

MANAGING THE REHABILITATION PROCESS

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During recent years there has been a growing interest in the rehabilitation of existing irrigation systems. This interest has been stimulated in part by awareness of the diminishing land and water resources that support the construction of new systems, and in part by the increasing inability of many countries to finance major construction. At the same time research has demonstrated that existing **systems** perform much less efficiently than initially anticipated, and has suggested that there is considerable potential to increase productivity with relatively little capital expenditure.

An equally important aspect of rehabilitation is that countries become increasingly concerned with crop diversification as they approach or achieve self-sufficiency in rice production. Irrigation systems built primarily for rice irrigation may require modernization of physical and managerial capacity to meet these different demands. Experiences from a number of rehabilitation programs indicate the need to examine the rehabilitation process from planning through to implementation.

There has been a tendency **to** focus only on the physical works of system redesign and reconstruction at the expense of providing the appropriate and' parallel support for system operation and management (**O&M**).

Definitions

The term rehabilitation includes a range of potential activities. The most general definition is that it involves **some form** of modification **of** an existing system as opposed to design and construction of a completely new system.

Rehabilitation is needed when existing facilities are under-utilized. A program may focus on restoring irrigation deliveries to a proportion of an existing system; it may involve expansion into adjacent non-irrigated areas; it may aim at alleviating specific technical deficiencies, halting or reversing development of adverse **environmental** impacts such as salinity or water-logging, or promoting changes in cropping patterns or cropping calendars.

If no change in the system objectives are envisaged rehabilitation is equivalent to deferred maintenance. However, the **term** is more properly applied to programs designed to lead to significant modifications in system operation or changed production strategies.

Physical *Bias* in Rehabilitation Programs

Most rehabilitation programs are biased toward improving physical infrastructure. This is largely a reflection of the legacy of many irrigation agencies which have emphasized design **and** construction rather than operations. Construction allows agencies and donor organizations the opportunity to quickly monitor progress, and facilitate large and rapid capital expenditure. As in any construction activity there may **be** opportunities for personal gain not normally present in routine operational activities.

Irrigation agencies and donor organizations have developed mutually beneficial linkages in construction programs. Linkages for operational activities are less common because they do not often fit into a convenient project framework. These factors contribute to a bias toward physically oriented projects with clearly defined life spans.

Many agencies are unfamiliar with alternative uses of existing systems. It is clearly easier to upgrade physical infrastructure than to redesign a system for a new purpose, particularly if crop diversification is involved. There is also considerable unfamiliarity among irrigation agencies on how to involve farmers in redesign. Farmer involvement in rehabilitation is clearly justified insofar as they have system experience that is not available to agency personnel. It is no doubt easier under these circumstances to opt for a traditional construction project than experiment with unfamiliar programs.

Distinguishing Between Operation and Maintenance

A weakness in many rehabilitation projects is that insufficient attention is paid to system operation. The view of rehabilitation as deferred maintenance tends to foster the impression that if the system is physically rehabilitated then its operation, and hence performance, will automatically improve. While this may be true in some cases it is by no means assured.

Maintenance activities are concerned with keeping physical infrastructure in good enough condition to facilitate conveyance and control of water according to original design criteria. Operational activities are concerned with the use of physical infrastructure to implement the planning decisions made in relation to water allocation and distribution. While there may be instances where deteriorated infrastructure makes it difficult to implement desired procedures, it is also true that in many cases physical infrastructure is under-utilized. In the latter case, improvement of infrastructure is likely to have little impact on system performance unless there is a parallel improvement in operations. It is important to ensure that within any rehabilitation activity the correct balance is obtained between the repair of physical infrastructure and the operational requirements of the system.

Planning and Defining Objectives

Because rehabilitation is concerned with existing irrigation systems, there is usually an accumulation of experience and knowledge of actual conditions. Identification of a system for rehabilitation implies that performance is below what was expected at the time of construction or that the system can no longer meet changed objectives. The facts, however, may be of insufficient detail to develop a full program of activities. A characteristic of rehabilitation programs, and linked to the physical bias described earlier, is that operational modifications are not thought out in as much detail as those of physical works. This seems in conflict with stated program objectives which emphasize increased agricultural output, employment, and income through more equitable and efficient water allocation and distribution.

A comprehensive knowledge of existing system management practices is essential to designing a rehabilitation program. If managerial capacity is limited prior to rehabilitation, then merely improving physical capacity will be an incomplete solution. Clearly some physical works are necessary but it is important to integrate the physical activities with realistic expectations for future system management. By analyzing prior managerial performance it may be possible to more clearly identify areas that need assistance. This approach can be regarded as operational rehabilitation.

A further aspect of rehabilitation programs is the extent to which it is desirable or feasible to recreate the original system. Irrigation systems evolve over time, with both farmers and irrigation agency adapting to unique local conditions. Past assumptions about physical, economic, and social conditions may no longer be and may never have been valid. There is a need to learn more about the system's attributes.

Unless the system is in a state of extreme disrepair physical rehabilitation may need to cover only a certain percentage of the total infrastructure. With financial constraints becoming more serious there is a growing interest in *pragmatic rehabilitation* where only the most essential structures and channels are improved. This strategy not only results in lower total costs but can provide a good opportunity for integrating operational improvements with physical repairs.

Evaluation of irrigation agency records is an important source of information on how the system has been managed. It will assist in determining what knowledge is available for the redesign process and indicate where there is need for additional information. However, this information is not always detailed and field investigations are almost always inevitable. It is in this respect that farmers have an important contribution to **make**.

Involving farmers in the redesign process is necessary in two respects. First, they can help in identification of specific problems at field level, such as deficiencies in the original design, problems of water delivery scheduling **and** location of areas of flooding, high topography, soil variability, and **so** forth. Second, they can advise on the practicality from their perspective of proposed changes **to** water scheduling, cropping patterns, and **O&M** responsibilities. Integrating farmers at this stage can strengthen linkages and communications that will last through implementation and subsequent operation. However, many irrigation agency **officials** are **not used to** dealing with farmers and **it** may be appropriate to involve some third party catalysts to foster farmer-agency communication.

Two other aspects of planning rehabilitation merit attention: existing agency regulations **and** the need for flexibility. Many systems irrigate areas that are not officially included in the command area. Similarly, farmers may have installed additional unsanctioned structures and channels. Rehabilitation can incorporate these changes whenever appropriate. This is only one type of flexibility that may be required. **As** more information becomes available concerning system conditions and performance, changes in the project will *be* inevitable. Flexibility is particularly desirable in rehabilitation programs since farmers' livelihoods are at stake if problems arise.

Program Implementation

Rehabilitation programs face unique problems of implementation because changes must be made within the framework of continued operation. Although it may be necessary to shut the system down for short periods, it is normally impractical to do so for long periods. Implementation of the program must be handled carefully to avoid antagonisms between farmers and the irrigation agency.

Construction activities may have to be scheduled to peak in periods when agricultural activities are at a minimum to avoid danger of damaging crops through water shortages or by machinery. There may also be access problems along minor channels due to encroachments on rights of way. Domestic water deliveries may also have to be maintained.

Many rehabilitation programs include opportunities for farmer involvement in construction activities. This not only provides some additional income opportunities but also offers the prospect of a greater sense of ownership or involvement in the system. However, farmer participation in Construction is only likely to result in longer term cooperation if farmers are also involved in the design and operation phases of the project. This implies that there must be agreement at an early stage between farmers and irrigation agencies on the scope of any future responsibilities.

Operational changes need to be implemented cautiously. It is not always possible to predict the system's actual behavior under different operational criteria, and it is essential that farmers' livelihoods are not threatened by modifications to existing practices. There are dangers inherent in unilateral imposition of new water delivery schedules by irrigation agencies.

Many irrigation agencies are structured so that there is a distinct division between design and construction on one hand and operation and management on the other. External personnel introduced for construction work may not, under these conditions, communicate fully with regular operational staff. This is particularly critical if design staff make assumptions on future system operation.

Evaluation

Despite the increasing number of rehabilitation projects there are few clear examples of objective evaluation of the project's actual impact. One major contribution of rehabilitation programs may be to strengthen the basic monitoring activities undertaken by irrigation agencies. Any evaluation depends on a reasonably continuous data base rather than a simplistic before-and-after approach. There is merit in establishing monitoring activities as soon as possible in the project life in order to assist subsequent evaluation, but also to provide opportunities for agencies to respond more effectively to short term difficulties experienced within the system.

In-depth evaluations of rehabilitation programs are needed. As in many projects there is a danger of over-optimistic assumptions during project formulation so as to arrive at favorable benefit-cost ratios.

Conclusions

While increasing attention is being paid to rehabilitation there is relatively little agreement on exactly what is involved and how it should be undertaken. To some extent, each project is unique in that it must accommodate local variability. At the same time some commonalties appear to exist. Five issues may be briefly summarized:

1. What and when to rehabilitate. There appears to be little consensus on when systems need rehabilitation and whether such activities should involve wholesale change or incremental improvement.
2. Integration of construction and management. Because rehabilitation occurs in existing systems there is need for greater integration of managerial activities (operation, planning, and maintenance) with design and construction. Unless there are specific technical constraints, it may be more appropriate to introduce some, if not all, of the managerial improvements before commencing physical work.
3. How and when to involve farmers. Rehabilitation provides an opportunity for a new start in strengthening agency-farmer relationships, not merely for construction but also for transfer of limited amounts of O&M responsibilities to farmer organizations.
4. Donor-contractor-irrigation agency relationships. Because rehabilitation programs need to be site specific, flexible, and self-sustaining, many of the existing donor-contractor-irrigation agency relationships require revision. Donor agencies must be less willing to accept cookbook solutions

based on generalized assumptions and more willing to support improvements in managerial capacity. They must also encourage irrigation agencies to be more flexible and innovative.

5. Evaluating the impact of rehabilitation programs. This assessment needs to be undertaken at two levels: a) benefits accruing from individual projects in terms not just of engineering and agriculture but also the full economic and social impacts, and b) if projects do not achieve a reasonable level of expectation, the evaluation should be extended to include the process undertaken in attempting to achieve these initial objectives. There is some evidence to suggest a mismatch between rehabilitation project objectives and the actual tasks undertaken.

Rehabilitation programs run the risk of being all encompassing: aspects of redesign, construction, operation, maintenance, and allocations may be present in a single project. While it is true that any or all of these activities could be improved, it may be inefficient to cope with all the changes simultaneously. A more effective approach may be to develop a process whereby key constraints are identified and remedied on a more frequent basis than is currently practiced.

REHABILITATION DISCUSSION: A SUMMARY

De Cock presented a short case study of the Uda Walawe Project in Sri Lanka, in which SOGREAH has been involved. Some of the problems addressed by rehabilitation include severe delivery inequities and wastage by those farmers receiving more water than they need. These problems can be traced to design and construction flaws, as well as organizational issues. Part of the rehabilitation effort will be directed to organizing farmers at the turnout level. Moore asked why such an effort is being made, given that turnout level groups have a poor track record elsewhere in Sri Lanka. Murray-Rust suggested that the primary function of farmer organization is at the D-channel (50-75 hectares) level, rather than at small turnouts of about 14 hectares.

One discussion issue focussed on the timing for rehabilitation and the prediction of rehabilitation benefits over time. Should rehabilitation be carried out when the **system** is still functioning fairly well but problems are anticipated, or should the system be allowed to deteriorate to a point where performance is severely curtailed? At what point along the curve should rehabilitation be carried out (Fig. 1)? What shape is the curve?

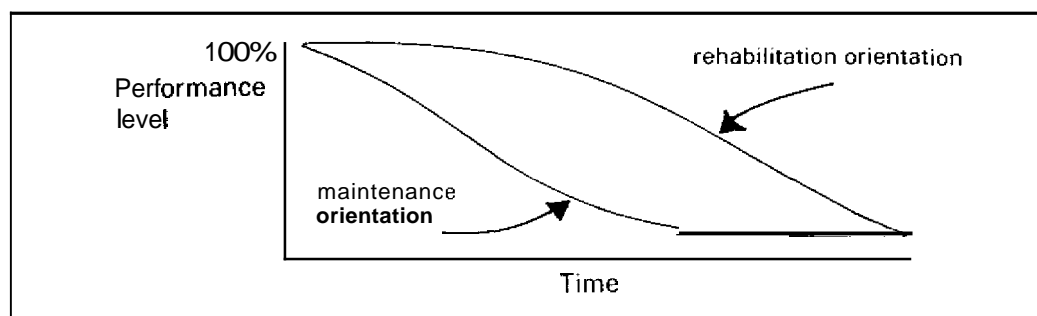


Fig. 1. Range of performance curve for suggesting when rehabilitation should begin.

After rehabilitation, what are the levels of increased performance that can reasonably be expected and for how long? Project appraisals generally indicate high benefits extending for a long period; the actual outcome is usually less beneficial for a shorter time. As Walter observed, "We refuse to admit that the design expectations, the project expectations at the beginning, are so unrealistic..." (Fig. 2).

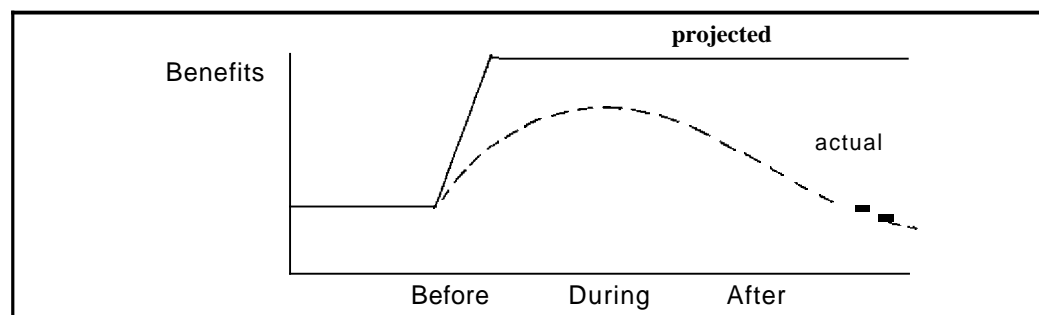


Fig. 2. Benefit curve for rehabilitation projects.

The trade-off between maintenance and rehabilitation received considerable attention from the participants. Tiffen suggested, "We have to distinguish between two types of rehabilitation: rehabilitation because of bad maintenance and because of bad design. The costs of regular maintenance have to be weighed against the cost **of** rehabilitation and its disruption to farmers." In practice, Murray-Rust pointed out, the two cannot be easily compared because "we're dealing in two separate currencies. When you do a major rehabilitation project, you get **a** major grant from outside; it doesn't cost the agency anything. When you're doing maintenance, it costs them everything. Therefore, from the agency's perspective it's cheaper to do nothing until rehabilitation **is** needed."

Several participants stressed the need for research into why maintenance is neglected (other than the reason just mentioned). Sundar asked, "Why does the problem arise? **Is** it possible not to make this irrigation system into a criminal **so** that he need not be rehabilitated?" This implies the need for close monitoring to identify maintenance problems before they get out of hand.

Questions of maintenance vs. rehabilitation and the **role** of donor agencies in the economic calculus facing irrigation departments "is an area that's just loaded with **policy** implications," noted Lowdermilk. We need comparative case studies as the first step in building a knowledge base that can be used **to** train managers and planners who must make these decisions.

The issues of what to rehabilitate and what should receive highest priority were also considered. Saldanha asked, "Are we talking about **normal** wear-related rehabilitation given an acceptable level of management or about rehabilitation aimed not so much at reconstruction but at bad management?"

How **does** one arrive at rehabilitation priorities? Wickham remarked, "I'm always impressed at the divergent views of the people on a mission as **to** what is required in particular rehabilitation projects. One person argues for watercourse improvement; another for cross-regulators. Everybody **has** his own **key** area. These points **are** seldom addressed on the basis of knowledge but on the basis of strength **of** persuasion on the team."

One guideline for focussing on the priority components of rehabilitation. suggested Nakamura, is the extent to which it would contribute to water savings or water re-use. Participants urged research attention on design issues as well as management. Prakash noted that there are still many design problems **for** which there is insufficient research available. Drainage was cited as a missing link in rehabilitation projects. Bandaragoda encouraged greater attention **to** this aspect. Carruthers pointed out that in non-rice growing areas especially, an integral part of irrigation **is** the removal of dissolved salts through proper drainage.

The organization and management aspects of rehabilitation were raised by Alwis, who reminded the participants that management capacity within irrigation agencies has an important bearing on the effectiveness of rehabilitation. This point was **also** raised by Groenfeldt who **suggested** that "we need to include the institutional aspects as something that deserves rehabilitation **in** itself. **We** might want to think about reform in the agency as well as reform to the physical system:"

Coward raised the issue **of** rehabilitating small-scale systems and systems which are logically distinct from large-scale systems as an area where design and management problems can be addressed simultaneously: "Many policy makers and program **implementors** are relatively uninformed about the experience others have with the same kinds of problems and issues." Research on small-scale **systems** is "clearly policy relevant and lends **itself** to cross-national comparisons. It provides an environment for dealing simultaneously with topics that cut across physical, economic, and institutional issues."

Sharing experiences and accessibility to information about rehabilitation was an issue which Wallach raised in reference to systems of all sizes. "If I want to find out about rehabilitation experiences in a particular country, what do I read?" For example, the participant from Indonesia did not know about Sri Lanka's experiences in rehabilitation and vice versa. Berkhoff noted that much relevant information is available in World Bank office libraries; Tiffen pointed out that contractors have documents relating to their projects. In neither case, however, is this information generally available. "Most of us don't have access to a great deal of information."

The information problem is one affecting not only policy makers and researchers but also consultants who design projects. As Tiffen noted, "Consultants need to know the operational difficulties with their designs. Designs will only be improved if the people responsible for them get some feedback on their performance."