TESTING A NEW FIELD CHANNEL DESIGN; A PILOT PROJECT OF THE UDA WALAWE REHABILITATION PROJECT, SRI LANKA

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INTRODUCTION

This paper is based on periodic observations of farmers' use of a rehabilitated field channel (FC) in the Uda Walawe 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 three years planned, and the left bank system was never completed. Costs mushroomed, and from the beginning there were numerous problems with the performance of the right bank. The right bank was not considered completed until 1979, with a commanded (not necessarily actually irrigated) area of about 12,000 ha. One indication of the severity of the problems is that Embilipitiya Block at the head of the system, with 15% of the total area, is estimated to use 40% of the water. About a third of the right bank area is not actually irrigated.

In 1982, management responsibility for the system was turned over to the Mahaweli Economic Agency (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 re-designed and reconstructed. In particular, the field and distributary channels will be redesigned, with modifications in their capacities, layout, and structures. Direct off-takes from D Channels will be eliminated and replaced by parallel field channels. Field channels will be re-constructed with a capacity of one cusec (28.3 liters/second) for roughly 15 ha, and redesigned pipe outlets will be installed.

In order to test and demonstrate these design assumptions, a pilot field channel, FC number 1 on Moraketiya Branch Canal, Embilipitiya Block, was rehabilitated according to the new design criteria in early 1986, with the advice of the consultants, Sir Malcolm MacDonald and Partners (MMP). MEA and MMP have installed flumes for measuring water deliveries to individual allotments, which they monitor 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 International Irrigation Management Institute (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.

PHYSICAL LAYOUT AND REHABILITATION OF FC-1, MORAKETIYA

This FC is the first one on the first distributary canal on Moraketiya Branch Canal. Thus, farmers are accustomed to having plenty of water. There are fifteen allotments on the FC, each approximately one ha, but exhibiting some variation in size (see figure 2, sketch map). The upper half of the FC follows a ridge, 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 to 2.0 cusecs 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 FC 1 is able to capture most of this flow.

According to the rehabilitation design guidelines, the FC should supply a maximum of 15 ha and have a capacity of 1 cusec, but be able to operate at plus or minus 25% of design capacity. Based on this, the following physical rehabilitation was done on the pilot FC:

1) necessary drop structures were constructed and damaged structures were repaired (see figure 2; from head to point "A" all the drop structures were newly built and from point "A" to tail (B) the existing drop structures were repaired);

2) necessary earthwork was completed and the canal capacity reduced to 1 cusec;

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 6 flumes were installed at the head end on farm outlets in order 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 blocks of the 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 based on the assumption that there will be new operating procedures, particularly rotations 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 the first week, and 7-8 farmers at the tail the second week);

2) from the 3rd week to the 8th week--6 days per week (3 days for head stream farmers, 3 days for tail enders, 1 day closed); and

3) from the 9th week to the end of the season, 4.5 days water issue per week (2 days head stream and 2 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 is considerably reduced.

FARMERS' VIEWS AND REACTIONS

The farmers, accustomed as they were to "over-irrigating" their fields, expected re-construction 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 thoroughly oppose the reduction of canal capacity and introduction of the new rotation procedure.

About 75% 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 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 over-irrigating their allotments and excess water flowed to the adjoining allotments. But after rehabilitation due to the limited capacity in the canal, headenders could not over-irrigate their fields 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 end has been given 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 to7 use excess water. It is thus a hindrance to equal water distribution (see figure 2).

2) Allotment No. 1318 has not been provided a separate farm outlet and therefore has to get water from the adjoining farmer (allotment No. 1278). Before rehabilitation these two farmers had two separate pipe outlets. But after re-surveying 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 has not yet been taken (see figure 2).

3) The last tail end allotment (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 during Maha 1986/87. The FC is designed for rotational water issues. Only 7 or 8 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 days 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 the design 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 end is inadequate.

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 1.25 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.

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 7 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 needs water. But the farmers were not ready to accept this rotation, leading to unequal water distribution. During the turn of tail enders head stream 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 head stream outlets had not been closed.

To solve this distribution problem, the IE Embilipitiya recommended two alternatives:

1) to fix concrete or iron lids to close the outlets of the head stream 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 water user groups) the head end farmers must be educated to cooperate for the operation of scheduled water distribution rotation.

The IE noted that the first alternative is impossible and unsuitable for improvement of system management.

FARMERS' PERCEPTIONS AND SUGGESTED SOLUTIONS

Except for 3 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 is 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 farmers of the tail end 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 tail three farmers for closing his outlet). They pointed out that if an officer intervened, no farmer would go against the officer.

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-consumption 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 the unfortunate feature was that he 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 rotation was operated. On these visits we observed that even while the FR was in the field, head stream farmers were disturbing the rotation. Therefore tail end and head end farmers had very frequent conflicts over water distribution.

The WUG failed to develop as a self-reliant organization. It met 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 from maha 1986/87. Due to severe drought MEA officials found it difficult to supply the required quantity of water. The problem was aggravated 2-3 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 main 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 other day of the week and this same rotation was effective to the FC1.

2) For the crop, due to the above mentioned water crisis,the Moraketiya Branch Canal was kept open for 5 days and Thursday and Friday it was closed. The distributary was kept open only for 2.5 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 6 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 headstream 7 farmers and the next day was for the tail enders, with a half day for any farmer who needs water. But during this yala this half day was in fact allowed for tail enders by the head stream farmers. However, all the farmers found the 2.5 day period was not sufficient.

On the other hand, due to minor damage of the Moraketiya Branch Canal bund seepage water flows to the distributary. In order to use this seepage water, the pilot FC head end farmers damaged the FC gate so they were able to use this water almost every day except Thursday and Friday when the canal was closed. (On 14 June when we visited the pilot project we saw that the bolts and nuts were removed and that they were kept on the iron plate which is 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 again there were 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 resides in the fields saw the damage to the FC gate but did not inform any MEA officer.

CONCLUSION

The major premise underlying the present approach to the rehabilitation of the Walawe Scheme is that the major reason for poor system performance is the dilapidated condition of the system. Therefore, improving the physical system is the key to improved performance. All other efforts thus 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. That is, the behavior of both the farmers and the officials (which together form an integrated social system), and the associated values and expectations, are what require change if the performance if 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 better fits their expectations. 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 (TIMP; System H) and in other countries including the Philippines (UPRIS). 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, 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.

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, return on the very heavy investment will be lower than anticipated.

We suggest that is it 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 this lesson 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 term 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 top 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 insure these are supportive of the effort. It will be important to devolve authority as well as responsibility onto WUGs, and federate them into larger responsible bodies, as has often been recommended (see 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 behavior.

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 insure that it can guarantee the expected 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 would need to take steps to insure 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 insure that there is no interference with the operation of the system, and that actions are taken 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.

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.

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Figure 1

Uda Walawe Scheme

Location Map