

ANNEX C : IRRIGATION

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C.1 Irrigation Scheme

Based on the Irrigation System Inventory basically prepared by the Government in 1993, number of irrigation scheme and irrigated area in each province are shown in Table C.1.1.

The irrigation schemes in the Study Area by size-wise are summarized as follows:

Registered Number of Irrigation Scheme and Their Area by Size-Class by Province

Descriptions		W.Sumatra	W.Jawa	D.I.Y	E.Jawa	NTB	Total
Size Class 0-500 ha	Irrigated area	75,625	97,898	32,053	370,785	37,289	613,650
	Scheme No.	720	626	586	6,009	174	8,115
	Av. Area/schme	105	156	55	62	214	76
Size Class 500-1,000 ha	Irrigated area	36,440	80,817	4,651	100,813	42,844	265,565
	Scheme No.	51	120	7	142	62	382
	Av. Area/schme	715	673	664	710	691	695
Size Class 1,000-5,000 ha	Irrigated area	58,375	262,463	19,369	357,349	71,879	769,435
	Scheme No.	32	87	12	161	38	330
	Av. Area/schme	1,824	3,017	1,614	2,220	1,892	2,332
Size Class More than 5,000 ha	Irrigated area	42,938	98,960	0	103,474	17,213	262,585
	Scheme No.	6	7	0	16	3	32
	Av. Area/schme	7,156	14,137		6,467	5,738	8,206
Total	Irrigated area	213,378	540,138	56,073	932,421	169,225	1,911,235
	Scheme No.	809	840	605	6,328	277	8,859
	Av. Area/schme	263.8	643.0	92.7	147.3	610.9	1,758

units : Irrigated area : x 1,000ha, Scheme No. : nos, Av. Area / scheme : ha/scheme
Source : INVENTARISASI DAERAH IRIGASI DENGAN LUAS RENCANA, DGWRD, PU, 1998

C.2 Operation and Maintenance of Irrigation System

C.2.1 Government Budget for Irrigation O&M

The irrigation O&M costs provided by the Government as a APBN and APBD are shown in Table C.2.1 and C.2.2.

C.2.2 Real Cost of O&M and the Benefits to be gained from applying EOM

(1) Real O&M cost

A detailed analysis was carried out for a number of irrigation schemes in Aceh Province in 1991, to ascertain the real costs of operation and maintenance, O&M, beyond the tertiary network. Each activity, from the shared cost of provincial supervision at one end, down to the cost of mending small cracks in the canal linings at the other, was studied and costed. The main analysis related to the 2,440 ha Krueng Jreue scheme, but for purposes of estimating some of the more expensive activities, such as the periodic replacement of gates, a wider view was taken and average annual costs over several schemes were calculated.

The original 1991 Rupiah per hectare cost estimates were as follows:

Government costs (operational)		Routine maintenance		Periodic, annual maintenance	
Item	Rp/ha	Item	Rp/ha	Item	Rp/ha
Provincial level	630	Grass cutting (canals)	5,265	Grass cutting (canals)	1,350
Kabupaten level	3,550	Grass cutting (drains)	5,265	Grass cutting (drains)	1,350
Kecamatan level	6,685	Embankment repairs	250	Embankment repairs	124
		Lining repairs	500	Trash removal	50
		Maintenance inspector	1,320	Structure repair	8,200
		Gatekeeper	317	Sediment removal	13,203
				Lining repair	28
				Weir upkeep	1,844
Sub-total	10,865	Sub-total	12,917	Sub-total	26,149
Emergency repairs	3,308				
Total annual cost ; Rp.53,239 (US\$ 27.3)					

Since then there have been major changes in the exchange rate and the relative Rupiah prices of the main

inputs, labor, machinery hire, fuel, cement, steel, sand and gravel have also changed very significantly. In some cases, such as with cement, prices have more than tripled.

The following tables provide details of the recalculated unit costs, Table C.2.3, using various inflation rates, as applicable, the revised work costs (Table C.2.4) and the revised per hectare costs (Table C.2.5). The cost structure differs slightly from that shown above, but they both cover the same range of costs. It will be seen that the total cost, in 2000 prices, is around Rp 120,000/ha, approximately double that required in 1991. In US\$ dollar terms the cost is significantly lower, falling from US\$ 27 in 1991 to US\$ 15 in 2000. This results from the use of an exchange rate of US\$1= Rp 1950, in 1991, and US\$1= Rp 8,000 in mid to late 2000.

Table C.2.5 also provides a breakdown of the overall cost, indicating that approximately 61% relates to unskilled and skilled labor, 9% to Government administration, 7% to operational staff costs (gatekeepers, etc) and 23% to materials. Were WUAs to completely organize O&M themselves, it would probably be possible to reduce the Government administration cost; there will, however, still be a role for Government staff and it will need to be considered if any of their costs should be charged to the WUA. The positions of weir keepers and such staff, which in many cases are currently the responsibility of Government, would probably become privatized, but the overall cost is unlikely to change significantly. The one area where the cash cost of O&M could be substantially reduced is with regard to the use of unskilled, and to some extent, skilled labor. Approximately Rp 70,000 of the total O&M cost relates to labor use, and this represents around seven workdays per year. On several schemes visited where farmers already have taken some responsibility for O&M of secondary and primary canals, it was noted that the farmers tended to provide around four *gotong royong* days per year for work on secondary and primary canals. If this input were to be doubled it would then be possible to reduce the cash contribution to O&M to around Rp 50,000/ha per year, equivalent to approximately 50kg of gabah GKG (dry paddy). Assuming two crops per year, this would represent around 25kg dry paddy per season.

Whether or not farmers pay in labor, cash or kind, if Rp 120,000/ha proves to be a realistic estimate of the cost of keeping an irrigation system in good working order, it would seem a very small price to pay to keep such a valuable asset intact. Many schemes cost between US\$3,000 and US\$5,000/ha to construct, or at current exchange rates between Rp 24 and 40 million; the suggested O&M cost represents less than 0.5% of this.

It is appreciated that every scheme is different and that the real O&M cost, based on a Needs Based Budgeting approach would vary widely. Some schemes are very well constructed, have few sedimentation problems, have relatively short lengths of primary and secondary canals, have stable headwork structures and enjoy stable soil conditions. Others are poorly constructed, are plagued by heavy sedimentation and canal collapse, face major problems with the headworks and have primary canals extending for 30km or more. O&M costs per hectare would be many times greater for the poor condition scheme than they would be for the good condition scheme.

(2) The benefits of keeping an irrigation scheme in good working order

Even under ideal O&M conditions, the condition of an irrigation scheme will gradually deteriorate and there eventually comes a time when it will require rehabilitation. The extent of rehabilitation will vary from scheme to scheme. Systems comprise a number of distinct components, all with differing life expectancies. In some schemes the basic structures are simple with long life expectancies, in others they are complex, and in many cases, more likely to require rehabilitation in the shorter term. Whilst careful maintenance can help to prolong the life of structures, most will, nevertheless, eventually break down.

It is believed, however, that in many cases, if structures or canals were to be well maintained, the life of the asset can be extended quite significantly and the cost of the repair can be minimized. It is evident from the field that where small breakdowns in the canals or in the main or diversion structures are allowed to remain unattended, these can soon develop into major problems; had the system been privately owned the owner would have attended to the problem at the outset, often at little cost. It can also be observed in the field where canal and drains, for example, have been left virtually unattended, that the sediment and vegetation problem becomes so large that it can no longer be handled by a group of farmers providing a few days of

gotong-royong. Instead, an expensive rehabilitation activity has to be applied.

Keeping an irrigation system in good working order is to everybody's benefit, except those who profit from commissioning and implementing rehabilitation work. The farmer benefits because he can rely on the system to work year after year, without any rapid decline in water availability (weather conditions, notwithstanding). Once a system starts to breakdown, those farmers who are most adversely affected become, understandably, reluctant to pay the O&M charge or to participate in *gotong-royong* activities. As soon as some farmers fail to contribute, the problem spreads throughout the scheme and the rate of deterioration accelerates. If everybody is satisfied with the provision of water, these problems are avoided. The nation benefits because the demands on the national budget are reduced. Even before farmers were expected to contribute towards O&M, it appears that it Government found it difficult to provide sufficient O&M funding to ensure full EOM. If, however, the real O&M costs are compared to those of rehabilitation, the benefits from properly looking after irrigation schemes become pretty evident.

A theoretical analysis, which supports the above, is presented below.

Table C.2.4 provides an indication of what farmers' net returns per hectare could be under two scenarios, (a) one where the irrigation system requires rehabilitation after nine years and one (b) when it lasts for twenty years. In both cases it is assumed that rice cropping intensities would always be 97% in the wet season, and that in the dry season they would fall from 75% to 70%, over the period between rehabilitation. Wet season yields (GKG) have been assumed to fall from 5.0 tones/ha to 4.0 tones in the wet season, and from 5.0 tones to 3.5 tones in the dry season, over the period between rehabilitation. The net returns were calculated by using the crop budget analyses discussed in section 2.3.4 of the Main Report..

By comparing the net returns from the two scenarios, it can be seen that if farmers were not to pay any O&M, (that is, Government were to pay) during the first ten years, farmers would be substantially better off where the rehabilitation is deferred for 20 years as in scenario (b). Thereafter, in most years, they would be slightly worse off as conditions within the long period rehabilitation scheme (b) become less favorable than those in the newly rehabilitated scheme, (a). If, however, the benefits over the whole period are considered, the overall impact is that the farmers are better off under scenario (b) The analysis indicates a net present value, over twenty years, in excess of Rp 3 m, using a 12% discount rate. If farmers pay the O&M themselves, there is still a substantial net benefit, although it would be reduced to around Rp. 2 m/ha. Over the twenty-year period this is equivalent to around Rp 400,000/yr where farmers rely totally on Government to pay O&M or around Rp 300,000/yr where farmers pay the O&M themselves.

As far as the cost to Government is concerned, the savings are also significant and indicate that whoever bears the cost of O&M, it is worthwhile trying to keep irrigation systems in reasonable working condition for as long as possible. With a 12% discount rate the following equivalent annual costs would apply to schemes which are rehabilitated every ten years (a) and which are rehabilitated every twenty years (b). A range of rehabilitation costs, from US\$ 1,000 to US\$ 2,000, have been used

Rehabilitation period (years)		10	20	Difference	
		(a)	(b)	US\$	Rp
Rehabilitation cost (US\$/ha)	1,000	177	134	43	344,000
	1,500	265	201	64	512,000
	2,000	354	268	86	688,000

The above indicates that for the range of per hectare rehabilitation costs used, the annual savings would be between Rp 344,000 and Rp 688,000. If the farmers pay the O&M cost, this would be total saving to Government; if Government pays for part or all of the O&M then the savings would be reduced accordingly. Under the assumption that the real cost of O&M is around Rp 120,000/ha, if Government were to pay all of this, the minimum saving would be around Rp 224,000/ha per year.

Combining the average benefits to the farmer and the Government, with a scheme costing US\$ 1,000/ha to rehabilitate, annual savings would be approximately Rp 600,000 per year, after having paid the real O&M cost.

It must be appreciated that the basis for this calculation is highly theoretical; the results are, however, sufficiently significant to indicate that there is a very significant marginal benefit to be gained from EOM.

C.2.3 Case Study on Maintenance and Rehabilitation at DI Pekatan in NTB

(1) Objectives

In the Phase Study, to verifying the countermeasures, The Study Team conducted Detailed walk though as a whole system of irrigation. DI. Pekatan in NTB was selected as a case study. Then the following inspection were conducted with farmers representative in the Field in April 2001.

- Listing the required maintenance and rehabilitation works for the primary and secondary canal infrastructure.
- A description of the required maintenance and rehabilitation works
- A description of the operational standard and capacity of the tertiary unit irrigation canal.

(2) Outline of DI. Pekatan

DI. Pekatan located in Pelopor and three other villages, Kecamatan Gangga, Kabupaten Lombok Barat in West Nusa Tenggara Province. The water supply is taken from a weir structure, named *Pekatan Dam*. The DI is irrigated via two primary canals delivering water to both the right and left hand sides of the river. The area to the right is serviced by a primary canal (*Saluran Primer Bedugul*) of 4.25 km in length and a secondary canal (*Saluran Sekunder Gondang*) of approximately 5 km. Both these canals service a total of 16 tertiary units with a total area of *sawah* of 332 ha. A primary canal of some 3.5 km in length and three (3) secondary canals of some 5.5 km deliver water to the irrigation area on the left bank. This area is a total of 499 hectares consisting of 19 tertiary units. Based on a total area of 853 ha, 22 hectares are not planted to paddy. The planting pattern for *DI Pekatan* is Paddy, Paddy, Palawija, i.e. seasons I, II and III respectively

(3) Walk Through Inspection

Together with WUA members, totally 36 irrigation facilities, canals and tertiary block were inspected. Their conditions and requirement of repair works are as follows;

Right Bank

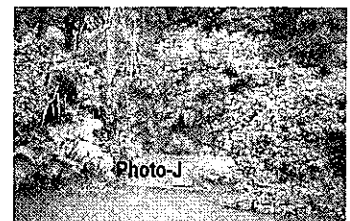
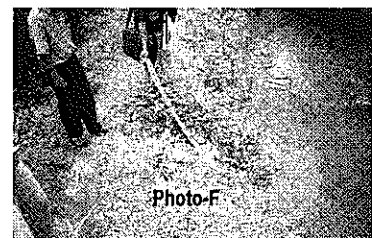
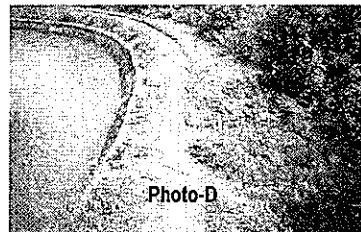
- 1) **In-take weir (dam), *Pekatan Dam***, is in good condition. The intake gate for the right hand side is positioned on the left-hand side of the river and the water passes under the weir through a culvert (siphon?) to the primary canal. The weir structure and gates are in good condition and the gate is operational and can be opened and closed freely. Photo (A) shows the off-take weir with the inlet to the *Bedugul* Primary Canal from a piped delivery under the weir wall.



- 2) **In-take weir > TU BG1:** The section of the primary canal from the off-take structure to TU BG1 is masonry lined. Photo (B) shows the inlet-canal from the pipe outlet into the primary canal. In some sections the canal passes through some natural rock formation and this rock forms the canal bank. Flow velocities in these sections of the canal are high and hence sediment at this upstream area is not a concern. Also in areas above the lining or natural rock, there are steep slopes and rocks fall into the canal damaging the lining and becoming obstacles to flow. Some are large and difficult to remove by hand – (especially in the area before TU BB1).



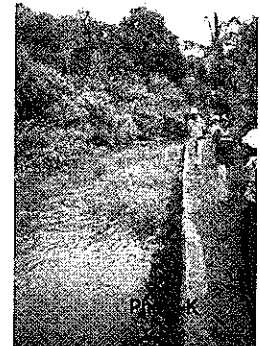
- 3) A **sediment pond** was constructed in the canal just prior to **TU BB1** and completed in February 2001. This construction was part of rehabilitation/upgrade works program. The sediment pond currently contains 30cms of sediment, i.e. the volume collected since being constructed, 2.5 to 3 months. Length of pond is approximately 100m.
- 4) A **supplementary supply from a small river enters at TU BB1**. This is a small weir and the supplementary supply flows naturally into the canal as the weir wall forms one side of the canal. At times of high flow (as witnessed during the field trip), water flows over the weir wall were evident. There is a need to ensure that the canal section / weir section remains clean to ensure that at times of low flow, water is not lost over the weir wall, hence negating the effectiveness of the supplementary supply.
- 5) The tertiary gates for **TU BB1, TU BB2 and TU BB3** are operational but the control gates are either not operated or missing. The TU gates are needed to regulate supply as the flow is fast into the TU Canal.
- 6) The **tertiary canals (BB1 & BB2)** appeared to be under capacity and sediment and grass was prevalent in the canals, i.e. both the tertiary and quaternary.
- 7) **TU BB3 > TU BG1**: This section is some 3.5 km in length with approximately 1,200 m of earth canal. The canal consists of sections with lining along the left-hand bank and sections that are of earth construction. Photo (C) shows a section of lined canal bank with approximately 7m of eroded lining with stones washed away and soil eroded from under the crest of the canal bank. Photo (D) shows damage to the outside batter (slope) of the left canal bank that has been eroded and broken by animal and human traffic to and from the rice fields. This section of earth canal has areas where sediment has built up over time (40cms of sediment – near to the left canal bank) and these areas are over grown with grass and shrubs. There are also a number of sections where the earth canal bank has eroded and in some instances, the length and width of the eroded section is some 2m by 1m, Photos (E & F). Photo (E) also shows where sediment has been deposited near the left-hand canal bank and shrubs and aquatic weed have grown in the canal bank and on the deposited sediment areas.



8) **TU BB3 > TU BG1 – Canal Section** – [Refer to Photos, (E), (H), (I) & (J)]: As can be seen from the Photos, (E) & (H), the right canal bank has very steep land above the crest of the canal bank. Several areas of this land are cultivated to fruit / nut trees or other crops. During rainfall, soil from these slopes is eroded and flows into the canal. In some areas of the canal the right canal bank has no shape and is just a deposited area of sediment (Photo (J)). Photo (I) shows the dense tree, bush and grass growth that has grown on the steep area of land adjacent to the canal. Similar growth has occurred on the right hand edge of the canal and on the area of deposited soil eroded from the slope.

9) **TU BG1:** The control structure in the main canal uses “Drop Boards” as the means of control. The drop boards were beside the canal. The gates for the tertiary distribution box were broken. At the gate and for a short distance down stream the sediment deposit was measured at 50cms. For a further 120 m downstream, sediment was deposited to a depth of 10cms. The tertiary canal and quaternary canals were full of weeds.

10) **TU BG1 > TU BG2:** This section of canal is 600 m of earth canal and 250 m of canal with the left bank lined with stone masonry. Within a 250 m section of the earth canal, 4 sites of bank erosion were inspected, with each site having bank erosion to a length of 2 to 3 m . A section of the lined canal, some 3 to 4 m, was broken with the compacted earth backing eroded from underneath the crest. At TU BG2 turnout the control / check structure within the main canal has no drop boards, there are no tertiary gates and a section of the concrete structure is broken.



11) **TU BG2 > TU BG3 > TU BG4:** Photo (K) shows a section of masonry lined left canal bank within this section of canal. The photograph is a good illustration of the deposited area of sediment, the growth of grass and weed and an indication of the depth of deposited sediment. The photograph also illustrates the restriction to flow. Also illustrated is the steep right hand slope above the canal, the cultivation occurring above the canal and the dense vegetation at the base of the slope that continues to intrude and grow within the boundary of the canal bank.

12) **TU BG1 > TU BG7:** Photo (L) is an excellent illustration of the following maintenance problems associated with the sections of earth canal:

- the erosion of the left side earth canal bank;
- the deposition of sediment against the left canal bank;
- the growth of grass and weed on the deposits of sediment;
- the intrusion of dense vegetation into the flow path of the canal on the right side of the canal;
- the narrowing of the canal flow path due to the sediment deposits and vegetation, and
- a steep, cultivated area downstream on the right side of the canal.



13) **TU BG3:** The tertiary canal has 10 to 15cms of sediment deposited on the bottom while the inspected quaternary canal has a decreased flow capacity due to sediment deposits. Both the quaternary and tertiary canals are heavily polluted with grass and weeds, reducing capacity even further. The control/check drop boards are not used for water control and the tertiary turnout structure is broken (broken cement and gates). The quaternary gate/s cannot be operated.

14) **TU BG4:** The quaternary gate turnout is broken. There is no control / check gate drop boards and hence no water control is implemented with the delivery of irrigation water.

15) **TU BG5 & TU BG6:** The condition of these turnouts is as per TU BG4, i.e. no check gate control of water flow, the tertiary gate is not 100% functional and the level of sediment in the tertiary canals is approximately 10cms. Weed and grass growth is excessive with the capacity of the

tertiary canal estimated at being less than the required size to effectively service 23, 27 and 30 hectares of rice fields.

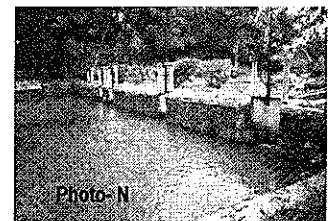
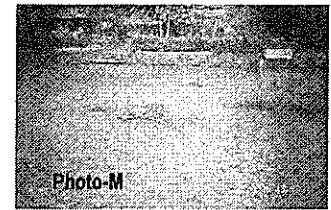
- 16) **TU BG 7:** This tertiary turnout is in good condition but the canals are below capacity due to sediment, grass and the original construction being to a size below required capacity for 37 hectares. Upstream of TU BG7 there is an area of the canal (included in the design) that is used by the farmers and villagers for washing cattle. The area although part of the design has become an area of large deposits of silt and eroded sections of the canal bank.
- 17) **TU BG11 & TU BG12:** This section of the secondary canal was inspected following a meeting with the respective P3A for this area, i.e. P3A – *Pelopar*. The TU BG11 gate is missing but the secondary canal, check-structure and gates are functional. The tertiary gates servicing TU BG12 are divided into three canals. On two of the canals the gates are either broken or inoperable. They need repair.
- 18) **Miscellaneous:** The following maintenance concerns were also noted:
 - Two villagers located along the canal create problems by throwing rubbish into the canal. The rubbish causes obstruction to flow through turnout gates and downstream control gates (where operational).
 - The upstream village (in the vicinity of TU BG2 / TU BG3) also creates problems by erosion of the right hand side canal bank due to traffic flow by the villagers and at the entry points for the cattle washing sites.

LEFT BANK

- 1) **Weir / In-take Gate to TU BP1 – Primary Canal – *Saluran Pekatan*:** The canal is lined. But, there is a need for water from the higher ground on the left of the canal and from houses and small villages in the same vicinity, to be drained below the canal and into the river. The water inclusive of dirt and silt currently runs into the canal. This drainage water contains sediment and the use of culverts or siphons underneath the canal would solve this problem. The control / check structure at TU BP1 is missing the drop boards (a common problem at all except one site within the DI canal system).
- 2) **TU BP1 > TU BP2:** Two sites, a 1 m length and 2m length of canal have had the lining broken and soil has been eroded from behind the lining eating into the canal bank. There is a 1 m length of lining that is broken and the crest of the lining has broken and collapsed. On the left-hand side of the canal a 7 m length of the canal bank has been broken and eroded by cattle, (the site is near to a designated cattle washing site). The canal passes through a village and at one site (a cattle wash area) the canal lining has been broken and collapsed for 4 m on the right hand side and for 2 m on the left-hand side (adjacent to the entry to the canal and slightly downstream).
- 3) **Village between TU BP1 & TU BP2:** There are some illegal off-takes for fish ponds (*kolam ikan*) and there are two water wheels used to deliver water to the toilet / washing area for the local mosque and Islamic school. These water wheels operate continuously as long as water is flowing. The question raised to the irrigation authorities (*Pengamat Pengairan & Sub-Dinas Pengairan*), was the matter of payment for usage of the water. This was laughed off as not possible. This attitude must change for the successful empowerment of WUA.
- 4) **TU BP2:** Again no use made of the check structure for delivery of water to the tertiary unit. Tertiary canal is lined for some distance but further downstream the normal deterioration of sediment and grass is evident. Canal banks are cut back by farmers using their hoes (*cunguls*).
- 5) **TU BP3:** No drop boards in use at the check structure. Tertiary gate in good condition but the tertiary canal further downstream was full of sediment and grass. A measurement of the sediment was not done but at this TU, it was excessive in the tertiary canal.

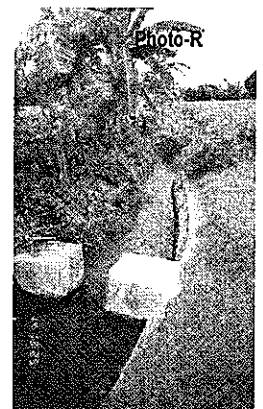
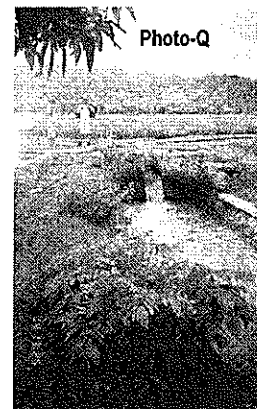
- 6) **TU BP4:** No drop boards and measuring structures drowned out. Gates operated via completely opened or completely shut. Tertiary canal in reasonable condition but unable to check the full length.
- 7) **TU BP3 to TU BP5:** Some sections of the earth canal in this region were eroded and needed repairs.

- 8) **TU BP5 & TU BP5a:** These off-takes to tertiary units are situated at a large **sediment pond** before water flows through drop structures into the 3 secondary canals. The depth of sediment varies throughout the pond from 10cms to 20 and 30cms. Photo (M) shows an example of the sediment deposits within the pond. In some instances water-weed is growing on the deposits. The pond is in need of cleaning but the advantage of *DI Pekatan* is the excess water that flows through the canal from the river, hence because of the size of the sediment pond, sufficient water can flow through the pond and into the secondary canals and tertiary off-take structures. Photo (N) shows the sediment pond and the off-take structure for the secondary canals, *Sekunder Kroya* servicing TU BP5d, *Sekunder Kandang Kaoq* servicing TU BP5c and *Sekunder Tanak Song* servicing TU BP5a. The tertiary unit off-take for TU BP5b is also part of this structure.



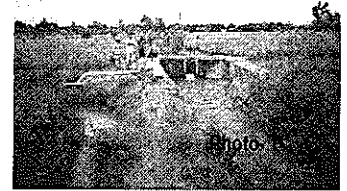
- 9) **Secondary Canal – *Sekunder Tanak Song* > TU BP5a:** This canal could only be inspected from the downstream end, i.e. from the tertiary unit TU BP5a). The distance that could be investigated was limited due to farmer damage to the secondary canal banks. Farmers have dug into the canal bank and used the area for cultivation area. The width of the bank crest makes it difficult to walk along and inspect the canal. The secondary canal does have levels of sediment and grass that do limit water flow. According to PU there are leaks through the canal banks because of the decreased size but again because *DI Pekatan* has an excess of water from the river, a continuous volume of flow compensates the farmers.

- 10) **TU BP5a (*Kiri, Tengah & Kanan*):** The level of sediment in the sediment traps leading into these canals is high and sediment has decreased the capacity of the tertiary canal/s. Photo (O) is a picture of the off-take TU – BP5a (*Kiri, Tengah and Kanan*), depicting the gates and the flow into the tertiary canals. This structure is in good condition but from Photo (P) and discussions with the *Pengamat Pengairan*, the condition of the secondary canal is not good the further the distance upstream from TU BP5a structure. The photograph shows the collapse of the inside canal bank and also the actual width of the crest and the closeness of the rice growing near the canal bank. Although not clearly defined, there are areas of erosion in the bank that are covered by grass but water does escape through the bank. Photo (Q) is the delivery flow into tertiary canal BP5a *Kiri*. The capacity of this canal decreases towards the downstream sections, through the erosion of canal banks, sediment deposits, grass and weeds. Photo (R) depicts the flow into the tertiary canal TU BP5a *Tengah* and as can be seen, the capacity decreases as the flow moves downstream. This canal is overgrown and the planting of crops (banana trees) on the banks does not assist the

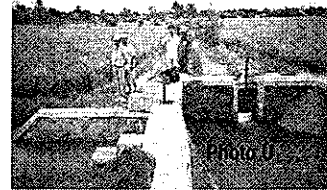


stability of the canal bank and causes collapse.

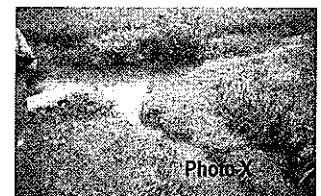
- 11) **TU BP5b (Kiri & Kanan):** There is no control / check gate to control the flow to both left and right. Sediment is again a problem in a small sediment pond leading from the distribution structure at TU BP5 and also in the tertiary canal.



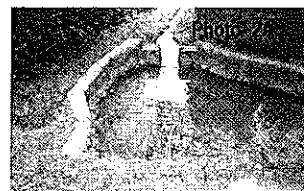
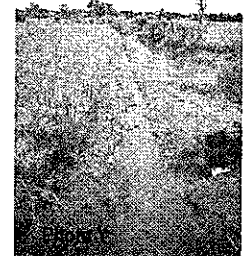
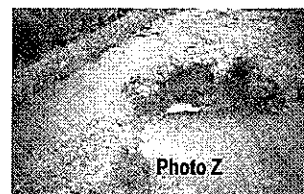
- 12) **Secondary Canal – Sekunder Kandang Kaoq – TU BP5c3 (Kiri, Tengah & Kanan):** It was also impossible to check this secondary canal from the upstream section because of the condition of the canal banks. From the farmers cultivating and planting as close as possible to the canal bank through eroding the canal bank with their hoes (*cungkuls*), the canal bank was difficult to traverse. TU BP5c2 was inspected during the walk through of secondary canal *Kroya*. The structure at TU BP5c2 was operated without control / check gates. The tertiary canal was full of grass and sediment and flow was definitely impeded. The constructed capacity (width and shape) of the tertiary canal for both BP5c *Kiri and Kanan* is questionable, when command area is considered, i.e. 41 and 24ha respectively. Sediment deposits were evident in the secondary canal at this off-take structure. Photo (S) is the secondary canal from the off-take structure, TU BP5c3 (*Kiri, Tengah & Kanan*). The canal becomes overgrown and capacity decreases towards the upstream section.



- 13) **TU BP5c3 (Kiri, Tengah & Kanan):** Photo (T) shows the off-take structure, TU BP5c3. The gate for the right tertiary canal is missing. It also shows the left side tertiary canal, that also has three branches (tertiary branches or quaternary canals) delivering water to the left and right of the main left tertiary canal. The left section (quaternary canal?) of tertiary canal TU BP5c3 *Kiri*, comes back and runs alongside the secondary canal. The delivery of water into this canal and the canal section to the right is non-controlled and water enters the canal through entries cut into the main tertiary canal by farmers. Photo (U) shows the tertiary centre (*tengah*) canal and the outlines of the right section of the tertiary canal from tertiary canal *Kanan*. A quaternary canal outline is seen that receives water from tertiary canal *Tengah*. Photo (V) shows the water delivery to TU BP5c3 *Kanan* (no gate). The canal disappears into the growth of trees and bushes.



- 14) **TU BP5c3 (Kiri) – Tertiary Canal:** Photo (W) shows the tertiary canal for TU BP5c3 *Kiri*. The



capacity and condition deteriorates towards the downstream section. Photo (X) shows the cuts into the banks of tertiary canal TU BP5c3 *Kiri* for delivering water to either quaternary canals (or continuation of the tertiary canal) to the left and right of the tertiary canal. These canals are meant to deliver water to rice fields within TU BP5c3 *Kiri* but as Photos (Y) and (Z) show, a cut into the right hand side quaternary canal bank delivers water back into the tertiary canal for TU BP5c3 *Tengah*. Also because of the velocity of flow entering the canal from this cut and the existing flow in the tertiary canal, the tertiary canal bank is eroding. Photos (2A), (2B) and (2C) depict a quaternary off-take from tertiary canal TU BP5c3 *Kiri*. This off-take is in the village and was built by farmers and PU to protect the village road. The gates or drop boards are not in use and the delivery to the quaternary canals is uncontrolled. And, the villagers throw rubbish into the canal causing blockages to water flow.

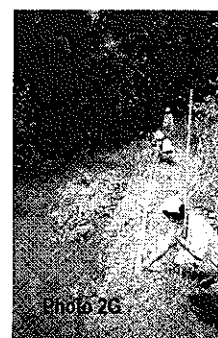
15) **TU BP5c3 (*Tengah*):** Photo (2D) shows a concrete quaternary off-take from tertiary canal TU BP5c3 *Tengah*. This structure has the gate removed and is now an uncontrolled delivery. The quaternary canal is full of sediment, rubbish and grass. It appears that pieces of concrete have been removed from sections of the tertiary off-take structure on the secondary canal and are used as a means of stopping flow to the quaternary canal.

16) **Secondary Canal – *Sekunder Kroya* – 2100m : BP5 > BP5d1** is an area of lining and earth canal. At the off-take there is approximately 30cms of sediment in the canal. The gate is operational at TU BP5d1.

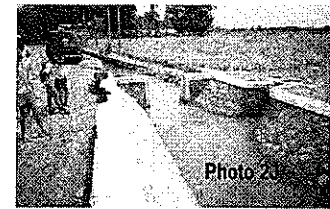
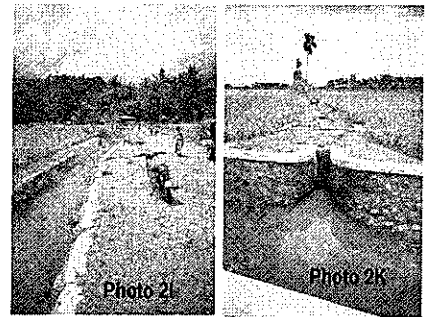
17) **TU BP5d1 > TU BP5d2:** The canal has a section where the canal lining is broken for some 2 m in length and there is soil eroded from behind the lining. The canal contains some 25cms of sediment. The farmers have made a hole either through the lining or below the lining to take water into a drain for irrigation (no sanction applied). Photo (2E) shows the damage on the right side of the canal from cattle using the canal. The sediment level in the canal is high at this point. The longitudinal section plan of the canal does not show a designated animal washing area at this location. Photo (2F) also shows the canal damage. Looking back upstream on this photograph shows the profile of the left-hand canal bank, i.e. how it is collapsed and also the high ground above the canal. This high ground is steep in parts, both upstream and downstream, and soil erodes into the canal.



18) **TU BP5d2 > TU BP5d3:** Photos (2G) and (2H) show the canal profile and how the inside of the right bank of the canal is collapsed in places and also how sediment has deposited against the bank. The thick foliage on the left bank is also illustrated. Photo (2G) shows some 5 m of sediment deposited against the right hand side of the canal. This deposit is now fully covered with grass and weed. The photograph shows only some 5 m of sediment deposit but the same scenario continued for another 5 to 7 m past this point. The original design of tertiary canal TU BP5d2 had the canal running alongside the right hand side of the secondary canal. This tertiary canal has been removed by the farmers (in an irrigation system, farmers will not accept the loss of land for two irrigation canals). The farmers now take water from the secondary canal through illegal piped off-takes through the right canal bank. There are some 5 to 6 illegal off-takes. Villages along the left bank have caused the canals to slump and erode.



19) TU BP5d3 (*Kiri & Kanan*): Photo (2I) shows the secondary canal leading into the upstream section of TU BP5d3 off-take. Photo (2J) shows the tertiary box and the downstream view to the tertiary canal leading to TU BP5d3 *Kiri*. Notice the absence of the gate. This canal passes through a village and is therefore masonry lined. This canal leads down to the end, whereby a distribution structure with a gate allows excess water to be used as a supplementary supply to the river that services another irrigation area, i.e. water is delivered to *Prawira Dam*. At the tertiary box, there are some 30 to 35cms of sediment between the secondary canal, box and inlet to the tertiary canal. Photo (2K) shows the off-take to TU BP5d3 *Kanan* minus the gate and a view of the tertiary canal looking downstream. The condition of this canal is reasonable but it is only servicing 9.5 hectares. The section of the secondary canal from a fair distance upstream of this off-take carries a lot of rubbish that is thrown into the canal by villagers.



(4) Findings and Conclusion

Based on the findings of the field inspections, the financial budget for the government turnover program can be expected to be excessive, if the pre-condition of “rehabilitation before turnover” is applied for the future turnover program. Hence, there is reason for the Government policy of turnover to be one of “rehabilitation after turnover”. The implementation of the policy change must be accompanied by a commitment from the water users, i.e. participation of the water users in planning, design, construction and funding, [monetary & in-kind (supply of labour and materials)]. A sense of belonging and a sense of ownership can be developed from participation and through this participation the empowerment of the WUA can be developed towards self-reliance and sustainability, not only of the WUA but the irrigation infrastructure and irrigated agriculture.

Additionally, from the field surveys, farmer and WUA discussions and irrigation system inspections, the number of existing WUA, be they single (WUA), federation (WUAF - *Gabungan*) or main (IWUA - *Induk*), that are already sufficiently developed to manage (financial, administration, operation & maintenance, rehabilitation) an irrigation system is minimal. For WUA to be empowered to stand alone as a self-sufficient WUA, external sources of assistance are required. A partnership between Government (under autonomy – *Kabupaten* level of local government) and the WUA, i.e. Joint Management of the irrigation system may be a viable activity of WUA empowerment.

In terms of maintenance or rehabilitation, DI *Pekatan* is in need of a lot of work. But, because of the abundance of supply of water it may be difficult to obtain farmer cooperation through the participatory approach. The sediment load is a problem, not in all sections of the canal because of flow velocities, but in the slower downstream areas the sediment is reducing canal capacity. It can be assumed that the DUP budget request of US\$28.00 per hectare, using the “Needs Based Budget” assessment. In fact, if the request has been prioritized, then the cost per hectare may well be higher when all the necessary maintenance and rehabilitation works are considered.

The “Walk Through” has revealed the extent of maintenance and rehabilitation works required for on irrigation area, DI *Pekatan*, only. But, it could be assumed, from the field visits, that all GOI irrigation schemes require similar maintenance and rehabilitation. The irrigation infrastructure can be rehabilitated but yearly (routine and periodic) maintenance work programs have to be implemented through the cooperation and joint management of farmers (the participatory approach) and the GOI Department of Irrigation PU *Pengairan*. If the input of farmers through participation is not sought, joint management is not developed and both GOI and farmers do not input to the works both

financially and/or in kind (labour, materials, design, survey etc), then sustainable irrigated agriculture will not be achieved.

C.3 Basin Water Management Policy

C.3.1 Water Resource Management

The original request to IBRD for assistance in the water resource sector contained the concept for a National Water Resources Policy (NWRP) that would govern both surface and ground water sources in both quantity and quality. This policy would be ordered on the basis of river basins from the watersheds to the estuarine areas and would embrace water rights, efficient use, conjunctive allocation, water quality, basin planning, enabling strategies for community development, private sector participation, environmental sustainable development, and inter sector coordination. Some 18 months after the request was received, the bank have formulated a program for NWRMP, which it is proposed, would start after the successful completion of the WATSAL conditions.

It was intended that a senior body known as the Apex Body would guide national policy resource allocation and program implementation. This body would be assisted by a technical team (*Tim Koordinasi*) and have recourse to an advisory group of key stakeholders, selected NGO's, and public representatives. It would also have direct reference to 9 agency Directorate Generals. A letter from BAPPANAS (April 27, 2001) to the Minister *KIMPRASWIL* has requested that all conditions for Tranche 2 be completed and that moves to inaugurate the Apex Body should be advanced. Plans for coordinating the work being done under the WATSAL agreement have been made, but to date (June 15, 2001) the Apex Body has not been established.

It would be the responsibility of the NWRMP to;

- consolidate WATSAL institutional reforms,
- build up service orientated agencies in the regions,
- institute basin water councils with stakeholder representation,
- introduce water pollution control and
- determine support for private sector participation.

Water management as defined under Government Regulation No.22 of 1982 comprises a strategy based on 'river basin management'. Since that time a number of pilot forms of River Basin Management have been set up under management corporations established under MOPW decree on the formulation of River Basin Water Coordination Committees (Balai PSDA) (Regulation 67/PRT/1993).

C.3.2 Provincial Water Management Committee

This regulation specifies both function and task of the Provincial Water Management Committee, which is responsible to the governor and acts as a forum for 'mutual agreement' in the coordination of water resources within the province. It also acts locally in assisting the governor to implement water basin management coordination within the province. Functions were specified as:

- priority planning for water use and water resources;
- priority planning for water use in relation to conservation, development and utilization;
- the management of water and water resource utilization;
- management of waste effluent and other waste discharge;
- management of irrigation facilities and other facilities situated on or around the water resource, and;
- management of problems arising from any of the above.

Tasks of the committees were specified as:

- collection of, processing of, and preparation of materials for the determination of Government and provincial policy in keeping with the National Policy on Water Management;
- advising the Governor on solutions to problems related to water supply implementation;
- providing supervision on implementation of coordination problems as determined by the governor, and;
- providing periodic reports on their activities whenever required to do so.

C.3.3 Basin Water Management

Capacity strengthening (N-1 component) under the WATSAL agenda is vital for the proper functioning of these Balai and institutional coordination through the Kabupaten and District Water Boards (PPTPA to PTPA) is necessary to maintain effective purpose and function. The devolution of irrigation management to the district levels through the imposition of Law No.22/1999 will require the Provincial Dinas and Cabang Dinas to examine their institutional roles and responsibilities. Criteria need to be developed to determine the relationship of Balai to PPTPA to PTPA and the share of responsibility in the execution of the workload. The division of assets, infrastructure for O&M, jurisdiction in water resources management and the coordination of management all needs critical examination. Even though an ADB project has been working for 6 years to complete management upgrading and reorganisation guidance, it is claimed that due to the considerable restructuring of the Ministry, little real advance has been achieved. This has prevented the timely completion of components in groups N-2 River Basin and N-3 Water Quality, requiring an extension of a further year to be granted.

One of the important tasks of the Balai will be the measurement of the hydrology of the water resource and the consequent allocation management. Monitoring, measurement, allocation approach and licensing require special consideration in each Balai area. There may well be special needs in both material and training requirement that result from such reviews. The approach to allocation of water resources to irrigation needs special consideration and must involve a participatory approach.

Although under the BWRM project most of this agenda is being attended to there remains much to be done. Consequently, the remaining conditions now form part of the third tranche of the WATSAL loan. The completion of these conditions will provide a new order in terms of strengthened institutions, regulation, management, and financial control. Such new order will set up conditions for a National Water Resources Management Program (NWRMP). The program it is argued will enable a framework that is:

- environmentally sustainable;
- socially sustainable;
- transparent in all dealings;
- creates a conducive interface for the supplier to use (joint management) and
- allows for 'top down' and 'bottom up' representation in planning and management of the resource.

C.3.4 Balai System

Ministerial Decree No 179/1996 issued by the Ministry of Home Affairs proscribes the organisational structure, the status, task and function for a number of Balai to be established under the Java loan program in all provinces of Java. It establishes Balai as 'technical implementation units' (UPTD) under the Provincial PU Service, Provincial Water Resource Development Service (PSDA). A program of support for the establishment of these Balai is currently being undertaken by the BWRM (Basin Water Resources Management Project) which is operating under the Java loan (IBRD, ADB, JBIC) supporting WATSAL.

The task and function of these Balai will vary according to the need of the basin(s) that fall within their management. It is envisaged however that they should have the capability of managing the

resource base of all water-related aspects, from coastal zone management to watershed management, according to the discrete need. An institutional guideline to determine task, function and operation is due to be produced to assist the administration of these offices. Many activities under these offices will appreciably differ from one office to another according to their geographical setting, requiring a different management approach. Management procedures and administration however can be similar irrespective of the overall approach. Some Balai are situated with the River Basin Management Authority areas (PJT and POJ) and their operational procedure will necessarily have to be reviewed as part of the overall WATSAL agenda.

C.3.5 Kabupaten Irrigation Committee and Water Councils

Under WATSAL it is proposed for *kabupaten* irrigation committees to become sub-committees of the river basin water management committees (PPTPA), and WUAs of irrigation schemes will be represented on the PPTPA together with other water use stakeholders. This was proposed in the past under existing legislation on *Panitia Irigasi* but never actioned, as there was no enabling process to empower WUA representatives to take up such positions.

The completion of WATSAL conditions will produce a new framework of water resource management policy and the accompanying necessary legislation that will provide the condition and institutional pathways for WUA's to be empowered and take up their rightful representation.

A system of Water Councils is to be established, at National, local and river basin level (Dewan National SDA, Daerah SDA and Wilaya Sungai SDA). These will interface with PPTPA or as they will possibly be known as *Kommisi Irigasi* representing the water users both private and public. Methodologies for invoking penalties, licenses, local bye-laws, financial and managerial controls will be evolved.

The governance of the water resource through the use of these tools (Councils representing the supplier and *Kommisi* representing the users) will need to take account of the new order of stakeholder interests consistent with regional development plans. A responsibility for standards of service delivery on the one side and cost recovery on the other enforces social harmony.

Programs involving the definition of the complex mix of aspects within the sphere of influence of the WUAs authority and the local government responsibility are due to start during 2002 with the EU supported programs of 'Good Governance' following the completion of the WATSAL conditional terms the start of the NWRMP. The expected outcome of such programs is the hope that satisfactory levels of functioning performance can be achieved. A number of key issues need to be clarified during the operation of these programs for example:

- can clear legal and administrative precedents be effected for the structural establishment of Dewans and Balai PSDA.;
- what are training needs requirement for Dewan?
- what is the functioning line authority of a Dewan, should it have one?
- will Balai PSDA be able to coordinate its relationships such that joint management will facilitate the collection and return of field level data to higher administration levels and
- levels of fund sharing obligation between Balai PSDA and WUAs consistent with the law UU No.22/1999 and the legality of agreements, (INPRES No.3/1999) discerning levels of authority.

C.3.6 Water Rights

Water rights have always been a contentious issue. The right to abstract water has been written in law for some considerable time, including the interpretation of the constitution of Indonesia (UUD 1945) which stipulates that '*All water is owned by the Nation's people and must be managed by the state for the greatest welfare of the people*'

Law No.23/1982 made the issue of rights clearer, however the real problem has always been the implementation of applying this law.

PP No.23/1982 authorized the management of water at the regional levels on the basis of water basins, it also specified that 2 or more natural drainage basins could form a river basin for the purposes of planning or management. Authority may be delegated from the Minister of Public Works to the regional/local government for river basins, which are in their jurisdiction, except where prior legislation exists. Priority of use and the right of use is given to drinking water and the individual.

Article 15 stipulates, *“in the case of water users community should be licensed to abstract water from a specified intake on the river or canal and that allocation of water among the members of the community should be arranged by the concerned group based on guidelines provided by the Governor”*

Under this law clear instruction of the delegation of authority from center to region and below to water basin level is given. Instruction was also given to delegate authority to the Governor to license water user groups to abstract water from specific locations. However this aspect of the regulation has never been enacted, possibly owing to the centralist policies and thinking of that time (1982/3) and to the interpretation of capabilities at the provincial and district levels.

Regional Autonomy Law No.22/1999 has empowered local government with these responsibilities. Law 34 of 2000 which is the follow up of Law No.18/1997 gives the Provincial authorities the right to raise taxes on both ground and surface water abstractions but does not say how this may be accomplished. Again the problem of how to implement the law is apparent.

A water- rights system providing mechanisms for among others;

- security of supply;
- obligations for the supplier and user;
- protection of social amenity usage;
- resource allocation and accounting;
- efficient and environmentally safe use and
- mechanisms for conflict amelioration.

These are required under the conditions of WATSAL. The absence of ways and means of physical regulation, the necessary institutional mechanisms, and the lack of administrative and technical guidelines all need to be addressed. To this end the IDTO project will implement preliminary trials of water rights by suggesting that all these issues be investigated initially in the 4 provinces in Java where they already have experience with specific irrigation scheme. Water Rights will be assessed in terms of the irrigation right in relation to existing rights for drinking water (PDAM), and industrial use. Even though the project acknowledges the implications of the rights on the balance of the total basin flow this aspect will be left to the hydrology unit of the Balai PSDA to investigate and define.

C.3.7 Concepts for Action

Much has been said above about River Basin Management in terms of Governing laws, in conditions for WATSAL, in terms of institutional structural changes and strengthening, and in terms of development methodologies. A lot of work has been undertaken for guideline preparation, participatory planning and fiscal recovery mechanisms. It would appear however that some perennial difficulties remain. The issue of water rights is seen as being of prime importance among these.

Water rights for groundwater and industry have been established for some time, this is possibly due to the fact that abstraction is usually done through a pump at which measurement is easily undertaken. The issuance of a water right for irrigation also implies that measurement has been or will be made as

part of the definition of the right. Measuring the quantity of water abstracted for irrigation is not difficult and would usually be done through the use of a permanent control structure. The measurement of the amount abstracted is not the important factor in the management of the resource, it is the measurement of the nature and limit of that resource that is the important feature. Once the dynamics of the basin flows are understood and quantified then water rights can be granted with confidence. It is not until this stage is achieved that water rights can be granted and mitigated with any authority.

Under the BWRMP strengthening of the Balai PSDA has established hydrological units in each balai. These units have responsibility for building, rating and operating hydrological models of the basins. On Java the build up of these units and their capability is now said to be going well. Following initial problems concerning capacity build up the program is running according to plan. The Sub Directorate of Hydrology under the Directorate PSDA has been established and it will now guide and monitor programs at the Dinas, Kabupaten and river basin level. The sub directorate will develop action plans to implement on Java, starting with pilot development in West Java. At the time of the Study, the Coordinating Minister for Economic Affairs (*KepMen Ekuin*) has issued a Hydrological Decree to encourage the set up of a working group under the proposed National Water Council (*Dewan Sumber Daya Air*) whose specific task will be to coordinate all hydrological programs. This is part of the WATSAL Tranche 2 stipulation. Instructions (*SK*) issued last year to *Dinas PUP* and a guideline on 'Role Sharing' issued by the TA consultants on how to function at all levels, this is now being followed by the 4 Java provinces. Most Balai PSDA will complete their transfer of role by the end of 2002, by which time all should have the capability to operate the time dependent software (TIDEDA) hydrological model. This will provide the general and technical background against which quantified water rights can be made.

While progress towards total hydrological modeling on Java is proceeding well, capacity on the outer islands is not so well developed. The institutional models and guidelines developed on Java are due to be introduced to all provinces overtime. It is thought however that actual capability remains well below that of Java. An outer island support program phased to develop those provinces where irrigation is a significant part of agriculture should first be considered. Such a program would necessarily have to be applied over an extended time period and contain significant allowances for training, travel, (both field and provincial), and material inputs.

C.4 Monitoring and Evaluation of WUA Development

C.4.1 Requirement of Monitoring and Evaluation for WUA Development

Monitoring and Evaluation (M&E) is an activity to assist management to monitor and evaluate progress and results of any specified program. M&E is a control of management practice, i.e. M&E results can be used as an input for 1) program improvement, 2) change or improvement of program direction, 3) program acceleration, 4) a revision of policy, and 5) an indicator of program completion or success.

M&E must be accurate and deliberate in its application and it is important that the aspects being monitored and evaluated are applicable to the outcome and are only influenced or controlled by the project, organization, department, etc. being evaluated. In addition, the M&E format must not be of a size that is difficult to apply, in terms of time required for field-level data collection and analysis. For example, the M&E of EOM by a WUA should only include indicators that are relative to O&M and which are directly influenced and controlled by the WUA. That is, an indicator that can be influenced by the actions of others and is not totally controlled by the party being monitored, in this instance the WUA, should not be recorded. Such indicators can be recorded and evaluated but should not be used to evaluate WUA performance. It may, however, be relevant to register it as a problem area via a yes/no answer. It can then be corrected, redirected or programmed by field staff at a later date because they then know where the problem and solution can be targeted.

M&E of a turned over scheme is a difficult matter under current policy of “rehabilitation of the irrigation scheme before turnover”. There is also no definite Government turnover process policy of with respect to the stage of development or empowerment of WUA. The turnover of the management of irrigation schemes to WUA, under the new irrigation policy reform, is to be done gradually, selectively and democratically, using the principle of one irrigation system one management unit. Government will, however, continue to supply technical assistance and also financial assistance until the WUA is empowered to stand-alone. In addition, where this is not possible initially, a WUA - Government (*Kabupaten* as of 1st January 2001) joint management body will continue to supply technical support and financial assistance to those WUA in need of support until such time the WUA is fully empowered to be sustainable and self supporting. It is therefore very important that Government introduce policy to enable turnover to progress gradually and also to commence at the time of WUA/WUAF formation or reformation and not following rehabilitation by Government.

The empowerment of WUA will be a slow, continuous and lengthy process and, accordingly, M&E programs must be developed and implemented to register this slow development and to include indicators of level of empowerment at which a WUA is currently positioned.

C.4.2 Present Monitoring and Evaluation Scoring Method for WUA Development

The Government has some 19 indicators by which WUA are evaluated. Table 3.4.1 of Volume I : Main Report presents the 19 indicators with their division into 6 categories. It is not the intention of this report to directly discuss the selection of those indicators as evaluation criteria but to discuss the indicators with respect to their importance and their implication within the “Proposed M&E WUA Evaluation Scoring Method”, presented as Table 3.4.2 of Volume I : Main Report. This is a revised M&E methodology and was developed by WATSAL and the JIWP – IDTO Project¹.

As already stated, the empowerment of WUA will in the majority of cases, be a slow and continuous process. It would be unwise to assume that a high percentage of WUA will achieve a rating/score “As a Developed WUA” directly following the turnover process. It is recommended that the M&E program be implemented by a third party and not Government or WUA but preferably a Consultant, University or NGO. It would also be advisable that a Government representative and a member of the WUA committee be included in the M&E team for the purpose of discussion and program application.

Suggestions of participatory M&E, i.e. WUA performing their own monitoring and evaluation are not realistic as incorrect data collection or analysis may result in outcomes that, in the long term, are detrimental to WUA empowerment. As Government is most likely to be part of the Joint Management of irrigation schemes, it is also not advisable to have Government as the M&E controller. If Government financial constraints are an issue for the M&E application to be implemented by a third party, then there are a number of possibilities. A possible scenario is as follows

- Government funds a third party as the supervisor, coordinator and analyzer only.
- Government staff, WUA committee members and/or village community organizers are used as the data collectors.
- Funding or partial funding by WUA is most likely not viable in the early years of WUA empowerment, hence Government must be responsible.
- Development and implementation of M&E programs must be through the *Kabupaten* coordination WUA Support Group. This body should coordinate all other activities relative to WUA empowerment, i.e. agriculture, irrigation, administration, training, etc.

WUA empowerment is dependent on a number of issues. Since M&E is targeted at post turnover, the initial step of community awareness program, facilitation of farmers and the success of community organizers will have a large bearing on the success of WUA empowerment. It may therefore be

¹ Reference: “*Pedoman Umum Pemantauan dan Evaluasi (P&E) Kinerja Perkumpulan Petani Pemakai Air Secara Partisipatif*”.

necessary to ascertain the success of a community awareness program within the farming and village community as part of a base data collection. Such aspects as the following may need to be known:

- The willingness and desire of all the farmers and community, culturally, socially and ethnically, and their political willingness to operate and maintain the irrigation system to the benefit of all beneficiaries.
- The “Political Will” of Government to offer “as requested” assistance and guidance through “on the job training” to WUA for the purpose of each WUA obtaining “Stand Alone Development”. This must come through the establishment of a permanent “*Kabupaten* – Coordination WUA Support Group” inclusive of *PU*, *Pertanian* & Local Government officials and field workers.
- The classification or type of irrigation system/infrastructure within the irrigation area of the WUA / farmers, i.e. traditional, semi-technical or technical. The more technical a system, the more time that may be required for a WUA to become a “Developed Stand Alone WUA”. In some systems this may never occur as the level of technical input – design / maintenance etc may be so far beyond farmer capabilities, that the irrigation system responsibilities of O&M may always remain a “Joint Sharing Arrangement” between Government & WUA. (Note: In all other aspects of WUA responsibilities, in O&M up to tertiary, secondary level and administration, funding, work programs etc. the WUA may be very efficient and developed. It may, however, be for the O&M of the upper parts, primary canal and structures, off-takes, weir etc. that the WUA requires a Government joint sharing of responsibilities.

The M&E, WUA Evaluation Scoring Method proposed by WATSAL and the JIWMP – IDTO project (Table 3.4.2 of Volume I : Main Report), contains some indicators that as evaluation indicators of WUA effectiveness, are indicators of activities for which the WUA is not solely responsible. That is, other influences outside the control of the WUA can affect the implementation of the indicator and its rating,

The items and indicators that reflect outside influences and are not the sole responsibility of WUA are listed below:

(1) WUA can restrict lands conversion:

- No land conversion – 5 (score)
- There is a plan for land conversion – 2 (score)
- Existence of land conversion – 0 (score)

The conversion of agricultural land to other purposes, domestic, industrial or other, is not the responsibility of WUA committees and the farming community. It is the responsibility of Government through legislation, i.e. legislation restricting land conversion or legislation requiring submission for Government acceptance. WUA have no legal right to enter this field and in fact the responsibility for such activities places additional pressure on not only the WUA Committee and members but also the community at large. Even if in the future, this is a legal responsibility that will be allocated to WUA, the period of post turnover development does not require an assessment of “land conversion”. WUA have sufficient tasks to oversee WUA empowerment.

The important function of WUA in the initial development phase of WUA empowerment is O&M of the irrigation system, efficiently, effectively and equitably. In fact, if a WUA is given the legal authority and power to enforce such matters, it should be realized that such authority may place the WUA in a position of having to defend itself against counter law suits etc. Such issues may deviate a WUA away from its main responsibility, i.e. Irrigation O&M for the benefit of its’ members. Other activities, as that discussed above and the entry of WUA into agribusiness, are decisions that must be democratically made by the majority of water user members and not through Government imposition.

(2) WUA can improve prosperity of its members through increasing agricultural production:

- Above average agricultural production – 5 (score)
- Equal average agricultural production – 3 (score)

- Below average agricultural production – 0 (score)
- Selling price is above market price – 5 (score)
- Selling price is equal to market price – 3 (score)
- Selling price is below market price – 0 (score)

This concept from both WATSAL and the JIWMP – IDTO appears to regard WUA committees and their members as some excellent agricultural producer with excellent marketing and forecasting skills. The current policy of irrigation reform and agricultural reform is one of democracy. That is the farmer has the right and decision to plant his crop of choice, grow his crop according to his valuation of agricultural inputs and market his yield as an individual.

How can the efficiency of a WUA be evaluated via the above indicators. Market price is set and currently the market price of rice is not favorable and this has a direct influence on how farmers grow their rice both in terms of area grown and agricultural inputs used (quality and quantity). It is generally known that at times of low rice price, farmers will decrease the quantity of agricultural inputs (fertilizer and chemicals) used for crop production, therefore yields can generally be reduced. Production is influenced even if the WUA is successful in delivering a good acceptable cropping pattern / calendar and delivering irrigation water to all farmers correctly and equitably.

Additionally, agricultural production may be totally dependent on the water source. If the source is intermittent and only delivers a reliable, assured supply for 1 to 1.5 seasons, then no matter how good the WUA is, average production achievements are dependent on the external influence of the water source, not the WUA. Therefore WUA should not be rated on an indicator that they cannot control.

WUA can assist with the purchase of agricultural inputs and the marketing of produce either as a cooperative or as a bulk handler of supplies and produce. This can create cheaper agricultural inputs and a possibility of obtaining higher prices through the marketing of bulk produce. Again the decision to do so is WUA member dependent and the WUA committee must only partake in such activities through a democratic agreement by the members. Such activities of marketing or acting as a cooperative are not indicators of successful WUA. It is quite possible that the cooperative and marketing could be very successful but the distribution of water in equitable quantities to all farmers and the application of maintenance programs may well be weak and ineffective. The above is not a good indicator of WUA empowerment. The above item and respective indicators are an indicator of growth and development of a WUA after it has established itself as an effective administrator of irrigation management.

(3) Business relationship with cooperative and other private sectors:

- WUA cooperative was set up at the level of sub-system – 2 (score)
- WUA cooperative was set up at the level of system – 3 (score)
- WUA cooperative was set up at the level of system and is extended to cover other business (contractor etc.) – 5 (score)

Again, the WUA is being rated with respect to its ability to establish a cooperative and business base. As for the point above “..... (contractor etc.), a rating is not applicable because once a WUA receives a legal entity and is able to function with legal registration and a bank account, they are able to enter into contracts etc. The need for cooperative and business operation is superfluous. Also the level at which a WUA operates is again of no importance to the rating. An IWUA (*Induk* WUA) is dependent on the level of development and effectiveness of all the federated WUA (WUAF) below them within the irrigation system as well as the WUAF being dependent on the level of development and effectiveness of the individual WUA at tertiary level and/or village level. Whether there is a cooperative, a business entity or where the cooperative etc. is operational is of no significance to the evaluation of WUA empowerment. Such indicators do not determine or add significance to whether a WUA is developed, in the process of development or in need of intensive assistance and guidance. WUA may decide to not include the issue of cooperatives or agribusiness.

It would appear at times that certain aspects of the Empowerment of WUA activities of some sections of Government are straying from the most important issues facing WUA, that is the primary responsibility of the maintenance of the irrigation infrastructure to achieve fair and equal distribution of water to all beneficiaries. For a WUA to be classified as developed, it must firstly be self-sustaining in achieving both financial and labour inputs from its members to achieve the necessary level of required maintenance. Or, to be able to submit rehabilitation proposals for Government assistance to *Kabupaten* level which include a large percentage of self-help from the members (financial, materials or labour) to ensure that the proposal is assessed in a favorable manner.

WUA will have enough concerns with irrigation management issues following turnover procedures rather than being concerned with the formation of cooperatives and business enterprises.

The issue that is of utmost importance to WUA is the ability of the WUA committee and the water users, at tertiary and village level, at federated level and at primary (*Induk*) level to efficiently and effectively manage the operation, maintenance and rehabilitation of the irrigation system. This must be for the mutual benefit of all the beneficiaries.

C.4.3 Proposed Monitoring and Evaluation Method for WUA Development

The revised M&E proposal presented by the JICA Study has deleted the above items and indicators from the evaluation scoring method. Also, some additional indicators have been added under respective items while some existing indicators have been altered to reflect the realism of the indicator. The alterations are presented in Table C.4.1, M&E WUA Evaluation Scoring Method – Rating for WUA Development – Post Turnover (1/2), Adapted from WATSAL & JIWP – IDTO, M&E Adoption. The alterations are discussed below:

First – Item – “WUA can restrict land conversion” – deleted from the Table – as discussed above.

Second – Item – “WUA can activate members in stages of maintenance works and development of irrigation system” – The score is altered for the first three indicators to 3, 4 & 4. An additional indicator is added – [Time allocated to ‘*gotong royong*’ is equivalent to the true & real time (man-days) to complete the maintenance work plan, i.e. sediment removal, grass cutting, canal repair, painting etc.] – a score of 4 is allotted, thus giving the item a new maximum weight of 15.

This has been included, as field study has shown that in many instances of *gotong royong*, WUA has organized the work plan but insufficient time has been allocated to the program to complete the works. Or as is generally the case, farmers are unwilling to allocate the time required to complete the works. As a means of reducing O&M cash budgets, effective *gotong royong* is an essential part of WUA management but if farmers are not willing to follow *gotong royong*, then farmers must pay.

Third – Item – “WUA can improve prosperity.....” – deleted from the Table – as discussed above.

Fourth – Item – “WUA can develop organization with regard to laws and regulations”. There have been two additional indicators added. (i) – [WUA has made application for legal registration of WUA Committee and the accepted form of AD / ART] and (ii) – [Not yet applied for legal registration]. These indicators are necessary if the concept of Government funding assistance is directed through the *Kabupaten* local Government and through a *Kabupaten* Coordination WUA Support Group. The WUA will require access to a bank account and the ability to legalize contracts etc.

Fifth – Item – “WUA can activate members to be financially self help”. The percentages have been altered with the top indicator of a score of 10 having the “Collected fee > 50% NBB” altered to > 60%. A collection fee of 50% is not realistic, as funding of O&M will in all probability be difficult to

implement for a 50% collection rate. The community awareness program should be assessed as successful only when the percentage of farmers agreeing to WUA implementation and agreeing to pay the realistic water fee, is relatively high, i.e. in excess of 85%. A percentage of 60% is a starting point and for an empowered WUA, empowerment should not be classified as successful until the percentage of collected fee equals or exceeds 85%.

Sixth – Item – “Representation of WUA in Coordination Forum/Irrigation Committee”. This item needs to be clarified as the meaning of “system” and “sub-system” is not fully understood. Does this refer to the irrigation system and the various levels of tertiary, secondary and primary? An additional question also arises, i.e. as to the current validity and continuation of the Irrigation Committee.

It would appear that the indicators of “a representative of WUA at the sub-system or system level” are not necessary. WUA representation within the irrigation area from individual WUA to WUAF to IWUA will automatically occur through the democratic election of committees, representatives and agreed responsibilities. The only representation by WUA that needs to be implemented is at the proposed *Kabupaten* Coordination WUA Support Group and at a level where catchment management decisions are made or where water distribution / allocation decisions between WUA are made, i.e. Irrigation Committee or Catchment Management Committee level.

The item is applicable in terms of the third indicator, which receives a score of 5, i.e. “Representative of WUA is at the level of Coordination Forum/Irrigation Committee”. It is assumed that this applies to -representatives from primary (*Induk* - IWUA), federations (WUAF) or traditional or village or simple semi-technical irrigation systems (WUA). The scoring system of 2 or 3 (sub-system or system) deletes a WUA and this is erroneous, because if a WUA is only capable of being represented at the sub-system of system, why then must it suffer a low score?

Within the revised M&E, the indicator, “Representative of WUA is at the level of Coordination Forum/Irrigation Committee” has been included. A WUA is only scored for this indicator if it is in a position of Federation, Village, Traditional or small DI WUA where such representation is expected or possible. The score should only be applied in those instances. Also, if a WUA is a tertiary unit WUA or a DI WUA inside a WUA Federation, the total rated score is deprived of 5 points, as it is not expected to be represented at the “coordination Forum / Irrigation Committee. The inability to achieve these 5 points is not due to WUA competence and as such the rating should not impact negatively on the evaluation of the stage of WUA development or empowerment.

Seventh – Item – “Business relationship with cooperative and other private sectors” – deleted from the Table – as discussed above.

Eighth – The total score now becomes 80 points rather than 100 points. The ranking formula has been altered to suit.

The success of WUA empowerment is also dependent on the relationship of the WUA with the Government supporting agencies, for example, the agriculture and irrigation departments (*Dinas Pertanian & PU Pengairan*). This relationship can affect how WUA request assistance from Government and how the Government delivers that assistance. Also of importance is the degree of expertise at the local Government level, the efficiency and the effectiveness of WUA support programs in place.

Items and indicators that are relative to the WUA and Government and other agency/organization relationships have been listed in Table C.4.2 – “Evaluation of the WUA Request for Technical/Administrative Guidance and Evaluation of the Response from Government / *Kabupaten* WUA Support Group”. These items and indicators relate to areas of WUA activities where it is perceived that assistance will be required by WUA Committees and their members (not all WUAs) to ensure an ease of transition and steady continuous development. The items and indicators are seen as the important “Hurdles/Stumbling Blocks” that may impede steady progress towards sustainable,

developed and autonomous WUA. The main items are:

- The establishment of yearly, seasonal cropping patterns and calendars.
- The preparation of water distribution plans for each cropping season, i.e. seasons 1 through to 3.
- The preparation of a routine, seasonal, periodic and emergency maintenance plan derived from the proposed methodology of "Irrigation System Walk Through" combined with farmer/WUA member meetings. Develop the plan according to urgent and routine needs. Allocate the requirements that can be handled by the WUA and members through "gotong royong" and WUA funds – contract if need be, and then develop the proposal for assistance from Local Government (*Kabupaten*) – funding, labour, machinery etc.
- The establishment of AD/ART guidelines, rules etc and the application for legalized registration

These items have not been evaluated as "a scored rating". They are simply listed as a YES/NO (Y/N) classification and then if the response is in the negative (N), then a series of questions to ascertain the reason for the negative response. This methodology simply shows where the weakness in development may be, and the weakness could be either WUA or Government initiated.

A scoring system has not been allotted to the M&E methodology as the score achievement is dependent on two parties, i.e. the WUA ability to activate and the Government ability to respond. The allocation of a score could negatively impact on a WUA evaluation when in fact the WUA is not the cause and effect. Also by ascertaining if a WUA is either requesting or not requesting assistance from the "proposed" – "*Kabupaten* WUA Support Group" (or in the future – private consultants), may also reveal aspects of the WUA development that may need improvement or a directional change.

For example – WUA evaluation: If a WUA is requesting assistance and scores a rating of High Development, then the system is working. If a scored rating of Low Development combined with a "No Request" for assistance is the evaluated result, then serious questions need to be asked of the capabilities of the WUA Committee and the water user members.

For example – Government evaluation: If a scored rating of Low Development combined with a positive request for assistance and a negative response from the *Kabupaten* WUA Support Group, then the Government system needs to be investigated. That is investigate the possibilities of a lack of Government financial support to the WUA, the Government (*Kabupaten* – local government) "Political Will" to assist is weak, staff responsibilities are not taken or the expertise, knowledge and extension capabilities are lacking, etc.

It is proposed that the revised M&E and Evaluation (Table C.4.1 & Table C.4.2) aspect open up paths of investigation to monitored problems of irrigation management and WUA empowerment.

C.5 Action Plan for Public Relation of Irrigation and Irrigated Agriculture

(1) Necessity of Provision of Action Plan for Public Relation of Irrigation and Irrigated Agriculture to Meet With Targets

Subjects of this Study locate in "**agriculture**" in "**economy**", and "**irrigation**" in "**the agriculture**". Whilst examination of the solutions in "irrigation" sector is effectual approach, some considerations are also needed through providing indirect Action Plans oriented vicinity related sectors, if being not wrong that the country will be avail to function properly after realizing mutual trust among those three domains, politic / administration, economy and social / culture, which is the situation that the people accept social preparations and follow them with their own willingness actually.

The JICA Study Team could understand that climate creation of "social trust", which available to accept any rules, and rules which can legalize plans of solution, for sustaining the country as one united society to proceed to his future. The social trusts are consisted of mutual trust of farmers who should owe irrigation O&M, trust for agriculture policy which directly relates to irrigation and the trust for economy policy

which guides agriculture sector.

Whilst being no limitation on expected expansions and strengths on mutual relations among related sectors, it is not available to discuss on all of related relations considering the expansions and strengths in this Study with same magnitudes. Also not available to describe individual wills and directions of each major three domains consisting the country.

In this Study a clarification is adapted that all of action plans oriented directly to irrigation as “Direct Action Plan”, while giving the title of “ Indirect Action Plans” for the issues of others like generation of trust among people, between administration and farmers. Indirect action plans are to highlight issues to generate trusts or characters which have seldom to be discussed on plan provisions. And not include setting directions or contents themselves of other domains.

(2) Action Plan for Public Relation of Irrigation and Irrigated Agriculture

"Action Plan for Public Relation of Irrigation and Irrigated Agriculture" which is shown below is the contents that the dimension is different completely from "the direct / core action plan" which was described to enhance the transfer of the irrigation O&M. On the occasion of the proposition of "the indirect action plan", some intentions are considered to push;

- 1) Not pour funds so much,
- 2) Available to utilize existing social infrastructures,,
- 3) To meet with "enjoying a life" character of the people in the country ,
- 4) To calls back "the social pride" which was cultivated from the ancient times in the psychology of the people,
- 5) To decrease the intervention of "the administration" which lost trust of the people,
- 6) To provide occasions to accomplish things with the people's cooperation ,
- 7) To imprint viewpoints that the role of task sharing and efforts by the individual to ensure their own subsistence is necessary.

Several ideas are shown in Table C.5.1 for reference.

Table C.1.1 PU Irrigation Scheme in Province (1993)

Province	No. of scheme				Planned Area (ha)	Sawah (ha)		Not yet develop'd as sawah	Scheme average area (ha)
	Technical	Semi-technical	Simple	Total		Irrigated Sawah	Total Area		
DI. Aceh	17	118	273	408	209,994	124,937	155,143	7,708	515
Sumatera Utara	148	336	145	629	281,673	185,800	208,707	28,228	448
Sumatera Barat	51	291	467	809	234,546	149,751	161,233	28,597	290
Riau	1	68	0	69	32,980	11,910	13,849	11,560	478
Jambi	3	63	31	97	26,164	14,451	17,471	6,655	270
Sumatera Selatan	3	78	15	96	73,642	31,017	32,049	9,160	767
Benkulu	24	194	122	340	81,588	53,430	58,486	17,300	240
Lampung	52	94	2	148	154,038	104,975	107,116	27,023	1,041
DKI Jakarta	1	27	4	32	8,369	7,724	7,724	0	262
Jatilhur	57	108	160	325	320,152	302,419	312,313	676	985
Jawa Barat	317	211	351	879	550,800	487,596	497,456	9,591	627
Jawa Tengah	748	929	4,943	6,620	803,001	760,113	792,161	3,060	121
DI Yogyakarta	180	290	134	604	58,217	52,894	54,167	2,137	96
Jawa Timur	2,501	2,660	1,122	6,283	935,347	910,280	914,938	695	149
Bali	92	310	0	402	88,527	79,715	79,782	6,643	220
Kalimantan Barat	0	72	24	96	30,380	12,737	17,943	2,566	316
Kalimantan Selatan	11	16	21	48	26,681	9,506	442,494	7,610	556
Kalimantan Tengah	3	1	6	10	5,480	3,003	3,430	1,231	548
Kalimantan Timur	9	11	55	75	32,065	6,000	11,948	5,724	428
Sulawesi Utara	17	85	35	137	66,358	46,658	48,883	14,582	484
Sulawesi Tengah	41	70	55	166	109,854	62,724	62,828	36,006	662
Sulawesi Selatan	45	81	86	212	322,783	228,861	247,526	13,697	1,523
Sulawesi Tenggara	19	19	32	70	52,914	26,741	27,792	16,516	756
NTB	35	217	25	277	175,038	146,460	152,206	7,152	632
NTT	5	85	50	140	55,819	38,225	29,374	25,717	399
Maluku	0	0	16	16	16,526	8,203	12,181	3,174	1,033
Irian Jaya	0	2	3	5	4,359	632	1,482	1,577	872
Timur Timur	0	10	0	10	9,977	8,392	9,263	0	998
Total	4,380	6,446	8,177	19,003	4,767,272	3,875,154	4,479,945	294,585	251
Total*	4,380	6,436	8,177	18,993	4,757,295	3,866,762	4,470,682	294,585	
Share	23.0%	33.9%	43.0%	100.0%	100.0%	81.3%	94.0%	6.2%	

Note; * exclud. TimTim

Table C.2.1 Disbursed O&M Budget By the Central Government
(APBN) for Irrigation Schemes

Regions	1995/1996	1996/1997	1997/1998	1998/1999	1999/2000
A : Budget (Disbursed. Unit : Rp. X 1,000) *1					
Indonesia	123,624,982	129,465,902	149,622,845	180,149,775	175,713,000
W.Sumatra	4,676,560	4,289,950	7,246,180	7,488,457	8,247,000
W.Jawa	15,416,742	19,956,051	18,266,735	14,823,477	26,211,000
D.I.Y	1,689,785	1,756,300	2,215,000	1,805,900	1,834,000
E.Jawa	19,574,677	23,931,107	27,232,300	24,475,168	27,831,000
NTB	3,540,000	3,415,200	2,944,000	1,566,005	5,411,000
B : Acreage to be Applied the Budget (Unit : ha) *2					
Indonesia	4,940,368	5,865,993	5,866,993	5,981,020	5,781,151
W.Sumatra	191,182	292,289	293,289	293,289	258,454
W.Jawa	346,691	483,997	483,997	483,997	724,103
D.I.Y	55,982	55,982	55,982	55,982	55,982
E.Jawa	839,354	907,668	907,668	907,668	856,148
NTB	133,289	176,143	176,143	185,385	177,893
C : Unit O/M cost by ha (Unit : Rp. / ha)					
Indonesia	25,023	22,071	25,502	30,120	30,394
W.Sumatra	24,461	14,677	24,707	25,533	31,909
W.Jawa	44,468	41,232	37,741	30,627	36,198
D.I.Y	30,184	31,373	39,566	32,251	32,761
E.Jawa	23,321	26,365	30,002	26,965	32,507
NTB	26,559	19,389	16,714	8,447	30,417

Note. Source: The Ministry of Home Affairs

*1: Budget covers Lowland field and Upland field

*2: Acreage consists of Lowland field and Upland field.

Table C.2.2 Record of Disbursed O/M Budget By the Provincial Government
(APBD) for Irrigation Schemes

Regions	1993/1994	1994/1995	1995/1996	1996/1997	1997/1998	1998/1999	1999/2000
A : Budget (Disbursed. Unit : Rp. X 1,000) *1							
Indonesia	94,333,639	97,448,325	123,621,981	129,465,882	149,621,845	243,496,703	
W.Sumatra	4,182,317	4,369,096	4,676,560	4,289,950	7,246,180	11,783,535	
W.Jawa	10,920,000	12,010,000	15,416,742	19,956,051	18,266,735	31,477,000	
D.I.Y	1,000,000	1,050,000	1,689,785	1,756,300	2,215,000	3,509,000	
E.Jawa	15,200,000	15,840,000	19,574,677	23,931,107	27,232,300	38,928,790	
NTB	3,480,000	3,800,500	3,540,000	3,415,200	2,944,000	7,154,744	
B : Acreage to be Applied the Budget (Unit : ha) *2							
Indonesia	5,540,054	4,961,304	4,940,368	5,865,993	5,857,994	5,924,107	
W.Sumatra	212,996	218,485	191,182	292,289	293,289	293,289	
W.Jawa	564,251	527,981	346,691	483,997	483,997	483,997	
D.I.Y	67,622	67,713	55,982	55,982	55,982	55,982	
E.Jawa	947,362	947,362	839,354	907,668	907,668	907,668	
NTB	177,044	177,044	133,289	176,143	176,143	136,385	
C : Unit O/M cost by ha (Unit : Rp. / ha)							
Indonesia	558,092	559,752	25,023	22,071	25,541	41,103	
W.Sumatra	19,636	19,997	24,461	14,677	24,707	40,177	
W.Jawa	19,353	22,747	44,468	41,232	37,741	65,036	
D.I.Y	14,788	15,507	30,184	31,373	39,566	62,681	
E.Jawa	16,045	16,720	23,321	26,365	30,002	42,889	
NTB	19,656	21,466	26,559	19,389	16,714	52,460	

Note. Source: The Ministry of Home Affairs

*1: Budget covers Lowland field and Upland field

*2: Acreage consists of Lowland field and Upland field.

Table C.2.3 Unit Rate for the O&M Works

Item	Unit	Rp/unit	Inflation factor 1/	Item	Unit	Rp/unit	Inflation factor 1/
<u>Salaries, wages and expenses</u>				<u>Materials</u>			
Unskilled labour	day	10,000	2.5	Petrol	l	1,100	2.0
Chain saw operator	day	10,000	2.5	Cement	m3	1,050,000	3.5
Driver	day	10,000	2.5	Aggregate	m3	42,000	3.0
Foreman	day	11,250	2.5	Sand	m3	36,000	3.0
Skilled labour	day	12,500	2.5	Masonry rocks	m3	39,000	3.0
Gang leader	day	15,000	2.5	Steel	kg	5,200	2.0
Maintenance inspector	yr	2,226,000	1.0	Concrete	m3	265,283	3.6
- salary	yr	1,260,000	1.5	<u>Machinery/vehicle rental</u>			
- expenses	yr	966,000	2.0	Grass cutter hire	day	9,000	5.0
Gate keeper	yr	968,500	1.6	Chainsaw hire	day	11,275	5.0
- salary	yr	724,500	1.5	Dump truck running	hr	178,610	5.0
- expenses	yr	244,000	2.0	Excavator	hr	228,875	5.0
Weir keeper	yr	864,000	1.6	<u>Government administration</u>			
- salary	yr	660,000	1.5	District office	yr	133,114,500	1.5
- expenses	yr	204,000	2.0	Ranting office	yr	21,124,500	1.5
Water controller	yr	3,122,000	1.7				
- salary	yr	1,362,000	1.5				
- expenses	yr	1,760,000	2.0				

Note: 1/ Approximate inflation between 1992 and 2000

Table C.2.4 Unit Cost Estimate of O&M Works

Component	Unit	Unit cost	Units	Total cost	Component	Unit	Unit cost	Units	Total cost
<u>Grass cutting costs/day</u>					<u>Sediment removal by excavator/m3</u>				
Grass cutter rental	day	9,000	1	9,000	- Excavator hire	hr	228,875	0.04	8,670
- Fuel	l	1,100	3	3,300	- Dump truck hire	hr	178,610	0.08	13,531
- Labour	day	10,000	1	10,000	- Unskilled labour	day	10,000	0.01	63
Total/day				22,300	- Foreman	day	11,250	0.01	71
<u>Weed cutting, drains or canals/ha/yr</u>	ha/yr	11,700	1.00	11,700	- Drivers	day	10,000	0.018939394	189
					Total/m3				22,524
<u>Embankments (earth moving/m3)</u>					<u>Mass concrete/m3</u>				
Soil removal					- Unskilled labour	day	10,000	5	50,000
- Unskilled labour	day	10,000	0.75	7,500	- Foreman	day	11,250	0.025	281
- Foreman	day	11,250	0.25	2,813	- Skilled labour	day	12,500	0.5	6,250
Sub-total				10,313	- Gang leader	day	15,000	0.05	750
Soil compaction					- Aggregate	m3	42,000	0.5	21,000
- Unskilled labour	day	10,000	0.25	2,500	- Sand	m3	36,000	0.333	12,000
- Foreman	day	11,250	0.01	113	- Cement	m3	1,050,000	0.167	175,000
Sub-total				2,613	Total cost/m3				265,281
Total/m3				12,925	<u>Repairs to masonry lining/m3 of original</u>				
<u>Structure maintenance/structure/yr</u>					- Unskilled labour	day	10,000	0.615	6,150
- Unskilled labour	day	10,000	12.00	120,000	- Foreman	day	11,250	0.031	349
- Foreman	day	11,250	6.00	67,500	- Skilled labour	day	12,500	0.08	1,000
- Skilled labour	day	15,000	6.00	90,000	- Gang leader	day	15,000	0.008	120
Total				277,500	- Stone	m3	39,000	0.275	10,725
<u>Sediment removal from headworks/scheme/yr</u>					- Sand	m3	36,000	0.028	1,008
- Unskilled labour	day	10,000	53.33	533,333	- Cement	m3	1,050,000	0.008	8,400
- Chainsaw operator	day	10,000	6.67	66,667	Total/m3				27,752
- Foreman	day	11,250	6.67	75,000	<u>Trash removal/scheme/yr</u>				
- Chain saw hire	hr	11,275	40.00	451,000	- Unskilled labour	day	10,000	12	120,000
Total/yr				1,126,000	- Chain saw operator	day	10,000	4	40,000
<u>Sediment removal/transport from canals/m3</u>					- Chain saw hire	day	11,275	24	270,600
Removal/m3					Total				430,600
- Unskilled labour	day	10,000	1.50	15,000	<u>Structure repair (% breakdown)</u>				
- Foreman	day	11,250	0.05	563	- Unskilled labour		7,130		
Sub-total/m3				15,563	- Concrete		418	5.9%	
Dump truck removal/m3					- Concrete		2,417	33.9%	
- Unskilled labour	day	10,000	0.08	835	- Steel		4,295	60.2%	
- Truck drivers	day	10,000	0.17	1,669					
- Dump truck hire	hr	178,610	0.03	4,971					
Sub-total/m3				7,474					
Total cost/m3				23,037					

Table C.2.5 Estimation of Full O&M Costs

p/ha)

	Unit	Unit cost Rp	Area served (ha)	Total cost Rp/ha		Unit	Unit cost Rp	Area served (ha)	Total cost Rp/ha
<u>Administration</u>					<u>Periodic Maintenance</u>				
Provincial overhead	ls	945	1	945	Weeding - canals	ha	3,000	1	3,000
District office	ls	133,114,500	25,000	5,325	Weeding - drains	ha	3,000	1	3,000
Sub district office	ls	21,124,500	5,000	4,225	Embankment repair	ha	407	1	407
Sub-total				10,494	Sediment removal, canals	ls	23,037	2	36,538
<u>Operation</u>					<u>Sediment removal, headworks</u>				
Water Controllers (ulu-ulu)	ls	3,122,000	1,000	3,122	Structure repair - skilled labour	ha	12,500	5	2,500
Gate keeper - salaries	ls	724,500	250	2,898	Structure repair - materials	ha	18,388	1	18,388
Weir operator - salaries	ls	660,000	2,440	270	Trash removal - major	ls	430,600	2,440	176
Sub-total				6,290	Lining repair (occasional)	ls	70	1	70
<u>Routine Maintenance</u>					<u>Sub-total</u>				
Weed clearing - canals	ha	11,700	1	11,700					
Weed clearing - drains	ha	11,700	1	11,700	<u>Emergency Repair</u>				
Embankment repair	ls	10,313	10	1,031	<u>Average annual cost</u>				
Structure repair - minor (via gatekeeper)	ls	244,000	250	976	ha	8,459	1	8,459	
Lining repair (regular)	ls	3,050,000	2,440	1,250					
Maintenance inspector	ls	2,226,000	1,000	2,226					
Weir operator - materials	ls	204,000	2,440	84					
Sub-total				28,967	<u>Total O&M</u>				
<u>Summary breakdown</u>									
Unskilled and skilled labour								61%	72,811
Administration								9%	10,494
Government/local staff								7%	8,516
Materials								23%	26,931
Total									118,752

Source: Horner J., Budgeting of O&M for Irrigation Schemes - Aceh Province. Institute of Irrigation Studies, UK. 1991.

Table C.2.6 Net Crop Returns with frequent and Extended Rehabilitation (Rp.'000/ha)

(A) Assuming rehabilitation evry nine years.

Year	Wet season			Dry season			Annual total net return Rp'000
	yield ton/ha	net return Rp'000	cropping intensity	yield ton/ha	net return Rp'000	cropping intensity	
1	5.00	3,917	97%	5.00	3,917	75%	6,738
2	5.00	3,917	97%	5.00	3,917	75%	6,738
3	5.00	3,917	97%	4.95	3,851	75%	6,688
4	5.00	3,917	97%	4.83	3,713	75%	6,585
5	4.80	3,677	97%	4.67	3,521	74%	6,173
6	4.60	3,437	97%	4.46	3,269	73%	5,721
7	4.40	3,197	97%	4.19	2,945	72%	5,222
8	4.20	2,957	97%	3.88	2,573	71%	4,696
9	4.10	2,837	97%	3.52	2,141	70%	4,251
10	4.00	2,717	97%	3.52	2,141	70%	4,135
11	5.00	3,917	97%	5.00	3,917	75%	6,738
12	5.00	3,917	97%	5.00	3,917	75%	6,738
13	5.00	3,917	97%	4.95	3,851	75%	6,688
14	5.00	3,917	97%	4.83	3,713	75%	6,585
15	4.80	3,677	97%	4.67	3,521	74%	6,173
16	4.60	3,437	97%	4.46	3,269	73%	5,721
17	4.40	3,197	97%	4.19	2,945	72%	5,222
18	4.20	2,957	97%	3.88	2,573	71%	4,696
19	4.10	2,837	97%	3.52	2,141	70%	4,251
20	4.00	2,717	97%	3.52	2,141	70%	4,135

(B) Assuming rehabilitation every twenty years

Year	Wet season			Dry season			Annual total net return Rp'000
	yield ton/ha	net return Rp'000	cropping intensity	yield ton/ha	net return Rp'000	cropping intensity	
1	5.0	3,917	97.0%	5.00	3,917	75.0%	6,738
2	5.0	3,917	97.0%	5.00	3,917	75.0%	6,738
3	5.0	3,917	97.0%	5.00	3,917	75.0%	6,738
4	5.0	3,917	97.0%	5.00	3,917	75.0%	6,738
5	5.0	3,917	97.0%	5.00	3,917	75.0%	6,738
6	5.0	3,917	97.0%	4.96	3,869	75.0%	6,702
7	5.0	3,917	97.0%	4.92	3,821	75.0%	6,666
8	5.0	3,917	97.0%	4.88	3,773	75.0%	6,630
9	5.0	3,917	97.0%	4.82	3,701	75.0%	6,576
10	5.0	3,917	97.0%	4.75	3,617	75.0%	6,513
11	4.9	3,797	97.0%	4.68	3,533	74.5%	6,316
12	4.8	3,677	97.0%	4.59	3,425	74.0%	6,102
13	4.7	3,557	97.0%	4.49	3,305	73.5%	5,880
14	4.6	3,437	97.0%	4.39	3,185	73.0%	5,660
15	4.5	3,317	97.0%	4.27	3,041	72.5%	5,423
16	4.4	3,197	97.0%	4.14	2,885	72.0%	5,179
17	4.3	3,077	97.0%	4.00	2,717	71.5%	4,928
18	4.2	2,957	97.0%	3.85	2,537	71.0%	4,670
19	4.1	2,837	97.0%	3.69	2,345	70.5%	4,406
20	4.0	2,717	97.0%	3.52	2,117	70.0%	4,118

(C) Net benefit to delayed rehabilitation

Net benefit (no O&M)	Net benefit (Rp 120,000)
0	-120
0	-120
49	-71
153	33
565	445
981	861
1,444	1,324
1,934	1,814
2,325	2,205
2,378	2,258
-422	-542
-636	-756
-808	-928
-925	-1,045
-750	-870
-542	-662
-294	-414
-26	-146
155	35
-17	-137
3,073	2,176

Net Present Value, @ 12%

Table C.4.1 WUA Evaluation Scoring Method – Post Turnover
(adapted from M&E IDTO Proposal)

Aspect	Item	Indicator	Scoring		
			Score	Max weight	Total weight
Aspect of authority in taking decision	WUA can decide profitable crops	Cropping pattern and cropping calendar are agreed by members	5	5	15
		Cropping pattern and cropping calendar have not been agreed by members	2		
		Cropping pattern and cropping calendar are not planned	0		
	WUA can prepare a plan of water distribution	Agreement amongst members of water distribution plan for the first cropping season	1	5	
		Agreement amongst members of water distribution plan for the second cropping season	2		
		Agreement amongst members of water distribution plan for the third cropping season	2		
	WUA can decide policy of water management to sustain irrigation system	Guideline of water management (including sanctions) exist and implemented	5	5	
		Guideline of water management (including sanctions) exist but not implemented	2		
		Guideline of water management (including sanctions) does not exist	0		
	Aspect of capability to manage irrigation system	WUA can activate members in the organization	Official meeting every cropping season	2	5
Plenary meeting annually			3		
No meeting			0		
WUA can improve its performance of irrigation management		Equality of distribution and allocation of water	3	5	
		Uniformity of cropping calendar	2		
		No equality of water allocation and no uniformity of cropping calendar	0		
WUA can activate members in stages of maintenance works and development of irrigation system		Meeting amongst members for planning and evaluation	4	15	
		Actual implementation of work program of maintenance and development using 'gotong royong' system	3		
		Actual implementation of work program of maintenance and development using 'fee collection' system	3		
		Time allocated to 'gotong royong' is equivalent to the true & real time (man-days) to complete the maintenance work plan, i.e. sediment removal, grass cutting, canal repair, painting etc.	5		
WUA can encourage members to be responsible for sustainability of irrigation system		Members are willing to follow the rule of utilization of irrigation water	5	5	
		Members break the rule and sanctions applied	3		
	Members break the rule but sanctions are not applied	0			
Aspect of satisfactory And prosperity of members	WUA can provide guarantee of water right for members	Guarantee correct equity of water allocation, i.e. time, area, quantity and equality for each member	5	5	5
		Less guarantee of water allocation for each members	2		
		No guarantee of water allocation for each member	0		
Aspect of autonomous and self help	WUA can develop organisation with regard to laws and regulations	Set up AD/ART, with respect to village regulation, traditional concepts and member requirements	5	5	25
		As above - setting up to be completed	2		
		As above - setting up not yet commenced	1		
		WUA has made application for legal registration of WUA Committee & Accepted form of AD / ART	5		
		Not yet applied for legal registration	2		
	WUA can activate members to be financially self help	Collected fee > 60% NBB	10	10	
		Collected fee = 30% - 59% NBB	4		
		Collected fee < 30% NBB	0		
	WUA can minimize dependency from other parties in irrigation management	Actual subsidy < 30% NBB	5	5	
		Actual subsidy = 30% - 49% NBB	2		
Actual subsidy > 50% NBB		0			
Aspect of equality with other institutions	Representation of WUA in Irrigation Committee	Representative of WUA is at the level of Irrigation Committee	5	5	5

Ranking formula a total score of a turned over irrigation will represent it's progress

Total score (N) max. 80	Turned over irrigation progress rank
55 > N < 80	Developed and becoming Self Sustaining
30 > N < 54	In the process of becoming Developed
N < 29	Not Developed – Requires continued & intensive guidance

Table C.4.2 Evaluation of the WUA Request for Government Guidance
(for Response from Kabupaten WUA Supporting Forum)

Item	Indicator	Response
Cropping Pattern and Cropping Calendar	WUA requested assistance and guidance from Government / Kabupaten WUA Support Group (PPL & <i>Juru Pengairan</i>) to plan the cropping pattern and calendar	Yes / No
	IF THE RESPONSE IS NO, THEN WHY NOT? A: WUA did not require assistance as the data on crops & water availability for the seasons is a known factor. B: PPL & <i>Juru Pengairan</i> had already advised on such items as crops and expected water availability. C: WUA did not know who or how to request assistance	A / B / C
	Government / Kabupaten WUA Support Group assisted with the planning and guided the WUA members in agreeing to the cropping pattern and calendar	Yes / No
	IF THE RESPONSE IS NO, THEN WHY NOT? A: There are insufficient staff to assist WUA B: There is insufficient funding for field activities C: There is no willingness from Government to assist WUA	A / B / C
Water Distribution Plan for three cropping seasons	WUA requested assistance and guidance from Government / Kabupaten WUA Support Group (PPL & <i>Juru Pengairan</i>) to plan the seasonal distribution of water throughout the irrigation system and WUA area	Yes / No
	IF THE RESPONSE IS NO, THEN WHY NOT? A: WUA did not require assistance as the data on water availability for the seasons is a known factor. B: PPL & <i>Juru Pengairan</i> had already advised on such items as crops and expected water availability. C: WUA did not know who or how to request assistance	A / B / C
	Government / Kabupaten WUA Support Group assisted with the planning and guided the WUA members in establishing the water distribution plan	Yes / No
	IF THE RESPONSE IS NO, THEN WHY NOT? A: There are insufficient staff to assist WUA B: There is insufficient funding for field activities C: There is no willingness from Government to assist WUA	A / B / C
Maintenance Works &/or Rehabilitation Work Plan – WUA inputs (monetary &/or kind) plus Government assistance request	WUA requested assistance and guidance from Government / Kabupaten WUA Support Group (PPL & <i>Juru Pengairan</i>) to partake in the proposed seasonal “WALK THROUGH” of the irrigation system and designate and plan areas in need of maintenance or rehabilitation	Yes / No
	IF THE RESPONSE IS NO, THEN WHY NOT? A: WUA did not require assistance as they have the capability to conduct the “WALK THROUGH”. B: The <i>Juru Pengairan</i> had already conducted a walk through and advised the WUA accordingly and this was additional to the WUA “WALK THROUGH”. C: WUA did not know who or how to request assistance	A / B / C
	Government / Kabupaten WUA Support Group conducted the “WALK THROUGH” jointly with the WUA	Yes / No
	IF THE RESPONSE IS NO, THEN WHY NOT? A: There are insufficient staff to assist WUA B: There is insufficient funding for field activities C: There is no willingness from Government to assist WUA	A / B / C
Establishment of AD/ART guidelines, inputs etc. Application for registration as a legal entity – legalized WUA	WUA requested assistance and guidance from Government / Kabupaten WUA Support Group (Pemda / WUA Administration Specialist) to assist and guide the WUA & members in the preparation and details of the AD / ART guidelines that are agreed by the members and take into consideration traditional, cultural, social & ethnic factors.	Yes / No
	WUA requested assistance from Government / Kabupaten WUA Support Group (Pemda / WUA Administration Specialist) to assist and guide the WUA in the matter of application for recognition as a legal entity (legalized WUA)	Yes / No
	IF THE RESPONSE IS NO, THEN WHY NOT? A: WUA did not require assistance as they have the capability and understanding to draft suitable AD / ART B: The methodology of AD / ART and application of legal status had already been explained during the formation of the WUA and subsequent follow-up C: WUA do not require an AD / ART or do not want to become a legal entity / company D: WUA did not know who or how to request assistance	A / B C / D
	Government / Kabupaten WUA Support Group responded to the WUA request and assisted through the Pemda / WUA Administration Specialist	Yes / No
	IF THE RESPONSE IS NO, THEN WHY NOT? A: There are insufficient staff or no qualified staff to assist WUA on this matter B: There is insufficient funding for field activities C: There is no willingness from Government to assist WUA	A / B / C

Table C.5.1 Action Plan for Public Relation of Irrigation and Irrigated Agriculture (1/3)

No.	Name of Action Plan	Key Word	Objective	Target Person	Contents	Incentive	Necessary follow-up	Remarks
Public mood generation								
	Tiny Goodwill Movement	Trust among people, in society	To generate mood of social trust or trust among people To imprint necessity of social participation to the people	Any generations	Public awarding sys. To rouse social trust & participate mood by Kab-Level, aiming any generations (or under high school)	Proud, public commendation	Publicity by newspaper, TV & radio	To let manage local univ. students as volunteer, with local mass-media. cosponsored by MoA, MoHA
	Mau Makan Lagi Competition	Crop diversity, cost crushing	To introduce new foodstuff to generate local demand of HVC. To generate demands for new crops	Any generations	Public awarding sys. To generate crop demand by Kab-Level, aiming any generations.	Proud, public commendation	Publicity by newspaper, TV & radio	To introduce as one of local events through mass-media, reaching to national level, + sponsorships of private industries related with cooking, cosponsored by MoA, MoHA
	Little scientist awarding	Rainfall & temperature data, cost crushing	To establish stable observation sys. While generating natural scientific minds in young generations To generate scientific sense in young generation, To obtain meteo-data, To force local officers to compile data into annual report. Local officers to be exposed to invisible public watching.	Elementary & Junior high school	Public awarding sys. to generate scientific sense and to obtain weather record by Kab-level.	Proud, public commendation	Dinas should compile annual report. Some educational commodities to the school.	To introduce as field activities of elementary / junior high school to generate scientific sense in young generation & to obtain precious meteo-data. Letting sponsership of private sectors, cosponsored by MoE, Kimpraswil.
	Sungaiiku, Airku Awarding	River waterlevels, cost crushing	To establish stable observation sys. While generating natural scientific minds in young generations Continuous river flow observation	Politechnic school student	Let high school student involve waterlevel observation as club activities, and let compete hydro-analysis over the country, then award.	Certificate at their graduation by Buppati	Dinas should estimate river flow & compile annual report	To introduce as field activities to generate scientific sense in young generation & to obtain precious meteo-data. Letting sponsership of private sectors, cosponsored by MoE, Kimpraswil.
	Good teacher prize	For supporting above 2 activities	To keep above participatory observation Continuation of field observation	School teachers	Public awarding sys. to encourage teachers who instruct students for above activities	Proud, public commendation	Publicity by newspaper, TV & radio	
	Farming Master Registration	Farmer to farmer.	To let farmers participate to activities of "Farmer to farmer" extension services.	Innovative farmers	To conduct campaign to dig out hidden talent in communities and encourage talents to extend techniques.	Proud, public commendation	Rewarding by community	Have to provide occasions to let them contact with specialist.
	Crop Tricycle Services	Consigning crops from field to market.	To provide occasions to let farmers manage marketing by themselves.	Potential farmers' groups.	Rent motor cycles & trailer to farmers group from kab. Govt.	Cheaper charge & market info.	Leave managements to farmers. Just M&E	After few years transfer implements to group.

to be continued

Table C.5.1 Action Plan for Public Relation of Irrigation and Irrigated Agriculture (2/3)

No.	Name of Action Plan	Key Word	Objective	Target Person	Contents	Incentive	Necessary follow-up	Remarks
Public mood generation								
	Tiny Goodwill Movement	Trust among people, in society	To generate mood of social trust or trust among people To imprint necessity of social participation to the people	Any generations	Public awarding sys. To rouse social trust & participate mood by Kab-Level, aiming any generations (or under high school)	Proud, public commendation	Publicity by newspaper, TV & radio	To let manage local univ. students as volunteer, with local mass-media. cosponsored by MoA, MoHA
	Mau Makan Lagi Competition	Crop diversity, cost crushing	To introduce new foodstuff to generate local demand of HVC. To generate demands for new crops	Any generations	Public awarding sys. To generate crop demand by Kab-Level, aiming any generations.	Proud, public commendation	Publicity by newspaper, TV & radio	To introduce as one of local events through mass-media, reaching to national level, + sponsorships of private industries related with cooking, cosponsored by MoA, MoHA
	Little scientist awarding	Rainfall & temperature data, cost crushing	To establish stable observation sys. While generating natural scientific minds in young generations To generate scientific sense in young generation, To obtain meteo-data, To force local officers to compile data into annual report. Local officers to be exposed to invisible public watching.	Elementary & Junior high school	Public awarding sys. to generate scientific sense and to obtain weather record by Kab-level.	Proud, public commendation	Dinas should compile annual report. Some educational commodities to the school.	To introduce as field activities of elementary / junior high school to generate scientific sense in young generation & to obtain precious meteo-data. Letting sponsorship of private sectors, cosponsored by MoE, Kimpraswil.
	Sungaiiku, Airku Awarding	River waterlevels, cost crushing	To establish stable observation sys. While generating natural scientific minds in young generations Continuous river flow observation	Politechnic school student	Let high school student involve waterlevel observation as club activities, and let compete hydro-analysis over the country, then award.	Certificate at their graduation by Buppati	Dinas should estimate river flow & compile annual report	To introduce as field activities to generate scientific sense in young generation & to obtain precious meteo-data. Letting sponsorship of private sectors, cosponsored by MoE, Kimpraswil.
	Good teacher prize	For supporting above 2 activities	To keep above participatory observation Continuation of field observation	School teachers	Public awarding sys. to encourage teachers who instruct students for above activities	Proud, public commendation	Publicity by newspaper, TV & radio	
	Farming Master Registration	Farmer to farmer.	To let farmers participate to activities of "Farmer to farmer" extension services.	Innovative farmers	To conduct campaign to dig out hidden talent in communities and encourage talents to extend techniques.	Proud, public commendation	Rewarding by community	Have to provide occasions to let them contact with specialist.
	Crop Tricycle Services	Consigning crops from field to market.	To provide occasions to let farmers manage marketing by themselves.	Potential farmers' groups.	Rent motor cycles & trailer to farmers group from kab. Govt.	Cheaper charge & market info.	Leave managements to farmers. Just M&E	After few years transfer implements to group.

to be continued

Table C.5.1 Action Plan for Public Relation of Irrigation and Irrigated Agriculture (3/3)

No.	Name of Action Plan	Key Word	Objective	Target Person	Contents	Incentive	Necessary follow-up	Remarks
Public mood generation								
	Tiny Goodwill Movement	Trust among people, in society	To generate mood of social trust or trust among people To imprint necessity of social participation to the people	Any generations	Public awarding sys. To rouse social trust & participate mood by Kab-Level, aiming any generations (or under high school)	Proud, public commendation	Publicity by newspaper, TV & radio	To let manage local univ. students as volunteer, with local mass-media. cosponsored by MoA, MoHA
	Mau Makan Lagi Competition	Crop diversity, cost crushing	To introduce new foodstuff to generate local demand of HVC. To generate demands for new crops	Any generations	Public awarding sys. To generate crop demand by Kab-Level, aiming any generations.	Proud, public commendation	Publicity by newspaper, TV & radio	To introduce as one of local events through mass-media, reaching to national level, + sponsorships of private industries related with cooking, cosponsored by MoA, MoHA
	Little scientist awarding	Rainfall & temperature data, cost crushing	To establish stable observation sys. While generating natural scientific minds in young generations To generate scientific sense in young generation, To obtain meteo-data, To force local officers to compile data into annual report. Local officers to be exposed to invisible public watching.	Elementary & Junior high school	Public awarding sys. to generate scientific sense and to obtain weather record by Kab-level.	Proud, public commendation	Dinas should compile annual report. Some educational commodities to the school.	To introduce as field activities of elementary / junior high school to generate scientific sense in young generation & to obtain precious meteo-data. Letting sponsership of private sectors, cosponsored by MoE, Kimpraswil.
	Sungaiiku, Airku Awarding	River waterlevels, cost crushing	To establish stable observation sys. While generating natural scientific minds in young generations Continuous river flow observation	Politechnic school student	Let high school student involve waterlevel observation as club activities, and let compete hydro-analysis over the country, then award.	Certificate at their graduation by Buppati	Dinas should estimate river flow & compile annual report	To introduce as field activities to generate scientific sense in young generation & to obtain precious meteo-data. Letting sponsership of private sectors, cosponsored by MoE, Kimpraswil.
	Good teacher prize	For supporting above 2 activities	To keep above participatory observation Continuation of field observation	School teachers	Public awarding sys. to encourage teachers who instruct students for above activities	Proud, public commendation	Publicity by newspaper, TV & radio	
	Farming Master Registration	Farmer to farmer.	To let farmers participate to activities of "Farmer to farmer" extension services.	Innovative farmers	To conduct campaign to dig out hidden talent in communities and encourage talents to extend techniques.	Proud, public commendation	Rewarding by community	Have to provide occasions to let them contact with specialist.
	Crop Tricycle Services	Consigning crops from field to market.	To provide occasions to let farmers manage marketing by themselves.	Potential farmers' groups.	Rent motor cycles & trailer to farmers group from kab. Govt.	Cheaper charge & market info.	Leave managements to farmers. Just M&E	After few years transfer implements to group.