

# Pro-Poor Irrigation Intervention Strategies in Irrigated Agriculture in Asia: Developing the Project Framework

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## **Background**

Despite the remarkable expansion of irrigated agriculture in Asia that brought dramatic increases in food production in the past three decades, there remain vast areas in the established irrigation systems where productivity and incomes of farmers remain extremely poor. This is attributed to inequitable distribution of water caused by poor management and to a range of other physical, sociocultural and economic constraints. The efforts of governments of the developing countries to address poverty reduction in these specific areas have been limited and ineffective due to lack of proactive policies and actions, and knowledge of how alternative economic, institutional, governance, and technical interventions can address poverty-related constraints. However, an increasing number of developing countries in Asia are recognizing the looming water-scarcity situation and the ever-increasing food demand across the region, and are moving toward major policy and institutional reforms to optimize the management of their water resources. Enhancing the productivity of poor farmers in these areas should be prioritized, as they are most vulnerable to water scarcity. The International Water Management Institute (IWMI) has proposed the study to assist the developing countries in determining realistic options for improving the returns to poor farmers in the water-scarce areas. A rigorous analysis of poverty-related constraints and the impacts of a range of potential pro-poor interventions on those specific constraints will be conducted, focusing on selected low-productivity irrigated areas and their peripheries in the participating countries, Bangladesh, People's Republic of China, India, Indonesia, Pakistan and Vietnam.

## **Goal, Objectives and Scope**

The overall goal of the proposed study is to promote and catalyze equitable economic growth in rural areas through pro-poor irrigation interventions in the participating developing countries.

The immediate objective is to determine realistic options to improve the returns to poor farmers in the low-productivity irrigated areas within the context of improving the overall performance and sustainability of the established irrigation systems.

The study will focus on selected representative low-productivity irrigated areas and their peripheries with a large number of people under persistent poverty in the participating countries. The emphasis is on identifying and assessing a set of appropriate economic, financial, institutional, governance and technical interventions at field and system levels, and changes in the overall policy and institutional framework as far as they affect access to water resources for the poor. The scope is as follows:

1. Analysis and field research on the impacts of the current policy and institutional framework, and the impacts of underlying physical, economic and sociocultural conditions on the selected areas in particular and on the overall irrigation systems at large, including the assessment of opportunities for, and constraints on, improving productivity in these less-productive areas through improved access to irrigation water.
2. Identification and in-depth evaluation of a range of potential pro-poor economic, financial, institutional, governance and technical interventions at field and system levels against a set of criteria including cost of implementation and potential to reduce poverty, and assessment of necessary changes in the overall policy and institutional framework under which such interventions could most effectively address poverty reduction in the study areas.
3. Formulation of a set of appropriate interventions and the policy and institutional frameworks, including adequate support systems, required to ensure large-scale uptake, replicability and higher impacts within and between Asian countries to culminate into a) the guidelines for identifying and evaluating appropriate pro-poor interventions and enabling policy and institutional framework for irrigated agriculture in Asia, and (b) country-specific action agendas for the selected low-productivity areas of the participating countries.

## **Irrigation and Rural Poverty**

### ***Positives***

The overall goal of irrigation development in developing countries has been the socioeconomic uplift of the rural masses. Within this goal, the governments of the developing countries have promoted irrigation for several broader objectives such as economic growth, rural and agricultural development, national food security, protection against famines and intensification of land use. Huge investments have been made in large networks of canal irrigation to achieve these objectives. Subsidized irrigation supplies, along with many other input subsidy programs have been established for the socioeconomic transformation of

national and regional economies and rural communities. However, as the socioecological externalities of irrigation became apparent, and as scope for further irrigation development became limited and donor support subsided, the focus shifted from development to management of irrigation. The new paradigm focuses on growth with equity and sustainability.

Irrigation has a strategic importance in agricultural production. There is little dispute of the fact that agricultural output per hectare is substantially higher on irrigated fields than on nonirrigated fields. Irrigated agriculture has been adopted by many poor farmers as a source of food security, income and employment. It has also been adopted by the rich and well-off as a business activity, as an investment alternative and, often, as a means to exert social influence and political control.

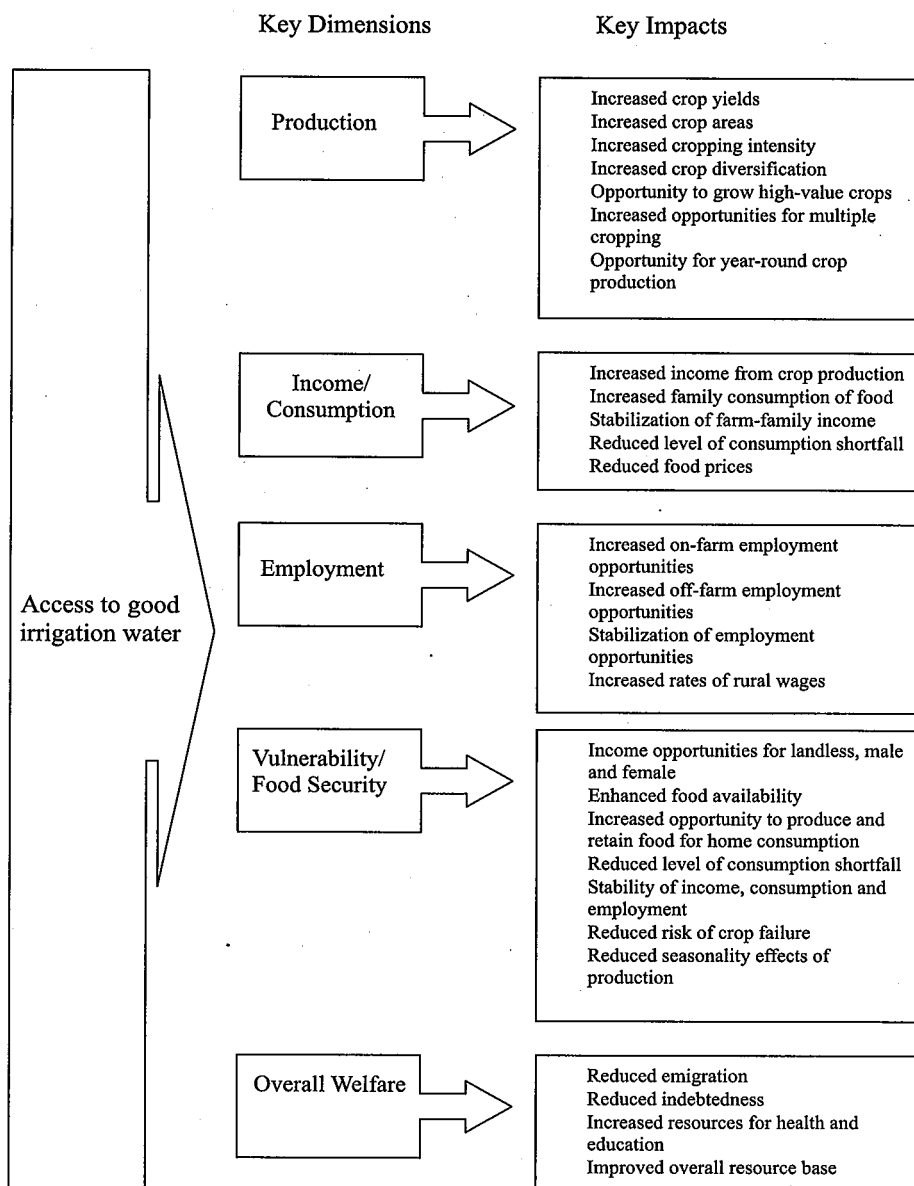
Irrigation has been regarded as a powerful factor for providing food security, protection against adverse drought conditions, increased opportunities for more employment and stable income, and for offering opportunities for multiple cropping and crop diversification. Access to reliable irrigation enables farmers to adopt new technologies and intensify cultivation, which lead to increased productivity, overall higher production and greater returns from farming. This, in turn, opens up new employment opportunities both on-farm and off-farm, and improves income, livelihood and the quality of life in rural areas. Overall, irrigation water, like land, has an important wealth-generating function, specifically in agriculture and generally in rural settings.

There are five key dimensions of how access to good irrigation contributes to socioeconomic uplift of rural communities—production, income/consumption, employment, vulnerability/food security and overall welfare (figure 1). In general, access to good irrigation allows poor people to increase their production and incomes, to enhance their opportunities to diversify their income base and to reduce their vulnerability caused by seasonality of agricultural production and external shocks. Thus, access to good irrigation has the potential to contribute to poverty reduction and to move from ill-being to well-being.

## *Negatives*

Access to good canal irrigation depends upon the performance of irrigation systems, including its hydrological, infrastructural, agricultural, socioeconomic and institutional dimensions. There is significant evidence that performance of large- and medium-scale canal irrigation systems in most developing countries has been poor. Historically, the large- and medium-scale canal irrigation systems have been owned, managed and operated by government agencies. These publicly managed systems are generally characterized by poor management, unreliable water supplies, poor maintenance, deteriorating infrastructure, unsustainability, inefficiency and inequity in water use and distribution, and financial dependence. These problems result in smaller irrigated areas than what could potentially be irrigated with available supplies, lower cropping intensities and crop yields, tail-end deprivation, increased problems of waterlogging and salinity, and lower returns from farming—resulting in overall reduced benefits to society from the available resources and little or no antipoverty impacts from irrigation. The vicious circle found in the irrigation sector of many developing countries is described in box 1 and figure 2 (modified from the World Bank 1999).

*Figure 1. Key dimensions and linkages between irrigation and socioeconomic uplift of the rural communities.*



With increasing realization of these problems, coupled with budgetary pressures and the need to reduce public expenditures for irrigation, there has been a significant emphasis on the strategies for performance improvement through reforms in the irrigation sectors of the developing countries of Asia. Steps toward development of policies and laws on irrigation water, basin level approaches to planning, irrigation management transfer to user organizations, changes in irrigation financing policies including irrigation charging policies, are all part of the reform initiatives.

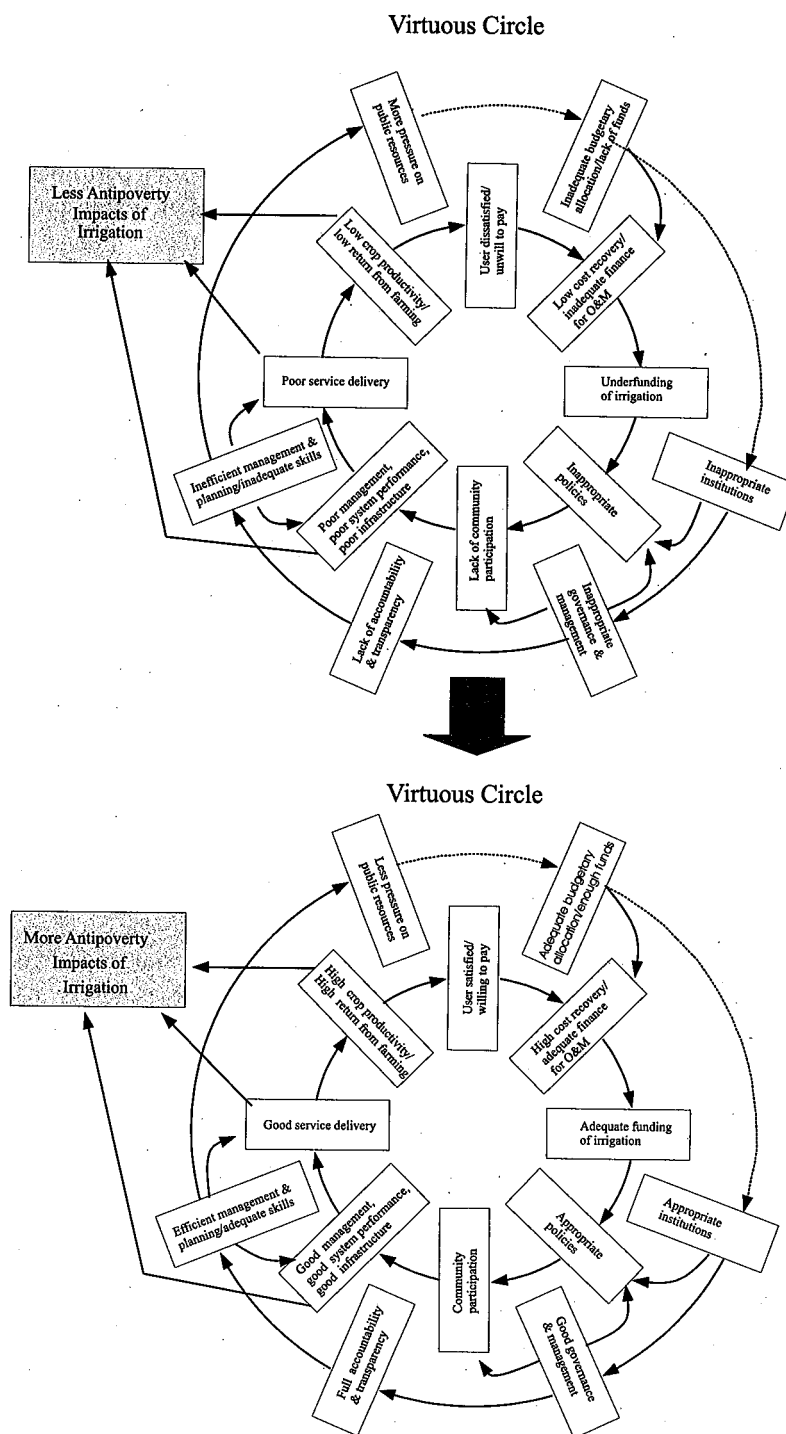
The overall goal of initiatives on the improvement of irrigation performance is to better utilize the available water resources and to increase overall agricultural productivity. It is implicitly assumed that equity concerns in the overall strategy for performance improvement would benefit communities, including the poor. The underlying assumption is that performance improvement would increase the "size of the pie" and that the poor would also benefit from the bigger pie. This is similar to the "trickle down" approach in general agricultural-development strategies pursued during the 1960s through the 1980s. Most agricultural-development experts would agree that the trickle-down approach was not very effective in reducing poverty. In the irrigation sector, general performance-improvement initiatives may prove another form of the trickle-down approach, specifically to the irrigation sector. It is timely to ask questions like: to what extent can the overall irrigation-performance improvement benefit the poor?; how and to what extent can poverty concerns be incorporated into reform initiatives?; which approaches and models have greater positive impacts on poverty? and what specific pro-poor interventions need to be incorporated into general performance-improvement strategies?

***Box 1. From vicious circle to virtuous pro-poor circle.***

The current situation in the management of the irrigation sector may be characterized by a vicious circle as shown in figure 2. The starting point in the vicious circle is most likely poor delivery of services resulting from poor management, poor infrastructure and poor system performance, and from inappropriate sector policies and lack of community participation. These factors lead to low crop productivity and overall low returns from farming, which, in turn, lead to water users' dissatisfaction with quality of irrigation services and their unwillingness to pay irrigation charges resulting in low cost recovery. This, combined with inadequate budgetary allocations for the sector, results in underfunding of the sector. All the factors given in the inner loop are the effects of the underlying causes, which are inappropriate governance and management, and inappropriate institutions resulting in overall inefficient management and planning, reducing antipoverty impacts of irrigation.

The key to convert this vicious circle into a virtuous one is to correctly diagnose and address these underlying causes. The research work in this project will focus on developing an understanding of these underlying causes in the vicious circle and identify strategic interventions that, in addition to improving overall management of the sector, also enhance antipoverty impacts of irrigation.

Figure 2. From vicious circle to virtuous circle.



## **Ambiguities and Unknowns**

While it is clear that appropriate institutions, policies and management practices are needed in moving from the vicious circle to a virtuous one, the fundamental question is: what are those appropriate institutions, policies and management practices? There is a vast amount of literature suggesting various types of performance-improvement interventions. These include decentralization of control, users' involvement in irrigation management, regulatory instruments and market-based approaches. However, there is no consensus on how, and to what extent, these interventions contribute to improving system performance. More importantly, it is not clear how these interventions help enhance the role of irrigation in its contribution toward poverty alleviation or, in other words, how performance improvement interventions can be designed so as to provide an enabling environment for the poor to secure greater benefits from irrigation.

## **Key Research Issues**

The central research issues in the above context are: whether, and to what extent, irrigation development and past management practices have contributed toward achieving the broader goal of socioeconomic uplift of rural communities and, if not, what are the causes of underachievements, and how have these affected the lives of the poor in rural agricultural communities. Alternatively, why do poverty and affluence coexist in irrigated agriculture, and in light of regional experience, what are the realistic options to make irrigation effectively pro-poor?

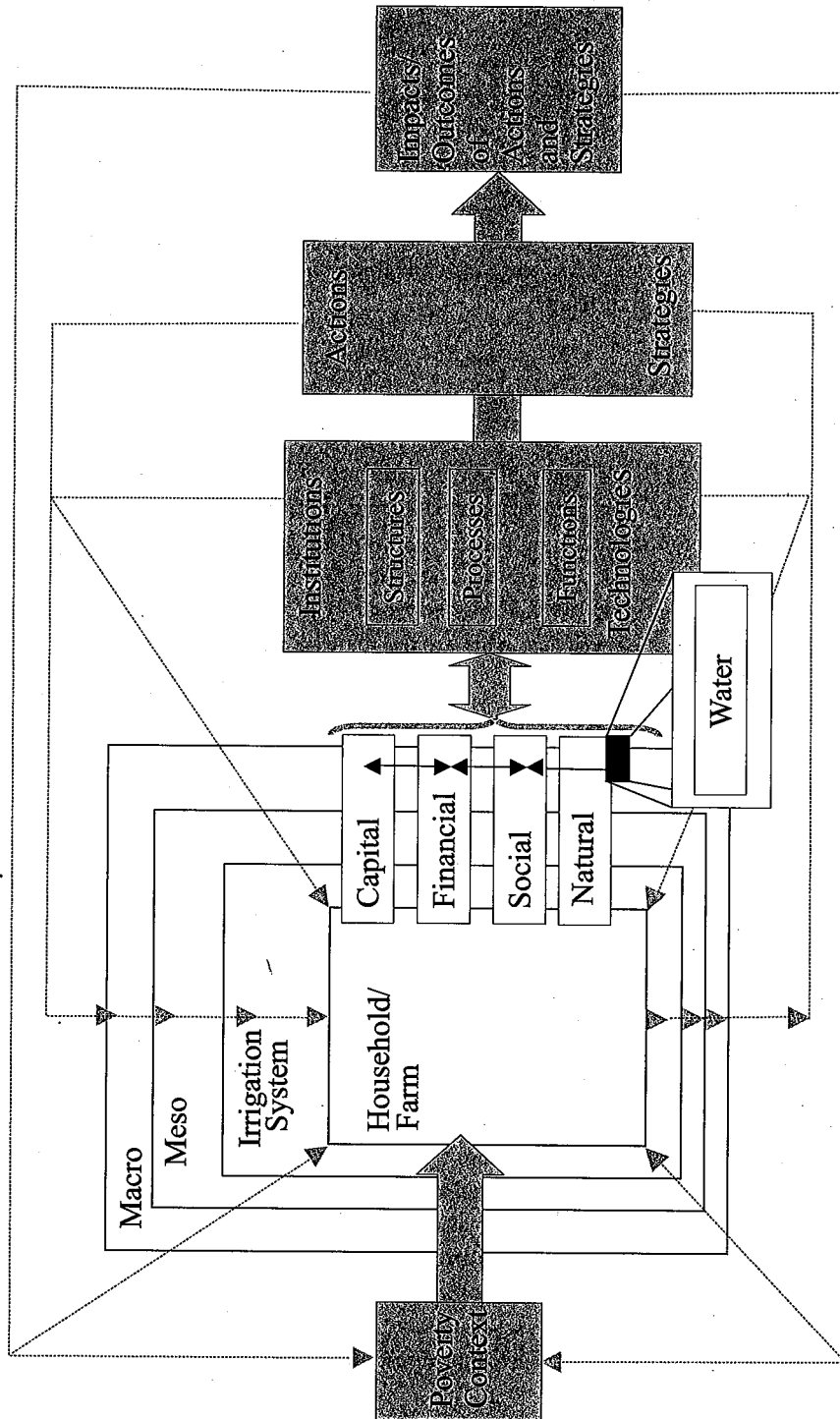
## **Conceptual Framework**

The broad framework adopted for this study is graphically depicted in figure 3. This framework establishes the conceptual approach for developing specific methodologies for the project. The framework takes a holistic perspective in understanding socioeconomic and physical environments and highlights some of the complexities in studying poverty in irrigated agriculture [Some of the concepts used here are borrowed from the Sustainable Livelihoods Approach (SLA) for analyzing poverty (see Nicol 2000) for details on SLA].

The starting point in this framework is to develop a sound understanding of the poverty situation at the household level, the basic unit. A household is a part of an agricultural/irrigation system that, in turn, is a part of the region/province/basin—which is a part of the macro or national socioeconomic system. A household is linked to these higher levels through a multitude of complexities, which come from several sources.

There is a stock of resources or endowments, which change over time. The resources are classified as capital resources (infrastructure...), financial resources (income, cash, credit...) social resources (education, skills, culture, social networks...) and natural resources (land, water...). These resources are shared across the various levels from macro down to farm/household level. Each household or irrigation system has a share of the total

Figure 3. Framework for studying poverty in irrigated agriculture.





available resources and these resources are interdependent. That is, a change in one resource will depend upon changes in the other resources.

In addition, there is a set of institutions and technologies. Institutions may be considered as combinations of policies and objectives, laws and regulations, organizations and their core values, operational plans and procedures, incentive mechanisms, accountability mechanisms, norms, traditions, practices and customs (Bandaragoda 2000). For analytical purposes, institutions may be perceived as comprising a) Institutional Structures; b) Institutional Processes; and c) Institutional Functions. Institutional structures refer to organizations, both formal and informal. Institutional processes refer to policies, laws, rules and regulations and practices. Institutional functions refer to implementation of institutional processes. Both processes and functions may be perceived as software parts of institutions. Structures are important because they develop the institutional processes, implement them and make them functional. All three components are deeply interlinked.

Institutions operate at all levels from the household to the macro/national level. Institutions and resources are also linked to each other. That is, institutions determine changes in stocks of available resources, and the available resources determine the type of institutions in place. Most importantly, institutions play a key role in determining how the available stock of resources is shared across households or systems, thus influencing access to these resources. Available resources, technologies and the institutions in place determine the type of actions taken and strategies adopted at each level (i.e., household to macro level), which result in certain outcomes. These outcomes could be positive or negative or a combination of both. Outcomes and impacts feedback affecting each of the four levels directly or indirectly—influencing the resource base, access to resources, and poverty situation at all levels. A good resource base with appropriate institutional arrangements and technologies combined with effective actions and strategies results in positive outcomes, which positively influences the entire system. However, inappropriate institutions and ineffective actions and strategies, even with a good resource base, may result in neutral or negative outcomes, adversely affecting the health of the entire system.

For positive poverty outcomes, two broad approaches may be adopted: a) redistributing the available resources in favor of the poor, and b) creating an enabling environment for the poor to benefit from available resources at various levels through appropriate institutions (technologies). However, there is no unique set of appropriate institutions that can be applied universally. A set of institutions may be appropriate under certain conditions, and may not be appropriate under others. Understanding these conditions and devising effective institutions are essential for any effort toward poverty alleviation.

It is clear from the above discussion that irrigation water is only one of several natural resources in a complex set of stocks of various resources. Poverty is an outcome of complex interactions of the resources, technologies and institutions, actions and strategies, and their ultimate outcomes. It is naive to believe that all rural poverty problems could be solved through irrigation interventions alone. However, since irrigation is an important rural resource, improved access to irrigation could be an important contributing factor toward poverty alleviation through its direct and indirect linkages with other resources. Identifying appropriate institutions and the associated conditions under which they are effective are crucial in devising actions and strategies that lead to pro-poor outcomes.

As complex as it is to study poverty, it is even more complicated to isolate the impact of one factor, irrigation, on poverty. Considering the complexities involved and the need to maintain a sharp research focus, the study will focus on the following specific research issues and questions:

### **Specific Research Issue 1**

Irrigation has been regarded as a powerful factor for increasing productivity, enhancing food security, providing increased opportunities for increased and more stable income and employment, and for increasing opportunities for multiple cropping and greater scope for crop diversification with increased overall returns from farming. Irrigation water is considered to have an important wealth-generating function in the agriculture and rural sectors. While there is little dispute to the fact that irrigation has benefited the poor, the overall benefits from irrigation are generally perceived to have been skewed in favor of the non-poor. Since poverty and affluence coexist within irrigated agriculture, the central research issue here is whether, and to what extent, poverty in irrigated agriculture is related to irrigation and non-irrigation factors.

### ***Research Objective***

To improve our understanding of how, and to what extent, irrigation contributes to poverty reduction, what the key dimensions are, and whether there are any spatial patterns in distribution of the poor and access to irrigation water along various reaches of irrigation systems. Linkage analysis involves analyzing impacts of irrigation on poverty.

### ***Research Questions***

1. What are the poverty situations in the study area?
2. Where, along irrigation systems, do the poor people live and are there any geographic patterns of the poor within an irrigation system?
3. What are the poverty prevalence and depths, trends, main causes, relation to income/asset distribution pattern, and key issues and strategies to reduce poverty (including those not related to irrigation)?
4. What are the benefits of surface irrigation for the poor and to what extent, including indirect benefits, to small farmers and landless? The issues include a) level of income/production/employment impacts, b) distribution of increased income/production among the poor and the nonpoor, and c) impacts on other dimensions including food security, vulnerability and empowerment.

## **Specific Research Issue 2**

There is significant evidence that the performance of large- and medium-scale canal irrigation systems in most developing countries has been generally unsatisfactory. Most large- and medium-scale canal irrigation systems are generally characterized by poor management, unreliable water supplies, poor maintenance, deteriorating infrastructure, unsustainability, inefficiency and inequity in water use and distribution, and financial dependence on government budgets. The vicious circle of the poor irrigation performance is generally perceived to reduce overall benefits to the communities from the available water resources. Since poor irrigation performance reduces the overall benefits of irrigation, the central research issue here is whether, and to what extent, poor irrigation performance affects the poor in the irrigated agriculture, and what the constraints and opportunities to increase benefits of irrigation are, through improved system performance, to the poor sections in rural agricultural communities.

### ***Objective***

To improve our understanding of irrigation performance and to establish and document a thorough knowledge of irrigation performance and management issues and their implications for the poor, specific to the country study areas.

### ***Research Questions***

1. What is the level of system performance in the study area?
2. What are the major irrigation water-related constraints to productivity?
3. What are the causes of unsatisfactory performance?
4. To what extent is poor system performance related to technical (farm water use, distribution pattern among canals or higher levels), institutional, economic/financial and regulatory aspects of system management?
5. To what extent will poor system performance (system efficiency and financial sustainability) dis-benefit the poor?
6. To what extent will improved system performance benefit the poor and what are the opportunities to reduce poverty by improving performance of irrigation systems?
7. What are the impacts of irrigation-related institutions, laws and policies on overall system performance, including impacts on productivity and on equity in access to irrigation water?

### **Specific Research Issue 3**

Inappropriate institutions and management practices are generally regarded as fundamental causes of poor irrigation performance (as shown in the vicious circle above). Consequently, various institutional-related performance-improvement interventions have been proposed and initiated including user involvement in management, regulatory and economic instruments. However, there is no consensus on whether, and to what extent, these and other similar interventions and innovations contribute to improved system performance. Less clear is the evidence on how these interventions contribute to poverty alleviation or, in other words, how these help create an enabling environment for the poor to benefit from irrigation in the context of improving system performance.

#### ***Objective***

The objective is to improve our understanding of the current interventions/innovations for improving performance of irrigation systems, specifically identification and assessments of current interventions and innovations with a focus on:

- IMT/PIM
- Irrigation financing—water charging/cost recovery
- Water rights and water allocation procedures

#### ***Research Questions***

1. What various interventions and innovations have been adopted for improving system performance and what are their effectiveness?
2. What are their implications for the poor?

#### ***Research Outcomes***

The above research work will lead to the following main activities:

1. Identification of opportunities and constraints for improving performance of irrigation systems.
2. Identification and evaluation of potential pro-poor interventions.

## ***Research Questions***

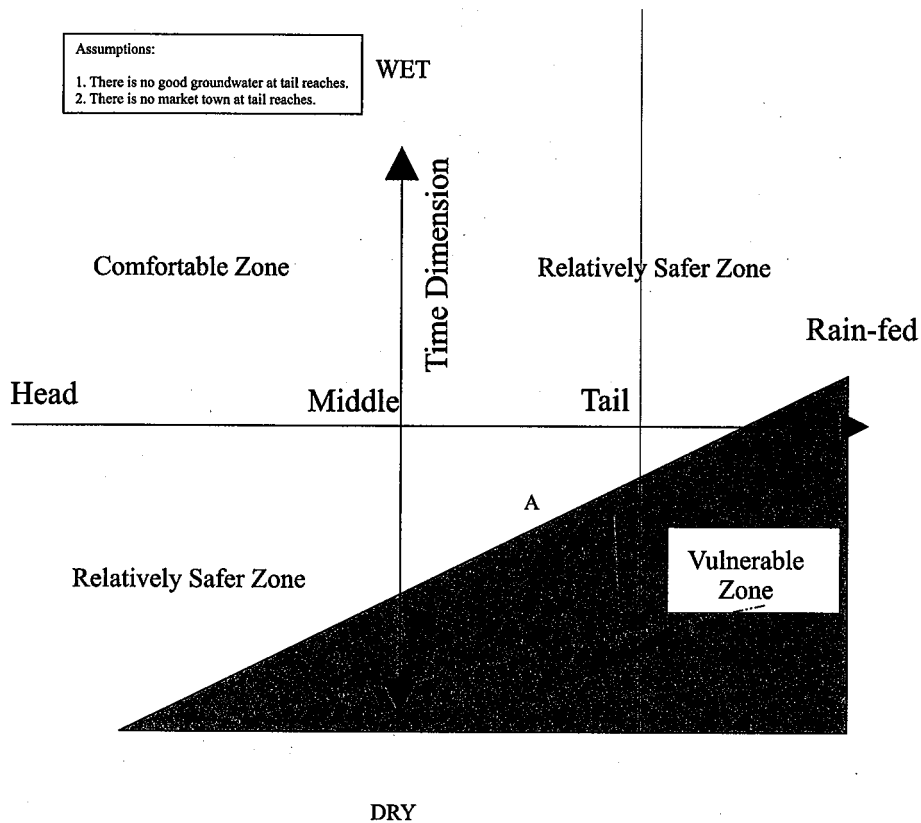
1. What are the measures necessary to improve system performance while ensuring optimal benefits to the poor? [The measures may include institutional (e.g., management transfer), regulatory (enforcing rules), economic (water pricing), and physical (water saving facilities) options.]
2. Are there any measures to provide discretionary benefits to the poor while improving system performance? [Specific options may include, for example, financing arrangements (discretionary levying to the nonpoor on capital and O&M costs) and others (employing the poor for water distribution operations to enforce distribution rules)].
3. What are the potential pro-poor financial, economic, technical, institutional and managerial interventions, and to what extent can they alleviate water-related poverty?

## **Key Research Hypotheses**

1. Command areas of specific canal reaches receiving less irrigation water per hectare have lower productivity and a higher incidence of poverty.
2. Under existing conditions, small, marginal and poor farmers receive fewer benefits from irrigation than large and nonpoor farmers.
3. The greater the degree of O&M cost recovery the better the performance of irrigation management.
4. Effective implementation of PIM/IMT leads to improved irrigation system performance that, in turn, reduces poverty.
5. The absence of both clearly defined water allocation and distribution procedures and effective and clear water rights (formal and informal) adversely affects the poor more than the nonpoor.
6. There is scope for improving the performance of irrigation systems under existing conditions, with effective and improved institutional arrangements.

Figure 4 shows the hypothesized spatial and temporal impacts of irrigation on poverty. Access to irrigation water is hypothesized to decrease as one moves from the head to the tail end of the irrigation system. Households located at the head and middle reaches of the system, with locational advantage, are expected to be in a better position in both the wet and dry seasons (quadrant I-comfortable zone, and quadrant II-relatively safer zone). However, those located at tail ends and rain-fed areas may be in a relatively safer zone (quadrant IV)

Figure 4. Spatial and temporal dimensions of irrigation and poverty—hypothesized relationships.



during the wet season, but the same households move to the vulnerable zone (quadrant III) during the dry period (months). The graph indicates that households located at the head and middle reaches face potentially less risk of vulnerability to water scarcity as compared to those located at the tail reaches. The risk may increase as one moves from the head to the tail reaches. The important issue is whether the potential risk (probability) or the vulnerability zone (area) can be reduced through improved system performance with improved and effective institutional arrangements (from point A downwards).

These spatial and temporal representations may not, however, hold in situations where there is good groundwater at the tail ends, and where there are market towns closer to tail ends and rain-fed areas, as groundwater provides an alternative and reliable source of water, and the market towns provide a nonfarm source of employment. These are expected to reduce risk of vulnerability due to canal water scarcity and seasonality of agricultural production. Furthermore, the presented graph shows only one possible mapping of an irrigation system. The vulnerability zone and risk can be mapped to fit the conditions existing in any irrigation

scheme. While the above representation may hold true at a broad level (and may appear an oversimplification of reality), it does have important policy implications for poverty alleviation in irrigated agriculture.

## Approach and Methodology

The study will adopt both explorative and rigorous analytical approaches for analyzing poverty, assessing irrigation performance, constraints and opportunities for improving system performance and institutional interventions. While the research focus will be at the household and irrigation system levels, the study will also assess macro-level irrigation and poverty-related institutions such as formal organizations, irrigation laws and policies.

As discussed in the previous sections, the research in this project has three key aspects:

1. Evaluation of impacts of irrigation on poverty—*analyzing irrigation-poverty linkages*.
2. Assessment of irrigation system performance—*diagnosing causes of existing irrigation performance-related problems*.
3. Assessment of current interventions in irrigation—*learning from innovations*.

Careful research design is essential for covering all three aspects in one study. The general approach of this study consists of selecting two to four medium- and large-scale irrigation systems in each participating country based on a number of criteria, including a) systems with and without interventions such as IMT and other innovations/experiments; b) systems with different management practices, different levels of performance, productivity and poverty, and c) systems representing water-surplus/adequate water/water-short situations.

The number of irrigation systems to be studied needed careful consideration of the trade-off between depth of analysis and coverage of systems. In consideration of available resources, the time frame for the study and manageability of the research, two to four representative irrigation systems will allow a meaningful in-depth analysis of poverty and system performance to be carried out. Because some of the selected systems may not have experience with innovative management and institutional practices, less in-depth analyses will be extended to other irrigation systems where innovative management and institutions are in practice (with a focus on specific topics: PIM/IMT, water charging/cost recovery, water allocation and distribution procedures and water rights).

During the national workshops conducted by IWMI and partners in each of the participating countries, the issue related to the selection of irrigation systems was discussed at some length. After deliberations, 18 irrigation systems were selected for in-depth analyses using a number of criteria as mentioned above.

Each of the selected irrigation systems will be divided into head, middle and tail reaches. The study will compare the situation across reaches and with nearby rain-fed areas. This approach will help in identifying and analyzing linkages between access to irrigation and poverty, mapping poverty along the irrigation systems, assessing distribution of direct

and indirect benefits of irrigation among the poor, including marginal, landless and non-poor farmers.

### ***Research Focus***

The project research will be implemented in selected irrigation systems. The focus would be on major surface water irrigation systems and large and medium-scale canal irrigation. The study may also include other sources of water, particularly groundwater, as far as they are related with surface water (hydrological interactions), although they will not be a direct focus in this study. Similarly, the study will cover only the agricultural uses of water. Other uses of water, including nonagricultural uses and micro-level multiple uses of water, will not be explored in the study.

### ***Level of Analyses***

The main research work will focus on two levels:

1. Household level
2. Irrigation system level

Analyses of impacts of irrigation and assessments of irrigation-poverty linkages will be undertaken mainly at the household level. While assessments of irrigation performance, evaluation of interventions and analyses of constraints and opportunities will be done at the system level most of the information collected at the household level will also feed into system-level analyses.

Since household and system levels are linked to meso/basin and macro levels, the study would also explore these linkages. However, at meso and macro levels, the study will only assess/review-related policies and institutions, such as antipoverty policies, irrigation management policies including water allocation policies and procedures, regulatory frameworks and irrigation financing. The study will also review irrigation-sector reforms currently underway in the participating countries. The purpose of these reviews will be to develop the context for in-depth analyses at the system and household levels.

### ***Time Dimension***

Household and system level information will be gathered for one complete year, covering both wet and dry seasons during the year. Since the study fieldwork, including administering participatory rapid appraisals and household level surveys, is expected to commence during the last quarter of 2001, the information will be collected for the wet and dry seasons during the previous year, i.e., 2000–2001.



## ***Types of Analyses***

The study will use both qualitative and quantitative techniques and methods of analyses, based on a combination of both primary and secondary data/information. However, the emphasis will be on in-depth and rigorous quantitative analyses for each of the main research activities of this study.

## ***Types and Methods of Data Collection***

As mentioned above, the study will use both primary and secondary data and information. While most of the macro- and meso-level assessments will be based on secondary-level information, household- and system-level analyses will use mainly primary information and data collected through fieldwork. Data and information will be obtained from five main sources:

- participatory rural appraisals (PRAs)
- key stakeholder interviews/consultations
- household level surveys
- data obtained through primary measurements (for water accounting and water productivity)
- data obtained from secondary sources, such as past research studies, project reports and documents

Details on the types of data to be used for each of the research components and activities are given in the following sections. More details on specific methods, tools or techniques are provided in the project work-plan document.

## ***Study Components and Sequencing of Research Activities***

For manageability and sequencing of research activities, research work is divided into four components that comprise the main part of the study work. These are:

- assessment of poverty in irrigated areas and analyses of linkages between poverty and irrigation
- assessment of irrigation system performance and associated impacts on poverty
- assessment of institutional interventions and innovations
- identification and evaluation of identified potential pro-poor interventions

These components can be broadly described alternatively, based on the progressive nature of the research as shown in figure 5. The first division in figure 5, "Main Research Activities," refers to the research activities that provide outputs that form the base of knowledge required to achieve the study objective, but are indirectly related. The second division of figure 5 "Outcomes of Activities," refers to research activities that result in concrete outputs directly related to achieving the study objective. Finally, the third division, "Study Objective," states the ultimate objective of the research project. The figure illustrates the flow of activities in achieving the objective.

## **Specific Methods**

Details on specific methods and tools are given in a detailed study work plan document. Summary of the some of the methods is provided below.

## ***Measuring Poverty***

In this study it is proposed to measure poverty in terms of the following two main dimensions:

1. Income poverty, where the poverty line is defined as minimum income needed for basic needs to survive. This is a widely accepted approach and can be used to analyze income gained from various sources including irrigation-related enterprises.
2. Non-income poverty, including asset or resource poverty, vulnerability and food security, and social poverty, such as a lack of participation or involvement in social activities.

## ***Income Poverty—Concepts of Chronic and Transient Poverty***

There are two basic concepts of income poverty, static and dynamic. Static concepts relate to measurement of poverty at a point in time. Dynamic poverty relates to changes in poverty over time. The concept of dynamic poverty may be further analyzed as chronic poverty and transient poverty. Chronic poverty is defined as a state where a household's income (consumption) is constantly below the poverty line. Transient poverty, on the other hand, is a state where a household's average income (consumption) is above the poverty line, but the household is confronted with the possibility of temporarily falling below the poverty line—vulnerability situation. Transient poverty is also called stochastic poverty. There are distinct policy implications underlying the two dynamic concepts of poverty. Recent literature from the Asian region suggests that transient poverty is more prevalent, with 50–70 percent of the population identified as under transient poverty.

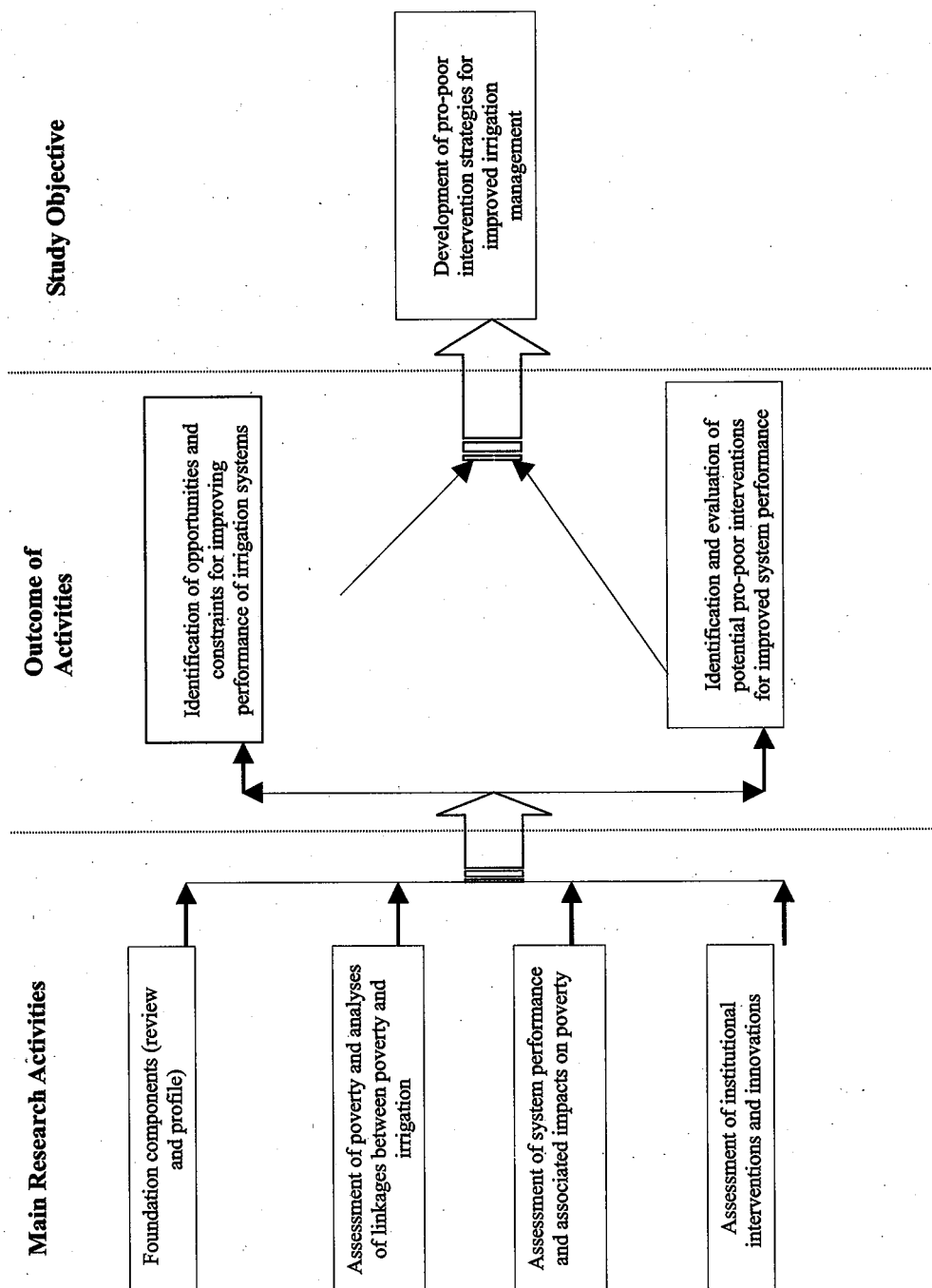


Figure 5. Study components and sequencing of research activities.

### ***Measuring Income Poverty***

The measurement of income poverty involves a) specification of an indicator of well-being such as income or expenditure, b) specification of a poverty line in terms of an income level or threshold below which a person or household is considered poor, and c) construction of poverty measures. The Foster-Greer-Thorbecke (FGT) is the most commonly used measures of poverty, which capture three aspects of poverty: incidence, depth/intensity and severity of poverty. These measures are: Headcount Index, the Poverty Gap Index and the Squared Poverty Gap Index.

Non-income dimensions of poverty will be measured using some of the key variables and indicators as given in figure 1.

### ***Assessing Performance of Irrigation Systems***

Performance of irrigation systems will be assessed in two stages. The first stage will involve diagnostic or exploratory assessment based on a few key indicators of performance. This will help in developing an understanding of the nature of the problem and the areas where research should be focused. Therefore, more in-depth assessments and analyses will be undertaken in stage two of performance assessment.

### **Criteria for Assessing Performance**

In the diagnostic phase, attention will be given to the following criteria by which performance will be judged.

- productivity, equity and water supply
- sustainability (economic, environmental and infrastructure)
- institutional/organizational/management effectiveness

Each of these criteria/sub-criteria will be assessed using a set of indicators as specified in the project work-plan document.

### ***Assessing Institutional Interventions and Innovations***

This section provides a discussion and broad methodological framework for analyzing irrigation-related institutions at the irrigation system/subsystem and higher levels. The term "institutions" is vague and means different things to different people. In sociology, the concept of institutions is defined as "an organized, established procedures" (Jepperson 1991 as quoted in Bandaragoda 2001). In institutional economics, the term "institutions" is defined as "the rules of the game in a society or more formally the humanly devised constraints that shape human actions" (North 1990). In that sense, institutions are frameworks within which human interactions take place. The institutions set the ground rules for resource use and establish the incentives, information and compulsions that guide economic outcomes. The main purpose

for the creation of institutions is to reduce uncertainty in society by establishing stable structures for human interactions. Generally, institutions may be considered as combinations of policies and objectives, laws and regulations, organizations and their core values, operational plans and procedures, incentive mechanisms, accountability mechanisms, norms, traditions, practices and customs (Bandaragoda 2000).

Following some of the major concepts and contributions by North (1990), Ostrom (1993), Tang (1992), and Saleth and Dinar (1999) on institutional analysis, the operational meaning and a consistent analytical framework for the analysis of irrigation institutions in this study are subdivided into the following three main components (and subcomponents) accordingly.

### 1. Formal institutions (in the irrigation sector)

- legal framework/statutory law
- policy issues
  - rules and regulations
- administrative arrangements
  - irrigation agency
  - WUAs

### 2. Informal institutions (in the irrigation sector)

- social norms and customs, traditions
- common law/customary law
- societal code of conduct, conventions
- other adopted cultural norms in water uses, and water allocations

### 3. Enforcement mechanisms (in the irrigation sector)

- both formal and informal enforcement mechanisms for water allocation rules
- sanction and punishment mechanisms for violation of water rules
- provision of third-party enforcement and monitoring effectiveness
- conflict resolution, mechanisms and provision of independent judicial systems
- interaction between organization and water rules and institutions
- interaction between technology and institutions

- incentive structures facing the different actors (farmers, agency officials, etc.)
- transaction costs
- accountability and compliance on water rules and regulations

Considering the complexities involved and the need to narrow down the scope of institutional analysis, the study will involve a) a broad assessment of institutions, and b) an in-depth analysis of key aspects and areas.

### ***Broad Assessment of Institutions***

The purpose of the broad assessment is to develop an understanding of the existing key irrigation-related structures, processes and functions (this is basically one of the foundation components of this study). The assessment will focus on four levels: national or macro level, state/provincial/basin or meso level, irrigation system level and household level. Assessments at these levels will be mainly qualitative in nature, and will include identification of both formal and informal institutions, their operations and linkages, their strengths and weaknesses, and their implementation effectiveness and overall performance. In addition, it will be important to assess the implications of the existing institutions for poverty reduction, i.e., to what extent poverty concerns are built into them and to understand the constraints and opportunities, and identify the type of interventions that will make them pro-poor. The assessments will also cover the institutions that are being reformed.

The assessments will be based on the review of existing literature and documents on institutions, interviews with key stakeholders and PRAs. The institutional assessments under the above framework will set a stage for more in-depth analyses under other study components.

### ***In-Depth Analyses***

More in-depth analyses will focus on the following key institutional aspects of irrigation at the system level.

- IMT/PIM—user participation in irrigation management
- irrigation financing—water charges and cost recovery
- water rights, allocation and distribution procedures

While there is no specific single method or model that can be provided for undertaking analyses of these key institutional aspects of irrigation, in light of the above discussion and through a series of questions, a general framework is provided as a guide for purposes of analysis. The set of questions also highlights the type of information needed for in-depth analyses.

## **Users' Participation in Irrigation Management**

- What are the current policies on user participation in irrigation management and the delivery services including O&M of the system, and what are their effectiveness in terms of practical implementation?
- At what level (primary, secondary or tertiary) are users involved in irrigation management? How many WUAs exist in the system? How does WUA contribute to water management decisions? How are WUAs formed and how are people selected? What socioeconomic groups do the members belong to? Are these controlled by local influential people/elites? Are they functional/effective (number of meetings, key decisions), and what are their overall performance? What is the nature of relations between irrigation agency staff and WUAs?
- What are the necessary incentive structures or regulatory instruments in place for users to participate in O&M of irrigation systems (why do head enders who control most water contribute to O&M of the system if these increases in the availability/supply of water are mainly for tail enders)?
- Is there evidence to show that user participation improves systems performance (in terms of improved equity in water distribution and increased crop productivity) and contributes to poverty reduction?
- What are the necessary pro-poor interventions needed to increase user participation to improve system performance?

## **Irrigation Financing**

- What are the policies and procedures for financing of O&M costs of irrigation?
- What are the objectives and mechanisms of O&M cost recovery?
- What are the actual and desired O&M expenditures in the selected systems?
- What are the bases for charging for irrigation water (i.e., O&M cost, benefits of irrigation...)?
- What are the methods for charging for irrigation water (i.e., area-based, volumetric...)? What is the structure and the level of irrigation water charges?
- What are the institutional arrangements in place for enforcement, charge assessments, collection and billing of irrigation water charges?
- What are the collection and assessment efficiencies, and collection costs?

- What are the equity and efficiency implications of present water-charging systems and practices?
- What is the capacity of farmers belonging to various socioeconomic groups to pay for irrigation water charges (analysis based on farm budgets will suffice)?
- What are the necessary pro-poor interventions needed in irrigation financing to ensure full cost recovery and financial self-sufficiency of the irrigation systems?

### **Water Allocation and Distribution Procedures, and Water Rights**

- What are the existing (and newly developed) policies, procedures/methods, rules and practices for allocation and distribution of canal irrigation water at primary, secondary and tertiary levels? Who are the decision makers at these levels?
- What are their implications in terms of equity and water use efficiency?
- Are certain water allocation methods/rules better than others in terms of equity and overall benefits of water?
- What are the implications of present irrigation water allocation and distribution rules and procedures for the poor, small and marginal farmers?
- What are the necessary pro-poor interventions needed to improve water allocation and distribution that ensure improved overall system performance?
- What are the existing (and newly reformed) key irrigation water-related laws, rules and regulations and other legal instruments for managing irrigation water in the selected systems?
- Are they responsive to situations of increasing water scarcity?
- What is their effectiveness in terms of practical enforcement/implementation? What is the incidence of disputes related to irrigation water?
- What are the formally and/or informally established irrigation water rights? How are these rights practiced, and what are their bases in the selected irrigation systems? What are their implications for the poor, small and marginal farmers?
- What are the necessary pro-poor legal and regulatory interventions for improving performance of irrigation systems?

More details on relationships between formal and informal institutions and enforcement mechanisms, framework for analyzing incentive structures of agents and choice of appropriate institutions, and institutional-performance linkages are available in the project work-plan document.



## ***Other Methods***

Details of other specific methods for assessing poverty impacts of irrigation performance, and methods for analyzing constraints and opportunities for improving system performance through pro-poor interventions are given in the detailed project work-plan document.

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