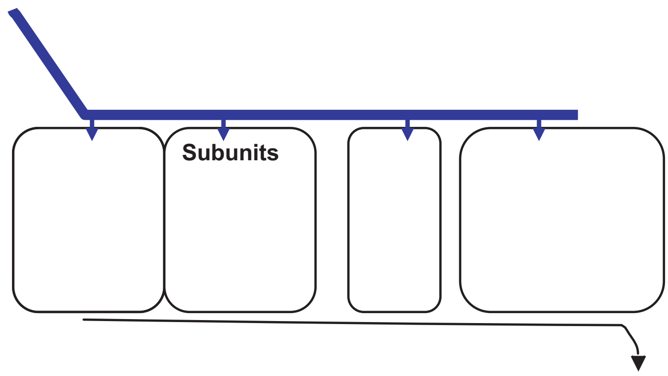
Chapter 14
Integrating service-oriented management options

Improvements in the management and operation of a canal system cannot be investigated only in one way (e.g. from the main canal down to the lowest management unit). What is required is an iterative approach with overlapping facets.

MASSCOTE is first applied within the entire CA without considering specific units. The CA is then partitioned into subunits, and MASSCOTE is applied again at the each of the management units. This phase defines the main characteristics of the service required for each subunit from the upper level.

Figure 74
Checking for consistency of the water management, services to subunits and main system operation (including drainage)



The main issues that need to be fully evaluated at this point are:

- Is the upper level capable of providing the desired level of service?
- If so, at what cost?
- What are the constraints with the other subunits that need to be considered?

Therefore, the integration as a double sweep of aggregation and disaggregation is fundamental in the development of management and technical options for the re-engineering of the whole system. This double sweep has to be performed several times, and it needs time to allow ideas to mature among the decision-makers.

In this aggregation process, improvement options for the subunits are identified together with the associated costs for each option. These are then aggregated at the system level. A modernization strategy is developed, according to the vision that has been developed as part of STEP 6, with objectives and proposed achievements/improvements.

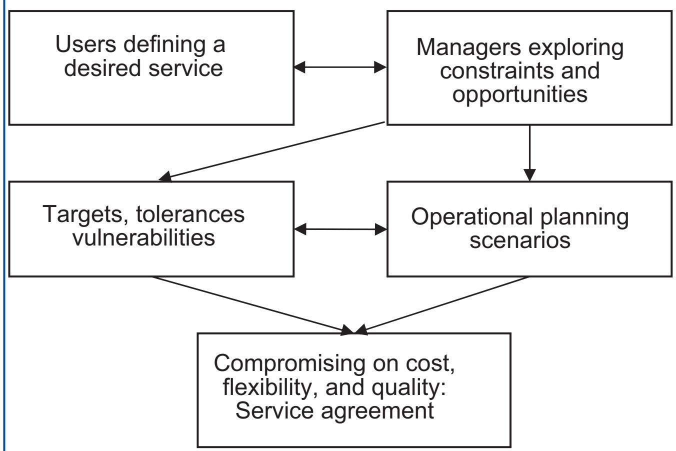
Solutions that are developed at the management unit level need to be aggregated at the upper system level in order to check for consistency and to see how feasible they are when the upper-level management and operation is considered (Figure 74). Some constraints at the upper level might prevent implementing requested services to the lower level.

Again this aggregation and consolidation process is a two-way process, moving up and down, and converging progressively towards a solution that can be tested on the ground.

AGGREGATING THE RATIONALE OF SUBUNITS AT UPPER LEVEL

Once the rationale of water management, services and operation has been investigated at the level of the local management unit, there is a need to aggregate all this at the upper level (e.g. the main system) in order to check for consistency and possibly return back to the lower level in order for any required change to be accommodated.

FIGURE 75
The process of determining a compromise on service



The rationale for water management, services and operation, how main water management is performed, and whether it is consistent with the lower-level options, how perturbations or unscheduled changes will be accommodated along the main system, etc.

REACHING A COMPROMISE BETWEEN COSTS AND SERVICE

In order to agree upon an irrigation service, a compromise has to be reached jointly by the users and the management and operation agency. For a given system layout, it is a compromise between technical opportunities and constraints, farmers' desires influenced by the agricultural system, and the costs of operation incurred (Figure 75). Decision-making can be seen as comparing what is desirable with what is possible, which then leads to what is affordable.

This process of arriving at a compromise can be summarized as:

1. The agriculture and water management systems determine what particular water service is desirable by the users (farmers or others).
2. The physical water resource and irrigation system in essence determine what is physically/hydraulically possible in terms of implementing a particular water delivery services as a function of various inputs in operation. This leads to a range of possible water delivery services.
3. Comparing the above two items will lead to the specific service that users can afford.

This compromise cannot be reached instantly. It is a progressive process that implies going iteratively back and forth between what is desirable and what is possible (and within the desirable, between individual and collective interests). There should be no illusions that achieving a compromise will be either simple or straightforward. On the contrary, it will often be the case that what is desired by the users is not technically possible, or that the irrigation service provider is too self-assured about its command and control and it does not study seriously possibilities to accommodate farmers' requests. How to guide this process through its different stages and feedback loops merits a paper for itself and, therefore, falls outside the scope of this paper.

Distinguishing between linear and non-linear changes

When considering improvements in canal operation, it is necessary to distinguish between:

- improving existing system and managerial procedures by incremental steps (linear approach);
- abrupt changes either in the systems and/or in the procedures – this type of change is relevant for full modernization or re-engineering interventions (non-linear approach).

SERVICE AGREEMENTS

The decisions taken as a result of all the above-mentioned negotiations and discussions are to be included in the service agreements between the service providers and the users. The service agreements describe:

- the service to be delivered;
- the obligations of the service providers;
- the rights and obligations of the users;
- the designated procedures in the event of failure to fulfil the obligations.

A service agreement can be formal and legally binding or informal. In both cases, it can serve as the basis for performance evaluation and accountability of both the service providers and the water users – for the former, in the event of failure to provide the agreed service; and for the latter, in the event of failure to pay for the services received.

In order to increase transparency in the obligations and targets for water delivery, service agreements should include clear information on:

- point of water delivery;
- quantity (discharge, volume, etc.);
- quality (timing, etc.);
- tolerance levels;
- flexibility;
- penalties;
- compensation in the event of failure.

Although water delivery is the primary concern of canal operation, the water service agreement will encompass more than the timing, reliability and volumes of water deliveries. The quality of service is also measured in terms of organizational capacity and accountability. Whether the operational setup allows for local control and flexibility will be important to many water users, and so are rigidity and transparency of rules for them and other actors. Irrigation service provision and performance of delivery can often be improved significantly by examining:

- how reliable the management institution is;
- what the governance mechanisms are to ensure that the service is actually provided.

In collective systems, the irrigation service level cannot be determined at the individual level in a practical way. There are some demands that are incompatible with others, and not all demands can be accommodated. This should be discussed, and it is essential to have coherence at all levels of the system. The irrigation system can be disaggregated to the smallest units for which differentiation is technically possible. These are not necessarily tertiary units as some decisions will have to be made at a higher level. Thus, service agreements can be decided collectively, depending on the physical ability of the system to accommodate "subsystem management" units.

Chapter 15

Towards a plan for modernization and for monitoring and evaluation

It is important to phase the implementation of modernization improvements in order to keep expectations and achievements at a realistic and practical level. A decision about what options and strategies are to be pursued has to be taken. The most cost-effective and easy-to-implement options are selected to start the process of modernization. However, it is necessary to realize that modernization is a long process that needs to start with an agreed-upon vision of the irrigation system and of the irrigated agriculture in the CA. The modernization plan can then be designed as a consistent set of interventions focused on realizing that vision.

A PLAN FOR MODERNIZATION

The RAP and MASSCOTE are tools – methodologies useful for diagnosing current performance and for laying the foundations for embarking upon a modernization plan. Implementing a plan for modernization is a long and iterative process. The RAP is rapid (a matter of days). MASSCOTE is fast (a matter of weeks). A modernization plan is much slower, probably taking months to formulate in all its aspects (Figure 76). Finally, implementation of this plan is a matter of years. An examination of irrigation agencies that are performing well today reveals that most of them have started a modernization process many years ago that is still continuing.

In a context characterized by rapid change in agriculture markets, water management, energy, labour costs, etc., modernization should be perceived as an ongoing activity that allows managers to adjust their performance at any moment of time to the conditions and opportunities.

The process of canal operation improvement is a long-term undertaking that needs to be phased into a proper time frame (which is also important for the financing of projects). The investment capacity of users and other stakeholders (state, local bodies, etc.) is usually limited. Therefore, establishing a realistic time frame is a key factor in the success of a project. Progress that is too slow may result in overly expensive improvements, while progress that is too fast may result in erroneous and expensive interventions.

The development of real, innovative solutions and the adjustment of people's lives to technical solutions takes time (at least several seasons). Even well-tested and reliable solutions need some time for adaptation and adoption, even in the best circumstances.

In summary, time is a key factor in planning for canal operation improvements. There needs to be a valid compromise between hurrying and going too slowly. Moreover, time frames should be defined clearly when embarking upon canal operation improvement projects.

FIGURE 76
Time-related interventions in canal systems on the path to modernization

MONITORING AND EVALUATION

Monitoring and evaluation of improved canal operations is a must in order to ensure achievements, take correct action, and compare conditions before and after investment. In any case, M&E should form part of the regular activities to monitor key points for operation and water management and periodically evaluate service to users.

The M&E of irrigation and drainage projects is usually meant to provide information on two important flows – water and money – and to evaluate the current level of performance of water delivery service and the cost-effectiveness. A good M&E system should be able to provide the managers with information on the available resources (water and money), output produced (water delivery service), and performance achieved (reliability, adequacy, flexibility, etc.), in order to determine the corrective action that should be taken.

The evaluation of water delivery service is done in order to assess objectively and systematically the realization of targets and objectives. It is a task that should be undertaken periodically. Seasonal (crop seasons, rainy and dry, summer and winter, etc.) or yearly evaluations of water delivery service are common. They provide a basis for discussion among the managers and water users and their representatives on any changes in operation, infrastructure and targets for water delivery.

Monitoring refers to the systematic collection of information and its use to help managers make decisions regarding: (i) day-to-day operation and management; (ii) asset management; and (iii) medium-term to long-term planning for improvements.

It is a task of operation that, where done properly, can make a difference between good and poor performance, particularly in systems subject to variable inflows and perturbations. For example, without monitoring, it is almost impossible to detect any unscheduled perturbation and related action. A "smart" information system is a must for effective operation.

Canal operation has its own, very specific, information requirements (collection, transmission and processing) and, thus, operational plans have to include specific "information management systems".

The main elements of monitoring for operation include:

- water levels at cross-regulators;
- discharges at the start of management units and offtakes;
- the condition of the canal sections and hardware – specifically, at the vulnerable points.

The monitoring of every structure and canal section is expensive and not necessary. Therefore, it is important to identify key monitoring points within the system based on the following criteria:

- sensitivity of the structure;
- vulnerable points within the system;
- service definition and criteria.

Sensitive cross-regulators and offtakes require frequent monitoring as compared with structures that are not sensitive to changes in water level and/or discharge. As shown in Chapter 6, sensitive cross-regulators are good points at which to detect perturbations, and sensitive offtakes may create a perturbation downstream. The monitoring of sensitive structures is necessary for enabling proper action to be taken and operational targets to be achieved.

Vulnerable or weak sections or reaches of the canal network need to be monitored frequently in order to ensure the safety of the infrastructure in the event of a sudden increase in discharge as a result of inflow or rainfall that may result in some damage, e.g. eroding the banks or causing a breach in the canal.

Service definitions and service agreements also define what should be monitored. For example, if the service agreement requires delivery of a certain discharge at certain delivery points, then the discharge at these delivery points should also be monitored.

Operations plans should include regular monitoring priorities, procedures and frequencies. The frequency of monitoring depends on various elements, including:

- changes in scheduled operation;

- variations in inflow – perturbations;
- changes in the gate setting of the key control structures;
- special cases (heavy rainfall, floods, etc.).

Conventionally, monitoring is done using human resources (gate operators and other field staff). However, with improvements in technology, it is now possible to have remote monitoring systems at a reasonable cost, e.g. an electronic sensor that sends information to the operator based on real-time conditions. These technologies are particularly useful in facilitating operations where operators are not based along the canals and where flow deliveries to the farmers are more demand oriented. However, some technologies are expensive and have very specific requirements (physical infrastructure, staff capacity and level of water delivery service) for installation and functioning.

There is no point in monitoring and collecting information if it is not analysed and used for making effective water management decisions. The information gathered through M&E is also used to determine the water balances (a must for good water management) and to assess achieved water delivery performance.

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