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ON PHYSICAL REMODELING AND INSTITUTION STRENGTHENING: AN EVALUATION OF THE IMPLICATIONS OF THE PILOT FIELD CHANNEL EXPERIENCE FOR THE REHABILITATION PROJECT AT UDA WALAWE, SRI LANKA

by

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Scheme, Sri Lanka. The Walawe *Scheme* (see Figure 1) was initiated in 1959, and the dam completed in 1963, Two main canals were built on the right and left banks of the Walawe River. For various reasons, implementation stretched far beyond the planned three years, and the left bank system was never completed, Costs mushroomed, and from the beginning, them were numerous problems with the performance of the right bank system. The right bank was not considered completed until 1979, with a commanded (not necessarily irrigated) area of about 11,500 hectares (ha). One Indication of the severity of the problems is that Embilipitiya Block at the head of the system, with 15 percent of the total area, is estimated to use 40 percent of the water. About a third of the right bank area is not irrigated.

In 1982, management responsibility for the system was turned over *to* MEA, and in 1984 an Asian Development Bank-financed rehabilitation project was initiated on the right bank. Under the rehabilitation program, the entire right bank is being redesigned and reconstructed, In particular, the field and distributary channels will be redesigned, with modifications in their capacities, layout, and structures. Direct offtakes from D channels will be eliminated and replaced by parallel field channels, Field channels, both new and reconstructed, will have a capacity of one cuseo (28.3 liters/second) for one to 15 ha, and redesigned pipe outlets will be provided to all allotments (farms),

In order to test and demonstrate these design assumptions, a pilot field channel, FC number one on D channel number one of the Moraketiya branch canal, Embilipitiya Block, was rehabilitated according to the new design criteria in early 1986, on the advice of the consultants, MMP. MEA and MMP installed flumes for measuring water deliveries to individual allotments, which they monitored from time to time.

The present study is based on periodic observations during maha* 1986/87 and yala* 1987, primarily by a research assistant from the IIMI, under the supervision of a social scientist on the staff. Its focus is on the farmers' behavior, farmers' perceptions of the changed FC, and field level officials' behavior and perceptions. These observations are intended to supplement the water measurements, and to assist in further decision making regarding the strategy for implementing the rehabilitation project. The conclusion, though not surprising, is important for long-term sustainability of irrigation system improvements.

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*maha -- wet season associated with northeast monsoon rains beginning October or November and continuing through January.

*yala -- dry season associated with minor rains of southwest monsoon usually beginning March or April.

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INTRODUCTION

This paper is a substantially revised version of a draft paper previously circulated to some officials in Sri Lanka. The title of that paper was "Testing a New Field Channel Design: A Pilot Project of the Uda Walawe Rehabilitation Project, Sri Lanka." It was reviewed by the International Irrigation Management Institute (IIMI)-Sri Lanka Consultative Committee at its January 1988 meeting; as the minutes of that meeting indicate, the Committee members

> recognized the significance of the main findings of the draft report, and agreed that physical rehabilitation by itself could be counter productive unless supported by proper institutional changes. It was also recognized that it would be essential for more attention to be given to institutional factors at the farm level, and in this regard officials should be considered as much a target group as farmers. It was also noted that the one cusec flow design for a field channel to accommodate all management problems as perceived by design engineers was too facile an assumption, and that appropriate institutional involvement at the field channel level should be given important consideration.

Despite the support of the Consultative Committee, the paper has been somewhat controversial within the Mahaweli Economic Agency (MEA). Although MEA officials have not officially provided comments and corrections, one of its consultants has provided very detailed comments. Middle-level staff have also discussed the first draft with the authors, and lent support to its findings. In addition, there have been a few changes on the pilot field channel since the original draft. This revised draft reflects some of those changes, and the comments of Mr. Alan Beadle, of Sir M. MacDonald and Partners Ltd. (MMP), consultants to MEA on the Walawe Rehabilitation and Improvement Project.

The paper is based on periodic observations (approximatelyweekly) of farmers' use of a rehabilitated pilot field channel (FC), and interviews with both farmers and field level officials, over two seasons in the Uda Walawe

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PHYSICAL LAYOUT AND REHABILITATION OF FC-1, MORAKETIYA

Since this FC is the first one on the first distributary canal of the Moraketiya branch canal, farmers are accustomed to having plenty of water. There are 15 allotments on the FC, each approximately one ha, but exhibiting some variation in size (see Figure 2). The upper half of the FC follows a contour, while the lower half runs straight down an incline, necessitating a number of drop structures. Before reconstruction, the gate at the head of the FC was missing, and the FC was drawing an estimated 1.5-2.0 cusecs (42.5-56.6 liters/second) continuously when the distributary was flowing, Even now, because of a leaky gate at the head of the distributary, there is always some water in it, and this FC is able to capture most of this flow.

According to the rehabilitation design guidelines, the FC should supply water to 3 to 15 ha and have a capacity of one cusec, but be able to operate at plus or minus 25 percent of design capacity. Based on this, the following physical rehabilitation was done on the pilot FC:

1) new farm outlet structures were constructed, and damaged drop structures were repaired (see Figure 2; from the head to point "A" all the outlets were newly built, and the existing drop structures from point "A" to the tail ["B"] were repaired);

2) necessary earthwork was completed, and the canal capacity reduced to about 1.2 cusecs (34 liters/second);

3) a gate was fixed at the turnout, and the pipe under the road was changed from 1.5 feet (0.46 meter) in diameter to 1 foot (0.3 meter); and

4) measuring devices were fixed at the FC turnout, and since this was a pilot project, MMP installed six temporary flumes on farm outlets at the head end to monitor the actual issues made to the allotments.

OFFICIAL OPERATING PROCEDURES FOR WATER DISTRIBUTION

Embilipitiya Block consumes much more water than the tail end blacks of the right bank (RB) main canal, The rehabilitation program therefore emphasizes improving water use efficiency on the upper reach of the command area of the RB main canal in order to save water for use elsewhere. This includes introducing new operating procedures on the pilot FC. Indeed, the new designs are b e d on the assumption that there will be new operating procedures, particularly rotations of (and on) FCs.

The following schedule of rotational water issues was introduced on FC-1 for the maha 86/87 season:

1) for land preparation -- continuous water issue for two weeks (but rotation between the 7-8 farmers at the head during the first week, and 7-8 farmers at the tail the second week);

2) from the 3rd week to the 8th week -- six days per week (three days for head stream farmers, three days for tail enders, one day closed); and

3) from the 9th week to the end of the season, 4.5 days water issue per week (two days head stream and two days tail end, the balance half a day allowed for any farmer who needs water).

It is important to note the fundamental behavioral change that is assumed: farmers are to shift from a practice requiring no rotations -- simultaneous irrigation along the whole FC -- to a system in which they must rotate since only half the FC outlets can draw water at any given time, even during the land preparation period, and the water supply to the FC is considerably reduced from what it was before the rehabilitation.[1]

FARMERS' VIEWS AND REACTIONS

The farmers, accustomed as they were to "over-irrigating" their fields, expected reconstruction of their defective drop structures, but not the other changes such as the reduced canal capacity, introduction of rotational water distribution, and repair of the FC turnout gate. With the exception of four farmers at the head end, the others say they oppose the reduction of canal capacity and introduction of the new rotation procedure,

Seventy-five percent (9 out of 12) of the farmers pointed out that they face more irrigation difficulties under the present rehabilitated system than they had experienced in the pre-rehabilitation period. The reasons they gave were:

1) before rehabilitation, there was no FC gate, and the pipe under the road was 1.5 feet (0.46 meter) in diameter, so they had plenty of water without rotation. Due to rehabilitation, this system changed, and the immediate effect was reduction of supply;

2) the canal capacity was reduced by the rehabilitation program, and the present quantity of water issued to the canal is not adequate to feed the entire area; and

3) tail-end allotments were able to use seepage water in the pre-rehabilitation period due to excess water in the FC. Head-end farmers were used to overirrigating their allotments, and excess water flowed to the adjoining allotments. But after rehabilitation, because of the limited capacity in the canal, head enders overirrigate their fields less than before, and therefore tail enders lost the seepage water.

From the farmers' point of view, some problems which were not addressed, also create distribution problems under the new system. They are:

1) the fifth allotment (allotment no. 1277) from the head has two pipe outlets of the same size. The extent of the allotment is the same as other allotments in the FC. This farmer points out that due to improper levelling of the allotment, the entire area cannot be irrigated

from one farm outlet. But the other tail-end farmers point out that this particular farmer now has the opportunity to use excess water. They suggest that two smaller pipes would be appropriate. This is now seen as a hindrance to equal water distribution (see Figure 2).

2) Allotment no. 1318 must get water for part of his allotment from a small canal through the adjoining allotment (no. 1278). Before rehabilitation these two farmers had two separate pipe outlets. But after resurveying for the rehabilitation, the farm outlet of allotment no. 1318 was included in the adjoining field. Therefore, the allotment no. 1318 farmer *can* take water only with his neighbor's permission. During the first season after rehabilitation, they shared water mutually, but later the 1278 farmer objected. They have both complained to the officers concerned, but action was not taken until recently (see Figure 2).[2]

3) The last tail-end allotment no. 1334 has no access facilities. This farmer told us that he had expected the FC bund to be *extended* up to his field, but this was not done. Now he finds it very difficult to get a tractor or buffaloes to his field. We observed his problem in the 1987 yala season, Normally he gets his tractor through the adjoining allotment no. 1332, but this time his neighbor had sown one week before, closing access to allotment 1334. They had a strong argument regarding this, on the day we visited the field.

WATER DISTRIBUTION PROBLEMS -- MAHA 1986/87

Serious water distribution problems arose during land preparation in maha 1986/87. The FC is designed for rotational water issues. Only seven or eight allotments can be provided with water at a time, not the entire area as before, but farmers are used to starting land preparation of the entire area at the same time. They do not like to wait for irrigation while the others complete their land preparation work, Though they get somewhat delayed in ploughing, they like to irrigate their fields with all the other adjoining farmers. This has proven a hindrance to the new water distribution procedure, It was scheduled to provide water to two portions of the FC separately; during the 15 day continuous rotation period, 7.5 days Continuously for head-end farmers and the balance 7.5 days for tail enders for completion of initial land preparation work. But farmers did not like this practice. Therefore, the official procedure could not be practiced, and 15 days continuous flow was allowed for all the farmers to start their land preparation work at once.

But due to their inability to operate a rotation, both officials and the farmers found it difficult to achieve equal distribution. Canal capacity is inadequate for all to take water at once. When the head-end farmers' outlets are open, the flow to the tail is inadequate. In his comment on the earlier version of this paper, Beadle notes that this is no different than before. He goes on to say that farmers are free to operate the FC with or without rotations, He says, further:

There is no need (in theory) for top-end farmers to take water continuously for more than 3-4 days to completely flood their lots. The planned water allocation, in weeks one and two in theory, considerably oversupplies the demand,

The experience of this season suggests the necessity of rotation, given the reduced supply to the FC. But implementing a rotation requires some kind of institutional mechanism to do it effectively, and in this case, to see that the head enders do not take so much that others are deprived, The above quotation implies mother major behavioral change: though it is undoubtedly true that fanners do not need water for more than a few days to flood their allotment, the farmers in this FC have become accustomed to a practice of continuous flow into their fields. Their resistance to what may be a necessary change is certainly understandable, and requires special efforts to overcome.

We met the Block Manager in the Embilipitiya Block who was in charge of this area in the 1986 yala season, the year of commencement of the pilot project, He told us that the same problem arose in 1986 yala, and farmers sought other alternatives from him. Therefore, he had changed the plan of operation by increasing the volume of water to 1.26 cusecs and operating five days per week, allowing all the farmers to begin land preparation simultaneously. This of course is a reversion to the previous practice.[3]

Not only in the land preparation period, but also afterwards, distribution problems were serious due to lack of farmers' cooperation in operating the prescribed schedule. The schedule of water issues for the crop was 4.5 days weekly rotation. Two days were allowed to the seven head-end farmers to open their outlets, and the balance two days were allowed for the remaining farmers. As described above, a half day was for any farmer who needed water. But the farmers were not ready to accept this rotation, leading to unequal water distribution. During the turn of tail enders, headstream farmers were reluctant to close their outlets. This was clear to observers, and both the irrigation engineer and the agricultural officer responsible for farmer organizations agreed that whenever they visited the field during the water issues rotation for tail enders, at least two to three headstream outlets had not been closed,

To solve this distribution problem, the irrigation engineer (IE) of the Embilipitiya Block recommended two alternatives:

1) to fix concrete or iron lids to close the outlets of the headstream farmers and lock them during the period of water issue to the tail enders; or

2) through farmer participation for achieving equal water distribution (formation of 'wateruser groups) the head-end farmers must be educated to cooperate in the operation of scheduled water distribution rotation.

The IE noted that the first alternative is impossible and unsuitable for improvement of system management. Beadle also notes this solution is expensive and impracticable.

FARMERS' PERCEPTIONS AND SUGGESTED SOLUTIONS

Except for three farmers at the extreme head end, the other 12 farmers of the FC believe that all these distribution problems were created by the rehabilitation program. They said, to quote one:

> We had more than sufficient water before rehabilitation of this canal, No FC gates, No rotations. What we had to do was just, visit the field once in two or three days and strengthen the weak points of the field bunds and go home. No farmer closed our outlets, because all had water. This so-called rehabilitation has created all these problems. Nowadays we have to visit the field almost every day.

The very narrow FC cannot carry sufficient water, so a rotation had to be introduced, but as the farmers are not used to rotational water issues, this system is not accepted by them. They made the following suggestions:

1) The canal capacity must be increased and without staggering all the farmers must be allowed to start their land preparation at once. No rotation should be operated during land preparation.

2) Given the existence of the new FC, MEA irrigation officials must intervene in the operation of rotations. They must come and close the farm outlets which should be closed according to the scheduled rotation. Otherwise, there will be conflicts among farmers. For example, three tail-end farmers told us that the outlet of 1277 at the head was supposed to be closed during one rotation, but was not closed, and therefore tail-end farmers had to close the outlet. This farmer had threatened these three farmers for closing his outlet. They pointed out that if an officer intervened, no farmer would go against the officer. (Beadle notes there are not enough field assistants now, and wonders whether farmers would pay for another person; but as part of a process of assisting farmers to shift to a new mode of operation, perhaps the existing field assistant could do this.)

OFFICIALS' ATTEMPTS AT SOLUTIONS

The field level officials understand that the long-term practice of excessive water use by the Embilipitiya farmers is a matter which should be examined properly in the introduction of measures for system improvement, Officials realize that farmer suggestions to alter the designed canal capacity cannot be accepted. What is needed is to improve system management and change the long term practice of over-consunption of water.

One approach that has been suggested is to form water user groups (WUGs) in order to obtain farmer participation for system improvement, During the 1986/87 maha season, some initiatives were taken by MEA. With the participation of the 15 farmers of the pilot FC, a WUG was formed and a farmer representative (FR) was appointed.

Unfortunately, from our observations, the objectives of the WUG were not achieved satisfactorily. The main expectation of MEA officials from the FR was that he would help the WUG members in equal sharing of water, but as described above, no equal distribution of water could be guaranteed.

The FR was not able to operate the scheduled rotation, and in fact, did not actually get involved in equal water distribution. The FC gate was operated by an irrigator appointed by the MEA, and internal distribution was a matter for farmers. In our frequent field visits, we had opportunities to observe how the rotation was operated. On these visits, we observed that even while the FR was in the field, head-end farmers were disturbing the rotation. Therefore tail-end and head-end farmers had very frequent conflicts over water distribution. The FR became discouraged and resigned his position before the end of the season, because despite his efforts, he was unable to satisfy either the tail-end or the head-end farmers.

The WUG failed to develop as a self-reliant organization. It only three times with the leadership of the agricultural officer in charge of the formation of WUGs. The WUG itself could not organize any meeting. At the end of the maha season, the WUG completely disappeared, but with the involvement of the unit manager, it was reformed later with a new FR.

While farmer participation in water management was lacking, the involvement of field officials in water management of the pilot project was also not satisfactory from the farmers' point of view, The tail-end farmers expected the officials to intervene in order to achieve equal water distribution, but the field assistant visited this FC only occasionally, and those visits had no significant impact according to the farmers,

WATER MANAGEMENT IN YALA 1987

This section analyzes only the differences in the water distribution and water management problems from maha 1986/87 described in the previous section. Due to severe drought, MEA officials found it difficult to supply the required quantity of water, The problem was aggravated two to three weeks after sowing. The O&M Division of MEA took every possible action to protect the crop. Over a loudspeaker, the O&M division informed the farmers that due to the present water crisis, water quantity will be reduced and even branch canals will be rotated. The pilot project was also affected seriously by this decision.

A rotation was operated as follows:

1) for land preparation, there was no separate rotation operated on the pilot FC this season. The distributary was opened every otheb day of the week, and this same rotation was effective for FC-1.

2) For the crop, due to the above mentioned water crisis, the Moraketiya branch canal was kept open for five days, but it was closed on Thursdays and Fridays. The distributary was kept open only for 2.6 days every week.

Farmers' and Officials' Irrigation Behavior under the New Rotation

During land preparation, all the farmers in the FC started their activities at the same time. However, because of the inadequate flows to the tail, the tail enders got late. Only after completion of sowing by the first six allotments in the head stream could the tail enders finish sowing.

The serious problems started after the 2.5 day rotations came into operation. One day was allowed for the seven headstream farmers and the next day was for the tail enders, with a half day for any farmer who needed water. But during this yala, this half day was in fact allowed for tail enders by the head-end farmers. However, all the farmers found the 2.5 day period insufficient.

On the other hand, because of minor damage to the distributary head. gate, water leaked into the distributary, even when the gate was closed. To use this water, the pilot FC head-end farmers damaged the FC gate, so they were able to use this water almost every day except Thursdays and Fridays when the canal was closed. (On 14 June 1987, when we visited the pilot project, we saw that the nuts and bolts were removed and were on the iron plate fixed to the top of the gate. This was not repaired until the end of the season.)

WUG Activities during Yala 1987

As described above, at the end of the maha 1986/87 season, the WUG completely disappeared. But with the involvement of' the unit manager they met once again and appointed another FR. Though this group was re-formed, there were again no activities. The FC was not cleaned, and there was no effort to improve water distribution. After the first meeting with the unit manager, they never met again. The new FR who resided in the fields saw the damage to the FC gate but did not inform any MEA officers.

CONCLUSION

The major premise underlying the present approach to the rehabilitation of the Walawe Scheme is that the primary reason for poor system performance is the dilapidated condition of the system. Therefore, improving the physical system is the key to improved performance. Thus, all other efforts take second place to the major investment in physical improvements.

There is no doubt that physical improvements are needed. However, our observations of the pilot field channel suggest that the basic premise of the project may not be entirely correct,, From our observations, it would appear that the fundamental problems are behavioral, and not just physical. That is, changes in the behavior of both the farmers and the officials (which together form an integrated social system), and the associated values and expectations, as well as physical upgrading, are required if the performance of the Walawe Scheme is going to be improved.

If changes are made only in the physical system, these changes themselves will almost certainly be modified by the farmers, so that the system operates in a way that fits their expectations better; this may undermine attempts to achieve the rehabilitation project objectives, We have observed the beginnings of this process already in the pilot FC. This type of behavior has been observed in other systems in Sri Lanka, for example, Tank Irrigation Modernization Project (TIMP) and System H; and in the Philippines' Upper Pampanga River Integrated Irrigation system (UPRIIS).

In the case of the pilot FC, the problem was compounded by two other factors: the farmers were apparently not consulted in detail about the rehabilitation plans and their implications before the work was done. So they were surprised at what they got; and as will be true throughout much of the head reaches of FCs, the agency is deliberately trying to reduce their water supply, an act not likely to be received favorably by farmers, however necessary it may be in the interests of the larger system.

Upgrading the physical system, by itself, is therefore unlikely to lead to the expected improvements in performance, especially where the water supply is *being* reduced, and is unlikely to be accepted by farmers. One can anticipate that under these circumstances, the return on the very heavy investment will be lower than anticipated.

It is important to address these issues head-on, and take very strong actions in implementing the rest of the project, The purpose of a "pilot project" is to learn lessons, and these lessons should be learned and responded to. Given that head enders have become so accustomed to using large quantities of water, it will be necessary to take strong actions to modify their expectations and behavior, in a way that will not be too costly to them. This will require proper incentives, positive and negative -- a "carrot and stick" approach -- and a long-tern effort.

On the positive incentive side, we recommend the following measures:

1) MEA needs to make a serious effort to organize WUGs, which will require a much greater level of effort and of commitment from tap management than is presently available, A comprehensive plan, with sufficient resources (especially human) will be required. MEA would need to re-examine the functions of its field level staff and its management philosophy as part of such an effort, to ensure these are supportive of the effort. It will be important to devolve authority as well as responsibility to WUGs, and federate them into larger responsible bodies, as has often been recommended (see, for example, IIMI 1986; Merrey and Bulankulame 1987).

2) As part of the effort to promote effective WUGs, it will be important to develop closer relationships between farmers and field level staff, provide training to both, and provide improved incentives and controls for field level staff performance.

3) As part of the design and reconstruction process, it is essential that there be a process of collaboration and negotiation with farmers regarding the proposed changes. The farmers should be fully informed of what is planned, and should have an opportunity to make suggestions within the parameters of the overall design.

4) MEA needs to take steps to ensure that it can guarantee the required supply of water. This is a necessary (though not sufficient) prerequisite for getting farmers to accept a rotation program, especially when there will be no significant water surplus delivered.

On the other side of the coin, MEA needs to take action to ensure that it is in a position to enforce the rules in a firm, certain, and even-handed manner, In particular, MEA would have to work hard to reduce interference with the operation of the system, and to act against violators of the rules, including acting as a guarantor of the rules for maintenance and rotation on FCs. To do this would require considerable changes in present patterns of behavior of lower and middle level field staff. This, in turn, may require reorientation of MEA's own management style and reexamination of its relationships with farmers. Are farmers responsible clients, or are they to be passive recipients of "benefits"?

We recognize that major changes in legislation and policy, as well as in certain local sociopolitical conditions, would also be necessary in the long-run. These are beyond MEA's control. However, even in the present circumstances, we believe MEA could do more to negotiate a more constructive relationship with farmers, assure a specific and adequate water supply, be more responsive to farmers' needs and wishes, and obtain their support and assistance in enforcement of clearly understood and fair rules. The rehabilitation project provides an excellent opportunity for this.

Clearly MEA faces a great challenge in trying to improve the performance of a system whose problems have complicated historical roots. Since these problems are primarily behavioral -- the physical problems are surface manifestations, symptoms of deeper problems -- it is essential to analyze the real problems, and address these. As is true when a doctor treats a patient, it is important to reduce serious symptoms, but it is also essential to come to a proper diagnosis and cure the underlying illness.

ACKNOWLEDGEMENTS

The authors are very grateful to Mr Alan Beadle, O&M engineer with the consultants on the Walawe Rehabilitation Project (Sir M. MacDonald and Partners, Ltd.), who provided very detailed and thoughtful comments and corrections on the first version of this paper. P.S. Rao, C.R. Panabokke, and Pamela Stanbury, all at IIMI, also provided very thoughtful and useful suggestions, Although we have incorporated many of their suggestions, it must be emphasized that the views expressed here are those of the authors alone, and are not necessarily the views of IIMI or of the project consultants.

NOTES

1. Mr. Beadle, in his comments, says that such rotations were "suggested" to help tail-end farmers, but are not "fundamental"; he says the system can operate with all farmers taking water at the same time under "design conditions." Since he gives the maximum capacity of the field outlet pipes as six liters/second, and there are 16 allotments to be fed by about 34 liters per second, it would appear that, in fact, the first six allotments can, in principle, take the full supply (on FC-1 they do) post-rehabilitation, making rotations necessary.

2. During Maha 1987/88, because of a dispute between the two farmers, the allotment 1318 farmer was not allowed any access to water for a portion of his allotment, However, since the first version of this paper was circulated, MEA officials have rectified this situation by arranging an exchange of land.

3. Beadle notes quite correctly that if all FCs did this, no water would reach the tail of the D channel. "This cannot therefore be allowed," The main canal capacity is the limiting factor. In fact, the Block Manager was simply seeking a temporary solution to an immediate prablem.

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Scale: 1:200000

UDA WALAWE SCHEME

FIGURE 1

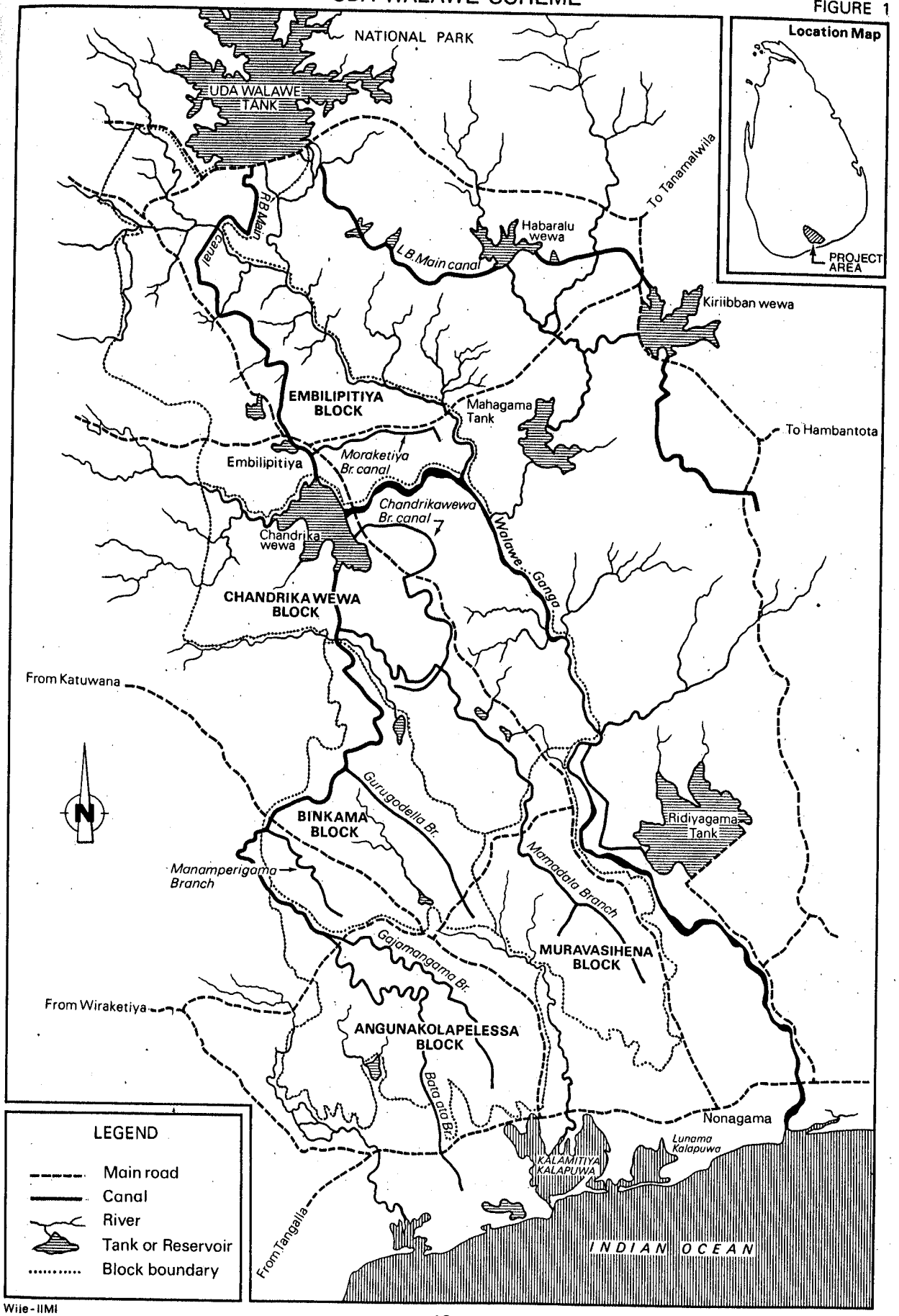

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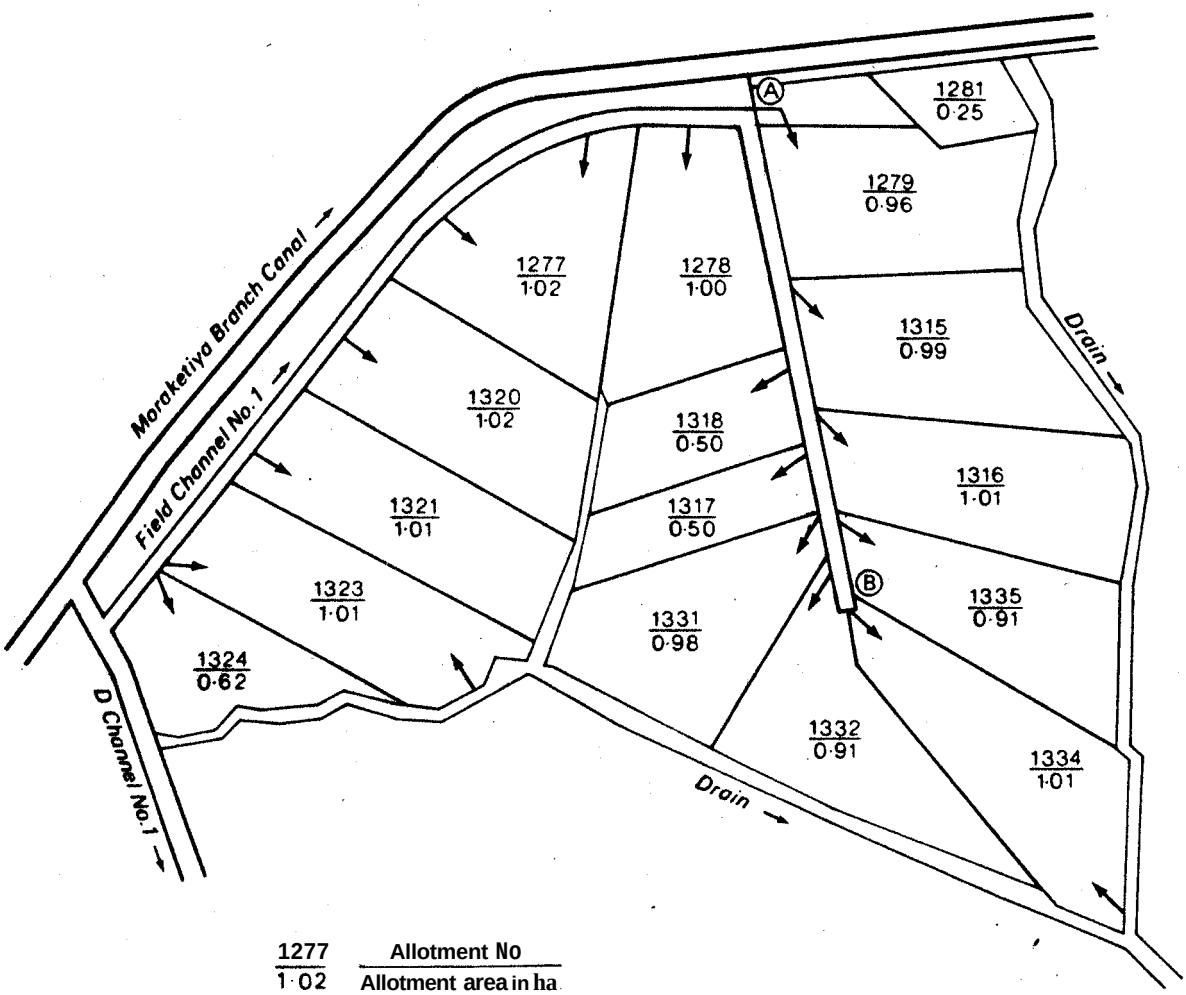
FIGURE 2

Layout of Field Channel No 1 - Moraketiya

(SCALE.– 1:4000)



1277 / 1·02 — Allotment No / Allotment area in ha