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GENDER ISSUES, WATER ISSUES

A Gender Perspective to Irrigation Management

Margreet Z. Zwarteveen

INTERNATIONAL IRRIGATION MANAGEMENT INSTITUTE

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Executive Summary

THE INCREASING INTERNATIONAL awareness about the importance of women in agricultural development so far has had little impact on irrigation planning, designing and management. The thinking and practices of irrigation professionals have remained unchanged and unchallenged despite the fact that some of the most striking examples of project failures caused by wrong conceptions of the gender-based intra-household organization of production are examples of irrigation projects.

This paper explores where and how irrigation policies, planning, design and management can and should pay better attention to gender. It starts with a review of a number of documented irrigation examples to find out why many irrigation projects have persistently failed to accommodate prevailing gender relations, to the detriment of both the well-being of women and the success of projects. The review shows that most irrigation plans and designs remain to be based on the assumption that the farm household consists of a male farmer, his wife and a number of children. The male farmer is thought of as being the sole manager of all household and farm resources, and he is typically conceived and addressed as the single focus of decision making and as the person to whom all costs and benefits accrue. His wife is generally only referred to in terms of the units of labor she is expected to contribute to the irrigated agriculture enterprise.

There are a number of persistent assumptions that are derived from this unitary household model. These assumptions include, for example, that women can be automatically counted upon to provide (free) family labor to the production of irrigated crops and that the proceeds of irrigated farming are equally shared among household members. Because of the fact that these wrong assumptions do continue to guide irrigation policies, assessments of optimal performance levels of irrigation systems are often unrealistic and the specific needs and interests of women are often not recognized or accommodated.

Making use of existing frameworks for assessing the performance of irrigation systems, the paper identifies where and how gender relates to irrigation performance. Gender relations, first of all, structure the ways in which water is turned into agricultural products and how agricultural production in turn relates to welfare and other socioeconomic and environmental impacts. Women and men have differential access to productive resources (including water); they differentially contribute to irrigated agricultural production and are differentially affected by increases in production. This may lead women and men to differentially evaluate new irrigation opportunities, and explains why women and men are not always equally motivated to invest (additional) time and resources in irrigation and irrigated agriculture.

Because of divisions along gender lines in crops grown, labor used, and responsibilities carried out, women and men may also have different criteria to evaluate the adequacy, equity, timeliness, convenience and quality of irrigation water deliveries. This paper discusses possible differences and illustrates, with examples, how these affect both irrigation performance and the well-being of women.

Women are seldom perceived and addressed as direct stakeholders in irrigation development and irrigation management. Women are often not members of users' organizations, which is not only a

reflection of gender-biased irrigation planning but also of the unequal gender relations prevalent in many societies. Given the high involvement of women in agricultural tasks almost everywhere in the world, the absence of women in formal organizations is bound to lead to inefficiencies and is likely to perpetuate existing gender inequities. Possibilities and constraints to better involvement of women in formal irrigation management organizations are examined in this paper. One important conclusion is that not only the nature and degree of women's and men's interests and needs with respect to irrigation often differ, but women and men may also have different perceptions about the costs and benefits related to participation in users' groups. Organizations that function for men, do not necessarily function for women.

The general conclusion of the paper lists those gender biases that are persistent in irrigation planning and management. Opportunities for improving the performance of irrigation through a more realistic assessment of gender relations are explored. Although sustaining gender biases in irrigation policy, planning and management is sometimes functional to the achievement of performance objectives, often there will be trade-offs in terms of health or environment. A focus on gender will help to more realistically assess the physical, economic and social sustainability of irrigation systems; it will draw attention to changes induced by irrigation interventions (especially in the areas of nutrition, health and environment) that normally escape the notice of irrigation professionals; it will enable to effectively devise institutional and legal frameworks that recognize and support existing rights and powers of all stakeholders; it will assist in making the provision of information and support services more effective by targeting them to the category of people responsible for using them; and it will help to devise effective irrigation intervention strategies.

The paper ends with an assessment of the empowering potential of changes in irrigation management practices and institutions. Often, changes in irrigation alone can hardly be expected to redress gender imbalances that exist in a society. Improvements that help to better meet women's specific practical needs with respect to irrigation will need to be backed up by other changes and support if more strategic goals of women conceptualizing and challenging their social position are to be met. However, if some of the more crucial needs of women relate to irrigation, changes in irrigation practices and institutions may very well be a good entry point to challenge inequities and lend support to processes of women's empowerment.

1. Introduction

1.1 The IIMI Program

THE GROWING AWARENESS of the importance of gender relations in understanding and improving agricultural development led the International Irrigation Management Institute (IIMI) to initiate a special program on gender issues in 1992.

Attention to gender issues arises from two basic concerns. The first is concern over the ineffectiveness and inadequacy of technologies and institutional choices as a result of the neglect of gender considerations. This concern stems from recognition of the important roles of women in both productive and domestic activities. Women often perform many more tasks and are much more involved in agricultural activities than is generally assumed and reflected in official statistical sources. The success of policies aimed at raising the levels of agricultural production, or at alleviating poverty, depends to a large extent on identifying and addressing the appropriate target group. Just as there is a need to differentiate between large and small farmers for purposes of policy and project implementation, there is a need to distinguish between the roles of women and men in agriculture.

The second concern is over the differential impacts of development strategies on women and men. It has become clear that, in many cases, women have not benefitted equally with men from development efforts. In some cases, women have even become worse off. Studies arguing that economic development and technological change are not indifferent to the already existing class and gender inequalities and often tend to reinforce these, have shown how poor women have gradually and systematically lost access to and control over resources in favor of their husbands and male relatives.

Despite the widespread and growing awareness about the importance of gender issues throughout the world, very few attempts have been made so far to apply gender analysis to problems related to irrigation and irrigation management. There is very little documentation about the interactions between changing gender relations and the introduction of irrigation technology and about the ways in which gender relations structure, and are structured by, changes in irrigation management.

IIMI's Program on Gender Issues and Irrigation Management aims to increase knowledge and understanding about the relation between gender differences and irrigated agriculture. An increased understanding of gender divisions gives scope for working towards reinforcing shared and complementary interests of women and men, addressing conflicts of interests, and clarifying specific disjunctions between women's responsibilities on the one hand and their rights and control on the other. It will thus help to better understand and accommodate both male and female water user interests, improving the overall effectiveness of irrigation management and, ultimately, irrigation system performance.

1.2 Identification of the Problem

Very few irrigation systems in the world are operating at their full potential: areas cultivated are far below areas commanded; water deliveries rarely correspond in quantity and timing to the requirements of crops. Maintenance is often poor and problems of salinization and waterlogging are widespread in arid and semiarid areas. The importance of better use of water resources is enhanced by the growing scarcity of fresh water. Irrigated agriculture accounts for the largest single use of fresh water; a more efficient use of irrigation water will thus lead to substantial fresh water savings.

Since its establishment in 1984, IIMI has contributed to addressing problems of both food production and fresh water scarcity by working out better approaches to irrigation management. A greatly increased ability of traditional irrigation agencies to respond to changes in the physical, social and political environment, an increased accountability of managers to stakeholders, and a system of incentives for good performance are identified as major conditions for improving the use of existing irrigation systems (IIMI 1992a).

One area of important institutional change is the interface between irrigation managers and the farmers to whom they are providing water. In the past decade, it has become increasingly accepted that views of farmers or water users on benefits and costs, and on what is feasible and desirable, must be taken into account when managing irrigation systems (Chambers 1988; Uphoff 1986). In the irrigation context, the cause of differences among farmers that has received the most attention is water availability which is dependent on the location of the farm plot in an irrigation system. In highlighting these head-end, tail-end differences, other causes of differences among farmers have tended to be overlooked. Gender is one of them.

Gender refers to the socially determined attributes of men or women, including male or female roles. Gender roles are based on learned behavior, and are flexible and variable across and within cultures. Although the specific form which gender relations take varies widely, gender relations are present everywhere. Gender is one of the structuring principles in society and, more specifically, in the organization of agricultural production (Whatmore 1991; Whitehead 1990). Attention to differences based on gender implies a shift in focus from the male farmer only, who is assumed to be the main or sole actor, to both female and male farmers and/or water users. In the two problem areas IIMI is addressing, food production and fresh water scarcity, the roles of women have been identified as being of crucial importance.

First, women are estimated to produce more than half the food in developing countries. In Africa, women farmers raise as much as 80 percent of the locally grown food crops (Blumberg 1989:xvi). In addition, women often have a key mediating role in household welfare and nutrition. Second, women play an important role in water management. Although the specific roles, tasks and functions women may have in irrigation have been very poorly documented, the important roles women play almost everywhere in the provision of water for domestic use and in using that water are now widely acknowledged. Women often have very clearly defined interests with respect to the quality and quantity of water resources. In January 1992, an International Conference on Water and the Environment, in preparation for the United Nations Conference on Environment and Development (UNCED), was held in Dublin. The Dublin Statement adopted by the Conference says, as one of its four principles, that "women play a central part in the provision, management and safeguarding of water."

In short, a focus on gender divisions of labor, responsibilities, rights and interests can be considered as a means to start identifying differences between farmers as well as a way of highlighting women in their important roles as food producers and water managers.

1.3 Scope and Content of the Paper

This paper is a first attempt to explore the gender considerations of relevance to irrigation management, based on a review of available literature and on observations in the field. The objective is to identify appropriate concepts and analytical approaches which would enable the linkage of gender with irrigation. It is expected that this, in turn, will contribute to better recognition by irrigation professionals of gender issues of importance in their fields of work. Gender can be dealt with from various perspectives and with different objectives, implying different views on questions of equity and efficiency in relation to planned changes. Likewise, irrigation systems can be evaluated and looked upon from a wide range of different angles, reflecting different world views, priorities and concerns. Rather than embarking upon a discussion on the relative merits of each of the identifiable views and approaches, the objective here is to enable professionals dealing with irrigation to recognize and identify gender considerations of relevance to their field of work. How much weight should be attached to those considerations depends on the specific objectives to be achieved. It will often not be possible to avoid all gender (and other) biases in research, planning and implementing of irrigation interventions. But it is important to recognize that biases exist, so that opportunities for action can be identified.

A brief summary of the most important concepts and tools underlying gender analysis is given in section 2 of the paper. Section 2 also gives some examples of irrigation development which highlight how prevailing gender relations determine the outcomes of this development process. The examples also show how women and men are differentially affected by irrigation interventions. As such, section 2 provides the background against which a more narrow identification of gender considerations of importance for irrigation management (section 3) needs to be interpreted. Section 3 aims to draw together existing frameworks for assessing the performance of irrigation systems with methodologies for assessing and ranking gender needs. This section is the core part of this paper in that it documents how gender differences can be made visible and expressed in irrigation terms. In the last and concluding section, the implications of a gender-sensitive way of thinking for irrigation management will be explored by answering whether and how a focus on gender can contribute to performance improvements of irrigation systems and by examining to what extent better irrigation practices and institutions can be expected to contribute to the empowerment of women.

2. Irrigation Development in a Gender Perspective: Concepts, Examples and Trends

WHILE GENDER OR women may be a relatively new subject for many irrigation professionals, most gender specialists have heard and read about irrigation systems. The reason is that some very convincing arguments for more and better attention to women are derived from examples of irrigation projects. Settlement schemes in particular have provided some of the most striking examples of gender-biased development planning. These schemes have a similar format which ignores the scale and significance of women's independent farming or income-generation activities, leaving this realm unmodernized or sometimes debilitating it.

After brief explanations of some basic concepts underlying gender analysis, descriptions of some examples of these settlement schemes are given in this section. These provide the case for assuming differential impacts of irrigation development on women and men. Examples from settlement schemes also make clear why there is reason to believe that a better recognition of intra-household, gender-based production arrangements will increase the effectiveness and efficiency of irrigation investments. Rather than arguing that a deterioration in the status of women (where this has occurred) is due to uninformed, culturally biased policies and technologies, it will be shown how the structural position of women within their households and within the wider economy determines their access to resources and control over the disposition of household income. This is not to deny, however, that irrigation design and planning are gender biased. This will be illustrated with examples from Asia and Africa.[1] Intra-household factors which influence the nature and direction of the development of irrigated agriculture will be highlighted. Particular attention will be given to the positions of women within households and the wider society and how these positions influence the degree to which they exercise control over resources, the terms under which their labor is mobilized, and the share of the household needs for which they are responsible.

2.1 Women, Gender and Family Farms

The success of any irrigation policy or planned irrigation intervention ultimately depends on the willingness and ability of the final users of the irrigation system's outputs to use the irrigation water efficiently and effectively. Many disappointing returns to irrigation investments can be partly explained by water users and farmers behaving differently than they were expected to. A good understanding of water users' livelihood strategies, and their incentives to invest time, labor and other resources in irrigation and irrigated farming provides the basis for realistically planning and devising programs to enhance the performance of irrigated agricultural systems.

Such an understanding begins with the recognition that farming, almost everywhere in the world, remains primarily a family affair (Butler Flora 1988; Long 1984; Whatmore 1991). The persistent existence of small, family-based farms has attracted a lot of research and generated much

discussion. What has become increasingly clear from this debate is that family farming represents a distinctive form of production in relation to the dominant features of modern industry. Some of its distinguishing features are directly related to the biological base of agricultural production; others relate to the fact that part of the labor and resources are geared towards the direct satisfaction of family consumption. Because much agriculture is organized on the basis of the family, *the household* is generally used as the basic unit of analysis. Farm households can be defined as kinship-based groups engaged in both production and consumption with corporate ownership of some resources and a degree of joint decision making among members (Cloud 1988). It is within the household that decisions are made about what will be grown and how, who will work for wages, who will go to school, etc.

While accepting that family-based farms form the principal unit of agricultural production, the world of farming has traditionally been depicted as a "man's world." Analytical attention has focused on the male farmer as business principal, farm manager, laborer and decision maker, the word farmer itself carrying masculine connotations (Whatmore 1991). The male farmer, in other words, is thought to represent the joint economic behavior of the household. As a consequence, the composite social character of the family farm has all too readily slipped from view. In particular, until the late 1970s, the role of women on farms had received scant attention, on the implicit assumption that it was much the same as that of any other married woman in western societies, namely that after marriage men are gainfully employed while women work in the house and have children (ibid.).

The major contribution of early research on Women in Development (WID) has been to show the inaccuracy of such an assumption and to catalog the varied combinations of labor roles performed by women on family farms. These include agricultural laborer on collectively owned fields, farmer of separate crops or fields, co-farmer and off-farm income earner. Some women contribute routinely to the production of the family food supply, others work only during the peak labor seasons. Women not only provide labor, they manage cropping enterprises that provide them with separate income streams (Cloud 1988). Much of the early WID work has been directed towards filling the vacuum created by official statistics on farm labor which tend to deal generically with the category "family labor" and fail to distinguish individual members' contributions within this (Whatmore 1991). However, while these studies demonstrated the economic importance of women's contributions to agricultural production, it remained difficult to incorporate their domestic or reproductive activities in the analysis of farm household behavior.

Underlying this difficulty is the narrow concept of labor that was common in earlier farm household analyses, which treated farms as firms. Only the activities geared towards the production of commodities for the market were included in this labor concept. This "productionist" concept has been criticized on the basis of evidence from developing countries, where much labor and land in farm households are devoted to food, clothing and equipment without ever passing through the market. This subsistence production in a way escapes the logic of the market, and is thus difficult to understand by referring to market prices.

In conventional analyses, subsistence activities performed by women were often automatically considered as "domestic" or "reproductive" and treated as the equivalent of household work performed by women in western societies. Irrespective of the exact nature of women's work, it was invariably conceived as the fulfillment of their domestic duties. However, in most family farms, domestic labor is characteristic of all household members' labor, across agricultural as well as subsistence production, and is not restricted to women's work. In fact, the very distinction between

subsistence, reproductive and productive activities is often problematic. Many women trade some of the products of their subsistence activities in informal markets, selling products such as eggs, dairy products, cooked or processed food, home-brewed beer and handicrafts. They may also provide paid services, such as sewing, laundry, cleaning, healing, midwifery and child care. On the other hand, part of the crops grown for sale in the market may be used for home consumption.

A narrow concept of labor thus not only misrepresents the farm production process by obscuring the essential interdependence between productive and subsistence activities, it also implicitly helps to underestimate women's participation in farming. Gradually, and very much based upon evidence from developing countries, the early farm models have been expanded to include production for use as well as for sale, and some reflect both consumption and production behavior. As it has become increasingly clear that the home and the fields compete for capital resources and family labor, economists have expanded their definitions of the "products" of the farm enterprise to include women's productive activities. Recent models include women's labor time as a rationally allocated resource and economic values are assigned to the goods and services produced by women, even when these do not pass through markets.[2]

The newer farm models still treat the household as maximizing a single utility function, for purposes of analysis of its decision making.[3] They assume that all resources of land, capital and labor are pooled and allocated where they will be most useful to the household as a whole. Empirical evidence, often based on studies that seek to explain unexpected outcomes of development interventions, has shown that this behavior does not occur in many parts of the world. It does not explain, for example, why incomes earned by women are spent in ways different to those of men. Nor does it clarify why male household head does not always have perfect control over the labor of other members of the household.

Within households there is an "internal economy" in which gender relations are an important structuring principle. This can be conceptualized as a continuum ranging from domestic units characterized almost entirely by "separate purses" among adult female and male members to domestic units where women have virtually no income-generating opportunities. Household production arrangements do not involve just one single household member, but different male and female members who play more or less interlocking and interdependent roles (Blumberg 1989). Male and female members of farm households may have shared, separate and conflicting interests within the household, and may wish to use the same resources in different ways. What is in the best interest of the household may not be in the best interest of particular members.

For explaining intra-household resource allocation, a bargaining model has been proposed as an alternative to the joint utility function model of the household. Bargaining models recognize that household members may have conflicting as well as complementary interests. The "weight" attached to an individual member's preferences depends on his or her bargaining power. A bargaining model of the household forces one to pay attention to those variables which give some household members greater leverage in determining the household resource allocation and expenditure patterns (Jones 1983). A bargaining model conceptualizes the farm household as

> *a political arena constituted by particularly dense bundles of rules, rights, and obligations governing relations between men and women, and elders and juniors. The rules defining property rights, labor obligations, resource distribution, and so forth are particularly subject to contestation and must be constantly reinforced and reiterated. The influence that different household members can wield in negotiations*

and struggles over the mobilization and deployment of "family"-labor and resources are reciprocally linked with the organization of labor and conditions of access to resources in non-domestic spheres. (Hart 1992)

Bargaining approaches to the understanding of farm household behavior have proven particularly useful in understanding the use of unpooled resources by African farm households (Jones 1986). Economists working with Asian data have begun to analyze the links between farm household income and the ways in which consumption goods are distributed within farm households (Folbre 1986).

This development in understanding and conceptualizing farm household behavior shows that paying attention to gender in agriculture goes beyond merely adding women to the research or planning agenda. Exploring the meaning and nature of the gender divisions of labor, rights and responsibilities in the context of agriculture is an intrinsic part of a much bigger project: that of understanding how farm households deal with changing economic, institutional and environmental contexts. Gender analysis provides a number of alternative tools and concepts to look at the farm household and to interpret agricultural development. Gender analysis efforts are both informative to as well as contingent upon the parallel development of new interdisciplinary approaches to agricultural development which call for more farmer participation in and user orientation of research, extension and planning (Chambers 1988 and 1992; Uphoff 1986), a focus on livelihoods instead of production (Chambers 1988), and diversity instead of uniformity.

2.2 Gender Analysis in Agriculture

In contrast to earlier WID approaches, which focused solely on women, gender approaches focus on men as well as women, and on the relations between them. Gender refers to the socially or culturally established roles of women or men. Although gender is universally one of the key ways in which societies and cultures demarcate rights and responsibilities, the specific form gender relations take varies widely across and within cultures and societies (Feldstein and Jiggins 1993). "Women" are a category within gender analysis, and they are not a homogeneous category.

Gender analysis in agriculture is based on the premise that women are primarily involved in farming through specific forms of familial gender relations, most significantly through marriage as wives, but also as daughters or mothers of male farmers (Whatmore 1991). While initially inspired by a concern about the differential impacts of development interventions on women and men, the focus of gender analysis is less on equity for women and more on the effectiveness and efficiency of policies and interventions. Understanding the meaning of gender relations in regard to how family farms operate and deciding on the allocation of resources constitute the central project of gender analysis efforts in agriculture.

One basic underlying notion of gender analysis in agriculture is that the farm labor process encompasses productive and reproductive activities. Rather than a dualistic conception which separates production from reproduction, a gender analysis framework highlights the essential interdependence of the two processes. In doing so, the often made distinction between family and farm which attributes the reproductive functions to the family (and especially to women) also loses its importance.

Feldstein and Poats (1989) have developed a basic, and simple to use framework for laying out the distribution of activities, resources and benefits between household members. This framework provides a basic understanding of intra-household decision making but does not directly reveal the actual process of negotiation within the household concerning the pooling or complementarity of resource allocation, or the subtler pressures which affect individual and household choices. Nor does it reveal much about the norms and values which shape male and female identities, physical and emotional powers or the social institutions in which these are sited.

The Feldstein and Poats framework is very useful in getting an overall picture of the gender-based organization of productive and reproductive activities, and helps to identify problems and opportunities for improvement. It helps to guide questions about the effects of changes at the household level. However, to gain a more in-depth understanding of the underlying social relations in which decisions about labor and resource use are embedded, additional and more detailed information is needed.

The framework proposes three sets of questions:

1. Analysis of activities; who does what, when and where? These questions are concerned with tasks performed by men, women and children which contribute to farm production, to household production, to childbearing and child rearing, and to other productive activities including off-farm activities. The activity analysis reveals periods of labor shortage and identifies all competing tasks by gender, not just those in farm production.

2. Analysis of resources; who has access to or control over resources for production? By control is meant the power to decide whether and how a resource is used, how it is to be allocated. Access refers to the freedom or permission to use the resource. For example, "where men have control of livestock or traction, their wives and female relatives may obtain traction services from them. Women have access to traction, but men have control of it. Where women keep the cash and make decisions about expenditures, women have control of cash, men have access to it. The question of access to and control of land can be confusing, but is also illustrative. For instance, in the case where land is allocated by a senior male, but decisions about what to plant are left to the person to whom it is allocated, one would argue that both adult males and adult females have access to land (with some indication that female access is through males) and that both have control of land, but that male control is greater (allocation and decision making on use) than female control (decision making on use only)" (Feldstein and Poats 1989).

   Resources include: land (and the terms on which it is available); capital, including cash, tools, and livestock for production or traction; labor (one's own, or of family/children, or others'); other inputs, including seed, water, fertilizers, and pesticides; services such as credit and education; and knowledge.

3. Analysis of benefits and incentives; who benefits from each enterprise? Benefits analysis refers to access to and control of the outputs of production. This includes all the end uses of a product (for example, a crop), home consumption, income from sale, fodder, compost, crafts, building materials, etc. Benefits can also refer to changes in the farm labor process,

such as reduced labor demands or reduced risks. It also includes the output of alternative or competing enterprises. The extent to which individual household members benefit or expect to benefit from activities will partly determine their willingness to invest their time and resources in these activities. Women may, for example, be willing to increase their labor contributions to irrigated crop production when they benefit from increased yields or incomes. However, whether or not they will actually do so will also depend on their roles and responsibilities as well as their control over resources. Is the extra work compatible with their other tasks; does their husbands allow them to work longer hours in the field; do they have the know-how and skills to perform the specific tasks concerned? Incentive analysis deals with these questions. It is the analysis of preferences which underlie farm household members' incentives to continue or change what they do.

2.3 Settlement Schemes

Irrigation settlement schemes provide some of the most striking examples of how neglect of prevailing gender relations in planning and implementing irrigation negatively affects project outcomes as well as impacts on women. Examples of these negative impacts have been used widely by WID professionals in their attempts to advocate more attention to women in development.

Most settlement projects, unlike cases where irrigation is introduced as a means of developing existing smallholder agriculture, are established with the specific purpose of promoting or controlling production of surplus food or non-food cash crops. Control of the labor provided by poor settler families was often considered a major condition for achieving the project's ambitious production targets. Free family labor, to be provided by the wives of the male settlers, was ensured by measures which deprived women of the possibility of exercising their former rights to cultivate personal crops. This left them with little choice than to work for their husbands. Often only the male household heads were recognized and accepted as official tenants, who could sign the tenancy agreement, receive inputs and services and participate in the scheme associations. And, although rain-fed land was quite often made available for household food and vegetable production, the size of rain-fed plots was invariably insufficient for women to cultivate a personal cash crop and sometimes inadequate even to meet consumption needs. Male control over the product of female labor further increased due to requirement, in most schemes, that irrigated crops be marketed through the household head (Dey 1990).[4]

One of the earliest descriptions of this pattern is probably that of the Mwea Irrigation Scheme in Kenya,[5] where women had access only to a very small piece of land to grow food crops. Outside of the Mwea Settlement Scheme, women used to have unirrigated plots on which they cultivated food crops. The land was usually obtained from a husband at marriage and was very rarely taken away. With very few exceptions, the woman held complete control over this garden. Its primary purpose was to grow food for her family. Any surplus could be traded or sold by her to obtain a small additional income.

The most significant difference of life on Mwea from the traditional pattern arose not because of the extra work entailed in rice growing--though this did put an extra burden on the wife at the peak season--but rather because women could no longer depend on their own resources to provide the family's food and to earn an individual income. Within the Mwea Scheme, some provisions had been made for home gardens, but as they are not a part of the scheme's official system (and so

not an embarrassment to a management that permits their use but denies their necessity) official allocations had not been made. Despite the extra labor contributions women were making to the rice cultivations controlled by their husbands, women could make little official claim on the gross income that their husbands received.

It was important for women to earn an individual income because "Mwea women continued to feel that it was their responsibility as wives to provide food for their families" (Hangar and Moris 1973). Women were very reluctant to depend on their husbands for food, or cash to buy food with, as they considered their husbands' contributions unreliable and insecure. In fact, it often occurred that husbands spent a substantial amount of the income from rice on beer or other individual purchases.

Women had various ways of coping with the new situation. One way was to sell small amounts of the "subsistence" rice on the black market. A man could not refuse his wife the access to this "subsistence" rice. Even though the amounts of rice thus traded were small (as the Scheme Management was doing everything it could to reduce the black market trade) the access to this income was of extreme importance for women. A second way for women to adapt themselves to the new situation was to engage in off-scheme enterprises[6] or to work as agricultural laborers for other villages which were on a different harvesting schedule. A third and more radical way women reacted to Mwea life was to leave their husbands; even though the rate of marital instability was not studied, it was observed that many tenants were deserted by their wives.

Another example of a settlement scheme is that of the Mahaweli in Sri Lanka. Here, the reduced possibility for women to grow food crops placed the poorest of the settler families in a very stressful situation. Whilst rice, the traditional "male" crop was the food most appreciated, the population has survived throughout the centuries on millet, the "female" crop.[7] The poorest settlers in the Mahaweli area could not grow enough rice for family subsistence, and the traditional "emergency food stock" of millet could no longer be depended upon. In the Mahaweli area, some land had been reserved for homesteads, but this half-acre (0.2 hectare) compound around the house "was hardly big enough for a latrine and some fruit trees" (Schrijvers 1986).

Schrijvers argues that

> *the chronic undernutrition in the Mahaweli H area is a direct result of planning that cuts women off from their productive resources. It is of primary importance that women, who have to provide the daily food for children and other members of the family, have the means themselves to obtain sufficient food. ... Research showed that only 35% of the net income of the male farmer (after debts were paid off) benefitted the rest of the household.* (Schrijvers 1986)

Settler women in the Mahaweli area had several strategies to cope with the problems. One way of escaping their isolation was to get pregnant, which gave them an alibi to leave the scheme and to stay with their mothers for a period of the year. Many women tried to grow at least part of their food crops on the homestead. Also, in order to cope with the heavy work load, some women started organizing "work-parties" and labor exchanges, forms of unpaid reciprocal labor that were rapidly disappearing outside the scheme (Schrijvers 1992). Other more recent studies suggest that many women have fallen back on casual wage labor--thereby gaining some autonomy by earning a minimal income of their own. It has been documented that some women were effective in

bargaining with their husbands for access to a small part of the irrigated land, in return for the labor they contributed to the male-controlled crops. And, as in the case of Mwea, some women opted for the radical solution of leaving their husbands (Rajapakse 1989).

It has been argued that many of the problems of women in settlement schemes are as much due to the "normal adjustment problems" which accompany the early phases of resettlement, as they are the result of gender-biased planning. The hardships and isolation women are reported to experience are faced by men as well. While this may be true, and while it is also true that settlement schemes can be criticized on many more reasons than just gender blindness, settlement schemes do clearly illustrate some persistent assumptions that have guided many irrigation interventions.

These assumptions center around the expected behavior of farm households. Irrigation planners typically expect farm households to "adapt" their farming and irrigation decisions and practices to the irrigation system in order to realize the technical potential of the system. It is assumed that irrigated crop production is the only or by far the most important activity of farm household members both in terms of the resources allocated to it, as well as in terms of its contribution to total household income. The fact that most farm households combine the functions of enterprise and family are overlooked, as are the specific gender-based, intra-household arrangements which balance the household and enterprise goals.

More specifically focusing on these arrangements, the following ideas implicit in irrigation planning emerge:

1. Farm household resources and labor are effectively controlled and allocated by the male household head.

2. Raising male farmers' incomes leads to improved well-being for himself as well as his family.

3. Farm households are composed of two able-bodied adult members (one male and one female) and a number of children.

Evidence from irrigation development experiences, mostly from African and Asian countries, have showed that these ideas need to be empirically verified rather than assumed.

2.4 Some Examples from Africa: Pooled and Unpooled Resources and Incomes

In many African societies, women have always done, and still do, independent work. The work performed by women and men was traditionally based on a sexual division of labor growing out of domestic and kinship arrangements. Within these relations, labor was exchanged between men and men, and between men and women. Usually, men could call upon their wives to work for them. One of the most significant obligations of the wife was to work for her husband and his senior close kinsmen. The effect was that many women combined their own independent farming objectives with work done as unremunerated labor on the farms of others. In their independent work, women require effective access to resources including land to farm. The work women did for their husbands or other senior men was usually not directly remunerated, it was part of her obligations as a wife in return for which she enjoyed the general welfare and security of the household.

Traditionally, all these arrangements were in the context of a domestic economy in which sharing of resources in marriage did not always exist. Very often, land, cattle, money, clothes and much else tended to be owned separately by husband and wife. A joint family budget or single common purse out of which family needs are met is rarely encountered. Rather, the separate resource streams of husbands and wives, which were the bases for their independent economic activities, also entailed a way of keeping incomes separate. Often, responsibilities for different aspects of household spending and consumption were conventionally divided and there is also a complex division of responsibilities of providing different items of food[8] (Whitehead 1990).

How has this gender-based organization of agriculture affected the development of irrigated agriculture?

A well-documented example is that of the Jahally Pachar Project in the Gambia (Dey 1990; Carney 1988; van Hooff 1990). Here, an initial assumption was made that men were rice growers with full control over the necessary resources. Incentive packages included cheap credits, inputs and assured markets offered to male farmers. Negotiations about the allocation of the land to be irrigated were made with the male elders of the villages, as a result of which land traditionally controlled by women now came under the control of men. All access to inputs, labor and finance was mediated through husbands. Women were expected to contribute their labor to the newly irrigated fields, but they became increasingly reluctant to do so as they did not directly benefit from the higher yields. They demanded compensation from their husbands for their work, in the form of cash, a share of the rice harvest or access to their own irrigated plot. If the husbands were not willing or able to provide their wives with some sort of compensation, women withdrew their labor from the irrigated plots. This had a far-reaching impact on the social organization of the household production and on the overall productivity of the project.[9] As a consequence of female labor withdrawal, there has been an increase in labor hire, because--given the high rate of polygamous marriages in the area--men cannot compensate for the loss of female labor by an intensification of their own.

Jones (1983 and 1986) gives a similar example of an irrigated rice project in North Cameroon which failed to attract sufficient farmer interest, with the result that about a third of the developed area remained uncultivated. A contributory cause was the inability of the project to adjust to intra-household conflicts in interest with regard to labor allocation, control of crops and monetary rewards. While women were obliged to provide additional labor for new male-controlled crops, their right to cultivate a personal crop placed limits on their obligation to their husband. Thus, in order to acquire more than the minimum female labor input, men were obliged to pay their wives cash rewards, the size of which was directly related to the level of their labor input.

Traditionally, red sorghum was the main crop. With the exception of the collective field, to which every compound member contributed several days of work each year, sorghum fields were usually cultivated on an individual basis with little labor exchange. Of the time women spent on cultivating sorghum, 95 percent was on their own fields, which indicates that women had minimal obligations to work on their husband's fields or on the collective field. Wives usually had their own granary and cooked each day for themselves and their children with co-wives alternating in the task of cooking for their husband. The woman's sorghum was consumed first, followed by her husband's supply and finally the sorghum from the collective field.

Unlike sorghum fields, the new rice fields were cultivated jointly by members of a conjugal household, irrespective of the member who actually registered for the field.[10] The woman is expected, however, to turn over all the income from her field to her husband even if the field is

registered in her name. Following the rice harvest, men reserve a certain number of sacks of rice for home consumption which they give to their wives for safekeeping. In effect, the rice retained for home consumption compensates for the sorghum production that both husband and wive forgo in favor of rice production. In addition, men also give their wives a lump sum in cash following the sale of rice. Women perceive this money and rice to be compensation for their rice-cultivation labor. It is given to them, they say, "in return for their sweat."

The amount of remuneration women receive from their husband is the subject of serious conflict within households. If women feel that they are insufficiently compensated for their labor, they will minimize the amount of time they spend in rice cultivation. The intra-household conflict over income is thus a significant factor in reducing the amount of labor allocated to rice production.

The examples from the Gambia and Cameroon can be supplemented by many basically similar experiences, challenging the notion of farm households behaving as joint production and consumption units. In Kenya, in the Turkana Irrigation Project, women withdrew their labor in similar circumstances. Traditionally, Turkana men had been herders and women had been the cultivators, who controlled the produce from their rain-fed sorghum plots. The project counted on women providing unpaid labor for their husbands' irrigated crops, but paid all cash earnings solely to the male household heads. Women resisted this arrangement by neglecting the irrigated project crops for their own off-project, rain-fed sorghum (Blumberg 1989:18). In Zanzibar (Dey 1990) and in the Comoé province in Burkina Faso (van Koppen 1990) new irrigation facilities were primarily used by women. In both countries, low labor returns to rice significantly reduced men's interest in irrigated rice production. In Burkina Faso, initial arrangements were to allocate land through men. The project's strategy changed when women working the plots belonging to their husbands appeared to be reluctant to invest time and money in these plots. They feared their husbands might decide to take the plots away from them once the land is improved. In a later stage, plots were directly allocated to women (van Koppen 1990).

The incorrectness of the idea that farm household resources and labor are pooled and can be mobilized by male household heads is most clearly illustrated by these and other examples from Africa. The way in which resources, including water and land, are used depends very much on who controls this resource within the household. Control over resources is not determined only by intervention policies. In Burkina Faso, land directly allocated to women turned out to be more profitably exploited than land allocated to women through their husbands. Because men did not have much interest in irrigated rice cultivation, they allowed the land to be controlled and used by women (van Koppen 1990). In the Gambia, the recognition of the importance of women in rice production led to a number of modifications to the original intervention policy. Land titles, for example, were given to women. This did not prevent male family heads changing the nature of the irrigated plots into "family plots." Although the land officially belonged to women, this family character gave men ultimate control over its use and the use of its products (Dey 1981). Hence, while it is important to devise realistic policies to understand intra-household arrangements of responsibilities and rights, policies and interventions by themselves cannot always guarantee that benefits accrue to all household members equally. In general, men will be better placed to take advantage of policies and actions.

The examples also show that for African women in peasant households, recruitment primarily as family labor represents the building of a hitherto rare form of dependence within and on marriage. While total household incomes may increase considerably as a result of new irrigation facilities, this does not automatically relieve women from fulfilling their specific responsibilities towards the

household. And, especially in countries or regions with high rates of abandonment or divorce (see subsection 2.6), women are quite motivated to secure control over household expenditures and to maintain independent incomes (Safilios-Rothschild 1991:45). In the Cameroon case, the compensation women received for their labor contributions was higher than the income they could have earned pursuing their own income-generating activities (Jones 1983). The fact that, despite of this, many women did not maximize their labor to their husbands' fields may be explained by their unwillingness to economically depend on their husbands.

Male farmers are thus not always in a position to effectively mobilize the labor of their wives. The extent to which women are able to resist their husbands' claims to their labor or secure some compensation for it depends on their relative bargaining positions within households, which is strongly determined by their access to other income-generating opportunities in and outside farming. It is typical that there are no cases of settlement schemes (where these possibilities are most limited) of women receiving a contribution for their labor from their husbands.

2.5 Some Examples from Asia: Influences of Class and Religion

In much of South Asia (Bangladesh, Pakistan and India, and to a certain extent also in Sri Lanka), the prevailing picture is that of the family-based household which is often composed of nuclear units, but sometimes of extended families. *Purdah*[11] norms, property rights and familial hierarchies coalesce within the household to produce a corporately organized, patriarchal collectivity. Men tend to control most of the household's material resources, including the labor of the female and junior members of their households, and also to mediate women's relations with the outside world. Women are ideologically constructed as passive and vulnerable, dependent upon male protection and provision for their survival. They are generally reluctant to seek income outside the socially sanctioned relationships of family and kin, first because there are few options to do so and second because they could forfeit the support of their kin. In contrary to the African picture, women's well-being tends to be tied to the prosperity of the household collectivity. Their long-term interests are best served by subordinating their own needs to those of the dominant male members of the household. Because women have very constrained access to material resources outside the familial domain, it is in their interest to try to maximize their security within kinship networks (Kabeer 1990).

In theory, this gender configuration more closely resembles the neoclassical household model of a unit of consumption and production. Still, even though they can rely more on sharing the incomes controlled by their husbands, in many cases women appear to be very eager to secure some individually controlled income, which they may keep secret from their husbands.[12] Studies have also shown that male and female members of households often have different preferences for expenditure, women being generally more inclined to spend their income on children's nutrition (Blumberg 1989; Safilios-Rothschild 1991; IFPRI 1992).

In many Asian countries, the impacts of agricultural development on traditional gender patterns are very much determined by the socioeconomic position of the household. Generally, in the larger farm households, women do not participate in any way in field activities. In Pakistan and Bangladesh, women belonging to richer families generally are the most strict observers of *purdah.* A woman who can afford to remain inside the house is a symbol of prosperity and honor to the family. However, these women often are indirectly involved in agriculture, since they provide meals for the hired workers or are involved in the organization and supervision of hired labor (Basnet 1992;

Hart 1992 and Rajapakse 1989). In smaller households, women and men are both engaged in field work. However, as a result of the prevailing ideology and idealization of motherhood, more than in Africa, the work of Asian women tends to be culturally invisible. The cultural unacceptability of women working in the fields means that it tends to be denied if a direct question is asked about it. It was observed in Bangladesh that the women who could be found working in the fields referred to this work as fulfillment of their "family" obligations, thus avoiding negative associations (White 1989:46-47).

An illustrative example of how the norm that places a high value on women remaining in their homes can affect attempts to develop irrigation is that of the introduction of hand tubewells in a Bangladeshi village. Hand tubewells were introduced to boost vegetable production. However, the introduction of tubewells did not result in the anticipated growth in vegetable cultivation. The main reason was that people preferred to use hand tubewells to obtain water for drinking and not for irrigation. In fact, many people applied for hand tubewells stating that there use will be for irrigation while intending to use them for domestic use. After a year "on show" outside the homestead, many were relocated within the homestead for greater convenience. Also, the low water table made manual pumping of water a very heavy task, for which people preferred to use machine-run shallow tubewells. A third important reason was that vegetables are usually grown by women in and around their homesteads, whereas the project envisaged field cultivation by male farmers. Women were interested in intensifying their vegetable growing activities. Some women actually did use the tubewell water for expanding their vegetable gardening activities in their homesteads. However, the project management considered the project to be a failure and prevented people from relocating the wells by substituting plastic pipes for metal ones (White 1989).

The development of irrigated agriculture with women belonging to different classes being affected differently is illustrated in many studies. In Sri Lanka, the sexual division of labor and resources (within the Mahaweli Scheme) vary greatly according to the extent to which the family has succeeded in becoming "entrepreneurial." Whereas in the richest families women's labor has been effectively withdrawn from all agricultural activities in the field and replaced by hired labor, in poorer landholding households, both men and women engage in almost all agricultural activities and jointly decide on how to spend the income. In the poorest households, both women and men, in addition to cultivating their own plots, work as laborers and control and spend the small incomes they derive from their work individually (Rajapakse 1989).

A similar picture emerges from Malaysia. In the Muda Irrigation Scheme, a comparatively high percentage of women from households with large landholding are actively involved in mobilizing and organizing agricultural labor, and in allocating contracts for transplanting and harvesting to poorer women. Women with medium-size landholdings work mainly on their own lands and on lands belonging to members of their labor exchange groups. Poor women are mainly involved in wage labor (Hart 1992).

Evidence from Asian countries suggests that women belonging to households which practice irrigation are likely to benefit from new or improved irrigation facilities, even if it involves increases in their workloads. An example from India shows how the introduction of irrigation in a northeast Indian village in 1954 brought significant changes in the lives of the villagers, including increases in household incomes and new employment opportunities. In this village, purdah was practiced, but this didn't inhibit women's participation in agricultural work as women tended to work separately from men in the field. The most apparent impact of irrigation on women from landholding families was an increase in agricultural work.[13] The introduction of cotton brought about a sharp increase

in women's labor, because cotton is harvested primarily by women and children. The increase in work was slightly compensated for by a decrease in the time women needed to collect fuel wood and water. More important, the increase in agricultural work was accompanied by increases in income and food, since irrigation also allowed more food crops (wheat, gram, bajra and vegetables) to be grown. Women were quite proud and happy to contribute extra labor, because they benefitted from it through an increase in family welfare (Stanbury 1981).

While the direct benefit of access to irrigation water (increased or more reliable production) is most obvious to irrigation professionals, many Asian examples mention a number of indirect positive or negative effects of irrigation development. For women, these indirect effects may be of particular relevance. The relation between irrigation water and the availability and quality of water for domestic uses is one widely documented example. Because women are almost everywhere responsible for providing water for domestic uses, they are the most directly affected. The example of hand tubewells in Bangladesh already indicated the importance attached to good drinking water facilities. In Nepal, when asked about their opinions and views about a new irrigation system, many women said that the biggest advantage of it was that they needed less time for fetching water. Even though the quality of the canal water was not as good as the well water they earlier used, the convenience of the proximity of the canals made women prefer to use this water (Backer 1992). In Pakistan, at the First National Conference of Peasant Women, the decreased quality and availability of water due to salinization was mentioned by the women gathered as their most critical problem. They referred to irrigation water; drinking water and to water used for consumption by livestock. Some women reported that they had to walk two hours to get water, three or four times a day (Aurat 1991).

Another indirect effect may be the increase in the growth of weeds used as fodder for livestock due to canal irrigation. This occurred in the earlier referred to example of India. Indirectly, irrigation thus increased milk and ghee production. This was particularly beneficial for women of the landholding families, since they earned a substantial individual income by selling ghee (Stanbury 1981). In Bangladesh, the impacts of the introduction of shallow tubewells were studied, with special reference to the implications for women. It was found that the introduction of shallow tubewells boosted agricultural production, which meant an increase in income for most households. However, because the use of tubewells lowered the groundwater table, there was also a sharp decline in food and fuel that used to be freely available. The canal, which used to be a good source of fish, dried up much earlier in the year. Fruits and vegetables that used to grow with little or no tending now gave much lower yields due to reduced soil moisture. The cutting down of forest areas for fuel and for cultivation has reduced the availability of fuel and land for pasture. Especially, the poorer women in the village were affected by the decreased availability of fuel; gathering of fuel materials (a female task) took up much more time than it used to do (White 1989). In Nepal, the reduction in the growth of trees used for fuel and fodder negatively affected the possibilities of keeping cattle by households. Cow dung is used as fertilizer, and the decreasing availability of it negatively affects yields of irrigated crops (Bruins and Heijmans 1993).

These indirect effects of irrigation development, some of which become apparent when focussing on women's roles, show the interrelatedness of the various activities farm household members are engaged in. They also illustrate how increases in production through improved water supplies may have trade-offs in terms of health or environment, and thus question the long-term sustainability of irrigation interventions.

2.6 Poverty: Changing Gender Norms and Changing Household Formations

In the face of increasing scarcity and hardship in securing family survival, the norms that dictate the behavior of women and men appear to change. It is documented that in South Asia, the norms that make women remain invisible and prevent them in engaging in productive activities become less strict or valid only for well-to-do households. The poorer the household, the more critical is the women's income for survival. Several studies from rural Bangladesh show how the norms and practices of purdah are slowly changing as women and men are developing strategies to cope with poverty. A well-documented example in the context of a water development project is provided by Jordans. Her study shows the eagerness of poor women to earn an individual income, even though this means that they have to confront social norms by giving up purdah:

> *Group members mention the fact that DDP (Delta Development Project) created opportunities for them to work on the embankment and roads. ... To start the work they had to break down the "purdah" barrier, facing disapproval and teasing of the society. One woman commented: "My husband does not like that I work outside. 'Don't go to the road,' he says, 'stay at home.' He prefers that we starve and he beats me up if I still want to go. But I do not listen and after the beating, go to work on the road."* (Jordans 1991)

Kabeer observes that, in Bangladesh, "hitherto strictly enforced rules preventing women engaging in field-based stages of rice production are showing signs of crumbling and women are being employed in harvesting, weeding and transplanting work" (Kabeer 1990).

Some evidence from Sri Lanka also seems to suggest that the traditional norm which tells women not to engage in productive activities is gradually disappearing. In traditional villages, women contributed as much as men to agricultural activities,[14] but their labor inputs were generally underestimated, also by themselves, because of the cultural norm that the male is the head of the family and the main farmer whereas the female is mainly respected because of her motherhood and corresponding domestic activities. Nowadays, women who contribute to the household in financial terms are increasingly respected (Rajapakse 1989). Also, formerly quite strict divisions of tasks according to gender are changing as a result of mechanization and the growth of wage-labor. Direct observations in the field seem to suggest that generally there exists a considerable flexibility in the division of tasks (for an example of Sri Lanka, see Rajapakse 1989).

Another result of increasing poverty is that, in many parts of the world, male or female household members leave--either permanently or temporarily--the rural areas to find jobs elsewhere. This not only leaves the responsibility for all the agricultural work with the household members who are left behind but, in many cases, also changes the rationality of the farming enterprise as farming is no longer the only or the most important means of subsistence.

In Malaysia, for instance, a large number of rural men engage in government jobs while they keep their farms, thus becoming part-time farmers. This part-time farming encompasses different sets of intra-household arrangements with very different implications. In middle-class households, women do not engage in farming activities. Men hold lucrative nonagricultural jobs through connections with government and "supra-village" relationships, which they combine with occasional visits to the rice fields. In contrast, for poor men and women, "the household" has become a more spatially and sectorally divided set of arrangements. Women have taken over agriculture which they

organize along the lines of organized labor exchange groups, while men have moved into low-wage nonagricultural jobs and many engage in circular migration. These jobs are sporadic, however, and poor men depended heavily on their wives' agricultural labor to retain a hold over tiny plots of land, and for income (Hart 1992).

In Bangladesh, "male survival strategies in the face of increasing impoverishment often entail the abdication of responsibilities to wives and dependents; a number of studies confirm the link between poverty and the incidence of desertion, divorce and female-headed households" (Kabeer 1990:143).

In Senegal, during the seventies, over one-third of Haalpulaar farming families became excluded from the cultivation of sorghum under flood-recession, which was their only secure source of livelihood. Men migrating to neighboring states and to France earned incomes which were used to buy grain. A new irrigation method was invented using floating pump sets to irrigate small local schemes of about 20 ha each. Thereafter, earnings from males who migrated were used by their wives and other extended family members to buy fuel, lubricants, etc. for the pump sets and to contribute to their amortization. Increased production meant less money had to be spent on food (Diemer and Vincent 1992:139). In the Nyaniyadze Irrigation Scheme in Zimbabwe, the highest incidence of female-headed farms was found in those blocks within the system with the poorest water supply. The low reliability of irrigation water led to insecure and low yields, which in turn made men to temporarily or permanently migrate in search of off-farm employment (Tiffen 1990).

In Africa, disruption of marriage has been reported to be one possible reaction to increased intra-household conflicts over the use of household labor and over the allocation and distribution of resources and income. In Tanzania "some women leave their husbands, children and household farm and go to town. Others remain, but refuse to work without payment on cash crop production under their husbands' command" (Mbilinyi 1990). Whitehead even suggests that there is a major crisis over marriage itself in some African rural areas: "In some cases marriages are difficult to secure and do not last; in others there is intensified pressure on women to marry and to remain married, and evidence of oppression within marriage" (Whitehead 1990).

Although there are specific instances of high female migration, for example in Thailand and Sri Lanka (Jayaweera 1989[15] and Shinawatra 1992), it is more common that men leave. Women then become solely responsible for all farming activities. The implications of male migration for the viability and sustainability of agricultural development is a new area of study. Different scenarios can be envisaged. High rates of male migration may lead to a decline in productivity because of labor shortages and because de facto female heads of households will have less access to credit and other support services (Safilios-Rothschild 1991). Evidence from Nepal suggests that single women have less easy access to irrigation water, partly because they are not supposed to attend water users' meetings (Bruins and Heijmans 1992).[16] It may also be (like in the example of Senegal) that male migration decreases the importance of irrigated agriculture in the livelihood strategies of households because the remittances from migrant labor supplement household incomes, which reduces the necessity and incentives to invest resources in irrigated production.

3. Gender Issues and Water Issues

THE PREVIOUS SECTION showed how gender relations and, specifically, intra-household divisions of labor, responsibilities and rights, affect and may be affected by the development of irrigated agriculture. It provides the empirical and conceptual background against which gender needs and interests with respect to irrigation management need to be understood.

This section will focus more narrowly on those gender considerations that are of specific relevance to irrigation management. It starts with the hypothesis that the invisibility of gender and/or women in irrigation management studies is not the result of women being not interested in irrigation or irrigation management being gender neutral. Subsection 3.1 will focus on the causes of the absence of gender in most irrigation management studies. In the second subsection, some concepts and tools for identifying gender considerations of importance to irrigation management will be proposed. Are gender needs and interests compatible with those of irrigation planners and managers? This question will be further explored, illustrating where and how female and male water users' interests and needs with respect to irrigation water may differ. On the basis of examples from literature and direct observations from the field, it will be shown that although women's interests are not necessarily opposed to those of men, women often have less power to defend them. Among other, and sometimes more structural, reasons is the fact that women have less formal access to irrigation water and irrigation management decision making.

3.1 The Invisibility of Gender in Irrigation Management

In most of the literature concerned with irrigation management, no specific mention is made of women or of gender considerations. Uphoff, in an analysis of fifty case studies on irrigation management found only three direct references to women (Uphoff 1986). The most easily recognized relations between gender and irrigation are those that relate to women's use of irrigation water for domestic purposes (Agarwal 1981), and the effect of irrigation on employment opportunities for female wage laborers (Agarwal 1981 and Chambers 1988).

The lack of attention to gender considerations is probably caused as much by the fact that approaches to planning and managing irrigation are often technically biased, top-down and hierarchical as it is by explicit or implicit gender blindness. Most approaches to planning and managing irrigation have not adequately conceived or accommodated the role of farmers of either gender. Decisions about water users' organizations and behavior are often based on wishful thinking, rather than on empirical evidence (Uphoff 1986). Water users or irrigators are often considered as a group whose members are differentiated only as far as their places, roles and functions in the irrigation system are concerned. Thus, not only differences between water users which can be attributed to gender are often neglected, but many other differences as well. Water users in fact have very differing and sometimes opposing interests, grossly depending on:

1. Their relation to the resources of land and water: Direct water users may be tenants, share-croppers, leasers, caretakers, family laborers, etc. In addition, people who use water for other than agricultural activities, for drinking or washing or bathing, may also be considered an interest group.

2. The importance of irrigated agriculture in relation to other income-generating or subsistence activities: Irrigated agriculture may be the main source of income; the main source of food, it's cultivation being "subsidized" by other activities; a side activity; etc.

As a result of these different positions, water users will have different perspectives; differential incentives for investing time, labor and capital in activities related to irrigation and differential information needs. Gender analysis may be a good starting point for recognizing these differences and understanding their impacts on on-farm and system water management, because the ways in which labor, money, land, water and information are allocated to various activities are often structured by gender relations. At the same time, more and better attention to gender issues in irrigation planning and management is contingent upon a better understanding of the real problems farmers, irrigators and water users are facing.

This is not to argue that the adoption of more farmer-oriented approaches to irrigation will automatically reveal concerns related to gender. The invisibility of gender is also due to the fact that women, generally, seem to be less involved in irrigation-related activities. In many societies, the processes of acquiring, allocating, distributing and draining the water appear to be strict male activities. This is often justified by the supposed physical strength or technical dexterity required for irrigation activities. In Peru, "water" is very much considered a male affair (van de Pol 1992). In India, irrigation researchers who were eager and willing to pay attention to women as well as men found it difficult to do so, because there were no women involved in irrigation (Mollinga 1992). In Pakistan, some women were even offended when asked if they were involved in irrigation (Basnet 1992). In addition, the collective decision making that irrigation requires seems to be more compatible with men's roles. Attending meetings and discussing matters in public may be thought of as male activities associated with political gatherings which are often traditionally confined to men.

While norms and perceptions (of both irrigation professionals and of male and female water users themselves) may deny female involvement in irrigation, actual patterns of involvement often differ. Even in Pakistan, where very strong norms and values prevent women from working outside the four walls of their homes, nine women out of a sample of 87 were directly engaged in irrigation (Basnet 1992). In Peru, many women are directly involved in on-farm water management and they also play important roles in settling water-related conflicts (van de Pol 1992). While it is true that in much of India, men's roles are more predominant in irrigation than women's, some anecdotal evidence from Andhra Pradesh shows that wives of male irrigators may join efforts with their husbands to secure adequate water supplies (India. Ministry of Water Resources; The Netherlands. Ministry of Foreign Affairs 1991). A few recent attempts aimed at increasing the involvement and participation of water users in irrigation management also show that low female involvement refers to norms rather than to actual practices. In the Philippines, during the process of turning over operation and maintenance responsibilities from the irrigation agency to farmers, female irrigators unexpectedly turned out to be very interested and willing to participate in water users' associations. This wish was strongly supported by their husbands; it was felt that some tasks would be better

performed by women and that irrigation decision making is something which concerns both male and female members of households (Illo 1988). An experience in Indonesia proved that, once women were explicitly addressed and encouraged to express their ideas and needs, they became very motivated and enthusiastic about getting formally involved in irrigators' groups (van Dok et al. 1992).

Part of the difficulty of directly relating gender to irrigation is probably caused by the fact that women's roles as mothers and housekeepers are more readily identified and recognized than their roles as producers, irrigators or managers. It is typical that many planned efforts within irrigation systems to explicitly address women focus on their domestic roles rather than on their roles as producers and providers. The use of irrigation water for domestic uses, for example, is often recognized. Special bathing steps may be constructed, or washing places built and drinking water and sanitation facilities taken care of within the context of irrigation projects.

The widespread initiation of small income-generating projects[17] for women within irrigation systems also illustrates the persistence of the assumption that women are not yet involved in productive activities. An example is that of an irrigation system in Burkina Faso. Here, the (predominantly male) staff of the project were ignorant of women's roles in irrigated agriculture. When discussing possibilities of better integrating women in the project, they expressed fear that women would not be able to understand the new production system and the new communal water management. All the newly irrigated land was allocated to men, while their wives performed at least half of the agricultural tasks in addition to working on their individually owned rain-fed plots. Despite their labor contributions, women were not formally involved in the cooperative organization of the irrigation system. In order to comply with donor requirements to pay attention to women, rather than addressing women as co-farmers and direct stakeholders of the project, a separate project for women was envisaged. Three thousand women were organized in groups of around forty. The women received as little land as 12 ha, or 1 percent of the total command area, to be used for the cultivation of vegetables (van Koppen 1990). Also in Senegal, rather than recognizing women as stakeholders on similar terms as for men, small separate plots alongside the main, irrigated plots were designed specially for women (Helsloot 1990). Or, as Diemer and Vincent conclude in a review of the policies of a number of major technical assistance groups working in Africa:

> *While technical assistance groups do express support for initiatives to support income generation for women, there seems to be continuing unease at debating the issue of shifting economic and political power between men and women, or of actually developing interventions which preserve women's rights in tenure and decision-making.* (Diemer and Vincent 1992)

Even where irrigation has traditionally been a male affair, it is likely that male migration increases women's direct involvement in irrigation-related tasks. This has been observed in several countries including, for example, Nepal and Sri Lanka. A Peruvian woman observed: "Currently more women irrigate, because men go to work elsewhere. We do all the irrigation-related tasks in the gardens and in the fields" (van de Pol 1992).

In summary, it is likely that the common perception of irrigation as a male activity (both by water users themselves, as well as by planners and professionals) has made female involvement in irrigation and irrigation management to go unnoticed. In some cases, it has even become a self-fulfilling prophecy: because women are not conceived as direct stakeholders of irrigation systems

they have been excluded from planned efforts to organize water users. As a consequence, many women have remained outside of formal irrigators' associations and thus lost the possibility of voicing their concerns.

3.2 Identifying Gender Needs in Irrigation Management

Gender analysis in the context of irrigation management addresses the questions of (1) how irrigation policies, institutions and practices affect gender relations and (2) how gender relations affect achievement of irrigation performance objectives. This basically implies asking if and how meeting gender needs and interests is compatible with meeting the objectives of the irrigation system.

A useful methodology for identifying gender needs has been developed by Maxine Molyneux (1987) which has been further refined by Moser (1989). The methodology, called gender planning, is based on the identification of the triple role of women in society, e.g., the reproductive, productive and community management tasks, and on a fundamental analytical distinction between practical and strategic gender needs.

To identify gender concerns, it is first of all needed to distinguish between **women's interests** and **gender interests**. The position of women in society depends on a variety of different criteria, such as class and ethnicity, as well as gender. Consequently, the interests women may have in common may be determined as much by their class position or their ethnic identity as by their biological similarity as women. The interests women have in common stemming from gender relations are called **gender interests**.

For example, the interests female heads of households may have in securing a reliable and sufficient water supply stem from their position as main farmers and not from the fact they are women. The particular constraints they may face in obtaining access to water may be due to the fact that they are women—these are the **gender** interests.

The gender needs that are formulated from the analysis of gender relations, and deriving out of strategic interests for an alternative, more equal and satisfactory organization of society than that which exists at present, in terms of both the structure and nature of relationships between men and women, are called **strategic gender needs**. Strategic gender needs may include the abolition of the sexual division of labor, the removal of institutionalized forms of discrimination such as rights to own land or property or access to credit, the establishment of political equality, freedom of choice over childbearing, and the adoption of adequate measures against male violence and control over women. Strategic gender needs such as these are often identified as "feminist," as is the level of consciousness required to struggle effectively for them.

The immediate needs many poor women have derive from the practical interest to survive. Women's needs are often a response to an immediate perceived necessity. These direct **practical** needs of women do not generally entail a strategic goal, such as women's emancipation or gender equality, nor do they necessarily challenge the prevailing forms of subordination even though they arise directly out of them. Practical gender needs may, for example, refer to specific constraints women face in achieving optimal levels of production, such as the time required for routine domestic tasks or inadequate access to extension and credit.

There is no direct positive link between practical and strategic gender needs. The satisfaction of practical gender needs may in some cases reinforce unequalities between women and men, in

others it may be a first step towards realizing more strategic gender needs. Irrigation planning that supports women's roles as mothers and housekeepers but denies their active roles in agricultural production and decisionmaking will help to strengthen the belief that women are of only marginal importance to irrigated agricultural production.[18] Conversely, even though practical gender needs do not generally entail a strategic goal, some change in the existing gender relations may be necessary to be able to meet these needs. In attempts to make agricultural extension accessible to women, for example, it is necessary that extension officers recognize women as farmers and it is also necessary that female agricultural producers value themselves as such so that they are able to formulate their extension needs. In some cases, the reluctance of male partners of female farmers to accept that their wives interact with extension personnel may need to be overcome. Likewise, the success in meeting direct practical gender needs that refer to irrigation management will often be conditional upon the removal of gender barriers in other sectors. When the availability of irrigation water for cultivating vegetables controlled by women is increased, for example, women will also need to have access to credit; agricultural information as well as guaranteed usufruct rights to the land they cultivate.

The relevance of the distinction between practical and strategic gender needs is that it helps to assess the objectives of proposed interventions. In order to qualify how meeting gender needs relates to the performance of irrigation, it is also necessary to bring some consistency in the many definitions and objectives of irrigation. Small and Svendsen (1990) in an attempt to bring some order in the irrigation discussion propose a framework for assessing the performance of irrigation systems. This framework is based on the identification of various levels in the irrigated agricultural production system. An irrigation system is defined as a set of physical and social elements employed to acquire, convey and distribute water to fields and disperse it to the root zone of crops. The output of this system (water delivered) becomes a major input into the next level, the irrigated agricultural system, the outputs of which (crops) are a major input into the agricultural economic system.

Parallel to these levels in the irrigated agricultural system, one can distinguish organizational levels. Bos et al. (1993) distinguish three functional levels: the *irrigation sector*, i.e., policymakers and planners usually located in ministries ; the *agency*, i.e., larger institutions responsible for allocation and management of goods and services in support of the farmer community; and the *irrigation system*, i.e., the organization responsible for management of a physical system for allocating and distributing water. Broad objectives are set at the sector level which (in principle) are turned into specific targets at regional or district levels by the macro-level agency; these, in turn, are the basis for specific targets at system level that presumably reflect objectives at the agency level (Bos et al. 1993). The organizations operating at these various levels supply services to a range of "customers" or stakeholders. While irrigation agency employees and consumers of crops produced can also be considered stakeholders, the most direct and obvious stakeholders are the members of farm households who cultivate land in the command area of the irrigation system.

The starting point for identifying gender needs with respect to irrigation is the farm household level. In order to be meaningful to irrigation managers and planners, gender needs with respect to irrigation should be formulated in "water" terms. Following the logic of nested systems (Small and Svendsen 1990), needs of water users can be identified with respect to the *impacts* of the irrigation system, the *outputs* and its *internal processes*. Impacts refer to the effects of the irrigation system on the wider environment, which includes relatively direct *outcomes* of irrigation (such as crop production) and those *effects* that are farther removed causally, such as welfare changes (or

changes in gender relations). Outputs relate to the amount, timing, uniformity and quality of water delivered. Process measures refer to a system's internal operations and procedures that lead to the production of outputs.

Once gender needs with respect to irrigation are identified at the household level, it will be possible to find out how and to what extent these needs can be met through (changes in) irrigation management processes, practices and institutions. An understanding of how gender structures the ways in which resources and labor are mobilized and allocated to irrigation and irrigated agriculture will also help to identify gender-related barriers and constraints to improving the performance of irrigated agriculture.

3.3 Gender Needs with Respect to the Impacts of Irrigation

The direct impact (which Small and Svendsen 1990 refer to as "outcome") most often attributed to (and aimed at with) irrigation is increased agricultural production. Accepting agricultural production as the major objective of irrigation has several advantages of which the fact that production is relatively easy to measure is probably particularly important (Chambers 1988). While increased production may be the most important objective of irrigation from a policy point of view,[19] not all households that practice irrigation and not all members of these households necessarily share this objective to the same extent. Also, objectives of households may change over time.

In the second section of this paper, some examples given showed how women and men differentially contribute to and are differentially affected by increases in agricultural production. It has been shown that this may lead women and men to differentially evaluate new irrigation opportunities. Gender differentiated impacts not only indicate that women and men may be benefitting differently from irrigation, they also may explain why women and men are differentially motivated to invest time and resources in irrigation and irrigated agriculture. In some African examples, women completely lost interest in cultivating irrigated crops because they felt that their extra labor contributions were not compensated for by additional benefits or gains. Examples from India and Sri Lanka have shown that men do not always share the income from irrigated agriculture with their wives and families.

How increases in production relate to gender depends on the specific gender configuration of the agricultural and household economy, the sexual division of labor and the intra-household allocation of resources, incomes and responsibilities. Following the Feldstein and Poats framework (see subsection 2.2), potential gender differences with respect to the agricultural production impact of irrigation can be expected to occur in:

1. The allocation of labor, land, water and other resources for the cultivation of crops, construction and maintenance activities, and participation in irrigators' meetings.

2. The use of the outputs of irrigated agricultural production (consumption, storage, exchange, sale, etc.).

As has been briefly discussed in subsection 2.5, indirect impacts of irrigation (defined as "effects" by Small and Svendsen (1990) may be as, or even more, important to household members as the direct outcomes of irrigation. Women in Nepal were highly positive about new irrigation facilities,

because they considerably reduced the time needed for fetching water (Backer 1992). In India, the unforeseen positive impact of canal irrigation on the growth of fodder was particularly beneficial for women, since it enabled them to produce and sell more ghee (Stanbury 1981). Irrigation water may also be directly used for watering cattle, which may be the specific responsibility of women. These indirect effects are often less obvious to irrigation professionals, but may partly govern choices and behavior of water users.

A very clear example of side effects is given by Sarah White (1992). This example looks at the changes due to the introduction of tubewell irrigation in a village in Bangladesh:

> *The new profitability of agriculture has meant forest areas have been cleared to provide more cultivatable land. With rising demand for fuel, this has dramatically reduced tree cover. The land available for pasturing animals has similarly been reduced and numbers of milch cattle in particular have fallen sharply. This again means less proteins and vitamins in the diet as milk becomes scarce, and the loss of income for some of the poorer women who used to sell milk. Also, with wood and bamboo, cattle dung has been a key domestic fuel: dung sticks may be sold by women to generate income. The shortage of these sources has thus increased the time that poorer women spend gathering fuel, and pushes them towards more and more marginal sources such as leaves and bark of trees, which hastens further the destruction of natural resources. In general, since the installation of the shallow tube-wells and the deep tube-wells in Kumirpur, there are noticeably fewer common resources. The canal, which used to be a good source of fish, is now dried up much earlier in the season by the use of STW engines as low-lift pumps (using surface, rather than ground water, to give much lower running costs). Fruit and vegetables that used to grow with little or no tending now give much lower yields due to reduced soil moisture.*
>
> *Not all side effects of irrigation are negative of course. The increase in crops means, for example, that there is more straw available for fuel--though the new crops are predominantly shorter stalk varieties so the supply of straw has increased less fast than grain production. Use of straw for fuel has its own drawbacks, however. The fire has to be fed constantly so cooking time expands and quicker flames increase danger of injury. Also, straw leaves nothing but ash, whereas the charcoal left by burnt wood could be sold to local blacksmiths and so used to provide women with a marginal income source. Formerly, the lower straw left after paddy was cut used to be burnt in the fields. The shortage means it is now used as domestic fuel and this denies the soil restoration of some of its lost nutrients.* (White 1992)

This example leads the author to the conclusion that "the 'random' unintended consequences ... are in fact not random at all, but show a clear class and gender bias" (ibid.). Chambers (1988) also clearly recognizes the class bias in discussing indirect gains and losses to the land-poor from irrigation. However, he just mentions two gender-specific impact indicators, namely, changes in employment opportunities for female wage laborers and changes in unpaid work loads for women.

This suggests that most of the other effects mentioned are gender neutral, which is not true. How some of the indirect effects listed by Chambers are gender specific is indicated in Table 3.1.

Other indirect effects of irrigation that are gender specific include the relation between irrigation and the growth of nonirrigated crops and trees. Seepage from canals may raise the water table and, unless soil conditions are such as to increase salinity, usually the effect can be expected to be positive in that it may stimulate the growth of fodder and trees. Women being often responsible for the provision of fuel wood and sometimes for the care of cattle are particularly affected by such changes. Canal irrigation may also replenish groundwater used for domestic purposes. In the

Table 3.1 Gender specificity of indirect effects of irrigation.

Gains	**Gender Specificity**
Return migration.	Migration may be confined to one gender; young men are most likely to migrate.
Lower food prices.	Gender division in responsibilities; it may be the specific responsibility of either men or women to provide food.
Nonagricultural uses of water, including uses that improve health.	Gender division in responsibilities; women are often responsible for carrying water, washing, bathing children, and sometimes for watering cattle.
Losses	**Gender Specificity**
Increase in land prices.	Differential access to and control over land of men and women; women's access to land is often mediated through their husbands or male relatives.
Market competition between farmers of irrigated and rain-fed lands.	Gender division of crops or fields; a possible division of rain-fed and irrigated land or crops along gender lines. Differential access to markets.
Increase in water-borne diseases	Gender division of responsibilities; women being most often responsible for caring for the sick.
Labor displacement	Gender division of labor; tasks being done predominantly by one gender being mechanized.

Source: Adapted from Chambers 1988:9.

Mahaweli System in Sri Lanka, women reported that their wells were dry during *yala* (the dry season). Especially, the wells in the tail-end areas of the system supplied water only when water was flowing through the nearby channels (Abeysirigunawardena and Kilkelly 1983).

In contrast, groundwater irrigation may have the opposite effects; lowering water tables and consequently reducing the growth of trees, fodder and other rain-fed crops. A reduction in the availability of fodder may lead to a reduction in the amount of cattle, which in turn will affect the availability of cow dung used (among other uses) as fertilizer.

The many direct and indirect linkages between gender and irrigation development are hard to foresee. They will be different in different cultural, institutional and environmental contexts and depend upon the type of irrigation technology used. Even if it would be possible to come up with a model or framework which incorporates all potential intervening factors and underlying social relations which may determine the outcomes and effects of irrigation development (which is rather unlikely), it would be highly time-consuming and unpractical to use. Probably, the most easy and reliable way to start identifying how gender relates to irrigation development is to ask male and female water users themselves to evaluate the outcomes and effects of irrigation.

3.4 Gender Needs with Respect to the Outputs of Irrigation

Some of the differential interests women and men may have with respect to the impacts of irrigation are reflected in differential needs with respect to the irrigation system's outputs. Output measures directly assess the nature and quality of irrigation services delivered to farm households, services which in turn will be important in determining production, income and other livelihood indicators. Output measures are thus critical in understanding the connections between irrigation services and its broader impacts. The concern here is with the criteria of male and female members of irrigating households for evaluating outputs.

Knowing and understanding the priorities and perspectives of irrigators, and possible differences or conflicts between them, will help to set realistic operational targets for irrigation systems. Operational targets are usually predominantly derived from the physical infrastructure of the irrigation system (cf Bos et al. 1993). This may be one reason that these targets are seldom achieved: the viability of targets is not just determined by the physical infrastructure. The people who manage and use this infrastructure as well as the social and economic relations between them are equally important in determining optimal levels of operational performance. Irrigation water often is a crucial productive resource, access to and use of which will reflect prevailing dynamics of power. Its impact on production will depend on who has control over it and how the people in control are using it; its use, in turn, will affect social relations (cf White 1992:51).

What are the criteria used by the direct users for evaluating the outputs of irrigation systems? Specific criteria will again depend on specific local, environmental, political and other circumstances. Chambers suggests that farmers, in general, can be expected to be interested in the "delivery to his or her farm of an adequate, convenient, predictable and timely water supply for preferred farming practices" (Chambers 1988:30). Svendsen and Small (1990) discuss, in more detail, a set of measures of irrigation service they judge to be of interest to farmers. The authors in discussing these measures focus on potential differences between farmers (whom they consider to be one person, instead of recognizing that farming often is a family undertaking) and managers and

therefore fail to recognize possible differences between farmers, let alone differences "within farmers," or within farm households.[20]

One fundamental remark on criteria suggested by Chambers, and Svendsen and Small is that they limit their attention to the flow of water from the irrigation system to the agricultural enterprise. While this may seem to be logical for those primarily concerned with agricultural production, it may be very illogical from point of view of farm household members. This is because, as earlier explained in the second section, farm household members are often engaged in a number of agricultural and nonagricultural activities, including activities aimed at direct subsistence. For some, but not all, of these different activities water (derived from the irrigation system) may be relevant in different ways. It may be that irrigation water is not intended to be used for other purposes than irrigating main agricultural crops; the reality is that it often is. Examples already referred to concern the use of irrigation water for domestic purposes and for watering cattle. It has been observed in Ecuador that some households used almost all their irrigation water for poultry farming (Smit 1988).[21]

Keeping these shortcomings in mind, the criteria proposed by Svendsen and Small will be used here to illustrate how men and women possibly value the outputs of irrigation differently. If, as is often the case, the various activities of farm households are divided among household members according to their gender, it logically follows that women and men may differently value irrigation services and that irrigation differently relates to the individual welfare of women and men. The list of possible differences given below is by no means meant to be complete. The main aim of identifying some potential differences is to show that they exist and to provide some pointers as to where they might occur.

The first set of measures Svendsen and Small identify are *depth-related measures:* adequacy, equity and timeliness. Adequacy refers to "the average depth of water delivered over a season relative to some standard" (Svendsen and Small 1990). Adequacy relates to the amount of irrigation water required, which is most often expressed in equations which balance the available water from rains and irrigation with the required soil moisture for optimal crop growth, sometimes with additional provisions for unavoidable percolation losses or leaching requirements.

Possible gender differences in judging the adequacy of irrigation outputs may first of all arise because of a gender division in crops grown, men being responsible for crops different to those grown by women. In Niger, women cultivate vegetables on plots separate from those of their husbands, where rice is grown. The rotation schedule for water deliveries is based on the crop water requirements of rice. When rice is ready for harvesting, water deliveries are stopped, despite the fact that the vegetables still need additional water applications. As a result, women have experienced severe losses due to the withering of their vegetable crops (Dadi Barmou 1993).

When the "main" irrigated crops are the most profitable, these can be expected to be controlled by and fall under the responsibility of men. Women often contribute labor to growing these crops, but very often they will also grow some crops of their own. These crops are often meant for home consumption but surpluses may be sold. When there is an opportunity of doing so, women will make use of irrigation water in growing these crops. They may take water directly from the channels, or sometimes they use drainage water. In the examples from Burkina Faso and Niger, specific plots were allocated for use by women. Since crops grown by women are not considered to be the "main" crops, or because it is not even realized that they are grown, their water requirements are seldom taken into account when devising water delivery schedules. In some cases, the use of irrigation water for growing crops other than the planned one, or for using water

on plots outside the designed command area, will even be considered illegal. The fact that most interactions between managers and farm household members involve only men obviously contributes to women's water needs being unnoticed.

Gender differences in irrigation needs with respect to adequacy may also occur as a result of a gender division in tasks. Water can reduce labor, as for example, in the case of preseason applications to soften soil for land preparation (Svendsen and Small 1990). Land preparation is often done by men, which means that preseason applications reduce the amount of male labor needed. Women may be expected to do the bulk of weeding in rice cultivation. Unless they work as paid laborers, women are likely to be in favor of increasing the ponding depth which reduces weed growth. In Nepal, women reported that the increased availability of irrigation water had considerably reduced the time needed for weeding (Backer 1992). For the same reason, reducing the amount of their labor needed, women may prefer that rice be broadcasted instead of being transplanted.

Some uses of irrigation water reduce expenditure on inputs, such as herbicides, rodenticides and fertilizer (Svendsen and Small 1990). A gender division in resources may also be the basis for differing opinions between men and women on the adequacy of water deliveries.

Equity refers to the spatial distribution of water across the irrigation system. When water is short, both farm households and managers will have to address the question of how to distribute the available water among plots and farm households. Equity then becomes a measure of fairness of the allocation of the available water. It is obvious that notions of fairness will depend very much on existing social and economic differences and power hierarchies. It may be considered fair that an influential farm leader receives a relatively larger share of water, for example. Also, farm household members may take local differences in soil moisture-holding capacity or seepage and percolation rates as valid reasons for differences in water deliveries (Vermillion 1990).

A first and very direct gender difference with respect to equity may be that, justified by existing gender ideologies, female irrigators receive less water than male irrigators. This gender discrimination in water allocation will often not be very direct and open. It may, for example, be that crops grown by women may be considered less important and therefore receive less priority when water is allocated. Female heads of households in Nepal felt that they received less water than men. Because they were not supposed to participate in agricultural planning meetings, water allocation plans were made in their absence (Bruins and Heijmans 1993).

Considerations regarding equity may also be valued differently by women and men because of differences in the nature and importance of social relations to men and women. In Nepal,

> *in Bhanjayang Tar Ko Kulo (canal) the head-reach people initially took much interest in the improvement of the head-reach section of the canal, but they were not concerned with the improvement of the tail-reach because of local politics. There was a critical section in the canal from which most of the water leaked, requiring improvement if the tail-end people were to receive reliable water. Some women from the head-reach said to the head-reach male farmers that "if you do not further improve the canal, we females will do the job." This embarrassed the male farmers, resulting in further improvement of the canal in the tail end.* (Pradhan 1989)

Investments in extra-household social relations and networks may carry a specific significance especially for poorer women on at least two grounds. They tend to be more disadvantaged in

relation to other more tangible forms of resources (see, for example, White 1992). Furthermore, it may offer women a measure of autonomy from male authority within the household and can help furnish them with powers of persuasion in their dealings with men (Kabeer 1992). It may be that women place a higher value on fairness of water distribution than men do.

Different appreciations of *timeliness,* which relates to the distribution of water across the season relative to some utility-based standard (Svendsen and Small 1990), may again arise because of a division along gender lines in crops cultivated. Potential gender differences may also occur because of male or female labor peaks.

A second set of output measures discussed by Svendsen and Small comprises the *farm management-related measures.* Particularly important with respect to gender is *convenience,* which refers to preference patterns for timing of water deliveries (Svendsen and Small 1990). Women may have some specific wishes with respect to the daily time at which to irrigate, because they have to plan their domestic and productive activities alongside each other. Some of these activities, like preparing the meals, have to be done at a more or less fixed time of the day. As a result, women may have a different preference for the time to irrigate or to work on the irrigated field than men. In a small-scale irrigated vegetable project in Senegal, for instance, even though a canal system for surface irrigation would have physically facilitated the task of irrigating and would have required the presence of the female farmers in the field only once in a few days, the women preferred a reservoir system which made it necessary for them to go to the fields every day in order to water the crops with watering cans. An important reason for women to prefer the reservoir system was that it left them free to decide when to irrigate, without having to consult other women (Helsloot 1990). In Nicaragua, there was a marked difference in the time women and men were willing and able to spend irrigating their fields: women preferred to start later in the morning than men, because of the domestic duties they had to perform early in the morning (Blaauw 1992).

Night irrigation may be particularly difficult for women because of social norms which prevent women going out at night. In Pakistan, the few women that were directly involved in irrigation would send a male relative or neighbor when their irrigation turn was at night. If there was no other possibility, they would try to be accompanied by a family member or a friend (Basnet 1992). Also, in Alto Piura in Peru, women complained of the specific dangers they had to face when irrigating their crops at night (van de Pol 1992).

In regard to the third set of output measures, *water quality*-related measures, women are more likely than men to place a high value on having access to irrigation water which is clean enough to use for domestic purposes. It has been observed in Sri Lanka that even though women used the water from the irrigation channels for domestic purposes, this water was not considered pure enough to use for ritual bathing and religious purposes (Perera 1989). Also, the health hazard presented by mosquitoes and snails which transmit diseases such as malaria, encephalitis and schistosomiasis (Svendsen and Small 1990) may be felt more by women because they are often responsible for caring for the sick.

3.5 Gender Needs with Respect to the Process of Irrigation Management

In the past, when attention was paid to the organizational requirements which have to be met in order to fully exploit the potential of the irrigation system, these requirements were often deduced from the physical characteristics of the irrigation infrastructure rather than from the social, political

and economical environment in which the infrastructure is used. Users were expected to adapt themselves to the technology rather than vice versa. More recently, the lack of direct interaction and dialogue with users, both in the design process (Vermillion 1990; Horst 1983; Meijers et. al. 1990) as well as in the management process (Uphoff 1986; Orstrom 1992; Vermillion 1991) has been identified as one major cause for poor performance of irrigation systems. Increased user participation in decision making and resource mobilization is now widely advocated as a means of improving irrigation performance.

Attempts to elicit more user participation in managing irrigation systems have, since the late eighties, often been part of

> *a more thorough-going approach--which is the turnover of primary management authority itself to water users' associations or other nongovernmental institutions. In response to poor management performance, financial pressures, increasing agricultural diversification and commercialization and increasing numbers of rural nongovernmental institutions, many governments in developing countries are privatizing irrigation institutions and turning over their management to water users organizations, or other nongovernmental institutions."* (Vermillion 1991)

Because addressing and accommodating gender concerns in irrigation can be expected to be more successful when user concerns are addressed and accommodated, and because of the many efforts all over the world to increase the involvement of users in irrigation management, the focus in this section will be on the potential gender differences with respect to participation in users' organizations. Looking at attempts to increase user participation in irrigation management from a users' perspective means looking at whether and where participation of women and men is desirable and possible. This will ultimately depend on how women and men evaluate the possibility of meeting their needs with respect to irrigation through formal participation, and how irrigation professionals think that male and female user involvement contributes to the overall performance of the irrigation system.

Evidence shows that if user priorities are taken into account at all in irrigation management, the users' group will usually be thought of as consisting of men only. This is a reflection of the assumption that each farm household is benevolently headed by an adult male who is able and willing to take all decisions on behalf of his dependent family members. The few irrigation management studies that focus explicitly on women reveal that in most cases women are virtually absent as official members of irrigators' associations. The most important reason for this is that membership is confined to either official landholders or heads of households, the majority of whom are men. Only in cases where men are not involved or hardly involved in irrigated agriculture, women will be officially involved in water users' associations.

The most well-documented case about women's relative participation in irrigators' associations comes from the Philippines. Here, the Irrigation Community Organizers (ICOs) in identifying prospective association members consider either the owners or the actual cultivators of land which will be served by the proposed system.

> *Consequently, the membership rule which evolved considers only one member, often the male head, from each of the qualified farming households; thus at least*

80% of the members of irrigators' associations formed in National Irrigation Administration (NIA)-assisted communal irrigation projects was male. (Illo 1988)

However,

the ICOs have responded positively to alternative arrangements suggested by local communities. In the Mountain Province, for instance, several irrigators' associations insisted in having both husbands and wives as members representing their households in the association. (Illo n.d.)

One reason for this was that allowing both wives and husband to become members of the association allowed for more flexibility; either the woman, the man or both would then be able to attend the meetings. Another reason was that, even though agricultural decision making is very much a joint affair of both husband and wife, women and men have distinct domains of influence. As women most often control the cash-flow within the household, it was found that associations encountered problems when collecting irrigation fees, unless the women were involved in formulating policies regarding irrigation and membership fee collection schedules. Community organizers also learned that unless women were encouraged to participate, financial obligations of farming households could not be guaranteed. (Illo n.d.)

The few women who occupied positions of leadership, held the posts of secretary and treasurer.

The assignment of women to these posts was rationalized on the basis of their persistence, patience, and neatness--"female" attributes which association members considered as important for record keeping and financial management. (Illo 1988)

This experience of the Philippines is one where the involvement of women in irrigation management was judged positively by women themselves as well as by their husbands. Gender needs with respect to the process of irrigation management also proved to be compatible with the interests of the Filipino irrigation agency, the NIA, because meeting these needs obviously improved the performance of the associations.

Another rather well known example of women's involvement in irrigation management is that of Bangladesh. Here, some first impressions seem to suggest that the involvement of women in owning and managing irrigation equipment sometimes meets with resistance from men. In Bangladesh, some NGOs have initiated innovative programs to enable the landless poor to gain access to and exercise control over irrigation equipment and water. Two of these NGOs (BRAC and Proshika) are actively testing and developing programs to support ownership, operation and management of irrigation assets by poor women. While BRAC's program works with joint male-female groups, Proshika works with all-male and all-female groups.

All-women groups managing irrigation equipment have faced specific difficulties; two groups were discontinued after a few years of operating the equipment. This was at the insistence of their husbands, not because of lack of profitability or mastery of operations, but because of various social resistances and constraints on their mobility. Their husbands took over the shallow tubewell

operations while encouraging their wives to engage in more "appropriate" or "traditional" occupations such as livestock rearing. Also, women faced difficulties stemming from their dependence on male relations to harvest and collect crop-share revenue for water in the farmers' fields, and to help them sell rice in the market. This sometimes undermined women's ability to directly control the financial aspects of the operation (Jenkins 1991).

These efforts in Bangladesh to directly address and involve women in tubewell ownership have not been carefully documented or evaluated so far and, unfortunately, no attempts have been made yet to study the nature and degree of women's involvement in mixed groups in a systematic way.[22] However, first impressions suggest that women cannot expect to benefit fully from the programs, unless their structural positions within households and within society are strengthened. Unlike the Philippine case, directly addressing and involving women in the ownership and management of irrigation equipment in Bangladesh seem to challenge existing gender relations. It is a situation where meeting a practical gender need of women, that of having access to irrigation water (or more broadly that of gaining an income), seems to be conditional upon structural change in gender relations.

There exist a few examples that suggest that the absence of women in irrigation management activities might have been a factor in the poor performance of irrigation systems. A study carried out in Indonesia suggests that a major reason for the poor functioning of water users' associations was the fact that the official members of the association--the male "heads of households"--were not the actual irrigators and farmers. Their wives often performed most of the agricultural and irrigation management activities while the men were away for long periods of the year (Schrevel 1989). In Nepal, in the Baurahua Irrigation System in the Terai, the absence of women in the preseasonal planning meeting led to inefficiencies in the water distribution. Female farmers were sometimes not aware of their turns. Acknowledging this, the male farmers took the initiative to invite women to the meetings (Bruins and Heijmans 1993). In Burkina Faso, the failure to incorporate women from the beginning in project planning and construction of the irrigation infrastructure, on the pretext that women did not own the land, made women (who were the actual cultivators) reluctant to do the maintenance. They feared that their husbands would confiscate either the land or the proceeds of the harvest (van Koppen 1990).

Even though women may be absent in water user's associations and are not recognized as water users by irrigation managers, they may be able to defend their interests and meet their needs in "informal" ways. The success of "informal" ways of influencing decisions may even be another reason for women not to be willing to participate officially in male dominated farmer associations. Bunker and Seligmann found women playing a crucial role in surveillance and conflict management in a small-scale system in the Department of Cuzco (Peru):

> *For the most part, women control the canals while their husbands and other male relatives irrigate, and it is not uncommon to meet a grandmother walking above or below the canal with a large stick in her hand and a ferocious look. Men explain that women play this role because men have to respect each other and not fight. But, as all the men are in agreement that the women should control the ditch, the women fight among themselves like cats and dogs... Full negotiations take place at the side of the canal, but even when it seems that they have reached an accord, as soon as the petitioner goes his way, the other opens the gate again.* (Bunker and Seligmann, cited in Lynch 1991a)

Another study in Peru gives women's own explanation for their important role in settling water-related conflicts: "Since we don't have money to pay for a water guard, we do it." Women also thought that they were more astute in settling conflicts than men, "because we can talk in a good way." Men stated that women are likely to have more success in settling conflicts, because men will not easily start to fight with women. Men also related it to women's overall responsibility for maintaining social networks (van de Pol 1992).

Another way women may try to exert some influence in irrigation decisions is through participation in maintenance and construction activities. One reason for women to be willing to contribute to construction and maintenance activities may be the anticipated greater say about the use of the irrigation system. Pradhan, for example, observed that

> *in well-organized systems in the western hills (in Nepal), the organization encouraged women to do sand, gravel and stone collection for wages. Women said the most important reason for them to participate was the need to earn some extra income. Some women were also anticipating the benefits: greater agricultural production with irrigation, ownership of the canal; reduced canal maintenance; improved water supply for cattle and washing clothes and dishes.* (Pradhan 1989)

While women may anticipate benefits from their participation in construction activities, participation in construction in itself doesn't guarantee that women benefit from the irrigation system. An example from Nepal documents women's dissatisfaction with the fact that their contributions to the rehabilitation work did not lead to an improved access to and availability of water. More water would have reduced the competition for water with men, in which women have a weaker bargaining position[23] (Bruins and Heijmans 1993).

Sometimes women have their own, often informal, organizations where they discuss matters of relevance to them, which may include issues related to irrigation. In the Muda Irrigation Scheme in Malaysia, for instance, many poor women had organized themselves in labor groups. The character and organization of the groups varied. At one extreme was a group of older women who only worked on each other's farms. At the other extreme were two highly commercialized groups of landless women and women with very small land holdings, who functioned primarily as labor gangs working both inside and outside the village. In between were two groups comprising women from households with small to medium landholdings, who mainly worked on each other's land but who also did a certain amount of contract work for wages (Hart 1992). In the hills of Nepal, the organization of literacy classes which were attended by women only, provided a forum for women to discuss problems of mutual concern. In some villages, these included irrigation matters (Backer 1992).

Even though the informal ways of solving conflicts and settling matters sometimes may be quite successful from the point of view of the irrigators, the fact that women are not formally included in water users' organizations certainly is one factor which contributes to the myth of women not being interested and/or involved in irrigation matters. The recognition of informal decision-making mechanisms and organizational structures is essential for realistically planning and devising institutionalized forms of farmer participation in irrigation management.

If (increased) participation of female water users is considered beneficial or desirable, the question arises as to how this can best be achieved. Just allowing women to become members of water users' organizations will not necessarily guarantee their equal and full participation, and may

not be the most effective way of achieving sustainable local management. Organizations which function for men are not necessarily successful for mixed or women-only groups. This is best illustrated by examples of female heads of households who are officially entitled to join irrigators' associations.

In Nepal, female heads of households often preferred to send a male relative as a proxy to the meetings of irrigators. If women did attend the meetings, they only listened. "Decisions are made by men and women must follow these" (Pradhan 1989). In Sri Lanka,

> *participation by female landholders in the Farmer Organizations is seen largely to be passive. Many women landholders reported that they are sometimes represented by their sons or husbands in the Farmer Organizations. When women need to present some problem, they usually do so through a male Farmer Committee colleague.* (IIMI 1992b)

In Niger, it was observed that female irrigators, although they were formal members of the users' cooperative, did not attend meetings. Many women were not even aware of when and where meetings were held, and they knew the cooperative only as a body which looked after the collection of the irrigation fees.

These examples show that the effectiveness of users' organizations sometimes may not be very high for women. Women themselves will often acknowledge this, and report the difficulties they have in having their irrigation needs fulfilled. One female irrigator in the Minneriya Irrigation System in Sri Lanka related that although the male farmer who cultivated the field adjacent to hers was good enough to represent her interests at farmers' meetings, she had to pay for it by allowing him to gradually encroach on her land. In Peru, women complained that they were always given the most inconvenient times for irrigation; one woman stated she always had to irrigate her crops at night. While, in principle, irrigation turns are distributed among all irrigators in such a way that every irrigator has the same number of night shifts, in practice, men are able to negotiate the timing of water applications (van de Pol 1992).

In the Baurahua Irrigation System in Nepal, water is allocated and distributed according to an on-demand system in wintertime, and according to a scheduled rotation system during the monsoon. Both male and female irrigators preferred the on-demand rotation because it ensured them of an adequate and timely water supply. However, during plowing and transplanting (when there is a peak demand for water) women found it more difficult than men to bargain for convenient water supplies. Women did not expect much from participating in the water user group; they feared that men would not listen to them. One woman suggested that women should organize themselves so that they might succeed in having more influence. Although women also preferred the on-demand rotation, they also clearly saw an advantage in the scheduled rotation system with the guarantee of getting water without having to go through the hassle of negotiating for it (Bruins and Heijmans 1993).

Attending meetings and discussing matters may be thought of as "male" activities associated with political gatherings which are often traditionally confined to men. Women are often not expected to speak in front of men or in public. Women's own attitudes as well as those of their male colleagues thus may inhibit open exchange of information. In contexts other than irrigation, the fact that women are not used to speaking in public or that they do not want to raise their voices in front

of men has often been described as a factor inhibiting women's equal participation in decision-making processes. According to Moser:

> *The spatial division between the public world of women (where the neighborhood is an extension of the domestic area) means that men and women undertake different community work. While women have a community managing role based on the provision of items of collective consumption, men have a* ***community leadership*** *role, in which they organize at the formal* ***political*** *level generally within the framework of national politics.* (Moser 1989)

An often advocated way to include women's views in decision-making processes is to set up special women's organizations. The ideological barriers women face when they are together with men in public meetings are removed in these organizations. A successful attempt to better include women in water users' organizations in Indonesia started with organizing women separately. Special training sessions were organized, both for female water users as well as for field agents and other officials. Special female field staff were also appointed and trained. This made women gain confidence and helped them to overcome some of their initial reluctance to attend "male" meetings (van Dok et.al. 1992).

Special women's organizations can be very useful in helping women to articulate and define specific needs and interests and in recognizing their gender specificity. If the nature of women's needs vary greatly from those of men, for example, because women grow different crops or because women are mainly interested in nonagricultural uses of water, it may be more appropriate to create a distinct forum where women can meet. However, a danger of these organizations is that unless they have the same legal status and power as men's organizations, they may tend to exclude women even further from mainstream decision-making processes.[24]

It is often argued that an important reason for women not to attend meetings is that they are too busy with other activities. However, even though women may face severe time constraints, evidence has shown that if women feel that their attendance is useful they will manage to accommodate time for meetings (Illo 1988). It may be that certain times for meetings do not pose problems for men while they do pose problems for women as a result of their domestic duties, or as a result of social norms which tell women not to go out at night.

Another problem may be that women are less well educated than men are. Often, many more women than men are illiterate which makes it difficult for them to make use of any written information. Being illiterate may also add to women feeling incapable and insecure, and in itself it is often a reflection of a gender ideology which places a higher value on intelligence and leadership qualities in men than in women.

The fact that field agents and irrigation managers are predominantly men may be another factor which inhibits open exchange of information between them and women. In the Philippines, the relatively large number of female Irrigation Community Organizers has been identified as a factor contributing to the community's acceptance of women as leaders in the irrigators' associations. However, the relation between the sex of the field agent and the frequency and efficiency of communication with female farmers is not as obvious as is often assumed.[25]

In summary, it can be expected that in many situations, the perspectives of men and women on participation in irrigation management differ. This is so first of all because the nature and degree of their interests and needs with respect to irrigation differ, as has been illustrated in subsections

3.4 and 3.5. Female and male perspectives may also differ because men and women have different perceptions of the costs and benefits involved in participating in users' groups. The attractiveness of participation may be less for women because the costs and time spent for travelling or attending meetings may be relatively higher for them, but also because social norms and values are not always supportive of women engaging in public meetings. Qualities for being an active and vocal member of irrigators' groups may be valued in men, but considered inauspicious when found in women.

4. Conclusions: Opportunities for Improvement

THE PREVIOUS SECTIONS provide a broad list of issues and matters that deserve attention when looking at irrigation management from a gender perspective. The evidence presented suggests that there is considerable potential within irrigation systems to improve efficiency as well as equity by paying better and more attention to gender. A very first and fundamental step towards realizing this potential is the introduction of a more user-oriented approach. This basically requires a change from a way of looking at water users and irrigators as mere instruments in realizing goals and objectives formulated by planners, policymakers and engineers. Instead, water users need to be recognized as actors who actively and rationally modify and shape their technical and sociopolitical environments in order to optimally make use of the services provided by the irrigation system.

Inherent to a more user-oriented approach is the acceptance of diversity. A group of water users is a diversified group. While most irrigation professionals and managers are aware of and do account for differences between water users based on different locations within the irrigation system (head-end and tail-end), other differences that affect the ways in which people use water tend to be overlooked. Gender is a potential source of difference which crosscuts all other social distinctions.

While a user-oriented approach does create the necessary room for gender issues, by itself it does not guarantee that all gender aspects and issues are adequately recognized and addressed. Evidence so far shows that persistent biases exist which prevent irrigation planners, engineers, managers and researchers to recognize women as users or customers of irrigation systems. This concluding section will start with summarizing some of the biases that appear to be inherent to normal irrigation thinking.

The ability to recognize gender biases thus can be seen as the second important step towards improving the performance of irrigation systems. Improvements will partly stem from a more realistic assessment of optimal performance levels and partly from a better recognition and accommodation of specific needs and constraints women water users may face. Subsection 4.2 will deal in more detail with potential gender contributions to irrigation performance.

One crucial question that arises when dealing with gender is whether and how women can be expected to benefit from (changes) in irrigation or its management. Policies and practices based on existing gender divisions of labor and responsibilities may (inadvertently) sustain or reinforce existing gender inequities. The potential trade-offs between gender equality and high performance are explored in subsection 4.3.

4.1 Gender Biases in Irrigation Thinking

Certainly the most persistently wrong assumption in much development and irrigation planning is that of the unitary household. Households are typically conceived as consisting of a male farmer, his wife and a number of children. The male farmer is thought of as being the manager of all household and farm resources; and he is normally conceived and addressed as the single focus of decisionmaking and as the person to whom all costs and benefits accrue. While it is acknowledged that the male farmer's wife performs certain tasks in irrigated agriculture, her position in the farm is generally referred to as that of her husband's assistant. She helps her husband whenever a need arises, her main occupation being that of a mother, cook and housekeeper.

The examples have shown that this picture seldom reflects the reality. There are a number of assumptions derived from the use of the unitary household model for irrigation planning purposes. When rejecting this model, these assumptions automatically also need to be reviewed.

Assumption 1. Raising the income of male farmers (through improved irrigation facilities and services) leads to improved well-being for himself as well as for his family; or, the male farmer is the main (or sole) provider and income-earner.

This assumption basically asserts that household expenditure patterns are not affected by who in the household earns the income. Examples provide evidence to the contrary, showing that women and children do not always and automatically benefit from increased incomes controlled by men. It is widely perceived that men tend to spend some of their income on goods for their own personal consumption, whereas women's personal incomes are usually fully committed to meeting household needs. This does not necessarily reflect selfish behavior of male family heads, but illustrates differential powers and responsibilities of women and men within rural households.

The importance of women's contributions in meeting rural household needs is now well documented. Women may be co-breadwinners, either working together with their husbands on collective household fields or pursuing their own independent income- and food-generating activities. Independent income generation by women often helps ensure stability and income of the household, which is particularly important if the breadwinning ability of the men is problematic. In addition, in some countries where there is a high rate of divorce or abandonment, women are particularly motivated to secure control over household expenditures and to maintain an independent income.

Assumption 2. Farm household resources and labor are effectively controlled and allocated by the male household head; or, male household heads can mobilize family labor and resources for irrigated farming.

Irrigation planners have been generally unwilling to champion principles that might reduce the availability of family labor. The allocation of land to both male and female household members, viewed from this perspective, is a possible threat to the availability of unremunerated women's labor for the cultivation of irrigated crops.

The examples show that appropriating women's land or denying women access to cultivation resources is no guarantee that their labor will be forthcoming. A husband's ability to mobilize his wife's labor, at least in many parts of Africa, seems to be contingent upon the remuneration he offers her, and on her relative bargaining power to resist his claims to her labor.

For highly patriarchal societies like those in Bangladesh and Pakistan, the image is that men are the undisputed heads of households. Even in these societies, many women do try to secure some individually controlled resources and incomes. In other societies, like in the Philippines, the norm is that of couples making decisions jointly with specific domains of female or male influence. Women may be particularly involved in the selection of seeds and other inputs, the amounts of fertilizer and chemicals to purchase, or in deciding how much the household could pledge to irrigators' associations.

The willingness of farm household members to invest (more) time and resources in irrigated farming does not depend only on the viability and profitability of irrigated farming as compared to other available alternatives. It will also depend on their individual interests and strategies. Any household members' willingness and ability to increase their contributions will depend on the extent to which they can expect to benefit from it, which in turn is often (at least partly) a function of his or her bargaining position within the household.

Assumption 3. The rural household is composed of two able-bodied adult members (one male and one female) and a number of children.

The composition of households, and of its constituting consumption and production units, varies widely across regions and countries. As a consequence, the "household" is not necessarily a decision- making unit, controlling production, consumption and investment decisions. Consumption units may crosscut the boundaries of residential units and neither may correspond to a cooperative unit of production. Furthermore, production, consumption and investment patterns will not only adapt to changing economic opportunities but will also vary according to the household life cycle, migration of some members and the incidence of polygamy. A wide range of different domestic and productive arrangements exist, which are difficult to grasp by using the term "household" without clearly specifying this term.

What seems to be pertinent almost all over the world is the increasing number of single-adult households. Intra-household conflicts over the remuneration of female labor, the decreasing profitability of (irrigated) farming and other reasons have generated the migration of especially young men from rural areas to towns, and even to other countries. Their number is high enough to suggest a "feminization" of agriculture in some countries. The consequences of this trend have not been adequately studied, but the economic cost may be high when, as is often the case, it is less easy for single women to mobilize land, labor and capital inputs on the same terms as their husbands or married couples.

Assumption 4. The labor of wives of male farmers is confined to assisting their husbands on his or family fields, in addition to domestic or reproductive tasks.

While it is true that wives of male farmers often contribute labor to the cultivation of the "main" crops, very often women also pursue some independent income-generating activities. These may include agriculture, livestock, crafts or wage-labor activities. Women's work has tended to be forgotten, because many goods and services provided by women do not pass through the market. These include goods and services for own consumption, but also those traded in informal markets.

The distinction between productive and reproductive activities is often problematic. Many productive activities are (partly) geared towards meeting household food demands, and can thus

be considered reproductive. Reproductive activities, on the other hand, sometimes generate services or products that are sold in formal or informal markets. Also, women may be responsible for providing food for hired laborers.

Referring to the work of wives of male farmers as "assistance" helps to underestimate the amount of labor they actually contribute. Wives and daughters may contribute routinely to the production of the family food supply, or they may only work during peak labor seasons. Many adult women also participate in managing the total farm operation. The perception of wives as "helpers" also neglects the fact that farm decisions may be taken jointly by husband and wife, or that there may be specific tasks or domains which fall entirely under the responsibility of women.

Assumption 5. Irrigated agriculture is the main and only income and food generating activity of farm households. All available household resources and labor will be allocated to irrigated agriculture and the main objective of irrigated farming is to maximize the returns to these resources.

Very often irrigated agriculture will only be one of a number of income- and food-generating activities farm household members are engaged in. In some cases (the Gambia, Cameroon), women pursue their own farming or off-farming income generating strategies. In other cases (Senegal, Nepal), irrigated farming is "subsidized" by incomes from off-farm employment and only serves to meeting the household's consumption needs. In Pakistan and Sri Lanka, irrigated farming is often a very important source of income and food, but it hardly ever is the only one. Vegetable gardening, cattle rearing and various off-farm jobs often supplement the proceeds from irrigated farming. The various activities performed by the different male and female household members are interlinked and interdependent; the proceeds from one activity being invested in another activity, for instance.

Much of the land and labor of farm households may be devoted to subsistence production—to food, clothing and equipment that are consumed without ever passing through the market. An understanding of farm household behavior needs to take these outputs of the farm enterprise into account. Since much of women's work may be occurring in this usually invisible subsistence domain, the inclusion of production outputs for subsistence in farm household analysis will help to make women's productive work more visible.

4.2 Potential Gender Contributions to Improving Irrigation Performance

Unless there is a clear potential for improving the performance of irrigation systems, irrigation planners, policymakers and managers cannot be expected to be interested in changing their thinking and behavior; their procedures and practices. Where and how, then, can gender analysis and gender awareness be expected to contribute to better performance?

1. At the sector level—which is constituted of policymakers who are concerned with overall performance of the irrigation sector vis-a-vis other sectors—the recognition of gender based patterns of agricultural production will contribute to a realistic determination of objectives of irrigation interventions, and to the creation of the most suitable conditions for achieving these objectives.

It is at the sector level that investments in irrigation, as compared to investments in other sectors, need to be justified. Investments in irrigation infrastructure are usually justified by anticipated rises in production of either food or cash crops, which in turn are thought to contribute to broader objectives of reducing poverty and economic inequality.

A good understanding of the gender-based intra-household organization of irrigated agricultural production is necessary for devising realistic production targets, and for creating the most appropriate incentive structure for reaching those targets. For instance, wrong gender-biased ideas about farm household behavior have often led planners to overestimate the availability of unpaid family labor. In situations where women have separate income- or food-generating activities and distinct responsibilities towards the family, they will have little incentive to contribute additional time to the production of crops controlled by their husbands.

Gender disaggregated information is also necessary to be able to understand and foresee how irrigation leads to changes in rural welfare. Aggregated household level data do not show how income and food are distributed within households, nor do they reveal how much individual household members contribute to producing irrigated agricultural crops. Proposed changes to increase efficiency of irrigated agriculture may, for instance, work by increasing the amount of unpaid labor women have to do. Without a proper knowledge of the gender division of labor, increases in women's unpaid time will escape the view of planners, as will its possible effects in terms of women's health. Also, improvements to be attained in the sphere of nutrition cannot be properly estimated or planned without understanding intra-household patterns of resource allocation and income distribution. Is the best course of action for improving nutritional status of irrigator families to improve irrigation services to male farmers, or to extend irrigation water deliveries to homestead plots cultivated and controlled by women?

In addition to realistically setting performance objectives, information obtained through a properly conducted gender analysis will also help to create the most suitable conditions for meeting the set objectives. It will contribute to devising legal and institutional frameworks in such a way as to recognize and support existing rights and powers of both male and female stakeholders of irrigation systems. If women's labor is needed to grow irrigated crops, legal frameworks should recognize women's rights to land and women's access to irrigation in order to provide the appropriate incentive structure for women to actually contribute their labor. And if irrigated farming is a joint responsibility of husband and wife, an effective irrigation organization should create legal opportunities for both women and men to participate in users' organizations.

There may be cases where sustaining gender inequities within the irrigation sector seems functional for the achievement of irrigation performance objectives stated at the system or agency level. It may, for example, be that denying women access to land or irrigation water leads to a greater availability of female labor for irrigated agriculture. It is at the sector level that the intrinsic costs of gender inequity, as well as its possible side effects in terms of

health, nutrition, environment or population, will become apparent and need to weighed against the more narrow irrigation performance objectives.

2. At the agency level—where the various institutions which share responsibility for management of inputs and services that support the farming community are—a proper recognition of gender issues will help to gear the inputs and services to the category of people that are actually making use of them. Gender divisions in crops, labor or intra-household responsibilities imply that women can sometimes make better use of specific services or inputs. If women have an important role in keeping the household's financial accounts, for example, they are most likely to be the most appropriate target group for the provision of credit and agricultural loans. Agricultural extension that relates to tasks or crops that are primarily done by women is most effectively disseminated when directly focusing at women. And when activities or crops are the shared responsibility of men and women, making sure that both have equal access to inputs and support services will ensure a better dissemination.

   It is at this level that specific constraints women face in making use of services and inputs need to be recognized, so that attempts to overcome these can be formulated. Land titles may, for example, be required to become eligible for obtaining agricultural loans, whereas most land may be in the hands of men. Training courses should be organized at times and places that are convenient to all potential participants, both men and women. Constraints on women's mobility can place limits on the access they have to markets, which in turn may negatively affect the incentives for women to produce more cash crops.

   Constraints to fully realizing the productive potential of women within irrigated agricultural systems may also lie in the sphere of the many reproductive activities which are often mostly women's responsibilities. Examples of attempts to remove these constraints include the provision of better health care, drinking water or child-care facilities, which may all contribute to reducing the time women spend on domestic duties.

3. At the irrigation-system level, a more gender-sensitive approach can help to make the flows of water, information and resources up and down the system more effective. By recognizing who does what and why, water and information flows can be targeted more precisely to the category of people who are responsible for turning water into agricultural products.

   Normally, information, resources and water flows are mediated through men, even when women are more knowledgeable or involved in certain tasks or decisions or when they are the ones most affected. Since women and men do not automatically have the same priorities and interests, it is unlikely to expect that decisions made by male farmers accurately reflect an intra-household consensus. Information or resources given to men will likewise not always automatically reach women. The reverse is also true: irrigation officials are often not aware of crops planted, or of the timeliness and adequacy of water supplies in the field when crops or specific tasks fall under the responsibility of women.

Recognizing and accommodating differences between water users based on gender at the irrigation-system level simply starts with asking whether women and men differently use water, either for plants or for other uses. As has been illustrated in the third section of this paper, differences in water needs between women and men do exist. These may be the result of: women and men growing different crops or cultivating different plots of land; gender divisions of labor, responsibilities, resources and rights; and differential access women and men may have to support services. In some instances not recognizing the gender specificity of water uses directly affects levels of agricultural productivity, as in the examples from Africa described earlier, where the expected female labor was not forthcoming. In other cases, gender-specific irrigation needs of women may refer to crops or plots of land that are not officially included in the irrigation system and its management. As a consequence, they may be considered irrelevant or even conflictual to meeting the system's performance objectives. Even though denying women the access to irrigation water for their specific uses may thus seem to improve water use efficiency, it will often have important side effects, for example, in terms of a decline in productivity of other crops, the time women need to spend on collecting water or fuel, or in terms of health or environment.

More indirectly, an understanding of gender divisions of labor or responsibilities is necessary for knowing how much of the costs of irrigation services are borne by women in relation to their share in the benefits. If the relation between costs and benefits is distorted because of gender relations, expected contributions of households for paying irrigation services may not be forthcoming. And if costs for services, or water savings, are disproportionately borne by women, this may again have unintended side effects.

The most pertinent way of giving attention to gender which will contribute to the performance of irrigation systems is incorporating women's perspectives and knowledge into the process of irrigation management. By finding appropriate ways for women to participate in water users' organizations, the performance of these organizations can be improved. This is most obvious in situations where many men are engaged in off-farm activities. Other examples include situations where women are the ones primarily responsible for keeping the household's financial accounts. Payments for irrigation services are more likely to be forthcoming when women are involved in deciding about the fees and collecting them.

4.3 Potential Irrigation Contributions to Improving Gender Equality

The specific needs women may have with respect to irrigation are embedded in or derived from the everyday situation that women find themselves in. The satisfaction of these needs will be more feasible when compatible with the broader objectives of the irrigation system. However, even though meeting identified gender needs may be evaluated positively from an irrigation point of view, to what extent can the satisfaction of women's irrigation needs be expected to reduce gender inequality?

Donors and funding agencies are placing more and more emphasis on objectives of gender equality, or empowerment of women. Within the context of irrigation, this has resulted in a proliferation of small projects, working either with women's groups in isolation or focusing on women

as a discrete component separate from other project activities. Irrespective of the success of these projects, a recurrent problem is that the ways in which the "mainstream" irrigation interventions interrelate with relationships between men and women remain neglected. Consequently, those gender issues that directly affect and are affected by irrigation, or its management, are unrevealed and unaddressed.

Any assessment of the quality-enhancing, or empowering, potential of irrigation necessarily starts with realizing that irrigation is only one component of society. Gender, and other social and political relations, are present everywhere and not just in irrigation systems. Gender imbalances within irrigation systems are not just the mechanical outcome of gender biases in irrigation planning, design and management, but also a reflection of prevailing gender imbalances in the wider society. As a consequence (changes in) irrigation alone can hardly be expected to redress these imbalances. On a practical level this means that improvements which help to better meet women's direct practical irrigation needs will need to be backed by other kinds of changes and support if strategic goals, which mean women conceptualizing and challenging their social positioning, are to be met. It also implies that creating more possibilities for women within irrigation systems will often be conditional upon changes in other sectors. The official recognition of women as irrigators and cultivators within the irrigation sectors will, for instance, have little impact if women are not entitled to land and if they have constrained access to credit and other support services.

On policy levels, the fact that gender inequities are embedded in society as a whole implies that the objectives of women's empowerment should not be expected to be attainable through irrigation-related interventions of limited scope. And, at a more conceptual level, irrigation interventions cannot be solely held responsible for, or be thought of as the one and only instrument in, changing gender relations.

However, while irrigation interventions by themselves will do little to challenge prevailing gender inequalities, it is possible that irrigation-related interventions provide a starting point for addressing these inequalities, at least at the field level. Preserving or even strengthening women's rights and powers is most feasible when gender considerations are appropriately recognized before construction starts; when rights to irrigated land and to irrigation water are to be established. New irrigation facilities often dramatically increase demand for land within the command area. Experience has taught that unless women's claims to land and water rights are strongly supported, women tend to lose out in the process.

In existing irrigation systems, there is scope for supporting processes of empowerment if the most important practical gender needs, as identified by women themselves, relate to irrigation. This is, for example, likely to be the case in situations where, because of male migration, women have become more responsible for agricultural and irrigation matters at the field level without being, as yet, involved in irrigation management decision making. Institutional changes which give women better opportunities to participate in the process of irrigation management will then support the already ongoing changes in gender relations.

Among the other concrete examples of opportunities for women's empowerment that can both be identified as well as realized within the irrigation context is the official recognition of irrigation water use by women, which would provide women with official rights to water. In theory, a greater certainty of getting water for specific purposes (like watering homestead crops) may induce women to invest more in these activities, and thus to earn more income. Also, the improvement of women's access to credit, markets and other support services may be a step towards increasing their control over the incomes derived from irrigated production.

Although there will often be some very clear linkages between irrigation and women's well-being, in the final analysis, it is women themselves who will decide about their willingness to challenge existing gender relations. Specific changes within the process of irrigation management can sometimes lend support to this process of empowerment.

Notes

1. There are as yet very few examples of studies on gender relations in irrigation in Latin America.

2. For a more detailed discussion on how to understand and conceptualize "the household" in the context of farming, see, for example, Folbre (1986). Long (1984), in a discussion about non-wage labor, also discusses women's domestic labor and its importance for farm production. Also, Whatmore (1991) gives a detailed summary of theoretical concepts and tools for interpreting family farms in the introductory chapters of her study on farm women in England. Ellis (1988) proposes some simple tools to incorporate intra-household dimensions into the economic analysis of farm production.

3. Using a single utility function is often preferred because economic relationships between people within households are not mediated by prices and therefore difficult to understand and conceptualize (Ellis 1988).

4. Almost all settlement schemes provide a similar picture with respect to the changes in gender relations. For examples other than the two described here, see, for example, Chimedza (1989) (Zimbabwe); Conti (1979) (Burkina Faso); Bernal (1988) (Sudan); and Jackson (1985) (Nigeria).

5. The Mwea project was considered one of the more successful irrigation projects in Africa. The authors of this particular study, which was published as early as in 1973, state that: "It is our contention that the unsatisfactory recognition of women's rights and needs within the Scheme remains one of the greatest weaknesses of the 'Mwea system.' It is our doubts about this central aspect, so important to the long term welfare of Mwea families, that has led us to question ... whether the Mwea pattern ought to be replicated elsewhere." (Hanger and Moris 1973).

6. Even though these enterprises are being referred to as "family enterprises" in the study, it seems very likely, in view of the described context of hardship for women, that they also started their own individual enterprises.

7. Unlike in some African situations, in Sri Lanka there is no very strict gender division of crops. Millet is called a "female" crop because of the relative large labor contributions of women to the cultivation of this crop as compared to male labor contributions. For the same reason, rice is called a "male" crop.

8. This short description is a somewhat rough generalization of gender patterns of responsibilities and powers found in Sub-Saharan African countries. The reality is of course always different from this general picture.

9. In the first year of the project (1984), average dry season pump-irrigated yield was 7.5 tons per hectare. In the 1985 and 1986 dry seasons, the yield averaged 5.7 tons.

10. In this area, women are permitted to and, in fact, do register for fields in their own names; about 20 percent of the women in Vele had rice fields in their own names.

11. *Purdah* refers to the practice of female seclusion. It is a social institution dividing the public male sphere from the private female sphere of life, excluding women from both the economic market place and political decision making. While *purdah* is most often associated with Islam, the seclusion of women from public life is found among non-Muslim communities as well (Shaheed 1991).

12. See, for example, Risseeuw (1991) who describes how female coir workers in the south of Sri Lanka have developed a strategy to hide part of their income in several places in the house. When the husband claims her money, she will show him only one of the hiding places, pretending it is the only one. Similar examples have been described for Bangladesh (White 1992) and India. The very fact that women have an interest in keeping the exact amount of this income secret implies that it will often not be reflected in estimates about household incomes.

13. The impact of new irrigation facilities on women from landless families was different. See Stanbury (1981) for the details.

14. See, for example, Sirisena (1986). This study shows that the total participation of women in rice agriculture in two villages in the Dry Zone of Sri Lanka was, respectively, 32.4 percent and 42.8 percent of the total labor input. In chena agriculture, women contributed 72.3 percent and 59.3 percent of the total labor.

15. In Sri Lanka, in 1981, 52.5 percent of all migrant workers and 77 percent of unskilled labor among the immigrant workers were women (Korale 1983 and 1984 cited in Jayaweera 1989).

16. Shinawatra (1992) shows the reverse trend in a study about *female* migration in Thailand. Here, the family members who were left behind used the wages (sent back by young girls who work in the tourist sector as entertainers and prostitutes) to invest in farm modernization.

17. The very term "income generating activity" reflects a gender bias. The term implies that women need a side economic activity that provides them with small supplementary income rather than a regular income that allows them to support themselves and their families. The assumption is that the male head of the household is employed as the main breadwinner thus denying the reality in many rural contexts that men and women are co-breadwinners and the fact that a large number of households are headed by women. Self-employment for men would imply a new double standard (cf Safilios-Rothschild 1991:43).

18. Alsop (1993) gives another example of how projects focusing on practical gender needs can undermine strategic interests.

19. Generally, irrigation systems have the triple objectives of 1) increasing agricultural production, 2) reducing poverty, and 3) reducing economic inequality (Gosselink 1993).

20. Though Chambers explicitly recognizes that farmers may be male or female, Small and Svendsen consistently refer to farmers as male persons. They even go as far as to claim that: "He (the farmer) depends on irrigation water to produce his crops and therefore to provide his family's sustenance" (Svendsen and Small 1990).

21. While irrigation water is used for other purposes than irrigating the main crop, it may be derived from sources other than the main irrigation system. This is, for example, observed in Indonesia, where "farmers .. tap multiple water sources as supplements to system channels, as a strategy for avoiding risk of water shortage" (Vermillion 1990).

22. The Department of Irrigation and Soil and Water Conservation (Wageningen Agricultural University) is currently conducting a study in Bangladesh on gender aspects of tubewell management. Also, IIMI-Bangladesh is in the process of developing a research project to look specifically into gender-related factors determining the performance of group-owned tubewells.

23. As the authors rightly point out (Bruins and Heijmans 1993:25), a high involvement of women in construction activities is often referred to in project documents as a positive sign, supposedly showing a high commitment of the project to women's issues. However, in this particular case (which is probably no exception), the high participation of women is a result of intra-household and wider gender relations rather than of an active concern for women's interests. Within the household, men can decide on the allocation of female labor. In the wider economy, labor wages for men are higher than for women, which explains the preference expressed by male household heads to send their wives to construction sites.

24. A study in several irrigation schemes in Sri Lanka describes several attempts to organize women. In Minneriya, special Women Farmers' Organizations were set up "by two particularly active women from cultivator families." Instead of focusing on irrigation-related issues, however, these organizations were used to start some ad hoc nonagricultural income generating activities, all of which failed after some time. The link between Farmers' Organizations and Women Farmers' Organizations was weak. On some occasions, members of the women's organizations were requested by the Farmer Committee to participate in *shramadana* (voluntary labor) to clean the canals. In 1990, a System-Level Women Farmers' Organization (SLWFO) was set up, as the counterpart of the system-level confederation of Farmers' Organizations. However, this SLWFO was not registered with any state authority and had no financial resources. These Women Farmers' Organizations seem to be based on the ideology of women as husband's helpers, who spend most of their time inside the house and need to be entertained (Athukorala, K., personal communication).

25. The conclusion of a study about women's access to extension was that female field agents not necessarily had better contact with female farmers than male extension workers, because both male and female extension workers tended to focus on male farmers (Carloni 1987).

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