BUREAUCRATIC AND FARMER PARTICIPATION IN IRRIGATION DEVELOPMENT

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PREFACE

This study was conducted as part of the Water Management Synthesis II Project, a program funded and assisted by the United States Agency for International Development through the Consortium for International Development. Utah State University, Colorado State University and Cornell University serve as co-lead universities for the Project.

The key objective is to provide services in irrigated regions of the world for improving water management practices in the design and operation of existing and future irrigation projects and give guidance for USAID for selecting and implementing development options and investment strategies.

For more information about the Project and any of its services, contact the Water Management Synthesis II Project.

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ABSTRACT

Bureaucratic and Farmer Participation in Irrigation Development

Mark W. Lusk and Bradley W. Parlin

Increasingly, international development assistance and domestic agricultural policy in the developing world has focused upon the expansion of arable lands through the introduction of technologically sophisticated irrigation works. While technical assistance has made substantial contributions to increasing food security in the developing world, the potential for expanding arable lands is limited and finite. In addition, a review of irrigation development reveals schemes often operating at only 10 to 15 percent efficiency.

Because of environmental constraints to expanding irrigated agriculture and due to the relatively poor performance of existing schemes, recent development assistance has increasingly relied upon improving and refining water management techniques. One crucial dimension of the trend of this strategy in irrigated agriculture is to incorporate farmers into irrigation system management. Efforts to involve farmers in irrigation system management have been conducted in a variety of cultural contexts but with mixed results. In some cases research organizational efforts have met with substantial success. Conflict among farmers and between farmers and agencies have been reduced, fee payments increased, and deviant irrigation practices curtailed. In other situations farmer participation projects have met with failure sometimes exacerbating antagonistic relationships between farmers and project staff leading to farmer apathy and disengagement.

The central argument of this paper is that the failure of many efforts to effectively involve farmers in irrigation management activities has resulted from insufficient attention to farmer/bureaucracy linkages and institutional reform. To focus exclusively on changing farmer behavior without also changing bureaucratic behavior patterns ignores the important interactions between farmer and agency staff that can spell success or failure of programs of irrigation development.

The paper proposes a model focusing on development inputs and incentives for both farmers and bureaucratic staff which improve the farmer/bureaucrat interactions, guide institutional reform, and enhance the effective management of irrigation development behavior. To this end the relationship between development inputs, incentives, desirable and undesirable behavioral outputs and counterdevelopment forces for both farmer and bureaucrats are examined.

Introduction

The development of intervention strategies designed to effectively involve farmers in the management of international irrigation projects has become the focus of considerable research and experimentation by social scientists (Parlin and Lusk, 1988). Indeed, the literature on various aspects of farmer participation in irrigation development is extensive. Studies of water user associations (WUA's) worldwide have contributed to the understanding of the costs, benefits and situational determinants which impede or facilitate farmer involvement in irrigation organization (FAO, 1985; Uphoff, 1985). Despite the substantial knowledge base concerning farmer participation in irrigation projects, intervention efforts have met with mixed reviews. In some cases organization strategies have met with modest success and others with dismal failure. In Sri Lanka, for example, the lessons learned in the National Irrigation Association experiments in the Philippines were successfully transferred to the rehabilitation of the left bank of the Gal Oya system (Wijayaratne, 1984; Uphoff, 1985). However, efforts to organize farmers in the Mahaweli Development scheme have been fraught with difficulties such as sabotage, deviant irrigation practices, settler apathy, and disengagement (Scudder, 1985; Nott, 1985; Parlin, 1986). A central question this paper addresses is why attempts to organize and involve farmers in irrigation management have led to such variable outcomes, especially given the well-documented results of scholarly and applied efforts in this regard.

The premise of this paper is that social science research on irrigation development has given insufficient attention to the implications of theoretically-driven, bureaucratic design and management strategies for project success. While social science research has provided substantial insight into the motivational basis of farmer participation, there has been little corresponding research on bureaucratic behavior and its implications for farmers in development settings. Given that farmers and bureaucrats comprise the two principal actors in the irrigation drama, it would appear that social science research has focused upon changing farmer behavior while ignoring bureaucratic behavior and its impact.

The social science literature on irrigation development has generally been characterized by site specific descriptive, or analytical case level studies (Illo and Chiong-Javier, 1983; Ganewatte, 1985). Importantly, most studies of farmer participation based on field research experiences, have not been based upon theory. A theoretical framework to facilitate the integration of the diverse wealth of case level findings would provide a useful tool to systematically guide informed inquiry into the sociology of irrigation development. A major purpose of this paper is to add to our understanding of the irrigation development process by proposing a model to guide research on irrigation development behavior utilizing rational choice theory.

Bureaucracy and Irrigation Management

Despite the rich tradition of research in the sociology of complex organizations (associations; bureaucracies), few writers have attempted to apply the theoretical, conceptual and substantive knowledge of the field to irrigation management and development. This important gap has been noted by Borlaug (1987:387), for example, who has emphasized the limits

on efficiency of third world irrigation schemes posed by "...a bloated bureaucracy...". Bromley (1987:173) stresses the need for research on irrigation organization in order to overcome the "...institutional vacuum..." which characterizes the management of irrigation programs in the developing world. Wade (1987:198) also sees organizational reform as a central issue in irrigation development. He argues persuasively that the failure of many systems is sometimes a result of physical design but that, ".. part of the answer is to be found in the design of the irrigation management organization" (1987:178). Another advocate of organizational reform in irrigation management is Chambers (1987). He calls for a "professional revolution" in which irrigation bureaucrats, following the lead of successful U.S. private sector industrial organizations, become responsive to the needs of their clients (farmers), and thereby contravene what Hart (1978) describes as a "syndrome of anarchy" in irrigation management.

The importance of irrigation to rural development and the potential for social conflict, corruption and disorganization make irrigated agriculture an ideal context for assessing applications of the sociology of organizations. This paper develops a strategy which stresses farmer-constituency incentives in the building of organizations as an alternative to focusing on the traditionally identified obstacles to rural development.

Irrigation Development: Theoretical Perspectives

The relative absence of attention to the organizational and management side of irrigation development emerges, in part, from the lack of theoretical underpinnings in the case level studies which have provided the knowledge base in irrigation development.

Theoretical sociological thinking with regard to irrigation is nascent. Few theoreticians have written on the subject of irrigated societies or communities. As Bromley (1982:3) for example notes, "while there is extensive theoretical literature on landlord-tenant relations, we do not have anything comparable in irrigated agriculture." This trend is unfortunate in light of the fundamental importance of irrigated agriculture to many societies in the contemporary world and throughout history. In addition, much of the current writing on irrigation development and management by social scientists is at the descriptive level. While the use of social science in irrigation development and management is necessarily an applied endeavor (solving problems in the real world), a key purpose of social theory has been to guide such social practice.

We will review a handful of theoretical approaches that have some relevance for understanding human behavior in irrigation communities so that we might stimulate irrigation development professionals to query their own assumptions and axioms about the process of developing and managing an irrigation project. Our choice of theories to review is not exhaustive but rather illustrates the utility of sociological theory for clarifying the process of irrigation development.

Development Theory

Sociology and anthropology have addressed the challenge of development and planned social/technological change using social and political theory. A rich literature has dealt with the implications of modernization (Rostow, 1971), neo-colonialism and dependency (Frank, 1969), economic growth (Hagen, 1968), and technological innovation (Spicer, 1967) to the development process. Although important to a general understanding of societal evolution, these classical perspectives have had limited application to the specific problems of local projects.

Growing out of these traditions is the theme that development is the process of overcoming obstacles to planned social change. Depending upon the theoretical perspective, the obstacles identified differ significantly however. Modernization theorists like Gunnar Mydral (1963) would emphasize internal obstacles such as the lack of "entrepreneurship". Others within the school might focus on the critical importance of culture (Banfield, 1958). An extreme form of the modernization approach stresses the psychological attributes of peoples and characterizes underdevelopment as a "state of mind" (Harrison, 1985).

At the other end, dependency theorists emphasize the exploitive relationship between the developed capitalist metropole and the stagnant, powerless periphery (cf. Foster-Carter, 1985). The emphasis, while purely political in form, is on the structural features of the development process. It seeks to explain the impediments to development not as characteristics of individuals or groups, but as artifacts of structural-organizational arrangements.

Both approaches suffer from a lack of utility at the project level because fundamentally they are ideologies and not theories. To risk oversimplification, modernization theory points to the internal constraints to development such as attitudes and cultural beliefs - in effect, a form of "blaming the victim" (Ryan, 1976). In contrast, dependency theory highlights external constraints such as multinational corporations and foreign investment - in effect a self-defeating mythology of "blaming the bad guys". While both orientations explain some aspects of the development process, neither offers a technology of organizational design which stimulates local participation and control or project goal attainment.

Development theory has had greater utility at a macro-level of analysis. On the other hand, applied anthropologists have identified local, micro-level impediments to the development/change process. Foster (1973) has listed cultural and social barriers to development which may impede organizational or technological change at the project level. They include traditionalism, fatalism, ethnocentrism, pride and prestige, cultural incompatibility, superstition, group solidarity, public opinion, factionalism, vested interests, local authority, caste, clan, and class. Depending upon the site specific characteristics of the target area, any of these factors may impede efforts to introduce changes in irrigation organization.

Applied anthropologists argue compellingly for the need to adapt development plans, analytic techniques, and organizational structures to the demands of the local socio-cultural environment in order to encourage local participation, enhance project success, and avoid unintended effects. What has been missing is a conceptual framework for designing organizations in irrigation and rural development that stresses the positive - those general organizational factors which, when incorporated, stimulate efficiency, effectiveness, and goal attainment. It is likely that organizational theories hold unexploited promise for enhancing the achievement of project level objectives in development - particularly with respect to problems of irrigation bureaucracies, farmer organizations, cooperatives, and water users' associations.

Human and Social Ecology Theory

Development theories provide substantial insight into the macrosociological dimensions of the development process. However, these theories have limited utility for enhancing our understanding of mezzoscopic and microscopic aspects of irrigation organization. By

contrast, human social ecology theory and organizational theories lead one to a more holistic understanding of irrigation development through their focus on the relationships between individuals (microscopic), the irrigation community (mezzoscopic), and the environment (macroscopic).

The concept of environment has been one of the most important legacies of the Darwinian Revolution. For one, it led to a recognition in most sociological and psychological theories of the importance of external environmental factors in determining the behavior of individuals and groups. The later emergence of human ecology as a theory in sociology marks the recognition of the importance of the interactions between organisms, species, and habitats.

Human or social ecology has provided a shared language between human biology, geography, anthropology, and sociology - a framework for describing human behavior in relation to the other sciences. Although to some extent the framework is metaphorical, it avoids the pitfalls of organicism because instead of emphasizing stasis, ecology is dynamic. The key concept in ecology is community - the subset of the species whose reactions to the habitat and coactions with each other constitute an integrated, dynamic, symbiotic system which seeks equilibrium.

There are several central ideas in human ecology theory that define the approach and which show clear relevance for irrigation development if we are to describe irrigation systems as communities. At the most fundamental level, communities respond to and are shaped by the environment which also includes the individuals occupying that habitat. Individuals likewise are shaped by the environment of which a key element is the community in which they survive. This allows for the basic insight that behavior is a product of all facets of the environment - the physical,

biological, geographic (spatial), and socio-cultural. Correspondingly, the four variables of interest to human ecology theory are: population, organization, environment, and technology. Not coincidentally these are among the four most important concepts in the sociology of irrigation.

By studying human communities, proponents of the view have derived several elementary principles of human ecology. For example, ecologists propose a principle of interdependence arguing that sociality is a given. Interdependence among the species is irreducible and based on symbiotic differences such as the division of labor and commensal similarities such as shared social characteristics. By virtue of these attributes, humans are compelled to both cooperation and competition - the framework for social organization (Hawley, 1973).

Clearly the principles of human ecology could form the basis for a sociology of irrigation. Irrigation is a human activity that is fundamentally rooted in social interdependence and the complex differentiation of functions and roles. Moreover, it is an activity which is inherently fraught with social conflict as users compete for scarce resources and social change as the irrigation system inevitably responds to fluctuations in the metereological, agricultural, economic, and cultural environments.

The advantages of the human ecology approach are that it links up well with the terminology and theories of agriculture and geography. It provides a handy vocabulary with relevant terms such as niche, population, territory, symbiosis, entropy, etc. It accepts change and conflict as givens and yet is not within an ideological tradition. Among its disadvantages are that it does not handle important social concepts (such as norms) very well. One is left wondering what motivates human behavior in the sense of values, customs, and beliefs. The ability to

understand human social organization in the context of an interacting biological population is a very fruitful beginning but is lacking in insights regarding what we might call the economic and normative bases of society.

Coward's (1980) research provides a contemporary example of the fruitful application of human and social ecology theory to irrigation development.

Organizational Theories

The irrigation enterprise involves the effective linking of both technical (hardware) and social (software) elements. The interfacing of the irrigation community with the technical apparatus of irrigation inevitably involves complex organizations (associations/bureaucracies). Given the rich tradition of theories about bureaucracy and organizational behaviors in the social sciences, it is surprising to see so little application of organizational theory to irrigation development. A brief review of some of the major organizational theoretical perspectives will reveal the substantial potential of contemporary organizational theory for enhancing our understanding of the social organizational dynamics of irrigated agriculture.

Many researchers have attempted to trace the historical evolution of organizational theory by categorizing dominant thinkers and writers into periods or perspectives (Harmon and Mayer, 1986; Grusky and Miller, 1981). Virtually all writers on the subject of complex organization begin with the seminal work of the sociologist Max Weber who developed an "ideal type" of bureaucracy by studying emergent organizational forms in late nineteenth century Germany. For Weber, bureaucracies were goal oriented and driven by rationally derived rules, regulations, and procedures (Weber, 1947).

> A particular goal has been specified and a collection of persons are engaged in a series of separate interrelated and rationally organized activities that presumably will result in goal attainment. The focus of attention is then on the legally prescribed structures and the mechanisms by which they are maintained. Persons comply with organizational rules mainly because the ends achieved by the total structure are valued and each must do his own part if the goal is to be attained (Haas and Drabek, 1973:26).

While Weber's "ideal type" has had considerable value in directing research to key variables in the explanation of organizational life, his work is also replete with shortcomings which provide the stepping stones for refinement and the emergence of alternative perspectives. His work, for example, does not address the importance of "official vs. unofficial" goals, "informal" or spontaneous organization, the relationship of the organization to its environment, and so forth.

Scientific management as espoused by Fredrick Taylor in the late nineteenth century in the United States, shared with his contemporary Weber, a concern for organizational efficiency (Gross and Etzioni, 1985). Whereas Weber saw efficiency as an outcome of rational organizational rules, Taylor's focus was on ways to motivate workers through economic incentives and by standardizing work procedures into minute components. Time and motion studies provided the basis upon which organizational success could be achieved. In contrast to Weber, Taylor's theory of organizational management does recognize the importance of informal organization and its impact on organizational behavior. A shortcoming of scientific management derives from the view that humans are machine-like in their response to economic rewards (Harmon & Mayer, 1986).

The human relations perspective in organizational theory grew out of the Hawthorne experiments conducted by Elton Mayo during the 1920's (Champion, 1975). In the classic experiments conducted in the Cicero,

Illinois plant of the Western Electric Company, it was found that workers were motivated by many factors - only one of which was economic. The researchers discovered the importance of status, prestige, appreciation, recognition, accomplishment and other social elements (Roethlisberger and Dickson, 1950). From this research it became apparent that informal organization was a paramount determinant of worker performance and attention to group participation led to higher productivity. The participation hypothesis has been effectively applied in the irrigation development setting in a variety of cultural contexts (Bagadion, 1988; Uphoff, 1986). An important limitation of the human relation perspective was its tendency to treat organizational life as though it existed in a vacuum, ignoring the role of environmental constraints.

The system perspective in organizational theory evolved as a way of visualizing organizations in relationship to their environments. It is important to note that Weber, Taylor and other early writers had a pre-occupation with "formal organizational" structure. By contrast, the systems perspective emphasizes the organization as a holistic unit striving for homeostasis. Additionally the systems orientation views every organization as having a unique personality based upon organizational history and the cumulative "informal" relationship of the group's personnel. The open systems approach emphasizes the interaction (conflict and cooperation) between organizations and their multitude of environments and interactions between the various subunits that comprise the complex organization (Scott, 1981).

Among all organizational theories, the conflict tradition has proven especially useful in analyzing irrigation organization. The conflict perspective sees change (rather than homeostasis) as the distinguishing

feature of groups because people vary in power (Jesser, 1975). Contemporary conflict theory in organizational sociology has its historical origin in the nineteenth-century writings of Karl Marx. Central tenets of conflict theory in the United States were outlined by C. Wright Mills (1959) and Lewis Coser (1956). The foci of conflict theory are on class conflict (owners vs. workers) and the ubiquity of group contest. Conflict is not confined to social classes but occurs between any groups which compete for the scarce rewards (resources) of society (e.g. racial, ethnic and religious groups, or between farmers and agency bureaucrats). Importantly, conflict does not always imply violence but can be exemplified by disputes and other contests. Conflict theorists tend to be preoccupied with power relations between privileged and dominant groups in competition over scarce resources with subordinate groups.

Karl Witfogel's Oriental Despotism: A Comparative Study of Total Power (1957) represents one of the earliest attempts to develop a theoretical framework to study irrigation development. His work draws on the conflict tradition and attempts to explain the despotic character of ancient, large scale, irrigated agriculture.

In the broadest sense, Witfogel's work represents a theory of societal change. His central argument is that societies tend toward despotism (total coercive power) when the productive base of the society is large-scale, government managed, irrigated agriculture. Simply put, this is because large-scale systems need a managerial bureaucracy to control the various irrigation activities (construction, distribution, flood control) and to mobilize large numbers of the agrarian community to participate in a cooperative ongoing manner in these tasks. The result of the evolutionary process is a coercive managerial bureaucracy which becomes a ruling class with total power over other members of society.

Moving water, especially large volumes, requires sophisticated patterns of organization, technical expertise, and cooperation not found in rainfed agriculture. As Witfogel (1957:18) observes,

> Hydroagriculture, farming based on small-scale irrigation, increases the food supply, but it does not involve the patterns of organization and social control that characterize hydraulic agriculture and Oriental despotism....
>
> Thus a number of farmers eager to conquer arid lowlands and plains are forced to invoke the organizational devices which--on the basis of premachine technology--offer the one chance of success: they must work in cooperation with their fellows and subordinate themselves to a directing authority.

Hydraulic economics have special features not found in rainfed agriculture. The division of labor is much more complex, involving preparatory activities (getting water to the fields) and protective activities (flood control) working in tandem. The size and scope of these activities in large-scale irrigation require the coordination and cooperation of many individuals. Coordination was solved by the development of managerial bureaucracies and cooperation is addressed by claims on corviable (forced) labor.

Witfogel's theory of despotism and total power in ancient irrigation systems provides a useful tool for understanding the historical context in which irrigation development has evolved. However, Witfogel's exclusive focus upon power and oppression tends to obscure the stable patterned cooperative social relationships which have been observed in both ancient and contemporary irrigated societies. Conflict theory's preoccupation with power and conflict, while distinguishing it from many other theories, can impede the sociologist's ability to see patterns of consensus, harmony, and cooperation in social relationships. Conflict theory also tends to be concerned with macrosociological issues at the expense of explaining conflict at the community level.

Public or Rational choice theory

A tradition of sociological and anthropological writing on farmers in the developing world and the underdeveloped regions of the industrialized world has emphasized the rationality of the farmer. Perhaps in response to a reactionary view of farmers as ignorant, lazy, fatalistic, and incompetent which is heard far too often in the environs of agriculture ministries and the like, social scientists have noted that the apparently conservative and risk aversive behavior of farmers is actually a rational response to the fragile economics of peasant society.

Foster (1973) and others have observed that the risks of failure in traditional agriculture have enormous consequences to those who live on the margin of survival. In reviewing studies of peasant agricultural societies, he notes that the observed resistance to change, unwillingness to compete, and static economies are best explained by the "image of limited good" or a zero sum culture in which one person's gain is seen as another person's loss.

The insight of explaining traditional agriculturalists' behavior by assuming that they are rational and are responding to economic forces is the beginning point for a different way of looking at irrigated agriculture - one which we would also apply to other important actors in irrigation development such as bureaucrats.

Public choice (or rational choice) theory is the application of economics to the study of non-market decisionmaking. The primary unit of analysis is not the larger society nor the community but rather the interests of the individual. Yet it is not the individual whom rational choice theorists seek to understand - this is a task for psychology. They instead attempt to understand society and social policy by studying the

decisionmaking of self-interested individuals who seek to maximize their gain and utility through the exercise of rational free choice (Buchanan & Tullock, 1962).

The origins of public choice theory are in utilitarianism, a social philosophy which, in contrast to Marxism, makes pessimistic assumptions about human behavior. As opposed to Marx, Rousseau, or Locke, the utilitarians argue a realist perspective which would hold that experience rather than reflection reveals human interests and explains their behavior. Humans are empiricists who are driven more by sanctions than by moral abstractions. Furthermore, humans are assumed to be rational economic actors in a utilitarian sense. That is to say that all things being equal, they will choose pleasure over pain and more over less. The assumptions of the "economic person" do not rule out irrational or altruistic behaviors. Instead these types of behavior, excepting mental illness or defect, can be better understood as rational and self interested when analyzed from the individual's point of view. As we shall see, it can be entirely rational and self interested to behave in a manner which the outsider might describe as altruistic or "irrational" - particularly in rural developing communities (Lusk & Parlin, 1986).

A few fundamental ideas can be extracted from the perspective to illustrate. Individual choice is the basis of collective action and social organization. What is conceived of as social organization is the aggregation of individual choices. Individual decisions are the expression of different preferences and incentives; therefore conflict is inherent in social life and organization is the means of managing that conflict. It follows that rules and discipline are needed to adjudicate conflicting preferences. Finally, conflict produces social change as societies adjust to

the dynamics of conflict management.

The key concepts of public choice which have relevance for understanding social organizations have an economic theme. This is because the theory is a wedding of economics, political science, and sociology as they apply to decisionmaking. To illustrate in a very condensed way - participation in collective social action always entails costs to the individual of time and energy. Collective action is more expensive than individual action and is therefore only logically justifiable when its benefits outweigh the costs of non-collective individual actions. Collective actions tend to limit individual liberty so people choose to avoid them when possible. Nonetheless, collective action can achieve results which are clearly impossible through unorganized individual behavior (Lusk & Riley, 1986).

Individuals who do not benefit from collective action will tend to ignore, resist, or boycott such actions unless compelled by force to comply. Therefore, decisionmaking, to be effective, must be democratic so that individuals can protect themselves from the actions of the collectivity. Decentralized decisionmaking incurs fewer individual costs because it is more proximate to the needs of those affected - it is therefore more effective. Centralized decisionmaking, while less effective, may be more efficient.

Like private market decisions, political or collective decisions are highly important to the users of public goods and services. Therefore the logic of market decisionmaking can be used with great utility in explaining public actions. Politics cannot be separated from the constituencies which are affected by public actions. Doing so will tend to produce alienation, disengagement, antagonism, and corruption. The task of public

management is in large part to link the managers to the constituents through political accountability - democratization. In sum, this means that the relevant public must hire and control the public servant.

In the absence of competitive or marketlike forces being present in the public sector, we can anticipate the emergence of public monopolies or the domination of decisionmaking by special interests. As in the market, public monopolies can lead to bureaucratic inefficiency, isolation, and corruption. Costs will tend to become magnified and effectiveness and efficiency will both be reduced (Shaw, 1987). The alternative is to transfer as many responsibilities to the private sector as is appropriate and to design public agencies that have incorporated elements of the marketplace. This can be interpreted variously. We contend that public agencies such as irrigation districts or agriculture ministries respond most effectively and efficiently to their constituents' needs when they are multi-levelled, segmental, and decentralized. This allows for the organizational character to be finely tuned to the constituency, the technology, and the policy.

By emphasizing the maximization of individual utility, there is an implicit theoretical emphasis on individual choice, democratic administration, and freedom from coercion. Under these assumptions, organizations are effective if they maximize the individual gain of their constituency while promoting freedom. They are efficient if they produce a net gain for members over aggregate individual actions.

Two fundamental aspects of organization contribute to effectiveness and efficiency: decentralization and the incorporation of market forces. Decentralization is important to effective administration because it allows for the adaptation or "fine tuning" of organizational policies to specific,

local constituencies. In addition, segmental organizations require a lower investment to mobilize them. Organizations are more competitive (and therefore efficient) if they respond to their specific market - the local constituency. This is made possible when organizations are representative (democratic) and do not enjoy a monopoly (competitive). To prevent monopolies from forming, whether state or private, requires that other agencies be permitted to render an equivalent service and freely compete for clients. Organizations become accountable when democratic representation makes them politically responsive and the market makes them economically competitive.

The rational choice approach thus generates a critique of centralized state bureaucracy - an organizational type which is very common among irrigation organizations in developing countries. The large public bureaucracy logically tends toward aggregate, unidimensional decision making rather than multiple, diverse, local decision making. The interests of the few are sacrificed to the state definition of the collective good - a definition which is not influenced by representative political processes but rather by appointed technicians. The large bureaucracy is neither cost nor decision accountable to its market (constituency) because alternative agencies are not permitted to compete for clients (monopoly), supply and demand are not freely balanced, and organizational costs are not contained for lack of incentives to do so. Also the coercive powers available to the state to force compliance to policy divert power from free constituents to unelected technocrats with the effect that the organizations do not have incentives to serve their relevant public (Ostrom, 1974). Given the lack of accountability, decisionmakers are more subject to the corruptability growing out of interest group control and the abuse of power.

The alternative is to limit and control administrative power; to stimulate competition through decentralized, multi-organizational arrangements; to maximize efficiency by reducing expenditures of time, effort, and resources; and to incorporate representation from relevant consumer constituencies - in sum, democratic administration (Ostrom, 1974).

Public Choice and Natural Resources

Public choice is particularly useful in the study of natural resource and water management problems because: 1) it provides a theoretical basis for fitting organizations to resource type, 2) it emphasizes the analysis of incentives in resource use, and, 3) it readily applies to common resource management problems such as resource depletion, negative externalities, "free riders", and monopolies.

A basic social science question in natural resource and irrigation water management is the determination of the most appropriate organization or institution for managing resource goods efficiently. The most efficient, effective and, therefore, appropriate institution, is a function of the nature of the good - a question of fitting organizations to the type of resource being managed.

Three fundamental types of goods can be identified: public goods, private goods, and common pools. Their differences are best understood in relation to their exclusivity, divisibility, and subtractibility.

Public goods are nonexclusive in that they are equally available for consumption to all of the members of a population and nonsubtractible because one individual's consumption of the good does not subtract from the amount available for another consumer's use. National defense, air, and public broadcasting are examples of public goods.

Private goods are exclusive, divisible, and subtractible. Marketable commodities and real estate are examples of private goods - they can be broken up into units (divisibility), excluded from multiple use (exclusivity), and one individual's use of the good reduces availability to others (subtractibility) (Goetze, 1986; Freeman and Lowdermilk, 1981).

Common pools are subtractible, nonexclusive and not easily divisible. Therefore, they combine characteristics of both private and public goods. Examples of common pools include public rangeland, fisheries, and lakes. The nonexclusive character of common pools can lead to a dilemma of overuse and depletion because the resource is subtractible, but is held in common by a community of users, all of whom have access to it. The logic of the unregulated commons is that individuals will draw on the resource to maximize private benefits and pass on the contingent use costs to the collectivity. In the absence of institutional restraints to overuse, the resource may be exhausted as increasing numbers of self interested users consume the good (Bullock and Baden, 1977). This logic is useful in accounting for overgrazing, deforestation, pollution, water mismangement and some forms of irrigation deviance.

To optimize organizational efficiency, the nature of good can be matched to institutional type. Logically, public goods correspond to state responsibility and private goods to management within the free market. A nonexclusive, nonsubtractible good (public) can be allocated in the collective interest through representative government. Problems which may arise in this process include state-imposed inequities in resource access, noneconomic subsidies for projects which could be self-sustaining, state monopoly by a subset of users, bureaucratic insensitivity to user concerns, corruption, patronage, nepotism, bureaucratic passivity, and

related problems of non-representative management (Lusk and Riley, 1986)

An exclusive, subtractible good (private) is efficiently allocated in a marketplace where user prices correspond to costs and demand. Problems which can arise in this respect include the diffusion of negative externalities (consequences) such as pollution, social inequities in allocation, and private monopoly control (Sproule-Jones, 1982).

With respect to common pools, some have argued on behalf of public monopoly control (Baden, 1977), while others have suggested that the marketplace can most efficiently allocate the good (Ostrom and Ostrom, 1975). In either case the corresponding problems of management noted above may emerge. A more useful analysis points to the divisibility and multiple ownership aspects of a common pool to identify an appropriate institution (Goetze, 1986). If a common pool can be unitized (divided) into portions and distributed to multiple individuals based upon their willingness to pay, it may be more efficiently managed as a private good. Surface irrigation water meets these criteria. If, on the other hand, the commonly held good has integrity only as a single unit and is not transportable, it corresponds that representative collective ownership (state or private) is the most appropriate institutional type. Instream fisheries meet these criteria.

The challenge of common pool management is to prevent the dilemma or "tragedy of the commons" wherein individuals perceive that their marginal use of the resource in the short term is inconsequential to the final outcome. The result is that multiple users will eventually deplete or degrade the common good. The dilemma of the commons reflects how the interests of resource users can come into direct conflict with public welfare when individual incentives do not correspond to policy objectives. Even

with renewable resources this depletion of the good may surpass the point of no return. An aquifer or pasture can be exhausted to a level from which it will not regenerate in the foreseeable future (Veeman, 1978).

It is crucial that appropriate institutions be selected to manage a resource so as to prevent the problems which can result from a mis-match between the organization and the type of good (Goetze, 1986). In China, for example, considerable effort has been expended in re-directing the management of agricultural resources away from collectivist strategies. While this has been effective in increasing domestic food supplies and fostering competition, numerous examples can be identified of situations in which public or collectively-held resources have been depleted in the name of privatization or what the Chinese call the "responsibility system". Schell (1984;77) has reported that as the Party has retreated from its role in managing public goods such as dams, terrace walls, flood control and irrigation projects, many of these structures have fallen into disrepair and pumps, concrete blocks, wiring, and motors have been stolen or sold as scrap. Government "ideological work" to appeal to the responsibilities of the systems' users will likely prove insufficient in the absence of collective organizations which enforce management policies over goods that have fallen into the common pool.

The technology used to exploit a resource can also be fitted to organizational type. The two relevant dimensions of this analysis are scale and divisibility. Freeman and Lowdermilk (1981) have argued that a divisible technology, one that can be used in small scale, portable units (seed, fertilizer, handtools) require a much lower level of organizational investment for utilization. The market can optimize the allocation of divisible technology. In contrast, a major irrigation project involves large

scale "lumpy" technologies such as dams or lined canals which are not divisible or portable and which require high organizational and capital costs for implementation and utilization - a role suited to the public sector.

State management is usually fitted to large scale technologies that serve multiple constituencies because of the representative and mediative (judicial) functions. This is particularly true when dealing with "rights of way", equity issues, minority group rights, and taxation. When the decision costs for resource management (the time and energy invested in securing agreements among and between constituents and interest groups) are very high, as with very large or diverse user organizations, a state role can be a useful option if those who must manage, act on behalf of their appropriate constituency. Private stockholder organizational forms, such as the corporation, can be very effective in coordinating large scale technologies for singular constituencies. Note, for example, that the majority of dams and reservoirs in the United States are privately owned and operated. If the technology is of such a scale that the state's taxation power must be invoked, rights of way adjudicated, or if the technology benefits assorted political or social constituencies, state management is implied.

Without careful attention to the organization of incentives, there is often a direct conflict between individual interests and collective welfare in managing both common pools and public goods. This suggests that great care be exercised in designing organizations so that there is a high degree of correspondence between individual payoffs (benefits) and public policy. Seen in this light, efforts to appeal to the altruism of resource users or to "bureaucratically re-orient" or sensitize resource managers seem naive (Korten, 1980). Such efforts could be better invested in designing

organizations that efficiently manage resources in the public interest by retaining incentives for individual use. This process can be abetted through privatization, democratization and decentralization.

Public Choice and Irrigation

Irrigation organization and rural development require collective decision making as farmers, bureaucrats, and other interested parties express their political will by attempting to manage the water resource in their own best interest. The structure of this decision making process is determined by the legal, political, economic, and cultural environment. Of particular interest to the success of irrigation development is the local political economy of agriculture. A public choice analysis of irrigation organization will, therefore, emphasize: 1) the nature of the good, 2) the organizational character, and 3) the incentive structure. The purpose of the analysis is to arrive at a site specific maximization of "appropriate use" which can be defined as the organizational design which promotes efficiency, equity, and project goal attainment.

Privatization and the nature of the good

Irrigation water is a private good. It is divisible (can be readily unitized), subtractible (one irrigator's use subtracts from the total available for others), and exclusive (boundaries between uses can be maintained). If private rights and responsibilities over irrigation water are not established, however, it becomes a common pool. In order to achieve policy objectives such as equity, some governments may define irrigation water as a public good. Yet unless everyone has equal and non-subtractible access to the resource, it cannot truly be a public good. To legally define irrigation water as a public commodity is to formalize its common pool character with the consequential risk of depletion and maldistribution.

Even though irrigation water is a private good, the property rights can be assigned to the public sector. In this case, its use is determined by the pressures of interest groups, elites, or legislatures on government agencies and bureaucrats (Goetze, 1986). State control carries with it the risk of monopolies by a subset of users, non-accountability to users, inefficient use, and corruption. Alternatively, property rights can be assigned to the market where the cost of water will correspond to its productive utility for individual or multiple users. While this will tend to increase efficient use, private sector risks include inequitable distribution, monopoly control, and negative externalities such as pollution, salinization, and soil erosion - risks which can be mitigated through careful organizational design.

Water shares

The nature of the good is fundamentally linked to the institutional alternatives for its management. This is, of course, based on the central importance of ownership and tenure to economic efficiency. At the simplest level, the question is whether state or private ownership is best suited to the resource type. If irrigation water is privately claimed, the role of the state is to adjudicate rights and to arbitrate in disputes. If irrigation is of the common pool character, either because it has not been made exclusive by government or been claimed by private users, it can be unitized (or divided up) through share systems. The alternative is a dilemma of the commons. Finally, if irrigation water is strictly state-owned, there is no capture of economic rents by private actors nor any market incentive to control costs, increase efficiencies, conserve the good, or maximize production. The case for establishing property right or otherwise privatizing irrigation can be compelling when it is balanced with

state involvement in controlling negative externalities, protecting minority rights, managing disputes, and capitalizing large projects benefitting multiple constituencies (Coward, 1986).

Broadly defined, every irrigation system involving multiple farms and limited water is based on private shares. These shares may be explicitly and formally identified as legal rights and responsibilities (common in mature irrigation schemes) or may be informal and consensual. Because a share system is in place, however, in no way guarantees that it is equitable, fair, or productive. Indeed share systems generally mirror the distribution of rights and benefits in the broader social order: democratic, oligarchical, egalitarian, pluralist, theocratic, statist, etc. As a result, many irrigation systems are plagued with "tailender" problems or other inequities which produce social conflict, irrigation inefficiencies, and poor production. The key social and legal mechanism for organizing, and, therefore, of understanding irrigation water management, is through share systems. A share system determines the property rights of water users by defining the volume, timing, and contingencies of water allocation and delivery.

Shares or water rights can be organized variously depending upon the local context. Freeman (1986) has classified them as follows:

A) Shares by fixed percentage allotments:
   1. by volume (e.g. a percentage of total volume available)
   2. by time period rotation (e.g. a percentage of the week)
B) Shares by priority
   1. priority by location (e.g. head to tail)
   2. priority by farm characteristic (e.g. time of settlement)
   3. priority by crop (e.g. subsistence over cash crop)
C) Shares by user demand
   1. demand on reservoir
   2. demand on groundwater

The design of share systems is, in effect, the social engineering of irrigation. Shares are the social and legal basis for the organization of

water under a given irrigation technology. To illustrate, a share system can be designed for local circumstances using one of the above types of property rights or some combination thereof. In the Spanish Acequia system of Northern New Mexico USA, for example, many of the acequias (ditch associations) use a mixture of the priority by farm characteristic and priority by crop. In their situation they have chosen to recognize the primacy of early settlers' rights by conferring shares on the basis of "First in time, first in right" - a method commonly used by state governments throughout the American West. Interestingly, though, the acequias also recognize the importance of subsistence food crops to rural welfare, and so during dry seasons or periods of drought, family food gardens are given primacy in rights over cash crops. Two additional considerations are built into the share rules. The water must be put to "beneficial use" as defined by state law - water cannot be wasted or the right to use it is lost.

Additionally, acequia officials, in designing their rotation schedules, must take practical considerations such as ditch losses and the location of a field on the system into account so that irrigators get a just and proportionate share (Lovato, 1974). In this sense, the New Mexican approach is to have all of the farmers share equally in the conveyance and evaporation losses along the system. There is no maldistribution between the head and tail.

It can be argued that problems of maldistribution are inherent in gravity-fed surface irrigation, but there is no reason to assert that the engineering of irrigation necessarily determines the rules of allocation. The logic of shares is influenced by the engineering environment, but not determined by it. Tailenders do not get less water because of seepage

and conveyance losses, but rather because the farmers on the canal are not sharing the "shrink" (losses). Lining canals may reduce seepage but it will not necessarily remove the tail problem.

In some share arrangements the rotation actually reinforces inequitable distribution. The warabundi share model of Pakistan combines shares by time period and farm size with priority by location in such a way as to give the tail farmers proportionately less water because they must absorb the conveyance inefficiencies. Thus a central question in looking at the efficiency, productivity, and equity of an irrigation organizational design is: "Does the share system promote or diminish the problem of 'head and tail'?" (Freeman, 1986).

While a public choice orientation will generally argue in favor of greater privatization of water rights than is typical in order to improve use efficiencies, cases can be found where multiple private ownership has been relinquished to state regulation so as to prevent a common pool dilemma. In the West Basin Aquifer of Los Angeles County, California USA, joint users of underground water functioned under a Doctrine of Absolute Rights wherein their water rights were tied to ownership of land above the aquifer. As the water demand grew, the underground basin was being depleted beyond safe yield levels (the future viability of the aquifer was endangered due to saltwater intrusion). To prevent a depletion which would negatively affect all of the users, a Doctrine of Correlative Rights was implemented through state courts and the creation of a public water district. User rights were adjudicated based on safe yield levels and the pattern of historical use (Blomquist and Ostrom, 1985).

The West Basin water users autonomously developed the institutional

capacity to manage a commons in the collective interest. The case illustrates that while resource users will act in their own rational self interest, collective and/or state-monitored management can be an effective organizational choice when private share rights are retained and representative management is ensured. It would be more economical over the long term to collectively regulate use than to follow the individual pumper's incentives to increase unrestricted use to the point of depletion. What is notable about the West Basin case is that the users self-imposed new cost sharing and institutional controls on water use without state coercion. It has been argued that the correlative rights doctrine could be of significant value in organizing groundwater rights in the Indo-Gangetic Plain of Northern India where presently groundwater pumping is essentially an unrestricted common pool (Veeman, 1978).

User fees

The privatization of irrigation is also related to costs, productivity, and farmer participation. It is dysfunctional not to price water in the marketplace. To make water freely available to users without imposing the corresponding costs of diversion and storage is to create a common pool and to transfer the operation, construction, and maintenance costs to the state (in effect to the taxpayer who may not be a project beneficiary) or to foreign donors. While in traditional subsistence economies, it may be unrealistic to expect risk-aversive peasant farmers to bear the front end costs of major project development, it is not unrealistic, indeed it is desirable, to have them bear the costs of ongoing operation and maintenance if they also have representation in determining the costs, rules of allocation, and methods of resolving disputes.

Free or very low cost water encourages overuse, reduces the

incentive to cooperate and participate in irrigation organizations, lowers system productivity due to overapplication (overirrigation can reduce yield because of inadequate root aeration) and poor conservation practices. In a very low cost state-subsidized or gratis situation, there is no incentive to husband water. If water is not abundant, overall system productivity will be reduced because of uneven application across the scheme - headenders will tend to overirrigate and tailenders will experience reduced yields for lack of an adequate supply. Participation will be minimal because the organizational costs of increased collective management will exceed the existing costs of unrestricted use (see Figure 1).

Very high cost cases encourage conservation but at the expense of system productivity. Unless low profit dryland crops are used with supplemental irrigation, the alternative is lowered yields due to crop stress from underirrigation. Artificially high priced water raises input costs to the level of non-profitability. Farmers have an incentive to disengage from irrigation organizations that impose unreasonable costs so participation is minimized.

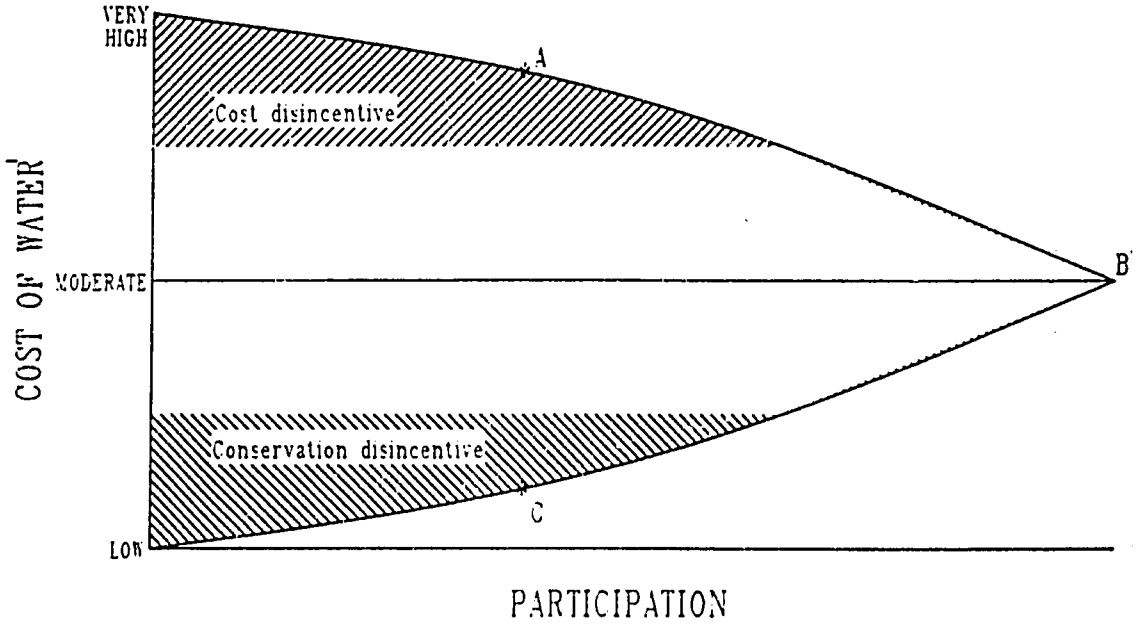
If the market is allowed to freely function, an optimization point can be achieved where water costs correspond to demand and use, and system productivity is maximum because the incentive to conserve is balanced against the need to achieve optimum crop application efficiency (see Figure 1). In this case, farmer participation is high because of the individual incentives to keep the organization responsive to the local farm economy. For the model to work it is crucial that the irrigation organization be democratic and decentralized.

Democratization and organizational character

By virtue of having to share the natural resource, water users are inextricably connected by the physical distribution system and by the

Figure 1

FARMER PARTICIPATION AND THE COST OF WATER



A High cost water, low productivity, low participation
B Moderate cost water, high productivity, optimum participation
C Low cost water, moderate productivity, low participation

[1] Water costs are both organizational and per unit

socio-political organization managing that distribution. The control of water availability by users is a function of the technology type and the organization's scale and character.

The simple case of gravity flow, canal fed, surface irrigation can illustrate. On-farm availability in this example is a function of the number of upstream irrigators on the delivery system, total water supply, net seepage, and evaporation. To have any effect on the delivery of water to the field channel, the agriculturalist has options which correspond to the technology. The farmer can try to increase total water supply to the scheme, reduce seepage through canal lining or other techniques, or can work with other farmers to collectively address inequities in downstream delivery. All of these strategies represent organizational problems. To affect total water supply requires that the farmer reach up into the system to influence those who control the main works. To line canals or otherwise reduce water losses necessitates influencing those who control the middle level irrigation organization: the canal company, water users' association, etc. To address inequities in the delivery of water to the tail requires that all of the users on the system cooperate in an allocation method that is fair and proportional. We can see that each method of positively affecting on-farm water availability requires a high level of farmer organization because individually a user cannot effectuate significant changes in water management except at the field level.

The function of irrigation organization is to design and manage the institutions and physical structures which economically deliver water in a timely and reliable manner with the highest possible degree of control at the farm level. Water has little or no value if it is not of sufficient volume for crop needs or arrives at the field channel too early or too late.

The volume of water must be predictable throughout the growing season so that growers can plant in relation to anticipated supply and the predicted volume must be available when needed.

Fundamental to the effectiveness and efficiency of irrigation organization is the problem of accountability and control. Because of the need for timely applications of requisite volumes at the field level in order to maximize yield, irrigation organizations that are not controlled or at least influenced by the irrigators themselves will produce inefficiencies (Parlin, Lusk, and Al-Rashid, 1986). This principle of irrigation organization functions because of accountability. The actors in inefficient irrigation schemes usually do not have to bear the costs of their inefficiencies. If, on the other hand, those who bear the organizational costs also capture the benefits, we can expect such inefficiencies to decline. To build in accountability is to ensure that those who must take the risks and pay the costs of farming should also be able to capture the benefits. Field experience reveals that farmers are willing to make enormous investments of energy, labor, and cash when they perceive that they are in control, their risks of failure are low or moderate, and that they will be able to reap the benefits of their work. What we have often seen in the field, however, is that the primary users of water have little or no control over its administration or delivery. Individuals whose livelihood is not dependent on the efficient and timely delivery of water (bureaucrats) may be those who have the greatest say in how it is allocated and managed.

The argument in favor of the bureaucratic administration of water is the presumed need for specialists to manage complex engineering and allocation systems for multiple users. This does not obviate the logic of farmer control. It is possible to privatize, decentralize, and democratize

the administration of water while still employing technicians and "experts". Farmer owned and operated waterworks can be managed by elected farmer directors under corporate models of organization (Lusk and Anderson, 1988). In cultural contexts where the private ownership or management of natural resources is restricted, the appropriate public organization can be democratized by electing water administrators or commissioners who then supervise specialists in the interest of the user constituency. Accountability is built in through the participatory process.

Democratic administration is a goal of irrigation organization because of the corruptability of decision makers and the abuse of authority possible under centralized bureaucracy. In resource and other public management, administrative rules are not a matter of political indifference to users (Ostrom, 1974). Indeed farmer welfare is fundamentally linked to the decision making process growing out of those rules.

The democratization of irrigation organization can be stimulated by a reduction in the scale of such associations. Large groups do not induce a sense of accountability or of permanency. In small groups individuals tend to feel more visible and, hence, more accountable to one another and a sense of reciprocity emerges among group members. In marketplaces where individuals expect to have continued interaction over long time frames, a norm of reciprocity is likely to develop in which individuals recognize the need to cooperate to achieve mutually rewarding pro-social outcomes (Axelrod, 1984). Reductions in scale can also stimulate healthy competition and thus efficiency. Multiple, diverse, segmental organizational forms allow free movement from one association or organization to another as consumers seek to find the least costly organization. Reductions in organizational scale can prevent monopoly (the

antithesis of free choice) by permitting competition, change, and face to face reciprocity.

Our working assumption is that farmers rationally seek to control their resources in order to maximize agricultural production and can effectively do so when they have private land and water rights, open markets, and predictable and accountable organizations for resource management. Integrated irrigation organization development pursues these ends.

Three central concepts can be used to guide organizational design for public development: democratization, decentralization, and privatization. Democratization is the process of building political accountability into organizational design. To decentralize organizations is to break decisionmaking out of the top heavy hierarchical mode by transferring authority (and responsibility) to those who are in communication with the needs of the specific local constituencies affected. Privatization is the process of restoring some public functions to the marketplace either by deregulation or the establishment of property rights for what had been publicly owned goods (Lusk & Parlin, 1986).

In irrigation, the democratization of the water management authority or other irrigation organization provides for accountability to the users and funders. Decentralization reduces the machine-like character of bureaucracies by scaling the decisionmaking process to the corresponding constituency, level of technology, and local environment. Privatization can clarify rights of use and ownership, stimulate competition, and diminish state coercion.

There are numerous implications of this theoretical approach to irrigation development and management. If one accepts the general

framework of the theory, the following strategies are suggested: A) clarification and adjudication of water property rights and entitlements, B) the formation of private irrigation companies or ditch groups, C) water marketing, D) user fees, E) elected water management officials (from the commissioner to ditchrider level), F) decentralized segmental irrigation project management, and G) codification and enforcement of the rights and responsibilities of water users and bureaucrats.

Another key implication of the rational choice model for irrigation development and management is that policy, planning, and organizational design must be cognizant of how the system is viewed from the point of view of the individuals involved in it - the farmers, policymakers, funders, and bureaucrats. When viewed from the farmer level we may be surprised at the confusion of incentives, sanctions, and cultural preferences which shape decisionmaking. Equally important is how the system is seen by the various bureaucrats. Government officials can also be assumed to be rational and self-interested decisionmakers who act in response to their own set of incentives and perspectives. Their behavior, which is not necessarily in the "public interest", is no less important to the success or failure of an irrigation project than that of the presumed primary beneficiaries.

Rationality, Bureaucratic and Farmer Participation

Considerable attention has been given by social scientists to the problem of involving farmers and other water users in the process of managing and developing irrigation projects (cf. Uphoff, Meinzen-Dick, & St. Julien, 1985 ; Parlin & Lusk, 1988). The lessons of this line of research are that farmer involvement in planning, design, water allocation,

and conflict management has several positive effects on project outcomes. Studies in the Philippines and Sri Lanka, for instance, have demonstrated reductions in conflict and deviance in addition to improved water application efficiencies (Bagadion, 1985; Uphoff, 1986). These are findings that are entirely consistent with the broader research traditions of the sociology of organizations and rational choice theory which would suggest that worker or farmer satisfaction and productivity will be linked to the degree to which they as constituents are meaningfully involved in the decisionmaking process (cf. Blumberg, 1969).

Repeatedly, however, irrigation development specialists report that one of the most serious obstacles to project success is not only the meaningful of involvement farmers, who after all are direct beneficiaries of increased water supply, but the bureaucrats who have little or no incentive to implement policies which have no bearing on their own welfare (cf. Wade, 1982; Freeman, 1986).

A preoccupation with farmer participation may have obscured to a degree the fact that farmer behavior is partly a function of the organizational behavior of project and agency bureaucrats who interact directly or indirectly with farmers, implement or neglect project policy, and otherwise have a bearing on the outcomes of the irrigation enterprise.

Several researchers have recognized the importance of the interface between the farmers and the bureaucrats. Bryant and White (1984:9), for example, propose:

> ...that if participation is to occur and be effectively managed, there must be incentives for farmers and peasants to participate. There must also be incentives for field level administrators to facilitate that participation.

They and others (cf. Bromley, 1982; Freeman, 1988) have emphasized the importance of farmer-bureaucrat linkages and <u>institutional</u> reform to increased farmer participation.

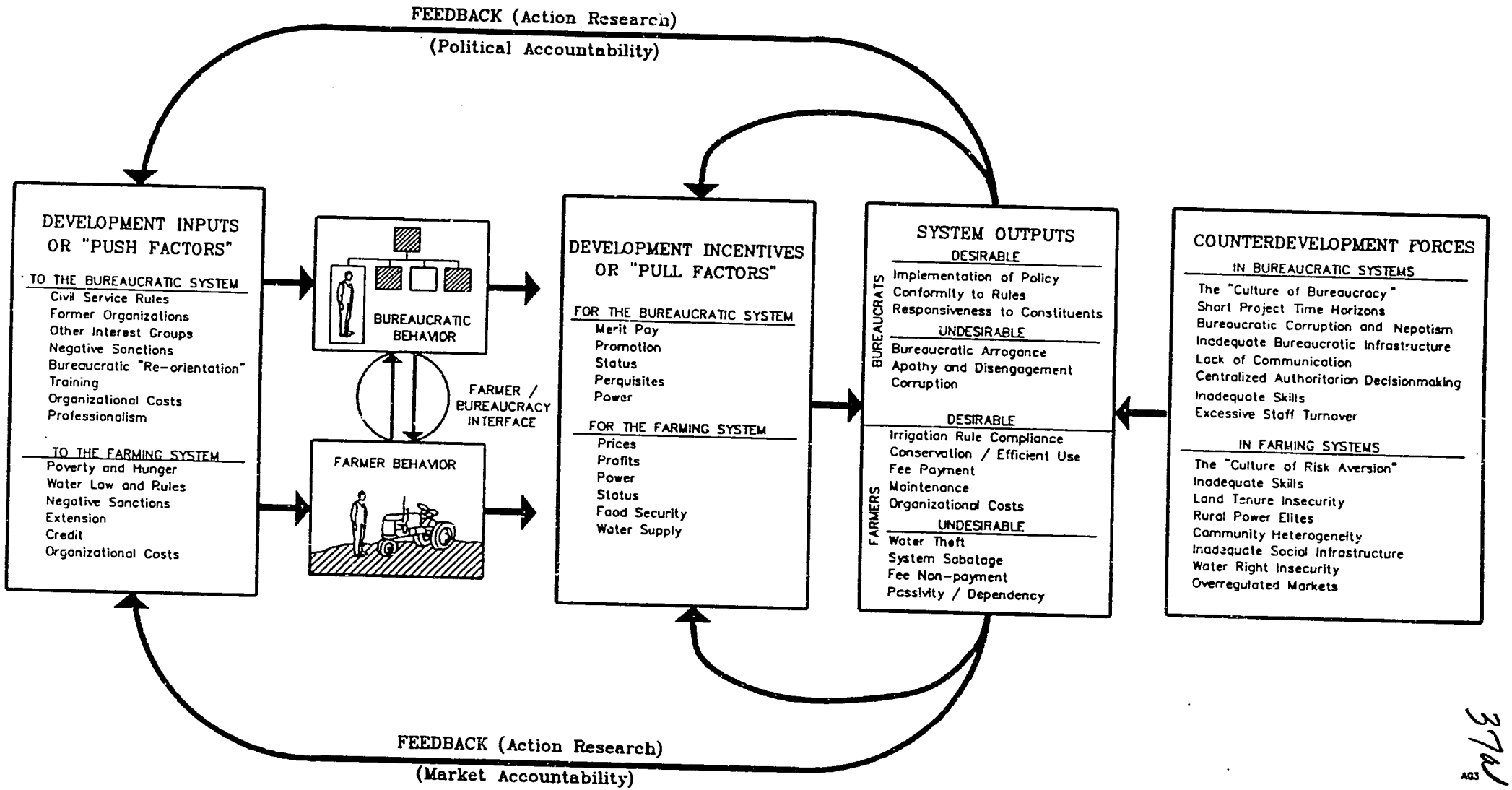
Korten (1980) and Bagadion (1988) have suggested "bureaucratic re-orientation" as a method of improving the relationship between irrigators and bureaucrats. The "re-orientation" or training technique used is to appeal to the altruism, commitment, or "public interest" of water management officials - an approach that to be effective will also have to incorporate "incentives" (Bryant & White, 1984) and "sanctions" (Lusk & Parlin, 1986).

Increased farmer participation alone is not necessarily a panacea to irrigation project success. Indeed some of the most successful systems in the American West are characterized by an almost complete absence of farmer or user participation. One can attend irrigation company meetings in Utah and Colorado, for instance, in which the users themselves are not participating. This is not because the irrigation company is a failure but precisely because it is a success. The users, having few complaints or conflicts, have no incentive to become involved. The timely arrival of adequate volumes of water to their land has made participation moot. What is important is that the institutional mechanisms for user participation or even better, control, be present in the irrigation organization's design. The irrigation association must be "engineered" or designed in such a way that decisionmakers are compelled to implement policy and represent the interests of the users.

The management of irrigation development behavior involves the design and monitoring of irrigation organizations that can simultaneously implement water management policy and represent the needs of the user constituency. It consists of the coordination of both "push" and "pull" factors which direct the irrigation project toward its stated development objectives (see Figure 2). If we conceive of irrigation projects as

Figure 2

MANAGING IRRIGATION DEVELOPMENT BEHAVIOR



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dynamic organizational systems made up of rational utilitarians, then we can identify those factors or pre-existing conditions that impel or push the key actors to behave according to development objectives as well as those factors which incentivate or pull the individual toward the desired outcomes. To look at an irrigation project in this way is to focus on the policies, rules, sanctions, preconditions, and incentives which shape the behavior of the two most important groups involved in irrigation development: farmers and bureaucrats.

As in any systems-type model, we assume that an irrigation project is dynamic and evolving as it seeks an equilibrium resulting from the forces impinging upon it. Those forces can be consistent with the goals of the project or may mitigate against them. The path of the project's evolution is a function of the development process (one of induced social and technical change) working against the counterdevelopment forces present within the irrigation system and the external environment. The task of irrigation management is to imbalance the equation in the direction of development by juxtaposing inputs and incentives in such a way as to change the behavior of farmers and bureaucrats toward desired project outputs. In addition, attention must be given to overcoming or at least minimizing counterdevelopment forces and incorporating a feedback mechanism whereby the project can become self regulating.

Figure 2 implies that the management of irrigation development must simultaneously address the behavior of bureaucrats as well as farmers. The development inputs and incentives shaping the bureaucratic and farming systems can be coordinated to maximum effect. Note that the profits, status, and search for security motivating farmers have corollaries in the bureaucracy - merit pay, promotion, perks. Similarly, such incentives

become more powerful in the presence of those pre-existing conditions and inputs which will make pro-development behavior possible - order, rules, and training.

By using the rational choice model to load the development equation on behalf of success, we can transcend a problem solving or "clinical" framework which would seek to resolve project difficulties on an atomistic, post-hoc basis using specialists to "diagnose" project ills. A problem such as farmer non-payment of water fees cannot be seen in isolation from the organizational framework that produces such deviance. Likewise, bureaucratic corruption and patronage can be better understood by looking at the checks and balances that impinge upon bureaucrats. To solve a specific problem will usually require some tinkering with the whole system.

Furthermore, a systems approach gives equal or greater emphasis to project performance as opposed to project problems. Therefore the perspective will look for "what is right" with an irrigation system with the goal of building upon what Keller (1988) has called "the islands of excellence". Superficially a project may appear to be in a chaotic state when the focus is on overgrown ditches, siltation, breached canals, poorly drained fields, and damaged structures. Yet few irrigation projects are immune to such problems and a "technical fix" orientation may overlook positive patterns of cooperation, water sharing, maintenance, or questions of profitability.

Institutional reform

We have seen that farmers and workers respond to meaningful involvement in agricultural organizations. This is in part because the project will be more likely to be accountable to their constituency's needs - a group who must survive by selling products in a marketplace that tends

to contain their costs and act as an incentive for their efficiency. We can anticipate that there are similar mechanisms by which bureaucrats can become more reliably efficient in attaining project goals. Bureaucrats, after all, spend other people's money, and have few incentives to reduce the size of their budgets. In most situations they are not elected by those they serve and therefore have little reason to be representative of their interests. Rarely are they subject to the forces of competition nor is their personal welfare linked directly to the successful implementation of policy (cf. Knott and Miller, 1987). While it has become clear that irrigation development can be greatly accelerated by incorporating farmer participation into the project, the importance of the behavior of those who are external to the farming system should also be considered.

Summary

A rational choice perspective suggests that at least three organizing concepts be used to design irrigation organizations: democratization, decentralization, and privatization. These concepts can be used with effect not only in thinking about water user associations, but can also be applied to the larger institutional framework of irrigation development.

The strategy implied by this approach to institutional reform will specifically suggest the: A) implementation of civil service rules and sanctions which are promptly and equitably enforced, B) replacement of the culture of bureaucracy with the rules of meritocracy, C) design of "representative bureaucracy" built around the election of water commissioners, directors, and ditchriders, D) development of corporate or utility water management organizations in which users are "stockholders", E) clarification and adjudication of water property rights and entitlements, F) emergence of decentralized segmental irrigation project

management, G) codification and enforcement of the rights and responsibilities of water users and officials, and H) optimization of use through water marketing and user fees.

While it is clear that such ideas must be carefully fitted to the local social and cultural environment by selecting incentives and sanctions which are appropriate in a given context, they nonetheless provide a useful starting point for guiding the institutional change which is an inevitable part of any development project.

The application of sociology to irrigation development and management produces its best yields when guided by relevant theoretical perspectives. The eclectic use of organization theory, human ecology, conflict theory and rational choice theory can be helpful to efforts to effectively manage irrigation development behaviors and processes. The use of a systems model which incorporates development inputs, incentives, counterdevelopment forces, environmental factors, and feedback can provide a holistic context for irrigation project management.

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