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DEVELOPMENT OF WATER USER ASSOCIATIONS ON THE MADURA GROUNDWATER IRRIGATION PROJECT, INDONESIA

Roger Jackson

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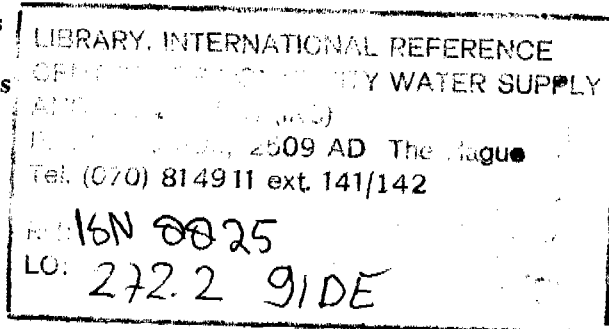
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DEVELOPMENT OF WATER USER ASSOCIATIONS ON THE MADURA GROUNDWATER IRRIGATION PROJECT, INDONESIA

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ABSTRACT

The establishment and training of Water User Associations (WUA) has been a crucial aspect of the Madura Groundwater Irrigation Project, East Java Province, Indonesia. The long-term sustainability of tubewell irrigation depends on the capability and motivation of the WUAs to operate and maintain their systems based on adequate water charge collection and sound financial management. This paper describes the procedures used in the WUA development programme, and discusses further measures that will need to be taken at local government level to build on the considerable progress that has been made by the Project.

1. BACKGROUND

1.1 Introduction

The main objective of the Madura Groundwater Irrigation Project was the development of groundwater resources for the irrigation of previously rainfed land to increase the production of food and cash crops, and to improve the incomes and welfare of farming families. A crucial aspect of the Project was the establishment and training of Water User Associations (WUA) to enable the primary beneficiaries of the Project - the farmers - to be actively responsible for the operation and management of the tubewell irrigation system serving their land. This aspect was considered to be of great importance in an area like Madura where the farmers have little or no experience of irrigated agriculture.

The WUA development programme is in line with the national policy of handing over of small-scale irrigation schemes (up to 500 ha) for operation by the farmers themselves (*Penyerahan Irigasi Kecil*).

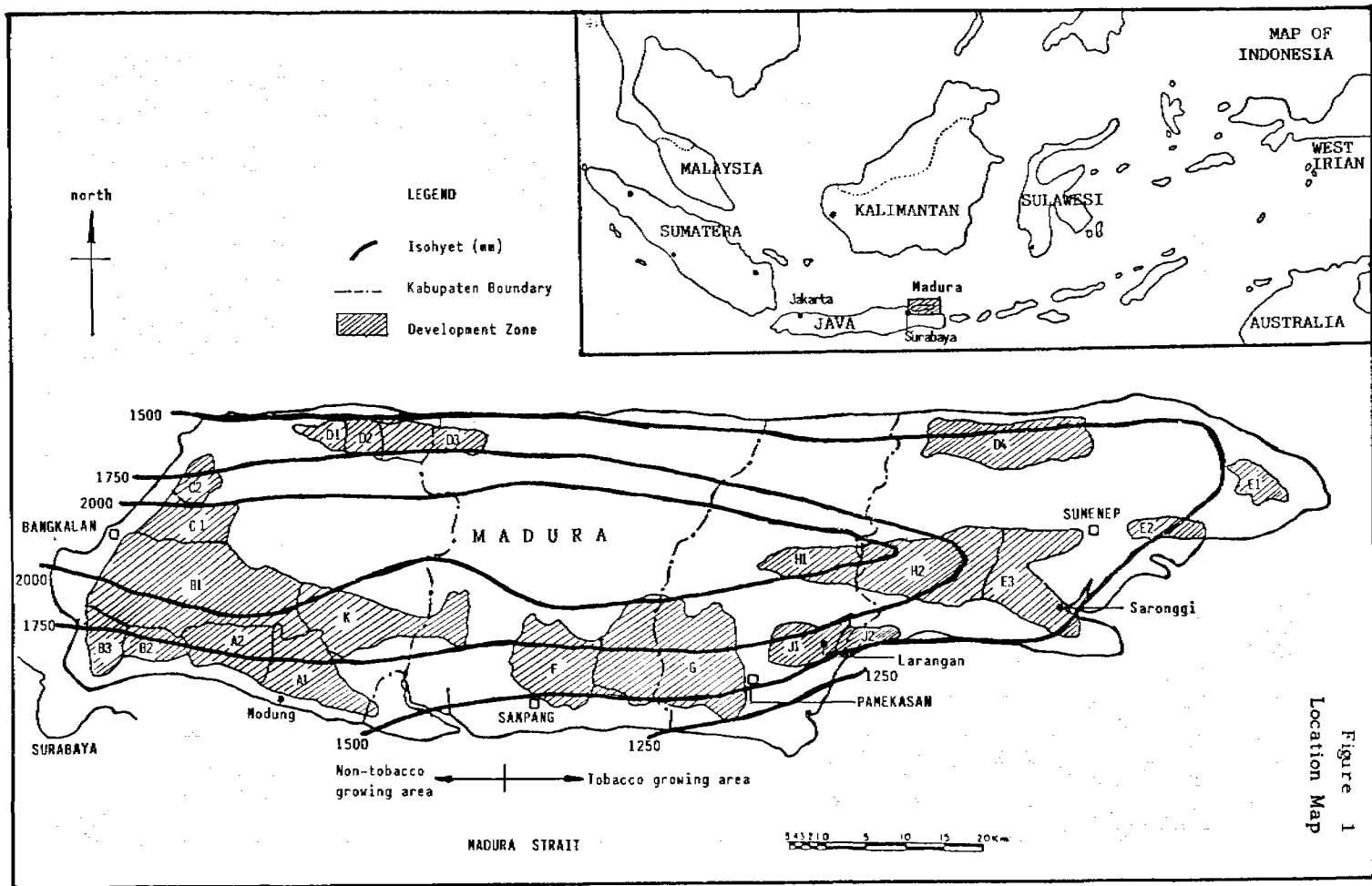


Figure 1
Location Map

The groundwater resource (limestone aquifer) was developed by means of tubewells with diesel-driven deepwell pumps. WUAs are particularly important for tubewell systems since the water will only flow if the pumpset has fuel and is well maintained - this requires some degree of organisation and cash flow management.

Water charges were introduced to cover operation and maintenance costs, and to give a sense of value to the water to encourage better water use. It was hoped that as the farmers benefited financially from the increased production of crops, they would have a feeling of commitment to the tubewell systems and thereby ensure the continued operation of the systems.

1.2 Project Description

The Project is located on Madura Island, East Java Province, Indonesia (Figure 1). Madura is noted for its dryness, having a more pronounced dry season than neighbouring Java, and the resilience and toughness of its people. The Madurese are known for their strong adherence to Islam, and their independent spirit and reluctance sometimes to accept central government authority.

As a result of the relatively harsh environment and lack of opportunities on the island, the Madurese have long migrated to mainland East Java and other parts of the Indonesian archipelago in search of work and a better life.

Agricultural output is low due to drought, poor agricultural inputs and, compared to Java, relatively infertile soils. The most important cash crop is tobacco in central and east Madura, and cattle form an essential part of the farming economy and the basis of the main cultural event on the island - the annual bull races or *Karapan Sapi*. The traditional food staple is maize. Rice is limited to the relatively few areas with surface irrigation. The main constraint to improving the welfare of the predominantly agricultural population of the island is the availability of water for irrigation and domestic supply.

As part of its programme to increase agricultural production in the 1970s and 1980s, particularly of rice in order to achieve self-sufficiency, the Indonesian government did not wish to leave out politically important, but economically less developed, areas such as Madura in the general development drive. Where suitable aquifers were known to exist, groundwater development was seen as the quickest and most feasible way

of providing irrigation water and improving social conditions in the rural areas.

From 1972 preliminary studies were carried out to identify potential development areas on Madura, and the Project proper was implemented in three phases from 1979 to 1990 (Phase 1: 1979-1984; Phases 2 and 3: 1984-1990). Tubewell development zones (A1 to K) were selected on the basis of groundwater and land resource potential for irrigation, and were grouped according to rainfall distribution and cropping pattern type into the following areas:

Areas	Rainfall	Cropping	Zones
West Coastal	1500-1750 mm	Non-tobacco	A1,A2,B2,B3, D2, D3
West Inland	1750-2000 mm	Non-tobacco	B1,C1,C2,K
Central and East	1250-1500 mm	Tobacco	D4,E1,E2,E3, F,G,H1,J1,J2.

The main physical works consisted of the construction of 126 tubewell systems with a total design command area of 4630 ha (average command area 37 ha per tubewell). Command areas were divided into seven day-rotation blocks which were supplied by concrete-lined open channels.

A base workshop was established in Pamekasan, the capital of Madura and the Project Headquarters, and field workshops were built at Sumenep and in *Kabupaten* (district) Bangkalan to serve the tubewells in the east and west respectively. However, generally the mechanical support service has been constrained by poor management and low staff motivation, particularly in the base workshop, and it is important that improvements are made to ensure the continued operation of the tubewells for the future (this is discussed further in Section 4).

The number of beneficiary farmers is about 18,800, i.e., about 150 farmers per tubewell system.

Tubewell operation was initially subsidised by the Project to enable the WUAs to accumulate a cash fund from the collection of water charges so that operations could be financed after the removal of the subsidy and handover from the Project. Cropping pattern demonstrations were held on selected farmers' plots at each tubewell during the first year of operation to introduce new varieties (particularly *palawija* crops), crop management and irrigation techniques, as a way of extending new information to farmers who previously had little or no experience of irrigated agriculture. Cooperation from the farmers was achieved by guaranteeing them a minimum return, while the inputs of seed, fertilizer, agrochemicals, etc, was provided by the Project. Generally, the demonstration programme has been successful, and has been particularly important in western Madura, where tobacco is not grown (because of the risk of rainfall in the dry season) and alternative cash crops need to be promoted. The uptake of new technologies by farmers in areas such as Zones B3 and A1 (Figure 1) is one of the major successes of the Project.

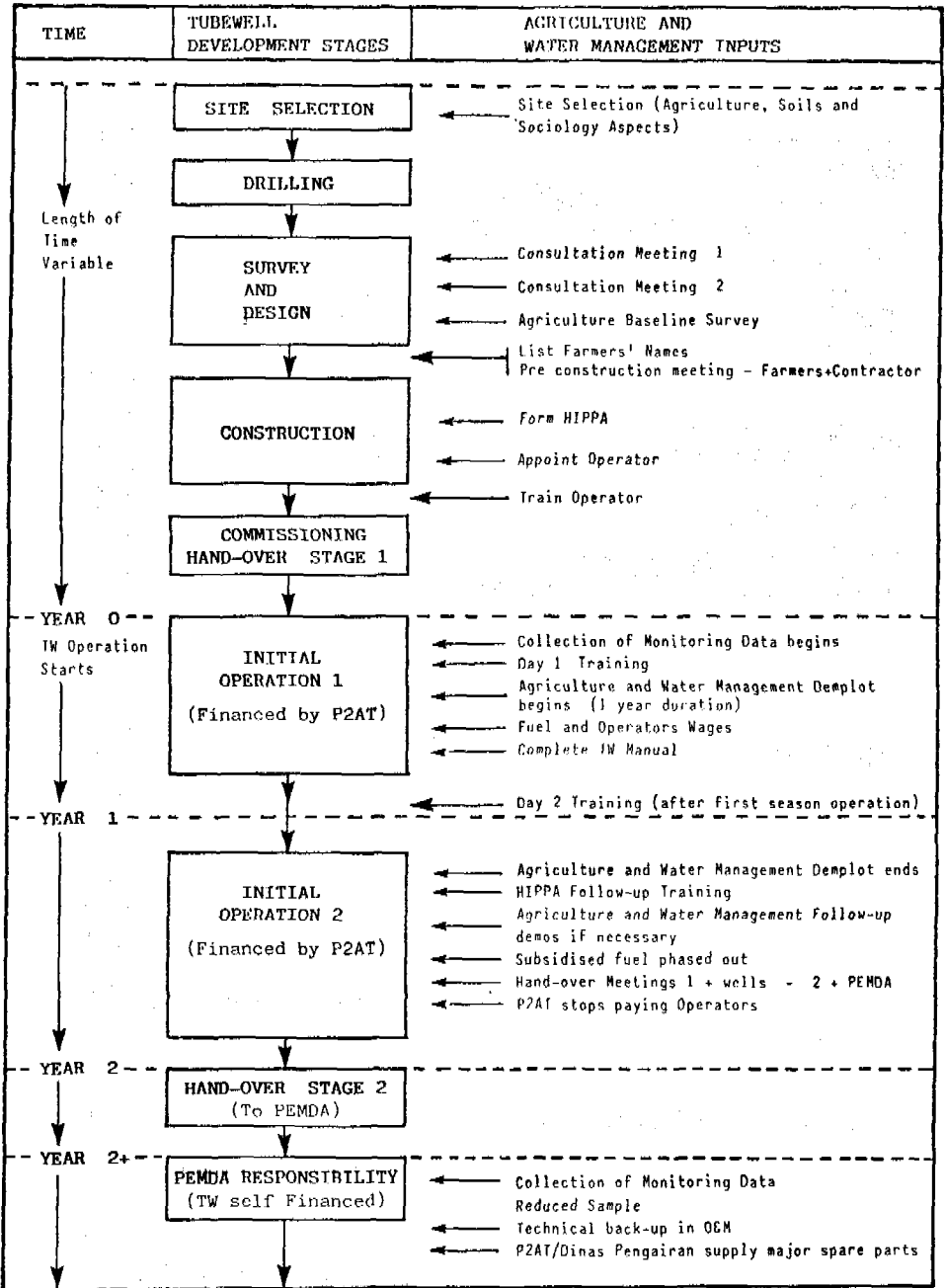
The development schedule of a typical tubewell system is illustrated on Figure 2.

Financial assistance for the Project was provided by grants from the Overseas Development Administration (ODA) of the British government (all phases), and the Commission of the European Communities (Phases 2 and 3 only). The Project was implemented by the Directorate General of Water Resources Development (DGWRD), Ministry of Public Works, Government of Indonesia, and the executing agency was the Groundwater Development Project (P2AT) of the DGWRD's Directorate of Irrigation II.

1.3 Social Influences on Development

During the early part of Project implementation it became apparent that there were considerable differences in economic and social issues between western and eastern Madura, which had a direct bearing on the eventual performance of the WUAs and success of tubewell operations. Sociological studies became increasingly important in the tubewell site selection process to assess whether social conditions in the villages under consideration were likely to be conducive to supporting a tubewell irrigation system. Factors considered included the attitude and influence of the village head and religious leaders in the village, extent of migration and share-cropping, land ownership, and general attitude to irrigation development. Particular attention was also paid to village boundaries and to ownership of land by

FIGURE 2
DIAGRAM OF DEVELOPMENT OF TUBEWELL.
INCLUDING AGRICULTURE AND WATER MANAGEMENT INPUTS



persons from other villages in order to avoid the problems encountered at some of the earlier sites. The role of women in farming and village society also emerged as an important consideration, as reported by Casey (1991).

Generally, the area east of Pamekasan has fewer economic and social dilemmas and there has been a positive response to tubewell development. Tobacco is the dominant cash crop in this area, and the effect on farmer incomes has been significant. WUAs have taken root and have responded well to project guidelines concerning water charges, financial control and responsibilities for canal and pumpset maintenance.

In the western part of Madura, however, social structure is far less cohesive, and conflict and feuding between factions led by powerful individuals is a feature of rural life. Migration to mainland East Java and other areas is high. Tobacco is not grown in this part of the island, and farmers have had few incentives to introduce alternative cash crops. There has been resentment to external intervention, and this sentiment is taken advantage of by those, who for their own reasons or because of vested interests, do not want to see particular government-sponsored projects implemented.

Given this background it is hardly surprising that WUAs at some of early (Phase 1) tubewells, sited purely on hydrogeological and land resource grounds without regard to social and economic considerations, failed to function once the initial Project operational subsidy was removed.

Sociological studies were introduced soon after the start of Phase 2 and were principally focused on western Madura. As a result of these studies a programme was developed for farmer participation in the planning, survey and design, and construction of all new tubewell irrigation systems. Attempts (albeit belated) were made to redress the exclusion of women's involvement. The programme was introduced in order that the Project should be perceived as something in which the farmers had an interest and responsibility, rather than being externally imposed. The programme centred around two New System Meetings (Consultation Meeting 1 and Consultation Meeting 2 in Figure 2) which were held at critical stages in the planning and design process, when farmers' views were sought. During the last year of construction (1989/1990) a Pre-Construction Meeting between the farmers and contractor was also held, to explain the requirements for good construction. These meetings were generally successful in ensuring that the irrigation systems were acceptable to the farmers and could be operated by the WUAs.

As the Project progressed the picture became less bleak in western Madura. Market forces from nearby Surabaya (the second largest city of Indonesia) and elsewhere encouraged the irrigation of marketable fruit and vegetable crops in the dry season, and the programme focused on villages where intervention had made headway. The process was helped by the appointment of more motivated village officials and the active participation of the local government extension service (*Dinas Pertanian*) in the Project's cropping pattern demonstration and vegetable trial programmes. More attention has also been given to contacting women.

Zone A1 (Figure 1) in particular has developed well. A further boost to the demand for tubewell produce should be provided by the bridge linking Surabaya to western Madura planned for completion in the mid-1990s.

However, it must be expected that many farmers will wait until they have seen a few years of examples of effective irrigation and good yields before they are prepared to make their own commitment of time and resources. Many of these farmers exist on marginal incomes and cannot reasonably be expected to take such a risk unless they are convinced that the irrigation system will work well and reliably, and good yields will be obtained. This is particularly true of those who would otherwise spend the dry season working in Surabaya or elsewhere. It is particularly important during these early years to maintain the impetus of the cropping demonstrations and WUA training work.

2. WATER USER ASSOCIATION FORMATION AND TRAINING

2.1 Introduction

Very little WUA work was carried out during Phase 1 of the Project. The need for improving the performance of WUAs was seen as an urgent task for Phase 2, and a decision was made to develop a training programme for each tubewell, following training methods formulated for the East Java Irrigation Project (EJIP) which provided a useful local model. The training programme was designed to deal with the following topics:

- ◆ WUA organisation and officers' responsibilities;
- ◆ Financial aspects of tubewell management;
- ◆ Improving water management;
- ◆ Increasing the area irrigated and the cropping intensity.

2.2 Formation

Water User Associations (generally known in East Java by the Indonesian acronym HIPPA - *Himpunan Petani Pemakai Air*) were set up for each tubewell through the Village Community Organisation (*Lembaga Masyarakat Desa*) in accordance with the East Java Governor's Decree Nr 201 of 1987. The guidelines contained within the Decree are mainly concerned with establishing the structure of the WUA (appointment of officials, formation of committees, etc), and are too general for any practical application to the running of WUAs. Although the guidelines are primarily for surface water (gravity fed) irrigation schemes, it is reported that most WUAs on surface water schemes exist in name only and their function is not clearly defined since the supply and distribution of water is generally in the hands of the local government irrigation service (*Dinas Pengairan*). However, since WUAs are crucial to the successful operation and management of pumped tubewell schemes, the Madura Project devoted a lot of effort to formulating practical guidelines for WUA training and strengthening, and it is hoped that the experience gained can be applied to other groundwater projects in Indonesia and elsewhere.

The organisation structure of the WUAs as set up on Madura is shown in Figure 3.

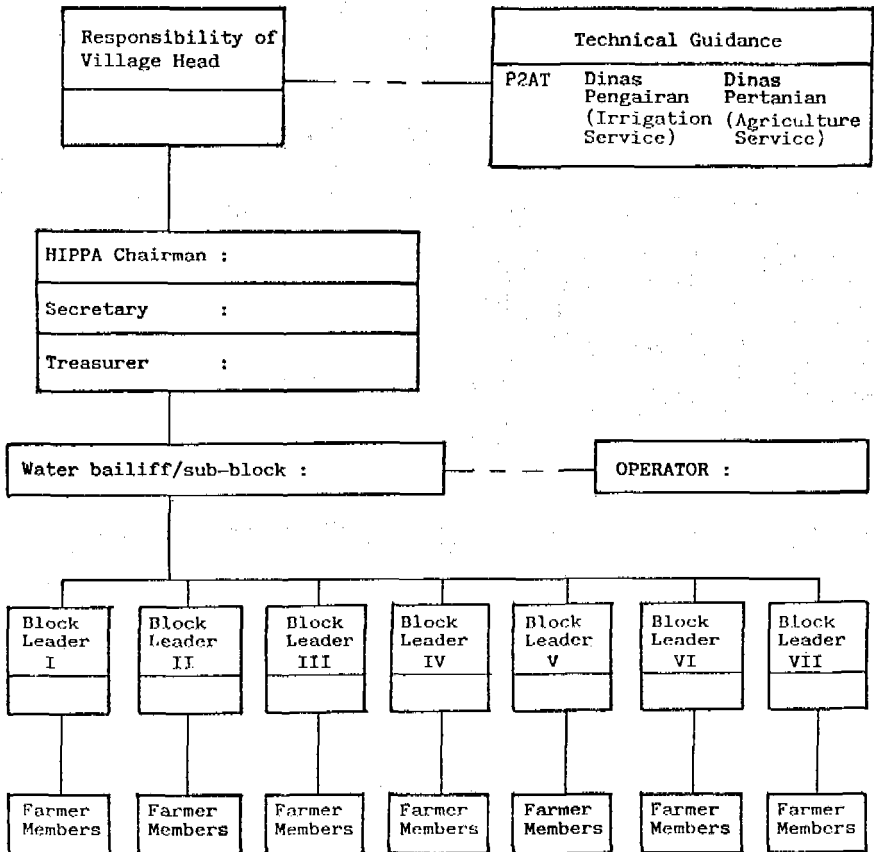
WUA formation took place during the construction of the irrigation system (Figure 2) and consisted of the following activities:

- ◆ Marking the names and landholdings of the farmers on the command area map;
- ◆ Listing the farmers in each irrigation block;
- ◆ Discussing the formation of the WUA with the village head and sub-district (*camat*) officer;
- ◆ Organising an official meeting of the farmers at the village to inaugurate the WUA - this involved an explanation about the role of the WUA and the election of WUA officers.

At some locations there was a tendency to appoint all the WUA officers from a particular interest group or family. This was usually unsatisfactory, and substitutions had to be made at subsequent training sessions in order to

FIGURE 3

STRUCTURE OF WATER USER ASSOCIATION (HIPPA)



————— Command line

- - - - - Consultation/Coordination line

ensure a more balanced representation. Nevertheless, it is inevitable that the water users with the most influence (which may include the village head) usually have the greatest role to play in WUA activities.

Around the time of pumpset installation (the final physical works before the tubewell scheme can be used), the pumpset operator was appointed and trained. Once the tubewell was ready for use a commissioning ceremony was held, and the WUA training sessions got underway. Experience showed that for maximum impact these activities were best done as a compact package.

2.3 Pumpset Operator and Training

The pumpset operator is a key member of the WUA, and needs to be carefully selected. The operator normally works full-time on a tubewell scheme whereas other WUA officers are much less active. The operator can therefore have a strong influence on the use of the system, extending much further than basic mechanical operation and maintenance.

P2AT asked the village head to nominate a number of candidates, and a selection was made on the basis of criteria such as age, education, literacy, landownership and nearness of house to the tubewell. In 1987 the criteria for operator selection was tightened up: potential operators were required to have studied to high school level and belong to an active farming family. This meant that although many of the newer operators were young, they were at least literate and more mechanically minded than some of the operators appointed earlier in the Project.

Successful operator appointment depended very much on interaction and discussions with the village head, and disagreements did arise where individuals were uncertain of the Project and had strong convictions about personnel. However, problems of this nature primarily occurred in villages west of Pamekasan, where there were both economic and social challenges in adopting new irrigation technology and institutions, and were reduced by sociological research and dialogue.

Experience showed that the selection process generally took a long time and needed to be started well in advance of the pumpset installation and commissioning programme.

Table 1: HIPPA Training Programme - Phase 2 Tubewells

Day 1 (one month before commissioning)

<u>Programme</u>	<u>Equipment Requirement</u>
1. Introduction	Transport: 2 x LWB L/R; Overhead projector (OHP); Flip-chart.
2. Video (Pertanian dan Sumur Pompa)	Video cassette recorder
3. Cost and charges	OHP; Flip-chart
4. Irrigation system and tubewell operation <ul style="list-style-type: none">- layout- rotation- cropping patterns before/after extension messages (OHP)	OHP; Flip-chart
5. Group photo	Camera
6. Lunch	
7. Visit to operating tubewell <ul style="list-style-type: none">- discussion with HIPPA- agricultural- demonstration	2 x LWB L/R
8. Walk the command area - discussing components and operation (PA system); Return and arrange meeting for Day 2	
9. Supper	

Day 2 (one season after commissioning)

1. Report on problems and experiences of operation	Transport 1 LWB L/R OHP and Flip-chart
2. Field inspection of system	Clip-board, Layouts
3. Record and charges - progress report	OHP, Flip-chart
4. Video 'HIPPA and Sumur Pompa' and Maintenance Video	Video cassette recorder Video cassette recorder
5. Lunch	
6. Summary of conclusion and agreements - operation and maintenance	
7. Explanation of Tubewell Manual	
8. Presentation of certificates and TW Manual	Certificates and TW Manual

After selection the operator attended a training course in pumpset operation and maintenance organised by the Project's Mechanical Engineering Division (MED).

2.4 Commissioning Ceremony

After the installation of the pumpset and training of the operator, a commissioning ceremony was held at the tubewell in the presence of the *camat*. The commissioning represented the start of operations and the first stage of the handover process from the Project implementing agency to the local government authorities. However, the official handover formalities were not usually completed until several years later.

An attempt was made to try and commission new wells before the start of the dry season, particularly for the tobacco crop in central and eastern areas (mid - late May).

Commissioning ceremonies were important occasions since the introduction of tubewell water represented an important step in the participation of the village community in formal development, and spearheaded later developments such as the provision of all-weather access roads and domestic water supply facilities.

2.5 Water User Association Training

WUA training consisted of a two day programme: Day 1 was normally held around the time of the commissioning ceremony, and Day 2 sometime later. Initially Day 2 was held one month after commissioning, but in 1988 this was changed to one crop season later in order to give the farmers time to accumulate experience and to see one crop demonstration through to harvest. The contents of the training programme are given in Table 1.

The main messages of the Day 1 training concerned the operation of the tubewell and the importance of setting, paying and collecting water charges. For this it was necessary for the MED to give an accurate account of fuel consumption in order to calculate pump operating costs. The session ended with a walk around the command area when all the components of the system were explained.

Day 2 training was concerned with maintenance and water management. It was usual for problems concerning construction and layout of the system to

be raised at this time, which enabled P2AT to make provisions for modifying the canal network for possible later rehabilitation works.

As many farmers as possible were encouraged to attend the training sessions, and usually about half the command area total did. This meant that there was usually a number of farmers representing each irrigation block. The main training aids used were video films and cartoons illustrated by overhead projector. Two video films were specially produced by the Project, '*Pertanian dan Sumur Pompa*' (Agriculture and the Tubewell) and '*HIPPA dan Sumur Pompa*' (Water User Association and the Tubewell), shown on Days 1 and 2 respectively. Both films took the form of a socio-drama with local actors and actresses playing the roles of pump operator, WUA officials, farmers, etc. The '*HIPPA dan Sumur Pompa*' video emphasised the need for a strong WUA and good farmer cooperation for the water to be used effectively. The video ended with a summary of the four major points needed for a successful tubewell:

- ◆ The WUA organisation must be strong and active;
- ◆ Different irrigation blocks should work together;
- ◆ Farmers within blocks should work together;
- ◆ Pumping charges must be paid.

Generally the videos were considered useful and enjoyable by the farmers. However, there were some objections to a fight scene involving a farmer caught stealing water, and some mild flirting between the operator and one of the female characters¹. A flashback scene, where a returning migrant remembers the "dry, bad old days" before the tubewell, was rarely understood. In contrast to fears that fight scenes might encourage more aggression in the real situation, farmers suggested that bad water management practices should be shown and highlighted as such, rather than the film showing recommended practices only.

Operation and maintenance manuals were prepared for each tubewell, and presented to the WUA during the Day 2 training. The manual covered the following main topics:

¹ Women (and some male operators) may have wanted this issue discussed, to show difficulties and fears over social interaction on both sides. As Margaret Casey shows, women were not invited to the video presentations. New technologies often require men and women to talk to each other in new contexts, and women need to negotiate for work to be done. This can be threatening to existing stereotypes and gender controls. *Editor's Note.*

- ◆ Description of tubewell, pump and engine;
- ◆ Description of irrigation system;
- ◆ Recommended pumping charges;
- ◆ Recommended irrigation programme and water scheduling;
- ◆ WUA responsibilities;
- ◆ Pump operator's responsibilities;
- ◆ Government responsibilities.

However, it was found that tubewell manuals were largely left unread, and it was unusual to find them at the pumphouse or with the operator. The problem seemed to be that the WUAs found the manuals too long and complex even though every effort had been made to make them as straight forward as possible.

Posters illustrating important points such as the collection of water charges, and what the revenue is to be used for, were better understood. These posters were displayed at the pumphouse, village office and wherever possible near mosques and other public gathering places.

2.6 Monitoring and Follow-Up

During the first year of operation regular contact was made with the WUAs through the cropping pattern demonstration programme, and the monitoring of accounts.

Follow-up meetings were generally held towards the end of this period to try and sort out any organisational, financial or technical problems the WUAs may have experienced, and to prepare the WUAs for the removal of the Project's operational subsidy and handover of the tubewell system.

At several sites WUAs were reformed because of ineffective or irregular management of water charge proceeds or due to popular request. Problems of WUA fund management were common to many tubewells and in 1989 it was decided to hold a series of two day training courses in book-keeping and accountancy for WUA chairmen and treasurers. The response from the participants was generally good, and the training was considered to have been very worthwhile.

In 1990 a WUA Newsletter (*Berita HIPPA Sumur Pompa*) was introduced to speed up the spread of information to the WUAs and to encourage dialogue between the WUAs. The newsletter has been published on

average every two months, and has proved to be a valuable means of communicating with the WUAs. Articles in the first three editions covered the following topics:

- ◆ WUA institutional development proposals;
- ◆ Field workshop operation, duties, service, etc;
- ◆ Dry season monitoring programme;
- ◆ Women in development;
- ◆ Selected tubewell profiles;
- ◆ Payments to WUA officials;
- ◆ Preparations for an Open Day for farmers at the experimental garden near Bangkalan.

3. WATER USER ASSOCIATION FINANCES AND PERFORMANCE

3.1 Water Charges

The WUA has to agree to charge its members (the farmers) for irrigation water received from the tubewell to cover all costs of operation. The level of charge is recommended by P2AT as part of the initial training, and is reviewed during subsequent monitoring and follow-up.

The charge is levied from the time the tubewell system is commissioned. Because operating costs (diesel and pump operator's salary) are subsidised by the Project for the first two years of operation, the revenue from the water charge accumulates to form a cash reserve to enable operations to continue after the subsidy is removed and the tubewell is handed over.

Operation and maintenance costs are made up of pumping costs (diesel, oil, battery water, etc) which are incurred while the pump is running, and system costs incurred whether the pump is running or not - these consist of the operator's salary, maintenance of the irrigation system and pumphouse, pumpset service and repair, payments (honoraria) to WUA officials and miscellaneous expenses (travel, etc).

After the removal of the P2AT operational subsidy, the WUA is responsible for all operational costs except heavy maintenance and repairs to the pumpset - this will eventually be borne by the Irrigation Service (*Dinas Pengairan*) after the Project has been handed over to the local government

or, in the more progressive areas, by a mutual WUA fund administered at *kecamatan* (sub-district) level (this is discussed more fully in Section 4).

There is a distinction between the way of paying for pumping charges between tobacco (paid by the number of plants) and non-tobacco crops (paid by the hour). This is because each tobacco plant is individually watered by hand (by filling semi-circular buckets from small reservoirs along the canals), and farmers know exactly how many tobacco plants they have in their fields - paying by plant for this high value crop is felt to be a fairer system.

In 1990 average recommended charges were Rp 1950/hour (US\$ 1.1) for non-tobacco crops and Rp 2100 for 1000 tobacco plants (US\$ 1.2). Although at most sites there is broad agreement between recommended and actual levels, there are cases of considerable disparity, particularly at tobacco-producing wells where higher level charges for tobacco are used to allow a discount on rice and *palawija* crop payments (*palawija* crops are non-rice food crops such as maize, groundnut, soybean, etc). The undercutting of rice and *palawija* payments is to encourage farmers to use water for these less profitable crops.

However, overall there were considerable problems with water charge collection and processing of funds, and in 1989 special training courses were held for WUA chairmen and treasurers to try and improve accounting practices. It is believed that as the WUAs gain more experience in operational practices the situation will improve - indeed, this is already happening in some areas.

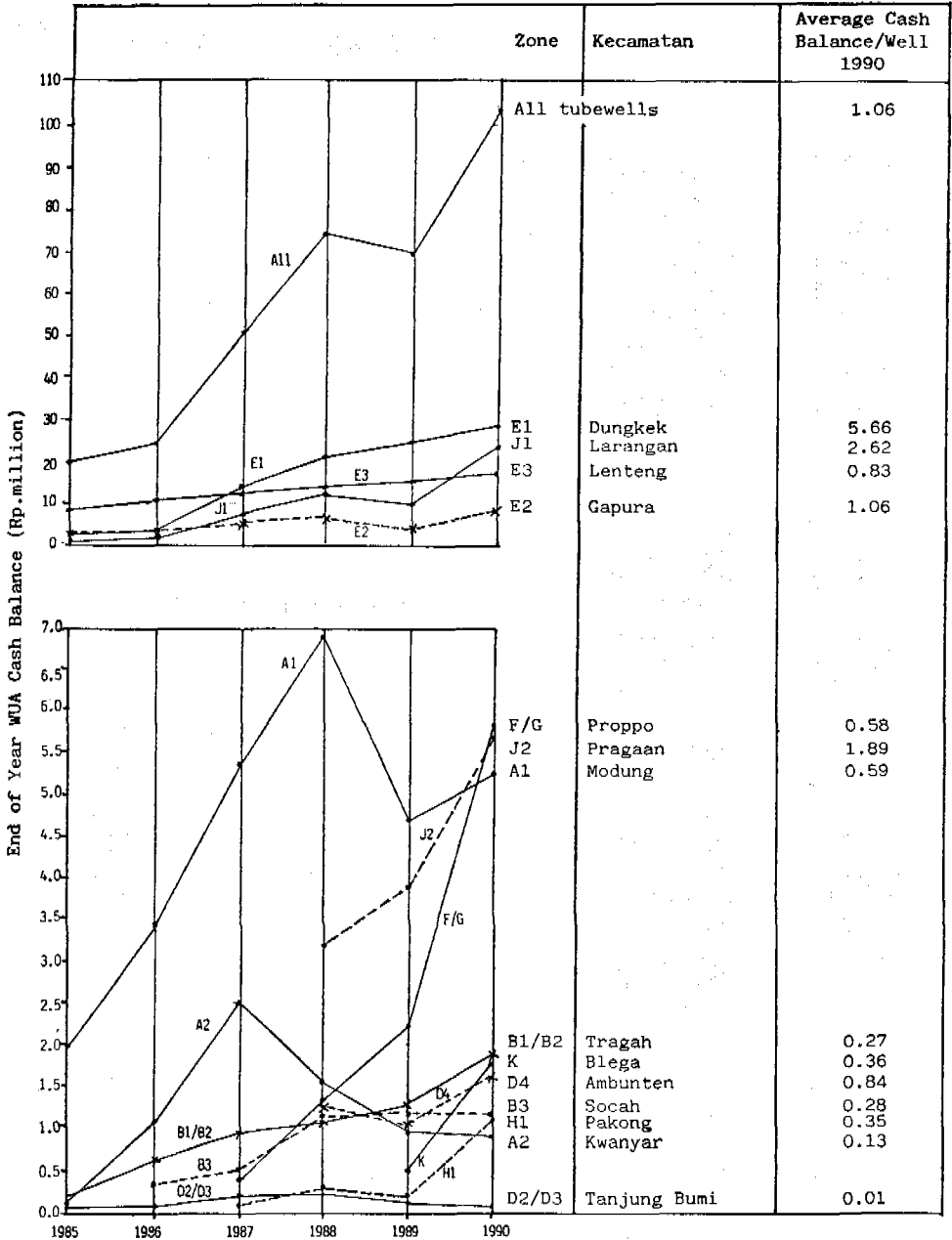
At many wells, particularly those in the west of the island, there is a strong psychological barrier to paying more than about Rp 1500 an hour for water, especially where poorly prepared plots can take 6-8 hours to irrigate. Further training and guidance is needed to convince farmers that the full cost of water charges has to be met, especially since water costs are normally less than 10% of total production costs (seeds, fertilizers, pesticides, etc, are far more expensive).

3.2 Water User Association Accounts

The balances in each tubewell's WUA accounts are monitored monthly, and provide a convenient indicator of how the WUAs are performing. End of year balances for each tubewell development zone are shown in Figure 4.

FIGURE 4

WUA CASH ACCOUNTS



Generally balances have risen steadily since 1985 (when monitoring began), with spectacular increases in the tobacco zones east of Pamekasan. Growth has also been good in Zone A1 in the west, where major efforts made on WUA strengthening and agricultural extension for *palawija* crops have been very successful. Average cash balances per well increased from Rp 0.78 million at the end of 1989 to Rp 1.06 million at the end of 1990. For most wells in the tobacco growing areas and in Zone A1 there has been no discernable drop in WUA balances after the removal of the Project operational subsidy and handover.

An effort has been made to get the WUAs to deposit their funds in village savings accounts, and most WUAs in the tobacco growing areas have complied. However, since WUAs are officially viewed as 'social organisations' they are not empowered to open bank accounts in the name of the WUA itself (only cooperatives or *Badan Usaha* at village level are able to do this), and accounts have to be registered in the name of a WUA official, usually the treasurer. There are obvious dangers in this, and legislation is needed to elevate the status of WUAs to enable them to open accounts in the name of the WUA and to perform similar functions as that of a cooperative or *Badan Usaha* - this forms the basis of a pilot institutional development programme being carried out at three sub-districts (*kecamatan*) during an extension to the Project in 1991 (see Section 4).

WUAs generally lack the necessary experience in fund management and accounting, and the Project devoted considerable effort to trying to improve the situation. As mentioned previously, in 1989 a WUA chairman and treasurer training programme was successfully undertaken to improve accounting and book-keeping practices. In five separate sessions a total of 94 WUA officials attended the training (98 were invited).

Although the size of the WUA balance is a reasonable indicator of the health of a WUA, the reported figures need to be viewed with some care. The WUAs with large balances quite often do not actually have all the cash readily available, as part of it is sometimes loaned for the purchase of cattle, motorcycles and other consumer items; it is felt this is a more secure way of protecting financial assets against inflation and the occasional collapse or default of village savings banks. Although there is an obvious danger of abuse of WUA funds with these measures, regular monitoring by the Project coupled with local community pressure has prevented the build-up of any widespread problems. In the few cases where extensive abuse of WUA funds has occurred, the intervention of the *camat* (who will be taking

Table 2: WUA Performance - 1990

Climate/ Crop Area	Groundwater Zone	No. Good WUAs	No. Satisfactory WUAs	No. Poor WUAs	No. Failed WUAs	Total
West Coastal	A1	2	5	2	-	9
	A2	-	1	5	1	7
	B2	-	1	-	-	1
	B3	-	1	3	-	4
	D2	-	-	1	1	2
	D3	-	-	-	3	3
Sub-Total		2 (8%)	8 (31%)	14 (54%)	2 (8%)	26
West Inland	B1	-	2	3	3	8
	C1	-	-	-	2	2
	K	-	1	4	-	5
Sub-Total		0	3 (20%)	7 (47%)	5 (33%)	15
Central and East	D4	1	1	-	-	2
	E1	5	-	-	-	5
	E2	3	4	1	-	8
	E3	8	7	7	-	22
	F	-	1	-	-	1
	G	2	2	5	3	12
	H1	-	1	2	-	3
	J1	8	1	-	-	9
J2	3	-	-	-	3	
Sub-Total		30 (48%)	17 (26%)	15 (23%)	3 (5%)	65
Grand Total		32 (30%)	28 (26%)	36 (34%)	10 (9%)	106

over the monitoring role from the Project) was generally sufficient in ensuring that corrective measures were taken. Eventually, it is hoped that WUA accounts will be audited by the *kecamatan* or *kabupaten* offices on a regular basis, and training in this aspect is being given in the Extension to Phase 3 in 1991 (Section 4)

3.3 Water User Association Performance

Although not perfect, the WUA account balance is a convenient yardstick to rank the performance of WUAs, and can be used to define the following categories:

Good WUA	cash balances of more than Rp 1.0 million (US\$ 570) have been achieved after removal of Project operational subsidy and handover;
Satisfactory WUA	cash balances of Rp 0.5 - 1.0 million (US\$ 285-570) have been achieved;
Poor WUA	cash balances have not exceeded Rp 0.5 million (US\$ 285);
Failed WUA	cash balance fell to zero after subsidy removal and handover.

Using these financial criteria, WUA performance for the period 1985-1990 is summarised on Table 2. Most of the good and satisfactory WUAs occur in the central and eastern zones, where tobacco is the dominant cash crop. However, WUAs in these categories also predominated in Zone A1 in the west where the Village Community Council (*Lembaga Masyarakat Desa*) is particularly active and farmers have responded well to the benefits of irrigation in the dry season. The worst WUAs occur in the west, particularly in the inland area which has the highest proportion of failures (Zones B1 and C1), and in parts of Zone G; these socially difficult areas are characterised by strong personalities at village level who have used WUA cash to their own advantage.

Overall, however, the majority of WUAs (56%) are either good or satisfactory, and it is believed that as the WUAs at some of the newer tubewells gain more experience the proportion of poorer WUAs will decrease. Also, the move towards vegetable production replacing traditional earners in Zones A1 and B3, and the practice of growing two rice crops in B3, should be reflected in stronger WUA accounts in these two areas in the future.

4. FURTHER DEVELOPMENT OF WATER USER ASSOCIATIONS

The long term sustainability of tubewell operation ultimately depends on the support given to the WUAs by the local government irrigation services (*Dinas Pengairan*) after the P2AT team has pulled out, and on the capability of the workshops to respond quickly to breakdowns and maintenance requirements. Discussions and investigations have been carried out with local government since 1989 to formulate concepts for WUA strengthening, and steps are being implemented on a pilot basis in 1991 during an extension to the Project. Three *kecamatan* were selected for this work to represent the main tubewell areas - Modung in the west, Larangan in the centre and Saronggi in the east (Figure 1).

Although the WUAs collect water charges and keep cash accounts for routine operational expenses, the big worry for the future concerns the financing for major repairs, engine overhauls (estimated cost Rp 3 - 5 million or US\$ 1715 - 2860) and eventual pumpset replacement (estimated cost up to Rp 14 million or US\$ 8000). Economic studies have shown that wells in tobacco areas, and the better well-schemes in the west (if cropping intensities are further improved) are able to create net annual benefits of at least Rp 40 million (about US\$ 23,000) which should be sufficient to cover these major equipment costs. The main aim of the work at Modung, Larangan and Saronggi is to develop WUA organisation and financial resources so that these major operating expenses can be covered in the future.

As a result of extensive discussions between P2AT and local government planning and technical service agencies, the following programme is being implemented:

(a) Formation of a steering committee in the provincial local government planning agency (BAPPEDA) to coordinate activities, and a P2AT working group to assist the steering committee;

(b) Formation of irrigation committees at *kabupaten* and *kecamatan* level in line with the East Java Governor's decree Nr 232 of 1988, to coordinate WUA development activities and to act as a channel for disseminating government policies on water and irrigation matters;

(c) Adoption by the WUAs of the basic principles that village-based organisations should adhere to, the *Anggaran Dasar - Anggaran Rumah Tangga* (AD-ART);

(d) Legislation to enable WUA groupings at *kecamatan* level to operate as cooperatives (*Badan Usaha*), with the right to open bank accounts in the name of the organisation and to have access to official credit facilities. A concept that has been proposed is for a WUA Mutual Fund to be established, that WUAs would pay into on a regular basis (and earn interest) and be able to borrow from when the need arises. A higher rate of interest would be paid on borrowed money to cover administrative costs;

(e) Formulation of measures to enable the workshops to operate on a cost recovery basis, including a mechanism for the procurement of spare parts and their sale to the WUAs.

The response from the local government officials and WUAs in the pilot areas has been very good, and the programme is so far running well. Some degree of legislation has already been passed to enable the WUAs to have more control over their finances, and cooperation amongst the WUAs is improving. However, the most difficult aspect of the programme is the development of the workshops since a suitable mechanism enabling a public sector facility to be run along commercial lines has not yet been established by the DGWRD or the local government irrigation service; it seems likely that some degree of privatisation will be needed to maintain the custom of the WUAs.

5. CONCLUSIONS

The establishment and training of WUAs has been a crucial aspect of the development of tubewell irrigation on Madura. The WUAs were formed to enable the primary beneficiaries of the Project - the farmers - to be actively responsible for the operation and management of the tubewell systems serving their land.

Most of the WUAs established on Madura are managing to operate the tubewells reasonably effectively, and the benefits of the Project are clearly apparent. However, the concept of WUAs is still relatively new, and, as project implementation draws to a close, the local government will need to take a more active role in providing support and encouragement to sustain WUA performance in the future.

Invaluable experience has been gained on the Madura Project in developing suitable procedures for WUA establishment, training and follow-up, and this experience could be applied to other projects of a similar nature. The main conclusions from the WUA work on Madura are summarised below:

(a) Much time and effort is required for effective WUA formation, training and follow-up, and close consultation with village officials and key farmers is essential to ensure that the aims and responsibilities of WUAs are properly understood. Well trained and motivated project staff with good communicative skills are needed for this work;

(b) The personalities and motivation of key officials need to be taken into account when forming WUAs. At some locations there was a tendency to appoint all the WUA officers from a particular interest group or family. This is generally unsatisfactory, and efforts should be made to ensure a more balanced representation. However, it is inevitable that the water users with the most influence (which may include the village head) usually have the greatest role to play in WUA activities;

(c) Pumpset operators are key members of the WUA and need to be carefully selected and trained. Potential operators should have studied to high school level (to ensure literacy) and belong to an active farming family. The selection process can take a long time (several months) and should be started well in advance of the pumpset installation and commissioning programme;

(d) WUA training should be split into two sessions, the first session around the time of tubewell commissioning and the start of operations, and the second session after one crop season in order to give the farmers time to accumulate some operational experience. Video films were found to be very useful, but for maximum impact should be short and to the point;

(e) WUA finances and the importance of maintaining a cash fund through water charge collection need to be stressed during the training programme. Cash flow management is a problem area for most WUAs, and special training should be given to WUA chairmen and treasurers;

(f) In order to get the WUAs off to a good start, the Project should subsidise operating costs (mainly diesel and the pump operator's salary) for at least a year after tubewell commissioning. However, water charges should be collected from the time operations start so that a cash reserve is formed during the subsidy period to enable operations to continue after the subsidy is removed. The WUAs need to be made aware at the outset that they will be responsible for covering operation and maintenance costs once the subsidy is removed;

(g) A regular newsletter is a very useful means of disseminating information to WUAs;

(h) Cash account balances are a convenient way to monitor the performance of WUAs, although the reported figures need to be viewed with some care. WUAs with large balances quite often do not actually have the cash readily available, as it is sometimes loaned for the purchase of cattle, motorcycles and other consumer items; WUAs feel this is a more secure way of protecting financial assets against inflation and the occasional collapse or default of village savings banks;

(i) Efforts should be made to get the WUAs to deposit their funds in village savings accounts. However, since WUAs are officially viewed as 'social organisations' they are not empowered to open accounts in the name of the WUA itself (only cooperatives or *Badan Usaha* at village level are able to do this), and accounts have to be registered in the name of a WUA official, usually the treasurer. There are obvious dangers in this, and legislation is needed to elevate the status of WUAs to enable them to open accounts in the name of the WUA and to perform similar functions as that of a cooperative or *Badan Usaha*;

(j) Most of the WUAs in the eastern part of Madura, where tobacco is the main cash crop, have performed well. A good response has also been achieved in Zone A1 in the west where village communities are particularly active and farmers have benefited from the growing of (non-tobacco) crops in the dry season. However, the economic and social problems in the west have generally resulted in poorly performing WUAs;

(k) The long term sustainability of tubewell operation ultimately depends on the support given to the WUAs by the local government and irrigation services after the P2AT Project team has pulled out, and on the capability of the workshops to respond quickly to breakdowns and maintenance requirements. These aspects are being addressed by further institutional development work during an extension to the Project in 1991, involving local government staff training and the introduction of cost recovery procedures for the workshops.

Many of the problems with WUA development, such as domination of the WUA organisation by particular family or pressure groups, operator literacy, etc, were addressed as they became widely recognised and satisfactory solutions have generally been found. However, longer-term problems involving changes to government policy or legislation, such as the legal status of WUAs and ability to open bank accounts, etc, cannot reasonably be expected to be solved during the period of Project implementation. However, once the problems have been explained to the various parties concerned, and there is sufficient consensus of opinion that changes are required, then solutions to these problems will become possible in the course of time.

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REFERENCES

Casey, Margaret, (1991) **Groundwater Development on Madura, Indonesia: Gender Issues in an Irrigation Project, (New Series) - ODI Irrigation Management Network Paper 1**, Overseas Development Institute, London.

Groundwater Development Consultants (International) Limited in association with Indec & Associates Limited, Phase 2 and Phase 3 Final Report, Madura Groundwater Irrigation Project, July 1990.

Ian Smout, (1986) 'Training Programmes for Irrigation Farmers - An Example from East Java, Indonesia', *ODI/IMI Irrigation Management Network 86/1e*.

Ian Smout, 'The Management of Irrigation Tubewells' Paper 36, Water Wells - Monitoring, Maintenance, Rehabilitation, 1990.