MAINTAIN – Case Study No. 5

Division 45
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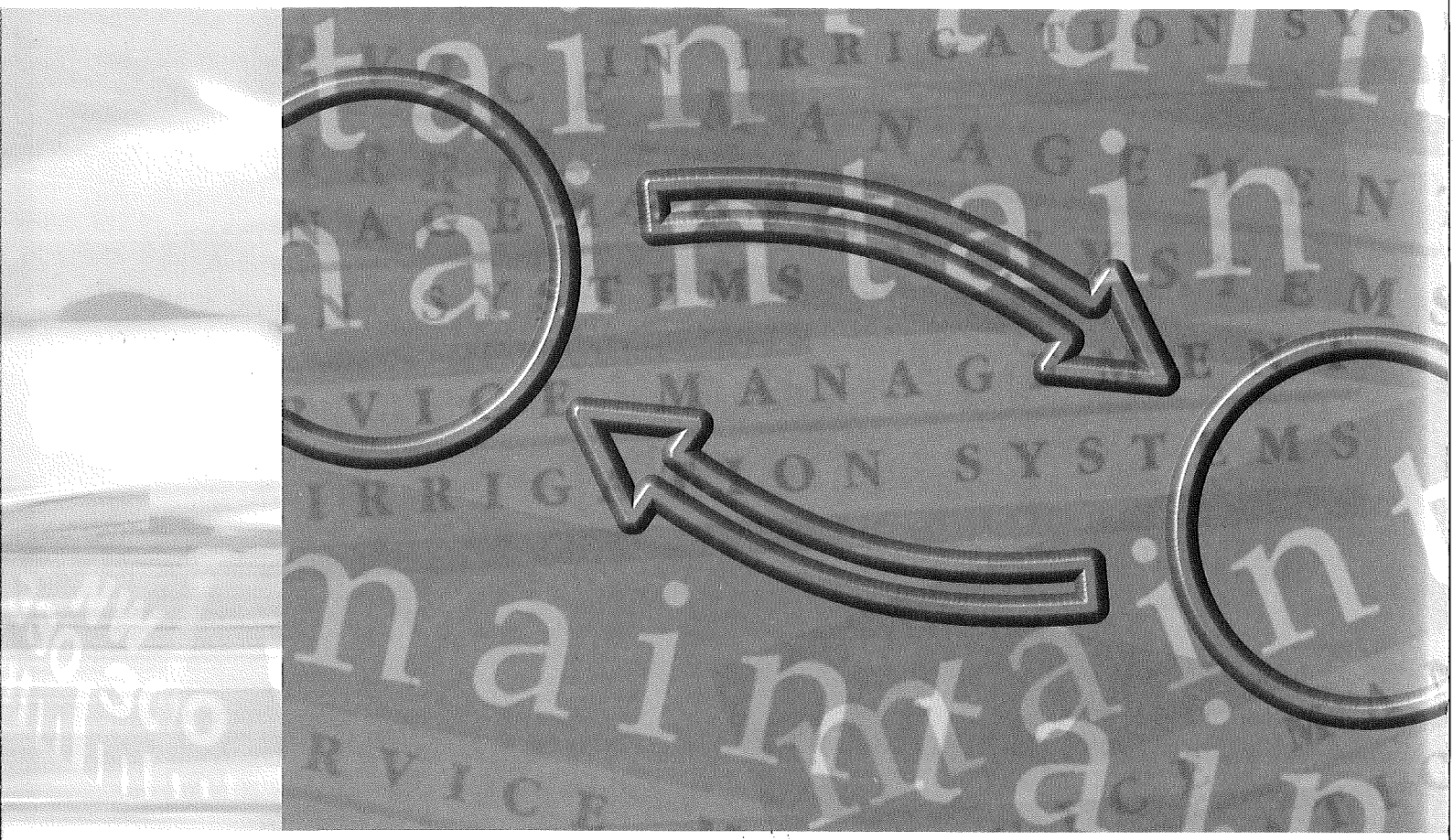

Mark Svendsen and Walter Huppert

Incentive Creation for Irrigation System Maintenance and Water Delivery: The Case of Recent Reforms in Andhra Pradesh

Deutsche Gesellschaft für
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Abbreviations and Acronyms

AC	Apex Committee
AP	Andhra Pradesh
A&T	Accountability and Transparency
CA	Competent Authority
CAD	Command Area Development
CWC	Central Water Commission
DC	Distributary Committee
D&M	Delivery and Maintenance
DEE	Deputy Executive Engineer
EE	Executive Engineer
FMISA	Farmers' Management of Irrigation Systems Act
FO	Farmer Organization
GOAP	Government of Andhra Pradesh
GOI	Government of India
GTZ	German Technical Cooperation Agency
ICADD	Irrigation and Command Area Development Department
MC	Managing Committee
MLA	Member of the State Legislative Assembly
MP	Member of Parliament
NGO	Non-governmental Organization
O&M	Operation and Maintenance
PC	Project Committee
SRSP	Sriramasagar Project
TC	Territorial Constituency
VRO	Village Revenue Officer
WALAMTARI	Water and Land Management Training and Research Institute
WUA	Water User Association

Measures

ha	Hectare
M	Million
R	Rupiah

Preface

This case study is a part of the Maintain Project, developed and supported by GTZ, the German Technical Cooperation Agency. Maintain is a longstanding project reflecting the interest of GTZ and the German Government in the critical challenge of adequately maintaining irrigation infrastructure worldwide.

Maintain has developed conceptual frameworks and tools for analyzing the provision of maintenance services. Maintain has also applied and tested these frameworks and tools in a series of case studies in Pakistan, Turkey, Mexico, Jordan, India, and California. These case studies have adopted a variety of approaches and have emphasized different aspects of the overall analytic framework. However, all look at maintenance as a service provided by one party to another, rather than as a set of predefined tasks. This simple shift in perspective opens the way to a number of new insights relating to the nature of chronic maintenance problems and potential solutions to them.

This case is a first look at a remarkable experiment currently underway in the Indian state of Andhra Pradesh. Policy makers and senior civil servants there are attempting to overturn 100 years of authoritarian management by transferring control of irrigation system water delivery and maintenance services to organized groups of farmers. It is a transformation that lends itself particularly well to analysis of the fundamental nature of service relationships linking independent parties.

Thanks are due to a number of people who have assisted in mounting this study. Mr. B. N. Navalawala of the Planning Commission Secretariat provided contacts and helpful introductions in Andhara Pradesh. Mr. Raymond J. Peter, Secretary, Government of Andhra Pradesh, gave us a most valuable overview of the program and introductions to other key players in the state. Mr. Maruti, Chief Engineer, Sriramasagar Project, organized an enlightening field visit for us. Mr. Setapathi Rao of IRDAS described the origins and history of the transfer program and patiently fielded innumerable questions. Dr. Ashok Gulati, of the Institute for Economic Growth, toured with us in the field and provided insight and perspective on the problems of irrigation in the state. Mr. N. K. Bandyopadhyay gave us a useful overview of the World Bank's involvement in irrigation in the state.

A number of people provided valuable comments on the draft study report. These included Shashi Kolavali, Ruth Meinzen-Dick, Doug Merrey, Tushaar Shah, and Ed Vander Velde.

Executive Summary

Innovative irrigation sector reforms in the Indian state of Andhra Pradesh were initiated in 1997 with the unanimous passage by the state legislature of a new irrigation law. Changes embodied in the law focus on transferring significant decision making authority over irrigation water delivery and system maintenance to farmers to enhance accountability of service providers to service users. At the same time, the existing field structure of the state irrigation department was left intact and continues to serve as the service provider in the new set-up. This creates a complex organizational picture in which relationships are non-linear and interconnected.

An analytic framework adapted to such a situation was applied to describe and interpret the changes which have taken place between the pre-reform and post-reform periods. This framework has 5 key features.

- It accommodates multiple actors
- It focuses on transactions among the actors rather than on positional relationships
- It looks at multiple points in time to assess changes
- It highlights incentives and incentive creation for desired behaviors
- It employs key principles of accountability and transparency in analyzing relationships

Important service relationships of water supply and maintenance are unbundled into 4 component transactions among parties comprising (a) arranging a service, (b) providing the service, (c) paying for the service, and (d) using the service. These transactions, together with governance mechanisms that ensure that the involved parties fulfill their rights and obligations, constitute the core of accountability. In a standard commercial transaction, the customer arranges for a service which is then delivered by the provider and paid for by the customer. The relationship and accountability are direct. In non-commercial exchanges and where middle-persons are involved, these closed loops can be interrupted, leading to a breakdown of accountability and ultimately to inferior service, unless effective non-commercial governance mechanisms are installed.

The irigation sector reforms introduced in Andhra Pradesh have several key features. These include

- Establishing contiguous irrigation districts covering all publicly-irrigated areas in the state and designating every irrigator in the state a member of a water user association (WUA)
- Giving WUAs legal personalities and powers to levy fees
- Federating WUAs in larger systems into Distributary Committees (DCs) to arrange and manage certain services for larger system canals
- Designating contact engineers in state irrigation department field offices as links between the WUAs and the irrigation department which provides water delivery services
- Allocating a per hectare maintenance grant to each WUA and Distributary Committee and empowering them to set maintenance priorities.
- Linking future maintenance grants to fee collection performance within the boundaries of the association.

The authority base for the reforms is comprised principally of provisions in the new irrigation law. In addition there have been changes in the revenue code to accommodate desired features of the reforms. All important changes are based on state-level rather than national authority. Undergirding the reforms is the authority of the Chief Minister of the state who has been the principal animus for the changes and continues to sustain and support them.

Prior to the reforms, most service relationships were incomplete. Interruptions occurred at a number of points.

- Neither water delivery nor maintenance services were related to fee payment by farmers. Payment or non-payment did not affect the nature and level of services received by farmers.
- Income to the irrigation department was unrelated to the quality of service it provided or the revenue generated by those services. The department was funded by a state budget line that was independent of fee payment by farmers or the quality or efficiency of its operations.
- Water users had no role in arranging either water delivery or maintenance services. This was done "for" them by the irrigation department.
- While water delivery services were provided to water users, maintenance services were functionally provided by the irrigation department to itself to meet its own convenience and priorities.

The reforms have repaired some of these linkages.

- Water delivery is now arranged jointly by water users, acting through WUAs, and irrigation department engineers.
- Some system maintenance is now planned by WUAs and Distributary Committees, with irrigation department engineers providing technical design services.

- Water user associations serve as general contractors for tertiary-level maintenance and repair services, arranging, supervising, and paying for the programmed work.
- The revenue loop for maintenance services is being closed by tying the level of maintenance grants to associations to the percentage of collectible fees received by the revenue department.
- The general assembly of water users provides accountability for association leadership through regular supervised elections, review and approval of annual maintenance programs, and public inspections of completed work.

Some gaps in accountability remain.

- Irrigation department engineers and field personnel are not accountable to WUAs for their performance in water delivery. There is no payment linkage and no alternative governance mechanism.
- Associations must depend on technical determinations made by department engineers in planning maintenance services and have no independent capacity to evaluate engineering advice provided.
- There is limited accountability in the revenue collection chain from farmer payment to official recordkeeping of payments and computation of payment percentages.

A significant threat to the health and sustainability of the new set-up is posed by a proposed internationally-financed rehabilitation in two major irrigation systems in the state. The proposed rehabilitation process ignores the newly implemented arrangements for arranging, providing, and paying for maintenance services into which water users are integrated and instead relies on old hierarchical pathways which bypass water users. This will weaken the new institutional arrangements and raise legitimate doubts among farmers about the government's commitment to the reforms.

A major continuing challenge to irrigation in Andhra Pradesh is effective water allocation. Because water is not priced, it must be rationed at all levels within a system to provide equitable water delivery service to all users. The state irrigation department has not been able to accomplish this task effectively in the past. Now the challenge falls to WUAs and Distributary Committees to devise ways to secure widespread user agreement with allocational rules and sanction non-compliance effectively.

On balance, the reforms represent a very positive step toward providing effective, efficient, and equitable water delivery and maintenance services to irrigating farmers in the state. However, the current set-up does not represent a final or necessarily sustainable set of relationships and practices. Reformers must continue to move in the direction they have charted by devising and strengthening accountability linkages where they are still weak or lacking, increasing the transparency of all transactions, and restructuring the state irrigation department to perform new roles.

1. Introduction

1.1 Change in India

Macroeconomic reforms began in India in 1991, awakening her from a long slumber. These reforms, and the dramatic new possibilities they create, are catalyzing sweeping changes in economics, politics, technology, and other areas in India. Among these changes are the following.

- Private sector investment and involvement in all areas of the economy, including the "commanding heights" previously reserved for the state sector
- The fall of the Congress Party from the preeminence it had enjoyed since independence and the rise of new parties and coalition governments
- Reduction in the power of the Center and increased power and authority at the state level to chart and implement independent development strategies
- The commencement of a lively public debate regarding development strategies and policies at both state and central levels, and a new openness about problems of rent-seeking and bureaucratic obstruction and inertia.

These changes have lead to a development pluralism in which different parts of India are attempting to solve difficult social and economic problems by applying different approaches at different paces and with different results. This affords a rich opportunity to study and learn from these alternative approaches, straightening the development pathway for all of the experimenting states.

1.2 Swarna Andhra Pradesh

Andhra Pradesh (AP) has become a leader among Indian states in efforts to ignite its own development and thereby improve the lives of its people. Under a popular and charismatic Chief Minister, Chandrababu Naidu, AP has, over the past five years, initiated programs aimed at Swarna Andhra Pradesh[1]. Initiatives have been a mix of classic moves to stimulate economic growth, such as infrastructure investments, coupled with populist measures aimed at quickly improving the lot of the poor and disadvantaged. This latter, going under the title Janmabhoomi[2], has included programs to give poor households access to propane stoves for cooking, safe drinking water, primary schools, healthcare, and rural roads, along with steps to increase people's participation in managing public

[1] "Golden Andhra Pradesh"
[2] "Motherland"

programs. Several programs, such as gas bottle distribution, have been targeted specifically on women.

The state has also embarked on a major effort to improve the performance of irrigated agriculture, in the process confronting some of the most basic and intractable problems hobbling Indian irrigation. The centerpiece of this effort is a program which is attempting to move farmers from the periphery of irrigation service provision to the center of the decisionmaking relating to operation and maintenance. This program is the subject of this study.

Key Features of the AP Development Program

- ✓ Reliance on economic growth to drive development
- ✓ Major investment in roads, airports, and other infrastructure
- ✓ Programs aimed at meeting the minimum needs of weaker sectors
- ✓ An emphasis on good government
- ✓ Steps to give people greater control over public services

In elections held in September and October of 1999, Naidu and his party[3] were returned to power with a near two-thirds majority[4] in the state assembly. The victory, achieved despite the anti-incumbency factor which has been extremely powerful in Indian politics, was widely regarded as an endorsement of his development programs and performance. It was also seen as a break with the older dominant school of patronage politics. In fact, the main opposition party in this election campaigned on a pledge to eliminate charges for rural electricity, which, though irresponsible, has had a powerful appeal in other states in the past. One commentator in the Economic Times put the lesson as follows.

The election suggests that the electorate is not hostile to tough decisions. What it is hostile to is the lack of action to improve their condition, the feeling that there is [not] good governance. It has shown that moves to initiate development earn votes. – S. L. Rao

1.3 Purpose of the Study

The primary purpose of the study is to describe and analyze changes in service relationships in the Andhra Pradesh irrigation sector resulting from recent sector reforms. A second purpose is to further test and refine the methodology developed by the Maintain project[5] to describe and analyze such relationships.

1.4 Study Approach

The methodology applied in this study is relatively new and still evolving. It is being developed by the GTZ project 'Maintain', through original research and adaptation of

[3] Telugu Desam Party (TDP), a regional party
[4] Including a small number seats won by a coalition partner.

concepts from other fields of study[6]. A number of core concepts of this approach are applied in this study. These include those of multi-actor systems, service relationships, transparency and accountability, and suitable incentives.

The study approach employed has five central features.

- It recognizes that a number of different actors are involved in operating and maintaining irrigation systems and that a useful understanding of O&M processes requires considering these multiple actors.
- It focuses on the interactions among these multiple actors, rather than on their organizational structures and static interconnections.
- It examines the service relationships among actors at several different points in time to highlight changes, both in the set of actors involved and in their roles, powers, and actions.
- It gives particular attention to the incentives affecting the parties involved in service relationships and explores ways to improve the incentive structure.
- It focuses on key principles of accountability and transparency in analyzing relationships.

To carry it out, a team of two, an engineer and a management specialist, spent two weeks in Andhra Pradesh interviewing stakeholders, reviewing documents, and visiting the field. The approach required first identifying relevant stakeholders, and then developing exchange diagrams which represented the service interactions of the actors for different purposes and at different times. The services of primary interest were irrigation system maintenance and operations. However, understanding how these services are provided necessarily involved also analyzing revenue collection systems, governance mechanisms, and opportunities for rent-seeking on the part of the actors.

1.5 Preview of Study

In the second section of the study, basic concepts used in analyzing relationships and interactions among the parties involved in providing water delivery and maintenance services are introduced. A third section gives background on the state and its irrigated

[5] The Maintain project is described in an annex.

agriculture. The fourth section describes the reforms introduced beginning in 1997, and the authority system for those reforms. The fifth section discusses the processes involved in providing water delivery and maintenance services both before and after the reforms. The final section draws conclusions about the Andhra experience to date, identifies potential pitfalls on the road ahead, and discusses the usefulness of the analytic methodology employed.

[6] See Huppert, 1997a; Huppert, 1997b; Huppert and Urban, 1998.

2. Concepts

When discussing key features of the ongoing irrigation sector reforms in Andhra Pradesh, two principles come quickly to the fore – transparency and accountability. To understand the impact of the current changes with respect to these important concepts, it is worthwhile to examine the meaning of the terms and to look at common problems related to them and at countervailing factors which could neutralize the negative effects of these problems (see box). Transparency and accountability are characteristics which insure that service relationships are effective, fair, and efficient.

Analysing irrigation system maintenance as a service is a powerful way of looking at this function. Irrigation water delivery and maintenance can be seen as services whether they are provided on a commercial or a non-commercial basis and whether they are supplied by an external party or by the service users themselves. In the past, water delivery and maintenance of infrastructure have been treated as technical functions performed in a unified command and control administrative set-up. Attention, in most cases, was focused exclusively on how to carry out the involved tasks. More recently, irrigation water delivery and system maintenance have come to be regarded as services provided by one party to another. This broadens the scope of the analysis, allowing consideration of different possible providers of particular services rather than assuming a single (public sector) provider.

Definitions

A ***service relationship*** is an interaction between two or more parties in which one party provides a service to the other, and a payment or other service is provided in return.

Accountability is achieved when the client and other stakeholders in a service relationship are able to shape the terms of the service agreement, monitor and evaluate service provision, and effectively sanction non-compliance in accordance with agreed upon terms.

Transparency is achieved when critical information relating to a service relationship is available to a client and other stakeholders in an understandable and accessible form and a useful timeframe.

Governance Mechanisms are contracts, laws, regulations, procedures and common practices which create incentives acting on the parties to an agreement which cause them to honor (or dishonor) its terms.

The fundamental difference between task performance and service provision is that the latter implies a relationship among independent parties. It suggests such questions as "who provides what to whom?", "what is provided in return?", and "how is the integrity of the exchange assured?" It also implies substantial interaction between the provider and the client in the provision process. While the traditional task performance model usually refers to activities *within* an organisation, the service provision

approach normally considers the relationship between the (providing) organisation and external, independent customers. However, since – according to contact theory – every type of exchange system or human interaction can be described as a kind of contractual relationship[7], the perspective of service approaches proves to be useful for the analysis of intraorganisational relationships as well.

Where services are provided in a multi-actor setting, *governance mechanisms* substitute for the management controls employed *within* unified service-providing agencies[8]. Governance mechanisms in service relationships comprise:

- formal and informal contracts and agreements between parties
- externally set and enforced laws and regulations
- third-party interventions such as external audits, regulatory actions, adjudication, and operation of joint committees comprising representatives of both sides
- basic norms, values, and common understandings (*cultures*), shared by the exchange partners
- procedures and common practices growing out of rules, regulations, norms and values

These mechanisms create incentives acting on the parties to the agreement which cause them to honor (or dishonor) its terms. Incentives can be either positive, such as bonus payments for superior performance or praise and approval from fellow farmers; or negative, such as penalty payments, loss of future contracts, or criticism and ridicule from friends or colleagues.

Accountability is based on these governance mechanisms, and relies on them for its legitimacy and its operational modalities. Basic accountability of a service provider to a service user relies on the internal features of the service agreement, such as the terms and conditions of payment. Third party interventions, based on laws and regulations, can also assist in promoting provider-to-user accountability, as can mutual respect for common social norms and values.

Transparency promotes a crucial precondition for accountability – access to information. Practices which contravene terms of an agreement flourish in the absence of information about the agreement, transactions relating to it, the nature of the services provided,

[7] See Wolff and Huppert, 2000
[8] Hierachical control can be looked upon as a particular type of governance mechanism.

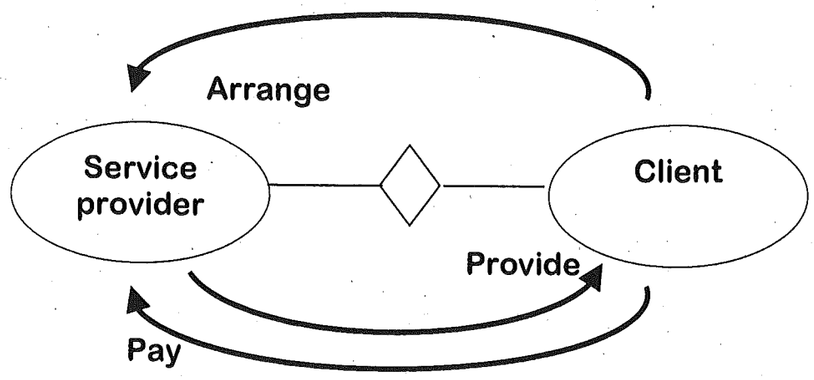
payments made, and so on. Transparency, or openness and access to critical information makes effective operation of governance mechanisms possible.

Further discussion is presented against this background. Water delivery and maintenance are seen here as twin services, necessary to generate benefits from irrigated agriculture. Water delivery is the final outcome of the service production process, since it is water delivery which feeds into the agricultural production process, generating the stream of benefits. Maintenance, though producing no additional value by itself, is a necessary supporting component of the water delivery service production process. Without maintenance, the system quickly loses its ability to provide water delivery service. These services may be provided by the same entity, or by different ones. The discussion hence centers around services of water delivery and maintenance (D&M) and not around the tasks of operation and maintenance (O&M). Conceptual issues are considered for two cases – a basic case of commercial service provision and a more complex case of multi-actor non-commercial service provision.

2.1 A&T Problems in Basic Commercial Service Provision

A service transaction can be conceived of as a bundle of four primary functions (Herder-Dorneich, 1986; Savas, 1987; Svendsen, 1994; Huppert 1994). These functions are arranging the service, providing the service, paying for the service, and using the service (Figure 1). Arranging the service involves identifying a need, selecting a supplier, and negotiating an agreement with that supplier. The contracts, agreements and other forms of governance mechanisms that coordinate the exchange relationship, are represented by the 'diamant' in the figure. Providing the service involves delivering it in a way which satisfies the terms of the negotiated agreement. Paying for the service requires transferring something of value to the service provider in exchange for the service provided, as specified in the negotiated agreement. Payment is usually made only upon satisfactory delivery, again judged relative to the terms of the agreement, although this is not always the case. Payment is usually made in money, but the transaction can also be arranged on a barter basis, where another good or service is provided in return.

Figure 1: Basic service transaction



Accountability in a service relationship is directly related to how, for whom, and by whom these four primary functions are performed. In particular, the functions of arranging the service and paying for the service are critical components of accountability, since it is these functions which bring work to the supplier and reward him for performing it. Transparency is another essential element of accountability. Without it, one party can easily take advantage of another, or parties can collude to further their own interests rather than the interests of the larger group wich they representet. Transparency fosters mutual understanding, honest dealings, and trust among the parties.

In the case of a simple commercial exchange between two individuals, the provider of the service, is accountable to the customer, i.e. the person or organization that uses the service delivered. In addition to using the service, the customer assumes the two key procurement functions – he is the arranger and the payer as well as the user of the service. The customer is thus able, under normal circumstances, to shape the terms of the delivery agreement, monitor and evaluate the provision of the service, and sanction non-compliance with the agreed upon terms by refusing to pay, thus achieving accountability.

Take the example of a farmer bringing a pump to a mechanic for repair. The farmer (customer), selects a mechanic (service provider), describes the problem, and requests the repair service desired. The two agree on a rate of payment, and the pump is repaired. Being satisfied, the farmer pays the mechanic and the transaction is complete. A joint inspection of the damage at the outset gives both parties a mutual understanding of the

problem, enhancing transparency. Posted hourly labor rates do the same for the other side of the transaction. The mechanic's estimate of the amount of time required and the farmer's request to put the pump back in prime operating condition give clear terms of exchange. Direct interaction between the two minimizes the chance for miscommunication, further enhancing transparency.

However under less-than-ideal circumstances, such high standards of transparency and accountability are often missing. A number of potential problems relate to intransparency. One problem arises because services such as consulting, advising, teaching, and other complex non-routine professional activities cannot be inspected in advance. Unlike the purchase of a material good, where the customer can evaluate the quality of the item by prior inspection, services are, by definition, intangible. The quality of a service can be ascertained in advance only by examining the qualifications of the provider and by reviewing the provider's past work. Even if the provider and the customer agree on a predetermined level of the service quality, a certain degree of intransparency – and hence risk to the customer – regarding the quality of the ensuing service will remain.

In this type of simple commercial service provision, the customer is simultaneously the consumer of the service, its arranger and the payer for the service and is in direct communication with the service provider. The customer is thus able to use the leverage stemming from the closed loop between service provision and direct payment to bring about and enforce acceptable terms and conditions even under difficult circumstances. In addition, direct interactions can lead to mutual trust between the customer and the service provider, particularly when both parties desire to build a longer-term relationship. This assumes, of course, that effective competition in providing the service is present, creating for the provider the risk that the consumer may avail of another service provider in the future if she is dissatisfied. Where a service provider places a low value on building customer loyalty, problems related to accountability and transparency are far more likely to arise. The advantages of such a direct provider-customer interaction are diminished or lost in more complicated cases. There, special steps and measures – in other words, particular contractual arrangements or other governance mechanisms – may be necessary to insure effective and equitable functioning of service relationships.

2.2 The Dilemma of Non-Commercial Service Provision

The dilemma of non-commercial service provision derives from the fragmentation of basic procurement functions of arranging, paying for, and using a service. To continue with our example of pump repair, if, as in the case of a traditional state-owned irrigation system, the pumpset is owned by an agency of the state, it will be the state who arranges for the pump

repair. It may do this either through a contract with an outside entity or by using its own facilities and staff. The state may require affected farmers to pay for the service, in which case farmers retain the payment and use functions. However the farmers will have little control over the service provider who will see the state, which arranges the work, as its primary client. Typically, the state will also pay for the repair, though farmers may be billed for the service after the fact in the form of service fees. No matter whether farmers pay or not, the state will pay the bills, making it the effective payer. In this case, the role of farmers is restricted to use of the pump when it is operational.

In this shrinkage of "customer sovereignty", the feedback loop between service provision and payments is interrupted and limited to a loop between the state as the arranger and payer and the service provider. This truncated loop has a vastly different incentive structure than does the full loop, which involves the users of the service, and is significantly more susceptible to problems related to intransparency and broken accountability ties. There exists a major feedback gap between the actual beneficiaries of this service and the parties providing, arranging and paying for the services.

Conditions which Counter A&T Problems

- ✓ Long-term perspective by provider
- ✓ Competition among providers
- ✓ Trust between consumer and provider
- ✓ Appropriate technical competence of involved parties
- ✓ Open disclosure of relevant information
- ✓ Effective governance mechanisms and supporting institutions

In a situation like this, where there are no longer incentive-creating streams of performance-related payments, these accountability problems are much harder to overcome. For consumers, it is difficult to inject their needs and preferences into the system, since it is not they who arrange for services. Similarly, consumers have little chance to sanction deviations from their needs and preferences, or to reward effective performance, since somebody else pays for the provision. Likewise, the state agency arranging the services has little incentive to reliably represent the interests of the users, since bureaucracies seldom reward managers for such fidelity to clients. No wonder then, that transparency and accountability problems arise so frequently, and give rise to opportunistic behavior which is almost always contrary to the interests of the service consumers.

2.3 The Challenge

As the above discussion and examples have shown, the provision of services, in both commercial and non-commercial situations, is inherently prone to problems of intransparency and failed accountability. Problems in a non-commercial setting are clearly more severe. These are not subtle problems of deficient technical knowledge, but rather

very fundamental problems of distorted accountability linkages and perverse incentives to perform[9].

The solution, however, is not simply to commercialize all service provision, hoping that so doing will solve potential A&T problems in a stroke. Fostering commercialization under imperfect market conditions has its own problems which must be overcome, and commercialization will be appropriate in some circumstances and not in others. Rather, the approach suggested here calls for a diagnosis of the relationships between the major actors involved, and, on the basis of this diagnosis, to discuss and design solutions with the parties concerned. Key elements of a solution include an appropriate set of institutions which fairly represent the interests of the major stakeholders, equitable contractual arrangements governing service delivery among the parties, and mechanisms which hold the service provider accountable to service users and which insure that transactions take place in the full light of day.

The following case study of irrigation reform in Andhra Pradesh is intended to demonstrate how institutional arrangements in the irrigation sector that have experienced serious failures of transparency and accountability are undergoing major changes having the potential to substantially improve the delivery of irrigation services. The reforms described are recent and their long-term effectiveness and sustainability are still uncertain, but early steps appear soundly grounded.

[9] For further discussion of these problems see Wolff and Huppert (2000).

3. Background

3.1 A P

Andhra Pradesh is one of the larger states in India, covering 27.68 M hectares, about the size of New Zealand. It has a population of about 75 million, 72% of whom depend on agriculture for a livelihood and about 30% of whom have incomes below the poverty line. The state is rich in natural resources – coal, barites, bauxite, iron ore, gas, oil, limestone, granite, and fertile agricultural land. Two major rivers, the Godavari and the Krishna, generate 84 percent of the in-state catchment yield and supply irrigation water to extensive coastal delta areas as well as inland irrigated areas. Rivers, even major perennial rivers, are highly seasonal[10] and require storage for sustainable irrigation development. Major crops produced are grains, oilseeds, cotton, and sugarcane. Agriculture contributes about 30 percent of the State Gross Domestic Product.

In spite of these riches, development has lagged. During the period 1980 to 1995, Andhra's annual growth rate was 4.6%, compared with an all-India rate of 5.2 percent. At the heart of this poor performance has been the state's inability to deliver essential infrastructure and social services[11]. A key element of this inability has been a bloated and ineffective government bureaucracy. Between 1986 and 1995, the state government's salary bill grew at 5.6 percent annually, in response to a 4.1 percent annual increase in employment (to 1.2 million) and a 1.5 percent annual increase in real wages. Wages consume about half of the state's total income.

Under the Naidu government (since 1995), several steps have been taken to address these chronic problems, and the capital, Hyderabad, has emerged as a leader in the new information technology industry, along with Bangalore and Pune. Many of the fundamental problems remain, however, including a static agricultural base, on which nearly three-quarters of the state's population depends.

3.2 Irrigated Agriculture

3.2.1 Irrigation

Around 11 M hectares (40%) of the state's geographic area is sown to crops, and about half of that is equipped with irrigation facilities. There is a wild confusion of contradictory

[10] More than 90% of their flow occurs between June and December.
[11] World Bank, 1997.

statistics on irrigated area available in government records, making a precise specification of the extent of irrigation difficult. Some outlines can be sketched out, however.

There are three basic types of irrigation in the state – large projects, comprising major and medium schemes[12]; tanks, which are smaller shallow reservoirs; and wells. Systems of all three types were constructed by rulers of Kakatiya and Vijayanagar Kingdoms, during the 13th and 16th centuries respectively, by the Moguls who followed, and during the period of British rule. During the British period, large and highly productive irrigation schemes were constructed in the deltas of the Godavari, Krishna, and Pennar rivers. At independence in 1947, existing irrigation potential was evenly divided between major and medium schemes (1.33 M hectares) and tanks (1.37 M hectares).

Following independence, emphasis was placed on developing major and medium canal systems. Since then 42 percent of the state development budget has been allocated to irrigation development, mostly to major and medium irrigation. About 1.67 M hectares of irrigation potential was added after 1950 under these categories. At the same time, there was strong growth in privately-developed groundwater irrigation, with more than 1.5 M hectares of command developed. Groundwater irrigation is based primarily on shallow large-diameter open wells dug in weathered hard rock formations of the Deccan Plateau.

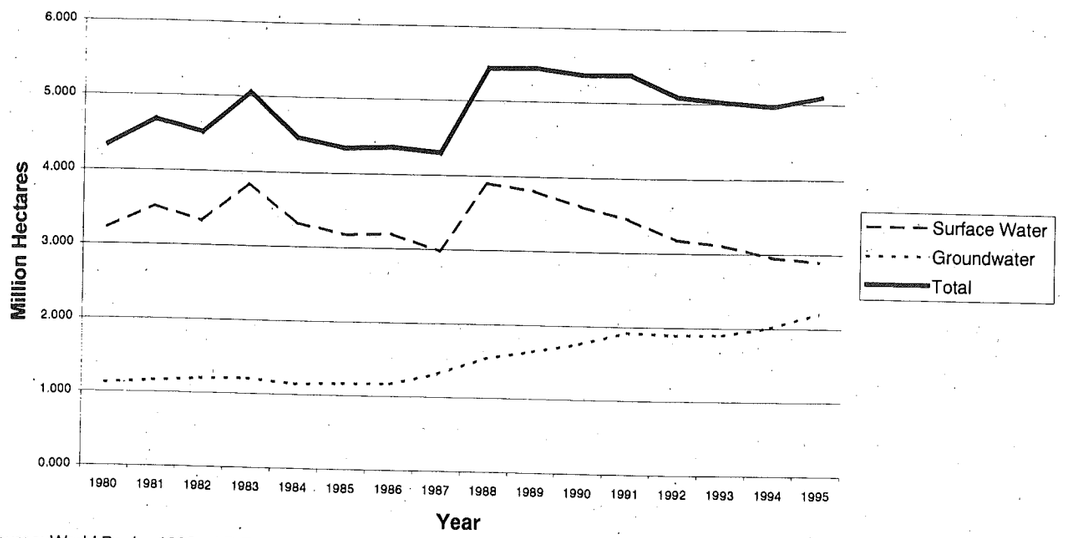
At present there are in the state 15 major projects, 75 medium projects, approximately 82,000 tanks[13], and 1.5 M wells. The ultimate potential command of this infrastructure is difficult to estimate, but probably lies in the neighborhood of 7.1 to 7.5 M hectares. Of the estimated ultimate irrigation potential, roughly three-quarters has already been developed, including virtually all of the minor surface and groundwater potential.

Not all of the irrigation potential is being utilized, however, giving rise to the famous "utilization gap." Because statistics vary, it is difficult to fix the exact magnitude of this gap. One World Bank document estimates the surface irrigation gap at 20 to 25 percent[14], implying that a quarter of the investment in surface irrigation is non-productive. More disturbing, the gross area actually irrigated by surface systems in the state is declining, and in 1995 was just 74 percent of its peak value of 3.9 M hectares in 1988. This decline has been partially offset by the strong run up in groundwater irrigated area, which

[12] Major projects are those with service areas of more than 10,000 hectares. Medium projects have service areas of between 2,000 and 10,000 hectares. Smaller projects are termed minor.
[13] Only about 12,000 of these have command areas greater than 40 hectares. The remainder are quite small and used as domestic water sources and for small-scale irrigation.
[14] World Bank, 1997.

commenced about the same time, encouraged by subsidized credit and nearly free electricity. But gross irrigated area in the state is still lower than it was in 1988 (Figure 2).

Figure 2: Pradesh gross area irrigated, 1980-1995



Source: World Bank. 1998. AP Economic Restructuring Project.

3.2.2 Agriculture

Average land holding size in AP is 1.56 ha, with irrigated farms averaging 0.88 hectares, just over half of the overall average. Land distribution is highly skewed, with 77 percent of the holdings being less than 2.0 hectares in size and covering just 36 percent of agricultural area, while 1 percent of the holdings larger than 10 hectares cover 13 percent of the area. Irrigated holdings are more evenly distributed. Fifty percent of irrigated area is in small and marginal holdings[15], worked by 79 percent of farmers, while only 6 percent of irrigated land is in economic holdings of more than 10 hectares[16]. Thus, while uneven, distribution of irrigated land is not as highly skewed as in some other locations.

Seventy percent of irrigated area is devoted to cereal crops, principally rice, 14 percent to other food crops such as chilies, fruits, and vegetables, 12 percent to oilseeds, and 4 percent to non-food crops such as tobacco, sugarcane, and cotton. Irrigation produces

[15] Less than 2 hectares.
[16] 1990-91 Agricultural Census, cited in World Bank. 1998. AP Economic Restructuring Project.

two-thirds of the cereal crops grown in the state and more than half of the fruits and vegetables. Although crop yields broken out by irrigated and non-irrigated crops are not available, rice, which is almost entirely irrigated, showed a relatively low yield of about 3.9 tons/hectare in 1994. The trend growth rate for paddy yield between 1980 and 1994 is an otherwise reasonable 2.1 percent per year, however this was accomplished on a shrinking sown area base which should have boosted the rate of yield growth on remaining land, as more marginal land was retired.

3.2.3 Public Sector Managing Organizations

A large number of public agencies are involved in managing irrigation service. These include the following:

- Irrigation and Command Area Development Department (ICADD). This is the most important of the involved government departments. It employs a staff of about 55,000 across the state and has traditionally been responsible for both developing and managing major and medium canal schemes, along with 12,294 of the larger tanks. It is described further in a separate section.
- State Irrigation Corporation. This corporation was formed in 1974 to develop and operate lift irrigation schemes and wells for irrigation. It is presently under the Minister, Minor Irrigation and Groundwater, however its performance has been unsatisfactory. At its peak, it employed about 3,500 staff. Staff levels have now been reduced to about 1,000 through attrition and transfers, and it is slated for winding up by 2001.
- Groundwater Department. A unit of the ICAD Department at the Chief Engineer level. It is responsible for monitoring groundwater levels.
- Panchayat Raj Department. This department, under a separate minister, is ultimately responsible for about 70,000 smaller tanks operated and maintained by local villages as drinking water sources and for small-scale irrigation.
- Agriculture Department. A separate department under a separate minister, it is responsible for agriculture, including agricultural extension, in the state.

In addition to line government agencies, there are several committees relevant to irrigation management. These are the following:

- State Command Area Development Council. This body was established in 1996, following guidelines from the Center, to take policy decisions on development

activities in public gravity canal commands in the state. It is to include a variety of non-government members, including elected Members of Parliament (MPs), members of the state Legislative Assembly (MLAs), WUA representatives, and NGO representatives. It is not currently active and its future role is uncertain.

- System Command Area Development Boards. These boards were to be established in the commands of major irrigation systems, such as Sriramsagar and Nagajunasagar to manage command area activities, under the guidelines established by the State Command Area Development Council. They were to have an executive committee to implement their decisions, but are likewise not active at present. This concept needs to be reassessed in light of the new WUA-based set-up within these systems.
- Water Charges Review Committee. This is a standing state-level committee chaired by the Principal Secretary, Irrigation and comprising Secretaries of Agriculture, Finance, Irrigation, Revenue and others. It is to meet annually to assess water charge practices and revenue collection performance. It is to have 3 members from the Apex Committee of water users once that body is created.

3.2.3.1 ICADD

The ICADD organization can be separated into three parts. The first, the government level, comprises two Ministers sharing authority over irrigation, the Principal Secretary ICADD, and four Secretaries[17] under him. A technical support position of lower rank dealing with tenders, the Chief Technical Examiner, is also attached to the Principal Secretary (Figure 3). Responsibilities of the two ministers are divided by scale of scheme. One oversees major and medium irrigation and the other minor (tank) irrigation and groundwater.

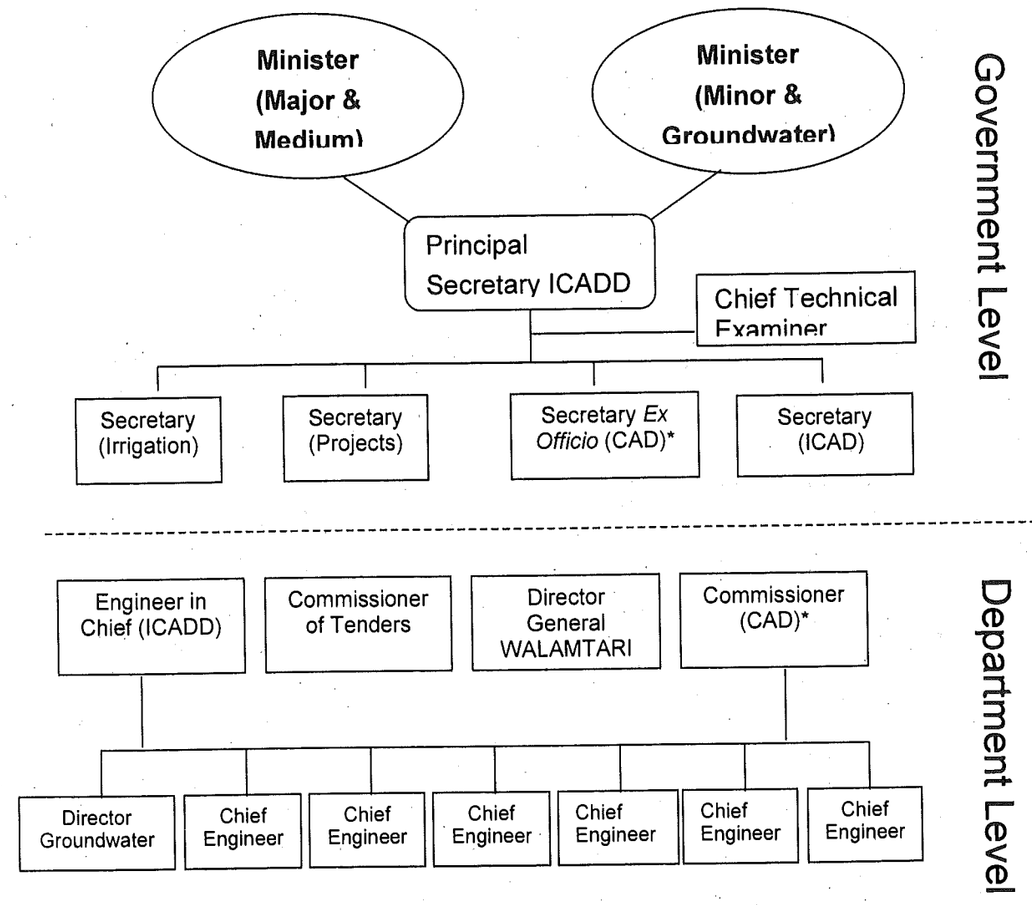
The second level comprises four positions, three Engineer-in-Chief positions and a similar one termed Commissioner Command Area Development (CAD). The Secretary (Irrigation) deals mostly with interstate water issues, and the Secretary (ICAD) deals with administrative matters. The Secretary (Projects) deals with capital projects, while the Secretary (CAD) handles O&M matters, including Water User Association formation and support. All of the above positions are based in the state secretariat in Hyderabad.

The third level is the field level and, unlike the government level in which lines of accountability are rather fluid, this level is organized as a classic hierarchy extending

[17] Titles in ICADD bureaucracy are a function both of position in the hierarchy and civil service ranking. As a result, they become somewhat idiosyncratic. Here they have been standardized somewhat to make them easier to understand.

downward from 6 Chief Engineers. Each individual in this structure has a span of control of about five. The Chief Engineers are accountable principally to the Engineer-in-Chief (ICADD) and the Commissioner (CAD)[18] depending on the function involved.

Figure 3: Primary organizational structure of ICAD Department



* Positions are filled by the same individual

In addition, there is a groundwater unit at the same level which deals with groundwater issues. The structure for a typical hierarchy under a Chief Engineer is shown in Figure 4. The second and third levels, taken together, comprise what is usually referred to as the ICAD Department. Total staff on the payroll is around 55 thousand, of whom about 12 thousand are engineers. About 40% are office staff.

[18] The other two supervise tendering and a department training and research institution respectively.

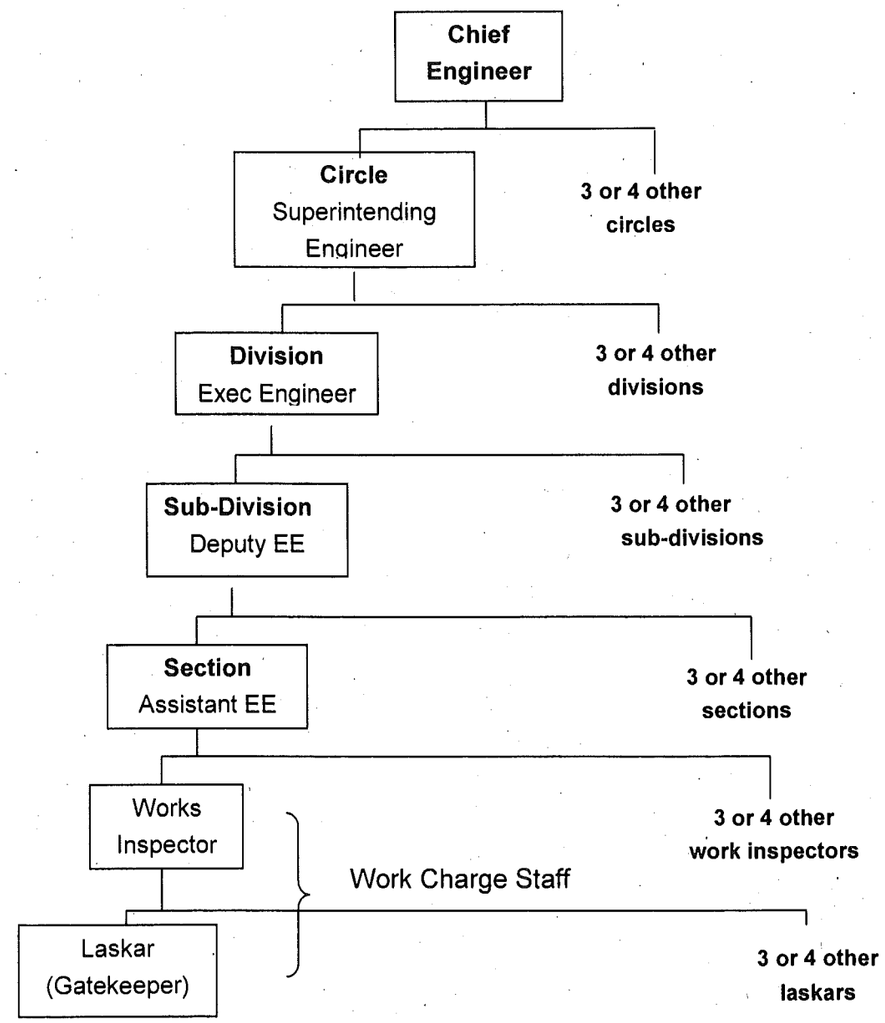
3.2.3.2 Problems Facing the Sector

The irrigated agriculture situation facing the new government in 1995 was dismal. Growth was slow, yields modest, and gross irrigated area actually shrinking. Systems embodying huge investments were in disrepair and donors were balking at making additional investments in rehabilitation and repair.

At the same time, the realization was growing that the roots of these problems were not technical or financial, but institutional. A huge administrative bureaucracy was deeply entrenched and rigid work rules prevented more flexible work assignments, transfers, and staff reductions. The Gangyopadhyay Commission, after looking at work norms and staffing levels, reported in 1995 that the ICAD Department was overstaffed by 50%. The Department, which should have been in the lead in searching for and solving root problems, seemed more concerned with administrative routine. Within the Department, incentives for problem-solving behavior and service-oriented management were virtually nil.

Staff costs consumed the bulk of allocations received from the Treasury for irrigation operation and maintenance (O&M). In the more distant past the ratio of staff costs to actual operating expenses was said to be around 1 to 4. By the mid-1990s it was closer to 1 to 1. A 1997 study conducted for the World Bank showed that only Rs 27/acre (US$ 0.68) was available for actual operations and maintenance after paying salaries and other overhead costs. Cost recovery from farmers was poor because of low irrigation fee rates as well as low collection and transmission efficiencies. Cost recovery, however, was not the fundamental problem. Other programs and sectors were receiving huge subsidies from the treasury and such allocations could have been made for irrigation O&M as well if the government had wished. There was no connection between water charge receipts and allocations to the Department; it was simply receiving short rations from the government relative to its cost structure. Its more fundamental problems related to management and incentive structures.

Figure 4: Field organizational structure of ICAD Department



4. Reforms

4.1 Overview

When the new state government took office in 1994, it determined to make reform of irrigation management one of its priority efforts. It first initiated and studied a series of experimental farmer-management pilot studies and then decided on a dramatic expansion of the reforms to the entire state, rather than continuing with the slow step-by-step pilot project approach.

4.2 The Farmer Participation Act of 1997

In April 1997, the Farmers' Management of Irrigation Systems Act (FMISA) was gazetted after having been unanimously passed by the Andhra Pradesh legislative assembly. The legislation opened the possibility of a real transfer of power and control over canal system operation and maintenance to irrigating farmers. Prior to introducing this act, the Chief Minister organized a series of meetings around the state to which political leaders from all parties were invited, to describe and explain the proposals for change. This consultative process of involving local politicians, along with the proactive leadership provided by the Chief Minister, were important factors in the acceptance greeting the proposed changes. In conjunction with the organizational changes, water rates were increased by a factor of three without significant protest. Elections for presidents and managing committee membership under the act were held in April of 1997 in 9,705 designated water user areas. In an additional 500 or so areas, elections were not held for various reasons. These elections are taking place as problems preventing them are resolved.

Key Features of the Act

- ✓ The act transfers control over field personnel of the state Irrigation Department to farmer-based organizations.
- ✓ The act makes membership in primary-level WUOs compulsory, along with obligations of membership including fee payment.
- ✓ The act requires annual budgets of Farmer Organisations be brought before the general body of the Organisations for approval.
- ✓ The act gives Farmer Organisations legal personalities and powers, including the right to levy taxes and impose fines which are ultimately enforceable through the legal powers of the state.
- ✓ The act separates Farmer Organisations from the local political establishments.
- ✓ The act allows the government to resume either governance or operational control from Farmer Organisations in the event that they fail to perform effectively.

The Act authorizes District Collectors[19] to delineate contiguous and comprehensive water users areas based on hydraulic boundaries within the commands of major and medium irrigation schemes in the state. In practice, these generally include the command of a single minor and encompass about 500 hectares each. A president is elected at-large by all of the land owners/tenants within the area of the WUA, and representatives of between 4 and 10 designated sub-areas, termed Territorial Constituencies (TCs) within each WUA area are elected by land holders/tenants within the sub-area. Together, this group comprises a managing committee (MC). The president and the MC serve for 5 years and make decisions related to the affairs of the Association. Employees of state and local government entities, including panchayats, are ineligible to stand for these posts. Persons in default on land revenue or water tax assessments are likewise ineligible.

Higher level organizations are federated from these basic units at the distributary, system, and project levels. Membership in the general bodies of each of these higher-level organizations is comprised of the presidents of the organizations one level down. Each also has a managing committee, selected from among its members. These are collectively referred to here as Farmers' Organizations (FOs).

Each farmers' organization is constituted as a body corporate with associated legal status and powers. WUAs may levy and collect fees from all farmers residing within the water user area. Arrears can be recovered as arrears of land revenue. It may also levy fines of up to Rs 1,000 (US$25) for infractions of rules. These sanctions can be enforced by the court system as civil offenses (with higher penalties) if not paid to the WUA.

The primary functions of each WUA are to plan and implement water distribution within its area of responsibility, to plan and implement maintenance within this area, to keep financial, land, water and facilities records, to resolve disputes among members, and to raise resources. Distributary and Project Committees have similar responsibilities for their respective areas.

To implement operational responsibilities, each organization is assigned a Competent Authority from the Irrigation and Command Area Development Department who is responsible to the farmers' organization to implement and execute all decisions taken by it. The intention is to put the state irrigation O&M machinery at the disposal of the farmers it is intended to serve.

[19] The chief state administrative officer at the district level, whose primary responsibility is revenue collection.

Funds for the operation of Farmer Organisations include a share of the water tax collected by the state in the area of the organisation's responsibility, fees collected directly from farmers, income from properties and assets attached to the relevant portion of the irrigation system, and development grants and funds from government or other agencies. Funds must be kept in a registered national or cooperative bank. Each Farmer Organisation must have its books audited regularly.

The state government may appoint a commissioner to exercise general control and superintendence over the competent authorities and district commissioner associated with particular Farmer Organisations if they fail to adequately perform their duties. It may also appoint officers to perform the functions of a Farmer Organisation until it is constituted (or reconstituted in the event of collapse).

4.3 Authority System for Reforms

Any service relationship must have an authority system, establishing and legitimating the rights and powers of the parties involved. Most of the powers used in managing irrigation in Andhra are derived from the state constitution and statutes. This authority, in turn, rests on the reservation, in the Indian constitution, of water as a state subject. These authorities are summarized in Table 2.

New authorities, and related changes in existing authorities, are conveyed principally by the Farmer Management of Irrigation Systems Act of 1997. Older institutions exist and function under previous acts. Exceptions to the primacy of the state sovereignty occur in only two areas. Regulation of dam safety is the responsibility of the Central Water Commission, a federal body, and allocation of the interstate waters of the Krishna River was carried out by the Centrally-mandated Krishna Water Disputes Tribunal Award of 1973. This award resolved disputes over the waters of the Krishna among the three riparian states, and, with amendments, continues in force.

In a less formal way, the present government of the state, in place for the last five years, provides the political legitimacy for the ongoing reforms and acts to support the system of legal authorities. Prior to the recent election, which returned the Naidu government to power, considerable concern was expressed over the possible fate of the reforms in the event that the government was not reelected. This suggests that, at least in the early stages of reform, both legal authority and political support are necessary to introduce and legitimate new rights and powers. Another informal authority is that which must be granted by the farmer-members of a WUA for the organization to exit. Although technically, a WUA

is constituted by an action of the District Collector, and farmers are automatically members, clearly the WUA will exist only on paper if farmer support is lacking.

There are at least two important areas in which necessary authority has not been established, however. One is the area of water rights. Coherent systems of allocating and adjudicating water rights are lacking across India and Andhra is no exception. The result is uncertainty for irrigating farmers over their future water allocations. Uncertainty arises from ad hoc procedures for allocating water among irrigation schemes, particularly under conditions of scarcity; for allocations among agricultural, municipal, and industrial users; and between existing and future users of water. As pressures on finite water resources increase, this uncertainty will grow, as will competition, making water delivery increasingly difficult and hard to manage.

The second area is the authority given to Farmer Organisations to control and manage irrigation system field personnel. Although granted the authority to issue instructions to the ICADD competent authority, Farmer Organisations are given no authority to insure that those instructions are carried out or to evaluate the performance of ICADD employees in implementing those instructions. This renders the authority to issue instructions hollow and potentially ineffectual.

Table 1: Authority system for Andhra Pradesh irrigation management reforms

Actor	Existence by Authority of:	Authority to:	Basis of Authority
ICADD	GOAP	• Allocate in-state surface water • Operate and maintain dams and other major structures • Plan and implement irrigation system rehabilitation programs • Assume control of FOs in event of failure to perform • Allocate interstate water	• Indian Constitution • AP Constitution • AP statutes • Farmer Mgt of Irrigation Systems Act of 1997 (FMISA) • Krishna Water Disputes Tribunal Award of 1973
Farmer Organizations / Managing Committees	GOAP	• Function as body corporate • Plan and implement water distribution • Plan and implement maintenance • Maintain landholder register • Prepare and maintain inventory of system facilities • Resolve disputes among water users • Levy and collect irrigation fees and other revenues and maintain accounts • Levy fines for infractions • Issue instructions to CADD Competent Authority for certain O&M activities • Conduct general body meetings • Elect officers of higher level FOs	• FMISA • Changes in Revenue Code
Farmer Members of WUA General Body	GOAP	• Elect WUA president and managing committee reps • Recall and replace WUA president and managing committee reps	• Land ownership or tenancy agreement • FMISA
District Collectors	GOAP	• Delineate water user areas • Establish WUAs and higher level FOs with compulsory membership of landholders • Organize and oversee FO elections	• FMISA
		• Collect irrigation fees	• GOAP Statute
Courts	GOAP	• Enforce irrigation-related fines and penalties	• AP Constitution • FMISA
Chartered Accountants	GOAP	• Audit FO accounts	• Statute
Central Water Commission	GOI	• Regulate dam safety	• GOI Statute

5. Service Exchanges

In keeping with the approach described earlier, irrigation system operations and maintenance are analyzed as a set of service exchanges. Two primary services are the focus of the analysis – water delivery and system maintenance. Water delivery service is the division of an allocated supply at the system level into allotments which satisfy quantity and timing criteria at lower system levels. Maintenance is the set of services which slows the deterioration of a facility, whether caused by use or aging, sustaining its capability to provide a specified level of a valued good or service[20].

Some important services, such as allocating surface water among schemes in response to shortages, are not addressed in this discussion because procedures and relationships have not changed as a result of recent reforms. A number of other supporting services related to the new WUAs and Distributary Commitees are changing and bear importantly on the two primary services. These include the following, with the involved parties indicated in parentheses.

- Updating irrigated land revenue records (WUA/Revenue Department)
- Collecting payments (Revenue Department/WUA/GOAP)
- Electing new WUA leaders (District Collector/WUA)
- Financial audits (Chartered Accountants/WUA/GOAP)
- Social audits (WUA/ICADD)
- Enforcing rules and applying penalties (Courts/WUA)

5.1 Pre-reform

5.1.1 Services and Exchanges

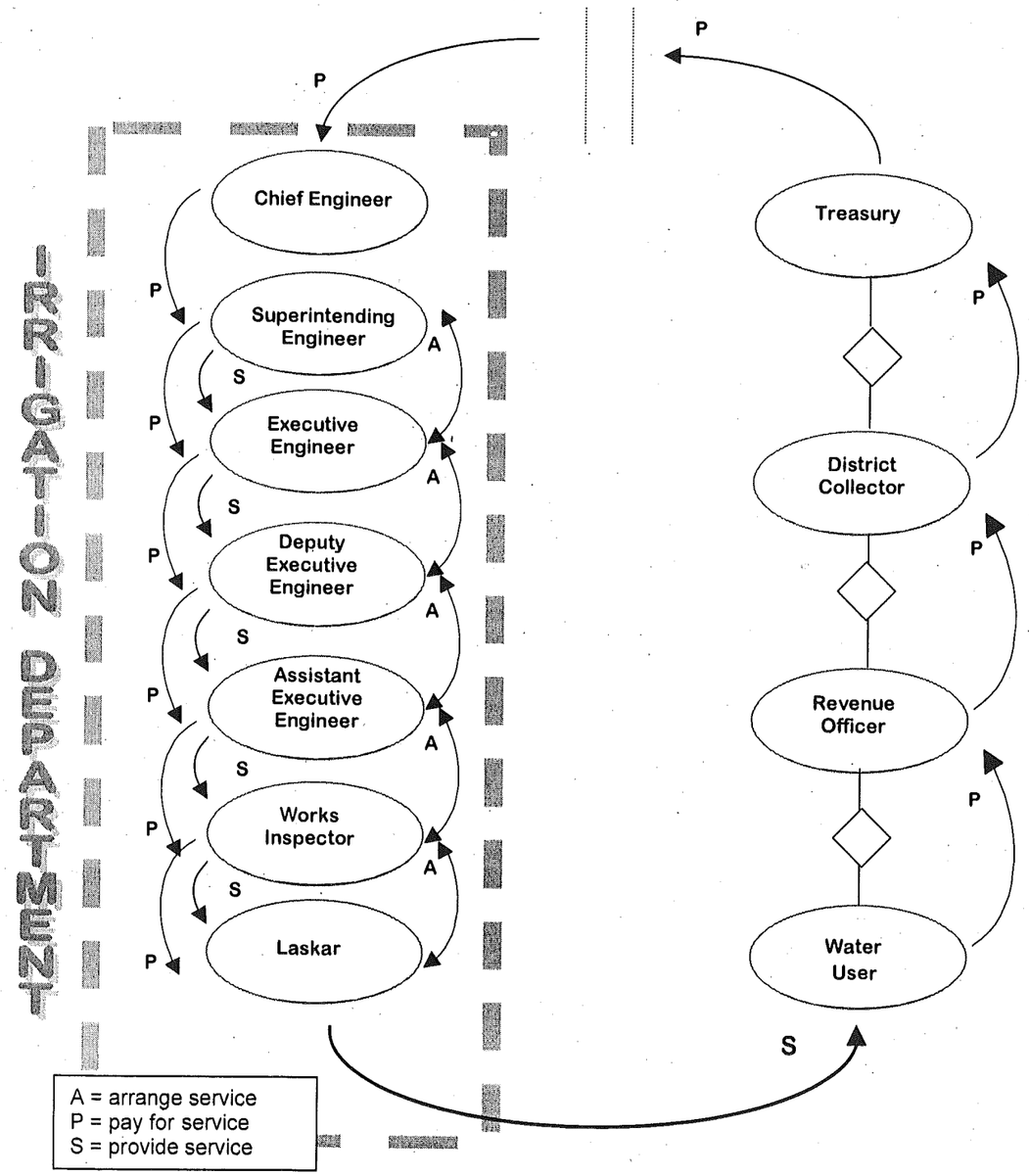
Prior to the implementation of the reform, water delivery and maintenance services were provided by the ICAD Department using standardized procedures employed for more than 100 years across India. Principal actors involved in pre-reform provision of water delivery and maintenance services were the 7 tiers of ICADD staff (see Figure 4). Water deliveries in major schemes were arranged through interactions among the various levels of the ICADD hierarchy, typically extending from the Laskar up through the Executive Engineer or Superintending Engineer (Figure 5). Laskars, the lowest-level field staff, are the ones who actually deliver irrigation service to water users. Accountability followed the standard authority channels in the ICADD hierarchy. Little or no farmer input was sought or utilized in making water allocation and delivery decisions or in evaluating the quality of service

[20] Based on definitions by Ostrom et al (1993) and Karunasena (1993) as cited in Carruthers and Morrison (1994).

provided. In theory, at least, demand for water was estimated by laskars and aggregated upward until it reached the level in control of the water source. This is shown as the Superintending Engineer level in the figure, but in practice would vary with the size of the scheme. This is shown as the arranging function A. Water would then be allocated and supplied to successively lower levels by the same officers (providing function S) until it reached a laskar who would deliver it to the end users.

The farmer, the local revenue officer, the District Collector, and the State Treasury comprised the payment chain (with payment functions P), but there was no linkage between payment and service. There were formal governance mechanisms in place between each of the parties in the payment chain, comprising laws and rules issues by the state government. In practice these were only partially ineffective.

Figure 5: Primary functional relationships among actors providing pre-reform water delivery service



Maintenance was carried out using the hierarchical ICADD administrative structure. Primary exchanges related to maintenance service provision are shown in Figure xx. Maintenance funds were allocated on a per acre base down to the level of the Executive Engineer (EE). From that point onwards, funds were concentrated and used for a discrete number of particular projects. Information on maintenance needs was transmitted upward through the hierarchy and decisions typically made at the level of Deputy or Assistant Executive Engineer. A private contractor was identified and engaged to carry out the work. Farmers had no role in this process and so the maintenance work can be depicted as a service provided to the supervising engineer. Because funds available for actual maintenance work[21] were always less than the amount required, much required maintenance was deferred.

In neither case was the payment function an important element of the service provision process. Payment from farmers was expected, in the form of irrigation fees collected by the Revenue Department. Revenue Officers of the Revenue Department maintained records of area irrigated by each farmer by crop and prepared bills for irrigation service accordingly. In theory, in major and medium schemes the type of crop which could be grown by each farmer (irrigated wet or irrigated dry) was specified, but this restriction was not enforced[22].

Actual revenue collected was only a fraction of the cost of providing the services. Moreover, there was no connection between service provision and payment. Funds collected from farmers were channeled upward, eventually reaching the state treasury and mingled with funds from other sources. Annual allocations of the state's general revenue supported the ICADD and its operations. Farmers who didn't pay received the same water supply as those who did. Likewise the ICADD budget was unrelated to the revenue stream generated by the services it provided. Farmers played the largely passive role of service users, and were not involved in arranging or paying for the service, per se.

5.1.2 Governance Mechanisms

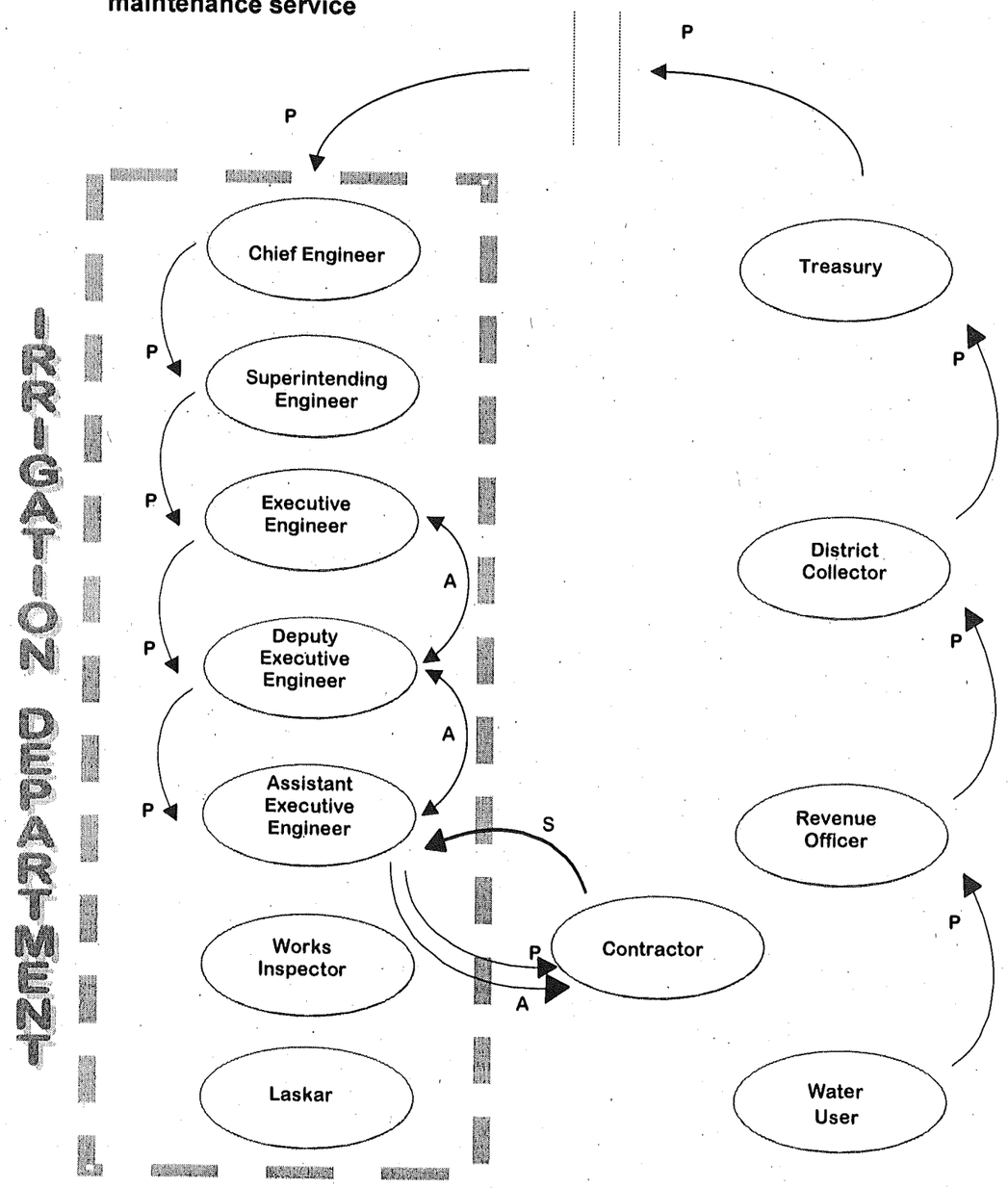
Governance in arranging and providing water delivery and maintenance services in the pre-reform setting consisted principally of the management and administrative controls internal to the ICADD. These were generally weak and oriented toward maintaining smooth administrative routines rather than toward service delivery. Management was not

[21] The residual of allocations from the center after covering personnel and other fixed costs.

performance oriented and so the orientation of field staff was inward and upward toward higher echelons of the department and not outward toward clients. The result was predictably poor service in terms both of water delivery and facilities maintenance.

[22] Farmers take advantage of the absence of enforcement to grow rice wherever possible in most systems. This greatly expands the amount of water consumed and diminishes the area, and the number of farmers the system can serve.

Figure 6: Primary functional relationships among actors providing pre-reform maintenance service



Revenue generation, though not directly linked to service provision had its own set of problems. Because governance mechanisms providing incentives for accurate recording of areas irrigated were absent and control and oversight limited, revenue officers operated in an incentive environment which was fertile ground for opportunistic behavior. The goal of the state Treasury is to maximize revenue collection to fund state government, including ICADD. However, lower level personnel routinely take advantage of weak accountability links to engage in practices which undercollect revenue. With respect to irrigation, the most extreme example is the massive underreporting of area irrigated in some large schemes. The differences between actual and reported areas create what economists would call "unallocated rent", which is frequently shared between the farmer and the revenue officer through side payments from the former to the latter. The payment function, which can provide a strong accountability linkage in a service transaction, did not provide such a linkage in the pre-reform situation, as the pathway between service and payment was broken at several critical points, as described earlier.

5.2 Post-reform

5.2.1 Services and Exchanges

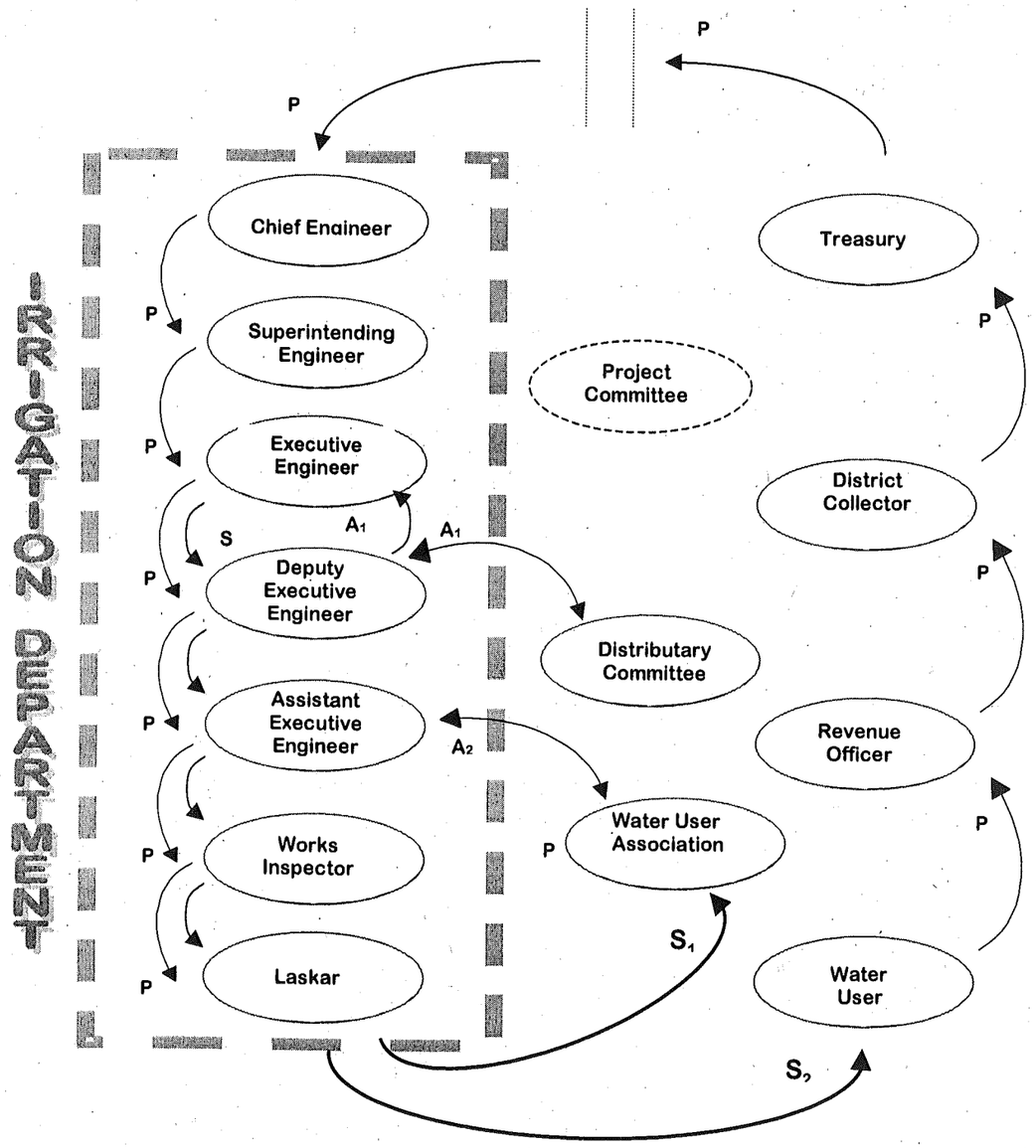
The reforms embodied in the FMISA contain some important changes in the service relationship structure. Initially, three new actors were introduced into the set-up. Water User Associations (WUA) were established at the minor level, and Distributary Committees (DC) at the distributary level[23]. The structure and characteristics of these committees were described earlier. The third additional actor is the new role given to specified engineers in the field structure of the ICADD – that of a Competent Authority (CA). The importance of these two new organizations and the competent authorities lies in their particular powers and responsibilities and, especially, in the service relationships which exist among them.

5.2.1.1 Water Delivery

Important changes have also occurred in the way service provision is organized. Although the service is delivered through existing hierarchical channels as before, it is now arranged differently. Under the new setup, the Distributary Comittee interacts with the corresponding Competent Authority, typically a Deputy Executive Engineer (DEE), to plan a water delivery schedule for the WUAs comprising it, within overall system operating parameters. This is shown in Figure 7 as arranging function A_1. Operational instructions are then passed downward through the

[23] These are to be followed by Project Committees (PC) and a statewide Apex Committee (AC) at later dates.

Figure 7: Primary functional relationships among actors providing post-reform water delivery service



hierarchy by the Deputy Executive Engineer to field staff who make the appropriate gate settings. The service is represented as being provided to the associated WUAs.

At the minor level, each WUA interacts with the corresponding Competent Authority, typically an Assistant Executive Engineer (AEE), to arrange delivery schedules for the WUA command. This is shown in Figure 7 as arranging function A_2. Service is passed down through the hierarchy. Works Inspectors and Laskars make the gate settings channeling water to individual water users.

For the moment, the revenue collection pathway remains as it was before 1997. Revenue is collected from farmers by the revenue officer and forwarded to the state treasury. One of the early changes introduced in the reform was to separate establishment costs from actual O&M costs and to fund establishment costs from a general line in the state budget. This does not reduce overall O&M costs, but it does separate the two, making the difference and magnitude of each more visible[24]. A combined allocation is then made to the ICADD to support its operations.

This new pattern of service provision raises the potential for providing higher quality water delivery service. Farmers now have a hand in arranging service delivery, a process which had previously bypassed them almost entirely. Their only function under the old setup was to use whatever water they received to grow crops. This change is important, in terms of incentives, because the users of the service are the ones with the strongest conceivable incentive to arrange the highest possible quality of irrigation service. They replace, in the arranging function, irrigation technicians and engineers who have little or no stake in the quality of service they provide, and thus little incentive to act in the interests of farmers.

The farmer's role in service arrangement also helps to close off some avenues of rent seeking behavior open to water delivery field staff. Previously, staff could play one farmer off against another, securing and bidding up side payment for preferential treatment in water delivery. Now, farmers have a venue (the WUA) in which to compare notes and take action to prevent this practice, which is not in their collective interest, as it raises the cost of water to them individually and collectively without increasing the overall quantity of water available to the group.

[24] Unfortunately this shift provides no incentive for cost control and right-sizing of ICADD staff levels – a step which must be taken at some stage in the interests of the fiscal position of the state government.

There are new risks also. Farmers have a lower technical capability than do the irrigation professionals on the ICADD staff. Because farmers have a more limited understanding of computations relating to water flows, losses, and requirements, they are at a disadvantage in understanding the details of the water allocation and delivery process needed to implement their preferred delivery schedule and the constraints to particular patterns of delivery. This makes it difficult for them to know what the possible delivery patterns might be, how much system loss is avoidable and how much is unavoidable, and the extent to which system performance might improve in response to greater staff effort. This leaves them dependent on the ICADD technical personnel, over whom they have little control. Thus while farmers may have a strong role in shaping delivery timings and practices, they may not be in a position to ascertain the efficiency with which service is being provided and how much better service could become.

Another potential problem attending the new setup is that of harmonizing competing individual interests. One of the positives associated with the traditional technocratic service delivery pattern is the supposed objectivity external actors bring to the allocation and delivery process. In designing the reform program, it was determined that the problem of weak incentives influencing the technical staff to perform effectively and efficiently outweighed the benefit of greater presumed objectivity. This is a reasonable determination and resulted in the provision in the reform shifting control of water delivery to WUAs and Distributary Committee. The problem then becomes one of organizing individual service users in such a way that their representatives act in the collective interest, rather than in their own personal interest. Democratic elections, wide dissemination of information, and transparent decisionmaking processes are tools which help to accomplish this. These are discussed in a subsequent section.

A limitation of the new setup as it currently exists is that it does not employ the potentially powerful leverage involved in paying for a service to control its quality. Because irrigation fee payments are not linked to the water delivery service function, the WUA and individual farmers are unable to indicate dissatisfaction with the service provided by withhold payment. They can, of course, refuse to pay fees, but the impact will not be felt by those in the ICADD who are responsible for implementing their water delivery directives, as described earlier. The payment function is thus effectively "out of the loop" with respect to providing incentives for effective and efficient water delivery service. The next stage of the reform process needs to find a way to utilize this potentially potent linkage to insure accountability and good service.

5.2.1.2 Maintenance

Changes in maintenance service provision under the reforms are more pronounced than those for water delivery. As noted, previously maintenance was carried out using the hierarchical ICADD administrative structure. Following the passage of the FMIS Act, maintenance is organized through two different channels. Maintenance and repair of larger works are handled in the traditional way through the hierarchical ICADD structure (Figure 6). Funds are coursed downward from the Treasury through the Chief Engineer and decisions regarding priorities are taken by the Executive Engineer. There is no farmer input into these decisions and services are regarded as provided internally to the ICADD.

At the level of the minor and below, WUAs receive maintenance grants through the ICADD to organize and carry out needed work. During 1998 and 1999, there were two separate grants for this. The first was a block grant of either Rs 30 thousand ($700) or Rs 50 thousand[25] ($1,165) to each newly formed WUA for emergency repairs and maintenance as the WUA saw fit. The second grant was made subsequently in the amount of Rs 200 per acre ($12/hectare) of registered irrigated land within the WUA area. Both types of grants were used for projects selected by the WUA. In major and medium schemes, Distributary Committees also receive a share of the revenue collected for maintenance use and in all schemes a 10 percent share goes to local government as a sweetener. Revenue sharing is shown in Table 3.

Table 2: Irrigation revenue sharing scheme

Level	Major Schemes	Medium Schemes	Minor Schemes
WUA	50 %	60 %	90 %
DC (Distributary Committee)	20 %	30 %	-
PC (Project Committee)	20 %	-	-
Local Government	10 %	10 %	10%

Source: Peter, J. R. Management of irrigation systems by farmers in Andhra Pradesh.

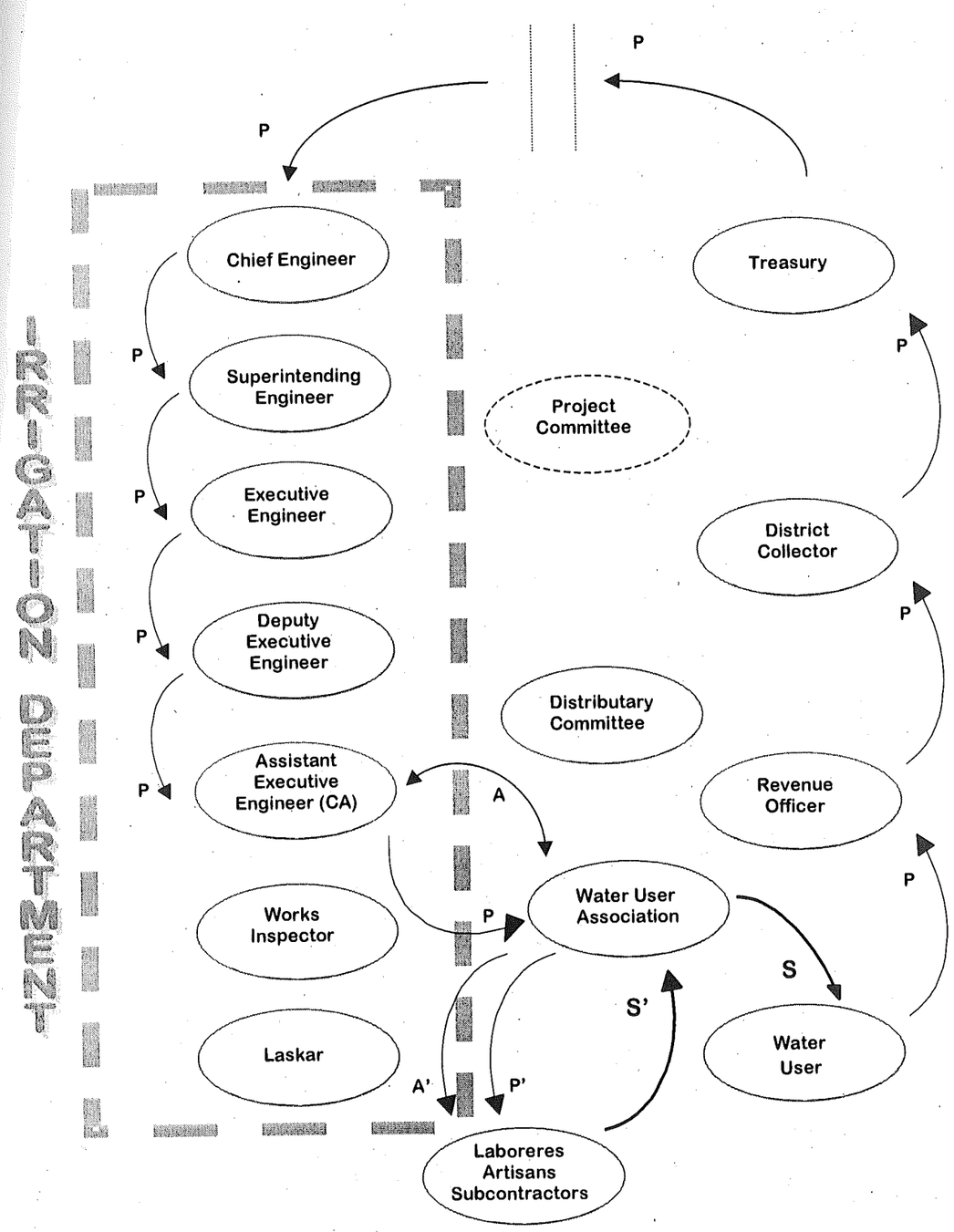
The procedure employed in spending these funds is the following. The Management Committee of the WUA identifies priority projects in informal consultation with WUA members. The Committee then requests the assistance of the corresponding Competent Authority in ICADD to prepare plans and quantity estimates for the work. A general

[25] The higher amount was given if the first election for WUA president was uncontested. This was done to encourage consensus decisionmaking, but may also have discouraged new candidates from coming forward.

meeting of the WUA is then called to consider and approve the program of work. Following the endorsement of the general body, the Competent Authority contracts with the WUA to carry out the work. The WUA can directly employ farmers and local artisans for this purpose or it can subcontract to a third party. The Competent Authority, which controls the funds, makes payments to the WUA on a predetermined schedule related to work accomplishment. Work quality is assessed through a "social audit", in which WUA members monitor activities and inspect the completed work. This process is shown in slightly simplified form in Figure 8. As seen in the figure, the WUA has more control in this case. It shares the function of arranging the service (A) with ICADD, and then provides the service, acting as the general contractor. The figure shows the arranging function moving in both directions between the AEE (CA) and the WUA, since the WUA identifies priority projects and the Competent Authority designs them and contracts with the WUA to carry out the work.

The WUA's role in providing the maintenance services then consists of arranging and organizing the work of laborers and artisans (A') and paying them (P'). Being the paymaster gives the WUA some control over maintenance service quality, however this function is exercised jointly with the ICADD since the Competent Authority also monitors work quality in making payments to the WUA under their contract. Services are provided by the employed laborers and artisans to the WUA (S'), which, in turn provides maintenance service (S) to the members of the WUA.

Figure 8: Primary functional relationships among actors providing post-reform maintenance service



This new system of procuring maintenance services at the minor level and below represents a fairly radical departure from the traditional approach and has the following effects.

- Distributing tertiary level maintenance funds more evenly across the command area than in the past
- Introducing specialized local knowledge into prioritizing maintenance and repair needs
- Strengthening the incentive to control costs of maintenance services
- Strengthening the incentive to control quality of maintenance services
- Increasing transparency of maintenance procurement processes, reducing opportunity for rent-seeking behavior on the part of those arranging the services

Rapid appraisal results indicate a number of impacts stemming from the maintenance work performed by WUAs. These include expanded irrigated area; increased canal conveyance capacity; more rapid movement of water from head to tail of canals; reclamation of abandoned lands, often in tail-end areas; reduction in inundation and flooding following rains, and shortened duration of rice transplantation (Perera, 1998).

In the Sriramsagar Project, Maruti (1999) reports that irrigated area increased from 45.8 thousand hectares in 1996 to 151.9 thousand hectares in 1998, following the introduction of the new maintenance arrangements. These results must be interpreted cautiously. Land use records were also updated during this period and made much more inclusive. Also, as Jairath (1999) points out, even a single irrigation in tail end areas is reported as "irrigated area" inflating the figures by ignoring the quality of irrigation service received by users.

There are a number of reasons for caution in judging these reforms, however. First, because little or no routine maintenance had been done in Sriramsagar Project in the 15 years since the system was built, the impacts of clearing blockages in canals were exceptionally large. After another year or two of such targeted repairs, additional benefits will certainly diminish. Incentives for farmers and WUA officials to act, and provide oversight, may also diminish as a result.

Second, as the understanding spreads that relatively large sums of money are involved in managing maintenance at the WUA level, management and governance may attract individuals with interests in turning these processes to personal gain. Put another way, controlling potential opportunistic behavior by WUAs, Competent Authorities, and laborers

and artisans will require more concerted effort, just at a time when farmer interest may be flagging because of the overall improvement in system functioning as a result of the targeted maintenance.

Finally, and most importantly, the government, with the World Bank, is planning to implement a comprehensive rehabilitation of Sriramsagar Project to take place over the coming five years. This rehabilitation is being done using a traditional top down approach to design and implementation with all important decisions made by ICADD engineers, external consultants, and Bank officials. There is no provision for WUA input into priorities and no role for WUAs or Distributary Committees in arranging, providing or paying for rehabilitation services. The message sent by this approach contradicts directly the message being sent to farmers through the reform process – that they, through their organizations, are responsible for system O&M. It contravenes the spirit, if not the letter, of the authority given to farmers under the 'Farmers' Management of Irrigation System Act' (Table 1). It reinforces the older notion that the irrigation system belongs to the government and is the government's responsibility to manage and care for (no matter how badly it may have done this). The technocratic approach also fails to take advantage of detailed local knowledge regarding deficiencies in the current system configuration which could be remedied in the modernization program. Once completed, the program of lining and other improvements will reduce maintenance requirements and consequently the importance of the WUA role in procuring maintenance services.

On the water supply side, the system of automatic proportioning modules proposed for installation under the rehabilitation, though they may promote equity of distribution if not tampered with, will reduce the flexibility and control WUAs and Distributary Committees have over water delivery services, which may weaken institutional incentives for involvement in that process. All in all, the rehabilitation program, as designed, works at cross-purposes to efforts to empower local farmers' organizations and will reinforce a tendency to revert to a traditional hierarchical control model for the rehabilitated system. It seems unfortunate that the two programs, ostensibly a part of the same reform effort, are not guided by a common philosophy.

An alternative approach to the rehabilitation could have proceeded in two phases, with the largest works – main canals, headworks, and distributary canals – rehabilitated through standard engineering and construction contracts, but with the Distributary Committees (and the Project Committee) significantly involved in planning and supervision. Rehabilitation at the minor level would then have been undertaken in a more extended fashion by coursing rehabilitation funds through WUAs or giving WUAs and ICADD joint control over minor

level rehabilitation. This would reinforce the messages of empowerment and responsibility which are being sent to WUAs and Distributary Committees rather than contradicting them as does the current approach.

5.2.2 Governance Mechanisms

Governance mechanisms linking the newly formed Distributary Committees and Water User Associations and their Competent Authorities within the Irrigation Department are weak. These relationships are specified only in very general terms in the reform act, which leaves the WUA and Distributary Committee in relatively poor negotiating positions. Powers and authorities of the farmers' groups need to be spelled out more explicitly.

5.2.2.1 Water Delivery

Most agreements relating to irrigation water management in Andhra Pradesh appear to be informal. Farmers arrange water delivery service through their WUAs and receive it from the ICADD. In exchange, members are expected to pay their irrigation fees to the revenue department, though there is no formal connection between payment and the service.

An individual farmer will seek to maximize the amount of water she receives[26] to allow the growing of a preferred crop (typically rice), to maximize production per unit land, and to minimize risk. Within a system and within a WUA if all individuals seek this objective competition will result. Thus the fundamental challenge for a management unit, whether a WUA, a Distributary Committee, or a Project Committee, is to moderate this set of desires in order to provide an equitable share of the available water to each management unit. This requires a fundamental emphasis on equity of distribution at all levels and the ability to control opportunistic individual or sub-group behavior. Early gains in system performance have come relatively easily by reducing the amount of water running to waste in drains. Subsequent improvements will come at a much higher social cost, since they wi ll involve reallocations of water from one user group to another, a far more difficult undertaking. Yet if WUAs and Distributary Committees are to be successful overall, they must succeed at this task.

For ICADD engineers and workers, on the other hand, incentives are quite different. Present incentives cause them to perform in ways that satisfy minimum expectations of the next highest administrative level in the structure, thus retaining their positions, and to capture any available allowances and salary increments. A portion of the staff will also be

[26] Up to some limit if irrigated dry crops are being grown.

motivated by a sense of professionalism and a desire to do a good job. Good management reinforces this desire by providing appropriate incentives and rewards, while poor management ignores or punishes it. Yet another group of staff will respond to incentives to maximize income through opportunistic behavior and the extraction of rents from those dependent on them. There are no fundamental incentives operating on ICADD staff to provide high quality water delivery service to users, however. These must be created through management practices and carefully crafted agreements with water users, along with other governance mechanisms, to insure their effective implementation.

Governance mechanisms linking ICADD water delivery staff with WUAs and higher-level farmer groups are very limited at the moment. Little or no real authority is granted in the reform act for WUAs to hold ICADD water delivery and maintenance staff accountable for their performance, leading to a fundamental gap in governance arrangements. One existing mechanism for achieving some accountability is feedback from WUAs to higher ICADD officials on performance of lower level ICADD staff. WUAs have this access through their Distributary Committees. In Sriramasagar Project, for example, there have been instances of ICADD staff transfers at the request of WUAs. This mechanism is indirect though and most suitable for addressing major malfeasance. An important challenge facing the reform program is to develop more direct and routine accountability linkages between WUAs and the ICADD staff providing water delivery service. These create strong positive incentives to perform in accord with the objectives of the WUA and constraints imposed by the larger system and resource availability. Possible mechanisms for doing this include tying salary increases to ratings given by WUAs, giving the WUA full or partial control over the monthly salary payment process, or, ultimately, by bringing field staff in under WUAs and Distributary Committees as their employees. In mature farmer-managed irrigation systems, the latter practice is usually found.

Because individual members of the Managing Committee represent large numbers of water users, it is critical that they represent the interests of those users fairly and even-handedly. This demands that they consult regularly with other water users and that their dealings with the ICADD and the Distributary Committee be highly transparent to those they represent. Much of this communication can take informally through normal interactions among members. More formal measures should also be taken though. For example, meeting minutes, schedules, budgets, and lists of fee payers can be posted in public village places.

5.2.2.2 Maintenance

Agreements between WUAs and other involved parties relating to maintenance are more elaborate and specific than those relating to water delivery. Water users have strong incentives to undertake deferred repair and maintenance work to remove obstacles to water flow in channels serving them. This is reflected in the enthusiasm shown for the new approach to tertiary-level maintenance and the jump in irrigated area reported following user-arranged "minimum rehabilitation." Benefits accruing to routine maintenance will be far less dramatic, however, and incentives for carrying it out economically and efficiently will consequently be weaker. Incentives for carrying out preventative maintenance with only long-term or delayed benefits can also be weakened by ambiguous rights to water and physical facilities. Responsibility for emergency repairs and periodic rehabilitation are important issues here which should be clarified. Currently plans for rehabilitating SRSP, which bypass WUAs and Distributary Committees, exacerbate the confusion over rights and responsibilities and may weaken WUA incentives to perform.

Accountability linkages between WUAs and their sub-contractors and work crews are strong. This is largely due to the control, by the WUA, of both arranging and paying functions, combined with strong incentives to get the greatest possible value out of limited maintenance allocations. Control by the WUA of an assured source of funds in crucial in this regard and this is a strong positive feature of the reforms. At present, this control is shared with the ICADD Competent Authority. Shared control should be phased out and responsibility shifted solely to the WUA.

Because significant sums of money are involved, all interactions relating to developing work programs, contracting, and inspecting completed work must be highly transparent to avoid opportunistic behavior within the WUA Managing Committees. Requirement that the general body of the WUA meet to review the work plan and inspect the completed work contribute to such transparency. The requirement for a regular financial audit also enhances transparency. The contracting process, which is often a source of self-enrichment by involved parties, should be sampled and monitored carefully by the reform managers over the initial years of the program to insure that the transparency requirements and accountability mechanisms in place are generally adequate to prevent such collusion.

5.2.3 Supporting Services

In addition to relationships involving the two primary services, water delivery and maintenance, a number of important supporting services involve the newly constituted

WUAs. In some of these, the WUA acts as the service provider, while in others it is the service user. Several of these supporting relationships are analyzed below in terms of incentives, accountability and transparency associated with them.

5.2.3.1 Revenue Collection

Revenue is currently collected by the revenue department as in the past. Future plans call for WUAs to assist in collection and eventually to take it over entirely. Many Presidents and Managing Committee members are reluctant to consider a full takeover because of the difficulties involved in trying to coerce payment from reluctant WUA members with whom they have social ties. This reluctance should be carefully considered. It may be that improving incentives related to irrigated area recordkeeping and collections effectiveness, along with heightening transparency in the revenue collection system, are more important than transferring actual collection responsibility to WUAs. A full range of options for improving the reliability, honesty, and equity of the revenue collection system should be considered.

The Andhra reformers have implemented several steps to modify the incentives relating to irrigation fee assessment and payment. The most important is tying WUA maintenance grants to the irrigated area registered with the Revenue Department. This conditionality has led a number of WUAs to conduct joint reassessments of crop-area records with village revenue officers (VROs). This can be seen as a supporting service provided by the WUA to the Revenue Department and the State Treasury. The WUA provides specialized local knowledge of local irrigation, cropping and landholding patterns and a strong incentive to be inclusive. In return, the WUA receives a larger maintenance grant due to the expanded irrigated area on the tax roles. The benefit for the Treasury is an increase in revenue to the state.

This practice has resulted in dramatic increases in the irrigated area carried on revenue records in many areas. In Sriramasagar Project, for example, recorded area went from 45,804 hectares in 1996 to 99,600 hectares one year later. This change was a result both of revising revenue records and of actual increases in irrigated command due to canal improvements. However local ICADD officials estimate that record revisions were the most important source of the increase.

This change cuts two ways, though, since now the additional area will be billed along with the much smaller area previously on the revenue books, making WUA farmers liable for larger collective assessments. Beginning with the 2000 agricultural year, incentives to pay will be reinforced by linking maintenance grants from the government not only to the area

carried on revenue records, but also on the percentage of revenue due which was actually paid by a WUA's farmers. This gives the WUA a strong incentive to encourage members to pay irrigation fees. A number of cross-cutting influences are thus in play here and how well the new system succeeds in increasing revenue collection percentages will be an important test of the effectiveness and sustainability of the new WUA setup.

Village revenue officers have sometimes met these new procedures with suspicion or hostility. Previously, revenue records were their province alone and not open to public scrutiny. The provision in the FMIS Act which gives WUAs the responsibility to assist with recordkeeping has also given them access to these land and payment records, throwing light on information which has previously existed in deep shadow. The shadows provided generous opportunity for opportunistic behavior on the part of those collecting and handing the revenue. From the WUA's point of view, three items are important here. The first is the amount of land, and the crops grown on it, shown on official revenue records, since this helps to determine the size of the maintenance grant received by the WUA. The second is the number of farmers who pay the fee due, which the WUA would like to maximize. The third is the amount the village revenue officers reports to his superiors as having been collected, since this amount determines the actual share of the potential maintenance grant which the WUA will receive. There must be strong incentives acting on both farmers and on the village revenue officers to pay, to collect, and to pass on the fees due, along with substantial transparency, if the system is to work fairly for the WUA (and for the general public). The present program of computerizing revenue records has the potential to greatly enhance transparency of these records and the record keeping process[27]. However, it may be that additional measures to revise incentives and enhance transparency and accountability will be required in the area of landholding records and revenue payment, collection, and handling for the system to function effectively. This should be a subject of ongoing external monitoring so that appropriate adjustments can be made promptly if required.

5.2.3.2 Design Services

WUAs generally lack technical capacity and are dependent on ICADD for engineering services. Since no direct payment for these services is involved, the WUA has little authority over their quality or the timing of their delivery. In addition the knowledge gap between the WUA Managing Committee and ICADD engineers makes it difficult for the

[27] When the reservation system of Indian Airlines was computerized a number of years ago, there was a sharp immediate improvement in the reliability of reservations and curtailment of the wide-spread practice of holding out blocks of seats for various preferred sectors.

WUA to evaluate the designs and estimates prepared by the engineers[28]. Although in many cases, this arrangement is presently working, these are potential weaknesses. Having the WUA pay ICADD for design services would not be an effective option at present, because the ICADD is not financially autonomous, and the incentive effect of payment on service quality would thus be lost. Options suggested earlier for making ICADD staff more responsive to WUAs could be applied. For example, salary increases for technical staff could be made heavily dependent on WUA ratings of performance. Ultimately, an independent and financially autonomous WUA should have control over its own maintenance budget and be able to contract for design services in the private sector.

5.2.3.3 WUA elections

Another supporting service involving WUAs is the election of leaders and representatives. Elections, which are an important governance mechanism for the USA, occur every 5 years[29] for President and Managing Committee membership. These elections, employing secret ballots, are organized and supervised by the District Collector according to rules issued by ICADD[30]. Procedures followed are similar to those employed in general elections. The election process constitutes a service provided to WUAs by the District Collectors, who both arrange for the service and provide it. Payment is by the state government, and so WUAs are involved only as users of the service, which, in the interests of impartiality, is appropriate.

Evidence from rapid appraisals suggests that the first elections, held in 1997, were fair and effective (Perera, 1998). One important observation growing from the rapid appraisals is that the WUA leaders which emerged from these elections share common socio-economic characteristics with the WUA membership. Caste and economic status were reported not to have been major factors in the elections. This is an important outcome, since local institutions under the control of rural elites cannot be expected to tackle fundamental problems of maldistribution of water, a situation tending to benefit the elites themselves. By contrast, leaders of outlet committees established under the Irrigation Utilization and Command Area Development Act of 1984 were generally large landowners with holdings at the head-ends of canals (Perera, 1998). An important factor contributing to the more democratic outcome of this reform effort is the division of each WUA into electoral districts (TCs), insuring that the MC is geographically representative and not biased toward the

[28] This gap should diminish, but not disappear, as a WUA gains experience in relating particular repair and maintenance activities with the level of effort required to perform them.
[29] The original legislation called for elections every 3 years, which would have provided greater accountability, but interval was extended by the Legislative Assembly.
[30] Dated 30 April 1997.

head end of the minor. The one landholder one vote principle is another democratic bias, since it gives proportionately more votes to smaller landholders.

WUA elections were also said by rapid appraisal informants to be largely independent of political affiliations. Political factions often control other local institutions, leading to decisions biased by political considerations. This is a strong argument in favor of separate single-purpose local-level water management institutions and against reliance on politicized multi-purpose local government institutions, such as gram panchayats, for these services. Water and politics, it has been said, do not mix well. Restrictions in the FMIS Act on local officeholders standing for WUA positions are well conceived.

Mollinga (2000) presents a somewhat different picture based on his experience with WUA elections in Tungabhadra Irrigation Project. He identified the political affiliations of the various Managing Committee members and pointed out that local political parties kept lists of the political affiliations of the members and presidents. He does not discuss what effect political affiliations may have had on the functioning of the Managing Committees. He also indicates that leaders were predominantly from higher caste groups. Neither of these facts is surprising and they do not, in themselves, constitute a problem for governance or accountability. The emergence of strong political party involvement in campaigns and favoritism shown to party members would be problems. One check provided, however, is the ban on involvement of local elected officials and civil servants in WUA leadership roles. More disturbing is Mollinga's observation of a low level of interaction between WUA leadership and members. This again is a useful indicator, but not indicative of poor performance or lack of accountability in and of itself. In many water user organizations in the western United States membership involvement is limited if officers and staff are performing satisfactorily, but come quickly into play when problems arise. The involvement of membership in key oversight functions, however, is important, and bears watching.

5.2.3.4 Financial Audits

The law requires that each WUA and higher level Farmer Organisations have its accounts audited regularly. This constitutes a service provided by the accountants to the GOAP and the farmer members of the WUA. Payment for the service is made by the GOAP so that the accountability linkage is upward to the government rather than to the Farmer Organisations itself. This is a critical control on financial probity, often the rock on which local organizations founder. At the same time, private auditors, accountable to a distant government, constitute a potential principal-agent problem in which the accountants display divided loyalties as a consequence of side payments from corrupt WUA officers. This is most likely to occur in just those situations where scrutiny is most needed. GOAP

should undertake check audits on a random sample of primary audits each year, blacklisting accounting firms which are found to be insufficiently rigorous or biased in their procedures.

A lesson growing from the recent experience of Turkey with farmer-managed irrigation, is that simplified and standardized bookkeeping forms and procedures should be introduced in all Farmer Organisations, and presidents and Managing Committee members trained in their use. This would have a number of positive effects. First complicated accounting procedures are unneeded for the relatively simple transactions involved and provide more opportunities for concealing information in complexity. Second, farmers must be able to understand the accounts as kept if they are to hold leaders of Farmer Organisations accountable for their financial management. The results of completed financial audit must be reported back to the general body by the auditors in simple and standardized terms. Understandability by farmers should be the most important single criterion employed in developing new forms and accounting procedures. Third, the costs of conducting audits will drop drastically if categories and processes used across Farmer Organisations are simple and standardized. Fourth, unless standard categories and rules are used, it will be impossible for the GOAP to establish consolidated figures for Farmer Organisations finances for Districts and the state as a whole, making monitoring and impact assessment of the program difficult.

6. Conclusions

6.1 The Andhra reforms

Recent irrigation sector reforms in Andhra Pradesh are bold and innovative. Reformers have attempted to tackle the root causes of poor system performance and unsustainable operation by addressing underlying institutional factors – institutional structure, incentives, accountability, and transparency. The reforms break new ground in India, and represent a hybrid approach that combines elements of organizational forms which have worked successfully elsewhere with Indian political and bureaucratic realities.

Reformers have opted for a pragmatic approach which attempts to establish horizontal responsibility linkages between newly formed water user associations and counterparts in the existing irrigation department structure. This approach helped make the reforms politically acceptable, but, at the same time, represents a significant weakness in the evolving structure which will require future modification. By leaving the existing structure of the ICADD intact, the reformers minimized resistance from the department and avoided continuity problems, since the same personnel continue to operate the systems. On the other hand, the new set up does nothing to reduce the huge drain on the public treasury represented by the massive ICADD bureaucracy. Although this burden is currently being shored up with foreign borrowings, this itself is an unsustainable practice. Ultimately, the problem posed by bureaucratic mass and inefficiency will have to be faced. This calls for a comprehensive top to bottom review of the purpose and functions of the department and a search for new roles for it as traditional ones are increasingly assumed by the newly-established farmer-based organizations.

Another fundamental difficulty in the new approach is the very weak accountability linkage between farmer organizations and ICADD field staff. This weakness stems from the vaguely specified nature of this relationship in the authority for the reforms, the FMIS Act of 1997. Authority needs to be strengthened to give Farmer Organisations greater control over the performance of the field staff in the service relationship. Utilizing the payment for service function by putting at least partial control into the hands of WUAs and Distributary Committees is one useful option for doing this. Longer-term solutions will involve shifting operational roles from the ICADD to Farmer Organisations. Considerable experience in doing this is available from other countries.

The decentralization of maintenance prioritization by allocating funds to individual Farmer Organisations for this purpose appears to have been highly successful. In addition to

identifying maintenance problems and establishing priorities, Farmer Organisations often serve as general contractors for the work. Compared with water delivery, Farmer Organisations have greater control over maintenance activities because of their central role in arranging maintenance services, implementing them, and paying for them.

The reforms have partially shifted responsibility for arranging and providing water delivery and maintenance services from a large state-level bureaucracy to local-level farmers' associations. This is reasonable from an incentive point of view, for, as the service users, farmers have the strongest of incentives to provide the services effectively and efficiently. Accompanying this responsibility shift, however, is the need to insure that transactions by leaders of Farmer Organisations are made openly and in full view of the farmer-members. The requirement for a high level of transparency here is critical and continuing. Requirements for documenting and posting accounts, agendas, and meeting minutes should be firm and clear. Likewise, public records affecting the Farmer Organisation, such as land records, must be open to farmer scrutiny. Several clever incentives aimed at this end have been crafted by the reformers.

The success of the Farmer Organisations in prioritizing needs and providing system maintenance services is threatened by pending comprehensive rehabilitation projects in Sriramasagar and Srisailam schemes. These rehabilitation projects are traditionally designed, employ centralized technocratic decision making, and ignore the new roles and authorities being assumed by Farmer Organisations under the reform package. It is likely that they will damage the performance incentives of the Farmer Organisations and will ultimately be more expensive and less effective than would be the case if they had been designed to work with and through the Farmer Organisations.

The reform process has been admirably designed and managed to secure the widest possible base of political support. The recent reelection of the responsible government has given added support to the reforms. Still the reforms are a work in progress and require continued support, monitoring, and adjustment to survive and succeed. Simple standardized financial and accounting procedures need to be put into place to insure transparency and accountability in financial matters. At the same time, WUAs need to be insulated from complex bureaucratic requirements from the state which could overwhelm them.

Of the more than 10,000 WUAs established in the state in 1997, it is statistically inevitable that some will fail. The new water law allows for such failures, but the department needs to plan for taking over a certain percentage of these 10,000 organizations and restoring them

to health. One basic principal would be that the terms of a take over should be less attractive to farmers than continued support for a WUA. For example, fees charged in areas where WUAs have collapsed should be higher than those charged in areas with viable WUAs and special efforts should be invested in rate collection in these areas to insure that farmers pay. A careful investigation should be undertaken to understand the cause for the failure and specialized NGO help enlisted in redesigning rules and practices for a reconstituted WUA.

Continued support and training are required. One powerful way of doing this is to develop horizontal linkages among WUAs and Distributary Committees, so that they can compare notes and share experiences with successful practices. Although perhaps superficially attractive, it would be a serious error to create a new cadre of government employees, a kind of WUA extension service, as a support vehicle for farmer organizations. Incentives acting on this new cadre of government employees would motivate them to foster dependency in WUAs and Distributary Committees rather than independence, would likely lead them to seek inappropriate authority roles in farmer organizations, and be enormously expensive and of limited benefit. Fostering interactions among Farmer Organisations, coupled with NGO assistance and by the Water and Land Management Training and Research Institute (WALMTARI) support for training would be a far more effective strategy.

6.2 Study Methodology

A number of core concepts taken from the "Maintain" framework were applied in this study. The concept of services arranged and provided by multiple actors is central and provided a powerful framework for analyzing irrigation system operations and maintenance. It proved particularly useful when examining the post-reform period in this case. In traditional analyses, operation and maintenance have been treated as functions performed by a unified public agency. If farmers' organizations entered the picture, a dividing point was selected, usually between the secondary and tertiary levels of the distribution system, and responsibilities divided geographically, with the public agency assumed to be responsible in the upper portion and the farmers' organization in the lower. The post-reform situation in Andhra is clearly more complex than this, with functions shared between Farmer Organisations and ICADD at many different levels. The multi-actor service provision framework is well-suited to analyzing such a situation.

A second core concept in the methodology, that of analyzing transactions rather than organizational structures, is also well suited to the case. In a sense, the transactions approach is an extension of a structures-based approach, in that basic organizational structures must be identified first and then the transactions among then analyzed.

However the emphasis here is on interactions among different actors rather than on administrative rules and procedures governing relationships within a large bureaucracy. In that sense, it is a logical concomitant to the multi-actor perspective of the methodology.

A third concept, that of analyzing the incentives involved in particular relationships and transactions proved to be a very powerful tool for anticipating relationships, performance levels, and potential problems of opportunism and rent-seeking. It breaks transactions down into four basic functions – arranging a service, providing the service, paying for the service, and using the service – and focuses on arranging and paying as key elements of incentives to perform. This is closely related to a fourth concept, that of governance mechanisms, which coordinate and manage the transactions between actors. The governance mechanism concept was not applied as extensively in this analysis as it has been in some other Maintain case studies but would be a useful tool in a more intensive analysis of relationships between WUAs and ICADD and Revenue Officers.

A fifth concept, that of authority systems, analyzes the legal basis for relationships and powers. Here a review of the authority system for the Andhra reforms identified several gaps which need to be closed to provide a sound basis for a well functioning management system.

All in all, the Maintain methodology offers some useful and powerful tools and concepts for analyzing irrigation system operation and maintenance. The wider use of these tools in the future will provide more incisive and useful diagnoses of O&M problems and better advice to policy-makers in designing, implementing, and sustaining reforms.

Annex

Maintain Overview

The figures are shocking: According to UNEP, some 1.5 million hectares of irrigated land are lost every year as a result of salinisation and waterlogging,[31] and the FAO estimates that worldwide, approximately 30 million hectares of irrigated land are severely damaged, and a further 60-80 million hectares partially damaged.[32] Various studies place unmistakable emphasis on the fact that the underlying reasons for this are to be found in the "operation and maintenance" of irrigation systems. As the World Bank puts it in its "Review of World Bank Experience in Irrigation", *"Poor quality of project design and planning are big problems, but poor operation and maintenance is a bigger one"*. And: *"O&M problems can be seen in the Bank's financing of so many rehabilitation projects. Almost all of them, when scrutinised, turn out to be deferred maintenance projects"*[33].

Given this problem situation, one cannot but conclude that the irrigation sector in development cooperation faces a "Maintenance Paradox". At the one hand maintenance is clearly seen at the origin of many of the most serious problems faced by the irrigation sector. At the other hand, maintenance seems to be a sort of "non-topic". In an analysis of its experiences in 614 irrigation projects, the World Bank found that 43% of all project evaluations made no reference at all to operation and maintenance issues. The situation is even worse with regard to maintenance considered in isolation: In the few statistical studies which do exist, operation and maintenance are rarely dealt with separately, and only in exceptional cases do irrigation project evaluations address maintenance issues in any greater depth: The aforementioned World Bank report describes the situation laconically: *"... audits rarely pay much attention to poor maintenance"*.

What is the reason for this paradox, i.e. this striking discrepancy between the well-acknowledged importance of maintenance and the attention it is given in irrigation practice? One of the reasons, suggested by recent studies[34] is that there is a lack of incentives for the different stakeholders to engage in maintenance efforts. Donors seem not to be very concerned about the maintenance question, since they do not finance maintenance budgets. Irrigation Departments in partner countries are faced with extremely

[31] UNEP: (1992): Saving our planet. Nairobi.
[32] FAO (1993): The State of Food and Agriculture, Water Policies and Agriculture. Rome, p. 289.
[33] WB (1994). A Review of World Bank Experience in Irrigation, Report No. 13676, p. 86.
[34] See e.g. Skutsch (1999)

high opportunity costs of scarce local financial resources, and hence try to substitute local maintenance funds with foreign finance for irrigation system rehabilitation. Irrigation agencies have little incentives to embark on maintenance activities as well: as mentioned before, funds for such activities are scarce and engineers do not perceive maintenance to be a "glamorous job". And last but not least, farmers very often see maintenance to be an obligation of the owner of the infrastructure, the state and have no incentive to engage in it.

How to overcome this "incentive deadlock" in maintenance provision for irrigation? The "Maintain" project of GTZ, a research and development project entitled "Institutional Arrangements for Maintenance in Irrigation", tries to contribute to this effort.
The approach of "maintain" so far is to perceive maintenance not only as a technical activity performed in order to preserve a certain physical state of a given infrastructure. Instead, maintenance is also looked upon as a 'service' (commercial or non-commercial) to be provided by certain 'providers' to certain 'service receivers' / 'customers'. The premise is that such a service provision normally takes place in the context of a network of involved actors – different organizations, groups, individuals – that need to interact in order to bring about a functioning and sustainable service provision. Hence the major focus of "maintain" are exchange processes and exchange relationships in the context of multi-actor institutional settings. And a central question to be answered is the question

"What are the mechanisms that make sure that the exchange relationships and exchange processes between actors with given interests and preferences come about in a way that guarantees an adequate functioning of maintenance services?"

With such an approach, "maintain" enters the realm of theories on exchange relationships and incentive structures – potentially including topics of institutional economics like contract theory, property rights theory, principal-agent-theory and theories on collective action -, draws on recent developments in the field of service management and links up to new discussions with respect to governance structures in interorganizational settings.

The focus of "maintain" is not so much focussed on "research" in the sense of scientifically introducing and verifying new methodologies but on using existing approaches that have proven to be of value in other fields of application and make them accessible in a heuristic sense as aids for planning and implementation in irrigation.

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