41	13300	856.7	42	20290	864.7	2132	43603	483	21064	50751
S. Sumatra	5	7000	265.0	17	3185	454.5	6	4500	401.0	29	9685	1119.5	2698	115591	334	38603	93019
Jambi	25	5470	321.8	-	-	-	13	7430	410.0	38	13000	731.8	1763	56292	342	19258	46405
Bangka-B.	23	4350	293.0	3	4200	175.7	8	2850	506.0	34	14500	974.7	2349	67221	426	28668	69128
Tot. S. Sumatra	50	13220	620.0	20	7385	630.7	27	17860	1317.0	101	37185	2826.0	6810	75998	368	27980	67472
S. Java	3	700	35.0	-	-	-	-	-	-	3	700	56.0	135	80000	233	18667	45981
C. Java	17	1377	15.0	1	900	9.0	-	-	-	18	2777	74.5	180	26828	154	4139	9973
W. Java	15	4520	223.5	6	1869	143.2	-	-	-	22	6395	367.3	885	57435	291	16695	40229
D.I. Tegay	3	356	84.9	-	-	-	-	-	-	3	356	84.9	205	89746	315	28300	68193
Sungai	3	3150	210.5	1	2400	105.0	17	7725	569.9	21	13605	806.4	2136	56125	638	42210	101711
S. Kalimantan	27	3655	142.0	41	4280	223.0	2	1100	54.0	70	9335	399.0	361	42742	133	5700	13735
Tot. Java, Bina, Sungai, Kalimantan	59	14481	732.2	49	10949	621.2	19	8825	613.9	137	33558	1865.1	4502	55668	245	13636	32852
Grand Total	275	60319	2296.2	102	35420	2152.0	115	65765	4209.6	441	160438	3447.7	22766	58369	364	21423	51522

Table A2

Sederhana (Simple) Irrigation Program - Repelita II (5 Years) - 683 Thousand Hectare Program

FY 1975-76			FY 1976-77			FY 1977-78			FY 1978-79			Total Repelita II						
#	Ha.	Cost Rp. Mil.	#	Ha.	Cost Rp. Mil.	#	Ha.	Cost Rp. Mil.	#	Ha.	Cost Rp. Mil.	#	Ha.	Cost Rp. Mil.	Cost \$ Thou.			
S. Sulawesi	-	-	88	23330	588.9	45	24570	1475.9	101	40153	1871.0	208	82380	3861.7	442	175933	8197.5	19753
SE. Sulawesi	1	70.0	3	3000	300.0	3	6100	610.0	-	-	-	15	22700	2270.0	22	32500	3250.0	7831
W. Sulawesi	11	1785	10	2385	134.1	7	2770	150.0	1	190	10.5	-	-	-	29	7130	372.4	897
C. Sulawesi	-	-	-	-	-	5	2360	210.0	37	11250	620.0	1	200	18.3	43	13750	648.3	2044
Tot. Sulawesi	12	2485	101	33715	1423.0	60	35740	2445.9	139	51593	2501.5	224	105780	6150.0	536	229313	12868.2	30526
Aceh	2	200	-	-	-	8	4875	137.0	7	4300	120.8	12	7500	210.8	29	17475	486.6	1173
N. Sumatra	5	1799	-	-	-	16	7165	365.0	70	31350	1597.0	80	35930	1830.3	171	75735	3871.8	9330
W. Sumatra	2	5040	-	-	-	11	7550	524.7	15	10055	432.4	34	23625	1016.0	62	46270	1920.0	4627
Riau	1	100	-	-	-	7	700	58.0	38	3800	314.9	-	-	-	44	4600	379.9	915
Tot. N. Sum.	10	2232	-	-	-	42	20290	884.7	132	49505	2465.1	125	67055	3052.1	302	144080	6658.3	16044
S. Sumatra	-	-	6	2000	264.0	23	7685	855.5	64	21277	2459.0	104	34750	4916.8	197	65712	7595.3	18342
Jambi	33	5870	25	5570	321.8	13	7420	410.0	85	29075	1636.7	76	25995	1463.3	232	73900	4169.3	10044
Bangkok	9	1700	23	4350	293.0	11	10150	681.7	35	15014	1009.0	69	29364	1973.9	147	60573	4037.6	9729
Tot. N. Sum.	42	7520	54	11920	878.8	47	25752	1947.2	194	65366	5104.7	249	90109	7454.0	576	200150	15801.2	35075
E. Java	3	1500	3	700	76.0	-	-	-	-	-	-	-	-	-	5	2500	700.0	487
C. Java	34	5613	17	2877	64.0	1	300	8.5	24	4537	121.7	21	3207	86.0	104	17174	495.7	1194
W. Java	49	7164	16	4570	723.7	4	1867	143.8	24	6085	395.4	5	1480	85.0	100	21824	1259.6	3035
D. I. Yogyakarta	-	-	7	945	44.7	-	-	-	12	3263	346.7	2	605	54.3	17	5414	485.9	1171
Lampung	10	5409	3	2180	210.0	18	12025	675.9	70	10400	693.7	35	22025	1456.4	102	51909	3401.5	2204
S. Kalimantan	9	1412	27	3355	142.0	43	5339	257.0	-	-	-	-	-	-	70	10750	467.5	1127
Sum. Kalimantan	18	2824	27	3355	142.0	43	5339	257.0	-	-	-	-	-	-	70	10750	467.5	1127
Grand Total	226	40226	62	14684	787.9	60	18674	1085.2	81	25775	1557.5	63	27317	1681.7	407	109631	6313.2	15713
"A"	226	40226	224	60319	3084.7	217	100169	6363.0	534	192239	11628.8	662	290261	18342.8	1627	683214	41440.9	99858
"B"	226	40226	224	60319	3084.7	217	100169	6363.0	528	192239	11316.9	797	290261	17087.4	1956	683214	39873.6	96081

Note: Breakdown by project not available from BOSTD for FYs 1977-78 and 1978-79. Provincial and Grand Total "A" figures for number of projects and cost were estimated using average cost per ha. and average area per project for FY 1975-76 and 1976-77 by province. Grand Total "B" figures for number of projects and cost were estimated using grand total average cost per ha. and average area per project for FY 1975-76 and 1976-77.

Table A3

Sederhana (Simple) Irrigation Program - Repelita II (5 Years) - 550 Thousand Hectare Program

<u>Indonesian Fiscal Year</u>	#	Ha.	Percent Ha.	Cumulative Percent Ha.	Cost Rp. Mil.	Cost \$ Thou.
1974-75	190	40226	7.3%	7.3%	2021.6	4871.3
1975-76	224	60319	11.0%	18.3%	3084.7	7433.0
1976-77	217	100169	18.2%	36.5%	6363.0	15332.5
1977-78	412	150000	27.2%	63.7%	8830.4	21278.1
1978-79	549	200000	36.3%	100.0%	11773.8	28370.6
Total	1592	550714	100.0%	-	32073.5	77285.5

Note: Breakdown by project not available from DGWRD for Indonesian FYs 1977-78 and 1978-79. Figures for number of projects and cost for these IFY's were estimated using grand total average cost per ha. and average area per project for IFY's 1975-76 and 1976-77.

Table A4

Sederhana (Simple) Irrigation Program - Repelita II and FYs 1975-76
1976-77 - 683 Thousand Hectare Program - Summary

Repelita II					FYs 1975-76 and 1976-77						
Region	Thou. Ha.	% Ha.	Cumulative % Ha.	#	\$ Mil.	Region	Thou. Ha.	% Ha.	Cumulative % Ha.	#	\$ Mil.
A. Sulawesi	229.3	33.6%	33.6%	536	30.5	A. Sulawesi	69.5	43.3%	43.3%	161	9.3
B. S. Sumatra	200.2	29.3%	62.9%	576	38.1	B. S. Sumatra	37.2	23.2%	66.4%	101	6.8
C. N. Sumatra	144.1	21.1%	84.0%	308	16.0	D. Java, Lampung & S. Kalimantan	33.6	20.9%	87.4%	137	4.5
D. Java, Lampung & S. Kalimantan	109.5	16.0%	100.0%	407	15.2	C. N. Sumatra	20.3	12.6%	100.0%	42	2.1
Total	683.2	100.0%	100.0%	1827	99.9	Total	160.5	100.0%	100.0%	441	22.8
Province					Province						
1. S. Sulawesi (A)	175.9	25.8%	25.8%	442	19.8	1. S. Sulawesi (A)	52.9	33.0%	33.0%	133	5.9
2. W. Sumatra (C)	75.7	11.1%	36.8%	171	9.3	5. Bengkulu (B)	14.5	9.0%	42.0%	34	2.3
3. Jambi (B)	73.9	10.8%	47.7%	232	10.0	6. Lampung (D)	13.4	8.4%	50.3%	21	2.1
4. S. Sumatra (B)	65.7	9.6%	57.3%	197	18.3	3. Jambi (B)	13.0	8.1%	58.4%	38	1.8
5. Bengkulu (B)	60.6	8.9%	66.1%	147	9.7	4. S. Sumatra (B)	9.7	6.0%	64.5%	29	2.7
6. Lampung (D)	51.9	7.6%	73.7%	102	8.2	13. S. Kalimantan (D)	9.3	5.8%	70.3%	70	1.0
7. W. Sumatra (C)	46.3	6.8%	80.5%	62	4.6	8. SE. Sulawesi (A)	9.1	5.7%	76.0%	6	2.2
8. S. Sulawesi (A)	32.5	4.8%	85.2%	22	7.8	7. W. Sumatra (C)	7.6	4.7%	80.7%	11	0.8
9. S. Java (D)	21.9	3.2%	88.5%	100	3.3	2. N. Sumatra (C)	7.2	4.5%	85.1%	16	0.9
10. Aceh (C)	17.5	2.6%	91.0%	79	1.2	9. W. Java (D)	6.4	4.0%	89.1%	22	0.9
11. C. Java (D)	17.1	2.5%	93.5%	104	1.2	14. N. Sulawesi (A)	5.2	3.2%	92.3%	17	0.7
12. C. Sulawesi (A)	13.8	2.0%	95.6%	43	2.0	10. Aceh (C)	4.9	3.0%	95.4%	8	0.3
13. S. Kalimantan (D)	10.8	1.6%	97.1%	78	1.1	11. C. Java (D)	2.8	1.7%	97.1%	18	0.2
14. W. Sulawesi (A)	7.1	1.0%	98.2%	29	0.9	12. C. Sulawesi (A)	2.3	1.4%	98.5%	5	0.5
15. D. I. Yogya (D)	5.4	0.8%	99.0%	17	1.2	15. D. I. Yogya (D)	0.9	0.6%	99.1%	3	0.2
16. Riau (C)	4.6	0.7%	99.6%	46	0.9	16. Riau (C)	0.7	0.4%	99.6%	7	0.1
17. E. Java (D)	2.5	0.4%	100.0%	6	0.5	17. E. Java (D)	0.7	0.4%	100.0%	3	0.1
Total	683.2	100.0%	100.0%	1827	99.9	Total	160.5	100.0%	100.0%	441	22.8

Table A5

Sederhana (Simple) Irrigation Program - Size Distribution of Projects -
Fis 1975-76 and 1976-77 (Ha.)

	50-99	100-199	200-299	300-399	400-499	500-599	600-699	700-799	800-899	900-999	1000-1499	1500-2500	Total
S. Sulawesi	-	31	33	18	7	17	7	5	3	1	9	2	133
SE. Sulawesi	-	-	-	-	-	-	-	-	-	-	3	3	6
W. Sulawesi	-	2	8	3	3	-	-	-	1	-	-	-	17
C. Sulawesi	-	-	-	1	2	1	-	1	-	-	-	-	5
Tot. Sulawesi	-	33	41	22	12	18	7	6	4	1	12	5	161
%/Cum. I	0%	20.5%	25.5%	46.0%	59.6%	75%	82.1%	88.3%	92.5%	93.6%	96.4%	99.4%	100%
Aceh	-	-	-	2	-	1	2	1	1	-	-	-	8
W. Sumatra	-	2	3	3	-	3	1	2	2	-	-	-	16
W. Sumatra	-	2	-	2	-	2	1	-	-	-	3	1	11
Bien	5	2	-	-	-	-	-	-	-	-	-	-	7
Tot. W. Sumatra	5	6	2	2	-	6	4	3	2	-	4	1	42
%/Cum. I	11.9%	17.4%	24.3%	26.2%	27.1%	33.3%	38.3%	41.2%	43.4%	45.3%	47.7%	49.7%	51.7%
S. Sumatra	-	11	6	2	1	4	-	3	1	-	1	-	29
Jambi	-	13	2	6	4	4	3	1	2	-	1	-	38
Bengkulu	1	12	4	4	1	1	2	4	1	-	3	1	34
Tot. S. Sumatra	1	36	12	12	6	9	2	8	4	-	5	1	101
%/Cum. I	1.0%	37.6%	49.6%	51.8%	53.4%	56.3%	58.3%	60.3%	62.3%	64.3%	66.3%	68.3%	70.3%
E. Java	-	-	2	1	-	-	-	-	-	-	-	-	3
C. Java	14	1	-	-	-	-	1	-	-	-	-	-	18
W. Java	6	6	4	-	3	-	-	-	-	1	-	-	22
D.I. Yogyakarta	-	-	1	2	-	-	-	2	-	-	-	-	3
Lampung	-	5	3	1	3	4	-	-	-	-	-	-	21
S. Kalimantan	17	38	13	-	-	1	-	-	-	-	-	-	70
Tot. Java, Lam- pung, Kalimantan	31	58	26	4	6	8	2	2	-	1	-	5	137
%/Cum. I	25.5%	36.7%	42.0%	43.3%	44.9%	46.7%	48.5%	50.3%	52.1%	53.9%	55.7%	57.5%	59.3%
Grand Total	41	127	80	45	24	41	18	12	11	2	21	12	441
%/Cum. I	9.3%	28.8%	39.1%	44.2%	47.4%	50.5%	53.6%	56.7%	59.8%	62.9%	66.0%	69.1%	72.2%

Sederhana (Simple) Irrigation Project - Internal Rate of Return (IRR) Calculation

Year (IFY)	Incremental Production (Thou. MT)	Net Value Production (Mil. Rs.)	Capital Costs (Mil. Rs.)	Recurring Costs (Mil. Rs.)	Net Benefits (Mil. Rs.)	Discounted Benefits (52.5%)
1(1976)	0	0	5822	0	-5822	-3818
2(1977)	83.6	1881	10506	322	-9047	-3890
3(1978)	241.0	5423	979	882	3562	1004
4(1979)	353.0	7943	0	962	6981	1291
5(1980)	577.6	12996	0	1072	11924	1446
6(1981)	759.9	17098	0	1201	15897	1264
7(1982)	832.7	18736	0	1304	17432	909
8(1983)	980.0	19600	0	1370	18430	630
9(1984)	914.1	20567	754	1419	18394	412
10(1985)	925.7	20828	1507	1435	17886	263
11(1986)	925.7	20828	0	1435	19393	187
12(1987)	925.7	20828	0	1435	19393	123
13(1988)	925.7	20828	0	1435	19393	80
14(1989)	925.7	20828	0	1435	19393	53
15(1990)	925.7	20828	0	1435	19393	35
Total						-11

Assumptions:

A. Incremental Production.

- 50% of Project area currently rainfed rice, 25% upland crops and 25% uncultivated. Percentages based on compilation of data contained in DDMRD first questionnaire for all projects scheduled for completion in IFY's 1976 and 1977 in South and Southeast Sulawesi.
- First irrigated rice crop after project completion on land currently:
 - Rainfed rice - first year.
 - Upland crops - third year.
 - Uncultivated - fourth year.
- 100% of Project area receives dependable wet season irrigation after project completion and 2% receives dependable dry season irrigation.
- 15, 35, 55, 75 and 90% of Project area included in New BIMAS Program in first through fifth year, respectively, that irrigated rice planted.
- 90% of dependably irrigated area actually cropped during particular season..
- Yields from Table 7. (in text).

B. Net Value Production.

1. Gross value of production Rp. 30 thousand per MT of dry stalk paddy based on price of \$175 per MT for 35% broken milled rice FOB Bangkok or \$210 per MT CIF Indonesian port of entry.
2. Cost of inputs 25% of gross value of production.

C. Capital Costs.

1. Includes cost of engineering services (consultants and training), cost to complete and cost of survey, hydrology and maintenance equipment.
2. Consultants - cost of services performed before 1 April 1975 included in IFY 1976 costs-remaining cost spread evenly over 2½ years of Project.
3. Training - cost spread evenly over 2½ years of Project.
4. Cost to Complete - all costs of individual projects incurred in year project planned for completion.
5. Survey and hydrology equipment - purchased in IFY 1976.
6. Maintenance equipment - purchased in IFY 1978.
7. Weirs - 15% of cost to complete - useful life of 7 years - replaced at end of useful life.

D. Recurring Costs.

1. Includes cost of operations and maintenance (O & M), tertiary unit water management and BIMAS program administration.
2. Operations and maintenance (O&M) and tertiary unit water management - July 1973 NEDECO estimate of Rp. 3600 per ha. per year contained in Draft Proposal for an Improved Maintenance Organization in the Jratunseluna Area increased to Rp. 5000 per ha. per year to take account of higher maintenance cost of gabion weirs and price escalation since July 1973.
3. BIMAS supporting services - August 1973 NEDECO estimate of Rp. 2900 per ha. per year contained in Jragung Dam Flood Control and Irrigation Project Feasibility Study increased to Rp. 3500 per ha. per year to take account of price escalation since August 1973.

Notes on Secondary Crops:

1. Secondary crops such as maize, cassava, sweet potatoes, etc. will probably be grown on some of the area dependably irrigated by Sederhana projects. Since this is unlikely to occur unless the net production value per season per hectare for these crops exceeds the net production value for rice, the growing of secondary crops would only increase the IRR of the Project.
2. Because of lack of information on the identity and yields of secondary crops currently being grown in upland areas included in Sederhana projects, the current net value of production of secondary crops in these areas has been assumed to be zero. This assumption results in an upward bias in the calculated IRR for the Project.

Annex: B

DGWRD First Questionnaire

QUESTIONNAIRE ON SMALL IRRIGATION/RECLAMATION PROJECTS

I. General:

1. Province :
2. Name of irrigation/reclamation project :
3. Location: a) Kecamatan (Subdistrict) :
b) Kabupaten (District) :
 - 3.1. Distance to the nearest town : Km.
name of the town :
 - 3.2. Distance to the nearest road : Km.
 - 3.3. Location map attached :
4. Expected land area : Ha.
5. Topography : plain/mountainous/hilly
coastal/swamp
6. Present vegetation : grassy/forest/alang/plain/
etc. /alang
7. Status of irrigation/reclamation area : new/extension/rain
irrigated/drainage system
ricefield/ebb tide/swamps
(non ebb tide) etc.
 - 7.1. Areal of extension (Additional to the existing area)
 - 7.1.1. Size : Ha.
 - 7.1.2. Yield (paddy) : Ton/ha
 - 7.1.3. Secondary crops :

QUESTIONNAIRE

- 7.2. Area of existing rain irrigated ricefield
- 7.2.1. Size : Ha
 - 7.2.2. Yield (paddy) : Ton/ha
 - 7.2.3. Other :
8. Wet season : (mention the name of the month)
9. Nearest rainfall station
- 9.1. :
 - 9.2. :
10. Soil quantity:
- 10.1. soil type : clay/lime/sandy
 - 10.2. soil colour : red/black/brown/white/etc.
11. Population
- 11.1. Density : dense/rare/uninhabited persons/Km², 1971 census
 - 11.2. Source of income : farmers/fishermen/traders/laborers etc.
12. Land status : private/state/kin ownership etc.
13. Transmigration : Manpower (farmer/peasants) already in existence and sufficient/already in existence but not sufficient /non-existent/immigrants required/not required.
14. Communication : easy/difficult/non-existent dependent on season
15. Suitable crops :
16. Activities already/not yet undertaken :

QUESTIONNAIRE

- 16.1. Reconnaissance survey : done/not yet done by
report available at
- 16.2. Situation mapping : done/not yet done by,
scale.,.....,reports
available at
- 16.3. Survey on land cultivation : done/not yet done by
reports available
at
- 16.4. Design : done/not yet done by
reports available at
.....

17. Implementation Plan

- 17.1. Difficult technical aspects encountered :
- 17.2. Duration of implementation : yrs
- 17.3. Estimated budget until completion : Rp.
(Including feeder road)
- 17.4. Requirement for seasonal laborers/farmers
- 17.5. Requirement for equipment/special tools
(materials) : bulldozer/shovel/dredger/
dynamite/etc.

- 18. Definite budget in REBELITA II : Included in project INPRES/
APED (Dev. Budget)/excluded
continuation INPRES.

II. IRRIGATION

- 19. Water resource : river/lake/drainage/
water source etc.

QUESTIONNAIRE

- 20. Quantity of water resource : sufficient fortimes planting with%
- 21. Water quality : good/bad/undetermined
- 22. Structure and canals
 - 22.1. Water tapping : dam using the existing river stone/iron netted stoned/freely flowing in/pumping/permanent dam/dam upgrading/etc.
 - 22.2. Canal : partially not/in existence/lengthkm/etc.
 - 22.3. Canal digging required : Yes/no/only the main canal/etc.

III RECLAMATION

- 23. Drainage from : swamp/floods
- 24. Is the project categorized as swamp area which:
 - 24.1. Is totally flooded during the rainy season and partially during the dry season? (Yes/No)
 - 24.2. Is totally flooded during the rainy season and dry during the dry season? (Yes/No)
 - 24.3. Causes of the flood/swamp: : regular flood/tidewater/lowland/small lake/natural swamp area/etc.
- 25. Depth of swamp water during:
 - 25.1. the rainy seasonE
 - 25.2. the dry seasonE
- 26. The highest point of the tide water difference:E.

QUESTIONNAIRE

27. Local paddy variety.

27.1. Life of local variety:months ordays

27.2. Planting season of local variety: from the month of
through the month of

Annex C

DCWRD Second Questionnaire

APPRAISAL TEAM

As has been outlined in the previous chapters, the implementation of small irrigation/reclamation projects faces various problems and difficulties. In order to achieve good results according to the goals that have already been planned and targeted an Appraisal Team will be sent to the regions which is extensively familiar with existing problems facing the project and assigned with the following tasks:

1. Making on the spot observation for each project proposed by the Provincial Public Works Agency.
2. To make direct evaluation as to whether the projects proposed are in compliance with the data submitted by filling out the questionnaire in the proposals.
3. To make inventory:
 - 3.1. of Provincial Public Works Agency personnel up to section.
 - 3.2. of Provincial Public Works Agency equipment up to section.
 - 3.3. Local participation as has been mentioned above.
 - 3.4. Local coordination.
 - 3.5. Private sector contractors that might assist in surveying, planning and implementation of local activities.
4. To find out Institutes/Universities/Academies that might assist in surveying, planning, research of small irrigation/reclamation projects in the region.

5. Compiling data not completely provided in the project proposals, particularly that which will determine which project can be included in the first year, second, third, etc.
6. To reevaluate existing manpower, the number of farmers as well as laborers, whether new workers should be brought in, their number, when they should come and the location of the village where they will live.

The Team should consists of officials having expertise in the problems of surveying, planning and practical solution (practical problem solving) on small irrigation/reclamation projects.

ANNEX I

To be filled in by Provincial Public Works Agency

1. Personnel in Irrigation Department, Provincial DPU
 - 1.1. Make a list of personnel and their highest education.
 - 1.2. Indicate where manpower shortages exist particularly in handling the implementation of small irrigation/reclamation projects.
 - 1.3. Is personnel training required either for those already on the payroll or for additional planned personnel.
 - 1.4. Is there any or sufficient STM (High School for Technology) Academy of Technology/Faculty of Technology in the Province.
2. Mention the Institute/Academies/Universities which can assist in:
 - 2.1. Surveying/Measuring/Planning:
Equipment possessed: -
-
-
 - 2.2. Implementation :
- 3.1. Private sector contractors available which can assist in measuring and planning:
 - 3.1.1.
 - 3.1.2.
 - 3.1.3.
 - 3.1.4.
 - 3.1.5.

3.2. Equipment at the disposal of private sector contractors
in 3.1. and the Irrigation Section of the Public Works
Agency:

3.2.1.

3.2.2.

3.2.3.

....., date.....

Confirmed:

Chief, Provincial Public
Works Agency

Chief, Irrigation Section

Provincial Public Works Agency

(.....)

(.....)

ANNEX II

To be filled in

1. Name of the project:
2. Area :
 - 2.1. Existing \pm Ha
 - 2.2. Rain irrigated \pm Ha
 - 2.3. New extension \pm Ha
 - 2.4. Size of second planting \pm Ha
3. Source of water :
- 3.1. Max. debit (volume)m³/sec
- 3.2. Average volume "
- 3.3. Minimum volume "
- 3.4. Area of rivuletKm²
- 3.5. Catchment area situation
- 3.6. Need for reforestration
- 3.7. Other
4. Climate :
 - 4.1. Climate type
(based on Schmidt and Ferguson)
 - 4.2. Average rainfallmm/yr
 - 4.3. Average rainy daysdays/yr
 - 4.4. Other
5. Soil situation :
 - 5.1. Fertility
 - 5.2. based on research/experience
 - 5.3. Soil problems
 - 5.4. Existing vegetation

- 5.5. Bimas/Inmas
- 5.6. Existing estates
- 5.7. Existing foreign concessions
- 6. Population :
- 6.1. Density \pm Km²
- 6.2. Farmers \pm %
- 6.3. Laborers \pm %
- 6.4. Traders \pm %
- 6.5. Fishermen \pm %
- 6.6. Existing transmigrantsfamilies
- 6.7. Transmigrants neededfamilies
- 7. Land/sea communication:
 - 7.1. Roads
 - 7.2. Bridges
 - 7.3. Land transportation facilities ...
 - 7.4. Sea transportation facilities
- 8. Project data:
 - 8.1. Survey
 - 8.2. Measurement
 - 8.3. Design
 - 8.4. Implementation preparation
 - 8.5. Implementation completed
 - 8.6. Works to be performed by DFU
 - 8.7. Works to be performed by local government/community

8.8. Special equipment required

8.9. Special material required

Appraisal Team
Directorate General of Irrigation

Provincial Public Works
Agency
Chief of Section

(.....)

(.....)

Confirmed

Chief, Public Works Agency
Province

(.....)

ANNEX III

1. Region capacity: Section
- 1.1. DFU Personnel, section:
- 1.1.1. Technicians: Univ. graduatesmen
 - Bachelorsmen
 - S.T.M.men
 - Surveyorsmen
 - Secondary Tech. Schoolmen
- 1.1.2. Gen. Admin staff:
 - Univ. graduatesmen
 - Bachelorsmen
 - High schoolmen
 - Secondary schoolmen
 - Elementary schoolmen
- 1.2. DFU equipment, Section
- 1.2.1. Instruments for surveying:
- 1.2.2. Transportation equipment:
- 1.2.3. Other equipment:
- 1.3. Available private contractors:
- 1.3.1. Survey/Design :.....
- 1.3.2. Implementation:
- 1.4. Possible assistance from local government:
 - 1.4.1. Land problem
 - 1.4.2. Mobilizing the people to dig irrigation canal/
open up new ricefields

1.4.3. Communication

1.4.4. Simple equipment

1.5. High School of Technology majoring in:

1.5.1.since year

1.5.2.since year

1.5.3.since year

2. Simple and expeditious method but well controlled financial
administration in sections:

.....
.....

Confirmed
Chief of Public Works Agency
Province

Provincial Public Works Agency
Section Chief

(.....)

(.....)