

INSTITUTIONS FOR IRRIGATION MANAGEMENT

by

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1. INTRODUCTION

In recent years, many countries have made substantial changes in the institutions which pertain to irrigation and irrigated agriculture. These changes have affected both the public institutions and the private sector. In some instances, they have been quite drastic or far-reaching in their consequences.

Several considerations have motivated such changes, so there are not many clear or consistent patterns. Among the various aims of institutional reforms have been the search for coordination or integration of the public services of irrigation engineering and agricultural support; the development of organizational structures within the farming community; a search for new relationships, both institutional and financial, between the farm community and the public agencies; and a desire on the part of governments which had invested heavily in constructing irrigation facilities, to create conditions likely to maximize the returns to that investment.

By no means all attempts at institutional reform have succeeded. Some, such as the attempts to amalgamate irrigation and agriculture ministries, which were a feature of the 1970s in several countries, were subsequently canceled. Various countries learned from such experiences that old-established organizations contain internal interests that can be very strong resistors to change.

This paper tries to review some of the characteristics of irrigation institutions, and some examples of changes that have happened in certain countries.

There have been relatively few attempts to develop topologies of irrigation institutions. Mary Tiffen (1987) in one such analysis, treated the degree of integration (both between government and farmers, and between different government agencies) and the governance arrangements as important determinants, and that view is supported here.

The word "institutions" has a wider meaning than "organizations." The organizations are indeed among the most important institutions; but there are others that can have significant impacts. A land tenure system is an institution; so are production relationships like share-cropping; so are the legal systems (formal and customary) by which water law and water rights may be safeguarded. In the space of a short review like this one, we shall focus predominantly upon the organizations; but that is primarily for reasons of space, and does not imply that other sorts of institutions are negligible.

2. MAJOR PARTICIPANTS IN IRRIGATION PROCESSES

We can identify three major groups of actors in the business of using a public irrigation system: there are farmers; there are people (usually government servants) who control the water supply; and there are people (some, but not usually all, governmental) who organize agricultural support services. There are numerous other participating groups, but these three have the most significant roles.

Figures 1 and 2 depict two modes of functional relationships among these three. We could call Figure 1 the "old" or "traditional" model, and Figure 2 the "new" model; but such terminology conveys value judgments which the writer does not intend. However, it does seem true that thirty years ago we could find many examples of structures that resembled Figure 1; and that now we find an increasing tendency towards Figure 2. Whether this will continue into the future is less certain.

The type of institutional arrangement shown in Figure 1 was thought appropriate in conditions of subsistence agriculture. An Irrigation Department (or perhaps a branch of a general Public Works Department) created facilities for capture, conveyance and distribution of water. An agriculture Department, or more usually a small group of agriculture-related institutions, arranged various support services: credit, research, extension, chemicals, seeds might be among these. These services were, in most cases, also provided to un-irrigated agriculture, and the supports to irrigation might not be differentiated in any way. The farmers were perceived (by governments) as "beneficiaries:" there was a perception of irrigation as serving the primary purpose of feeding those people and their dependents.

A virtue of the Figure 1 model is functional clarity. The Irrigation Department had a precise function of delivering water, usually according to some specified spatial and temporal distribution patterns, to the farmers. The agricultural units had similar clarity about the specific services they should deliver. The farmers, acting as individuals, had certain rights to all these inputs, and were supposed to utilize them to feed their dependents and, if all went well, to produce a surplus whose sale would enable them to satisfy some of their nonagricultural needs.

In the model of Figure 2, these three major groups are shown as having coalesced into a single unit, which we may call an "irrigation enterprise." The common purpose of such an enterprise is to produce a marketable surplus. The same kinds of people -- farmers, engineering staff and agricultural support staff -- are still necessary, and their functional interactions are much the same, as in Figure 1. But governance, decision-making and financial interactions may be radically different. The best examples of the Figure 2 type are probably to be found in such enterprises as company-owned estates for such crops as sugar; or in those farmer-managed irrigation systems that have succeeded in maintaining genuine independence from government.

Many systems, in many countries, are at present using models intermediate between these two. In many cases it can be thought of as a process, taking many years, by which the separately-governed units of Figure 1 slowly move together, perhaps over years or even decades, with the ultimate goal of merging under integrated management. The incompleteness of this process, at present, contains its own problems.

Figure 1. A traditional institutional structure with functional separation.

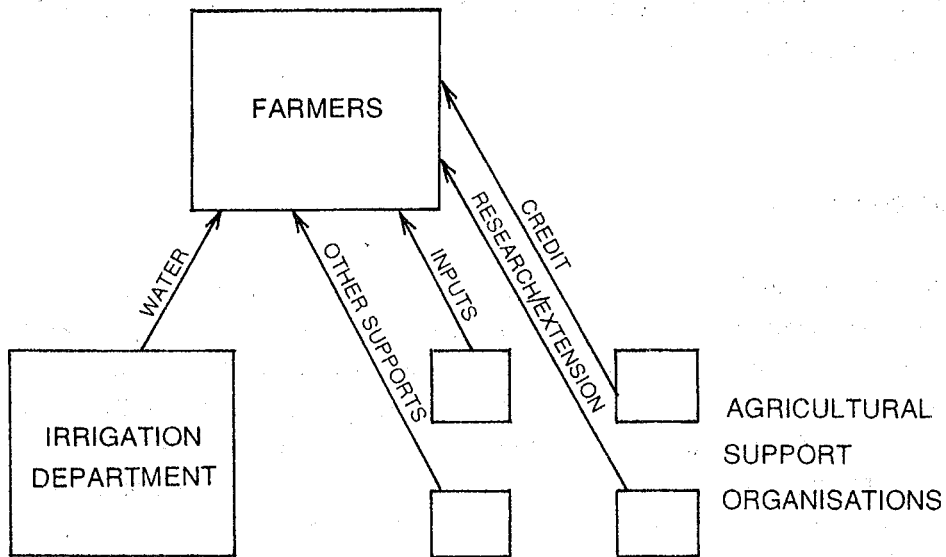
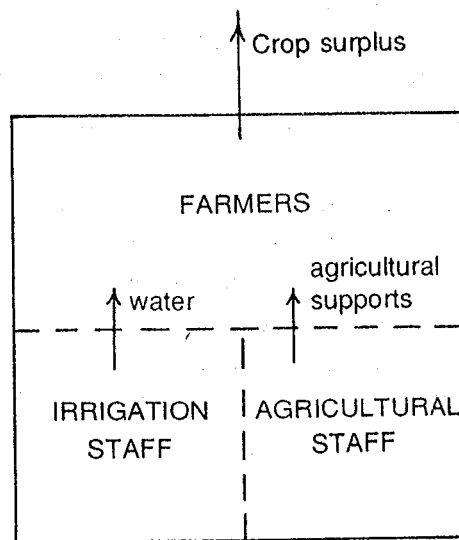


Figure 2. An integrated irrigation enterprise.



Figures 3 and 4 illustrate types of partial integration that can be found at present. In Figure 3 (which approximates the Morocco style) the government elements are unified; in Figure 4 (which approximates the case of advanced Irrigators' Associations in the Philippines) the farmers' organization acts as the channel for agricultural supports, and enters a formalized, contractual relationship for the provision of irrigation water.

3. GOVERNANCE

The three units depicted in Figure 1 have very different kinds of authority. If we consider this question in terms of the locus of control and decision-making, we can see that, usually, the water supply sector of our institutional map is under a structured control: perhaps a Chief Engineer for the system, who, in turn, answers to a sectoral manager -- Director of Irrigation, perhaps -- in the capital city.

The agricultural services sector has not usually such clear and hierarchic control. There may well be quite distinct organizational lines: an agricultural credit bank, an agricultural research organization, an agricultural extension organization, while private sector merchants may make inputs available and arrange to purchase surplus outputs. There is usually not a focus of decision-making in this area, even in respect of the group of government units. Therefore there is a coordination question within this sector as well as between this and the other major sectors. (For example, agricultural banks may become directly involved in technology choices; they may be more ready to give credit for equipment of one technology than another; this may not always be in line with messages being delivered by extension services.)

The farming community had, in most countries, very little formal organizational structure until recent times. Organizational structures among that community have been promoted by governments, especially in the 1980s; as yet such structures are not very robust, but their growth is usually perceived as a necessary condition for the transition from models like Figure 1 towards those like Figure 2 or Figure 4.

So, in summary, the Figure 1 model contains a water delivery organization with strongly structured control and restricted functional responsibilities; agricultural support organizations with more diffused control; and a farmer sector that is weakly organized, quite possibly with no focal point that would allow their views to be presented with weight commensurate with the other actors.

The fully integrated Figure 2 model might be expected to have a single focus of decision-making and control. Such models can be found, but are at present rare in publicly provided irrigation systems. More usually, the governance arrangements of Figure 1 persist.

Figure 3. A partially integrated system with integration of public participants.

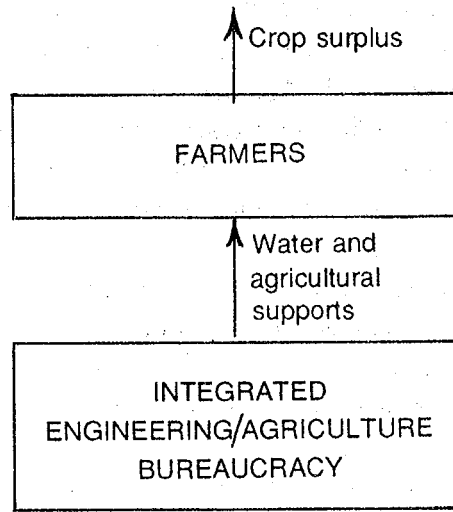
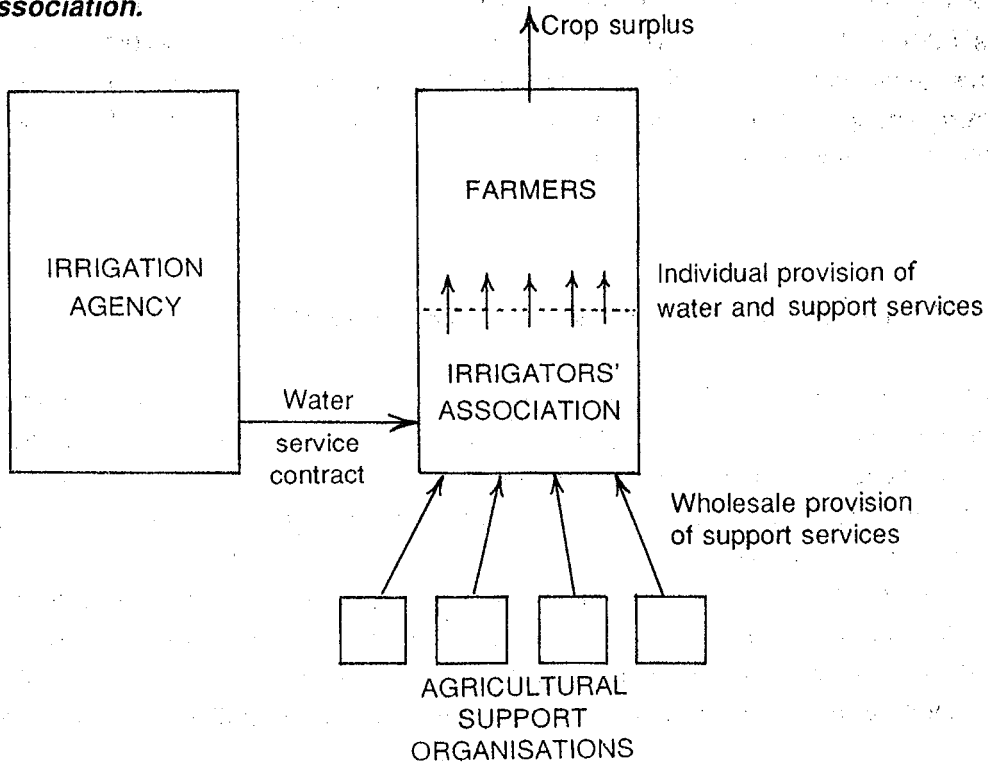


Figure 4. A partially integrated structure based on a strong irrigators' association.



4. THE TREND FROM SUBSISTENCE TO COMMERCIAL IRRIGATED FARMING

What has caused the modern shift towards a more institutionalized role of the farming community, and more integration of management at the system level? There are numerous factors, among which we should note the following developments. Together, they constitute a long-term adjustment process that is taking us away from subsistence and welfare concepts of irrigated agriculture, towards market-oriented attitudes under which, it is hoped, systems will become strong enough so that ultimately they may not require constant support from government funds or even government personnel.

First, plant breeding and other agronomic research successes from the early 1960s onward made opportunities from farmers to produce surpluses very much greater than before. Second, urbanization and population growth proceeded rapidly, augmenting demand for these surpluses. Both of these processes have led to a growing awareness of the importance of markets. On the other hand, older modes of management exhibited rigidities and slowness to adapt to market signals: for example, when improving rice technologies led to satisfaction of market demand for that crop in many countries, farmers could not move easily to other crops.

At the same time, farmers who were fortunate enough to capture their own water sources (most commonly, by pumping) were better able to respond to markets, and were observed to become more affluent.

In the public irrigation sector as a whole, however, farmers' incomes have, in most countries, been falling steadily behind those available to urban populations, and this, in turn, has led to great losses of young people from the systems, which is a serious problem in regard to long-term sustainability.

Lastly, government finance ministries show increasing reluctance to meet as much of the costs of irrigation as they once did. This is a natural consequence of the perception that food demand is much better satisfied than it was twenty years ago; and the trend is not likely to reverse soon. Therefore, governments desire to see institutional structures that may be expected, through course of time, to become strong enough to collect and pay back to government much of the cost of running the system; or alternatively, simply to take it over themselves.

5. SYSTEM MANAGEMENT AND SECTOR MANAGEMENT

The foregoing discussion has been conducted in terms of an irrigation system (meaning usually a water delivery network that is dependent on one, or very few, primary water-capture facilities). Irrigation is however managed at various levels both higher and lower than the single system. We may look briefly at the institutions for managing the irrigation sector, at national level or, in large countries, state or province level.

A major difference between system management and sector management is in the role of the farmers. Efforts are being made, as we have noted, to bring in organizational structures through which farmers may influence decision-making at system level. These efforts do not generally reach up to the sector level. Even among countries that are very active in promoting the move towards the

Figure 2 type at the system level, there is not usually a parallel movement at sector level. Sector management can still, in most countries, be approximated by Figure 1.

This dichotomy between the promotion of farmers' participation at system or minor levels, and the continuance of full government control of sectoral organizations will no doubt generate tensions. As long as the principal operational officer and staff are responsible to instructions coming from far away -- instructions which may sometimes run contrary to local wishes and local circumstances -- then the farmers will feel that theirs is still a subordinate position.

This problem seems central to the process of creating the conditions in which irrigation organizations can become financially self-sustaining. Farmers, very commonly, perceive the existing bureaucracies as over-staffed, and in other ways they often doubt that resources are applied in the most beneficial ways. It will always be difficult to persuade farmers to contribute towards the costs of an organization whose behavior they cannot influence.

6. DIVERSITY OF IRRIGATION SYSTEMS

All irrigation systems are different. Even where they occupy virtually identical terrain -- say in different parts of a large delta, or in the Punjab plains -- subtle differences of soil, or water entitlement, or climatically optimal planting and harvesting dates, or of physical canal and drain facilities, or of distance from large markets, bring about differences in their potentials and their feasible targets. Farm communities likewise vary in ethnic and social composition.

This suggests that there should be a certain flexibility, and site-specificity, in institutional design, at the system level. We find this in the private or farmer-managed sector. Institutions evolve, over time, in response to endogenous pressures and needs. There are no imposed paradigms.

Yet, it is not what we are accustomed to find in the public sector. There, in most countries, there appears a strong tendency to establish a limited range of institutional formats (perhaps only one) and try to make it fit all cases. In this process, sector management at national level usually seeks to constrain or determine the style of system management.

Is this necessary, or desirable? Further, to what extent is a national or provincial organization for irrigation sector management needed at all?

Within the great irrigation bureaucracies, such questions sound outrageous, almost absurd. Yet they deserve to be considered seriously, in these days when the deficiencies of centrally planned methods in other sectors are widely recognized. If we consider the viewpoint of the water user in a particular irrigation system, it is not obvious that he relates in any significant way to other users in other systems; and it is hard to identify what benefits these users derive from sharing an overall management institution. Some would point out that if the unit of management is too small it may not attract staff of adequate competence; but beyond a certain scale that benefit too becomes dubious.

A mode of organization that exists in a few countries is the parastatal authority limited geographically to a single river basin or a hydrologically-linked set of water sources. These usually have integrated public management in the style of Figure 3. Examples are the Company for

Development of the Sao Francisco Valley (CODEVASF) in Brazil, the nine Regional Organizations for Agricultural Development (ORMVA) in Morocco, the Mahaweli Authority of Sri Lanka, and the Muda and Kemubu Authorities of Malaysia. There is an attractive logic in the hydrologic foundation of these, and in times of increasing concern for conservation of water resources, this mode may well spread. Financial autonomy is relatively easy to develop in such structures. Perhaps they should observe a certain minimum size, say 50,000 ha., in order to attract and retain good quality staff.

7. INTEGRATION OR SEPARATION OF FUNCTIONS

We have remarked earlier on the trend of the 1970s and the 1980s towards integration of management. It seemed to begin with attempts to integrate (or at least coordinate) the water delivery and agricultural support bureaucracies. Then it moved on to efforts to strengthen the decision-making role of farmers and make them more equal participants: in that matter the Philippines has had a leading position in Asia.

Yet, if we look around, we can find apparently successful examples of institutional systems based on functional separation, as well as those using functional integration. Full integration is found (for example) in farmer-managed irrigation systems (FMIS) and in private-sector estates. But in many cases, in the western United States or in Australia or southern France and many other countries, irrigation water delivery resembles other public utilities: users have some process for indicating their water needs to the supply organization, and can verify its compliance, but they do not expect many interactions with bureaucracies over the way they use the water. This can be called functional separation. In the developing countries, the Sudan Gezira system, for long deemed by many to be economically the most successful system in Africa, used a very sharp set of functional separations.

The more advanced of the Philippine irrigators' associations are moving in the direction of integrating the local agricultural support functions under the control of the elected representatives of the farmers; while defining a separate, contractual relationship with the water delivery organization.

8. OBJECTIVES AND ACCOUNTABILITY

A key question about any institutional system is by whom, and through what processes, the system's objectives are determined. A closely related, equally vital question is what occurs if objectives are not attained.

In an irrigation system, many specific objectives may need adjustment or renewal in each cropping season: we can call this seasonal planning. It concerns such things as crop intensity, cropping pattern, water delivery pattern, organizational expenditure and income, perhaps marketing arrangements and contracts. In water-deficient periods, it involves water-sharing questions and equity.

Consider that in the corporate sector a company exists whose purpose is to produce, say, soap. Even in that apparently simple business it needs a process for continually setting and re-setting objectives: what quantity will it produce weekly; what grades and qualities of soap will it make; will it extend its operations to other countries; will it enhance quantity and quality with new machines; and so forth. A board of directors exists to determine these objectives and to verify whether they are attained. These people may reasonably expect to be dismissed if objectives are not attained.

But low, unambitious objectives, are also not conducive to success. Likewise, a failure to discern that some shift in the external demand for the products requires the company to adjust its own objectives may cause financial loss. So a wise board is likely to consult widely among its staff, the users of its products, its bankers and others, in the process of deciding and renewing the company's objectives.

In many of the institutional systems we find in public irrigation, these features -- a consultative process and clear locus of objective-setting for the irrigation system as a whole -- are rather deficient. Where they exist, they are most likely to be dominated by the bureaucracies, with often negligible influence by the farmers. Their responsiveness (that is, the speed with which objectives are adjusted in reaction to some change of external circumstances) is often low.

Accountability (meaning clear assignment of responsibility for improper choice of objectives or for failure to attain objectives) is likewise low, largely because of the dispersion or default of the goal-setting process. Managers of public irrigation do not, in general, face quite the same personal concerns (or rewards) as the directors of our hypothetical company.

We should note the dependence of accountability upon the linked processes of target-setting, execution, and verification of target achievement. Where these processes are imperfect or vague, accountability is difficult to establish.

The objectives of our soap-making company are agreed through a process of matching internally-generated and externally-generated pressures. External pressures include, for example, customer demand, and preferences among alternative products; internal pressures include manufacturing capacity, skills and other resources. (Of course there are a great many more pressures than these few examples.)

In public irrigation, it seems fair to say that internally-generated pressures have tended to be dominant. In the long term, as many economic sectors have discovered, that is not a sustainable attitude; although it can also be observed that governments sometimes sustain for remarkably long times, by use of subsidies, institutions that adopt this attitude.

In addition to the primary purpose of producing crop outputs, governments and society in general are, to an increasing extent, wanting irrigation enterprises to attend to other goals. Let us consider environmental protection and maintenance of public health as examples of the institutional problems associated with such nonagricultural goals.

Targets in such areas cannot be set by internal processes alone; other people, external to the irrigation groups, feel concerned. Indeed, it is not unusual to find that the major actors in the irrigation enterprise show rather low levels of concern for these nonagricultural goals, and therefore make no effective efforts at target-setting. In the public health field, they perceive an existing institutional arrangement (Ministry of Health) and consider it is their affair. In environmental matters, there are

usually weaker, newer institutional arrangements, and the social goals in this area often lack clarity; so there is a temptation for irrigation organizations to ignore these as well.

Consequences of these attitudes include such things as accumulation of agricultural chemical residues, through drainage water, in coastal lagoons; and gastroenteric diseases contracted through human use of canal water into which sewage has been discharged upstream.

Such matters do not seem likely to improve if the current trends to increase the financial autonomy and self-sufficiency continue.

Organizations which have to be financially self-sufficient are likely to reject or downgrade goals that can be perceived as incurring expenditure but no returns.

We should therefore hope in future to see external regulatory institutions and procedures emerging, strong enough to negotiate appropriate targets with the irrigation organizations, to verify subsequent compliance, and thus impose accountability. We should not, however, take a naive view of the magnitude of this task, since (in general) the record of collaboration between irrigation organizations and health ministries is not impressive: so the mere existence of a regulatory organization is by no means sufficient.

9. SOME CURRENT EXAMPLES OF INSTITUTIONAL FORMS

In this section, we consider a few specific institutional patterns that have features of particular interest, and see what lessons they may offer.

The Philippines has been a leader in institutional reform since the late 1970s. Faced (because of terrain) by very large numbers of small to medium systems, and with an existing division between farmer-managed and government-managed systems, its reforms have the aims of making the national agency financially autonomous (unsubsidized), primarily through fee collections from farmers; and fostering farmers' organizations which can ultimately become strong enough to channel most agricultural support functions, to maintain their own financial viability, and to sustain a contractual relationship with the irrigation agency for the delivery of water. The reforms have been in progress for over a decade, and many satisfactory farmers' organizations have emerged; but there remain also many weak ones. This model, as we have noted, approximates most nearly Figure 4.

In Morocco, the concept of a national irrigation authority has been replaced by the nine geographically defined ORMVAs, with irrigated extents averaging around 100,000 ha. each, more or less according to the pattern of Figure 3. The arrangement operates under a regulatory Ministry, but much autonomy is delegated to the institutions. The system fosters entrepreneurial attitudes, and is conducive to an atmosphere of competitiveness or at least comparability among the institutions, in contrast to the more normal monopoly situation.

Sri Lanka has created two parallel organizations of rather similar size, an integrated basin authority structured like Figure 3, and a more traditionally structured style, intermediate between Figure 1 and Figure 2, for the rest of the country. Again, a certain competitiveness that is probably beneficial has been one outcome.

China has devised a system that may give the greatest amount of flexibility for site-specific institutional arrangements at the system level, by integrating irrigation management into local government structures. According to the size of the system, it will be the responsibility of the appropriate local government unit (province, prefecture, county or township) that contains it. This allows for a relatively small national superstructure, concerning itself with policy.

This list could continue, for institutional forms and innovations are numerous. In general, the newest ones emphasize financial autonomy, farmer involvement in system decisions, and site-specificity of management.

10. THE CONCEPT OF A SERVICE CONTRACT

The relationship between the irrigation bureaucracies and the water users has, in many countries, developed unsatisfactory characteristics. It is poorly balanced, between the strongly-structured, monopolistic, non-accountable water delivery organization and the unorganized farmers. Some people consider that the way to balance the relationship better is by developing users' organizations, and putting them in a contractual relationship with the supply organization.

It is not such a new idea. The *Warabandi* system of northwest India has the nature of a service contract: the farmer knows precisely when he may abstract water, and the supply organization knows that it is supposed to keep a fixed water level in the canal, so that equal time of access implies equal share of water. Egypt and Sudan (though their systems were quite different) also had procedures based on the premise that the water supply organization could maintain nearly steady levels in the canals, within small tolerances.

Such systems have the virtue of transparency. An aggrieved user can see, and bring other witnesses to see, if his share is incorrect. Redress can be obtained through some legal apparatus of water courts.

In many places, procedures of this kind have been undermined either by political pressures, as for instance where individual farmers may have captured disproportionate shares of water and are not motivated to relinquish them; or by bureaucratic inertial and non-compliance.

It is not yet clear that new contractual approaches, involving irrigators' associations, will succeed in resolving these difficult issues. The process should be seen, however, as a significant part of the overall trend we have described, towards introducing organizational accountability, devolving and localizing decisions, improving and sharing a target-setting process, and empowering farmer groups.

11. DEDUCTIONS

The subject of appropriate irrigation institutions is evolving, and it is premature to offer conclusions about it. We may however draw the following deductions from the foregoing analysis:

1. Irrigation systems need good target-setting procedures that involve farmers as well as other actors.
2. Irrigation organizations need to develop systems of accountability in relation to attainment of targets.
3. The institutional needs of irrigation systems vary from site to site, so centrally determined institutional paradigms may be unsuitable, and there should be flexibility of formats.
4. There is a dichotomy between the reliance on farmers' strong participation in system institutions, and their absence from national sector-level institutions.
5. Because of (4), the desirability of national (or in large nations, state or provincial) irrigation agencies needs to be reviewed. It may be argued that smaller institutions, governing areas that might be of 50-200,000 ha. order, would be more responsive and more dynamic. It may also be thought that hydrologically based institutions could deal better with competition for water.
6. Nonagricultural goals, such as environmental protection, are likely to be externally imposed on irrigation institutions, with increasing firmness. The institutions are not themselves well fitted to select targets in these areas. External regulatory institutions are needed to assist in target-setting and monitoring.
7. Most countries now want their irrigation institutions to work towards reduction of subsidy dependence and ultimate financial self-sufficiency. This is likely to require more market-responsive behavior, including flexibility and quicker decision-making, and is a further reason in support of point (5) above.
8. The imposition of nonagricultural goals is not readily compatible with financial autonomy. The location of budgetary responsibility for compliance with nonagricultural goals needs to be clear.