MORE JOBS PER DROP:

TARGETING IRRIGATION TO POOR WOMEN AND MEN

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STATEMENTS

1. Irrigation agencies contribute optimally to poverty alleviation if they target their support to poor women and men, and vest rights to newly developed irrigated land and water primarily in them.

2. Since this thesis and many other evaluations show that development interventions often do not lead to poverty alleviation, international and national aid agencies must use inappropriate definitions that show that poverty alleviation has been achieved through their programs.

3. If irrigation agencies aim at poverty alleviation, the performance of irrigation schemes has to be assessed on the basis of indicators of poverty alleviation.

4. The most critical negotiations on the rights to irrigated land and to water take place in the early design phase of the construction and rehabilitation of irrigation infrastructure. Both technical and social scientists tend to ignore this by considering this phase as a technical one.

5. Natural resource management is always linked to property arrangements and socio-economic development. Ignoring these links favors the well-off dominating the forums on natural resource management.

6. Participatory development is a pleonasm. The issue is who participate on which terms.

7. The only thing an NGO can do to prevent the rich from getting all gains from NGO-supported activities, is to screen more effectively at the start that only the poor are in the group (Sanowara, leader women's group Bangladesh).

8. Water scarcity is a meaningless concept unless quantity, quality, place, time, and access are specified, and related to a demand of water.

9. The nature of human competition over water is illustrated by the etymological meaning of 'rivals', which is 'users of the same irrigation canal' (Latin: *rivus*).

10. 'Les blancs ont les yeux gros, mais ils ne voient rien'. (Proverbe from Burkina Faso)

Barbara van Koppen. 'More jobs per drop: targeting irrigation to poor women and men'. Wageningen, 8 September 1998.

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Wageningen, June 1998

1. Introduction

1.1 Problem definition

Human development

Human development and the development of fresh water resources will be two major global concerns in the twenty-first century, which, unfortunately, tend to be treated as separate issues.

Human development is the process of enlarging people's choices to enjoy a long and healthy life, to acquire knowledge, and to have access to the resources needed for a decent standard of living (United Nations Development Program (UNDP), 1995: 16). Hence, human development refers, first of all, to the 1.3 billion people who lack that access to the needed resources, and still live in physical, economic, social and cultural deprivation and socio-psychological distress. More than two thirds of them live in the rural areas of developing countries. They are still excluded from access to sufficient food, basic goods and assets, services, infrastructure, markets and information. Their persistent insecurity and vulnerability has led the world's leading financing and development agencies, governments of developing countries and developed countries, and numerous non-governmental development organizations, to acknowledge that their earlier efforts for poverty alleviation failed, and to bring poor women and men to the centre of the stage (World Bank, 1990; International Fund for Agricultural Development (IFAD) in: Jazairy et al., 1992; UNDP, 1995 and 1997). Targeting and redirecting scarce public funds from the better-off to the poorer is an advocated implication (Zuckerman, 1989). The declaration of the actual decade from 1997 to 2006 as the Decade of the Eradication of Poverty, also expresses this priority. The same concern is central in this thesis. The focus is on poor smallholders and landless people, the two largest vulnerable groups, and especially on the women among them. The poor need, among other things, 'more jobs' in the sense of self-employment and wage employment.

Water development

The development of the world's fresh water resources also figures high on policy agendas (World Bank, 1993; United Nations Conference on Environment and Development, 1992). A water reform has to provide answers to the growing claims on water by an increasing and more demanding population, to water pollution, to depletion of fossil water reserves, and to the fact that the less costly opportunities for water abstraction from the most accessible water sources are increasingly exhausted. New institutions at watershed level are needed to steer water reform. At the same time, many governments in developing countries disengage from water production and transfer water management to the private sector. Financial constraints in public funding since the debt crises of the 1980s are the main cause. Each drop is at stake.

The link between fresh water resources development and poverty alleviation is well articulated only for drinking water and sanitation. Lack of access to drinking water and sanitation have become common poverty indicators. Women's roles as managers in domestic water supply are recognized (International Conference on Water and the Environment, 1992; World Bank, 1993). With regard to water used for agricultural production, however, its potential contribution to poverty alleviation remains largely unnoticed. Neither in academic circles, nor in the development policy or practice of the same leading development institutions mentioned above, has a generic body of knowledge been developed on the role of irrigation development in poverty alleviation. For land, another vital natural resource, the critical role of land reform for poverty alleviation is widely acknowledged in mainstream development thinking (World Bank, 1990; Jazairy et al., 1992). An equivalent debate on water reform in this sense of equity has only started piecemeal (Chambers et al., 1989; Shah, 1993). The potential merits of irrigation are at risk of being lost to sight under the growing general dissatisfaction with irrigated agriculture as too large a water consumer, too great a threat to the environment, too heavy a burden for national budgets, and too often a wedge in an already skewed agrarian structure.

Irrigation and poverty alleviation

The potential contribution of irrigation development to poverty alleviation is considerable. Cost-reducing technological change, with water as the leading input, is crucial to achieving production growth and intensification by smallholders (Mellor and Desai, 1985; Jazairy et al., 1992). The sizes of their land holdings steadily decrease as a result of continuing land concentration and higher population pressure. Only in a few regions in the world can land frontiers still be developed (Jazairy et al., 1992). As long as rural and urban off-farm employment is lacking, land reform stagnates, and more massive urbanization is undesirable, there are hardly other options. Especially in regions where the climatic and hydrological conditions are appropriate for irrigation development, irrigation water could allow a large part of the growing numbers of rural poor to escape income poverty.

Smallholders' land and labor productivity are increased substantially by irrigation. Irrigation makes cultivation possible even in arid areas. It reduces risks by securing yields, and allows people to grow higher yielding varieties and more diverse and higher value crops. Irrigation also increases cropping intensities and, thus, augments the land. Spreading the cropping season over the year mitigates the hungry season just before the new harvests. Irrigated agriculture also has a strong potential to absorb an excess supply of wage labor. Irrigated agriculture will increasingly be the source of growth in food production in the world. Whereas irrigated agriculture now provides 40 percent of the world's food supply, it is estimated that 80 percent of additional food production will come from irrigated agriculture (FAO, 1996: vii). If irrigation water is not used for own cultivation, it can be

exchanged or sold to generate an income. For these reasons the inclusion of the rural poor in irrigated agriculture will increasingly lead to human development.

Inclusion

The perspective of better inclusion of the poor in irrigated agriculture and the implications for the irrigation sector are the central theme of this thesis. The irrigation sector is defined as the non-commercial international, national, or local, governmental and non-governmental agencies, that provide financial, technical and organizational support for the development and use of irrigation infrastructure. The core competence of the irrigation sector is providing farmers with access to irrigated land and water. Better inclusion of the poor in irrigated agriculture, rather than accepting their continuing exclusion, seems an appropriate answer to the problems the sector is facing now: both increasing scarcity of water and increasing scarcity of public funds. Inclusion of the poor is primarily seen as a matter of targeting and redirecting the available external support to the poor, and, as a corollary, avoiding leakage of these external resources to the non-poor. So the sector would include the poor and contribute to poverty alleviation by strengthening the access to irrigated land and water by poor women and men. It is the perspective of 'more jobs per drop'[1].

Poverty alleviation is already an explicit aim of several irrigation agencies, especially NGOs. However, some agencies claim to pursue poverty alleviation but they fail to operationalize this aim. They persist in considering the water users as a homogeneous group, and fail to differentiate among water users according to class, gender, ethnicity and caste. They fail to define whom they consider to be the poor, and how their intervention is expected to improve their well-being. In the debates on irrigation performance, for example, poverty alleviation is ignored as a performance indicator. As agencies' own actions and approaches usually remain a black box, it becomes impossible for the agency, and for others, to learn from the trials and to improve targeting. Still other agencies have not adopted the aim of poverty alleviation. Their overriding concern is the efficient increase of agricultural output. The assumption is widespread that there is a trade-off between poverty alleviation and agricultural growth, because poor farmers would be less able than larger farmers to make productive use of the agencies' resources. Undoubtly, this assumption enhances agencies' reluctance to address poverty issues. However, empirical evidence of women and men smallholders as producers in irrigated agriculture points to win-win scenarios, if agencies aim at both poverty alleviation and agricultural growth.

[1] 'More jobs per drop' is the salient expression of this concern, used by Ruth Meinzen-Dick, during the Workshop 'Women and Water' organized by the International Irrigation Management Institute, September 1977.

Targeting external support to the poor under scarcity differs radically from conservatively protecting the claims of those who already have access to irrigated land and water, by excluding new entrants from obtaining this access. As many of the actual and future poor have no access to irrigated land and water yet, poverty can only be alleviated by more effective support for them in their competition with better-off farmers, or by newly developing water resources targeted at them. Conserving vested rights in times of scarcity tends to favor the 'haves' at the expense of the 'havenots'. Scarcity should not become a justification for exclusion on the basis of history: not having had access in the past (Shah, 1993).

Targeting support to the poor for poverty alleviation only partially overlaps with the pursuit of equity in the sense in which this concept is mostly used by mainstream irrigation agencies. For them, 'equity' refers to differences between water users upstream and downstream, and the need to defend the interests of people downstream in sharing in a given quantity of water. Where topographical siting of the scheme is related to socio-economic class, and people downstream are poor unlike people upstream, a more equitable water distribution serves their interests in the first place. Although this is a contribution, it still differs from targeting the poor. The latter expresses a priority concern for these categories of people to be vested with rights to irrigated land and water, and designing schemes in such a way that their plots are at the head-ends.

The obvious condition for sustainable targeting and poverty alleviation is the ecological preservation of the resource-base itself. In certain regions soil and water salinization, water-logging, ground water depletion, arsenic and fluor contamination, salt intrusion, or pollution by agro-chemicals are threats to the ecological sustainability of irrigation for which solutions have hardly been found yet, if they are ever found. These problems are not discussed in this thesis.

1.2 Research questions and methodology

This thesis aims to contribute to a better understanding of the link between irrigation development and poverty alleviation, focusing on the role of external support agencies. An attempt is made to transcend the actual stage of either macro-level analyses or fragmentary case studies, and to develop a more systematic and comprehensive framework. This framework should highlight a general state of understanding, and allow further testing and systematic comparison in each specific situation. Especially the black box of the targeting approaches of irrigation agencies is opened in order to identify the factors that hamper or lead to better targeting of external support to the poor.

The questions in this thesis are the following.

1. Does access to irrigated land and access to water by the poor both improve productivity and alleviate poverty?

2. Which inclusion and exclusion processes take place in irrigation?
3. What is the role of irrigation agencies in targeting their support to the poor, and avoiding leakage?

4. Which recommendations can be derived for the irrigation sector to better target its support to the poor, and to avoid leakage?

Special attention is paid to women because they are a large disadvantaged group. Their economic advancement has multiplier effects for the poverty alleviation of others, now and in the future. Moreover, the analysis of exclusion from the mainstream irrigation sector from the perspective of this often blatantly excluded group, makes processes visible that are also valid for poor men, and have also been ignored for them.

Methodology

The methodology comprises a literature review on irrigation support and gendered poverty alleviation worldwide during the last three decades. Further, situation-specific data are derived from two constrasting field studies. They were carried out from 1991 to 1995 in Burkina Faso and Bangladesh, and resulted in different publications (WAU and BIDS, 1992; Van Koppen, 1993; Van Koppen and Mahmud, 1996; Van Koppen, forthcoming). The specified four research questions and the methodologies in both field studies are detailed in the respective chapters. These two countries are the second and seventh lowest ranked countries by the relative welfare index of IFAD (Jazairy et al., 1992: 44), and annual per capita incomes are $ 253 (Burkina Faso) and $ 196 (Bangladesh) (UNDP, 1997: 160). Both field studies concern infrastructure construction for irrigated rice cultivation, and in both studies household-based and producer- or women-based targeting criteria are compared, for the same type of infrastructure. For all other variables they widely differ, as shown in Table 1.

Table 1. Variables of the case studies

type of irrigation	public, with land reform	private
use of water	irrigating own land	irrigating own land and water sale
gender classification rice cropping system	female	male
irrigation agency	government	NGOs
target group	smallholders	smallholders and landless
targeting criteria	household representative producer former right holder	household representative women
forums	male-dominated female-dominated	female-dominated
poverty dimensions	access to irrigated land	multidimensional well-being

1.3 Structure of the thesis

The first question on the relation between irrigation, poverty alleviation and productivity is addressed in Chapter Two. Poverty, poverty alleviation and social exclusion are defined, with special reference to women. Evidence of the impact on productivity and poverty alleviation is reviewed for a number of situations in which the poor obtained access to irrigated land and water, and in which they benefited indirectly from irrigation.

In Chapter Three, inclusion and exclusion processes in irrigation are conceptualized for the range of irrigation contexts that exist world-wide. The role of agencies in vesting rights to irrigated land and water is highlighted (questions two and three). This role is different in public irrigation, which is defined as irrigation in which the agency itself invests in infrastructure, compared to private irrigation. In the latter the farmer bears these costs. For both types of irrigation it is analyzed what the key issues in vesting resource rights are, when they are on the agendas, and who decides about these issues at the interface of agency and local people.

Chapter Four reviews global empirical evidence on the role of irrigation agencies (question three). This illustrates both cases of inclusion and of exclusion of poor women and men as right holders to irrigated land and to water.

Chapter Five presents the field study on public irrigation, accompanied by a localized land reform, in Burkina Faso (Van Koppen, forthcoming). The state-supported project *Opération Riz* intervenes in the Comoé Province. The project constructs central drains and contour bunds in rice valleys, and takes other measures to improve rice cultivation. Rice cultivation is predominantly a female cropping system in this region. This field study focuses on the role of the agency in the process of vesting resource rights, especially access to land, and compares the household-based targeting approach in early schemes, with later schemes in which individual producers were targeted. Effects on productivity and gendered poverty alleviation are indicated.

Chapter Six presents the field study in Bangladesh, where external support for private irrigation is studied (WAU and BIDS, 1992; Van Koppen, 1993; Van Koppen and Mahmud, 1996). Rice cultivation is a male cropping system there. Several NGOs support both smallholders and landless people in purchasing and managing mechanized irrigation pumps. They use the water to irrigate their own land, and they sell the water. NGOs organize their target groups in forums, which are called a '*samity*'. We translate this as 'group'. Nowadays, the large majority of the groups are women's groups. Some NGOs adopt a household-based approach and target, via the women, other members of the household. Other NGOs pursue primarily women's own empowerment. The impact of these different targeting approaches on women's participation in the irrigation groups, and the impact of this participation on women's economic and non-economic well-being are studied. Effects on productivity are indicated.

The overall conclusions of the thesis are drawn in Chapter Seven. This entails recommendations for irrigation agencies to better target their support to the poor, and avoid their exclusion from public and private irrigation.

2. Irrigation and poverty alleviation

2.1 Poverty and social exclusion

2.1.1 Poverty

Poverty is commonly understood as a state of multidimensional deprivation (cf. Mellor and Desai, 1985; World Bank, 1990; Chambers et al., 1989; Jazairy et al., 1992). Basic needs are unfulfilled. Food consumption is below minimum caloric requirements during part of the year, if not the whole year. Incomes are too low to obtain the food basket and non-food basic requirements as well. Access to health facilities, schooling, minimum housing and clothing, safe drinking water and sanitation, is lacking. In crises like illness, accidents, natural or man-made disaster, or events requiring lump-sum expenditures, the poor lack the assets or social security nets to master these contingencies. They risk getting trapped in debts and in a downward spiral. Material deprivation is compounded by physical and by psychological harassment, stereotypes and prejudices. This easily leads to low self-esteem.

Poverty is gendered, as is society. In most societies, being born as a woman rather than a man, implies that one's access to health and education facilities, paid employment, land and other assets, goods, labor markets and public services is systematically worse than for men. This is reinforced by rigid role ideologies. Like gender, ethnicity and caste also compound many dimensions of poverty.

These different physical, economic, social, cultural and socio-psychological dimensions are distinct, but related. Changes in one domain, like access to land, trigger changes in other dimensions, for example, self-respect. Better health improves one's working capacity. On the other hand, changes in one sphere may not last, if other dimensions do not also change. Only multifaceted change can break the vicious cycle of poverty.

For the purpose of monitoring and intervention by external agencies, poverty is usually defined in terms of only one or a few dimensions. Measurements based on basic needs, such as the incidence and severity of nutritional deficiency, morbidity and mortality rates, water supply and sanitation facilities, housing conditions, and education and health facilities, are most useful in designing programs or policies specifically geared to those problems. On the other hand, the minimum income (poverty line) approach makes it possible to formulate policies and programs that influence employment generation, agricultural production, incomes, and prices. Problems are likely to arise when a priori conclusions about one dimension of poverty are drawn from measurements based on another (Kumar, 1985: 54-58).

Standards and cut-off points are the levels that are considered to be too minimal or sub-minimal for well-being. By defining these dimensions and standards, a population can be divided in the non-poor, poor and ultra-poor. Different definitions of poverty define different people as poor. Correlations among different definitions of poverty identifying 'the poor' in a certain population may be weak (Glewwe and Van der Gaag, 1990: 804). For example, even the nominal ranking of different regions varies according to the definition of poverty used (Mellor and Desai, 1985: 193).

2.1.2 Social exclusion

Poverty is above all, and almost everywhere, a manifestation of social exclusion. Whereas poverty describes a state, the concept of social exclusion points to the process by which society systematically and structurally excludes particular groups, like poor people, from assets, goods and services, rewards of production, rights, and valued economic and social resources (cf. Rodgers, 1994; Safiliou, 1998). Social exclusion can be observed at different levels, ranging from the world as a whole, to nations, regions, institutions, social groups and individuals. Institutions which include or exclude are, for example, world markets of labor and goods, and agencies like the state, military, enterprises, academics, religious groups, local or religious authorities, and the elite. Social exclusion can also affect non-poor groups, like ethnic minorities.

The concept of social exclusion is intrinsically tied to the very organization of society and patterns of socio-economic development. This 'ideological baggage' comes with the concept. Exclusion is at the heart of society, if one focuses on society's distribution of resources, economic and social opportunities, rewards, power, rights, jobs, and their monopolization by some groups, or 'the mainstream'. These groups restrict access to these resources by others, or enforce disadvantageous terms of inclusion. Thus the identity of the excluded is socially constructed. Society can also be conceptualized as divided into groups, which may be functional, regional or ethnic in character. These constituent units do not lose their identity when merging in some form of union. The elites of these groups interact in peak institutions, notably political institutions and bureaucracies. The compromises of the elites may be at the expense of allowing exclusion of particular groups within the unit to persist (Silver, 1994: cited in Rodgers, 1994: 5-6).

The state is important both as an excluder and includer. Excluder, because it operates in the interest of dominant groups; it may promote an economic policy which fails to integrate particular groups; or integrates them against their will; or distributes public goods and services unequally. Includer through regulation of markets and employment practices, as guarantor of civil, political and social rights, as the primary agent of redistribution (Rodgers, 1994: 41).

The notion of exclusion is closely bound up with ideas of inclusion or integration (Rodgers, 1994: 3-4), and is as ambiguous as inclusion. Inclusion can be voluntary but also forced, if the terms of inclusion are imposed, and unacceptable. Examples are the settling of pastoralists, or the integration of tribal groups. The subjective sense of exclusion is important. For example, the visible growth of mass consumption among affluent minorities intensifies a sense of deprivation and exclusion, even if absolute poverty does not increase. The excluded develop coping strategies to promote their own inclusion and their participation on their own terms, but exclusion can also lead to passiveness and despair. Strategies for innovation can be individual, or may comprise collective organization, representation, and political voice.

In the same sense in which poverty is multidimensional, so is social exclusion. It encompasses economic, social, political, cultural, and socio-psychological facets. Individuals or groups can be excluded in some ways, and not in others. Exclusion in one domain can reinforce exclusion in other domains.

2.1.3 Gender, poverty and social exclusion

Core issues in rural poverty are exclusion from land and productive assets, from inputs and goods markets, or inclusion on unfavorable terms, and the absence of remunerative off-farm employment. Urban labor markets provide some alternative, but the poor typically enter the worse segments and many do not escape poverty. In all these respects, women often face a greater degree of exclusion. The justifications for external support agencies to include them in socio-economic mainstream development, and on better terms, are three-fold.

Women as the poor

Of the 1.3 billion people living in poverty, 70 percent are women (UNDP, 1995: 4). Poor women are more disadvantaged than men with regard to all dimensions of poverty, except life expectancy, and probably food consumption (Jackson, 1996: 495). In Pakistan, Nepal, India and Bangladesh even the latter two are not excepted (Agarwal, 1994: 50).

Women as providers

Poor households need the economic and labor resources of all their members. Men's incomes alone are not sufficient for the survival of households (Safiliou, 1991: 2). Moreover, men's and women's incomes tend to be used to satisfy different household needs, and expenditures are gender-specific (Fapohunda, 1988: 147). Women's incomes also tend to be more effective for poverty alleviation because women spend a larger share of their incomes than men for the benefit of their dependents, as reported in Asia (cf. Agarwal, 1994; Safiliou, 1991) and in Africa (Safiliou, 1988; Von Braun et al., 1987: cited in Jazairy et al., 1992: 155).

De jure and *de facto* female-headed households depend more or even solely on women's incomes. Female-headed households are more poverty-prone. In India the proportion of female-headed households is higher in the poorer income-deciles, or scheduled caste groups (Agarwal, 1986: 189). Among the landless in Bangladesh, for example, 25 percent of the households are female-headed, whereas the average for all rural households is 15 percent (Safiliou and Mahmud, 1989: 3). Especially the statuses of divorced or widowed worsen women's well-being more than men's. One reason is that children, usually sons, are less concerned to support their mother than their father, especially if they inherit from the latter (Lipton, 1983). However, not all female-headed households are poor by definition (Jackson, 1996: 494). Poverty alleviation programs that only target female-headed households would make two targeting errors (Carvalho and White, 1994: 20): including non-poor women who head households and excluding poor women in male-headed households.

A general lack of data on women's incomes reinforces the stereotype that only men are family providers. However, in poor areas in Pakistan, for instance, women contribute up to 46 percent of the household income (World Bank, 1989: cited in Safiliou, 1991: 6). Women's homestead cultivation for own consumption and for sale also contributes substantially to household income especially among the poor, as in Bangladesh (Westergaard, 1993: 415-423). The class dimension also appears from the findings that women's labor force participation in India is higher among poor and unpropertied households than among somewhat higher classes (cf. Agarwal, 1986).

Women's roles as farmers are also underestimated in cases in which men are primarily engaged in off-farm employment. Men's factual involvement in the farm depends on the nature of their off-farm employment. Distance plays a role too (Safiliou and Mahmud, 1989: 6). However, men's roles are usually overestimated by researchers, who confuse family-headship with farm management; by the farm women who give socially acceptable answers; and by the men who still exert claims on the farm output. The latter is also one of the motives for them to return home during harvest, or hire wage labor. This marginal contribution justifies their claim on the income (Safiliou, 1988: 12).

Women as procreators

Lastly, improvement of poor women's incomes is important because this is the most effective way to reduce fertility rates and break the macro-level problem of increased population pressure. The demographic transition from high to low fertility rates takes place in regions where women have their own incomes and savings (to provide for themselves in old age) and are educated, which is related to later age at marriage and more information about and access to contraceptives (Safiliou, 1986; Jazairy et al., 1992: 78). At the micro-level, having a large number of children is a rational response to poverty because wealth flows from the younger to the older generation in rural areas. Therefore,

poor households tend to be relatively large and to show high dependency ratios. Children provide labor, and are often the only source of help and old age security. This is even more vital for women, because for them widowhood is more strongly related to poverty than for men. Moreover, the period of widowhood is longer for women, because they live longer and marry at a younger age, whereas their remarriage rates are lower than men's.

Intra-household organization of production

Women's relatively more frequent exclusion from land and productive assets, inputs and goods markets, or their inclusion at unfavorable terms, and the absence of remunerative off-farm rural or urban employment, does not stop at the front door of the household. 'Household' can be defined as 'a family plus resident servants, lodgers, or other unrelated inmates who share residence (Lipton, 1983), and/or eat together. Insight is needed into intra-household relations and use and transfer of external resources. This also highlights the need of targeting support to both men and women. Insight into the intra-household organization of production is most relevant for agricultural and irrigation intervention.

In male-headed farm households the organization of production can be conceptualized as consisting of two (or more, according to the number of wives) production units (Safiliou, 1988). The manager of a production unit is the main decision-maker in a productive activity, who mobilizes labor and inputs, and controls the output. Household members' contribution to other members' production units is not evident. Udry et al. (1995: 407) found, for example, that men in Burkina Faso used large amounts of fertilizers, manure and family labor on their own fields. The authors estimated that the value of total output of all plots cultivated by the different household members could be increased by 10 - 15 percent, if currently used factors of production were reallocated across plots of women and other family members. Apparently, resources between spouses are not allocated according to this rationale. Neither are men inclined to pass on to their wives new information and new skills from agricultural extension, as is reported worldwide. Among women farmers in Burkina Faso who had learned new agricultural techniques, only 1.3 percent had learned this from their husbands. Own kin and neighbors were the most important informers (Burkina Faso, Ministère de l' Agriculture et de l'Elevage, undated: 10). On the other hand, women promote their own activities sometimes at the expense of men's activities. In mixed-cropping among the Bamileke in North-Cameroon, 'it is quite normal for women to cut the roots of the husband's coffee plants, so that bushes can stay small and much space can be left for the women's food crops. In some cases, the women may even completely destroy the husbands' coffee plants' (Den Ouden, 1980: cited in Safiliou, 1988: 5).

Higher remuneration, so better terms of inclusion in their husbands' production unit, motivates women to contribute more labor. Women's remuneration can be in kind, usually as a share of the output, but also a lump sum in cash 'in return for their sweat'.

Women can either dispose of the output as they want, or they are supposed to use it for food consumption of the family. In the area of the SEMRY irrigation project in Cameroon, Jones (1986) highlights that women rejected too low a compensation, primarily by engaging in alternative income-generating activities like their own sorghum fields. Married women receiving below average compensations generally spent more time working as hired labor the next year.

Women's intra-household bargaining position is largely influenced by alternative employment options. Dey (1990: 16) mentions the absence of documented evidence in Sub-Saharan African settlement schemes on men compensating their wives in cash for their labor inputs in men's crops. She explains this by the relatively weaker bargaining position of women cut off from alternative income-earning opportunities and support of their kin in these schemes. Carney (1988) also observes in Gambia that Wolof, Fula, and Serrahuli women with alternative options to cultivate high-land groundnut plots, tend to put in less labor on male-controlled irrigated rice fields than the Mandinke women who do not have that option (Carney, 1988: 74).

Evidence of egalitarian and shared decision-making on the disposal of a joint income comes from Madagascar. Women's own land rights were an important explaining factor (Raparson, 1989: cited in Dey, 1990: 12).

These are illustrations of the exchange and bargaining that takes place between intra-household production units, each manager of a unit trying to 'get the best deal'. The relative bargaining power of household members determines who will benefit most from ongoing activities and endeavors. The bargaining power of different members varies according to age, education, stage of family cycle, access to economic and agricultural resources, employment opportunities, cultural norms, etc. In all these negotiations the limiting factor is family stability. Only in extreme situations in which negotiations completely break down may household members consider sacrificing family stability. The importance they attach to marital stability may be determined by the weight of the potential stigma attached to marital instability; the chances for remarriage or the ability to survive socially and economically without a spouse (particularly relevant in the case of women); and the possibility to modify the marital contract (for example by increasing the number of wives) (Safiliou, 1988; 1994).

The distinction of intra-household production units allows a gender classification of a farming system, or of one branch of a farming system like the cultivation of a particular crop, for example rice. In a male cropping system men are the decision-makers on rice cultivation. Alternately, if women assume this role, rice cultivation is a female cropping system.

The household as targeting unit

For long, it was common for agencies to consider the household as a unity, represented by one member, usually the male head. External resources were targeted to the male head, and women were thus excluded. Land reform is an example with close analogies to water. In most land reforms of the past five decades only the male household heads were recognized as eligible title holders. Exceptions are the formal reform laws of China, the Philippines, Vietnam and Tanzania. Since the 1980s, however, the recognition of the legitimacy of women's land rights is growing (cf. Agarwal, 1994). Eight Latin American countries have been implementing counter land reforms of titling and parcelization of formerly collectively owned or state land. The beneficiaries of joint titling were explicitly all adult individuals in a household, whether married or living in a consensual union. Joint titling occurred among spouses, and also among groups of brothers and fathers with sons. Moreover, in Nicaragua and Colombia women heads of households were, for the first time in history, given priority in land distribution. These formal laws had some impact on women's control over land, but many obstacles in implementation remain (Deere and Léon, 1997). Moreover, some women fail to claim their formal rights, as reported in Honduras (Safiliou, 1988: 216).

2.1.4 Social exclusion and water development

Water is a naturally available resource. In the words of many farmers, it is 'given by God'. The growing global concern about the precariousness of the world's fresh water resources expresses a notion that, in principle, water belongs to all, and that the needs of all should be taken into consideration. National states legitimize their role as custodian and formal owner of the nation's water resources on similar grounds of safeguarding citizens' equal inclusion in water use. There is a moral connotation to inclusion and exclusion processes by which a society develops its water resources and satisfies the needs of some people, and not the needs of others. There is no justification for a monopolization of this limited resource by an affluent minority. Water development, as an increasingly vital part of socio-economic development and rural livelihoods, articulates, strengthens or may even lead broader inclusion and exclusion processes. Inclusion of the poor in irrigation development can contribute to a development process in which both poverty is alleviated and agricultural output increases. This development perspective, which is the rationale for better targeting and greater inclusion, is described in the next sections.

2.2 Irrigation and poverty alleviation

2.2.1 Benefits of access to irrigated land and water

Improved production

Irrigation water is a leading input for agricultural production, and will increasingly deter-

mine food production and agricultural growth (FAO, 1996). In arid regions agricultural production is impossible without irrigation. In semi-arid regions supplementary irrigation assures water availability during the full cropping cycle, irrespective of erratic rainfall, and reduces risks. Irrigation during the dry season increases cropping intensities, and is land-augmenting. It prolongs the period of production. Controlled water availability allows the cultivation of more diverse crops, higher value crops and higher yielding crop varieties which are also more responsive to other inputs like fertilizers.

The improvement of agricultural output by applying irrigation water is especially relevant for farmers who have access to only a small portion of land, and who optimize the use of this land because they lack other remunerative on-farm and off-farm employment opportunities. In other words, irrigated agriculture fits the actual needs and potentialities of many land-poor cultivators locked in underemployment. By adding to the range of options in the diversified livelihood strategies of the poor, irrigation reduces poverty (Chambers et al., 1989).

Poor cultivators with access to irrigated land and water increase and stabilize their output for a longer period of the year, and usually at less risk. Their land and labor productivity increase substantially with irrigation. New possibilities of irrigated cultivation have also prevented distress sale of land, for example, in Bangladesh (Hossain, 1989: 115). In villages where irrigation has not been adopted, a larger proportion of marginal landowners rent out their tiny holdings and are dependent on the agricultural labor market and nonfarm activities for their livelihood (Hossain, 1989: 115). In Bhutan, the possibility of making productive use of one's own land and of augmenting incomes through irrigation, makes smallholders less dependent upon tenancy and wage labor, thus improving the terms of tenure arrangements and pushing up wage rates (Jazairy et al., 1992: 121).

Lipton's (1985) review of the relationship between land and poverty confirms that this varies regionally, and also depends upon irrigation. The negative relationship between land (owned and operated) and risk of poverty is strongest for good quality irrigated plots, in which case even an acre can significantly reduce the risk of poverty, and weakest for very poor quality rain-fed land, in which case much larger plots are needed to make a noteworthy difference (Lipton, 1985: cited in Agarwal, 1994: 31).

The ultimate effect of improved production on consumption, incomes and well-being also depends upon other factors. The net profitability of irrigated agriculture is often less for the poor than for larger farmers. Tenants have to pay rents which are substantially higher for irrigated land than for non-irrigated land. The terms of inclusion in the agricultural input markets and services, and in the produce markets are also disadvantageous for poor cultivators. The infrastructure for markets and roads is often inadequate. Information on prices is rarely available. This is even more so for women. Adesina and Djato

(1997: 52), for example, find less income earned for the quantities marketed by female rice cultivators, in comparison to marketing by male rice cultivators in Côte d'Ivoire. Cultural taboos may even physically exclude women from markets and from interactions with 'strange men'. Mediation in marketing by male kin reduces the incomes for women. In Bangladesh, however, this is hardly the case if sons sell the produce (Safiliou and Mahmud, 1989: 13). These specific problems for the poor impinge upon generally high input prices and low producer prices, which, moreover, fluctuate sharply within a year and over the years. Foreign markets are blocked by the more adverse terms for trade of agricultural produce from developing countries, and increased protection by the industrialized countries (Jazairy et al., 1992: 11).

Water sale

The value of water as an input in agriculture makes the trading of water to farmers also lucrative. Smallholders not using part of the water, or not using water at all during a certain period, can exchange this with other farmers for an income or another form of compensation. Even if such compensations are minimal, it still helps smallholders and tenants, for example, to bridge a period in which they do not have access to land, or do not themselves cultivate.

Unlike the benefits from irrigated cultivation of one's own land, gains from the access to water for exchange and sale can accrue to both smallholders and entirely landless people. In local irrigation, this is not uncommon. Evidence of allocation of water rights to landless people, for example, comes from traditional systems in Portugal (Van den Dries, Hoogendam and Portela, 1996). Investments by landless people to secure water rights for future land acquisition are also reported in Ecuador (Krol, 1994). Obviously, the importance of access to water is also closely linked to the other uses of water, an issue not addressed in this thesis.

2.2.2 Indirect benefits

Wage employment

Intensification of agriculture, both on smaller and larger farms (Hossain, 1989), demands more labor. The creation of more days of wage employment in irrigated agriculture at higher nominal wage rates, also during the slack season, has improved the position of wage workers. For example, in Bangladesh an increase of labor use of 47 percent per unit of land is reported. This, as well as higher own production, resulted in an income increase for the landless of 73 percent compared to villages without irrigation (Hossain, 1989: 44-45, 121). In India many women shared in these opportunities over the period mid-1960s till mid-1970s when the Green Revolution gained a foothold. At an all-India level the positive labor demand effects of the HYV-irrigation package (as opposed to effects of mechanization for tillage and crop processing) have been taken up slightly more by fe-

male than male wage laborers. This is related to the fact that the tasks for which more labor is required by adopting the HYV-irrigation package are sowing/transplanting, weeding and harvesting. These are traditionally women's tasks. At an all-India level wage differentials narrowed down slightly (Agarwal, 1986: 208-210). However, neither for men nor women were money wage rates adjusted to the rising food prices, and real wage rates tended to decline.

Wage employment is reduced if larger farmers adopt mechanization. Abundant labor has been absorbed at a much slower rate than might have been expected during a period of rising production through irrigation when the hacendado and capitalist farmers in Latin America, or the large farmers of the Indian Punjab, or the state and commercial farms in Africa, chose more capital-intensive technologies and land-intensive cropping patterns (de Janvry, 1981: in Sobhan, 1993: 108).

There are other important expenditure-induced growth linkages to the introduction of irrigation (Hossain, 1989: 108). Bell, Hazell, and Slade (1982) concluded from a study of the Muda irrigation project in Malaysia that for each dollar of agricultural income created directly by the project, an additional 80 cents of value added was created indirectly in the local non-farm sector. Jazairy et al. (1992: 15) report that 10 percent growth in output gives 13 percent growth in non-agricultural activities. This also offers employment for the poor.

Construction and maintenance work

Construction and maintenance of irrigation infrastructure demands a high labor input. If agencies pay these costs, this by itself offers wage employment. Wage rates are usually above current rates, and not seldom supplemented by Food for Work. Much work is typically carried out by the poor and very poor. Construction work has even been identified as one of the few activities with effective self-selection by the poor (Glewwe and Van der Gaag, 1988: 29). For that reason, since the 1970s infrastructure development has often been a part of targeted Poverty Alleviation Programs, for example in Pakistan, Bangladesh, and India. However, criticism of these programs has been that the assets created were either of little value, or not cost-effective, or finally benefited primarily the land-owning classes who use irrigation. So rather than conceiving and implementing isolated programs, which offer employment that, moreover, depends upon erratic public funds, merging of these programs with general irrigation development targeted at the poor is proposed (Hirway, 1991: 69, 71; Chakravarty, 1990: 150). For landless women and men, however, mere employment remains an important indirect benefit from irrigation development.

In the past, poor women have largely been excluded from paid construction employment, and wages for women were substantially lower than for men. In countries like Bangla-

desh this is now slowly changing. These experiences also confirm that women perform as well as men in construction work (Duyne, 1994; Jordans, 1991).

Food prices

As food often constitutes up to 80 percent or more of the expenditures of the landless and urban poor, food prices are the most important determinant of poverty among net food-buyers (cf. Mellor and Desai, 1985; World Bank, 1986). Increased agricultural output through irrigation, whether produced by small or large farmers, contributes to lower food prices. Moreover, irrigated production reduces fluctuations in supply and extends the period of marketed surplus, so it stabilizes prices. Further, local food production limits the dependence on supplies from other regions of the country or abroad, and limits transport costs. However, hunger and famines have occurred in spite of sufficient food availability. The purchasing power of the poor is the critical factor.

The interests with regard to food prices of smallholders, who are net sellers of food, and the poor, who are net buyers, diverge. Cost reduction in production, for example by cost-reducing technology (Jazairy et al., 1992: 170), and minimum added value by trade reconcile these opposed interests to a certain extent.

Non-economic effects

Inclusion in irrigation development, whether directly through their own access to irrigated land and water, or indirectly, is also likely to change other dimensions of people's inclusion in the community and in the family, and their self-perception. These changes are studied empirically in the field study in Bangladesh. The study in Burkina Faso examines the processes of inclusion and exclusion with regard to the production factor irrigated land. Implications for other spheres are indicated.

2.3 Poverty alleviation and productivity

Holding size and irrigated land productivity

Once smallholders obtain access to irrigated land and water, they make productive use of their scarce resources. The following evidence confirms the propensity of the poor to exploit the potential for increased land productivity by irrigation better than do larger farmers. Data, especially from the Green Revolution areas in India, Bangladesh, Pakistan, the Philippines, and Sri Lanka, show that small holdings, compared to large holdings, tend to:

- have higher net sown proportions of their land irrigated,
- have higher cropping intensities,
- apply more fertilizer per unit of cultivated land,
- cultivate more diversified, higher value and more labor-intensive crops,
- obtain higher yields per crop per unit of land, and

- have higher labor contributions by own family labor but also by hired labor, especially during peak periods when wage rates are high.

(cf. Berry and Cline, 1979; cf. Hossain, 1989; Boyce, 1987: 202-209; Krishna, 1979: in Mellor, 1985: 33; World Bank, 1980: 9; Jazairy et al., 1992: 129).

An inverse relation between size of operational holding and output per unit of land has been observed since the beginning of the century all over the world (cf. Berry and Cline, 1979; Boyce, 1989). Higher land fertility and better application of compost, soil and water conservation and levelling measures by smaller farmers contribute to this relation. Small farmers in Bangladesh also adopted indigenous labor-intensive irrigation methods more than larger ones did in the early 1960s (Boyce, 1989: 17). In Côte d'Ivoire research has also disproven the assumption that large farmers are more efficient than smaller ones (Adesina and Djato, 1997). Similar but fragmentary findings are reported from Latin America (Sobhan, 1993: 123; Berry and Cline, 1979).

Sen (1962) concludes that the crucial explanatory factor for this inverse relationship is not the size of the holding as such, but the system of farming, viz. whether it is wage-based or family-based. Family-based farming reduces supervision inefficiencies, while hiring and exchanging labor is on a more mutual basis (Boyce, 1987: 206). Hossain (1989: 87) suggests that the subsistence pressure on larger families to meet the consumption needs of all their members by working at below average wage rates, leads to adopting the Green Revolution package of modern varieties, fertilizer and irrigation. Thus poverty induces technological innovation (Boyce, 1987: 159).

Tenure and irrigated land productivity

Most attempts to find important inefficiencies in land use and land productivity associated with sharecropping and tenancy either before or after the Green Revolution have been unsuccessful. The recommendation that 'government policies toward land rental should encourage large land owners to rent out their land in small operational units' was expected to have a neutral or positive impact on output (Cline and Berry, 1979: 26, 137; Sobhan, 1993). It is another issue that tenants' productivity can be still higher if they have longer-term security. Without such security, tenants refrain to some extent from longer-term investments in fertilizers, soil and water conservation measures, etc. (Jazairy et al., 1992: 129).

Gender and irrigated land productivity

The few studies that compare the productivity of irrigated plots under women's management and under men's management indicate the higher land productivity of female-managed plots. In the Dakiri scheme in Burkina Faso both men and women obtained irrigated plots. Women's irrigated rice plots appeared to have higher yields per unit of land than men's plots. At the same time, wives who also had their own irrigated plot contributed

more labor on men's irrigated crops than wives without own irrigated plots (Zwarteveen, 1997). In Senegal a higher density and variety of crops was observed in women's irrigation schemes compared to men's schemes (Deuss, 1995).

This is in line with most estimates of male-female differences in technical efficiency. These estimates show that male and female farmers are equally efficient managers, controlling for levels of input and human capital (Quisumbing, 1996; Udry et al., 1995: 416; Adesina and Djato, 1997: 52). In one Kenyan case (Moock, 1976) a simulation model predicted a 22 percent increase in women's yields on maize, beans, and cowpea plots if women farmers were given the human capital and input levels of male farmers (Saito, Mekonnen, and Spurling, 1994: all cited in Quisumbing, 1996: 1587).

Women's productivity is reported to be related to their control over the output. In a Kenyan study by Ongaro (1988), the introduction of new weeding techniques increased yields of female heads of households by 56 percent and those of the farms of male heads only by 15 percent. Ongaro argues that female heads may have a greater incentive to adopt better weeding practices (traditionally a women's task) when they control the proceeds of their increased effort (cited in Quisumbing, 1996: 1588, citing Elson, 1995). As already mentioned, lack of control over the output of husbands' production units, and too limited compensation by husbands, were also important reasons for women to reduce their overall labor input on their husbands' irrigated plots to the minimum level of culturally defined obligation. For that reason women even completely abandoned irrigated agriculture and returned to their original villages from the Mwea scheme in Kenya (Hanger and Morris, 1973).

Marketing

Another assumption which discourages the irrigation sector from vesting rights to irrigated land and water primarily in the poor, is that male and female smallholders would produce mainly for subsistence. Evidence also points to the opposite here: smallholders provide a substantial proportion of a country's cash crop production and also market part of their food crops (Hossain, 1989: 52; Jazairy et al., 1992: 412 - 413). Smallholders are probably even more responsive to the relative prices of different crops in the market than commercial farmers with all their investments tied up in particular crops and processing equipment (Sobhan, 1993: 118). Even if the poor were to retain part of an increased food output for their own consumption, the growth path can still be viable.

Lower productivity by the poor

Small farmers are less likely to use land and water at least as productively as larger ones, if they lack access to agricultural inputs like fertilizers, extension, capital and marketing facilities, compared to large farmers.

Income diversification strategies and employment at a distance can also lead the poor to devote less labor and apply less inputs in irrigated agriculture, and even to lease out plots to larger farmers. Under these conditions, smallholders can be less productive than large farmers. This is reported for a semi-urban scheme in Mali (Castellanet, 1992: 106). Reverse tenancy is also observed in South Asia (Sobhan, 1993: 132) and in Latin America, where many poor farmers now rent out their land and seek more rewarding wage employment. Men's opportunities of remunerative off-farm employment are often better than women's, so women become relatively more dependent on (irrigated) agriculture than men.

Mechanization of plowing, weeding, harvesting or crop processing and economies of scale in larger irrigated farms represent a third set of conditions under which holding size often positively relates to productivity. Better control over water by larger farmers may reinforce this relation. The viability of this pattern of agricultural growth, however, needs to be considered in the light of overall costs and benefits. Mechanization has often been induced because capital was subsidized and priced below its market value, whether in Pakistan, Brazil or the Philippines. This has encouraged inappropriate and less efficient use of capital, when there was abundant labor. With the use of this labor rather than its replacement, and with less capital and land, the same results would have been achieved at a significantly lower cost (Berry and Cline, 1979; Sobhan, 1993: 116).

Implications for the irrigation sector

The relationship between productivity and holding size indicates that the often assumed trade-off between poverty alleviation and productivity is most likely not to exist. Outside the irrigation sector this is already reflected in policy making. Nowadays many mainstream development agencies expect, for example, land reforms not only to lead to poverty alleviation, but also to increase agricultural output (World Bank, 1990; Jazairy et al., 1992; Sobhan, 1993; Berry and Cline, 1979). Endowing the poor with productive resources induces 'trickle-up growth' (Jazairy et al., 1992: 14), 'broad-based' growth or 'poverty-reducing' growth (World Bank, 1990). Public investments to help the poor to become more productive and increase their incomes has high returns for society and helps economic growth - a win-win policy (Johansen, 1993: 14). As a corollary, subsidies to capital-intensive and less productive large-scale farming are seen as leakage of public funds which needs to be avoided (Jazairy et al., 1992: 18).

Avoiding leakage is also important in the irrigation sector. If larger farmers obtain access to irrigated land and water this has, at best, indirect and limited positive effects on the poor. Wage laborers receive only a part of the added value, and may still lack the purchasing power to buy the food that they help to produce. Moreover, employment is also created when smallholders intensify their production. Large or medium farmers who have the means to become private owners of irrigation pumps, sell excess water under certain

conditions. Such a private water market has allowed millions of marginal farmers in India (Shah, 1993) and Bangladesh (Mandal and Parker, 1995) to irrigate their fields and improve their production. However, water buyers have to accept the terms of inclusion that the pump owners set. The effects on poverty alleviation through these trickle-down processes are not only limited but they can even be nullified if the poor lose out in a direct competition over irrigated land and water. This competition will only increase with growing water scarcity. So the irrigation sector, given its mandate and core competence, contributes most optimally to both poverty alleviation and productivity by targeting support to the poor and vesting rights to irrigated land and water primarily in poor women and men.

The next issue is, then, how inclusion and exclusion processes in irrigation development and the roles of the agencies can be comprehensively conceptualized. This framework is developed in Chapter Three.

3. Inclusion and exclusion processes in irrigation

3.1 The role of infrastructure

3.1.1 Infrastructure and water rights

The development of water resources is basically a matter of infrastructure development. This is due to the characteristics of water as a resource. Most water in the form in which nature offers it has no use value for humans, or it even has a negative value. Rain on agricultural land is one of the few natural forms of water that is directly used. In other cases, water only gets use value if it is available in the right quantity and quality, at the right moment, and at the right place. Infrastructure is the means to achieve this. By irrigation infrastructure we mean the variety of artifacts, such as dams, weirs, canals, bunds, dikes, division structures, pipes and sprinklers or drips, wells, hand- and animal-powered or mechanized pumps, etc.

Infrastructure development often requires collective action, firstly, because normally one water source is shared by more people. Secondly, collective action enables important economies of scale to be achieved, although this entails organizational complexities. For that latter reason, smaller-scale infrastructure may be preferred. Investments in infrastructure of cash, skills and labor are often the most costly part of irrigation, and represent a major bottleneck in the development of water resources.

Throughout history and worldwide, those who have invested in infrastructure, whether individuals or small or large groups, have firm rights to the water conveyed (Coward, 1986). People can make the investments themselves, or they let others do the work in their names. Investors in infrastructure, and their descendants, are the main decision-makers in water development and irrigation. Hence, inclusion and exclusion processes are primarily to be found at their level.

Evidently, the use of infrastructure supposes that there is a surface water flow, or a reservoir, or a sub-soil reserve, from which water can be derived to be conveyed by the infrastructure. This availability depends, firstly, on the natural availability of water, and, secondly, on the behavior of water users upstream in the watershed or water users tapping from a same ground water reserve. The problems of users downstream, and the shared problems of falling ground water levels, need to be solved at the aggregate levels in the watershed. Water rights can be defined at these higher levels as well. This is the case if a water source is divided between agricultural, urban and industrial sectors, or between secondary or tertiary units within an irrigation scheme, or otherwise between specific sites in a watershed. However, the negotiations on water rights at these higher levels of the watershed often fail to address inclusion and exclusion processes at the lower levels

of water allocation and distribution, and individual water rights. Conser levels may well be reached at the expense of further exclusion within the g the case, for example, if these negotiations at higher aggregate levels are le powerful water right holders, who use the negotiated gains primarily to their o and expect other water users to compensate them for their efforts. In cases where stakeholders who are taken into account are those that already have access to in ture, the people who do not yet have access to infrastructure, like many poor people, excluded in advance. From the perspective of the poor, therefore, the first condition for getting access to water is to obtain access to infrastructure and to acquire individual water rights within a group sharing the infrastructure.

Given the strong claims of investors in infrastructure to the water conveyed, the role of external irrigation agencies in infrastructure development, and hence in inclusion and exclusion processes, varies according to their involvement in the investments in the infrastructure. Public and private irrigation are distinguished.

3.1.2 Public irrigation

In public irrigation agencies bear the largest part of the costs for the construction of the infrastructure, and often also for the operation, maintenance and rehabilitation of at least the main system. Public irrigation can be small-scale, e.g. subsidized pumps, but it is mostly medium- or large-scale. Modern states are the most important public irrigation agencies. Some NGOs, often in collaboration with governments, play a similar role. There is a dichotomy between investors in infrastructure and the water users. Obligations and rights to the water conveyed are divided between the agency and the users. Users can be involved in construction or rehabilitation as co-investors in the infrastructure, contributing part of the investments in the form of cash, kind or labor. This practice reduces public expenditures, and is an important mechanism for vesting individual water rights.

Rights and obligations are increasingly transferred to users. Many governments nowadays redefine their own role in the operation and maintenance of functioning schemes, and the rights and obligations to be vested in water users. In a sense, the fruits of subsidized investments in infrastructure are redistributed, in return for obligations of operation and maintenance. This usually implies precisely specifying who are the legitimate users with the new rights and obligations. Important inclusion and exclusion processes take place under irrigation management transfer (IMT) programs.

In spite of decreasing public funds and increasing management transfer, national governments are likely to remain the most important investors in irrigation infrastructure in the future in developing countries. This concerns mainly rehabilitation, and some new construction. The World Bank (1993) justifies government's involvement in infrastructure

development by pointing to a probable lack of private initiative in this area, because of the large size and sometimes extremely long time horizons of investments, and the underdeveloped capital markets. Where people are willing to invest privately, the state should prevent the emergence of monopolies because of the achievable economies of scale, and it should prevent overpricing (World Bank, 1993: 28).

In most countries, the state claims to be the owner of the nation's water resources. If the state is the main investor in infrastructure as well, the legitimacy of the state's formal claims is strong. Nevertheless, other legal systems than statutory law, like local law, religious law, or project law, may well prevail simultaneously at local level and influence factual behavior as well, or determine this even more strongly (Von Benda-Beckmann, 1991). Formal law sometimes exists only on paper, without the people concerned being aware of it (Byrnes, 1992).

The potential contribution to poverty alleviation by irrigation agencies, especially the state, in public irrigation is substantial for three reasons. Firstly, agencies can target their technical, financial and organizational support, and provide access to infrastructure and to the water conveyed, directly to the people they select. The state especially has the legal and financial means to select a preferred target group, such as the poor. Secondly, financing by public irrigation agencies provides a remedy for the problem that the poor especially lack proper longer-term financing facilities. This remains valid if a larger part of the costs of the investments have to be repaid than has been required up to now. Even without any subsidization, poor farmers, and other farmers alike, may well accept an obligation to repay investments in infrastructure, as long as there are net profits from which to finance it. Thirdly, the poor tend to be less organized to take a collective initiative, or such initiatives are more easily encroached upon by the well-off (Subramaniam et al., 1997: 29). Hence, in theory, the possibility for the state to implement an equitable water reform is considerably greater than in the case of a land reform.

3.1.3 Private irrigation

In private irrigation, private persons or institutions bear the bulk of the investment costs for the infrastructure. This is the case with so-called indigenous or 'local' farmer-managed irrigation schemes (Ostrom, 1994; Merrey, 1997). These schemes may be centuries-old medium- and large-scale gravity schemes, for example, in mountainous areas. However, if their upgrading is financed by external agencies, this is here defined as public irrigation. Private irrigation also comprises the use of commercially developed and traded technologies. Nowadays, mechanized pump irrigation, sprinklers and drip irrigation by individuals or small groups are the most widespread form of private irrigation. In practice local legal arrangements usually prevail in private irrigation.

Agencies have a much more restricted role in private irrigation than in public irrigation, and their potential contribution to poverty alleviation is limited accordingly. Financial, technical and organizational support may include credit facilities, subsidies, incentives to stimulate the design and use of particular equipment beyond the available commercial technology, and organization and institution building among infrastructure users.
The state has, moreover, the role of legislator and regulator. It can regulate trade in equipment, electricity provision, siting, zoning and water abstraction (cf. Shah, 1993). However, the *de facto* decision-making power on water use by private investors is often great, for example, in ignoring siting regulations. The issue is how agencies supporting private irrigation can target the poor and contribute to poverty alleviation. Trends in commercial development of irrigation infrastructure are beyond the scope of this thesis.

3.2 Access to irrigated land and water

3.2.1 Irrigated land

Having access to irrigated land is the first condition for irrigated cultivation. Most irrigation infrastructure is land-bound. Site selection, layout and division structures of a scheme determine which land becomes the command area and can physically be irrigated, and how well. The siting of the head-end is important. Upstream users can take advantage of receiving water first. The land-boundedness is more temporary in the case of mobile equipment, or equipment with a shorter life-time. Small irrigation pumps owned by tenants, for example, allow them to irrigate leased land, and can be installed elsewhere if the land owner resumes the land. The expression 'irrigated land' refers to land that can be irrigated because of this physical relationship.

'Access' to irrigated land is a vague expression, which entails a 'bundle of rights' (Von Benda-Beckmann et al., 1997). It comprises temporary, informal land use rights. Weaker land rights are often typical for poor cultivators. This concerns, firstly, tenants, although well-off farmers can also lease in land. The class composition of tenants has to be clarified in each specific situation. Cash rent, sharecropping and other tenancy arrangements provide access to land for an estimated 30 percent of all farm families in Bangladesh, Indonesia, Malaysia, Nepal, the Philippines and Sri Lanka. Tenancy is most common in fertile/irrigated flood crop lands such as central Thailand (57 percent) (Arulpragasam, 1990: cited in Jazairy et al., 1992: 58). In irrigated areas in the Southern Punjab in Pakistan 60 percent of the land is cultivated under tenancy arrangements (Terpstra, 1998).

A second large group of poor cultivators who do not necessarily own the cultivated land are women (cf. Agarwal, 1994; Deere and Léon, 1997; Von Benda-Beckmann et al., 1997). The extent of land cultivated is often underestimated. In Burkina Faso, for example, women cultivate independently one fifth to one quarter of the total land (Imbs, 1987; Burkina

Faso, Ministère de l'Agriculture et de l'Elevage, 1989). In patrilineal societies women may borrow land from their in-laws, and have life-long use rights, or borrow it from others. Women's cultivation on borrowed land is increasing nowadays through men's outmigration to better employment opportunities elsewhere and the feminization of agriculture. In Kenya, for example, percentages of women-managed farms are now in the range of 40 - 90 percent (Safiliou, 1994: 61). On the other hand, women may also have rights to land, which they themselves are not able to cultivate, because of physical or social handicaps. They can farm by hiring laborers, or they can lease the land out (Agarwal, 1994: 296).

3.2.2 Water

Whether this land is irrigated in reality depends on further conditions. One condition is the availability of water at the intake, thus in the source from which the water for the scheme is derived. If there is either no water or abundant water, it is evident that the land is either not irrigated at all, or irrigated as much as desired. Having water rights, or not, does not matter much. However, if there is only a limited quantity of water and a competition among all land users, which is usually the case, irrigation depends upon the rules and practices governing water distribution. Under these circumstances of relative scarcity, rules and their implementation determine who succeeds in getting water to his or her plot.

The basis upon which one person, group or institution is vested with a certain right is an important aspect of water rights. These grounds explicitly or implicitly determine whether the poor can obtain a certain water right. Common grounds for allocating water rights to some land users in the command area, and not to others, are one or a combination of the following principles (Van Koppen, 1998):

- investments or co-investments in infrastructure construction and maintenance,
- resource rights before an intervention,
- gender, household composition and other socio-economic characteristics, and
- type of land rights.

The bundle of water rights encompass, in order of increasing control, the right to:

- use a certain benefit stream of water at a certain moment,
- construct, operate and maintain a scheme,
- decide on scheme affairs and represent the scheme to third parties,
- formulate and change regulations on use and management,
- enforce rules, and
- occupy a position of socio-political or religious authority with regard to water (Von Benda-Beckmann et al., 1997).

Having a combination of rights, for example use rights and the right to enforce the rules at the same time, gives a better assurance of getting water, than if one only has the minimum right of using a certain benefit stream of water at a certain moment. Rights are related to obligations, for example, water fee payments or maintenance work. Fulfilment of an obligation confirms the right. The expression 'access to water' refers to the minimum right to use a certain stream of water, and fulfil the obligations. All persons endowed with this minimum use right are usually also the legitimate members of the group of water users who share a common water source. The issue addressed here is whether agencies formally vest these water rights in poor women and men.

In this Chapter and in Chapter Four, no attention is paid to the fact that post-project local norms and factual practices may well differ from agencies' rules and regulations. Neither is the gap discussed between having rights and being able to realize the rights one has (cf. Von Benda-Beckmann et al., 1997; Meinzen-Dick and Zwarteveen, 1998).

The quantity of water one is allowed can be based upon the type of crops cultivated, area of land, and investments and payments made. Water ceilings can be established to prevent a few large water consumers from using the bulk of the water at the expense of small users. Water ceilings per individual, or progressive water tariffs and cross-subsidization, could be effective redistributive measures, analogous to land ceilings. This issue is not further elaborated.

3.2.3 Links between water and land

The statement that there are links between land and water has different meanings, which should not be confused. Infrastructure is land-bound, and, spatially, water is led to a specific site for crop growth. Economically, the monetary value and the rents of land that can be irrigated, are higher than those of land outside a command area. A third aspect is the relation between land tenure and cropping potentials. Under construction of new infrastructure the provision of water may enhance the cultivation opportunities so drastically that a localized land reform is warranted. Then, land is expropriated and the improved land is reallocated to former producers and/or producers who newly enter the scheme. For example, in local farmer-managed irrigation schemes in Peru, communities are reported to redistribute the land in the command areas, in order to guarantee benefit to more members of the community (Fernandez, 1998: personal communication). Land tenure in the command area can also be adapted to seasonal or more permanent water scarcity. Datye et al. (1997) describe the traditional '*phad*' system in Maharashtra, India, which regulates land tenure under seasonal water scarcity. It allows users of land in the tail-ends to occupy land in the head-ends during periods of scarcity (Datye et al., 1997: 27). With long-term water scarcity at the intake, as increasingly occurs, it can be decided to completely close off part of the infrastructure, and no longer irrigate certain parts of the

command area. The users of that land are excluded from irrigated agriculture, unless a land reform is organized. During the use phase of irrigation schemes land occupation and tenure also change, but usually more gradually.

Fourthly, control over water in a political-economic sense influences rights to irrigated land in the long term. This became clear, for example, in land reform in the Near East and North Africa. An overriding concern existed for land issues, but traditional water rights by the waterlords were not touched upon. This rendered the land reform largely ineffective (Jazairy et al., 1992: 110). In other places, where smallholders have little control over water, and where access to water can even be refused to them, they are also reported to lease out or sell their lands to the waterlords (Sobhan, 1993). On the other hand, people with weak land rights or without land rights, but with strong water rights, can use the latter to buy land or negotiate better terms of tenancy contracts. They can also exchange and sell the water that they do not use on their own lands.

Lastly, there may be legal links between land rights and water rights. However, this is neither automatic nor necessary. Regulations and the authorities that govern land tenure and water tenure usually only partially overlap. Water rights are never vested in a specific parcel, but, at best, in people with certain claims to that parcel. These claims, for example land ownership or land use rights, or both, have to be stipulated. Water rights can be transferred simultaneously with land rights, but this is no universal rule either. On the other hand, one's capability to use water productively often legitimizes one's claims.

3.3 Inclusion and exclusion

3.3.1 Which issues?

The core business of irrigation agencies is developing irrigated land and water. However, agencies also play an important role in including and excluding local people in these developments, and vesting rights to these newly developed resources in some of them, and not in others. This section lists the issues on the agenda of agencies supporting either public irrigation or private irrigation, that directly influence whether the poor are included or excluded as right holders to irrigated land and water.

Public irrigation
Under public irrigation, the access to irrigated land is implicitly decided upon when the site for construction or rehabilitation is selected, and the layout and division structures are designed. Implicitly, all people with actual or potential claims to the command area are included in (improved) irrigated agriculture. Others are excluded. In the case in which land tenure does not change, the poor benefit if their lands are selected for improvement.

If land tenure changes with the construction of infrastructure, agencies, especially the state, often steer the localized land reforms in the areas selected for an irrigation scheme. Agencies have good opportunities to allocate rights to irrigated land primarily to marginal farmers and landless women and men. Former land users whose rights are expropriated can rather easily be compensated by the improved resources, and thus they can still gain from the intervention. In national land reform law, land ceilings are typically lower for irrigated land than for rain-fed land, like one third in Syria, or a half in Tunisia (Jazairy et al., 1992). The construction of irrigation infrastructure releases land for redistribution. Agencies can also steer the more gradual changes in land tenure during the use phase in favor of the poor.

The second set of decisions that agencies in public irrigation have to make concerns the vesting of water rights. Among all those who have actual or potential access to land in the command area, agencies can decide to vest water rights only in a selection of them, and exclude the others in their formal definition of the water user. A choice can be made between land users or land owners, or both, and women and men, or both. If the poor are land users rather than land owners, targeting the poor would imply vesting rights in both poor women and men, irrespective of the type of their land rights.

A last issue of inclusion and exclusion on the agendas of public agencies is the expropriation and compensation of pre-project resource rights. With the construction or rehabilitation of infrastructure, certain pre-project claims to land and water need to be expropriated. Expropriation can be very substantial, for example, if land reform is implemented. Changing water flows also affect, and often erode, the claims by users downstream or users from the same ground water reserve. The definition of water rights under irrigation management transfer also entails a nullification of the existing and reformulation of the new rights. The issue is how these expropriations are arranged and compensated. Expropriation of the sites needed to build the infrastructure is not further considered.

Developing new land and water resources requires, by definition, new arrangements with regard to these newly available resources. Only elements of pre-project arrangements can be incorporated. Change roughly varies from endowing those who already have resource rights with more rights, to maintaining existing divisions of rights, and to redressing existing unequal divisions towards more equality. In general, the latter contributes most to poverty alleviation. In any case, the former rights of the poor that need to be expropriated should be properly compensated.

Private irrigation

In private irrigation, agencies hardly play a role in the site-selection, the vesting of water rights, and expropriation issues, since these issues are typically decided upon by the private investors in infrastructure. The investors aim at irrigating their own lands best. They

also have strong rights to the water conveyed. They pass these rights on to the next generations by inheritance, or otherwise. Newcomers usually have to pay something to the group of early investors or their descendants, in order to compensate for the earlier investments. Investors' own control over the water also allows them to sell excess water.

Agencies supporting private irrigation can contribute to poverty alleviation by, firstly, promoting private ownership of equipment by the poor, and, secondly, stimulating well-off private owners to include the poor, e.g. by providing water services to them. At watershed level, governments play an important role in the provision of water sources that poor owners of private equipment can tap.

3.3.2 When?

The issues on the agenda differ according to the phase of an irrigation scheme, whether public or private. The phases are:

- initiative for construction,
- plan formulation, feasibility study and physical design,
- plan implementation and construction,
- use, operation and maintenance of the infrastructure by users, and (in public irrigation often:) by agencies,
- initiative, plan formulation, design, feasibility study and implementation of rehabilitation, and
- (optional in the case of public irrigation:) turn-over of state's rights and obligations in operation and maintenance to users.

Generally speaking, changes in resource rights are the greatest when infrastructure is constructed, and water becomes newly available. In rehabilitation and turn-over earlier vested interests play an important role. Besides these changes bound to the life-cycle of a scheme, many other factors also provoke changes, e.g. water scarcity at the intake, increasing population pressure, market developments, etc. Each redefinition of resource rights implies inclusion or exclusion.

The phase of initiative and plan formulation of a redefinition is especially critical, firstly, for the expropriation and compensation of pre-project resource rights. These rights can only be compensated if they are known, legally recognized, and registered. The negotiating power of the 'losers' is considerable, if the compensation measures have to be agreed upon before the expropriation actually takes place.

The phase of initiative and plan formulation is further crucial if water rights are vested through co-investments in the construction or rehabilitation of infrastructure. This is evi-

dent in collective private irrigation, but it is also valid if this principle is adopted by public irrigation agencies. Inclusion means that one is allowed and informed to acquire water rights in this way, and that participation in the implementation leads to rights. Public agreement on those links before the investments are made, and transparent registration of investments, contribute to the legitimacy of those claims later. The poor especially are unlikely to have other grounds for claiming their rights.

These two particular arrangements clearly highlight the importance of the general principle throughout all phases of a scheme: claims on the fruits on investments, whether in cash, kind, or time, are typically negotiated before the investments are implemented. If this has not sufficiently crystallized, people are reluctant to invest voluntarily. As a corollary, once investments start to be made and to accumulate, the original investors are unlikely to accept further newcomers, unless these newcomers compensate the efforts already made by others. Joint investments are exclusive processes by nature. This implies that, if the poor are excluded from investments at the very beginning, it becomes much more difficult to include them later.

In public irrigation it is easily assumed that design and construction phases are neutral, since they are technical phases, primarily to be left to engineers. This ignores the most critical moments for vesting rights to irrigated land and water. The appropriate moments for inclusion of the poor can easily be passed, without project staff even being aware.

3.3.3 By whom?

On the one hand, irrigation agencies tend to have a powerful say in the above-mentioned decisions on the vesting of rights to irrigated land and water, and they also set the pace of plan formulation and implementation. On the other hand, agencies are heavily dependent upon collaboration of at least some local people who have to endorse and to help in implementing agencies' proposals and plans. People's participation may be fashionably presented as a favor for the people, but in reality it is a must for the agency. Agencies may also leave important legal decisions more or less open, especially in the case of public irrigation in which the agencies concentrate on rapid construction work, or other neutrally defined tasks of resource development. These voids are then left to 'the' community to be filled. Therefore, important but often unnoticed inclusion and exclusion processes are initiated or endorsed at local level.

It is an empirical question in which local networks or organizations the rules and the means to coerce compliance are generated with regard to the rights to the newly developed resources. These networks can be seen as semi-autonomous 'social fields' (Moore, 1973). These fields are semi-autonomous, because they are affected by the rules and practices of the agency and the factual behavior of different local staff members of the

agencies, and by local social relations and legal arrangements with regard to land and water. The social fields are most likely to overlap partially or fully with the communication networks at the interface between agency staff and local people, through which plans for joint investments are discussed, contested, reformulated, endorsed, and implemented, and through which certain existing resource rights are expropriated. Agency's staff, especially field staff, play an important role in composing these networks, by systematically contacting, informing, organizing and negotiating agreement with some people in a kind of evolving network, and, thus, excluding others. Agency's staff select the people with whom they raise critical issues of the vesting of rights to newly developed irrigated land and water, or to whom they leave the legal voids.

The composition of the networks of local people interacting with agencies, and representing the social field in which resource rights are negotiated, is grossly under-researched. Innovative literature on participatory intervention (cf. Pretty, 1995; Thompson, 1995; Gosselink and Thompson, 1997) still leaves the uncomfortable question unanswered: whose interests, among all the people interviewed and ranked according to wealth, are prioritized when the process of joint investments and mutual commitments starts?

If this issue is not explicitly addressed, it is likely that in reality the male elite dominate. The local elite fill this void, and either negotiate, or simply decide on all issues that are left open. They are the easiest to contact, as they often already have the best contacts with agencies, such as the local and decentralized branches of state administration, the ministries of irrigation, and many NGOs. They are often also the politically powerful, and may have contacts up to the parliament. The local elite are usually literate, speak the national language and are male. Although they may claim to represent a certain locality or group, or are simply assumed to do so, the compromises that these elite persons negotiate in these networks may well be at the expense of exclusion within their groups. In any case, if they negotiate certain favors for the poor, they only channel these to them if they get their own advantages in return, such as votes and other services. This is leakage of external resources.

3.3.4 Inclusive procedures

Which issues, when and by whom are part of the process of intervention. This process can be structured in such a way that it most probably leads to the vesting of resource rights primarily in poor women and men. These are 'institutional mechanisms which spell out the terms of intervention of different actors, and which can make clear the rights, obligations and benefits of each' (Rodgers, 1994: 38). They are basically the same for public and private irrigation.

An 'inclusive procedure' in irrigation is defined as a process of joint development of irrigated land and water, and joint definition of rights to the developed resources through local 'forums' (cf. Röling, 1994). Firstly, the composition of this forum is well-defined, namely poor women and men. They are the main decision-makers, and participation of others who are not poor is meant to negotiate the sustainable acceptance of these interests. Secondly, the key issues in the changes in resource rights are transparently on the agenda, and addressed at the proper moment. Thirdly, mutual commitments of all parties on investments and claims on the fruits are decided upon in good time and effectively implemented.

Agencies play an important role in structuring these processes by, for example:

- providing organizational support to the poor in establishing such forums, since the poor are often not organized yet and lack the necessary negotiating skills,
- making explicit the decisions on access to irrigated land and water, in which they themselves are involved, but also making explicit the issues left to the local people,
- setting the pace of decision-making and only proceeding when sufficient agreement on earlier steps in the decision-making process has been reached,
- withdrawing their support, if the conditions that guarantee inclusion of the poor remain unmet.

The framework presented in this chapter identified inclusion and exclusion in irrigation, and highlighted the roles of agencies, for the wide variety of irrigation contexts worldwide. Some flesh on the bones of this framework is given in the next chapter, namely empirical evidence on agencies' choices in vesting rights to irrigated land and water. Evidence on the process of intervention and the composing of forums, is almost absent. These latter issues are addressed in depth in the field studies in Burkina Faso and Bangladesh.

4. The role of irrigation agencies

4.1 Introduction

Empirical evidence on the roles of external irrigation agencies in inclusion and exclusion processes is scarce. A number of post-facto studies, however, cast some light on the outcome of the process: the resulting formal access to irrigated land and water, compared to the pre-project division of resource rights. They are presented in this chapter.

The available evidence is not only scarce, but also incomplete, and definitions of poverty and information on the populations covered are often lacking. The literature on women's inclusion or exclusion usually does not specify their socio-economic status. The implications of formal criteria in pluralistic reality, and the impacts of changing resource rights on poor people's well-being, are rarely indicated either. These imprecisions are reproduced in this chapter.

Nevertheless, the evidence shows, first of all, that explicit targeting of rights to irrigated land and water to the poor, is still very rare. Inclusion and exclusion is often implicit in more general allocation principles. Besides ample evidence of exclusion of the poor, there are also cases of inclusion. The latter are often more recent and concern agencies that improved targeting once they had recognized that their former approach excluded the poor.

First, public irrigation is discussed. In Section 4.2 access to irrigated land is reviewed. Distinction is made between irrigation development

- with localized land reform at the moment of construction, and
- without changes in land tenure at the moment of construction.

Changes in land tenure during the use phase, such as in-migration or closing-off of parts of the command area during water scarcity, are not considered. Agencies' explicit attention to poverty issues in this respect was hardly found. In Section 4.3. the access to water among all potential land users is discussed. No explicit targeting is reported. This section follows the general allocation principles of vesting water rights according to:

- co-investments in infrastructure,
- gender and household composition, and
- type of land rights.

Section 4.4 concerns the role of external agencies supporting private irrigation.

4.2 Rights to irrigated land

4.2.1 Localized land reform

Inclusion

Irrigation development accompanied by a land reform has effectively included the poor in the Medjerda Valley in Tunisia. Land in excess of 50 hectares was expropriated from private owners against compensation, for redistribution in ownership units of five to ten hectares, to small tenants and landless workers having experience in irrigated farming (Jazairy et al., 1992: 115). In Ethiopia the more disadvantaged of the rural poor were recruited, whether from overpopulated areas or areas struck by droughts (Dey, 1990: 14). In Egypt allocation to smallholders and the landless was implemented in the first stage of land reclamation and irrigation development. However, in later stages land distribution favored unemployed agricultural university graduates over the rural landless (Jazairy et al., 1992: 36). In Malaysia and Sri Lanka, settlers in irrigation schemes were also mainly drawn from the rural poor (Jazairy et al., 1992: 125).

Priority allocation of irrigated land to women smallholders has also been effective, albeit on a small scale, and especially for women-specific horticultural schemes. Negotiations between project staff, women's groups and former male land right holders in these patrilineal societies have sometimes led to quite favorable lease contracts for women's groups. This occurred in the Nyandusi scheme in Kenya (Povel, 1990) and in several horticultural schemes in Senegal (Helsloot, 1990), Burkina Faso (Projet Sensibilisation, 1995), and Gambia (Carney, 1994). The long-term tenure security of these recent experiences cannot be assessed yet, but continuation of land claims by former land owners is reported in the case of Gambia (Carney, 1994), and in some of the schemes in Burkina Faso (Projet Sensibilisation, 1995).

In larger irrigation scheme it is rare that both men and women obtained plots. However among the Wolof and Soninke in the Delta and upstream in Senegal, both women and men obtained their own irrigated plots, but women's plots were only half the size of men's plots (Diemer, 1990).

Joint titles in reclaimed land were allocated in the Rawa Sragi Project in Sumatra, Indonesia. In the early schemes, rights were exclusively allocated to male heads of households, although women in these societies have substantial land rights. At that stage the project staff had not thought of alternatives. Once the option to allocate joint titles was suggested, neither the project staff nor any arm of the state objected. Women welcomed this change towards the allocation of joint titles. The factual impact has not been studied yet. Nor has the question been addressed whether women would have preferred independent rights (Van Hussen, 1990: personal communication).

Implementation of prevailing land reform law when irrigation infrastructure was installed, occurred in Karnataka, India. The lower ceilings released land for redistribution. Implementation of this law has slightly benefited the poor, although the better-off were still able to use the law to their own advantage (Epstein, 1973: cited in Chambers, 1994).

Exclusion

The evidence of effective targeting contrasts with many examples of concentration of the newly developed irrigated land among better-off and male farmers. Pre-project land rights of the poor have even been nullified without compensation.

Expropriation of land for irrigation development has nullified the grazing rights of nomadic pastoralists (Jazairy et al., 1992). The expropriation of waste lands has also especially affected the poor, who are more dependent upon these wastelands for their fibres, food and fuel (Agarwal, 1994). All these existing rights were not recognized, let alone registered in time, so there was not even a basis for compensation.

Worldwide the rights of women smallholders were ignored. Loss of land rights without compensation has affected women in the matrilineally inherited rice lands in West-Africa (Dey, 1990; Carney, 1988; Van Koppen, 1990) and the bilaterally inherited land in the Mahaweli Ganga Scheme in Sri Lanka (Kumar, 1987; Schrijvers, 1985). In all these schemes, land was almost exclusively reallocated to males as the head and the only household member eligible.

Similarly, among farmers newly entering settlement schemes or small-scale irrigation schemes, only male heads of households got land rights. Original land use rights of women settlers were ignored, as in the Mwea Scheme in Kenya and the Office du Niger settlement scheme in Mali. In the latter scheme, 11,842 male tenants and 68 female tenants were registered in 1995. Most of these 68 women are governmental (ex-) employees. Two have been registered because their husbands could not pay the water fees (Klaver and Van Koppen, forthcoming).

In about fifty small-scale rice schemes in central Burkina Faso less than one percent of the irrigated land is allocated to individual women (Projet Sensibilisation, 1993). However, in that same region up to 20 percent of the land in rain-fed agriculture is farmed independently by women (Burkina Faso, Ministère de l'Agriculture et de l'Elevage, 1989). In only one of these schemes did women obtain 11 percent of the plots. These women had former land rights and participated in construction. The active support of the agency's field workers also contributed to this exception (Projet Sensibilisation, 1993).

4.2.2 Unchanged land tenure

Inclusion
Explicit targeting of external support to smallholders by selecting their lands for improvement is effectuated by the 'PATA Project of Integrated Agricultural Development' in Pakistan. This governmental project installs ground water pumps at subsidized rates. PATA rejects requests for assistance, unless three conditions are met: the group consists predominantly of smallholders; men accept women's inclusion during the whole design process; and there is no political interference. Only after identifying such a group of smallholders and the command area they propose, is a project pursued.
The project discusses women's involvement during the first contacts with the local people. Men are reported to readily accept women's inclusion in the design process, women's suggestions on domestic water uses, women receiving agricultural training and even women's visits to other schemes, provided an older man accompanies them. Apparently, this approach is compatible with the prevailing cultural norm that women should not talk to strange men. In these Pathan communities, this norm is stronger than in virtually all other places in the world (PATA, 1996; Zigterman, 1996).

Exclusion
Examples of effective targeting if land tenure remains unaffected are, again, outnumbered by cases of preferential improvement of sites owned by well-off farmers. This occurred on the land of large-scale commercial farmers, like the whites in southern African countries, and haciendas in Latin America, but also multiple large-scale state and commercial farms. Smaller-scale irrigation development has also disproportionally been implemented on the lands of the well-off (Shah, 1993).

An example of the latter is the state-supported and heavily subsidized development of mechanized surface and ground water irrigation from the 1960s to the mid-1970s in Bangladesh. This concerned primarily Deep Tube Wells (DTWs). Installation of a DTW rendered the land in the command area much more valuable than unirrigated land, by as much as 400 percent (Hamid, 1982: 86). These DTWs tended to be sited on the lands of the well-off although these locations were not optimal from the technical standpoint of maximization of total irrigation coverage. Thus these larger farmers maximized, firstly, coverage of their own lands and, secondly, their personal control over the DTW itself (Boyce, 1987: 240). The managing committees were 'totally dominated by the richer and influential farmers' (Murshid, 1980: 18, in Boyce, 1989: 239). Water delivery to poor farmers in the command area was unreliable and late. Moreover, the poor farmers had to pay higher water prices to this elite who thus derived an extra income. Some larger farmers enforced this by altering the terms of water delivery after cultivation of crops had commenced, presenting the cultivator with the choice of either paying whatever additional costs were demanded, or losing the crop (Murshid, 1980: 19, in Boyce, 1989: 239).

By deliberately withholding water from cultivators within the command area, they could ultimately gain control of their land. In cases in which the landlords still leased out their lands, they charged much higher rents to tenants. So the terms on which tenants obtained access to state-subsidized irrigated land largely benefited the well-off.

Ultimate expulsion of the poor from their lands by large farmers has also been reported in Brazil after the introduction of (heavily subsidized) commercial irrigation (Jazairy et al., 1992: 58). These examples show, firstly, that leakage of external resources to the well-off is not neutral, but aggravates poverty. Secondly, control over water appears to increase control over land in the command area.

4.3 Rights to water

4.3.1 Co-investments in infrastructure

Pre-project division of water rights
Vesting water rights through investments is a widespread allocation principle, and in places where local irrigation systems already function many irrigation agencies will encounter it as the pre-project situation. Inclusion or exclusion already prevails in local law. The limited evidence on women's local water rights gives a mixed picture. Vesting rights through investments is open and legitimate for both women and men in countries like Ecuador, where both sons and daughters can inherit water rights (Krol, 1994; Arroyo and Boelens, 1997), or Bolivia (Prins, 1996). However, in the rainy mountainous areas in Tanzania (Kitunga, 1989) and in Kenya (Adams et al., 1997), where population pressure on land is high, women are rarely allowed to acquire water rights in this way in local law. In Kenya women have to mobilize others to do the work, or they have to purchase water from legitimate right holders.

Poor men may also face exclusion in local schemes. In the Raj Kulo scheme in Nepal, for example, neither women nor low-caste farmers are allowed to work on canal maintenance. This means they cannot fulfil their obligations to the association, and instead must pay a fine for being absent from work. A low-caste landowner and system member raised the issue of discrimination against him in an annual meeting, but he received little support for the changes he suggested (Yoder, 1994: 39). The issue is in which direction external agencies change the pre-project local divisions in water rights.

Inclusion
Some recent projects which granted water rights on the basis of participation in construction included both women and men smallholders. In the Licto project in Ecuador, for example, about 80 percent of all construction activities are carried out by women in working groups (*mingas*). These activities have been registered and new water certificates are in

the names of the investors, mainly women. Pregnant women also obtain water rights, but they are granted dispensation from carrying out construction work. Male outmigration is strong in this region. In local law also women commonly have independent water rights (Arroyo and Boelens, 1997).

The Traditional Irrigation Improvement Program in Tanzania, which upgrades highland schemes, tries to include women in construction work in order to vest water rights, even though women are not allowed to acquire water rights by investments in local law. Intensive legal training on women's existing land rights has been given (Traditional Irrigation Improvement Program Tanzania, 1993).

The Cidurian Upgrading and Water Management Project in Indonesia carried out an experiment with a combination of paid employment, which also entitled the workers to membership in the water users' association, in a pilot project of tertiary unit development. Since 1992 both men and women have been invited to take part in construction activities and later water users' associations. Women responded positively (Van Dok et al., 1993).

Exclusion

Exclusion of women from acquiring water rights through co-investments is reported to take place in two ways. One way is when agencies forbid women to participate in construction work. The second way is when women are allowed to participate, but their work is not linked to rights as it is with men. The latter occurs by not counting women's work, or by counting it in their husbands' names. Or even if women's work is counted in their own names, it may be ignored as a basis for acquiring rights.

Exclusion from any participation in construction work is fostered by middle-class stereotypes of women's inability to carry out construction work properly, or of the low status for women attached to construction work. These stereotypes are widespread and may even be adhered to in official government policy, as is the case in the Philippines (Illo et at, 1988). Local governments may also propagate this. For example, the village government in Malolo, Tanzania, suddenly decided to prohibit women from continuing to maintain the canals as they used to do. Now women state that they can hardly any longer protest when they do not get their water turn (Van der Grift, 1991).

Agency's limitations against women's participation in construction work weakened women's water rights in the Laka-Laka small-scale irrigation scheme in Bolivia. In this region independent land and water rights for women are socially accepted. Moreover, male outmigration is substantial. When people were mobilized for the construction of a new irrigation reservoir, women came in large numbers. The Direction of the new water users' association, which had just been created at the instigation of the project staff and with a

powerful voice for this staff in it, feared that too many people would claim water rights. They therefore forbid women from doing construction work if they had able male relatives who could do construction work or could finance paid laborers from off-farm employment. Boys and girls under sixteen were also excluded. The women were sent home from the construction site, and they protested in vain (Prins, 1996).

Exclusion of women also took place in small-scale schemes of the Project *Sensibilisation et Formation des Paysans autour des Barrages* in Burkina Faso. Here access to irrigated land and water could be obtained through participation in construction work. Women were often not informed about this possibility and their labor contributions were counted in the name of their husbands. Or, as the author observed in Gaskaye in 1989, women's individual labor contributions were registered, but then the project suddenly decided not to apply the rule to women, and allocated only half of the land to which the women were entitled according to their labor contribution.

The weak links between investments and decision-making on water distribution of women compared to men were also noted in the Bauhara Scheme in Nepal. Women contributed 70 percent of the construction work. However, initially women were wholly absent from the decision-making bodies like the Construction Committee and Water Users' Committee. Only after some months did the male members begin to encourage women to increase their informal involvement in management for the smoother operation of the scheme (Bruins and Heijmans, 1993).

Lastly, agencies often adopt a narrower definition of labor contribution than is done locally. In local definitions of labor contributions leading to rights, labor almost always comprise the provision of food and drinks and child care on the construction site, for example in Nepal (Pradhan, 1989), Tanzania (SNV Tanzania, 1996), and regions in Peru (Lynch, 1991).

4.3.2 Gender and household composition

For land rights, there is substantial evidence by now that targeting the 'household', assumed to be represented the male head, implies exclusion along gender and age lines. An analogous debate with regard to water rights is only starting. Although it is commonly reported that water rights are vested in 'the household', hardly any research has been done on the implications within the household. No evidence has been found of joint water titles of spouses. However, the principle that each household has to send one member for maintenance obligations seems more current. In a Nepalese case, women are reported to do most of the maintenance work on the canals. They said they did so to enable their husbands to work elsewhere in paid jobs (Vos, 1994). One aspect of water rights that has received more attention, is membership of water users' organizations.

Inclusion

In the beginning of 1990s, the Provincial Irrigation Unit in the Nyanza Province in Kenya has changed its former policy of targeting predominantly male household heads as members of water users' organizations. Now the project explicitly includes both men and women. In this region women contribute over 60 percent of all hours spent in rice farming, including irrigation, and manage 64 percent of all plots (Hulsebosch and Van Koppen, 1993). The project requires a minimum of 50 percent attendance by women at the preparatory meeting of new water users' organizations. Parallel to this, women are organized in women-only groups and trained to articulate their interests and to participate effectively in meetings that were formerly dominated by men. Women's attendance in the preparatory meetings and committees improved by comparison with typical male-biased forums in other schemes. Furthermore their knowledge of project matters increased, as well as the relative participation of women in water distribution and maintenance. Performance of women leaders is similar to male colleagues (Hulsebosch and Ombarra, 1995).

The Small-scale Irrigation Program Dodoma in Tanzania also starts activities only if the target composition of 50 percent women and 50 percent men is reached (SNV Tanzania, 1996).

Exclusion

The male domination of water users' organizations and the justification of this on the basis of headship of the household has widely been observed (*cf.* Van Koppen, 1990; Zwarteveen, 1995; Meinzen-Dick and Zwarteveen, 1998). Women heading households are grossly underrepresented in decision-making bodies when the assumption that men are household heads is taken as the norm. In many situations they have to find and send male relatives as their representatives (cf. Projet Sensibilisation, 1993; Zwarteveen, 1995; Lynch, 1991).

Illo's (1988) study of the Aslong Irrigation Scheme in the Philippines is one of the few studies that analyze in greater depth the intra-household dimensions of agencies' membership criteria. In this scheme the National Irrigation Administration had imposed a one-member-per-household criterion and had stipulated that this representative should be male. Whereas men consented to do the construction work, several male farmers' associations also tried to convince the irrigation community organizers of the National Irrigation Administration that their wives should also become members of the irrigators' associations, or at least represent them there as proxies. Women in this scheme have substantial land rights and are also main decision-makers on the payment of water fees (Illo et al., 1988).

4.3.3 Type of land rights

Introduction

People with weaker land rights are implicitly included as water right holders if water rights are vested in all potential land users, irrespective of the nature of their rights. Often the poor have weaker land rights. However, with reverse tenancy the well-off lease the land of marginal farmers. In such conditions linking water rights to land rights may strengthen the water rights of the poor. Another concern is that vesting water rights in tenants may induce the eviction of tenants (Uphoff, 1986: 132). It is further noted that the type of payment system influences the links between land and water rights. Where water is indirectly paid for via the land tax, land owners automatically bear the obligations and have all the rights (and charge their land rents accordingly).

Inclusion

The often-cited example of water rights allocation to poor people with minimal land rights comes from villages near Chandigarh, Haryana, India, where the Sukhomajri project intervened. Here the landless families were allowed to have equal access to small surface reservoirs. They gained by using this water on share-cropped land, or selling it or otherwise trading it, or giving it for goodwill or other benefits (Seckler and Joshi, 1982).

The Small Scale Irrigation Program Dodoma in Tanzania also encouraged equal allocation of water rights in quantities sufficient for one acre, to both men and women, regardless of ownership of land. Now landless women and men rent land for irrigated agriculture from land owners (SNV Tanzania, 1996).

Governmental agencies may also propose to vest water rights and membership of water users' associations in tenants rather than, or besides, owners, as is stipulated in statutory law in the North Western Frontier Province in Pakistan (Byrnes, 1992). Water markets, as currently proposed, also favor the linking of water allocation to actual use and water payment rather than to land ownership (Rosegrant and Binswanger, 1994).

Exclusion

Many state agencies still tend to vest water rights preferentially in the formal land owners. This was the case in Mexico. In 1966, the government proposed a new national law in which water rights would be linked to land rights. For a long time smallholders in one scheme had controlled the water from their own private irrigation scheme. They exchanged or sold water which they themselves had in surplus. In the 1960s, the land in the command area was increasingly purchased by a few landlords. The smallholders, however, could negotiate advantageous sharecropping arrangements with these land owners, because they brought the water. When the law was announced in 1966, these smallholders

successfully resisted it. At the national level the law was abandoned in 1991 (Nederlof and Van Wayjen, 1996).

Linking water rights to land ownership prevails in most irrigation schemes that were accompanied by expropriation and reallocation of land in the command area. Those who were selected as the new land right holders were automatically entitled to rights to the water, membership of the water users' organization, access to inputs, credits, training and marketing facilities. As these localized land reforms often excluded poor women and men from independent rights to irrigated land, they now also lack access to the other services rendered by the irrigation agencies.

4.4 Inclusion and exclusion in private irrigation

Inclusion and exclusion as owners

In private irrigation, farmers are the main investors in, and owners of, infrastructure. Whether the poor are included as owners of infrastructure primarily depends on the availability of appropriate equipment, and on the financial, technical and organizational capacity of the poor to purchase and use the equipment. Most modern equipment such as pumps, sprinklers, or drips, is designed for individual use or for use by small groups, and adapted to the scale of cultivation of larger farmers. For poor farmers the organization and collective use of equipment would be needed, with the common problems that collective use entails (Boyce, 1987; Subramaniam et al., 1997). Moreover, purchasing equipment requires quite large longer-term investments. Poor male farmers, and still more female farmers, lack this capital, and they do not have the access to credit facilities that the larger farmers have (Wood et al., 1990). Thus, modern private irrigation tends to be biased against the poor.

With falling ground water tables, or other forms of scarcity of water sources from which water can be tapped, increasingly powerful and expensive equipment is needed. Cheaper and more shallow equipment can even become dysfunctional (Chambers, 1994; Shah, 1993). This further skews the access to water by owners of private equipment.

Non-commercial irrigation agencies can at best mitigate these intrinsic biases. They can promote private ownership of equipment by the poor by stimulating the design of, and trade in, more appropriate equipment. Thus NGOs worldwide invested in the development of small-scale and low-cost irrigation technology, like manual irrigation pumps (Alam, 1991), treadle pumps (Jordans and Zwarteveen, 1997: 57-58), or rope pumps (Demotech, 1986). Longer-term credit facilities within the reach of the poor are needed. By providing organizational support, agencies can promote collective ownership. The field study in Bangladesh explores the opportunities for collective ownership of mechanized irrigation pumps by poor women and men.

Regulation of the use of infrastructure and water abstraction from common sources by other private owners is another important means for agencies, especially the state, to safeguard the access to water by the poor with less powerful equipment.

Inclusion as water buyers

As water buyers, non-owners of irrigation equipment can have access to water conveyed by privately owned equipment. As early as the 1930s private owners started selling excess water in Gujarat, India (Shah, 1993). In the last decades highly dynamic private water markets have also developed in other Indian states, and in Bangladesh (Wood, 1990; Kahnert and Levine, 1993; Mandal and Parker, 1995), Pakistan (Strosser and Meinzen-Dick, 1994), and elsewhere. The interests of the owners are to irrigate their own land first and best, and to set maximum water prices for the buyers. However, growth in pump ownership and competition in the supply of water has increasingly led to lower water prices and more adequate water service. External regulation of electricity tariffs, taxes, and subsidies, can further stimulate maximum water pumping and sale of this excess (cf. Shah, 1993). This is in the interest of all water buyers, but especially of small and marginal farmers who cannot afford their own equipment.

5. Evaluation of public irrigation in Burkina Faso

5.1 Introduction

Research subject

The present field study concerns inclusion and exclusion processes in public irrigation accompanied by a localized land reform, in small valleys in South-West Burkina Faso (see Figure 1). In these valleys swamp rice is cultivated in the rainy season. This is a predominantly female cropping system. The governmental project *Développement de la Riziculture dans la Province de la Comoé*, or in short *Opération Riz* (OR) aims to improve rice cultivation by constructing infrastructure for better water control, and by introducing high yielding varieties and inputs. Construction is accompanied by the expropriation of land, and reallocation of the improved land. Access to land and water are connected. 'Scheme' indicates a valley where intervention took place. In the first 15 years of project intervention, expropriation and allocation processes underwent substantial changes. Ten valleys were improved in this period. In the project document it was proposed to allocate land rights to producers. In the first two schemes the project adopted household-based allocation of land rights, but this changed towards producer-based allocation in later schemes. By 1993, this had crystallized into a general procedure of expropriation and allocation that is still applied today.

The research questions are:

1. Does access to improved rice land by men and women smallholders both improve productivity and alleviate poverty?

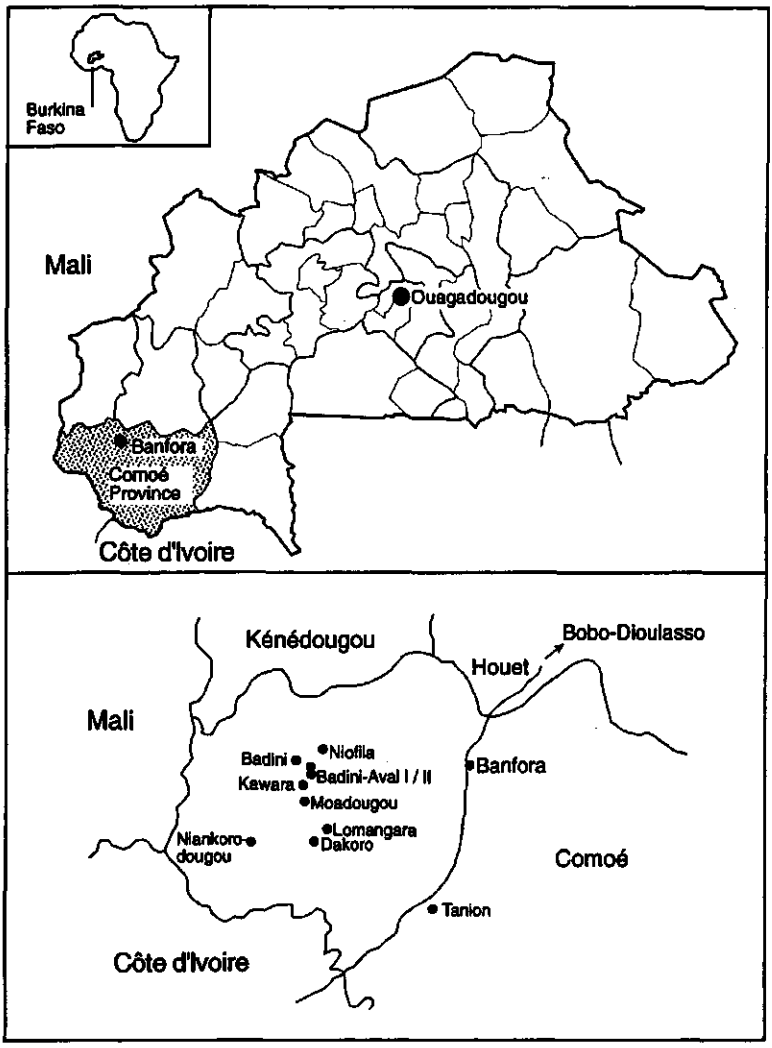
2. Which inclusion and exclusion processes took place in the land reform under household-based allocation and producer-based allocation?

3. What was the role of the irrigation agency in targeting its support to women and men smallholders, and avoiding leakage?

4. Which recommendations can be derived for public irrigation agencies to better target their support to poor producers, and to avoid leakage?

The focus is on the process of changes in access to irrigated land. Effects of differential land rights on women's and men's incomes and on agricultural output are indicated. The results of a quantitative comparison of the productivity and incomes of female-managed rice plots and male-managed rice plots in two later schemes were not available to be included in this thesis.

Figure 1. Location of the 10 rice schemes in the sample



Methodology

The method comprised interviews with female and male rice producers, male and female local authorities and administrative authorities, project field officers and sociological, agronomic and technical project staff, project direction and expatriate assistants. Project archives at the project's head office in Banfora and the office of the Delegation of the Commission of the European Community in Ouagadougou were studied. Citations of project documents are originally in French and all translated by the author. The field work was carried out in the period between 1991and 1994. This field study was part of the Research Program '*Aménagement et Gestion de l'Espace Sylvo-Pastoral au Sahel*' of Wageningen Agricultural University.

Structure of the chapter
The chapter follows the chronology of events. The pre-project situation is described in Section 5.2. The description is extensive in order to highlight the difference between this local reality and the later perceptions of the project. In Section 5.3 the project's aim, initiative, and formulation phase are presented. Section 5.4 concerns the implementation of the first two schemes. The composition of forums influences the emergence of household-based allocation criteria and factual land expropriation and reallocation. The consequences for land tenure and productivity are mentioned. In Section 5.5 the change towards producer-based allocation and the consequences are analyzed. Conclusions and recommendations for inclusive public irrigation are formulated in Section 5.6.

5.2 Prevailing farming system

General farming system
Agriculture is the main source of income of the large majority of the 200,000 inhabitants of the Comoé Province. Off-farm employment is available in Banfora, the capital of the province. Out-migration mainly to neighboring Côte d'Ivoire provides a temporary income, especially for young men. In-migration by Burkinabe from Sahelian regions of the north of the country is increasing rapidly, because land pressure in the Comoé Province is relatively low. There are still pockets of land available that remain fallow for at least eight years (SAED, 1988). The annual rainfall is 1100 mm.

Rain-fed agriculture is practiced on uplands where maize, millet, sorghum, fonio, sesame, groundnuts and cotton are grown. The latter two are the most important cash crops. The average area cultivated per household is 7.8 hectares and per active person 1.06 hectare (Burkina Faso, Ministère de l'Agriculture et de l'Elevage, 1990). Decision-making in upland agriculture is dominated by male household heads. All household members contribute labor to men's fields. Few women have their own upland plots.

Rice cultivation
In valleys swamp rice is cultivated. These small valleys are depressions subject to shallow or deep flooding with runoff and rising sub-soil water sources. This naturally available water cascades from field to field along the valley slopes. The plot location, for example higher or lower on the slope, strongly influences the availability of water. At plot level farmers open or close small earthen bunds and ditches to store or drain water. Many bunds and ditches also serve as plot boundaries.

Valley land constitutes three percent of the total cultivated area in the Comoé Province, but sixteen percent of total cultivated plots are rice plots. The average size of one rice plot is 0.12 hectare (Burkina Faso, Ministère de l'Agriculture et de l'Elevage, 1990). Two thirds of all valleys are cultivated, while the valleys around the two main province towns

are fully cultivated. The proportion of households around a valley with at least one member cultivating rice varies between 28 percent and 63 percent, according to a study of two valleys (OR, 1980d). Rice is both consumed and sold. It is also the favored and indispensable food at ceremonies, and used as gifts and in meals for visitors.

About four fifths of all rice plots are managed by women in four ethnic groups, Senoufo, Gouin, Turka and Dioula. However, among the N'Gon Dioula of Sindu, the second province town, men are the main rice cultivators, whereas women are traders. Around Sindu fertile high land is relatively scarcer than elsewhere. Swamp rice predominantly as a woman's crop is quite widespread in West Africa and is also reported among the riverain Gambian ethnic groups, the Kusasi of northeast Ghana (Dey, 1984) and the Senoufo in South-Mali (Doucouré, Defoer, Ahmadi and De Groote, 1996). Rice cultivation by both men and women occurs in other places such as Sierra Leone (Richards, 1988). It can be hypothesized that women's general predominance in swamp rice cultivation is related to the fact that swamp rice is labor-intensive compared to the more extensive cultivation of dryland crops. Therefore, rice remains a second choice crop for those who have access to upland cultivation. As women have less control over both cropping and land tenure in uplands, valley cultivation is the best option left to them.

Rice production systems

Three production systems of rice cultivation can be distinguished according to the manager and the place of rice in his or her overall production strategies: younger women, older women and men.

Younger women. Younger women up to their mid-forties who cultivate rice also work on their husbands' upland fields. Especially among the Gouin and Turka these labor obligations are time-consuming and compete with women's own rice cultivation. Out of each five days in the Turka and Gouin 'week', there is only one day, locally called 'the day of the woman', which women can devote to their own activities, besides the one day of the local market. The other three days men can command their wives' labor. Senoufo and most Dioula women, on the other hand, have fewer obligations. The organization of their weeks does not stipulate gendered labor divisions. They are, for example, free to start rice cultivation even when the plowing and sowing of rain-fed upland crops have not yet finished. After marriage women may also continue to provide labor on their mother's or aunt's rice plot. Younger wives use their rice to feed themselves, their children, and their husbands, as well as to sell. It is also used for gifts, especially to their maternal kin, and for ceremonies.

Older women. In their mid-forties, when sons or nephews become adult and take over women's labor obligations on husbands' fields, women are liberated and can dedicate themselves full-time to rice cultivation, and, incidentally, to upland cropping. However,

as women stop providing labor on their husbands' fields, the latter are no longer obliged to share the food with them. So for older women rice is their main source of income.

Proportions of younger and older women vary per valley. In five of eight valleys with data on these proportions, more than half and up to two thirds of the women are not liberated yet (OR, 1980d; OR 1991; Ouedraogo, 1990). In the three other valleys older women are the majority. An estimation of the average total rice area cultivated by a woman is 0.34 hectares (Ouedraogo, 1978). Others measured an average of 0.17 - 0.23 hectares (Ouedraogo, 1990; OR, 1991). At least two thirds of the women cultivate two plots or more (OR, 1991).

Both younger and older women mobilize labor in multiple forms of mutual help among daughters, mothers and maternal aunts, and of unpaid and paid working groups and laborers. In some places men, especially sons, might help a little to harvest and thresh if yields are abundant, but the time they contribute varies between zero and three percent of all labor for rice cultivation (Van Koppen et al., 1987).

Men. Men focus primarily on upland cropping, where they are the decision-makers, mobilize labor of their women and children according to culturally defined norms, and control the output of their fields. Part of the food crops is given to younger wives, or sold for family needs, but the remaining income is used for men's own personal needs, such as getting more wives, or drinking, which does not benefit the other family members. Most men in the Comoé who need rice for themselves, buy or exchange this on the market or with their wives. Some men have their own rice plots. In the eight valleys where percentages of male rice plot owners prior to the project are known, four valleys have less than one percent. In the four other valleys it varies between six and fourteen percent. Usually these men belong to specific hamlets in which they constitute up to a quarter or one third of all rice cultivators. In one valley 93 percent of men with rice land are reported to be older than 40 years. Most of these few men who manage rice plots are land chiefs, or sometimes family heads, who use the rice for their ceremonial obligations and for visitors. They do not cultivate themselves but let their wives do so. For the incidental man who works himself in rice cropping this is a second crop: 'if one sees a man going down into the valley, one knows he has finished upland cropping'. When men have rice plots, their women are most likely also to have a rice plot (cf. Groesz, 1992: 26). As mentioned, among the N'Gon Dioula from Sindu, the second province town, the situation is different. Here 85 percent of the 52 rice cultivators are men (OR, 1980c; OR 1991). Since the 1940s some men have started to cultivate rice here.

Some yield measurements are available in which the land productivity of men's and women's plots is compared. According to a study by the Centre Régional de Production Agropastorale de la Comoé, on women's plots 2707 kg/ha was obtained and on men's plots

2448 kg/ha (Burkina Faso, Ministère de l'Agriculture et de l'Elevage, 1990). Own data of OR (1992) indicate that men had 2696 kg/ha; older women 2366 kg/ha and younger women 2300 kg/ha (OR, 1992). The studies do not explain the different and contradictory findings.

Land and water tenure

In most West African countries land, whether upland or valley, belongs to 'a large family, with many members who died, some who are alive and innumerable members to be born' (Bachelet, 1982). The clan that comes first in a region assumes the authority of land chief (in French: *chef de terre*; in Dioula: *dugukolontigi*). Most land chiefs govern both uplands and valley land. In one valley of 50 - 100 hectares some three or four land chiefs may have claims on its different parts. In one exceptional valley of 75 hectares 27 land chiefs were reported (OR, 1991). Fallow upland or valley land can be cleared by anyone, including newcomers, but for such new land use the land chief concerned has to give formal permission. Usually this permission is given because 'one cannot deny people to feed themselves and their children'. Use of land strengthens the users' claims on the land over the years and generations. However, these proprietors are not allowed to transfer or sell land to persons outside the group. Among most communities in the Comoé Province land inheritance is still matrilineal, or in the local expression 'in the way of the mother'. Sons inherit uplands from the brothers of their mothers, while daughters inherit their mothers' plots in the valleys. Nowadays matrilineal inheritance is gradually changing towards patrilineal inheritance, especially in the uplands and among the Senoufo.

In local tenure land chiefs have a certain authority in land issues, and in valleys in water issues as well. They give permission to newcomers to occupy unused land, but they cannot take land back, because by doing 'one would go against the will of his father' (Ouedraogo, 1978). Land chiefs represent the group's interests, both towards third parties, and within the group. Land chiefs primarily assume a function of administrator (Le Roy, 1982: 55). They are informed about land clearance and transfers over the generations in their area. In these non-literate societies there is no other registration than that memorized by the land chief.

Land chiefs may intervene in land disputes, which are primarily inheritance issues. In valleys, land chiefs also intervene in water disputes between neighbors. Water management conflicts arise, for example, with regard to the small earthen bunds or ditches and their operation. The bunds may be encroached from both sides up to the point of collapsing as plot owners try to enlarge their own cultivable area.The need to stock water may also go against the need for water of the downstream neighbor. This neighbor may suffer from overdrainage too, or from the sand and weeds coming with the drained water. In these, and other land and water conflicts, both parties try so far as possible to find solutions themselves. A rule to promote both parties' cooperation, is that, if intervention is

needed, both parties have to pay something, even the party who is judged to be right. Another rule is that in the absence of a solution the land will be taken away from both.

In valleys, the land chief also makes a sacrifice as the sign to start rice cultivation as soon as hydrological conditions seem appropriate. This also contributes to a more or less simultaneous cropping calendar for the whole valley. The latter is important in order to harmonize crop water requirements, to avoid the attacks of birds on isolated early maturing crops, and to allow for early entrance of animals into the valleys after the growing season. Land chiefs also indicate from which moment onwards fishing from ponds, a male activity, can start. Water from ponds or shallow wells in the valleys is used for drinking and domestic purposes during the whole year.

Lastly, land chiefs play a central role in several socio-religious customs, like fixing totem days on which no hoe may be used, and making sacrifices. Special sacred bushes or woodlots in the valleys and uplands are reserved to this end. As a recognition of the authority of the land chief, the land users in his or her area give some ten percent of the harvest and provide labor on their rice plots during one or two days per year.

The function of land chief governing uplands is always carried out by men. However, in the valleys the function of land-cum-water authority is often carried out by women, such as the married sisters or daughters, mothers, or sisters' daughters, of the male land chiefs. In some villages, there may even exist a taboo on male chiefs going down into the valleys during the cropping season. 'This would cause inundations and make cultivation impossible; a sacrifice would be needed to put things right', reported a female chief. Only the slaughtering of animals is strictly forbidden to women chiefs 'because women give life'. Male land chiefs may keep the function of main representative of the group both towards group members and outsiders. In such cases, women who want to request a rice plot may have to address themselves first to the male land chief, who then delegates the factual work to his female relatives. His agreement may also be required in dispute settlement. He can have a say over the crop shares offered, and over the harvest of the rice field to be cultivated by the users on the land under his command. In other cases women are the decision-makers.[1] These women may also take their sons to public meetings, for example in the project OR, with the justification that 'he has to slaughter the animal'. However, women are not allowed to participate in the village council of elders (Ouedraogo, 1990), so when land issues are discussed there, they depend upon mediation by their male relatives.

Women's land rights

As rice cultivators women established land rights in the valleys. There are three main ways in which women obtain rice plots: via maternal relatives, via the husband's family and via the land chief. As one rice cultivator expressed it: 'women have two to four plots:

one from the mother, one from the maternal aunt, one from the husband and one the woman herself asked from the land chief'. This flexibility allows women to adapt the total size of land to the labor availability during their life-cycle. Data on the mode of plot acquisition are available for a total of 177 plots of 80 women in four valleys. 28 percent of these plots are obtained from maternal relatives: mother, elder sister or aunt. The women obtained 37 percent via the husband's family. 34 percent are plots asked for from the land chief. The remaining one percent are borrowed (Ouedraogo, 1990: 78; Somé, 1991). The option to establish land rights by clearing a virgin area and bringing it under cultivation is still open in some valleys, although land scarcity has become pressing in others. Some women were reported to do so without even knowing any land chief there (Van Etten, 1992). In all these cases women control the output of their lands.

Mother's lineage: women's ownership rights. In this case the rice plot passes from mother to daughter without interference of male kin or land chiefs. 'You do not have money, so the rice plot is your treasure to give to your daughter'. Land transfers are delicate issues and one mother saw this transfer 'as if you confide your secret to your daughter'. Plots may be transferred when women stop working, or die, or when daughters marry (Van Etten, 1992). Usually the eldest daughter who has worked longest with the mother inherits, and she divides the plot with her younger sisters. If there are no younger sisters, or if all have already enough rice land, it is the turn of the next generation. This inheritance system assures women of the labor force of their daughters, and assures daughters of their future land rights. Up to ten kilometers distance is reported between a woman's inherited rice plot and her marital residence. Women keep these plots even in case of divorce, or during illness when the plot is fallow for several years, or after neglect of obligations to work on the land chief's field (Somé, 1991). Women can mutually borrow and lend their land for periods of one or several years in case of migration or sickness (cf. Groesz, 1992: 28). If anyone in African land tenure can be called proprietor of the (rice) land, this is the inheritor.

Husband's lineage: women's use rights. If there are no plots in the matriclan to inherit or if a woman marries far away in these virilocal societies, where women go to live with their husband at marriage, she can get a rice plot from her husband's family, especially when she gets older. Not only her husband, but especially her husband's mother, sisters and aunts should agree. Generally husbands prefer their wives to grow rice, rather than their sisters who 'are going to feed another family'. It is his interest and his obligation to find a plot if his wife cannot get one otherwise. However, men do not support their younger wives' land requests, if women's own productive activities would jeopardize their labor obligations on men's upland fields. Most wives get life-long use rights but in case of divorce they cannot take the plot to 'feed another man'. There are exceptions to this rule especially when the divorce is on the husband's initiative (Van Etten, 1992). The land chief has no role in intra-household plot transfers. Rice cultivators should only respect

the rules and obligations. Women married into the land chiefs' family, on the other hand, may benefit from the relative abundance of rice land available via their husbands.

Request to the land chief: establishing new rights. The growing population density increasingly leads women to ask the land chiefs for permission to occupy unused land in the valleys. Women go themselves or mothers negotiate with a land chief on behalf of their daughters (Van Etten, 1992). In several villages and ethnic groups, husbands accompany their wives in their formal requests, or brothers accompany their sisters. According to a Senoufo male land chief 'nowadays women should not bother their husbands any more and should address themselves directly to the land chief.' Elsewhere, however, it may be impossible for women to obtain a plot without the husband's formal request to the land chief. This is the case in a Gouin village studied by Somé (1991). Here women need the approval of both their husbands and the male land chief. This land chief allocates at best one small plot because 'if women get more land they are not going to work properly on their husbands' fields'. Divorced women can hardly acquire land, and one of them complained that 'the land chief does not have the same confidence in women as in men'.

In principle, plots requested from the land chief become the property of the clan who made the request. In some parts of the Comoé Province, families can still vest new permanent rights in valley land acquired via the land chief. In other parts land chiefs increasingly prevent people from establishing longer-term use rights by allocating land for one to four years only. For example, the Gouin land chief in the study just mentioned (Somé, 1991) effectively takes plots back 'even without giving a valid reason'. All twenty women interviewed, including the wife of the land chief, criticized him for keeping a reply to a request for a plot too long in suspense, for imposing the choice of the site, and because the crop shares that he demands are too large. So this land chief considers land under his authority rather as private property which he lends to others against strict compensation. This behavior led at least two of the women interviewed to prefer the state to come and manage the valley, as in the neighboring schemes of OR (Somé, 1991).

So under matrilineal inheritance women have independent access to land in the valley without the interference of husbands and land chiefs. These male authorities or relatives might not even know the location of the plot. Access to rice lands via in-laws requires the husband's mediation. This allows him to effectuate his partial control over his wife's labor. If the intervention of the land chief is required, as a third way to obtain access to land, this may lead either to women's long-term rights, but also to the personal enrichment of the land chief and the hampering of women's timely cultivation and long-term rights.

5.3 Irrigation development by *Opération Riz*

5.3.1 The project

Agency and aim

In the 1970s it was increasingly recognized that irrigation schemes with full water control were relatively expensive in the West African context, so agricultural policies started to pay more attention to the development of swamp rice production. Swamp rice constitutes 25 percent of total rice production in West Africa (Dey, 1984). OR started in 1979 as one of the first projects in this domain. The project's aim is to improve swamp rice production in valleys, increase producers' income and decrease rice imports.

OR is a semi-autonomous project attached to the regional department of the Ministry of Agriculture and Livestock of the Comoé Province, and financed by the Government of Burkina Faso and the European Community. France and the Netherlands provided technical assistance during the period studied. In the first project phase of OR from 1979 to 1986, seven schemes of a total of 860 hectares were constructed. Up to 1993 three other schemes were constructed during the second phase, which continued thereafter. In 1997 the third phase commenced. The important changes in land allocation, which are studied here, took place from 1979 to 1993.

Support provided

The project provides the following technical, agricultural and organizational support, largely financed by the project.

- Two water control techniques are applied (see Annex 1). The first are central drains for quick evacuation of floods, with storage and irrigation facilities for dryer periods. Secondly, bunds are constructed according to the contour lines for improved dispersal of peak floods and for water retention in the dryer periods. The design and construction costs for this infrastructure are borne by OR. All construction work is paid for, except the construction of part of the bunds in farmers' fields. Moreover, a start-up fund for infrastructure maintenance is provided.

- High yielding varieties, such as IR 15-29, 44-18, BR 51-39, and FKR 16, are tested and introduced. Fertilizers, and to some extent pesticides, are provided against payment. Training is given free on infrastructure operation and maintenance, and cultivation practices such as timely sowing. From the mid-1980s onwards credit and marketing facilities are provided.

- In the use phase users in each valley are organized in two-tier water users' organizations, the 'Rice Organization Unities' (*Unités de Groupement Rizicole*) and 'Rice Or-

ganizations' (*Groupements Rizicoles*). The Rice Organization Unities comprise groups per neighborhood or village. The federation of all Rice Organization Unities in one valley composes the Rice Organization.

Conditions

OR provides the support to farmers on two conditions. One condition is their acceptance of the localized land reform on the sites to be improved. For construction the land needs to be expropriated. New plots of more or less equal size are designed, and one producer gets one plot only. So land has to be redistributed, and in most valleys some plots become available for producers who did not cultivate rice before. The project is supported in this condition by national law no. 29-63/AN of 1963 which 'allows the state to intervene at any time in the rural areas according to the criteria of its own development policy and (..) to reserve for the state parts of land which are the object of improvements' (Ouedraogo, 1986: 165-166). OR allocates life-long use rights. Land titles imply membership of the rice organization, the right to operate the new infrastructure, and access to other services just mentioned. As water control is still partial after the improvement, the site of a plot influences the availability of water.

The second condition of OR is that, in the long run, the water users themselves take the responsibility for operation and maintenance of the scheme (*auto-gestion*), and produce according to the new techniques introduced. However, OR has hardly the means to enforce this second condition. Formally, the state is the owner of the improved land, but according to the project Rice Organizations are also supposed to arrange land tenure issues.

5.3.2 Physical design in the project formulation phase

At the start of the project the first decision taken for all schemes was the engineers' selection of a site, according to technical criteria only. At the very beginning of the identification and formulation phase, in January 1978, a hydro-technical study by a French engineering bureau proposed eight schemes of a total of about 1000 hectares for improvement during the next four years (Faye, 1978). They also proposed a plot size of 0.25 hectares per plot, assuming that one cultivator would get one plot. This proposal is not justified. The responsible engineer visited eleven schemes during ten days (OR, Second Half-yearly Report, 1980). He made preliminary designs on the basis only of hydro-technical aspects of the valleys. When phase II of OR was formulated in the mid-1980s, similar rapid technical appraisals were carried out, either in the field (OR, 1985) or, later, on the basis of satellite photography (CEDRAT, 1989).

The site selection implied that these sites would be expropriated, reallocated, and redistributed. Land allocation is defined as the criteria and norms according to which the land

should be distributed. Land distribution is the act of pointing out the plot boundaries to the new right holders. Thus, by selecting the site for improvement it was implicitly stipulated who would lose their rights. The technical construction schedule determined at which time the factual expropriation had to take place, in order to enable construction activities to proceed, and immediately at the end of the construction activities land was to be distributed.

In the following an analysis is made of the decision-making process on land expropriation and reallocation, firstly, during the formulation phase, secondly, during the implementation of the first two schemes, here designated as scheme A and B, and thirdly, in the schemes C and D and the subsequent schemes in which project procedures on this issue crystallized.

5.3.3 Allocation criteria in the project formulation phase

First sociological study
After the engineer's selection of the sites, two sociological studies were carried out. The first study was done by an individual sociologist employed as a consultant by the Delegation of the Commission of the European Community (Ouedraogo, 1978). The other study was carried out by a research team of the bureau *Société Africaine d'Etudes de Développement* (SAED, 1978). Each visited the eight valleys selected by the engineer between March and June 1978, during two to four weeks in total. The researchers communicated mainly with local male authorities, both village chiefs and land chiefs, with men and also with a relatively small number of women. Both explained to the villagers that rice harvests would double after the project. They also mentioned the necessity for land expropriation and reallocation. In one of the eight selected valleys women rice cultivators and the male village authorities opposed the planned construction of infrastructure. Nevertheless, the scheme was incorporated and budgeted for in the project document. Several years later OR canceled this particular scheme for hydro-technological reasons.

The consultant-sociologist studied the prevailing production relations and land tenure, and assessed the likely acceptance by the different categories of people of the project's crystallizing plans. Although he realized that there were no clear allocation criteria yet, for an unknown reason he himself had assumed that new land rights would be allocated to male household heads, or to young unmarried men. The following citations from his reports give a vivid impression of people's reactions.

> *Older men*
> '(..) A village chief said: 'The Government's actions are an honor for our village There will not be any land tenure problem, because the improvement is in every-

body's interest'. Another older man has declared: 'We, the men, do not cultivate rice and are obliged to buy rice from our women. If the scheme comes we will take plots and devote some of our time to the rice in order to have rice for marriages, funerals...

(..) The men declared themselves to be ready to occupy the improved plots.

(..) More than half of the men interviewed agree that their wives will have plots for themselves. Only in Sindu women do not cultivate rice and will not do so after the improvement'.

Young men

(..) Young men are very interested to get a plot. They find that after the improvement, women should rejoin their husbands in the collective plots enabling them to benefit from plot allocation. Then they would not have to go and suffer in Côte d'Ivoire.

(..) It would be interesting if young men find a place in the scheme'.

Women

'(..) The women rice cultivators demand that they get their own individual plots, because, as they say, they themselves take charge of rice cultivation and without rice they will not be able to manage.

(..) During one interview the men and women almost started fighting because one man (the village chief) wished that the women would rejoin their husbands on one single plot. Some women got really worried when I raised the problem of common plots or individual plots. One woman said to me: 'If my husband obliges me to cultivate rice with him, that will not work out. I will never agree because he himself was born finding that women cultivate rice'.

(..) The women are worried about their fate after scheme improvement.

(..) When I was measuring plot sizes young men came and said to me: 'You come to retrieve the plots from women, as in Baguéra? What do you want them to become? Women have always cultivated rice. If you chase them out what are they going to eat?'

(..) People are not well informed. They have been visited by a 'white man followed by black men' and they do not know the problems of a scheme (..). They do not know that not everybody who requests a plot will get one because there will be selection criteria. Especially the women do not know that perhaps the selection criteria will not leave them any chance to have a plot allocated to them. More than 90 percent of the people interviewed do not know what an improved scheme is, as they have never seen one.

(..)The only serious problem will be the fate of women. Do selection criteria allow women to have individual plots?' (Ouedraogo, 1978).

In his description of prevailing production relations and land tenure this consultant underestimated the prevalence of matrilineal inheritance, and ignored the role of female land chiefs. At one place in his report husbands are even ascribed an exclusive decisive role in land tenure. 'Almost everywhere the management of rice plots is assured by men, who distribute the land to the women, who cultivate' (Ouedraogo, 1978). Male land chiefs receive most attention. The consultant emphasizes the need to integrate them in future decision-making forums, especially in order to regulate inter-village problems on land tenure in the valleys that he identified. Representation of the group's interests toward third parties is the typical task of a male land chief in local law.

Second sociological study

The legal void in the project's allocation criteria, as appeared from Ouedraogo's report, has been filled in the later report of the SAED (1978). This report clearly stated that new rice plots would be allocated to the former right holders and cultivators, so predominantly to women. This was justified on the basis of women's existing role in rice cultivation and the willingness that women had expressed to adopt new practices. The authors also seriously doubted whether male family heads would be willing to spend their efforts in labor-intensive rice cropping, since they already cultivated food crops and ground nuts as a profitable cash crop (SAED, 1978: 41). Thirdly, allocation to women was expected to be the outcome if 'the mode of allocation was left to the villagers' (SAED, 1978: 42). The latter was the conclusion of their own discussions in almost all the valleys.

In assessing prevailing tenure relations, however, this report ignored women's independent land rights even more than the first report. Moreover, it ascribed power to the male land chief that he never had traditionally (SAED, 1978: 16, 20).

> '(..)The management of rice plots exclusively accrues to the land chief.
> (..)The valleys for rice cultivation are the 'property' of the land chief'.

The authors also recommended that especially land chiefs should be well informed and 'visit other irrigation schemes in the country'. Further, they recommended that 'a committee elected by the population should be created to follow the project progress, assist in plot allocation and mobilize people's participation'. However, 'the' population is not specified (SAED, 1978: 44). Neither of the sociological studies mentioned procedures to identify the former right holders.

The authors attempted to assess the fit between the number of new plots and the number of existing rice cultivators, who would be the eligible right holders. The engineer's proposal to design plots of 0.25 hectares implied that on the proposed 1000 hectares 4000 cultivators could get an improved plot. The only empirical data available to these sociologists were 45 interviews with male family heads, and the 1975 demographic data of the National Institute of Statistics and Demography. On this basis, the total number of

inhabitants in the villages cultivating in each of the selected valleys was estimated to be 32,136. Assuming that all women between 20 and 60 years produce rice (21 percent of the population), the total number of current rice cultivators was estimated to be 21 percent of this 32,136, or 6748 rice cultivators. This number was higher than 4000. As 'a bad reaction from the population can be expected if only some of the actual rice cultivators can benefit from a plot', the authors proposed two solutions. One was simply to reduce the plot size to 0.15 hectare, which would require 1012 hectares in order to cover the entire target population (SAED, 1978: 41). Thus technology was adapted to social reality.

The other solution was to see whether there are social units that fit technology, taking the 4000 plots as a given (SAED, 1978: 16-17, 39-40). Their demographic data on social unities allowed the authors to consider extended families and nuclear households. So they considered the allocation of one plot per so-called family farm (*exploitation familiale*). The number of so-called family farms was calculated by dividing the total number of 32,136 inhabitants by the average size of a family. The family size was derived from the authors' interviews with 45 family heads in which the members mentioned by this head were considered to constitute his family. The sociologists did not concern themselves with the intra-family organization of the cultivation of this one plot. The calculation gave 2167 family farms, which was far below the planned number of 4000 plots. Therefore, SAED also considered allocating plots to the smaller nuclear households (*ménage*). For this latter the province's average household size was taken, as defined by the same National Institute of Statistics and Demography. The total number of inhabitants divided by this average household size was 6301. This was too high again.

The effort stopped at this point, but this type of 'sociological' reasoning is revealing. Legal persona or entities to be vested with resource rights are invented in order to fit the decisions of engineers, who just had to propose something in order to go on with their technical design and project proposal. The basis for this 'construction of social units' is merely whatever sociological or demographic concepts and data are available, which relate neither to legal entities, nor to rice production units.

5.3.4 Project document and implementation

Project document

On the basis of these technical and sociological reports a proposal for a four-year project *Opération Riz* was submitted to the Delegation of the Commission of the European Community (DCCE) in August 1978. It contained the following citations:

> 'The two aims are the technical improvement of eight valleys of in total 1000 hectares and the intensification of rice production by the introduction of HYVs, fertilizer, etc.. This will increase rice yields from 700 to 3000 kg (..). With a planned plot size of 0.25 hectare the number of beneficiaries will be 4000. These beneficiaries

are primarily the women who already cultivate rice in the valleys that are to be improved (..). The valleys are the 'property' of the land chief who allocates plots to those who request them' (DCCE, 1978).

The construction of the infrastructure constituted 72 percent of the agreed budget. This proposal was accepted for financing in the form of aid and the implementation started in January 1979. At that time the great majority of farmers involved had not been informed at all. A small number of people had some information. The project agents had developed only a rudimentary network with local people, dominated by male elite. However, expectations among men, and fears among women, were raised that the project would allow men to obtain claims on valley land which they traditionally never had.

Project implementation

Phase I of OR continued till 1990, instead of 1983, and not eight but seven schemes were constructed. The time frame to construct the planned infrastructure and to spend the bulk of the negotiated fund, appeared to be too tight. The following Table 2 shows the characteristics of the schemes that were implemented from 1980 to 1993 during phase I and part of phase II. The next sections describe how in the course of these ten schemes the formal producer-based allocation in the project document, was changed into a household-based allocation in practice in the first schemes, before changing back to producer-based allocation again.

Table 2. Characteristics of the schemes constructed by OR from 1980 to 1993

Number	Scheme	Size (ha)	Average plot size (ha)	Year of construction	Total producers	Percentage women	Title criteria
PHASE I							
A	Tanion	188	0.14	80-83	1371	78*	household
B	Dakoro	45	0.19	80-81	235	100*	household
C	Moadougou	106	0.31	83-84	339	96	producer
D	Niofila	101	0.18	83	562	82	producer
E	Badini	130	0.31	84	420	86	producer
F	Kawara	226	0.20	84-85	1142	93	producer
G	Niankorodougou	54	0.16	85-86	331	93	producer
PHASE II							
H	Badini aval I	76	0.19	91	390	79	producer
I	Badini aval II	124	0.19	92	645	80	producer
J	Lomangara	40	0.20	93	203	89	producer
Total		**1090**	**0.19**		**5638**	**85**	

Source: DCCE, 1990; OR 1997

* In schemes A and B women cultivators do not necessarily also own the plot

5.4 Household-based allocation

5.4.1 Land expropriation and allocation in schemes A and B

Local forums and expropriation

In 1979 OR started schemes A and B simultaneously. Under the time pressure to achieve construction goals the project staff concentrated on the refinement of the technical design, land expropriation and the start of construction. To this end the project's staff contacted the village chiefs, the land chiefs and the administrative leaders. With the support of this loosely organized local network, women's rice lands were readily put at the disposal of OR. The network also helped the project to mobilize male wage workers, up to 200 per day, who were needed for paid construction work. The wage rate paid was the official minimum wage. This is about one and a half times the local agricultural wage. One eightth of this wage was subtracted and put in a maintenance fund. The village elite managed this fund. For the unpaid construction of field bunds the project engineers asked men, and supervised them (SNV, 1984). The project also organized a visit for this village elite to a nearby new rice irrigation scheme with full water control in a Turka region. In this scheme plots had been allocated to men, although the women were the traditional rice cultivators.

Separated from this male network, the project's agronomist and the staff member responsible for Women's Mobilization started agronomic tests on farmers' plots, demonstrations and agricultural extension. For this purpose rice cultivators were gradually organized into groups of some 15 to 20 members according to kinship, affinity and neighborhood. The project reached the women via the male network: 'A first meeting has been organized with the land chiefs, the authorities, and administrative village representatives to explain the importance of the creation of a group' (OR, Third Quarterly Report, 1980c). Such 'extension groups' were also already started in the future scheme D. 58 groups existed by 1981 (OR, 1981b: 16; 1984). 57 groups were exclusively female. One male group was established with the rice cultivators of Sindu who cultivated a small part of scheme D.

According to the staff member for Women's Mobilization and a number of women rice cultivators, at the moment of expropriation for construction the women had been given the idea that they would get individual plots themselves on the day of land distribution. The project has never discussed allocation criteria with these well-organized women extension groups of scheme A and B.

Allocation criteria and procedures

In 1980 the project's expatriate management, an engineer and an agronomist, initiated demographic surveys 'to evaluate the total population concerned, to get an idea about the

number of men and women cultivators in the valleys in order to proceed to a more rational redistribution of plots after the construction' (OR, Annual Report 1979-1980, 1980: 7). The questionnaires were addressed to the male household heads and comprised detailed questions on the number and ages of all family members, the number of adult men and women, and sons and daughters, active on the family field and on individual fields, including rice plots. It was also asked whether the family had a rice plot in the valley to be improved or wanted to have one. Note the use of 'the family' as the social unit of analysis.

A field officer in charge of these surveys commented that, in fact, he went to the tax office in the nearby town to collect and check demographic data. For taxation, for instance, active family members are distinguished. They are men or women above 10 years of age. Older 'liberated' women were also distinguished as they have to pay tax individually. This officer also registered the names of people who came to visit him requesting a plot. In scheme B tax lists were also used (Groesz, 1992: 20).

In mid-1980, the project management commented as follows on the findings in scheme A:

> 'An estimation of the population was made in order to know the number of families cultivating in the valley. It was found that 191 families cultivate a rice plot in the valley, and that 791 persons also cultivate an individual plot. On this basis one could reasonably allocate 0.25 hectare to each family and 0.125 hectare to those who cultivate an individual plot (OR First Quarterly Report, 1980a)'.

It is further specified that within these 191 families 243 older women, 498 younger women, and 50 men cultivated rice, giving the total of 791 (OR, Third Quarterly Report, 1980b). The project management interpreted these data in the sense that there were two types of rice plots: individual rice plots of these 791 cultivators, and 191 'family' rice plots. This imaginary family rice plot was, then, counted as a man's plot and added to the 50 individual plots managed by men. This overestimation of the total pre-project number of male rice cultivators is reproduced in all later reports, up to the lists mentioned in the final report of phase I in 1986 (OR, 1986). In scheme B the same occurred. In a later study some of the men in scheme B who had been registered as having had a 'family' rice plot, confirmed that they never had it (Groesz, 1992).

Thus by misinterpreting survey data the project management created a new concept: the family's rice plot, managed by men. Moreover, they proposed this as a viable production unit in which part of the rights to the improved plots could be vested. In this stage of the process, the allocation criteria for individual plots were still based on former rights to individual rice plots.

In 1981, just before construction was finished and the scheme was to be handed over, allocation criteria were finally decided upon in scheme A. Two reports of the same event describe how this occurred.

> 'Information and sensitization meetings on the land distribution and cultivation requirements have been held in scheme A in the presence of the village chiefs, land chiefs and authorities. Unanimously it was decided that one or more plots would be allocated to the family heads according to the number of active members' (OR, Half-Yearly Report, 1981c).

> 'We proceeded to a survey of active members per family in order to guarantee an equitable allocation (..) Contacts were made with the individual farmers concerned. It appeared that they agreed with any form of distribution. Therefore, allocation will be based upon the number of active members' (OR, First Quarterly Report, 1981a).

Thus the project reached the decision on the crucial land allocation matters exclusively within the networks of male elite and other men, with whom the project had achieved its construction goals. Evidently, these men agreed with 'any form of distribution' of expropriated land, which would give them resource rights they never had before. Men's cooperation with the construction project was rewarded with land titles, on top of a maintenance fund and construction wages. Thus women's independent land rights were channeled to men. This was rationalized by the assumption that all rice production is family-based and controlled by the male head. Any resource allocation issue became an intra-household issue, falling under the authority of the male head.

In scheme B the same allocation procedure was followed. This scheme is smaller. Before the project there were 484 rice cultivators, almost exclusively women. Their number already outnumbered the number of plots designed by the engineer, which was 360 (OR, 1980c). Household-based allocation in this scheme was, moreover, explicitly justified as a solution to the scarcity of new plots. So the claims of people with former land rights, women, were categorically nullified because they were too many. Instead, a new category of people, men, who were more restricted in number, was introduced and entitled to land. Adapting the socio-legal unit of allocation easily reduced the number of claimants, and the project's distribution problem became an intra-household issue. The concept of the family farm also served to reduce numbers.

Land distribution

In reality, on the two days of land distribution no demographic lists were used, in neither scheme A nor B. The project's field officers, the village chiefs, administrative authorities and male candidates passed through the valley. Each land chief silently appeared when the group arrived at his portion. Plots were allocated on the spot to any man who presented himself. Formally, the project's field officer was responsible, but the land chief of

that portion closely 'witnessed' the process. Although some less important land chiefs complained they had lost land, rumors abounded that land chiefs put their own family on their portion and 'even allocated plots to babies'. People sent others in their name, or the same person presented himself twice.

Women were not informed how and when distribution would take place. When women saw the group of men in the valley, a number of them came themselves to negotiate for land. The two sisters of the most powerful land chief in scheme B commented:

> 'Our brother, and the village chief, and the people from the project told us that there would be a list of the women wanting a plot. We thought that each woman would select her own plot. The day of the distribution we came too late, because we were not informed. Part of the plots had already been distributed. Then they told us that the plots would not have been enough for all women, because many women would have wanted them, including those who had no plot before. Therefore, they had decided to allocate to the chiefs of the extended households. Our brother had already selected our plots. But he does not know the good sites and he selected a bad site. We are women. We could not do anything. Then, the chiefs of the families divided the plots they had got. First they took a part for themselves, and the rest they divided in small parts for the older women in their family. We have never seen a list'.

In scheme A women felt 'the men have betrayed us'. The few widows who had obtained plots, immediately paid their contribution to the maintenance fund in order to confirm their claims. The amount equals the daily wage for an agricultural laborer. In scheme B both men and women told that they paid this contribution (Groesz, 1992: 37).

In the project reports no mention is made of the factual process of distribution. One report even claimed that the plots had been distributed 'in alphabetical order' (SNV, 1984: 19).[2]

[2] Only by 1985 OR compiled lists of the number and gender of cultivators (not necessarily owners). They changed in the course of the five following years (OR, 1985; 1986; Delegation of the Commission of the European Community, 1988; SAED, 1988; Delegation of the Commission of the European Community, 1990). In scheme A the estimated number and gender of cultivators decreased over these five years from 1616 to 1371, and the proportion of men from 66 percent to 22 percent. This probably reflects the growing recognition by OR that most men who are plot owners leave cultivation to the women. No data are available on plot ownership in scheme A. In scheme B, the total number of cultivators was estimated to be equal to the number of plots according to the technical design, which was 358. The field survey in 1987 showed that, in reality, there were 235 cultivators. In this scheme, OR recognized from the beginning that all cultivators are women. Men, however, were the owners of 44 percent of the plots.

5.4.2 Effects of household-based allocation on productivity and incomes

Land tenure

Six and more years later three studies were done on the functioning of schemes A and B (OR, 1987a and b; Ouedraogo, 1990; Groesz, 1992).

> 'In scheme B, plots were allocated to family heads. The latter have divided those among their women after taking a portion for themselves. Thus the women cultivate half or two thirds of the plot for the man and they themselves have only a small portion which gives them very little in comparison with the charges they bear. It is felt that they need to revise their status. The women want to be owners of the plots they cultivate, which would motivate them much more' (OR, 1987b: 8).

Only 56 percent of the plots in scheme B were found to belong to women, out of 95 plots studied (Groesz, 1992). Among 58 women who worked in rice cultivation in scheme B, the ownership and mode of plot acquisition was studied (Groesz, 1992). 28 percent of them worked only on their husbands' plots. They had not received any land from their husbands but were obliged to cultivate his plot. 26 percent had received some land of their own from their husbands and 21 percent from other relatives, especially brothers. Only 7 percent, all widows, had succeeded in negotiating their own plots directly with OR on the second day of land distribution. Other widows had been less successful on that day, and had not got land through relatives either. Finally, 19 percent of the women interviewed had inherited the plots in the decade since the distribution, or otherwise got their own plot. In all but one case women controlled the harvests of their own plots.

Allocation to men has also strengthened men's control over rice plots vis-à-vis their sisters as rice land inheritors. All improved plots of men in scheme B would go to their sons. Mothers would still pass on the portions of land that they got to both sons and daughters, but the preferences for a male heir increased, especially when the daughter was married at some distance (Groesz, 1992).

Labor and incomes on men's plots

The predictions of SAED (1978) in the formulation phase on the consequences of allocation to men appeared to be valid. Both in scheme A (Ouedraogo, 1990: 11-12) and scheme B men did not abandon their upland food and cash crops to start working in the schemes, but let their wives cultivate their rice plots. However, men's new rights enabled them to increase their control over the harvest. Only on 10 percent of these men's plots did the men themselves provide some help, which was minimal. Nevertheless, in 94 percent the rice harvest of these plots is put into men's granaries, so it is under men's control. In one interview, a woman strongly disagreed when her husband called his plot the 'family' plot,

the expression introduced by OR, instead of the local expression 'man's plot' (Groesz, 1992: 36-41).

Similar observations were made in scheme A.

> 'On husbands' plots women cannot dispose of the harvest as they could before the project came. Most often women are obliged to cultivate their husbands' plots' (Ouedraogo, 1990:11-12).

Men's control over the harvest has probably had a negative effect on women's motivation to produce. According to Groesz's (1992: 41) observations, women's plots were better maintained than men's.

At scheme level it was evident that vesting rights in men had negative effects on production. As formal plot holders, men were responsible for infrastructure maintenance, but most of them refused to do it. Moreover, the male village elite in schemes A, B and C used the maintenance fund to repair a school (schemes A and C), a road, and a prefect's office (scheme B). Amounts of money that completely disappeared (scheme B), or that was rumored to be used for the land chief's pilgrimage to Mecca (scheme C) could not be retrieved by field officers, not even with the help of the prefect. Only in one part of scheme A, where a competent male leader was elected, are the funds still there. However, recent political rivalries have forced him to leave.

People's mobilization for scheme operation and maintenance was also frustrated by the fact that the infrastructure itself soon appeared to be inadequate in parts of scheme A and in the whole of scheme B. Oversizing of the central drain, inadequate leveling and earthen constructions that could not resist the force of the floods, had 'spoiled the valley' up to the point that cultivators wished the project 'to fill up this bad hole and leave'. One can wonder if women rice producers would have accepted the implementation of such a design, if they had been involved in construction work (Dey, 1984). In 1988 parts of scheme A have been rehabilitated. Scheme B is now called 'the lost scheme'.

In 1983, long before these three studies, the same effects had already been noticed. This was done by the director of the regional department of the Ministry of Agriculture and Livestock of the Comoé Province, who also had the formal authority over OR. He had made a study on women's role in food crop production, and clearly highlighted the role of women land chiefs and the widespread matrilineal heritage in rice cultivation (Sérémé, 1983: 7). His vision on OR in 1983 was:

> 'Before land improvement, rice cultivation was almost the exclusive domain of women, who are both actors and beneficiaries as a result of the original land alloca-

tion. After public intervention, the administrative allocation ignores women whose juridical existence is only through the family head. This new distribution of rice land induces a new nature of land operation in which the woman is still the principal actor but no longer the exclusive beneficiary. (..) The improvement of the scheme worsens the situation of women (..) and, as a consequence, the situation of children whose care is fully delegated to women (..)' (Organisme Régional de Développement, 1983: 5-7).

His statement that 'the juridical existence of a woman is only through the family head' is not explained further. Whatever the origin, this may have prevented even him from recommending and changing allocation criteria.

However, in that same year important changes of allocation criteria and procedures were already taking place in the schemes C and D. This occurred in the field, at the lowest hierarchical levels of the field officers, local authorities and women rice cultivators. Time-saving allocation procedures emerged which fully recognized women producers as legal persona and included them in the forums.

5.5 Producer-based allocation

5.5.1 Scheme C

As with the approach in scheme A and B, OR contacted the male elite to inform them about their construction plans and proposed land expropriation and reallocation. Criteria for the latter were vague, but included men. This was done in 1981 so two years before construction would start. From the minutes (OR, 1981d):

> 'In the meeting, the land chiefs expressed their amazement they had never been contacted for the construction of this infrastructure. The village authorities asked whether the survey would only concern the women cultivating in the valley. Mr. (..) answered that a survey would be held among both men and women which would allow allocating the plots more equitably' (OR, 1981d).

After several meetings exclusively with the prefect, the male village chiefs, and land chiefs and the project, the chiefs themselves 'invited the women, because rice is a woman's affair', as one land chief respondent explained. So the women were included in the networks between project and village almost from the beginning, and could influence decision-making in a sort of open forum. Several factors contributed to this.

The women in this valley were warned by the events in both scheme B at some eight kilometers distance, and one of the earlier irrigation schemes at more than 30 kilometers

where women 'had been pushed out' (Ouedraogo, 1978). As Senoufos 'they are not ashamed to express themselves in front of men like the Gouins' [3]. Senoufo women have fewer labor obligations on men's fields and devote themselves fully to their rice plots. No man used to cultivate rice in scheme C before the project. Further, women were already organized in a women's group by the regional department of the Ministry of Agriculture and Livestock. Last but not least, the women had time to negotiate their inclusion in the local forum before construction would start. Apparently, the field officers were receptive to women's claims.

Men in scheme C were also warned by the events in scheme B. Initially, the most important male land chief of scheme C strongly resisted the project's construction plans and could only be 'convinced' when the project called in the help of the prefect. During construction many men still benefited from the wage employment offered by the project. The elite managed, and misused, the maintenance funds. The bad experiences with the physical infrastructure of scheme B has undoubtly contributed to men's limited interest in new plots.

Soon after the first contacts, the existing right holders were registered. A woman leader summarized how the formal allocation criteria, which originally were open to both women and men, were further shaped:

> 'The field officer registered all women per quarter. Some men asked for plots because the field officer said that if it succeeds everybody will have rice. But men do not like the work of rice. Some abandoned them and left them to their women. If you do not work you cannot take the benefits. During the land distribution women negotiated their own plots while men observed, because the women cultivate. For the collective maintenance work men help. Everybody eats the rice'.

Neither demographic surveys nor lists from the tax office were compiled in scheme C. Although the project had given ample opportunity to men to apply for land, only four percent of the new title holders are male (OR, 1986). All women with former land rights got a plot, but many daughters got individual plots as well. The average plot size is 0.31 hectare. In this scheme the central drain has improved water management, and women take up the responsibilities for operation and maintenance. However, the centralized valley-wide social organization required for this technology appeared to be too complicated, and the infrastructure still fails to function fully as designed (Ran, 1990).

[3] Scheme A is cultivated by Gouin, and scheme B by Senoufo who have assimilated elements of the gendered organization of production of the Gouin. Among the Gouin women's labor obligations and men's control over rice land are greater than among the Senoufo.

5.5.2 Scheme D

In scheme D, the first contacts between project and villagers were already established in 1980, whereas construction would only start in 1983. Immediately the project's field officer took the initiative to visit the land chiefs to ask and register who were the actual plot users. In this way the field officer recognized former plot holders as claimants for future allocation. In two villages these former right holders were almost exclusively female. The opposite was found for the N'Gon Dioula of Sindu. This inventory of former right holders, which took just one morning, made the roundabout demographic survey superfluous. Although such demographic lists were still established in scheme D, they were never used.

However, the legitimacy of this procedure was later challenged on completely different grounds. Just before land distribution in 1984 strong controversies arose between the local revolutionary committees (*Comité de Défense de la Révolution*), created at the instigation of the new government of Thomas Sankara, and the traditional chiefs. In the two villages with female cultivators, the revolutionary committees accused the land chiefs of favoritism and demanded that the inventory be made again. The prefect preferred not to intervene in the conflict. Members of these committees placed primarily their female family members on the lists. In one village six percent were men, and in the other 26 percent. In both villages some 250 new cultivators were added, half of the total number of new plot holders. Plots vary between 0.10 and 0.15 hectare. The men of Sindu, whose number did not change, got 0.30 hectare each. Women participated in land distribution.

The physical infrastructure also changed from scheme D onwards. Strengthened bunds according to the contour lines and soil leveling were more adapted to the geo-hydrological environment and easier to operate by rice cultivators, who had always managed water via bunds. This technique hardly required new centralized organization for scheme operation and maintenance. The only new requirement was that water flows also have to be led to lateral plots, and not only to those of downstream neighbors. Costs per hectare for this infrastructure were estimated at one eightth of the costs of central drains with irrigation facilities (SNV, 1984; Ran et al., 1992), so the opportunities for male wage employment were also less. This has probably further inhibited men from interfering in land allocation as in the earlier schemes. Scheme D is cultivated by Turka. Women's labor obligations are comparable to those of the Gouin.

5.5.3 Project procedures for expropriation and allocation

This new approach developed by the field officers, local chiefs and rice producers further crystallized in the three schemes that followed from 1984 to 1986. From 1987 onwards OR summarized these tested practices gradually into a consistent and transparent proce-

dure of expropriation, allocation of rights and stipulation of conditions (*cahier des charges*). In the next three schemes, constructed under phase II, this was further refined and written down. This written piece of project law now structures both the interactions between project and villagers and between project and prefects and other administrative authorities. The whole procedure costs less time than the demographic surveys. The point is that it begins in time, before any construction. It also effectively integrates useful elements of local law, like the knowledge of the land chiefs. By prioritizing the former land users it satisfies the feelings of fairness of both women cultivators, their male relatives and the local elite. These are the elements:

Information for all concerned. OR organizes public meetings with village authorities, administrative authorities and all current rice cultivators in a selected area. OR explains, firstly, the project's proposals for the construction of infrastructure, and the accompanying land expropriation and reallocation criteria and procedures. Secondly, the rights and obligations for future plot holders are stipulated. Thirdly, OR indicates their future assistance for crop intensification, operation and maintenance of the scheme and users' organization.

Registration of current plot holders. Before any construction is started, field officers make an inventory of current plot holders in the field. They register name, sex, age, quarter or village, ethnic group, whether a woman is liberated or non-liberated, number of plots cultivated, plots held in neighboring improved schemes that have already been improved. In the field or later on, the names are checked with the male or female land chiefs.

Registration of new applicants. OR decides on the plot size, and thus how many 'have-nots' can also benefit from the intervention. With the project, ethnic groups which did not have any land rights before, like Blacksmiths, are also included. Interested new candidates register with the field officer. In practice, women appear to remain the majority of new applicants. In some cases male land chiefs submitted requests, which were difficult to refuse. However, in the few regions where fertile uplands have become scarce, men are increasingly reported to register and also start cultivating rice (OR, 1997). These men have to negotiate their wives' labor, and also to pay women wage laborers. Their upland crops remain their priority.

Placement and land distribution. Rice cultivators from the same quarter or village are placed in the same portion of the improved scheme for reasons of social cohesion. Further plot selection is at random. On the days of distribution, plots are distributed according to lists of rights holders and topographical maps. A committee of project staff and male village and administrative authorities supervises the process. However, female land

chiefs and users who do not occupy a position of authority, and all women, are still not represented in these committees (OR, 1991).

In general, women rice cultivators accept this drastic change in land tenure imposed by OR, especially those who gain more land, or acquire better situated plots. However, former land holders still find it difficult to shift to another site, where 'others have buried their sacrifices'. This shift implies that claims on a site that were built up over the generations, vanish. Incidentally, women try to return to the old site immediately after land distribution, or whenever the new right holder stops cultivating there. With increasing external interference, the crop shares that cultivators used to give to the land chiefs in local tenure are decreasing. Evidently, land chiefs regret this erosion of their traditional power (SAED, 1988; Ouedraogo, 1990).

Before the project most women cultivated two plots or more. The project has the uniform rule that rice cultivators can receive only one plot. It is appreciated that less time is needed for travel (Groesz, 1992). A disadvantage, however, is that cultivation risks are no longer spread. In order to avoid risks some cultivators are reported to have started cultivating second plots in unimproved local valleys (Ouedraogo, 1990). Another disadvantage is that the former flexibility in tenure decreases. Division of plots already occurs.

Again: the family farm

In 1988 phase I of OR was evaluated in order to reach recommendations for the next phase (SAED, 1988). The sociological evaluation adequately described the prevailing production relations. It highlighted, for example, that both older and younger women cultivate rice, and that older women have no time constraints. Male land chiefs are reported to insist on the continuing inclusion of older women, as they depend on rice for their survival. Local men 'do not disagree' with plot allocation directly to their wives. The author even acknowledges that the concept of the family farm is problematic in the local farming system. 'It is difficult to distinguish between family fields and individual fields of men because both types of fields are cultivated by the same family members' (SAED, 1988). However, in the concluding recommendations of this report the imaginary family rice plot, managed by the male head, is put forward once again.

> 'The field studies show that traditional rice cultivation is a quasi-exclusive women's affair, especially of older women. Should such a situation be continued by allocating land exclusively to women? This raises the following questions:
> - problem of infrastructure maintenance. Could one count on their contributions to ensure maintenance of the infrastructure?
> - what attitude would men have if they saw economic power concentrating in women's hands?

- what future would the project have if it is only carried out by older women? Would the objective of production increase be achieved? Could the cooperative spirit be initiated?
- would the objective of self-management be possible?

In fact, the basis should be laid now for a progressive elimination of presently predominant production forms (exclusively female) in favor of familial and collective forms. Those forms (..) could allow a growth in production by installing a credit system.

Therefore, we suggest that in plot allocation one allocates both individual plots and family (..) plots. Individual plots of 0.25 hectare will be allocated to the women already present in the valleys that will be improved. (..) Family plots will cover 0.50 hectare. With the expected profits, the production conditions (*cahier de charges*) that will be imposed on men to work on the plot, will bring rice cultivation to a higher level than that of secondary crop as at present'.

Apparently, neither ten years experience of trial and painful error, nor the answers of the respondents to their own questions, prevent the authors from claiming the rationality of the imaginary family farm, which implies men's preferential treatment in the allocation of resource rights. Fortunately, these recommendations were never applied. The allocation criteria and procedures as they were crystallizing in the field, continued, serving the income needs of former producers, offering opportunities for both female and male new cultivators, and providing optimal conditions for agricultural growth at the same time.

5.6 Conclusions

Poverty alleviation and productivity

Rice land is an important asset for women in the Comoé Province. Their own rice plots provide them with an income to meet their own needs and the needs of their dependents. Older women depend almost entirely on rice for their livelihoods. Men are hardly interested in rice cultivation because their farming priorities lie on the uplands, in accordance with the gendered farming system among these ethnic groups. Only in places where fertile uplands are becoming scarce does men's interest in rice land grow.

The expropriation of women's rice lands and the reallocation of these lands to men, in the first two schemes of OR, evoked considerable and constantly repeated complaints by women. Men gave only a part of their new plots to the women, and also expected them to cultivate the men's rice plots. The majority of men neither contributed labor on their plots, nor did they take up their responsibilities for scheme maintenance. In later schemes, however, land was reallocated to women who were the former right holders and to new entrants. The project still offered men the possibility of obtaining rice plots after improvement, but only a few men took this opportunity. Hence, land allocation exclusively

to men had several negative impacts on women's well-being and on land productivity, which did not happen under land allocation to both women and men, prioritizing former right holders.

Exclusion and the role of the agency

In schemes A and B, women lost their former land rights, and the male elite and other men were endowed with rights they traditionally did not have, because decision-making was confined to the project staff and male village elite. Even though the project had already organized the women, they were excluded from these negotiations.

The formal allocation criteria in the project document, according to which allocation was to women as former right holders and rice producers, were ineffective. The document failed to stipulate procedures for the registration of former rights, and failed to define women's roles in the local forums in which allocation criteria would be further defined and implemented. Thus, this formal policy only served to raise false expectations among women, to convince them to give their lands for construction, and to prevent them from engaging in timely and effective negotiation (and it served to mobilize donors' funds).

The project management filled this void by designing its own project law of registration procedures through demographic surveys, and of allocation criteria. At the very last moment, just before handing over the scheme, the original producer-based allocation criteria were changed into household-based criteria. The project decided this together with the male elite and others with whom they had established communication networks and most intensively collaborated. This collaboration had been essential for the 'merely technical' construction activities.

The project strongly set the agenda and the pace of events of activities at local level. Rapid implementation of construction plans was the main objective of the project, in order to meet the tight construction schedule. As in most construction projects, the donor had allocated funds on the basis of a technical pre-design and an estimate of the construction costs, which constituted the largest part of the budget. These construction plans had been conceived and agreed upon by the donor without the cultivators on the sites selected even being aware of them.

Because of these financial commitments to the donors, a supply-driven implementation of pre-conceived construction plans became the short-term aim in itself. At local level project staff were primarily seeking for acceptance and implementation of these plans. This comprised, firstly, the fine tuning of the site selection and layout of the pre-design; secondly, the smooth effectuation of land expropriation, as required to start construction; and, thirdly, the mobilization of paid and unpaid labor. The local male elite was the most easily accessible and effective partner for arranging the delicate expropriation issues and

for mobilizing labor. After their support for the implementation of the project's tasks, access to the improved resources was a kind of reward. In fact it would have been difficult to deny them their voice in negotiations on the improved resources. Moreover, local endorsement was needed. Thus, in participation with 'the farmers', exclusive allocation criteria were decided upon.
The sociologists in the project facilitated these exclusion processes in two ways, although they themselves were also excluded from decision-making. Firstly, they reported selectively on the complex local relations, by paying disproportionate attention to the perspectives of the elites and men, compared to their actual role in rice production and in land tenure. They ascribed forms of authority to land chiefs and men in general which they traditionally never had. Whereas the sociologists easily recognized women's labor power, they ignored their roles as decision-makers in farming and their traditional resource rights. It is true that land chiefs exercise important roles in the interactions between their own group and third parties, but this inter-group power cannot be equated with intra-group power.

Secondly, the construct of the unrealistic 'household farm' by the sociologists and demographers, and later by the technical project management, was instrumental in rationalizing the preferential treatment of men over women. Allocation to 'households' justified the reduction in the number of potential claimants, even though the large new category of male household heads was added. This facilitated a so-called 'rational' distribution of scarce new resources. The concept inadequately described production relations, and it was even less of a legal entity. In local law land rights and control over the products are separate, and in complex ways embedded in marital arrangements. The assumption that the land title holder would distribute resources under his control in an egalitarian way and among all members he is supposed to represent did not fit reality.

Inclusion
A certain time span between the first interactions of the project with local people and the implementation of construction activities allowed the rice cultivators in later schemes to participate in decision-making with the field staff and male elite. Thus consensus on the outlines of resource expropriation and reallocation was reached before construction started. Awareness of the implications of the project's plans, as observed in the nearby scheme B, incited women to prevent this exclusion, and probably decreased men's interest in becoming included also. This process of negotiation was smooth, because it fitted existing production and tenure relations, and because the field staff were receptive to local reality. Respect for local reality, including oral land registration practices, even saved time. The total time input needed to reach this consensus on changing land rights, and to register the former plot users, was considerably less than for the extensive demographic surveys. It was done at the proper time.

Comparison

A comparison with the Jahally Pacharr irrigation project in Gambia highlights that the case of OR is not unique. This project also aimed at improved rice production in an area where women were the main rice cultivators. Women also had quite substantial pre-project land rights, and controlled the rice, although to a lesser extent than in the Comoé. Unlike the case of OR, the pre-project gendered farming system and women's land rights were thoroughly studied, and lessons from earlier male-biased projects in the region were well documented (Dey, 1980). As in OR, the objectives of the Jahally Pacharr project clearly articulated the protection of women's land rights. However, this did not affect the events. Tight construction schedules required rapid expropriation of land. This was endorsed by the local elite who signed agreements to lease the land to the state for 99 years. The engineers designed 'household plots', assuming a unitary family farm and assuming that land was to be allocated to the male household head. Only at the end of the construction phase did the project hire a legal expert to arrange land allocation. Then it was too late for an inventory of former land rights. Moreover, by then, these elite groups had already consolidated their power in the Water Allocation Committees that were created at the instigation of the project. As a consequence, the elite, and their wives, obtained disproportionate access to the improved plots in the pump irrigation scheme. Unlike OR, where the men were not very interested in the project's support, the technology package offered by the Jahally Pacharr project in pump irrigation schemes led to the highest average net returns per labor day of any crop in the region (Dey, 1990: 9). Only after all men had obtained their plots in the pump irrigation schemes, did women get their own plots in the less profitable tidal irrigation schemes (Verkruijsse, 1991; Carney, 1988).

In both cases the change in resource rights, namely a localized land reform, was far-reaching and visible. In both cases this reality has been documented. In other public irrigation projects, less visible and less documented expropriation of former land and water rights and exclusion from new rights of the poor may well have remained unnoticed. The assertion that 'the population' participated in decision-making is no guarantee that the poor were included.

Recommendations

The case of OR learns that other public irrigation agencies target their support to poor producers, if they:

- study poor people's production relations and the land and water tenure institutions prior to the project, rather than restrict their research and inventories to traditional or modern authorities who represent the group to third parties, or are assumed to do so,
- distinguish intra-household production units and gendered resource rights, rather than assuming a unitary family farm, represented by the male head,

- provide support to organize the poor producers from the first contacts onwards in a local forum for further decision-making on changing resource rights, rather than interacting and negotiating local endorsement on these issues only with the male elite,
- organize women and men separately, and ensure women's effective participation in decision-making,
- reach consensus on arrangements for expropriation, compensation, and reallocation of resource rights, well before plans are implemented and construction starts, rather than imposing decisions and leaving decisions in suspense till the last moment,
- stipulate which priority target groups are to be vested with rights to the newly developed resources, rather than considering resource development as a neutral task,
- evaluate the project's performance in that light, rather than rewarding supply-driven, short-term implementation of seemingly neutral tasks,
- are aware that the construction phase is not a 'merely technical' phase.

6. Evaluation of private irrigation in Bangladesh

6.1 Introduction

Research subject

The present field study on private irrigation in Bangladesh concerns NGO-supported collective ownership of mechanized irrigation pumps by poor women and men. In the prevailing farming system in Bangladesh private pump ownership is concentrated among the larger and medium farmers, and irrigated agriculture is a male cropping system. Rice grown in the dry (*boro*) season is the most important irrigated crop. The demand for water on the private water market in Bangladesh makes pump ownership also a potential income-generating activity for the landless, including women.

The NGOs that support private irrigation by the poor are development agencies explicitly aiming at poverty alleviation and targeting marginal farmers and landless people. The organization of the poor into groups is the first step in intervention. Women and men are organized into separate groups. In Bangladesh the large majority of groups are women's groups. Women use external resources to improve their own well-being, but they also act as the household representatives who mediate the external resources to male relatives. Accordingly, some NGOs adopt an 'empowerment approach', aiming primarily at women's own well-being, whereas other NGOs that see women primarily as household representatives, adopt a 'household approach'. Once the poor are organized, NGOs provide support for a range of activities adapted to the needs and potentials of these groups. Irrigation support is one of the possibilities. The NGOs aim to vest pump ownership in their target group, both for irrigating own household land and for water sale. They provide loans for the purchase of pumps and operational costs, and provide technical and organizational support.

This field study focuses on NGO-supported irrigation development in groups in which women are the organized household members, and in which irrigation loans are taken in women's names. Such groups are called 'Female Irrigation Groups' (FIGs). In Mixed-sex Irrigation Groups (MIGs) members of both male and female groups take pump loans in their names.

Note that the context under which irrigation is taken up is the opposite of the situation studied in Burkina Faso. As described in the former chapter, the early forums at the interface between agency and local people were male-dominated, although rice cultivation is a female cropping system. In Bangladesh women are well represented in the local groups, whereas irrigated rice cultivation is a male cropping system, dominated by the larger farmers.

The research questions are:

1. a. What are the economic gains of the irrigation enterprises and how are the gains distributed?
   b. Do the irrigation enterprises improve women's economic well-being?
   c. Do the irrigation enterprises improve women's non-economic well-being?
   d. Do the irrigation enterprises improve production?

2. Which inclusion and exclusion processes take place in the NGO-supported irrigation enterprises?

3. What is the role of the NGOs in targeting the support to the poor, and avoiding leakage?

4. Which recommendations can be derived for irrigation agencies supporting private irrigation, to better target the support to the poor, and to avoid leakage?

The field study includes 52 irrigation groups supported by six NGOs. They represent

- the empowerment approach:
  - Proshika Manobik Unnayan Kendra (in short: Proshika),
  - Comilla Proshika,
  - Shaptagram Nari Swanivar Parishad (SNSP), and
- the household approach:
  - Rangpur Dinajpur Rural Service (RDRS),
  - Grameen Bank Tangail[4],
  - Bangladesh Rural Advancement Committee (BRAC).

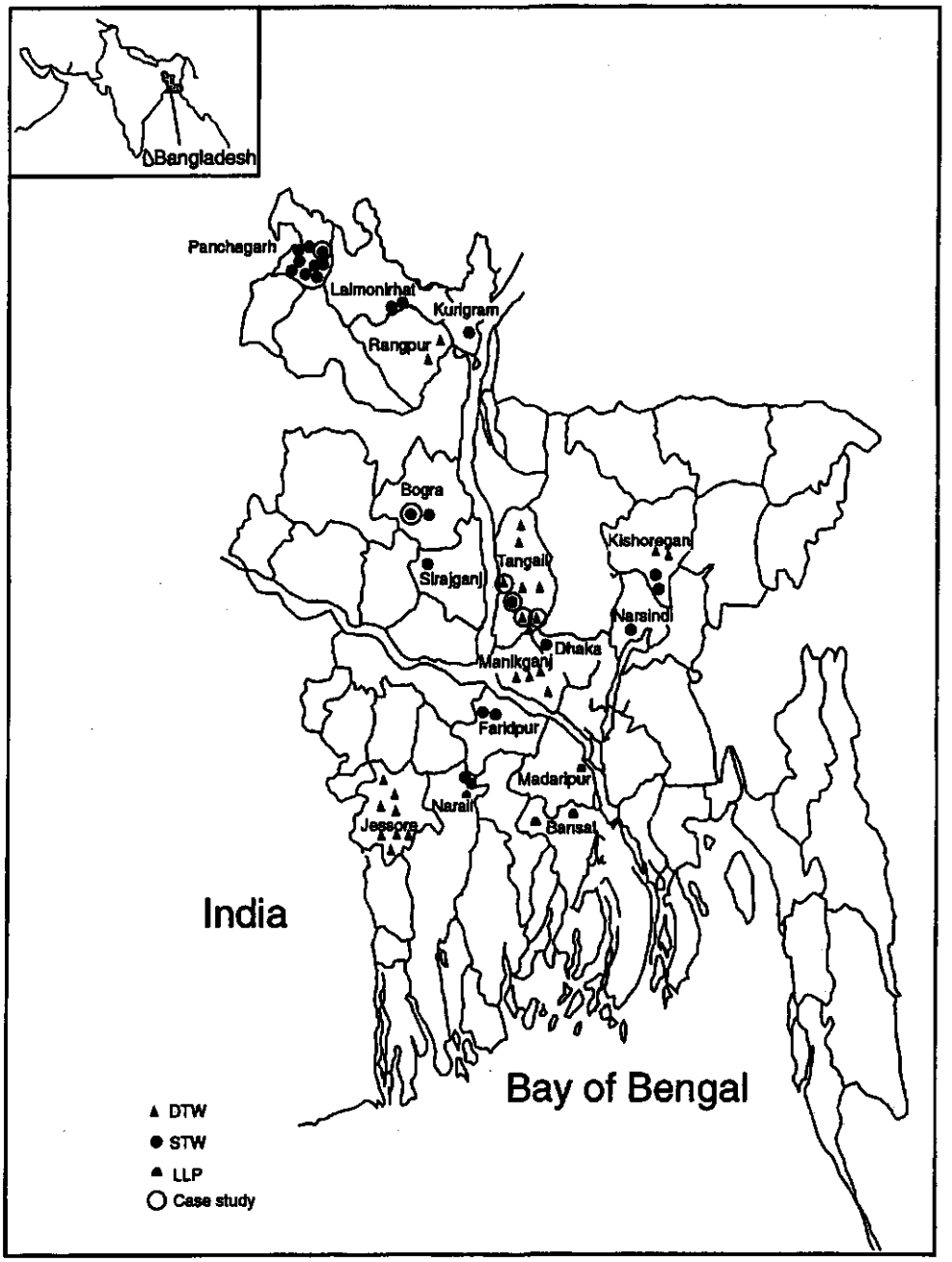
Five NGOs aim at self-management of the irrigation enterprise by their (male or) female groups (FIGs). The sixth NGO, BRAC, co-manages the irrigation enterprise together with shareholders in mixed-sex groups (MIGs).

Sample and methodology

On the basis of a national inventory of all NGO-supported irrigation groups in Bangladesh, these six NGOs were selected, covering 92 percent of all female and mixed-sex irrigation groups, and representing both targeting approaches.

[4] It is noted that Grameen Bank is a financial development institution rather than an NGO. However, the irrigation program of Grameen Bank in Tangail and the type of financial, technical and organizational support provided are quite comparable to that of the other NGOs, so in this chapter it is also referred to as an NGO.

Figure 2. Location of the 52 irrigation groups in the sample



For each of these NGOs either all FIGs or a representative sample of the FIGs and MIGs were studied. This sample comprised 33 self-managed FIGs of Proshika, Comilla Proshika, SNSP, RDRS and Grameen Bank, and 19 MIGs of BRAC. The geographical dispersion of the 52 irrigation groups is shown in Figure 2. The names of the groups are listed in Annex 2. The 33 FIGs were studied in the irrigation season 1993-1994. The 19 MIGs of BRAC were visited in the irrigation season 1992-1993.

From the 33 FIGs four cases were selected, which included both the household approach (RDRS Case and Grameen Bank Case) and the women's empowerment approach (Proshika A Case and Proshika B Case). Two cases of the BRAC MIGs were also studied in-depth (BRAC A Case and BRAC B Case). The six cases were selected on the basis of relatively high profitability, strong participation by women and at least three years of functioning. These cases were studied throughout 1992 and 1993, and in late 1994 an in-depth analysis was carried out.

For the country-wide study of 33 FIGs, structured and unstructured interviews were held separately with the multiple actors involved: women group leaders and irrigation managers, women members who were less vocal, husbands, other male relatives, pump operators and linemen, water users, village elite and other unrelated men. NGO staff at the headquarters, at the local offices and in the villages were interviewed using checklists. NGO staff also supplemented the financial data. In the country-wide study of 19 MIGs interviews were held with leading IG-members, and with BRAC officers in the field, and at the area and headquarters level. For the economic analysis, BRAC Area Offices provided data on the economic performance for a total of 69 enterprises in their areas.

The in-depth study of the six cases was done on the basis of interview guides for women managers, women members, husbands, male relatives and unrelated men. Effects on productivity, in the sense of water buyers' satisfaction with the water service, and non-economic effects have only been assessed in these case studies (Safiliou, 1994).

The research was carried out as a project entitled 'Female Landless Irrigation Groups in Bangladesh'. The national coordinator was Simeen Mahmud, assisted by Bashir Ahmed and others, of the Bangladesh Institute of Development Studies, and with the author from Wageningen Agricultural University as the expatriate coordinator. The project was funded by the Special Program Women and Development of the Netherlands Development Assistance of the Ministry of Foreign Affairs.

Part of the research findings have been presented in three publications.

- Female Landless Irrigation Groups in Bangladesh: present situation and research priorities (Wageningen Agricultural University and Bangladesh Institute of Development Studies, 1992),

- Female Landless Irrigation Groups. A study on the gender aspects of minor irrigation managed by the landless in Bangladesh. Report of Phase II: Exploratory field research during the *boro* season of 1993 (Van Koppen, 1993), and
- Women and water-pumps in Bangladesh: the impact of participation in irrigation groups on women's status (Van Koppen and Mahmud, 1996).

This chapter presents a further analyis of the field data, and includes two case studies that have not been published yet.

Structure of the chapter
In Section 6.2 the prevailing farming system is described. This comprises the prevailing class and gender relations in irrigated rice cultivation, mechanized pump irrigation and the water market. In Section 6.2 the general NGO approaches are presented. The organization of the target group before irrigation is discussed and the predominance of female groups is explained. The six NGOs in the sample have developed different irrigation programs with specific support packages, as indicated in Section 6.4. The economic performance of all irrigation enterprises is presented in Section 6.5. Section 6.6 focuses on FIGs and describes the different forms of participation of men and women in the enterprises, and the corresponding division of economic benefits. Female-managed, jointly managed and male-managed FIGs are distinguished. The relationships between this gendered participation, the NGO's targeting approach and the strength of the group are assessed. It is also indicated who are systematically excluded from any participation. Section 6.7 deals with these issues for the co-managed MIGs of BRAC. The effects of women's participation in the different types of irrigation enterprises on their non-economic well-being are elaborated in Section 6.8. In Section 6.9 conclusions are drawn.

6.2 Prevailing farming system

6.2.1 Agrarian structure

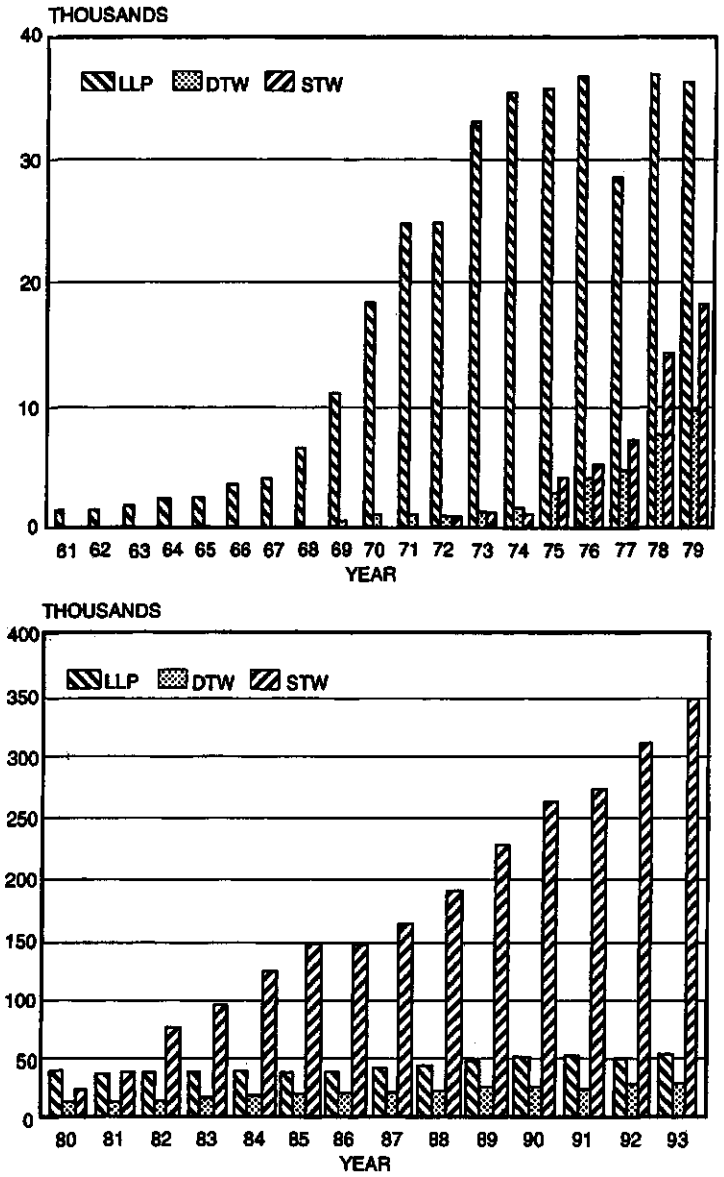
The agrarian structure in Bangladesh is highly skewed. The highest 20 percent of the rural population owns 56 percent of the land, whereas the lowest 20 percent has only two percent (Jazairy et al., 1992: 414). However, owing to population pressure and the lack of off-farm employment, the small farm of one hectare is the dominant form of production. Holdings of more than three hectares constitute only five percent of the total holdings, representing 26 percent of the cultivated land (Hossain, 1989: 22-23). Plot fragmentation in Bangladesh is the highest in the world. Two fifths of the holdings have more than ten land parcels scattered over the territory of one or more villages (Jazairy et al., 1992: 416; Hossain, 1989: 22; Mandal and Parker, 1995).

Self-employment and employment opportunities are also skewed along gender lines. In rural Bangladesh, women's and men's intra-household production units roughly correspond to the spheres of homestead and non-homestead production (Sarkar, 1987; Westergaard, 1993). Especially in higher classes, social taboos on women's movement outside the house, and prejudices that 'crops are spoilt if women go to the fields', restrict women's employment. Rice cultivation in the *boro* season is a predominantly male cropping system. Men have most access to the land, they mobilize inputs and the labor of male relatives and to some extent of female relatives, and of wage laborers, and they control the harvests. Among the poorest, however, women's participation in non-homestead production and in irrigation tasks is higher (Safiliou and Mahmud, 1989; Jordans and Zwarteveen, 1997). Women of all classes process the crops, manage the stocks for family consumption, and may use some paddy for saving and for sale to traders. Women earn their own incomes, for example, by vegetable and fruit growing, poultry and the sale of eggs, rearing goats and cows and the sale of milk, handicrafts, paid domestic labor, and wage labor.

6.2.2 Minor irrigation development

In the *boro* season from November till May, ground water irrigation by electric or diesel Shallow Tube Wells (STWs), Mini Shallow Tube Wells (MSTWs) or Deep Tube Wells (DTWs) and surface water irrigation by Low Lift Pumps (LLPs) are widespread. Since the 1960s the number of pumps and the acreage of irrigated land have increased rapidly (Mandal and Parker, 1995). The growth has been the highest for STWs, leading to a total of 349,000 pumps in 1993. During this same period the number of LLPs increased to 52,000 and the number of DTWs to 26,000 (see Figure 3). In terms of total coverage, these three irrigation technologies covered 2.3 million hectares in 1993, which was 26 percent of net cropped area, 34 percent of potential irrigable area and 82 percent of actual irrigated area. High yielding *boro* rice was most often cultivated. Production registered an average increase of 9.1 percent annually between 1981 and 1992. Thus Bangladesh attained self-sufficiency in rice. Besides irrigating rice there is also supplementary irrigation of wheat, tobacco, vegetables, potatoes, pulses and *aus* (pre-monsoon) rice in some areas, which results in higher and more stable yields.

Figure 3. Number of minor irrigation equipment in Bangladesh, 1961-1962 to 1992-1993



Source: Mandal and Parker, 1995: 20.

Note: Years refer to financial years, e.g. 80 refers to 1979-1980 and so on.

The basic characteristics of these different pumps are indicated in Table 3 and Annex 3.

Table 3. Characteristics of different types of pumps

Pump	Discharge (liters/second)	Possible command area (ha)	purchase price 1993 Tk*	life time (years)
MSTW	14	4	8,000	2-3
STW	28	10	20,000	7
DTW	56	25	175,000	10
LLP	56	25	150,000	10

Note: $ 1 = Tk 38 (1994)

In most of rural Bangladesh, ground water tables are high and aquifers are easily recharged during the monsoon. At the end of each dry season, however, water tables may have lowered so much that the more shallow pumps installed on high land fall dry. This affects especially hand pumps for domestic water. Recently, ground water appears to be polluted by arsenic which dissolves because of the increased concentrations of sub-soil oxygen.

From public to private irrigation

In the early 1960s, the parastatal Bangladesh Agricultural Development Corporation (BADC) initiated mechanized pump irrigation using LLPs and DTWs, mainly in the Comilla region. STWs were included in the program in the early 1970s. In the earliest schemes, BADC purchased the pumps and installed, operated and maintained them. Farmers only paid for the water delivered. Subsidies were high but management problems abounded. Therefore, LLPs, DTWs, and STWs were gradually rented out at subsidized rates, or sold. Management was handed over to individual male farmers or male farmers' cooperatives (*Krishok Somobai Samity*) organized by the Bangladesh Rural Development Board (BRDB). Since 1989, 'reputable NGOs and informal groups' have been accepted as clients of formerly rented DTWs and LLPs (Haggblade, 1990). In the early 1990s, the last stock of BADC's DTWs were sold at subsidized rates of Tk 175,000. BADC's role in minor irrigation has been negligible since then.

Under public irrigation only richer farmers had access to the state distribution channels and to the commercial credit lines. The only effort by the government to involve landless and marginal farmers was undertaken in a project funded by the Ford Foundation, 'Irrigation Assets for the Landless'. It started in 1983 but failed because of institutional, technical, and organizational problems and was closed in 1990 (Hakim, 1986). This project was exclusively directed at men.

State deregulation in the trade of equipment, decreases in import duties, and liberalized credit and financing facilities, especially for STWs, were observed after 1979. As seen above, a boom in adoption came in 1987, when the private market imported and distributed engines and motors for STWs, mainly from Japan, and later the Mini STWs from China. Command areas of DTWs and LLPs have been greatly encroached upon by STWs and MSTWs.

With the liberalization in the trade of equipment, pump ownership has become less skewed. In 1985 only 13 percent of all STW owners belonged to the category of farmers with less than one hectare of land. In 1994, after widespread privatization, this proportion had doubled to 27 (IIMI and BAU, 1996: 124, Figure 1). The limited financing facilities for smaller farmers still represent a major handicap (Wood et al., 1990; IIMI and BAU, 1996).

6.2.3 Water market

Because holdings are small and composed of scattered plots, it is rare for anyone to own a pump, even the smallest MSTW, exclusively for irrigating his own land. Intrinsically to the technical design, pumps give an excess of water. Private pump owners sell this to neighboring farmers in the command area. Even larger farmers who irrigate part of their lands with their own pump are water buyers on their other irrigated plots. Independence for irrigating one's own land is the primary incentive for pump ownership. Therefore, farmers tend to prefer smaller pumps, which also avoid the managerial problems of water delivery to large numbers of water buyers.

In most areas in Bangladesh, water is paid for in crop shares at harvest time. Proportions vary between 3/16, if pump density is high and competition fierce, and 1/3 if the command area is sandy, water tables low, capital investments high and recent, and if the pump owner has a monopoly. If water is paid for in cash, the buyer needs to prefinance at least part of the costs. Sometimes water buyers bring their own fuel for the use of diesel pumps.

Pump density and the possibility for tail-enders to shift to other water sellers have increased so strongly that the supply of water is competitive. This competition in supply, a critical characteristic of a 'market', improves water delivery and lowers prices. This is in the interests of all buyers, and especially of those marginal farmers who cannot afford to become pump owners themselves.

This demand for water renders investment in pumps attractive not only for farmers whose primary aim is still to irrigate their own lands. Selling water can become the main aim of investors who are less interested in using the water on their own cultivated land, or do not have land. These are the employment opportunities tapped by NGOs.

6.3 NGOs

6.3.1 Aims and organizational support

The embeddedness of irrigation support in the broader development goals and intervention approaches of the NGOs has major implications for the inclusion of poor men, and especially of poor women, in irrigation. The explicit main aim of many NGOs in Bangladesh, including the six NGOs studied here, is poverty alleviation. They target the functionally landless, that is those who earn more than half of their livelihood by selling their manual labor, artisans, craftsmen, and fishermen. NGOs attempt to redress the imbalance in power relations by altering the dependent relationship between the poor and the rich in favor of the former. Their intervention is two-pronged: institution building and economic activities. Any intervention starts by mobilizing the target group, raising their consciousness and forming groups, emphasizing leadership training, planning and capacity building. Group sizes vary and are mostly between 10 - 30 persons. The Grameen Bank also starts by organizing its target group in small groups of five borrowers.

Within or through these groups various activities are undertaken. NGOs assist by providing occupational skill training, employment generation and enterprise development, credits, and by the endowment of productive assets like irrigation equipment. Credit programs have become a mainstay of many NGO efforts in rural areas (Goetz and Sen Gupta, 1994: 5). The objective of contributing to agricultural or industrial output is linked to equity considerations. NGOs also provide non-formal primary education, and deliver health and nutrition services. Political participation, paralegal training, activating local administration, and access to government services, are also encouraged (Hossain et al., 1991: 72-73).

6.3.2 Empowerment and household approach

Two decades ago, poor men constituted the majority of the people reached and organized by NGOs. At present, the opposite holds true. For example, whereas women constituted only 39 percent of members of the Grameen Bank in the early 1980s, their proportion has increased to 93 percent ten years later (Goetz and Sen Gupta, 1994).
Several factors contributed to this massive response by women. Women responded primarily because this improved their access to external resources and support which they lacked. Women's membership also increased due to efforts by the NGOs to reach more women. The national development community and foreign donors also insisted on a more visible involvement of women.

Women's own empowerment is an important aim for many NGOs, such as Proshika and Comilla Proshika. An NGO like SNSP even primarily targets women, and its 'men's

component' covers only 12 percent of all members. NGOs like RDRS, BRAC and the Grameen Bank also pursue women's improved well-being, but, parallel to women's increased membership they also revived the notion of household representation and the one-member-per-household criterion, but now applied to women. They strengthen and institutionalize women's role as the mediator in an approach which we call here a 'household approach'.

RDRS was one of the first NGOs to stipulate the policy that only one person in a household can become a member of an RDRS group, mediating external resources to the other household members. The rationale of RDRS is that, with limited field staff, more people can be reached directly or indirectly. Male field staff increasingly work with female groups, and female field staff also work with male groups.

With BRAC, the share of women's groups, or Village Organizations (VOs), has increased consistently between 1989 and 1994. Only 56 percent of the VOs were female in 1989, compared to 86 percent in 1994. This was the result of both an increase in the number of female VOs and a decrease in male VOs since 1992. In 1992 to 1994 respectively 38 percent, 20 percent and 33 percent of the men left BRAC. BRAC explains this phenomenon by the fact that members who defaulted in their loan repayment or could not keep up with the organizational disciplines either left or were expelled. More males than females were found to have disqualified themselves. In addition, BRAC also formally allowed its members to resign if they wished. From 1992 onward, BRAC adopted the policy of keeping only one member from a target household (Khandker and Khalily, 1996). BRAC even decided to phase out the formation of new men's Village Organizations and now concentrates only on forming female VOs (Goetz and Sen Gupta, 1994: 5).
Male relatives encourage women's membership because in this way they can obtain individual loans, the most widely transferred resource, through their female relatives. Women's membership saves them the time involved in participating in the time-consuming village meetings and other required obligations. 'Men are clever. They send their wives to BRAC to take loans', as a woman respondent said.

The scale on which women transfer loans taken in their own names to male relatives is considerable. Goetz and Sen Gupta (1994), who studied BRAC and other credit institutions, found that women retained full or significant control over their loans in only 37 percent of the cases. Rahman (1986) studied the Grameen Bank, and found that 77 percent of women were using up to three quarters of their loans themselves, while 12 percent surrendered the entire loan to their husbands or other male guardians (Rahman, 1986: 32-33). White's 1991 study suggests that approximately 50 percent of loans taken by women are used for men's activities, while another significant proportion are used for activities where gendered patterns of control are more ambiguous (White, 1991: 29; cited in Goetz and Sengupta, 1994: 11). The present study found that virtually all BRAC loans taken in

the names of women in male-headed households were used by men, except in the case of women in leading positions in the VOs.

For women there are both advantages and disadvantages in channeling loans to their male relatives. There are indications that a woman's intra-family status improves as she brings in important external resources. Husbands are reported to spend more of their money for the benefit of the women (Rahman, 1986). Family stability is secured, a major concern for poor women rather than for men (Jiggins, 1992: in Goetz and Sen Gupta, 1994). However, women have to spend time and effort to pursue their husbands and ask for the instalments. If relatives do not repay, intra-household tensions and violence are bound to increase. As women hardly have means to enforce repayment, the only option left is to pay out of their own incomes (Goetz and Sen Gupta, 1994).

NGOs benefit from vesting the liability for loan repayment in women. Women are more easily available during the day. Their role as mediator also solves the problems that NGOs experienced with men: their lack of commitment to village credit groups, their poor financial discipline when it comes to repaying loans, their greater capacity to evade development agents and the law, and the threat of violence from men. Goetz and Sen Gupta (1994) noted that several field workers described male credit society members as 'touts' or petty criminals. Hence, these field workers find: 'We are much better at getting our loan money back now that we are using women as middle-men' (Goetz and Sen Gupta, 1994).

The present study explores the case in which irrigation resources are provided to women as the main, if not exclusive, household member organized in a group by an NGO.

6.4 Irrigation development by NGOs

6.4.1 NGO-supported irrigation groups

The privatization of irrigation equipment and the water market make pump ownership attractive even for the target groups of the NGOs, provided costs and management can be shared by a group and financing facilities and other support are available to the poor. NGOs fill this gap. BRAC started in 1976 and Proshika in 1980 (Wood et al., 1990). Other NGOs followed. STWs and MSTWs were mainly bought on the private market. RDRS which only promotes MSTWs started its irrigation program only in 1991, when these pumps became widely available.

NGOs also supported the management of the larger DTWs and LLPs. In the 1970s and early 1980s, CARE (Committee for American Relief Everywhere) was engaged in the Deep Tubewell Irrigation and Credit Programme which provided technical assistance

and training to BADC farmers' groups. Unsatisfied with the class bias among the beneficiaries of the BADC farmers' groups, CARE transferred the technical expertise and launched a new project: the Landless Operated Tubewell Users Support (LOTUS) project. From 1986 to 1991 CARE-LOTUS collaborated with BRAC, Grameen Bank Tangail and Proshika for the creation of DTW schemes managed by the landless. This program consisted of technical support and skill development during the first three years of a group. After that period, groups were expected to be able to function autonomously.

When LOTUS stopped in 1991, Grameen Bank Tangail ceased creating more DTW enterprises managed by the landless. Out of the 72 enterprises started by Grameen Bank Tangail, only 15 were still functioning by 1993. In the old Rangpur Dinajpur district, Grameen Bank created a separate foundation, Grameen Krishi Foundation, to take over DTWs. GKF manages the large majority of these DTWs itself. Unlike Grameen Bank and Proshika, BRAC expanded its DTW program with the landless. BRAC arranged the purchase at the prevailing subsidized rates of 550 new DTWs which BADC still had in stock. BRAC also obtained 100 existing, dysfunctional DTWs. Outstanding debts to BADC and the Rural Electricity Board from the former pump renters or pump owners were added to the price for the pumps. 615 DTWs were installed in the very short time span between the years 1990 and 1992 (BRAC, 1995).

Occurrence

In 1992 there were at least 21 NGOs, including Grameen Bank, supporting a total of 1,498 Irrigation Groups (IGs) with 67,471 members (see Annex 4; WAU and BIDS, 1992). A further unknown number of groups already functioned automonously and were no longer supported, monitored and/or registered.

Among the NGOs the highest share of supported IGs was shown by BRAC with 37 percent, followed by Proshika Manobik with 22 percent, RDRS with 10 percent and Comilla Proshika with 8 percent. Grameen Bank Tangail had 2 percent and SNSP less than one percent. These six NGOs accounted for 79 percent of all NGO-supported IGs in 1992.

While SNSP exclusively supported female IGs, eight other NGOs exclusively supported male IGs. The remaining 12 NGOs supported both male and female IGs or mixed-sex IGs. The proportion of female/mixed-sex IGs under Proshika was less than five percent while the proportion of mixed-sex IGs under BRAC was over 99 percent. In 1993-1994 RDRS had a total of 344 IGs of which 39 percent were female groups.

Among all 67,471 members (excluding RDRS members for whom no gender breakdown was available in 1992), 17,458 (27 percent) belonged to exclusively male groups, 2,059 (3 percent) belonged to exclusively female groups and 45,749 (70 percent) belonged to

mixed-sex groups. The proportion of women in the mixed-sex groups was 52 percent on the average. Almost 40 percent of all IG members were women.

The IGs are mainly concentrated in the north-western and central parts of the country. The largest proportion of IGs was seen in Thakurgoan, followed by Tangail, Dinajpur, Bogra, Rangpur and Jessore. Manikganj near Dhaka also had a fair share.

The FIGs retained in the sample represented 23 percent of the FIGs of RDRS and all FIGs of the other NGOs which had functioned for at least two years. The average period of functioning was five years for the Grameen Bank groups and 2.8 years for the others.

6.4.2 Support for self-managed irrigation

The different NGOs developed different financial, technical and organizational support packages and procedures for decision-making on the type of pump and the site. The interest rates on irrigation loans are similar to those on the other NGO loans, and broadly correspond to commercial rates. All NGOs, except BRAC, pursue self-management of the enterprise by their groups. Again all NGOs except BRAC do not allow groups to take other substantial loans as long as the irrigation loan has not been repaid.

Proshika, Comilla Proshika and SNSP
Proshika, Comilla Proshika and SNSP adapt their choice of technology to the circumstances of the groups. Groups themselves take the initiative to start irrigation, and identify a command area. STWs and increasingly MSTWs appear to be the most suitable. Before disbursing the loan and starting irrigation, a number of conditions have to be fulfilled. The first condition is that groups have already proven themselves to be able to undertake collective activities successfully. Only mature groups are eligible. Then, NGO staff and interested groups together assess the choice of technology, prospects of the command area and farmers' willingness to buy water from the group, and the financial and economic feasibility of the enterprise. Three-year group-based capital loans and seasonal operational loans are provided. Technical support is given for pump selection, purchase and installation. Training in pump operation, water management and irrigated agriculture is also given. Organizational support includes financial management, financial and operational record keeping, conflict resolution, and negotiation with water buyers. Pump operators are often paid.

RDRS
RDRS exclusively promotes the MSTW. At least 25 percent of the capital costs need to be paid in cash as equity deposit, and for the remaining sum one-year capital loans are provided to groups. RDRS provides some training in pump operation and irrigated agriculture, and supports irrigation groups only if needed. RDRS also allows one member to

pay the equity deposit and repay the loan. The command areas are often too small to require a paid pump operator.

Grameen Bank
Grameen Bank Tangail provides three-year group loans to finance the capital costs for taking over dysfunctional DTWs. Groups can also take operational loans. After some seasons of providing technical and organizational support, groups are supposed to continue on their own. Grameen Bank's village irrigation organization consists of several small groups of five members. The average total was 23 members. Ownership of the DTW is subdivided among members in so-called shares. Members repay capital and operational loans in regular instalments. Pump operator and linemen are paid functions. The manager is unpaid.

6.4.3 Support for co-managed irrigation (BRAC)

BRAC developed a form of co-management of its DTWs (BRAC, 1992a). First, BRAC identifies a site and assesses the feasibility of this locality for the installation of a new DTW or for taking over an existing DTW. A criterion for the selection of the locality is that BRAC has organized men and/or women in Village Organizations in that area. In order to keep the investment costs within the reach of an individual member, the capital costs are shared by a large number of shareholders, on average 84. After site selection and often even after installation of the DTW, the male and female BRAC members in that locality are offered the opportunity to become shareholders in the enterprise. Members can obtain a five-year capital loan to that end, repaid in weekly instalments. They do not get this money themselves, but BRAC takes the sum from its own sources to finance the purchase of the DTW from BADC and/or former owners. After the repayment of the capital loan shareholders receive a share in pump ownership. This document can be sold. Its value depends upon the commercial value of the pump.

BRAC keeps about 20 percent of the shares, or more if too few shareholders can be found, and bears operational costs and shares in the water income proportionally. The record keeping of shareholders, loan collection and monitoring are done by BRAC. BRAC also assumes most responsibilities in scheme management and is chiefly responsible for the recruitment of the paid pump operators and linemen. BRAC can be assisted, at least on paper, by some shareholders who are elected as members of the operational and management committees, and by one elected manager, which is a paid function. So for the majority of shareholders managerial participation is limited to attendance at meetings and collecting the gained crop shares. The financial participation of shareholders consists in repaying the capital loan in regular small instalments. Further, shareholders co-finance operational costs, for which they can also obtain seasonal operational loans. Each season the income from water is divided among the shareholders, including BRAC.

6.4.4 Case studies

The characteristics of the six cases studied in-depth are summarized in Table 4.

Table 4. Characteristics of the six cases

	self-managed				co-managed	
	NGO targeting approach					
	empowerment		household		BRAC	
case	Prosh. A	Prosh. B	RDRS	Gram. Bank	BRAC A	BRAC B
district	Tangail	Bogra	Pancha-garh	Tangail	Tangail	Tangail
number of IG members at the start	12	16	8	30	80	71
percentage members heading households	33	13	17	n.a.	6	19
percentage members with land in command area	58	88	100	67	19	13
percentage better-off members*	25	84	50	40	25	33
type of pump	STW	STW	MSTW	DTW	DTW	DTW
price pump Tk	30,000	15,000	9,250	131,000	105,000	62,000
size command area (hectares)	5.6	2.8	2.8	15.2	16.0	11.6
number outside water buyers	21	4	17	100	60	31
profitability	breaking even	breaking even	profitable	profitable	breaking even	loss

*'Better-off' refers to group members who live in households owning more land than the NGO itself has defined as target group criteria of maximum size of land holding (BRAC, Proshika, Comilla Proshika: 0.2 hectares; Grameen Bank 0.16 hectares; RDRS (agricultural program): 0.6 hectares)

6.5 Economic performance

6.5.1 Self-managed FIGs

Water income

Net water incomes and the profitability of the enterprise would be indicated by any net positive or negative water income, after meeting all costs including NGO loan repayment and reimbursement of all other prefinancing. For the self-managed 33 FIGs attempts were made to construct balance sheets of costs and returns for all the irrigation enterprises, in order to calculate the net income for the different irrigation seasons. Unfortunately, exact computations of the net water income are not possible since information on costs and investments is fragmented, incomplete and unreliable, and the information from different sources could not be reconciled satisfactorily. On the basis of available information only a crude assessment of net income was possible, in terms of positive or profitable, some profit or break-even, and negative or loss-making.

Table 5. Proportion of enterprises (percentage) making profits, breaking even or making losses according to NGO (type of equipment)

NGO	Profitability			
	profits	breaking even	loss	total %
Proshika/Com. Prosh/SNSP (STW) (n=19)	-	47	53	100
RDRS (MSTW) (n=10)	50	40	10	100
Grameen Bank (DTW) (n=4)	100	-	-	100

As shown in Table 5, only the DTWs by Grameen Bank are profitable. In these four cases relatively cheap existing pumps were taken over. The non-profitable Grameen Bank schemes have already been discontinued in the course of this six-year old program in which only 15 of the 72 enterprises survived.

Apparently, the MSTWs are more profitable than the STWs, a finding that is also confirmed elsewhere in the literature on Bangladesh (Merrey, 1997: 144). The costs of equipment play an important role. The effects of the short life-time of MSTWs compared to STWs cannot be assessed yet because the MSTW groups function for only two to three

years. The Proshika A Case and Proshika B Case with STWs are breaking even. They have just finished the initial years of capital loan repayment. The pumps were second-hand. The Proshika A Case especially has a large command area, and good prospects.

Nine loss-making Proshika/Proshika Comilla/SNSP groups sold or rented out their pumps, or the pumps were taken back after one season without repayment of the loan. In the other groups the losses led to low capital loan repayment performance: half of the Proshika loans have hardly been repaid yet, and one third are behind schedule. On the other hand, the loans to 90 percent of the RDRS groups and all Grameen Bank groups, most of which made profits, have been repaid in time.

6.5.2 Co-managed MIGs

The profitability of BRAC's DTWs has been questioned since 1991 when the program was still expanding. The net revenues generated in the majority of cases would not be sufficient to allow shareholders to repay their personal DTW loans to BRAC out of such revenues (Wright, 1991). In that same period comparative studies on other DTWs showed similar results. For example, an analysis of the economic performance of 624 DTWs owned and managed by the Grameen Krishi Foundation revealed that in the 1991-1992 irrigation season an average loss (water income minus all costs) of Tk 115,000 per DTW was made (WAU and BIDS, 1992).

For 69 co-managed DTWs of BRAC in seven areas, the profitability was assessed with the data that the Area Offices provided on capital costs and operational costs and water income during the irrigation season of 1991-1992 (see Annex 5). It was calculated how many years it would take for the shareholders to repay the total capital loan and interest, assuming that all the water income would be used for capital loan repayment, and also assuming that the net profits (the difference between operational costs and water income) of all other years would be similar to those of the season of 1991-1992. The duration of BRAC's capital loan is five years, so for poor shareholders the issue is whether the net gains are sufficient to repay the capital loan within five years. In these calculations the interest rate for the capital loan was assumed to be only 16 percent (in reality interest rates rose in 1993 to 20 percent but declined again in 1995). Interest on operational loans was not taken into account. Even under these optimistic assumptions, loans for 65 percent of the DTWs could never be repaid from the operational benefits only. For 17 percent of the DTWs the period exceeded the five years, and in only another 17 percent of DTWs would shareholders be able to gain benefits after five years. The low performance of BRAC's DTWs is mainly due to the high investment costs of new DTWs and the widespread installation of STWs which increasingly encroach on the command areas of DTWs.

The BRAC A Case and BRAC B Case belong to this best 17 percent. Their relative profitability was also confirmed also on a national scale, by the profits and loss statements in BRAC's Head Office RDP/Irrigation Project Report on Irrigation Scheme, relating to all 601 DTWs operating during the *boro*-season 1991-1992 and 1992-1993 (BRAC, 1992b, 1993). If ranked according to these data, BRAC A Case is among the 13 percent of BRAC's most profitable enterprises nation-wide, and BRAC B Case among the 36 percent of the best performing ones. In both cases existing pumps were taken over, so the investment costs were relatively low. However, the figures found at field level showed lower profitability than the figures at Area Office and headquarters levels. According to the respondents and the calculations in the present field study, the BRAC A Case required shareholders to add extra money in order to repay the loan within five years. In the BRAC B case the income did not even cover the operational costs. In BRAC B losses were due to the physically unfavorable command area, technical problems of the pump set, and encroaching STWs. The feasibility studies in 1989, the year in which the schemes started, were far too optimistic. For example, the projected command area in BRAC A (now 16 hectares) varied from 22 to 32 hectares. The projected command area in BRAC B (now 11.6 hectares) was 20 hectares (Van Koppen and Mahmud, 1996: 109, 143).

In November 1995 in its Deep Tube Well Report on the *boro*-season 1994-1995, BRAC acknowledged that 76 percent of its DTWs are loss-making. BRAC proposed to stop the program, and to sell the DTWs for an average price of 29 percent of the purchase value, while keeping the interest paid from the capital loans to finance its own losses (BRAC, 1995).

6.5.3 Intra-group division of benefits

Benefits and losses from water sale

The way in which the gains or losses from the sale of water at the level of the enterprise were distributed within the group, depended upon the actual participation of women members and their male relatives in the management and in the financing of the enterprise. As elaborated in the next section, there were three forms of management in the 33 FIGs: female-managed, jointly managed and male-managed FIGs. There are no indications that the profitability of the enterprise was related to the form of management. The BRAC MIGs are discussed separately.

As water sale brought in few of no profits, water buyers received a service egual to or below its real costs, and improved productivity. These gains accrued to unrelated water buyers, and also to group members' households with land in the command area.

Irrigating own household land and home gardens
Improved irrigated production on household land was an important gain from collective pump ownership. The small scale, low installation costs and mobility of MSTWs and STWs even allowed tenants to start irrigating rented land in four FIGs in northern Bangladesh. However, the group members with land in the command area usually only constituted a part of the group. FIGs, like all NGO-supported groups, are composed on the basis of kinship, affinity, and neighborhood, and not primarily on the basis of adjoining land. Where the land was contiguous all members benefited from improved production. This occurred in only three groups, which were all small RDRS groups.

Benefits from improved cultivation were a direct benefit for male relatives, who controlled rice cultivation. Female relatives in male-headed households benefited at best indirectly through household consumption, or by their husbands buying livestock, or sarees for them from the income earned. Women who were heads of households and cultivated some land in the command area benefited themselves.

Improved home garden production was observed in eight FIGs only, mainly because homesteads are on higher sites. Only the few members whose homesteads adjoin the command area gained.

Wages
Depending upon scale, the irrigation enterprise provided seasonal wage employment for a certain number of persons: pump operators, linemen and manager, and daily wage employment for channel making, crop collection and crop threshing. The few women members in male-headed households whose male relatives obtained wage labor might have also received indirect benefits from this.

6.6 Inclusion and exclusion in self-managed FIGs

6.6.1 Exclusion

The analysis of inclusion and exclusion processes in gendered participation in FIGs showed, first of all, that in one third of the 33 self-managed FIGs, the irrigation activity was initiated by only a part of the existing NGO-supported group. Typically the poorer members stayed outside the new initiative. Often their households had no land in the command area. Moreover, they lacked a more or less regular source of income and were afraid of being unable to repay the substantial loan. Sometimes this caused tensions. In one Comilla Proshika group in which the group as a whole had to sign, the women without land in the command area felt forced to sign. Tensions also emerged in some male-managed groups (see below).

Group members who did not participate in the irrigation activity were disadvantaged, because other group activities tended to decline since the group first had to repay the irrigation loan before other loans were granted. Outstanding debts even prolonged this period.

6.6.2 Impact of the targeting approach

Inclusion and exclusion processes further took place among the members and their male relatives who participated in the irrigation activity. The intra-group participation of women and male relatives in the 33 FIGs differed with regard to:

- initiative (idea, identification of the command area, site selection),
- financial involvement (capital and operational loan taking, contributions, repayments),
- managerial involvement (operational decision-making, negotiations with buyers, supervision of wage laborers, maintenance, crop collection),
- allocation of gains, and
- vesting of pump ownership.

Three main management forms emerged: female-managed, jointly managed and male-managed. The targeting approach of the NGO largely influenced the management form of the FIG, as shown in Table 6. The other important variable was the strength of the women's group. A strong group was defined as: having internal solidarity; able to elicit favorable external linkages, such as with farmers in the command area or former pump owners, and village elite; knowledgable about the irrigation activities; and dynamic also in other group activities. Leading FIG members, such as chairperson, cashier and secretary, usually played a much more important role in initiation, decision-making, training, and so on, than less vocal members.

Female-managed FIGs only occurred under the empowerment approach, and most of them were strong groups. Under a household approach men might manage the enterprise jointly with the women's groups, but such enterprises were more often found to be managed exclusively by men, especially in weaker women's groups.

Table 6. Types of management according to NGO targeting approach and group strength

	NGO targeting approach						
	empowerment			household			total
	group strength			group strength			
type of management	strong	weak	total	strong	weak	total	
female-managed	9	-	9	-	-	-	9
jointly managed	3	6	9	5	-	5	14
male-managed	-	1	1	2	7	9	10
total	12	7	19	7	7	14	33

6.6.3 Female-managed FIGs

Initiative

In the nine female-managed FIGs, women took the initiative for the enterprise and identified the command area. Then, women negotiated the support from their male relatives, from farmers in the command area, and, if a pump was taken over, the former pump owner. A woman leader of Proshika B:

> 'I found the men earning a profit from water sale, and getting irrigation loans from Proshika, so I also asked Proshika for our women's group and they agreed'.

In Proshika A and Proshika B, the two case studies of female-managed FIGs under an empowerment approach, pumps were taken over from male relatives. This partly explains why the percentage of members who did not fulfill the NGO target group criteria of land owned by husbands, was 25 and 84 respectively (see Table 4). In both cases women heads of households (deserted, polygamous) played leading roles.

Fund mobilisation

In the female-managed irrigation groups most, if not all, capital costs were paid by the capital loan provided by the NGO. Own contributions for initial purchase or later loan repayments were financed out of group savings, but also individually by members. Operational costs were either paid by individual contributions, or by loans. The poorer members, who cannot easily prefinance, were usually in favor of taking a loan. In male-headed households, male relatives often paid these individual contributions. In some groups men also contributed to their wives' group savings. Men's contributions can be interpreted as a sign of the bargaining strength of women in the allocation of household resources to an

activity that they initiate. In female-managed enterprises, ultimate pump ownership was clearly vested in the women's group.

Management and labor contributions
In female-managed enterprises women hired male wage laborers for daily pump operation, water distribution and channel maintenance. Women selected the pump operator and set the wage rate. Paid workers were often male relatives but could also be unrelated men, or incidentally, also the women themselves. If the operation of smaller pumps or channel-making was unpaid, this was usually done by male relatives. Men, especially in better-off households where the taboo on women's work in the field is strongly adhered to, also assisted in the labor-intensive collection of the crop share. Women decided whether part of the income would be distributed or whether all would be used for loan repayment. When the enterprise appeared to be unprofitable, women decided to rent the pump out, or sell it, usually to male relatives.

In the Proshika A Case, male relatives decreased their involvement in management and operation in the course of the time. In two groups, women's activities stimulated men to organize themselves and start an irrigation enterprise elsewhere.

NGO support
The NGOs, which all had an empowerment approach, gave financial, organizational and technical support to the women. The support was similar to the support rendered to men, but it was more intensive. Access to capital and operational loans improved women's bargaining position in pump purchase and their performance in water delivery. Women received training in pump operating, water management, irrigated rice cultivation and financial and operational record keeping.

Allocation of economic benefits
The profitability of water sale was zero or negative in all female-managed enterprises. In rare cases, however, women members reported that they were able to save or invest a small part of the income collectively. Paddy income from the crop shares that was distributed among the members was mainly used for family consumption. Wages also accrued to some men and very few individual women members. In case of forced rental and sale of the pumps to male relatives, they benefited from the cheaper purchase prices.

In the two Proshika cases in which the capital loans had been repaid, both women and their husbands felt positive about the enterprise, and would do the same again. Women were unanimously proud to be the owners of the pump. In male-headed households, both husband and wife claimed the distributed paddy as their property. Two women in the Proshika A Case mentioned their improved decision-making power with regard to their

husbands' expenditures in general, as a result of their involvement in the irrigation group. In female-headed households women benefited automatically.

6.6.4 Jointly managed FIGs

Initiative

In the 14 jointly managed FIGs, men together with the NGO took the initiative, identified a command area and selected a pump. None of these men were able to obtain a loan themselves from the NGO, either because they already had an outstanding irrigation loan for their own scheme, or because they were not organized at all or not organized well enough. In the case of two large and expensive pumps, women's participation was solicited to combine with a male group to reach a sufficiently large number of members. Proshika and Comilla Proshika intended to empower women by initiating new women's schemes with the help of local men. Under the household approach of RDRS, interested men were not even allowed to organize into groups, if their wives were already doing so.But in both cases the men were willing to collaborate with the women and to start a jointly-managed scheme. In these 14 cases, women responded positively to the new opportunity.

Fund mobilisation

If the capital investments were only partially covered by the capital loan, women's group savings, a readily available sum of money, were used for the remaining amount. However, in most groups, men contributed substantially to this savings fund, to the repayment of the capital loan and to the operational costs or operational loan repayment. Ultimate pump ownership is mostly claimed to be joint by the women's group and their male relatives.

A high cash investment was reported in the RDRS Case, where women contributed without resentment Tk 4000 out of their savings fund amounting for over 75 percent of their own contributions. Most of the remaining capital costs were paid from the water income and by husbands. Although virtually all further capital and operational expenditures were borne by men, the pump is seen as women's property.

Management and labor contributions

In jointly managed groups, men took the management decisions and arranged the operation and labor input for pump operating, water distribution, channel maintenance, and fee collection. However, the NGOs with an empowerment approach strongly encouraged women to play an active role in management, pump operating and labor input. They also provided some training to women in pump operating, water management and irrigated agriculture. The Grameen Bank also did so, but only in one experimental case, and RDRS did so only in two strong groups. In two other strong RDRS groups, some women them-

selves were well-informed about the enterprise and helped in minor tasks. Encouraged by the NGO, one woman became an unpaid manager (Grameen Bank group), and three women the formal pump operator (three Proshika groups).

However, when loans were repaid and the NGOs withdrew, women also withdrew from management and labor inputs. Many FIG members who were given training in pump operating tried to start operating the pump in the beginning, but stopped later, reportedly due to the burden of other work, most frequently child care. In two jointly managed loss-bearing Proshika groups, the pumps were sold to male relatives.

Whereas male leaders in a few groups still deployed efforts to inform women, men in other groups declared openly after some years that irrigation was again the male production system it had been before. The Grameen Bank Case is an example of the latter. A poor member, whose husband and his four brothers have one share through her, reported her involvement in the beginning:

> 'In the first season if the channels were broken we would all rush out in groups of five or ten. We were happy to save money in this way. Instead of having laborers to clean the drains, we can do it ourselves. There was no coercion from the Grameen Bank sirs'.

However, according to the better-off woman manager women's involvement in management was primarily a result of the efforts of the Grameen Bank:

> 'Initially women visited the fields in groups. So when Grameen Bank came, we were able to answer. Later they did not come any more so women stopped going into the fields'.

The *de facto* male manager, a rather well-off man, called a meeting immediately after the first season. There he announced that women were no longer allowed to go to the command area. He had organized a small group of the richer husbands - and, in one case, a brother - of members who were already involved in the earlier scheme before the DTW became dysfunctional. Most of them did not fit the Grameen Bank's criteria for a target group. Besides the female manager, these men appointed a male manager, a function that rotates. The *de facto* male manager commented:

> 'Although there is a female manager, it is only in name. The Grameen Bank said that if we did not have a female manager we would not get the loan, but they know that the men are actually managing. We call the female manager when we need a signature. Women just sign. It is the same whether men or women get the loan. With appropriate training women could learn how to manage. We, the men, could teach them too, but we do not allow it because women already have a lot of work in the household and in crop processing. I do not allow poor men to participate in decision

making. They do not have enough experience and cannot do it on their own. The men of poorer households always follow our suggestions'.

For the next five seasons the official function of manager was still carried out by a woman, and some women members continued to come to important meetings with the farmers to discuss DTW affairs. In the sixth season the *de facto* male manager created an official male management committee of ten male relatives of Grameen Bank members. By then even the appearance of women's participation in management had vanished. Only pump ownership was still in the names of both women and men.

No woman member questioned the male manager's decisions. The better-off members especially readily agreed to stop going out into the command area, if they had ever done so. Some women themselves felt it a loss of status to go into the field. They felt somewhat embarrassed by the comments of people coming from other villages and seeing women in the command area, who asked, jokingly, if there were no men in this village. Other women said that they now have grown up sons who can go. Or that one fiels shy to be the only one to go out now. All members found that the relations within the group are good and that the group is doing well in the enterprise. No one felt left out of this decision making. The high profitability of the scheme and the fact that all members benefited from the water income in spite of class differences, certainly contributed to this satisfaction.

In the RDRS Case, in which the pump was partly financed out of the women's group fund, the group consisted of eight female relatives of male kinsmen. When the NGO offered women training in pump operating, both women and men agreed that the men should get that training. Women received training in irrigated agriculture. Women also engaged in channel making in the first years, but this declined in later years. However, the husbands still took major decisions on pump management in the presence of the women members. In one male-headed household, the woman participated in paddy cultivation more than before. It is noted that half of the women had husbands owning more land than the target group criteria of RDRS.

Allocation of economic benefits

Women's financial contributions and management and labor input were limited in the jointly managed Proshika groups. In return, they received at best some nominal part of the water income and wages directly. In the case of loss-bearing schemes their investments were lost.

In the Grameen Bank and RDRS groups, which almost all were profitable, women in male-headed households gained indirectly from the distributed water income. Only in the RDRS Case was water income seen as joint income. Women with household land in the

command area also gained indirectly from their husbands' crops. These gains were direct for all female-headed households in jointly managed FIGs.

6.6.5 Male-managed FIGs

Initiative, fund mobilisation and management
In the third category of FIGs women's involvement was restricted to giving their signatures for the capital loan and further loans. All other aspects of the enterprise were dealt with by men. Ultimate pump ownership was mainly vested in men. The supporting NGOs, who have a household approach in nine of the ten groups concerned, also failed to involve women more actively. Women in eight of the ten cases constituted a weak group.

Economic benefits and risks
Women in male-headed households benefited, at best, indirectly. The woman members heading a household gained directly. However, in five of the ten male-managed FIGs, which were all RDRS groups, the male relatives of only one or two members, among them typically the female cashier, paid the equity deposit and repaid the loan, and thus became an individual pump owner. They were often the better-off. The NGO accepted this. This led to serious mistrust in the five women's groups. In one of these RDRS groups and also in one Proshika group, individual men even abused the situation by refusing to repay loans taken in women's names. In these manners the women were negatively affected by male relatives taking irrigation loans via their group in six out of the ten male-managed FIGs, which constitutes 18 percent of all FIGs.

6.7 Inclusion and exclusion processes in co-managed MIGs

6.7.1 Nominal inclusion

Unlike the irrigation programs of the other NGOs, BRAC co-manages the DTW enterprises, and is supposed to have about 20 percent of the shares. The country-wide sample of BRAC's 19 MIGs was based on the lists of shareholders in running enterprises provided by BRAC's headquarters. 18 of these enterprises had started during the short time span between 1989 and 1991. As mentioned, most were unprofitable.

It was found that in at least 70 percent of the sample BRAC was the main shareholder and managed the enterprise. So the inclusion of the majority of shareholders mentioned on the lists was merely nominal. In these MIGs, shareholders' participation in the enterprise was often already limited at the start of the enterprise, and the role of BRAC became only more pronounced in later years. This is illustrated below. The MIGs that were studied in-depth have been selected from the few MIGs in which shareholders were still the majority, and are discussed in the next Section 6.7.2.

BRAC members had never been involved in Kolapara, Kishoreganj, according to the women leaders.

> 'Two years ago BRAC installed a DTW. They did everything to convince us to become shareholders, short of touching our feet. But only very few members were interested. Most of us and our husbands were afraid of not being able to pay back. That is why BRAC has managed the scheme itself from the very start. We do not blame BRAC, we see BRAC workers working till late at night'.

In several other cases, especially in the Navaron and Monirampur Areas in Jessore and in Kishoreganj, BRAC had also started DTW enterprises without 'having disbursed the loan', so without signatures of BRAC members.

Some VO members ignored the reason for the signature, like the wife of the DTW pump operator (Amini, Jessore):

> 'My husband told me to join the Deep group. I put finger prints two to three times, but I do not know if it was for the Deep or for other loans'.

Another woman complained (Sarifpur, Jessore):

> 'I was forced to sign by the group leaders and BRAC. If I did not, our village would not get the DTW'.

In Dhakili, Tangail, the elite had taken the initiative for the DTW, and had asked BRAC members in the village to sign. A member explained why they had agreed to do so:

> 'If we as landless can help the elite in this way, then the elite will surely do something for us too'.

In Jessore, the participation by BRAC members was limited in the first year, as explained by a woman leader (Munshikanpur 1, Jessore):

> 'In the first year we had to pay Tk 100. I do not know for what, maybe for channel construction. BRAC started to make us understand about instalments. This year, the second year, it will be a major issue. But nobody paid up till now. We wait for the harvest, to see if there is any profit'.

In Austabarga (Kishoreganj) the enterprise started in the way the DTW program had been designed. However, most shareholders withdrew when the first instalments had to be paid:

> 'Out of the 55 male and the 55 female BRAC members who gave their signatures, only 22 men were willing to repay weekly instalments of Tk 6 for their share of Tk 1000. One of us was clever. She calculated that within five years the amount to repay for the DTW of Tk 175,000 would be around Tk 260,000. Then the machine is old, we cannot sell the shares even for Tk 1000. So only three to four men paid

their instalments in the first season. BRAC did not agree, and therefore, they took over the DTW. Now the DTW is managed by BRAC'. Note: the daily agricultural wage for men is about Tk 20'.

So, at best, a small number of shareholders continued as shareholder. During the interviews these shareholders either did not know the number of other shareholders in the enterprise, or they mentioned numbers far below those on BRAC's lists. In some groups (Ziga Bari, Rangpur; Dhalai 1 and 2, Manikganj) BRAC selected some shareholders at the start of each irrigation season to contribute to operational costs and share in the water income, according to the respondents. A female shareholder in Rajib 2, Rangpur, commented:

'The enterprise is in our names, but it is not really ours'.

In Andal Pota, Jessore, the DTW enterprise had completely stopped because of managerial conflicts.

There are indications that BRAC's irrigation activities concentrated in the hands of the few male shareholders, excluding the female shareholders. In villages in which mainly women were organized, BRAC initiated new small male groups, including, for example, the new pump operator and manager (e.g. Ziga Bari, Rangpur; Rajib 2, Rangpur; Dhakili, Tangail; Aurangabad, Manikganj; Munshikanpur1 and 2, Jessore; Deoli, Jessore). Some women felt that 'BRAC dictated that we need the help of the men, because this concerned irrigation' (Ziga Bari, Kaunia). In one group, women themselves actively tried to interest their male relatives in the DTW enterprise (Aurangabad, Manikganj). BRAC gave training mainly to men. In the one case in which BRAC trained a woman in pump operating, she now just 'keeps an eye on the machine and wipes it'.

Women became scheme managers in only four out of the 69 MIGs with information on this issue. One was the daughter of a member of the male elite (Dhakili, Tangail). One female manager of a promising scheme had been replaced by a man after the first year, 'God knowing why' (Aurangabad, Manikganj). The presence of female managers in the other two groups led to the selection of these groups for the in-depth case study.

6.7.2 Forced inclusion

The processes of inclusion and exclusion, the role of BRAC and the ways in which the economic losses were borne, were studied in-depth in the case studies.

Initiative

Initially, the BRAC A enterprise consisted of 80 shareholders: 35 men and 45 women. (See Tables 7 and 8 for group composition). They belonged to two male and two female

Village Organizations, in a relatively poorer and a relatively better-off neighborhood. 25 percent of the total number of shareholders did not satisfy the target group criteria. From the fourth season of its operation onwards there was an elected female manager. She belonged to the relatively well-off and was especially supported by the better-off women shareholders. The relatively well-off male shareholders supported the former male manager.

In the BRAC B enterprise there were initially 71 shareholders: 45 women and 26 men. On the basis of kinship rather than neighborhood, they were divided into factions of relatively well-off men and women, led by a middling male manager, and poor men and women, led by a woman. The latter was elected as manager in the fourth season. However, opposition from the male manager and his adherents forced her to leave after that season. 33 percent of all shareholders were more prosperous than was stipulated in the target group criteria of BRAC. The male manager and three better-off male shareholders have expressed an interest in buying the DTW.

In the BRAC A and BRAC B Cases the percentage of eligible BRAC members who did not join, was more than half and 38 percent respectively. The large majority of those who did not join were among the poorest BRAC members. They feared that they would not be able to repay or felt already overburdened by BRAC loans.

'BRAC says: even if there is someone dead in your house, you have to pay'.

When the BRAC members signed up to become shareholders, they were positive about the opportunity that BRAC offered. Paying regular small instalments in order to get a share of paddy from the water income, and saving through investing in an asset, was attractive for all those who had a more or less regular source of income. Further, they felt encouraged to join the enterprise because BRAC itself took 20 percent of the shares. A woman shareholder compared:

'If I had invested in mortgaging land it would have been more profitable, but I cannot get the money to invest all at once'.

The expectations of profitability at the start were optimistic. In the BRAC B Case some people thought that the value of their share would be twice, if not thrice the purchase costs. The overoptimistic feasibility studies by BRAC, and field workers' endeavors to find shareholders, as their superiors had instructed them, have probably contributed to this euphoria.

Gendered participation

In both the BRAC A Case and BRAC B Case, women's membership of the NGO and their direct access to external resources led to similar patterns of intra-household participation as found in the self-managed FIGs. Women in male-headed households in which

only the woman was a BRAC member often took the initiative and participated in management. Most of them convinced their husbands that they should contribute financially.

This pattern also prevailed in one third of the male-headed households in which both men and women were BRAC members. The household's share was put in the man's name, because, thus, 'he would feel more compelled to pay'. Exceptionally, married women also took the financial responsibilities. These women were among the group leaders. For example:

> 'My husband was a fertilizer dealer, but he made losses and had to sell all our land and properties and he hid from his creditors. It was a hard time. I had to work in other people's houses. I had already one share, but I wanted more, even five. I thought 'If I cannot buy land, let me buy this share'. My husband is a leader in the male VO. He never goes to DTW meetings. I do. Now he has started selling the clothes that I sew. With that money we pay the instalments'.

In the other two thirds of the male-headed households in which both men and women were BRAC members, men participated managerially and financially in irrigation. Some well-off male BRAC members took more than one share and put this nominally in their relatives' names. Thus the male manager and three better-off shareholders in the BRAC B Case, who were interested to buy the pump, accumulated half of the shares.

Women heads of households participated both managerially and financially, although the income of a husband or a brother who had migrated was used in some cases. One of them found: 'The DTW is like your own field. Both give paddy'.

Women's participation was somewhat unconventional. Especially in the more conservative village of the BRAC A Case, men observed:

> 'In the beginning people did not like women to get involved in the DTW enterprise, but BRAC was behind them and that gave them credibility'.

Later forced inclusion

Shareholders who had signed for the capital loan had committed themselves to repay within five years. However, it soon became clear in scheme A that the water income was not sufficient to finance both the operational costs and the capital loan instalments, so net investments were required during five years. In Scheme B the water income. was not even enough to pay the seasonal operational costs. The loan arrangements failed to offer any way to get out half-way. Stopping loan repayment and dropping-out implied that all instalments and interest already paid were kept by BRAC and lost for the shareholder. BRAC simply 'cancelled' their names and they were removed from the registers. The average amount lost by the poorest shareholders who opted for this in both groups was Tk 985, an amount equal to 50 days of wage labor.

The other option, finalizing repayment till the share would be 'ripe', would at least end the obligations towards BRAC and give ownership rights, but this would only give a return if the DTW could be sold. Moreover, this required that all shareholders became owners, and that no shares went back to BRAC. Asking BRAC to reimburse the instalments already repaid in case of dropping-out, or asking BRAC to buy the DTW and reimburse payments in this way, was 'talking to deaf ears'. In the BRAC A Case, many poor shareholders dropped out. In the BRAC B case, even the poorest shareholders continued repayment, hoping to sell the DTW afterwards to the four richer shareholders.

BRAC A Case

In the BRAC A Case, 55 percent of the original 80 shareholders dropped out in the course of four seasons. Most of them belonged to the poorest neighborhood (see Table 7). In the fourth season BRAC still tried to convince them to continue by offering them new loans for the average amount that was still outstanding. This amount was Tk 1200, which is 80 percent of the purchase price of one share four years ago, Tk 1500. But after the experience with this DTW enterprise, the drop-outs did not consider this worthwhile. The position of drop-outs within the IG and towards BRAC is illustrated by the chairman of the male Village Organization in the poor neighborhood:

> 'Whatever we have paid to BRAC, we cannot make a case against them. Secondly, we do not have the same interests in the group. Some have cleared their debt, some have repaid only a little bit. If we were all irregular repayers we could have come together and made a proposal. Thirdly, if we could find a buyer for the machine, then I would have some say in it. So far we have not discussed any sale'.

On the one hand, the better-off shareholders benefited from the drop-outs. BRAC offered the opportunity to buy shares for 80 percent of the original value also to the remaining shareholders. Seven rather well-off shareholders bought a total of ten shares, paying in cash. They considered this purchase a good deal because 'other people had already paid for it'. On the other hand, the fact that 25 shares had gone to BRAC frustrated the richer shareholders with the ambition to become independent collective owners of the DTW. For this reason they had pressurized shareholders to continue their involvement. The female manager, who is somewhat well-off, for example, had strong negative feelings against most drop-outs and accused them of just taking the paddy and not repaying loans. She felt that the regular repayers had become the losers.

Of the actual shareholders only 38 percent, among them the relatively richer, had already expected this financial outcome, or still did not regret that they joined, like the male manager:

> 'We went in hoping that something would happen, something new, knowing in the back of our minds it is not a big deal. Agriculture is not profitable'.

However, none of the other 62 percent of the actual shareholders, including all the poorer shareholders, would have joined in the beginning if they had known the outcome. They had only continued repaying because they would have lost all their money otherwise, and because other group members convinced them to stay. They found repayment of instalments too hard and the gains less than expected and till now too low. They felt relieved that the share had been cleared and expected gains to increase in the future. However, the limited response to BRAC's offer of shares for 80 percent of the original purchase price made them aware of the low value of their share. This was not even half of the amount they paid for it, namely the original purchase price plus 50 percent in interest, if new clients could be found at all. BRAC took not only the money that drop-outs had repaid for their shares, but also the interest. Moreover, BRAC claimed ownership of the DTW for 45 percent of the shares, its original 20 shares plus the net 25 shares of drop-outs.

Table 7. Changes in IG composition according to VO, gender and economic level (BRAC A)

	POOR VO			MIDDLING VO			DTE	%
	F	M	TOT	F	M	TOT		
1989 VO members	63	na	na	100	62	162	na	300
1989 shareholders	19	9	28	26	26	52	80	100
1994 shareholders	2	0	2	19	15	34	36	45
1994 shares	4	0	4	30	21	51	55	69
1994 shareholders:								
level I			0			12	12	
level II			1			18	19	
level III			1			4	5	
89-94 drop-outs	14	6	20	6	5	11	31	39
Shares drop-outs	15	7	22	6	5	11	33	41
Level drop-outs:								
level I			0			5	5	
level II			9			6	15	
level III			11			0	11	
89-94 transfers							17	

Note: level I indicates a level of well-being above BRAC's target group criteria, whereas level III is below these.

BRAC B

In BRAC B the paradoxical reaction to the DTW's unprofitability was to finalize repayment. Then, the DTW would become the property of the group and could be sold to the group of four relatively richer shareholders who had expressed their interest in buying the pump. Thus BRAC's loan arrangements rendered the poorer shareholders dependent upon the richer shareholders, and upon any price these buyers, as the only clients available, were willing to offer them. One of the very poorest expressed this relation:

> 'If we sit together we can convince Nazrul to buy'.

Sale would only be possible if the whole group continued. Hence, group pressure to fulfil loan repayment was enormous. The female manager, who was the leader of the poorer shareholders, exerted the same pressure as the others, as a poor woman shareholder illustrated.

> 'The female manager convinced me by saying: 'Everything put in would be lost, so even if you die, try''.

Only 34 percent of all shareholders dropped out (see Table 8). The reasons for dropping-out varied from completely leaving BRAC, migration, death, etc.. They were not related to the problems of the DTW.

The female manager, leader of the poor faction, looked back:

> 'We, the poor came into this group with the hope of making some profit, but in fact the rich got all the gains. They are interested in buying the pump now. It is not BRAC's fault. The only thing BRAC could have done was to screen more effectively at the start so that only the landless were in the group. But they are outsiders and it is not possible for them really to find out what is going on in the village'.

Allocation of economic benefits

The paddy from the water income was primarily used for family consumption and for the repayment of loans. One woman with five shares in a rich male-headed household in the BRAC A Case planned to sell the paddy when prices were high. This is the only indication of women's independent allocative power over the paddy in the BRAC Cases.

Table 8. Changes in IG composition according to faction, gender, economic level (BRAC B)

	POOR FACTION			MIDDLING FACTION			TOT	%
	F	M	TOT	F	M	TOT		
1989 VO members	64	-	64	-	50	50	114	161
1989 shareholders	45	-	45	-	26	26	71	100
1994 shareholders	12	2	14	13	13	26	40	56
1994 shares	12	2	14	15	15	30	44	62
1994 shareholders:								
level I			2			8	10	
level II			3			17	20	
level III			9			1	10	
89-94 drop outs	6	4	10	9	5	14	24	34
Shares dropped	8	4	12	10	5	15	27	38
Level drop outs								
level I			0			3	3	
level II			6			7	13	
level III			4			4	8	
89-94 members							11	

Note: level I indicates a level of well-being above BRAC's target group criteria, whereas level III is below these.

6.8 Effects on women's non-economic well-being

6.8.1 Overview

The impact of women's participation in the irrigation groups on non-economic dimensions of their well-being was studied in the self-managed Proshika A and Proshika B Cases, the jointly managed Grameen Bank and RDRS Case, and the less unprofitable BRAC A Case. In male-managed FIGs or the BRAC B Case no significant changes in women's non-economic status were expected. In each case, four categories of actors were interviewed: women members (managers and less vocal members), their husbands, male relatives and unrelated men (see the sample in Annex 6). For each category interview guides were made. Representatives from these four categories were asked whether they had observed positive, negative or no changes with regard to a number of women's mul-

tidimensional status dimensions that could be expected to have changed in the short term of the irrigation group's existence. The respondents specified these changes. The dimensions are: women's self-concept (only asked of women), skills, public behavior, status within the community, status within the family and (for married women:) the relation with the husband (Safiliou, 1994).

Almost all answers were observations of positive changes or no changes. In Table 9 the percentage presented concerns the observations of positive changes. This indicates how widely a positive effect in a certain dimension has been noticed. Selected citations illustrate the kind of changes observed. Two exceptions of negative change by less than 10 percent of the observations are indicated by *. It was not always possible to distinguish between effects of women's general involvement in the NGO group, and effects as a result of their participation in the irrigation enterprise.

Table 9. Percentage of observations of positive change

	Proch. A	Proch. B	RDRS	Grameen Bank	BRAC A
self concept	79	63	100	91	29
skills	71	70	100	50	14
public behavior	83	83	100	100	42
status in community	77	76	100	84	11*
status in family	78	81	98	33	14
relation with husband	44*	56	47	24	9

* Besides positive and no change also negative change observed in less than 10 percent of total observations.

Table 9 shows the overall positive or very positive effect of women's participation in irrigation on their non-economic status. However, there are differences between the cases. Among the five cases, the positive changes were most limited in the BRAC A Case. 'The beat of the drum is as before'. This is probably due to the limited economic gains and to the fact that women's managerial participation in these co-managed enterprises did not require much action. The improved self-concept was related to being owner of the DTW. Reportedly, improved public behavior was rather due to general BRAC membership and loan taking than to participation in the DTW enterprise.

In the Grameen Bank Case, women's status in the family and the relation with the husband were less often observed to have changed positively than in the Proshika and RDRS cases. In the Grameen Bank Case men were the main decision-makers, unlike the cases of Proshika and RDRS. Women's mediating role in rendering a water service to many water buyers in this Grameen Bank group is likely to have contributed to the increased approval by the community.

The unanimous observation of positive changes in women's status in the RDRS group is likely to be related to the fact that the women contributed a substantial amount of money for the pump. Moreover, this is a small, cohesive group, in which the new pump had strong positive effects on the irrigated production of all members' households.

In both Proshika groups, some observers remarked that the status of the women leaders had changed more than that of less vocal members. Especially for wives of rather well-off husbands, who participated hardly at all, no changes were observed.

In all cases the water buyers were satisfied with the water service, and did not notice differences between men's and women's irrigation enterprises. The only exception was the BRAC A Case, in which conflicts between factions impinged on the judgement of the water service.

The following examples illustrate respondents' specifications of the positive and negative changes.

6.8.2 Self-concept

• *Proshika A Case*

Woman manager: 'I got courage. Anything new will be easier'.

Woman member: 'I became clever. Now I also feel more confident to talk to the richer people in the village'.

Woman member: 'Now I am more valuable to others, like my husband and my son. I am more able to get a loan'.

• *RDRS Case*

Woman member: 'I became experienced in irrigation'.

• *Grameen Bank Case*

Woman manager: 'I talk to many people now'.

• *BRAC A Case*

Woman member, clarifying why there had been no change for her: 'The DTW does not give an income for myself. Without that I cannot think of my own development'.

6.8.3 Public behavior

• *Proshika A Case*

Woman member: 'Before I went only to my father's house. Now, if a woman wants to go somewhere, I can go with her'.

Unrelated elite man: 'The behavior of the women improved a lot. They learnt how to interact with different types of people. They became more polite and gentlemanly'.

Unrelated man: 'These women understand much better now. Nobody can fool them any more'.

Unrelated man: 'Women are developing. Now they are able to get people to do things for them'.

Although women's involvement in the STW enterprise did not change the fact that women are excluded from men's village meetings, it was reported how the women spoke up in other public meetings. A male relative:

'A goat got caught and hurt by a sugar cane crushing machine in the field of Lutfor. Before they would have gone to the village leaders to solve it. Now they managed this among themselves. The women of the irrigation group spoke up in this meeting'.

• *Proshika B Case*

Manager, a deserted woman herself:

'Two years ago we went to another village where a man tried to divorce his wife. We opposed him in a public meeting. I made him stop thinking of divorce. Then all the men told him 'O.K. you stop doing that'. Now they are living together'.

6.8.4 Status in the community

• *Proshika A Case*

Unrelated elite man: Women's involvement in irrigation is a good thing. Women are doing a public service. People do not say bad things and do not mock'.

Male relative of leader: 'Now people address her as sister (*appa*)'.

Unrelated man: 'Others, like Proshika, admire these women more too'.

Woman member: 'There are religious meetings in Yusuf's house. Mullanas talk about many things. They used to say that women should not go into the fields. That God would punish us after our death. But we do not know and how do the mullanas know what will happen to us after our death under the ground? We do not bother too much about what the mullanas say. They do not bring food or anything for the household. Now we are going into the fields for the STW, the mullanas no longer talk like that. They know we would not listen and just would keep on going into the fields'.

• *Proshika B Case*

Woman manager: 'Since I became the manager of the STW enterprise people come and consult me. If a woman wants to calculate something, suppose she sold some chicken, ducks and eggs but she does not like to tell her husband, then they call me to calculate'.
'Before starting the scheme I used to go to houses and people talked to me first, and then they gave me something to sit on. Now they first give me something to sit on. People also invite me for festivals now'.
'Some people do not like women working in the field. They think women should live inside and observe purdah. Some people say 'Gias's son is coming', when I go to the field. I tell them that I am doing my job. I am not doing any job that harms society'.

Woman member: 'People say that we are doing well. We are developing economically and serving the people'.

• *RDRS Case*

Woman member: 'When we formed a women's group, people insulted us. Now they say we are doing good'.

Unrelated elite man: 'The women's group was the first to bring the pump to the village. They are well-off now'.

Male relative: 'Women changed their economic position and are advanced; they can work in the field now'.

Unrelated man: 'Women have money now. They wear more sarees'.

Male relative: 'If someone becomes rich, everyone admires him or her'.

• *Grameen Bank Case*

Male village leader: 'Before, women were hot tempered because they were hungry. Now they have enough to eat'.

• *BRAC A Case*

With regard to women's status in the community and among water users, nine percent of the respondents in this conservative village found it a negative change that women no longer observed purdah and that they went into the fields.

6.8.5 Respect from the water users

• *Proshika A and B Cases*

Male water user: 'When women took over, the yields became higher because water distribution improved. Women keep their promise to give water, while a male pump owner would not'.

Male water user: 'Yields are much better now. Water distribution is better because the women have a loan for operational costs. Fertilizers and seeds, weeding is done according to the advice of Proshika people. I have talked many times with them'.

Male water user: 'The women give more importance to the farmers than the former pump owner. They react immediately'.

Male water user: 'I talk mainly with the pump operator. If he does not listen I might go to the women members to complain, but till now it has not been necessary'.

• *Grameen Bank Case*

Male water user/elite: 'It is a good thing that women got involved in irrigation. They provide water to land that could not be cultivated before. We discuss things among ourselves like this'.

6.8.6 Status in the family

• *Proshika A Case*

Woman member: 'My family relies more on me now. If a loan is needed now, I can get a loan from people who would not have given me a loan be fore. With the machine people are confident of repayment'.

Woman member: ' Now my mother-in-law pays more attention to me. We talk about the STW'.

• *Proshika B Case*

Husband: 'Two months ago I wanted to sell the two goats owned by my wife. Then she opposed me and suggested getting money to pay off a mortgage on land from another source. Then she took a Tk 200 loan from the Proshika group and gave it to me'.

6.8.7 Relation with the husband

• *Proshika A Case*

Woman member: 'Now I have an income of my own. Previously my husband could be rude to me. Now I can talk back. I also had to get my husband's permission for many things. Now I do not need it any more'.

Woman member: 'Before we were very much in need and he beat me up when I disagreed. Now he no longer does so'.

Husband: 'Before I would fight with her. No more now'.

Besides the observations of positive and no change, one woman member in the Proshika A Case complained that her relation with her husband had deteriorated because of her participation in the irrigation group:

'My husband says: 'You can take all the irrigated crops and leave this house if you are too busy with carrying and taking the crops from the machine, instead of threshing my crops'. I do not even get a share of his crop but I still have to thresh. I had to hide the

crops which came from the machine for three days in my own house, otherwise he would have been angry'.

• *Proshika B Case*

Woman member: 'Now I feel freer to give my own opinion'.

Husband: 'Now she is more intelligent. She can make suggestions. I like her intelligence'.

• RDRS Case

Woman member: 'Before the scheme I feared him but not any more now. I work in the field and in the house and generate an income. He does not feed me. I work and eat'.

Her husband: 'When we lived from hand to mouth I sometimes quarreled with my wife, but now we generate an income and develop financially because we work jointly with this pump and the group'.

Husband: 'My wife became braver, and more experienced since she has been in the women's group'.

Husband: 'Now I behave differently to my wife. Suppose she took a loan of Tk 5000 from RDRS and I invested it in my trade and made a loss. Then I should have to explain. In this way I evaluate their power'.

6.9 Conclusions

Economic benefits and productivity

It was the exception rather than the rule that the sale of water by NGO-supported irrigation groups was profitable for the water seller. Those who gained most were group members with household land in the command area, and external water buyers. Irrigation improved their agricultural outputs. The water service was not only underpriced, but also good according to most external water buyers. Women's involvement in irrigation management was generally appreciated.

The profitability of the sale of water for the water sellers seemed highest in the case of MSTWs, and when pumps were taken over. More insight into these economic costs and benefits is needed, not least for the groups themselves, and *before* they start this long-term investment.

Most BRAC's co-managed DTW enterprises were unprofitable. In at least 70 percent of the enterprises studied BRAC members constituted the minority of shareholders or did

not participate at all in the enterprise. However, where BRAC members participated as shareholders, the poorest shareholders had to bear an even disproportionate part of the financial losses. In its loan conditions BRAC had stipulated that stopping loan repayment half-way implied that the money already paid would be lost. The majority of the poorest shareholders, who could not afford five years of net-investments, either lost their money in this way. Or they continued repaying this capital loan, plus a total of 50 percent in interest to BRAC, for a share of much lower value than they had given for it. BRAC and the better-off shareholders who increasingly controlled the enterprise, benefited from this.

Non-economic benefits for women

Whereas the economic gains of the irrigation enterprises were limited or absent, women's self-concept, skills, public behavior and status in the community and in the family improved, both in groups in which women actively participated in irrigation management, and in groups in which women primarily mediated the irrigation loans to male relatives.

Inclusion and exclusion, and targeting approach

The targeting approach of the NGOs not only contributed to the overrepresentation of women's groups in NGO-supported groups in Bangladesh. It also strongly influenced whether poor women, who were traditionally excluded, obtained access to water as private owners and managers of irrigation infrastructure. Women took the initiative and managed the irrigation enterprises, while male relatives contributed financially, if the NGO aimed at women's empowerment and channeled its financial, technical and organizational support directly to the women, and, secondly, if the women's group was strong. This was the case in 9 (27 percent) of the 33 FIGs studied.

In the other 24 groups (73 percent) male relatives were primarily interested in taking up irrigation, whereas the women were the only member of the household with direct access to the resources of the NGO. In 14 out of the 24 cases, the new enterprises were managed jointly by women and male relatives. The strength of the group and the efforts of the NGO actively to involve women played an important role in encouraging women and men to explore new forms of joint management. Women heads of households directly benefited from the fact that the resources of the NGO were channeled through women's groups.

Ten FIGs were solely managed by men. In these cases the NGO had adopted a household approach and considered women primarily as mediators of resources to other household members. In six of the ten cases, which were all weak women's groups, this situation created tensions within the women's group, and prevented the women from continuing their own activities.

Exclusion of the poorest

NGO-supported mechanized irrigation only reached those NGO-members who had some regular source of income and, therefore, dared to take the risks of the investment in the capital costs. The poorest members tended to withdraw. This was reinforced by the fact that these poorest households had less land in the command area to benefit from the irrigation enterprise. For poorer members, who joined the irrigation activity, the availability of operational loans and group solidarity were essential.

Recommendations

NGOs which support private irrigation and organize predominantly women in the local forums can improve women's access to infrastructure and water, and improve their non-economic well-being, if they stipulate that:

- the groups are strong and cohesive, and
- the women themselves get the financial, technical and organizational support needed to take up the activity.

Targeting women as mediators can improve women's well-being, if NGOs:

- ensure that women's own activities with the NGO are prioritized, and
- settle rights and obligations of other household members with regard to the repayment of loans that they use. In this sense separate targeting is still needed.

The financial risks of mechanized irrigation in Bangladesh are substantial, and these risks represent a major obstacle for the poorest members to invest in infrastructure. The risks should be limited by:

- realistic and transparent feasibility studies,
- longer-term loan facilities with adapted interest rates and safety nets,
- free choice of technology, and equipment which is cheaper and can be used by smaller groups or by individuals, and
- preventing relatively well-off members from entering the NGO groups, and capitalizing on the poor.

7. Conclusions and recommendations

Irrigation, poverty alleviation and productivity

The failure to link irrigation development and human development leaves opportunities for both poverty alleviation and increased productivity underexplored. Irrigation development tends to be separated from socio-economic development in general by defining it in terms of neutral tasks, by seeing water users as a homogeneous group, and by not specifying *who* at local level is expected to participate. In thinking on rural poverty alleviation, on the other hand, it is still largely ignored how water development shapes patterns of inclusion and exclusion in society's mainstream socio-economic developments. Although the importance of employment and self-employment for the poor is widely recognized, water is underestimated as a leading input for agricultural intensification in increasingly smaller holdings.

Evidence from the literature and the field studies underlines that access to irrigated land and water by poor smallholders increases their land and labor productivity, and increases and stabilizes their production over a longer period of the year. Landless women and men find employment in irrigated agriculture and they can, in principle, benefit from water sale. This decreases their dependence upon other income sources, and improves the terms of inclusion in these other domains. Thus irrigation improves their well-being in economic and non-economic respects.

Differentiation of productivity according to size of holding points to the importance of this variable, at least in the available studies on the productivity of irrigated land. Smallholdings are often found to have higher land productivity than larger holdings. This is due to a higher input of own labor, and often of hired labor as well, fewer inefficiences related to supervision, and more intensive application of high yielding varieties and fertilizers than is true for larger farmers, provided the poor have access to agricultural inputs. Smallholders' land productivity may be lower, however, if larger farmers mechanize operations like plowing and weeding, and benefit from economies of scale. Livelihood diversification may also warrant distant off-farm employment and temporary or permanent migration, especially for poor men, which decreases farming intensity.

Targeting

The irrigation sector provides organizational, technical and financial support to farmers in order to improve irrigated land and water. In doing so, they also allocate rights to these resources, especially in public irrigation. In this thesis, the sector's contribution to poverty alleviation and productivity has been operationalized as vesting rights to the improved irrigated land and water primarily in poor men and women. In cases of skewed divisions of resource rights prior to project intervention, this often implies pro-actively redressing imbalances in resource rights in favor of the poor.

Irrigated agriculture by larger farmers may also contribute to poverty alleviation, but the effect is, at best, limited. If employment is created, the wages represent only part of the added value. Employment opportunities and wage rates are curtailed by net labor-saving mechanization. If large farmers lease-out irrigated land, they charge higher rents. Improved food production and lower food prices only benefit poor net buyers of food if they have sufficient purchasing power. Poor net producers, on the other hand, have an interest in higher prices. Larger farmers in private water markets, who sell water to poor cultivators, contribute to poverty alleviation, but for clients the water costs are usually higher and the water service less than for water sellers. Competition over access to irrigated land and water may directly harm smallholders. With increasing water scarcity, the relative gap is likely to grow. Therefore, support to farmers who are not poor mainly represents leakage, and is to be avoided.

Poor women's inclusion in irrigation development, and the vesting of rights to irrigated land and water in both men and women, were explicitly considered here. This had several implications. A gender-differentiated analysis of agriculture and irrigation highlighted the roles of both genders, and the specific situations in which women farmers were the main producers. The social organization of intra-household production was conceived as consisting of different production units, with exchange and bargaining between the managers of the units. Secondly, the meaning of 'household representation' by one member towards external agencies, and the intra-household transfer of external resources, were examined. It appeared that targeting by external agencies of the household as the unit, represented by the male head, did not fit local reality and fostered women's exclusion, as in rice cultivation improvement in Burkina Faso. On the other hand, household representation by women, as occurs nowadays in the large majority of NGO-supported groups in Bangladesh, also required insight into and intervention in intra-household processes. Hence, the generally appropriate targeting units are individuals, both men and women, rather than households.

Targeting support and vesting rights to irrigated land and water primarily in poor men and women is the contribution that the irrigation sector can make within the boundaries of its mandate and core competence. This is not to deny that lack of access to irrigated land and water is only one aspect of the state of multidimensional deprivation which is poverty. It entails a bias towards the economic sphere. For those who obtained access to the resources there are still many other factors which influence the final impact on their well-being. Access to appropriate inputs at reasonable prices, and to marketing facilities and rewarding prices, may be at least as important. For a large part of the world's poor, irrigated agriculture is not the most urgent need, for example, if climatic conditions are favorable. Neither is irrigation always a feasible solution, especially if the costs of irrigation are too high for the producers, even if irrigation is heavily subsidized. Last but not least, only ecologically sustainable irrigation leads to sustainable poverty alleviation.

In the past, many cases were reported in which irrigation agencies excluded poor men, and especially women, from access to irrigated land and water. The analysis and lessons of these cases of exclusion, and the growing body of agencies' experiences of targeting organizational, technical and financial support, suggest that an effective targeting approach consists of a combination of the following elements.

Organizational support
The targeting of external support to the poor is only possible if there is a forum at the interface of agency and local people, composed by this priority target group. This forum should allow poor men and women to effectively participate in decision-making on the site-specific and typically collective development of irrigated land and water, and in the negotiations on the claims to these improved resources. Poor women and men are rarely already organized in forums appropriate for land and water improvement. This implies that the agency needs to provide organizational support to that end as the first step in intervention. Creating an inclusive forum starts by providing information about the possibility of external support, in the local language, and by oral rather than written means. Training in negotiating skills with the local non-poor, and with the agency itself, is also needed.

Many NGOs worldwide have specialized in organizing the poor in forums, and men and women respond positively to this support. Governmental agencies that adopted clear target group criteria, and adhered to these criteria during implementation, achieved similar results. Innovative forms are developed for women's increasingly effective participation in male-dominated forums. However, the poorest still tend to be excluded from these forums.

These efforts build upon local forms of organization and resource management by poor men and women which often already exist. The field study in Burkina Faso shows that inclusive forums even emerged in a project in which the project management had adopted male-biased target group criteria and mainly interacted with the village elite. Women's inclusion could occur, firstly, because there was a certain time span between the first interactions of the project with the village elite, and the implementation of construction. Secondly, the excluded women were aware of the implications of the project's plans which had already been implemented in a nearby village. Thirdly, the field staff, unlike the project management, acknowledged the prevailing local land and water tenure arrangements. This, and evidence elsewhere, show that there is less reason than often assumed to expect *a priori* resistance or sabotage by local elite and men against inclusive and gender-balanced forums.

Instead, the behavior of the agency in reaching the poor emerges as an under-researched factor. Agencies decide whom to contact, inform and involve in resource development at

local level, and whom to exclude from their networks at the interface. Evidence, which was confirmed in the field study in Burkina Faso, reveals that many agencies themselves narrowly confine their contacts on the 'business' of negotiating resources to the local male elite. There are several reasons for this.

Firstly, the fact that irrigation development is often supply-driven, and defined as a task that needs to be implemented under pressure of deadlines, induces project staff to limit their local contacts to those who can help them best and most quickly in implementing this task. External agencies often use existing communication channels between decentralized administrative, planning and technical governmental institutions, and local people, and take the composition of these networks for granted. Poor men, and to an even larger extent poor women, are typically excluded from these networks.

Secondly, the project's strict adherence to formal law, or their own interpretations of this, also contributes to the neglect of the more complicated and pluralistic realities. Local legal systems may well recognize more diversity, including the range of rights that poor women and men hold. On the other hand, formal law that stipulates equality legitimizes efforts to redress imbalances in resource rights.

Lastly, the delicacy of expropriation and reallocation of rights to irrigated land and water may also persuade project staff to refrain from involvement in these issues, and to leave the arrangements to local people as much as possible. Agencies may find that negotiating the minimum local support for changes in resource rights, especially for expropriation, may well be easier with the elite and with men, who are then assumed to represent 'the' village or 'the' household.

Hence, as long as it remains undefined *who* is supposed to participate and to be vested with rights to the newly developed resources, the male elite has every opportunity to fill this void. They can claim the resources, in return for their support for the project, and at the relative or absolute expense of the poor.

Inclusion in local forums is the more effective if it is arranged in early stages, during the planning of joint investments. Investments are the major ground for claiming the fruits of the investments, and these claims are usually negotiated before the investments are made. A forum for investments evolves into the local organization that monitors the implementation of the vested rights. The scope for targeted irrigation development is usually largest when new infrastructure is planned, since this often represents the earliest and major investment. Investors have strong rights to the water conveyed. Schemes in the use phase, whether public or private schemes, have a history of earlier investments from which poor men and women may already have been excluded.

Nevertheless, any new initiative by agencies, such as rehabilitation or irrigation management transfer, or exogeneous changes, for example male outmigration, give new opportunities to create inclusive forums. Currently, the establishment of water users' organizations for the increased participation of water users is advocated. The issue is the composition of this new forum. Inclusion in forums or water users' associations is a proxy for being vested with resource rights, and belonging to the social group through which rights are, at least partly, implemented. Formal and *de facto* membership of water users' associations is a recognition of one's water rights. Membership criteria, which explicitly stipulate the inclusion of poor men and women, and their class, gender, caste and ethnicity characteristics, are likely to be the most effective. In any case, membership criteria should not implicitly exclude women through household-based criteria, or land users with weak land rights through criteria of land ownership.

Providing organizational support for the creation of inclusive forums, or for the better integration of poor men and women into existing biased organizations, is the first element of an effective targeting approach. Through these forums agencies can channel their technical and financial support to the poor. In their turn, these technical and financial dimensions further shape this forum and the issues at stake.

Technical support
In targeted technical support, the physical design and the design phase are recognized as the critical moments to vest rights to irrigated land and water in the poor. This is especially the case in public irrigation, in which external agencies are the main investors in the construction or rehabilitation of infrastructure, and employ the engineers who make the physical design. The selection of the site, the layout and division structures in a scheme largely influence whether the land of the poor or the prosperous is improved. Hence, the issue *whose* land becomes irrigated land constitutes the starting point of an inclusive design process. Evidently, this is closely related to the composition of the forum.

The new farming opportunities may allow more producers to enter the new command area and make a localized land reform possible. The opportunities of such reform to vest rights to irrigated land preferentially in the poor are grossly underexploited.

Inclusion of the poor in the process of physical design also protects them against expropriation of resource rights without compensation, and guarantees the mobilization of their own technical and environmental knowledge for a sustainable design.
Lastly, co-investments by users in the construction activities are part of the technical design and its implementation. This allocation principle is a potentially important mechanism to vest the poor with water rights, provided this opportunity is explicitly opened up to the poor. Moreover, the link between their investments and the rights they can claim needs attention, since this link tends to be weaker for poor than for other co-investors.

Women are especially affected by both forms of exclusion. Timely establishment of transparent arrangements, and proper registration of the factual contributions to the investments in the widest sense, are expected to improve the bargaining position of the poor in claiming their rights later.

If the poor themselves bear the capital costs of new infrastructure they also take the decisions on site-selection and dispose of the water conveyed. In this private irrigation, the major bottleneck in obtaining access to irrigated land and water for the poor is the availability of equipment and energy sources that are adapted to their scale of farming, land tenure security, and investment possibilities. The provision of appropriate equipment and energy sources is the most needed technical support. Modern commercially developed equipment is usually inappropriate, unless collective ownership is feasible. In that latter case, the agency's organizational support needs to be fine tuned for this purpose.

Both in private and public irrigation, technical training in operation and maintenance of infrastructure is indispensable.

Financial support

Financial support in public irrigation mainly concerns the payment of the capital costs of the infrastructure, so targeting is implicit in the technical support. In the past, the poor have often been excluded from these benefits, or from making the limited co-investments in the infrastructure to obtain access to these benefits, or from obtaining access to the benefits on an equal footing with the prosperous. Targeting subsidies entails avoiding this leakage.

With increasing privatization, public agencies will increasingly require the recovery of capital costs, as commercial financing institutions do. This in itself does not exclude the poor, as long as irrigated agriculture has net profits for a small as well as a large farmer. Prefinancing of the investments by the state or by another institution already removes the typical obstacle for the poor, which is the lack of capital, and the lack of access to longer-term credit facilities. In fact, the evidence from NGOs in Bangladesh which offered such credit facilities, shows that poor women and men took high financial risks to become pump owners. In one NGO-program, poor women and men even had to pay a high price for a type of pump that other farmers had only used with substantial subsidies. This underlines the need for credit facilities, but also for an optimal, free choice of technology, for sound feasibility studies, and for safety nets in the credit obligations to cover adverse conditions.

The poorest who are unable to make any investment either in infrastructure or in water fees before harvest, remain excluded from the use of water for irrigated agriculture, or from the use of water for sale. This exclusion hardly receives attention.

Through the targeting of external organizational, technical and financial support along these lines, irrigation development and gendered poverty alleviation become increasingly intertwined.

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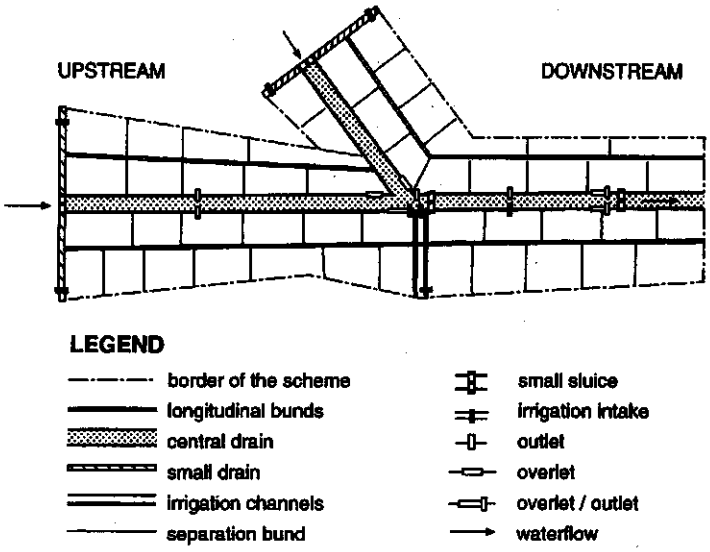
Annex 1. Technologies *Opération Riz*

SCHEME WITH CENTRAL DRAIN



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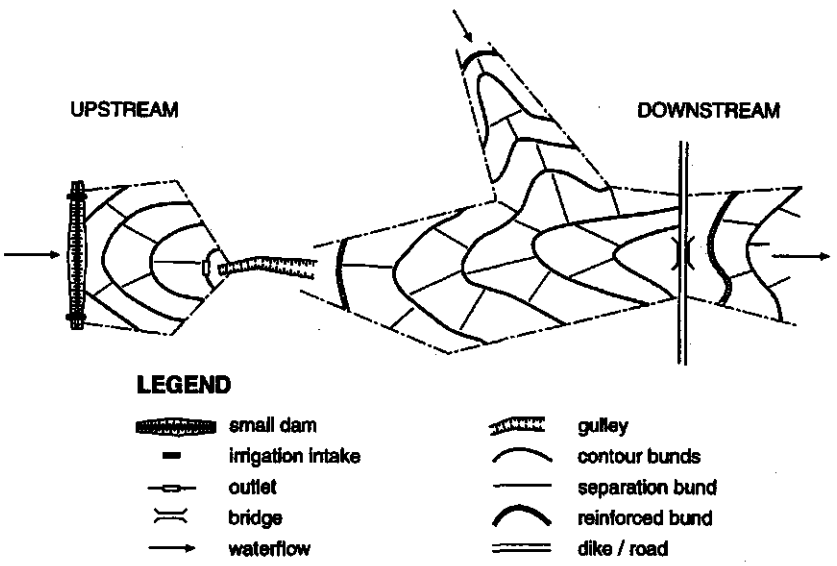


Source: *C. Nijburg and M.O. de Bont, Aménager une plaine avec les paysans, Department of Irrigation and Soil and Water Conservation, Wageningen Agricultural University, and SNV, Netherlands Development Organization.*

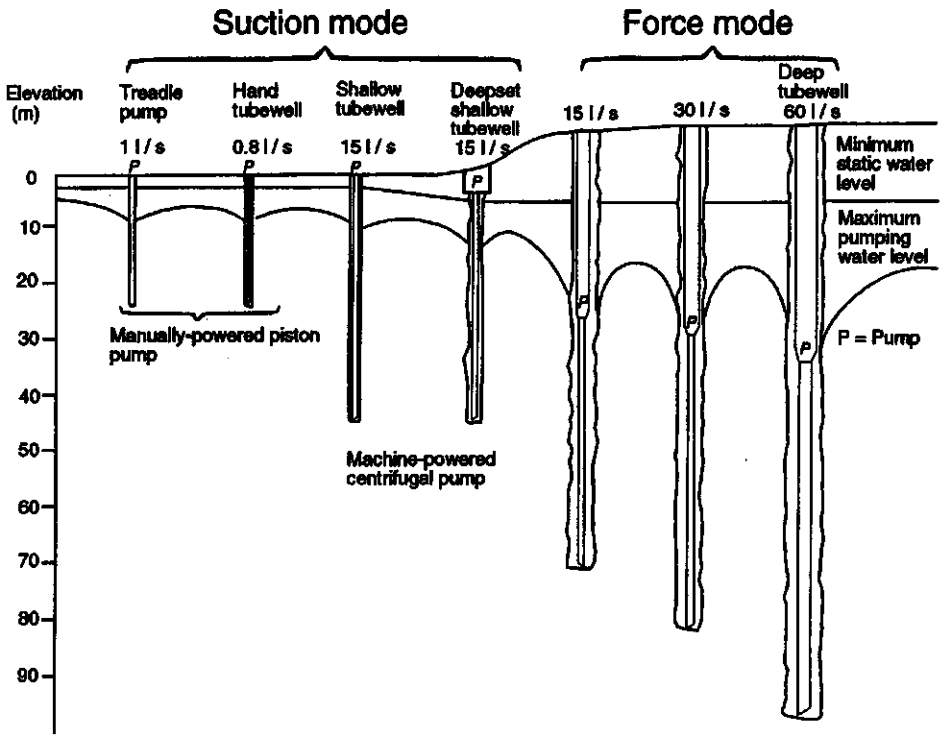
Annex 2. 52 Irrigation groups in the sample Bangladesh

	Village	Thana/District	Starting	Pump
RDRS:				
1.	Kamarpara	Atwari, Panchagarh	1990-91	STW
2.	Barshalupar	Atwari, Panchagarh	1991-92	STW
3.	Paikpara	Atwari, Panchagarh	1991-92	STW
4.	Molani - 1	Atwari, Panchagarh	1991-92	STW
5.	Molani - 2	Atwari, Panchagarh	1992-93	STW
6.	Nitupara	Atwari, Panchagarh	1991-92	STW
7.	Kaharganj	Boda, Panchagarh	1991-92	STW
8.	Panchpir	Boda, Panchagarh	1992-93	STW
9.	Tajpur	Lalmonirhat, Lalmonirhat	1992-93	STW
10.	Khuniagachi	Lalmonirhat, Lalmonirhat	1992-93	STW
Proshika Manobik Unnayan Kendra:				
1.	Darika	Ulipur, Kurigram	1991-92	STW
2.	Malchandi	Debiganj, Panchagarh	1992-93	STW
3.	Khidrapery	Gabtoli, Bogra	1991-92	STW
4.	Gobardhanpur	Bogra Sadar, Bogra	1991-92	STW
5.	Nazarpur	Raipura, Norsindi	1991-92	STW
6.	Matikata - 5	Kuliarchar, Kishoreganj	1991-92	STW
7.	Matikata - 6	Kuliarchar, Kishoreganj	1991-92	STW
8.	Chawk Gobindapur	Raiganj, Sirajganj	1991-92	STW
9.	Delduar	Delduar, Tangail	1991-92	STW
10.	Chawna	Dhamrai, Dhaka	1991-92	STW
11.	Bahadurpur	Madaripur Sadar, Madaripur	1984-85	LLP
12.	Baropaika	Agoiljhara, Barisal	1991-92	LLP
13.	Meghia	Babuganj, Barisal	1992-93	LLP
14.	Mahanandapur	Shakhipur, Tangail	1991-92	DTW
Proshika Comilla:				
1.	Jalalshi	Lohagara, Narail	1989-90	LLP
2.	Krishnapur	Lohagara, Narail	1989-90	STW
3.	Narandi	Lohagara, Narail	1989-90	STW

Village	Thana/District	Starting	Pump
SNSP:			
1. Komarpur	Faridpur Sadar, Faridpur	1991-92	STW
2. Baithakhali	Faridpur Sadar, Faridpur	1991-92	STW
Grameen Bank:			
1. Babupur	Delduar, Tangail	1988-89	DTW
2. Shatshaila	Ghatail, Tangail	1988-89	DTW
3. Maistha	Kalihati, Tangail	1988-89	DTW
4. Talina	Mirzapur, Tangail	1990-91	DTW
BRAC:			
1. Dulla Begum	Mirzapur, Tangail	1989-90	DTW
2. Kumarjani	Mirzapur, Tangail	1989-90	DTW
3. Dhakili	Mirzapur, Tangail	1990-91	DTW
4. Ramnagar	Jessore S, Jessore	1990-91	DTW
5. Munshikanpur-1	Monirampur, Jessore	1991-92	DTW
6. Munshikanpur-2	Monirampur, Jessore	1991-92	DTW
7. Sarifpur	Navaron, Jessore	1990-91	DTW
8. Amini	Navaron, Jessore	1989-90	DTW
9. Andal Pota	Navaron, Jessore	1989-90	DTW
10. Jafar Nagar	Jhikorgac., Jessore	1989-90	DTW
11. Deoli	Keshapur, Jessore	1990-91	DTW
12. Aurangabad	Betila, Manikganj	1991-92	DTW
13. Gillondo	Manikganj, Manikganj	1984-85	DTW
14. Dhalai-1	Manikganj, Manikganj	1990-91	DTW
15. Dhalai-2	Manikganj, Manikganj	1990-91	DTW
16. Rajib-2	Kawnia, Rangpur	1989-90	DTW
17. Ziga Bari	Kawnia, Rangpur	1989-90	DTW
18. Kolapara	Kishoreganj, Kishoreganj	1991-92	DTW
19. Austabarga	Kishoreganj, Kishoreganj	1991-92	DTW

Annex 3. Technologies Bangladesh

GROUND WATER IRRIGATION TECHNOLOGIES



Annex 4. NGO - supported irrigation groups in Bangladesh in 1992

NAME OF NGO	Number of RDW groups				Number of NDW groups				Number of LLP groups				Total				
	Male	Female	Mixed	Total	Male	Female	Mixed	Total	Male	Female	Mixed	Total	Male	Female	Mixed	Grand Total	%
1. BRAC	14	23	515	552									14	23	515	552	36.85
2. PROSHIKA	33		2	35	225	10		235	62	3	65		320	13	2	335	22.36
3. RDRS*1					NA	NA		147					NA	NA		147	9.81
4. COMILLA PROSHIKA*2	14			14	69	2		71	26	1	27		109	3		112	7.48
5. GONOSHASTHYA					59			59	35		35		94			94	6.28
6. ORD	15	4		19	31	2		33					46	6		52	3.47
7. SPP	20	1		21	25	1		26					45	2		47	3.14
8. BEES*3					23			23					45	2		47	3.14
9. CARITAS					23	3		26					23	3		26	1.73
10. GRAMEEN BANK	7	4		21	3			3					20	4		24	1.60
11. JARDI									19	1	20		19	1		20	1.34
12. AVRD-B*4									10		20		19	1		20	1.34
13. CDA					14	2	1	17					14	2	1	17	1.13
14. HADS	1			1	10		1	11					11		1	12	0.80
15. HEED	1			1		2		2	4		10		10			10	0.67
16. FIVDB									6	1	7		6	1		7	0.47
17. PSKS					3			3					3			3	0.20
18. RRC	3			3									3			3	0.20
19. SOSHIKA					3			3					3			3	0.20
20. SAPTAGRAM						2		2						2		2	0.13
21. GUP					2			2					2			2	0.13
TOTAL	118	32	517	667	490*1	24*1	2	663	162	6	168		770*1	62*1	519	1498	100.00
%	7.88	2.14	34.51	44.53	32.71	1.60	0.14	44.26	10.81	0.40	11.21		51.40	4.14	34.65	100	

Notes: 1.Male and female totals may not add up to grand totals due to absence of male-female breakdown in the case of RDRS
2.Three Comilla Proshika LIGs own more than one pump
3.Three BEES LIGs own more than one pump
4.One AVRD-LIGs owns more than one LLP
NA. Means: not available

Source: Gender in minor irrigation managed by the landless in Bangladesh: present situation and research priorities. Working Paper No. 2, December 1992, Wageningen Agricultural University and Bangladesh Institute of Development Studies.

Annex 5. Profitability of 69 BRAC DTWs

Imputed capital loan recovery period under 16% and 20% interest on the basis of the operational costs and water income in 1991-1992

	Cap. Loan	Op. Costs	Income	Op. Profit	Imputed Recovery Period (years) (int. 16%)	(int. 20%)
Mirzapur						
1. Kumarjani	106.500	93.754	126.266	32.512	5.0	7.2
2. Dulla Begum	120.000	88.354	166.370	78.016	1.9	2.5
3. Buryhaty	80.000	90.325	129.341	39.016	2.7	3.6
4. Sarishadier (1)	132.000	108.946	122.444	13.498	∞	∞
5. Bahuraichar	127.500	94.404	79.092	15.312	∞	∞
6. Mirdewhata	100.000	64.962	87.615	22.653	8.3	14.4
7. Paharpur	80.000	89.048	133.369	32.116	3.4	4.6
8. Sarishadier (2)	102.000	70.429	104.996	34.567	4.3	6.0
9. Giogi	100.000	102.140	124.761	22.621	8.3	14.5
10. Budirpara	82.000	78.224	83.680	5.465	∞	∞
Kaunia						
1. Shadu-1	61.200	70.062	35.770	-34.292	∞	∞
2. Shadu-2	43.250	80.128	73.500	-6.628	∞	∞
3. Khudra-Vulsara	46.500	73.755	103.398	29.643	1.9	2.5
4. Shahabaj	104.000	79.493	134.505	55.012	2.4	3.2
5. Poschim Shibu	146.000	71.420	130.726	59.306	3.4	4.6
6. Ziga Bari	146.500	63.886	136.600	72.714	2.6	3.5
7. Rajib-2	42.500	15.917	17.524	1.607	∞	∞
8. Purbo Shibu	150.000	47.907	85.495	37.589	6.9	10.8
Manikganj						
1. Gillondo	140.000	140.589	145.440	4.851	∞	∞
2. Nobograme (1)	90.000	63.034	59.520	(-)3.514	∞	∞
3. Nobograme (2)	60.000	53.077	43.420	(-)9.657	∞	∞
4. Dhalaye (1)	192.000	107.994	67.060	(-)40.934	∞	∞
5. Dhalaye (2)	190.000	75.326	78.520	3.194	∞	∞

	Cap. Loan	Op. Costs	Income	Op. Profit	Imputed Recovery Period (years) (int. 16%)	(int. 20%)
Jessore Sadar						
1. Ramnagar	186.000	53.065	103.500	50.435	3.6	9.0
2. Tolagolder	-	41.635	621.000	20.464	∞	∞
3. Fatapur-1	186.000	55.240	99.000	43.760	7.7	12.8
4. Fatapur-2	186.000	46.459	66.000	19.541	∞	∞
5. Talbaria	-	58.771	94.500	36.060	∞	∞
6. Bhatpara	-	48.000	88.000	40.000	∞	∞
Jhikorgacha						
1. Mohinikati	210.000	88.410	124.900	36.490	17.1	∞
2. Jafarnagar	254.000	68.766	149.310	80.544	4.7	6.7
3. Youssoufpur	86.000	89.471	116.063	26.592	4.9	7.0
4. Mathuapara (1)	199.000	81.510	90.500	8.990	∞	∞
5. Mathuapara (2)	160.000	79.553	102.625	23.072	∞	∞
6. Mathbari (1)	160.000	102.651	105.300	2.649	∞	∞
Navaron						
1. Sarifpur	165.000	106.318	149.028	42.110	6.6	10.3
2. Amini	200.000	92.176	115.350	23.176	∞	∞
3. Manikali	135.000	63.384	75.689	12.305	∞	∞
4. Dhakapara	-	63.568	83.474	19.906	∞	∞
5. Panch Pota	-	63.060	80.596	17.536	∞	∞
6. Bowsa	-	37.947	59.400	21.453	∞	∞
7. Sree Ram Kathi		156.000	88.341	102.700	14.369	∞
8. Matikumra	156.000	97.931	102.858	4.927	∞	∞
9. Uttar Navaron	156.000	83.281	100.312	17.031	∞	∞
10. Uttar Dailly	156.000	69.640	77.000	7.360	∞	∞
11. Andal Pota	156.000	64.879	92.880	28.001	15.0	∞
12. Chara Tola	156.000	86.570	107.640	21.070	∞	∞
13. Shailghona	-	63.596	65.520	1.924	∞	∞
14. Kashadanga	156.000	50.672	78.000	27.328	16.5	∞

	Cap. Loan	Op. Costs	Income	Op. Profit	Imputed Recovery Period (years) (int. 16%)	(int. 20%)
Monirampur						
1. Agarhati	200.000	66.554	105.709	39.155	11.5	∞
2. Munshi Khanpur-1	180.000	77.125	115.236	38.111	9.5	19.5
3. Munshi Khanpur-2	(175.000)	82.180	96.903	14.723	∞	∞
4. Bharatpur Biswas	(175.000)	65.884	97.960	34.076	11.6	∞
5. Bharatpur Ga	(175.000)	64.953	104.720	39.763	8.2	14.3
6. Baliadanga	200.000	85.907	115.000	29.093	∞	∞
7. Madhupur	(175.000)	99.030	83.808	(-)15.222	∞	∞
8. Hogladanga East	223.000	82.869	102.340	19.475	∞	∞
9. Mongladanga	200.000	86.811	115.236	31.065	∞	∞
10. Ghughurail	200.000	56.579	49.995	(-)6.584	∞	∞
11. Kashipur (S)	(175.000)	82.524	85.391	2.867	∞	∞
12. Kashipur (B)	166.000	46.270	29.455	(-)16.815	∞	∞
13. Kashipur (N)	200.000	99.350	101.994	2.644	∞	∞
14. Majiali	200.000	80.748	72.167	(-)8.581	∞	∞
15. Hakoba	200.000	80.923	83.808	2.885	∞	∞
16. Hajrakati	192.000	57.885	60.236	2.351	∞	∞
17. Chalkidanga	(175.000)	79.438	93.472	14.034	∞	∞
18. Khordagangra	225.000	68.109	65.475	(-)2.634	∞	∞

Annex 6. Number of respondents per case study per category

Case	members	husbands	other male relatives	unrelated (incl. elite & water users)
Proshika A	11	7	2	6
Proshika B	6	5	1	3
RDRS	6	5	7	4
Grameen Bank	9	4	2	3
	neutral shareholders and male relatives	drop-outs and male relatives	transfers	unrelated (incl. elite, watermen, other BRAC members)
BRAC A	33	17	2	13
BRAC B	25	14	2	15

Summary

Research theme

The central theme of this thesis is the relation between irrigation development and gendered poverty alleviation in rural areas in developing countries. The focus is on the role of the irrigation sector. The sector comprises national and international governmental and non-commercial non-governmental agencies which develop irrigation infrastructure. They provide organizational, technical, and financial support to that end and participate in arranging the vesting of rights to the improved resources of irrigated land and water. The research questions concern, firstly, the effects of access by poor men and women to irrigated land and water on both poverty alleviation and productivity; secondly, inclusion and exclusion processes in irrigation; and, thirdly the role of the irrigation sector in these processes. This provides insight into the agencies' targeting of their support, and into the factors that critically contribute to vesting rights to irrigated land and water in poor men and women, and, hence, to poverty alleviation and productivity.

The analysis explicitly includes rural women. They constitute the majority of the poor. Improvement of their incomes strongly contributes to family welfare and to the reduction of fertility rates. A gender-differentiated analysis requires the distinction of intra-household production units and women's and men's own resource rights.

Method

The three research questions are addressed in a review of global literature (Chapter Two, Three and Four), and in two field studies on external irrigation support for rice cultivation. The case in Burkina Faso concerns public irrigation by a state agency. The intervention is accompanied by land expropriation and reallocation. Ten subsequently constructed schemes are studied. Rice cultivation is a female cropping system in the region (Chapter Five). The subject in Bangladesh is NGO-supported private pump ownership by groups of marginal farmers and landless women and men, who use the water for irrigating their own household land and for sale. A country-wide study is made of 52 irrigation groups in which the irrigation loans are taken in women's names. They are supported by six NGOs. Irrigated rice cultivation is a male cropping system there (Chapter Six).

Irrigation, poverty alleviation and productivity

Access to irrigated land and water by poor men and women generally improves their well-being (Chapter Two). Water is often a leading input for agricultural intensification, and for stabilization and growth of production during a longer period of the year. It fits the needs of farmers in increasingly smaller holdings. Water sale by smallholders and landless people provides an income, in principle. Remarking these positive effects is not to deny that lack of access to irrigated land and water is only one aspect of the state of multidimensional deprivation which poverty is. Improved access is not necessarily the

most urgent need, the sufficient solution, nor the most feasible solution. It is a potential solution for only part of the world's poor. It is a sustainable solution only if the ecological resource base is conserved.

The field study in Burkina Faso highlights the importance of women's own resource rights for their own well-being and for family welfare, and also for improved productivity. In Bangladesh, however, there appear to be hardly or no economic benefits from water sale for most irrigation groups. On the other hand, the non-economic status of women members of irrigation groups tends to improve, in the sense of women's self-concept and public behavior and their status within the family and the community.

In many circumstances, access to irrigated land and water by the poor not only alleviates poverty but also leads to higher productivity (Chapter Two). Evidence shows that agricultural output per unit of land in smaller irrigated holdings is higher than in larger holdings. This relative higher productivity may disappear, however, if large farmers adopt large-scale mechanization; secondly, if the poor have limited access to other agricultural inputs; and, thirdly, if income diversification strategies lead the poor to take up employment far from home. There is also considerable evidence in the literature that gender by itself does not effect a farmer's production efficiency. The case studies also indicate the relatively good performance of poor producers and water sellers. In female cropping systems, like rice cultivation by most ethnic groups studied in the Burkina Faso case, women are the main producers.

Evidence in the literature shows that if larger farmers obtain access to irrigated land and water, this may provide paid employment and a commercial offer of water to smallholders, and thus alleviate poverty indirectly. An increased food supply lowers the food prices. However, the effects are limited since the larger farmers largely set the terms of inclusion. The purchasing power of poor net buyers of food may still be too limited to buy the increased food supply. Poor net producers of food, on the other hand, benefit from high food prices. Moreover, access to irrigated land and water by larger farmers can also be at the direct expense of the poor. Such competition is likely to become more severe with growing water scarcity. Therefore, the irrigation sector contributes optimally to both poverty alleviation and productivity by targeting the poor and avoiding leakage of external support to the non-poor.

Targeting

The contribution that the irrigation sector can make to poverty alleviation and increased productivity, given its mandate and core competence, is in vesting rights to irrigated land and water primarily in poor men and women, and redressing existing imbalances in resource rights in favor of the poor. The role of the irrigation sector in providing some users' groups with access to newly developed irrigated land and water, and excluding

others, is identified in Chapters Three and Four, and empirically researched in the field studies. The type of irrigation support, the phase of a scheme, and the communication networks at the interface of agency and local people, are important variables in these inclusion and exclusion processes.

The influence of the agency is especially strong in public irrigation, which is defined as irrigation in which the external agencies bear most of the costs of the infrastructure. Agencies usually have a powerful say in the physical design, and as investors their definition of their own claims and the users' claims to the water tends to be seen as legitimate. In private irrigation the water users are the main investors in the infrastructure. These private investors largely decide on the physical characteristics of the scheme and dispose of the water conveyed. The steering role of agencies is indirect and usually more limited.

The definition of rights, and the role of agencies, differ according to the phase of a scheme. Usually the most important negotiations on the rights to irrigated land and water take place when infrastructure is newly constructed. Participation in these investments, either in cash or kind, are a firm basis to claim rights to the fruits in later phases, and over the generations. New construction is rare nowadays. Instead, the major redefinition of water rights occurs in irrigation management transfer and rehabilitation programs.

It is an empirical question in which social fields the expropriation and reallocation of resource rights of users are negotiated under intervention, but, generally, these fields are embedded in the communication networks between local people and external agencies. Processes of inclusion and exclusion of the poor take place in these fields. If the poor are included in these networks, this network is called an 'inclusive forum'. Any new initiative of the agency, such as rehabilitation or irrigation management transfer, entails more or less substantially restructuring the local networks and redefining their competences.

From the analysis of inclusion and exclusion processes in externally supported irrigation development, according to the literature and as studied in the field, it is concluded that there is considerable scope to improve the performance of the irrigation sector in vesting rights to irrigated land and water primarily in poor men and women, and in avoiding leakage. A combination of the following factors in agencies' targeting approaches appears to be pivotal.

Organizational support
Targeting support is only possible if agencies work through inclusive forums at local level, composed of the priority target groups. The earlier these forums are established in an intervention process, the fewer rights become vested in the non-poor, which would hamper the later inclusion of new groups, in particular the poor. Organizational support

in creating this forum is required, since poor women and men are usually not organized to that end.

By now, several governmental and non-governmental irrigation agencies worldwide have succeeded in establishing such forums. These agencies have explicit and clear target group criteria, and adhere to those criteria during implementation. Culturally appropriate forms for effective participation of women in mixed-sex forums are created as well. Women are even the majority of the members of such forums in, for example, NGO-supported groups in Bangladesh.

Poor people's existing organizations, and their motivation to be included in irrigation development, provide a substantive basis for these inclusive forums. In the later schemes studied in Burkina Faso, inclusive forums with women emerged even in spite of the male-biased targeting approach of the project management, which they had already implemented in earlier schemes. Such inclusion better fitted the prevailing social relations of production, for which the field staff was more receptive than the management.

A rather poorly documented but important factor in excluding the poor from irrigation development appears to be the tendency of agencies themselves to confine their interactions to the decentralized branches of administrative and technical ministries, and to the local people who have most contacts with these institutions. These communication channels are dominated by the male local elite. By defining irrigation development as a matter of neutral tasks, and by failing to specify *who* at local level is supposed to participate and to be vested with the rights to these resources, the male elite act as a quick and effective partner in implementing these tasks. Tight implementation schedules and task-oriented reward structures for agencies' staff foster this. Within these task-oriented local networks, the elite easily claim the rights to the newly developed resources. In the early schemes studied in Burkina Faso, women lost their former land rights in this way, whereas men were endowed with rights they traditionally never had. The project's unrealistic concept of the unitary household farm represented by the male head was instrumental in this.

The social fields in which rights are defined evolve over time as the social fields in which rights are implemented. In the use phase this social field is currently called a water users' organization. Membership of these organizations is closely related to having legitimate rights to irrigated land and water. Exclusion of women implicitly takes place if rights are vested in households, thought to be represented by the male head. Womens' inclusion requires the separate vesting of rights in both men and women. Poor land users with weak land rights are included as potential right holders if water rights are disconnected from land ownership. The recognition of pre-project rights, including those according to local legal systems, as a basis to vest new rights is likely to favor the poor, who, in the past, often lost their former rights without compensation.

Only through inclusive forums can technical and financial support reach the poor. The types of technical and financial support, in their turn, further shape the organizational support required.

Technical support

In public irrigation, the technical support in the construction, operation and maintenance of infrastructure entails major inclusion or exclusion processes in two respects. Firstly, the site-selection, layout and division structures heavily influence *whose* land can be irrigated, and how well. If land tenure in the command area does not change, the physical design directly determines whether the poor or the non-poor obtain access to irrigated land. In the past, the non-poor have often been favored in this way. If land reform in the command area is possible or needed, this usually offers good opportunities to provide primarily the poor with access to irrigated land. However, these opportunities are rarely used. Land expropriation even ousted poor men and especially poor women not only in Burkina Faso but also elsewhere.

Secondly, agencies in public irrigation can vest users' rights to the newly developed water, and sometimes to irrigated land as well, by arranging co-investments in construction and maintenance work in the form of labor and/or other contributions. An effective means to include the poor is explicitly opening up these opportunities to poor men and women. Timely and transparent procedures better guarantee that investments by the poor are effectively linked to rights. Poor women have often been entirely excluded from these opportunities, or their investments did not lead to rights as they did for men.

In private irrigation, the poor obtain access to irrigated land and water as owners of equipment if appropriate equipment and energy sources are available. Commercial technology often does not fit these needs, or collective ownership is needed. The latter has been studied in Bangladesh. A free technology choice for optimal adaptation to local conditions, is primordial. Some NGOs develop appropriate equipment for small-scale or individual use.

Financial support

Investments in infrastructure are often the most costly part of irrigation. The poor typically lack the access to capital and to longer-term credit facilities that prosperous farmers tend to have. Hence, subsidized investments in public irrigation infrastructure should support the poor especially in obtaining access to irrigated land and water. In reality, however, these funds for irrigated land and water development have often leaked to the well-off. In private irrigation longer-term credit facilities for the poor are primordial. The study in Bangladesh shows that the poor take even substantial risks as soon as these credits are available. Therefore, sound feasibility studies and safety nets are warranted.

The poorest of the poor tend to be excluded as owners of modern infrastructure, because they lack a minimal regular source of income for long-term repayment of credits. They remain largely dependent on the targeting efforts of irrigation agencies in public and private irrigation, and on the terms of inclusion set by private or semi-private owners of infrastructure, who sell the water.

Samenvatting

Onderzoeksthema

Het centrale thema van deze dissertatie is de relatie tussen irrigatieontwikkeling en armoedeverlichting, en de rol van de irrigatiesector hierin. De irrigatiesector is gedefiniëerd als de nationale en internationale overheidsinstanties en niet-commerciële, niet-gouvernementele organisaties (NGO's) die organisatorische, technische en financiële steun verlenen voor de ontwikkeling van geïrrigeerd land en water. Zij bepalen mede wie de rechten op deze verbeterde natuurlijke bestaansbronnen krijgen. De onderzoeksvragen betreffen, ten eerste, de effecten van de toegang van arme mannen en vrouwen tot geïrrigeerd land en water op armoedeverlichting en landbouwproductie; ten tweede, insluitings- en uitsluitingsprocessen in irrigatie; en ten derde, de rol van de irrigatiesector in deze processen. Dit geeft inzicht in de wijze waarop irrigatie-instanties hun steun richten, en in de factoren die doorslaggevend zijn voor het prioritair vestigen van rechten op geïrrigeerd land en water in arme mannen en vrouwen, en dus voor armoedeverlichting en productieverhoging.

Aan vrouwen wordt expliciete aandacht besteed. Zij vormen de meerderheid van de armen. Verbetering van hun inkomen draagt sterk bij aan het welzijn van de familie, maar ook aan verlaging van het geboortecijfer. Voor een gender-gedifferentiëerde analyse is het nodig productie-eenheden binnen boerenhuishoudens en de eigen land- en waterrechten van mannen en vrouwen te onderscheiden.

Methode

De drie onderzoeksvragen worden behandeld in een literatuurstudie (hoofdstukken twee, drie en vier) en in twee veldstudies naar ondersteuning van geïrrigeerde rijstverbouw. De studie in Zuid-West Burkina Faso (hoofdstuk vijf) betreft publieke irrigatie door een overheidsdienst, in een gebied waar rijstverbouw een door vrouwen gedomineerd bedrijfssysteem is. Irrigatieontwikkeling gaat hier gepaard met de onteigening en herallocatie van de gronden in het stelsel. Tien opeenvolgend aangelegde stelsels worden bestudeerd. Het onderwerp in Bangladesh is door NGO's ondersteund particulier eigendom van pompen door groepen kleine boeren en boerinnen en landlozen. Zij gebruiken dit water om hun eigen land te irrigeren en ze verkopen het water. De studie betreft 52 over Bangladesh verspreide, representatieve irrigatiegroepen die het irrigatiekrediet op naam van vrouwen hebben genomen. Deze worden ondersteund door zes NGO's. Hier is geïrrigeerde rijstverbouw een door mannen gedomineerd bedrijfssysteem (hoofdstuk zes).

Irrigatie, armoedeverlichting en productiviteit

In het algemeen blijkt de toegang van kleine boeren en boerinnen tot geïrrigeerd land en water hun welzijn te verbeteren (hoofdstuk twee). Water is vaak de kritische input voor landbouwintensivering en voor stabilisering en verhoging van de productie gedurende

meerdere seizoenen. Water voorziet in de behoeften van kleine bedrijven wier areaal steeds verder afneemt. De verkoop van water door kleine boeren en boerinnen en landlozen geeft, in principe, een inkomen. Uiteraard is een gebrek aan toegang tot geïrrigeerd land en water slechts één aspect van de staat van multidimensionale deprivatie wat armoede is. Verbeterde toegang is niet noodzakelijkerwijs de belangrijkste behoefte, of een voldoende of haalbare oplossing. Bovendien kan het alleen een lange-termijnsoplossing zijn als de ecologische duurzaamheid van irrigatie gewaarborgd is.

De veldstudie in Burkina Faso onderstreept het belang van de eigen rechten op geïrrigeerde grond van vrouwen voor hun eigen welzijn en voor het welzijn van degenen die van haar afhankelijk zijn. In Bangladesh blijkt participatie in de irrigatiegroepen verbetering te brengen in de niet-economische dimensies van het welzijn van vrouwen, zoals haar zelf-concept en optreden in het openbaar, en haar status in de familie en de gemeenschap. Economisch profijt van waterverkoop blijkt echter gering of afwezig te zijn in de meeste groepen.

Zoals eveneens in hoofdstuk twee aangegeven, leidt toegang van de armen tot geïrrigeerd land en water in vele omstandigheden niet alleen tot armoedeverlichting, maar ook tot een hogere productiviteit per eenheid land dan bereikt wordt als grotere bedrijven geïrrigeerde landbouw bedrijven. Grootschalige mechanisatie in grotere bedrijven, beperkte toegang van kleine boeren en boerinnen tot landbouw inputs, en werk elders ten behoeve van spreiding van inkomensbronnen, kunnen deze relatief hogere landproductiviteit echter teniet doen. Er bestaan vele aanwijzingen dat de sexe van een boer op zich geen invloed heeft op zijn of haar efficiëntie als producent. Aanwijzingen in de veldstudies bevestigen deze relatief goede landbouwproductie en waterleverantie van kleine boeren en boerinnen en landloze waterverkopers. In door vrouwen gedomineerde bedrijfssystemen, zoals rijstverbouw door de meeste etnische groeperingen die in Burkina Faso bestudeerd zijn, zijn vrouwen vrijwel de enige producenten.

De literatuur geeft aan dat toegang van grotere boeren tot geïrrigeerd land and water werkgelegenheid voor loonarbeiders kan verschaffen en een commerciëel wateraanbod voor kleine boeren kan creëren. Bovendien drukt een toegenomen voedselaanbod de voedselprijs. Dit draagt bij tot armoedeverlichting. De effecten zijn echter beperkt, omdat de grotere boeren sterk de voorwaarden bepalen waarop arbeid gevraagd wordt, of water verkocht. Voedselprijzen kunnen nog steeds te hoog zijn voor de koopkracht van arme kopers van voedsel. Arme voedselproducenten hebben juist belang bij hoge prijzen. De toegang tot geïrrigeerd land en water door de rijkeren kan bovendien ook direct ten koste gaan van de toegang die de armen hebben. Deze concurrentie wordt waarschijnlijk alleen maar groter bij toenemende waterschaarste. De irrigatiesector draagt dus optimaal bij aan zowel armoedeverlichting als productieverhoging, als de steun gericht wordt op de armen, en het weglekken van steun aan de grotere boeren vermeden wordt.

Het richten van de steun
De bijdrage die de irrigatiesector binnen haar mandaat en competentie kan leveren aan zowel armoedeverlichting als productieverhoging ligt in het prioritair vestigen van rechten op geïrrigeerd land en water in arme mannen en vrouwen, en in het verschuiven van bestaande lokale verdelingen in deze rechten ten gunste van de armen. De rol van de irrigatiesector in het vestigen van rechten in sommige gebruikersgroepen, en het buitensluiten van andere, met name de armen, wordt geanalyseerd in de hoofdstukken drie en vier, en empirisch onderzocht in de veldstudies. Van belang blijken het soort ondersteuning, de fase van een stelsel en de communicatienetwerken tussen de irrigatie-instanties en de lokale bevolking.

Vooral in publieke irrigatie is de invloed van de irrigatiesector aanzienlijk. Publieke irrigatie is gedefiniëerd als irrigatie waarbij de externe instanties het grootste deel van de kosten voor de infrastructuur betalen. De instanties hebben vaak een belangrijke stem in het technisch ontwerp. Omdat zij de investeerders zijn, wordt de wijze waarop zij hun eigen rechten bepalen op het water dat door de infrastructuur geleid wordt, en die van de gebruikers, over het algemeen als legitiem beschouwd. In particuliere irrigatie investeren de watergebruikers zelf in de infrastructuur. Meestal bepalen zijzelf de fysieke kenmerken van het stelsel en beschikken zij over het water. De sturing van buitenaf is indirect en vaak beperkt.

De definitie van rechten en de rol van irrigatie-instanties hangen samen met de fase van een stelsel. De meest ingrijpende onderhandelingen over rechten op geïrrigeerd land en water vinden doorgaans plaats wanneer nieuwe infrastructuur aangelegd wordt. Deelname aan deze investeringen, in geld of in arbeid, is een sterke basis om in latere fasen, en zelfs latere generaties, de vruchten van de investeringen te claimen. Aanleg van nieuwe publieke infastructuur komt minder vaak voor tegenwoordig. Nu zijn rehabilitaties en de programma's waarbij irrigatie management wordt overgedragen aan gebruikers, de belangrijke gelegenheden waarop rechten geherdefiniëerd worden.

Het is een empirische vraag in welke sociale velden de onderhandelingen over de onteigening en de herallocatie van geïrrigeerd land en water plaatsvinden, wanneer geïnterveniëerd wordt. Deze sociale velden zullen over het algemeen ingebed zijn in de communicatienetwerken tussen instanties en lokale bevolking. In deze velden vinden dan ook de processen van insluiting en buitensluiting plaats. Als de armen tot deze netwerken behoren, wordt dit netwerk een 'insluitend forum' genoemd. Elk nieuw initiatief van een instantie, zoals voor rehabilitatie of management overdracht, gaat gepaard met een zekere herstructurering van dit lokale netwerk.

De analyse van binnen- en buitensluitingsprocessen van arme mannen en vrouwen in extern ondersteunde irrigatieontwikkeling in de literatuur en de veldstudies, toont aan dat

er aanzienlijke mogelijkheden zijn voor de irrigatiesector om haar steun beter op deze doelgroep te richten, weglekken naar anderen te voorkomen, en rechten op geïrrigeerde grond en water prioritair in de armen te vestigen. Een combinatie van de volgende elementen van een doelgroepbenadering blijkt cruciaal te zijn.

Organisatorische steun
Gerichte ondersteuning is alleen mogelijk als irrigatie-instanties van meet af aan plaatselijk een forum organiseren, waaraan de prioritaire doelgroepen deelnemen. Hoe eerder deze fora in het interventieproces georganiseerd worden, des te minder rechten de niet-armen verkrijgen, hetgeen de latere insluiting van nieuwe groepen, met name de armen, zou bemoeilijken. Organisatorische ondersteuning is noodzakelijk omdat arme mannen en vrouwen gewoonlijk nog niet zodanig georganiseerd zijn.

Er is wereldwijd inmiddels ervaring opgedaan in het opzetten van dergelijke fora door zowel overheidsinstanties als niet-gouvernementele organisaties. Deze instanties hebben duidelijke, expliciete doelgroepcriteria en passen deze toe in de praktijk. Vormen voor effectieve en cultureel gepaste deelname van vrouwen aan gemengde fora worden eveneens ontwikkeld. Vrouwen zijn zelfs de overgrote meerderheid van de leden van dergelijke fora in, bijvoorbeeld, door NGO's ondersteunde armoedeverlichting in Bangladesh.

Bestaande organisatievormen onder de armen en hun motivatie betrokken te worden in irrigatieontwikkeling zijn een solide basis voor deze insluitende fora. In de latere stelsels in Burkina Faso ontwikkelden deze fora zich zelfs ondanks het project, dat in eerdere stelsels vrouwen juist had buitengesloten van de fora. Insluitende fora sloten echter beter aan op de lokale sociale organisatie van de productie, waarvoor de veldstaf ook meer oog had dan de projectdirectie.

Een onderbelichte factor in de uitsluiting van armen van irrigatieontwikkeling, blijkt de neiging van instanties zelf te zijn om de interactie op lokaal niveau te beperken tot de communicatiekanalen van de gedecentraliseerde administratieve en sectorale overheden, en de burgers die hier de meeste toegang toe hebben. In deze netwerken domineert de lokale mannelijke elite. Zolang irrigatieontwikkeling gedefiniëerd en geëvalueerd wordt als een neutrale taak, en zolang verzuimd wordt om expliciet te maken *wie* op dorpsniveau geacht wordt te participeren en *wie* rechten op geïrrigeerde grond en water zal krijgen, helpt deze mannelijke elite het project snel en effectief om de taken binnen de gestelde termijn uit te voeren. Binnen deze taak-geöriënteerde lokale netwerken is het dan de elite die vanzelfsprekend de eerste rechten op de verbeterde bestaansbronnen opeist. In de vroegste stelsels van het project in Burkina Faso verloren vrouwen hun landrechten op deze manier, terwijl mannen landrechten verwierven die ze traditioneel niet hadden. Dit werd gerationaliseerd door het onrealistische concept van het familiebedrijf als eenheid, dat het project had bedacht.

De sociale velden waarin rechten worden gedefiniëerd, ontwikkelen zich over de tijd tot de velden waarin de rechten worden geïmplementeerd. In de gebruiksfase worden dit gewoonlijk de watergebruikersorganisaties genoemd. Lidmaatschap van deze organisaties hangt nauw samen met het hebben van rechten op geïrrigeerd land en water. Uitsluiting van vrouwen vindt impliciet plaats als lidmaatschap en rechten gevestigd worden in huishoudens, waarvan het mannelijk hoofd geacht wordt de vertegenwoorder te zijn. Insluiting van vrouwen vergt het afzonderlijk vestigen van rechten in zowel mannen als vrouwen. Arme landgebruikers met zwakke landrechten worden binnengesloten als waterrechten losgekoppeld worden van grondeigendom. De erkenning van bestaande rechten vóór interventie, ook die volgens lokale rechtsstelsels, als grondslag voor nieuwe rechten, is vaak met name in het belang van de armen, die hun bestaande rechten voorheen vaak verloren zonder compensatie.

Alleen via deze insluitende fora kan technische en financiële ondersteuning de armen bereiken. Het soort steun bepaalt, op zijn beurt, het functioneren van het forum en de benodigde verdere organisatorische ondersteuning.

Technische steun
In technische ondersteuning voor constructie, gebruik en onderhoud van infrastructuur in publieke irrigatie vindt op twee momenten insluiting en buitensluiting plaats. De keuze van de ligging en waterverdeling van het fysieke stelsel bepaalt sterk *wiens* land hoe goed geïrrigeerd kan worden. Als de landbezitsverhoudingen in het stelsel niet veranderen, bepaalt het technisch ontwerp dus rechtstreeks of de armen of de rijkeren toegang tot geïrrigeerd land krijgen. In het verleden zijn de rijkeren vaak bevoordeeld. Als een landhervorming binnen het stelsel mogelijk of noodzakelijk is, biedt dit doorgaans goede mogelijkheden om rechten op geïrrigeerde gronden prioritair toe te kennen aan de armen. Van deze mogelijkheid is echter weinig gebruik gemaakt. Integendeel, de grondonteigening heeft niet alleen in het geval van Burkina Faso, maar ook elders geleid tot verdere uitholling van de landrechten van de armen.

Een tweede moment van insluiting of buitensluiting in publieke irrigatie betreft de investeringsfase. Gebruikers kunnen in menig project rechten op water en soms ook op geïrrigeerd land verkrijgen door deel te nemen aan de constructie en onderhoud van de infrastructuur. Armen verwerven rechten als deze mogelijkheid expliciet aan hen wordt geboden. Tijdige en transparante procedures moeten beter garanderen dat investeringen door de armen ook inderdaad tot rechten leiden. In het verleden werden met name vrouwen geheel buitengesloten van deze mogelijkheid, of haar investeringen leidden niet tot dezelfde rechten als bij mannen.

In particuliere irrigatie verwerven de armen pas rechten op geïrrigeerd land en water als eigenaren van infrastructuur, indien aangepaste technologieën en energievoorzieningen

beschikbaar zijn. Commerciële infrastructuur voldoet hier vaak minder goed aan, tenzij het gemeenschappelijk gebruikt wordt. Dit laatste is bestudeerd in Bangladesh. Enkele NGO's ontwikkelen kleinschalige en individueel te gebruiken infrastructuur.

Financiële steun
Investeringen in infrastructuur zijn meestal het duurste onderdeel van irrigatie. De armen hebben geen toegang tot kapitaal en langere-termijn kredietfaciliteiten zoals de rijkeren die hebben. Gesubsidiëerde investeringen in publieke irrigatie zouden dan ook met name de armen kunnen helpen toegang te verkrijgen tot geïrrigeerd land en water. In het verleden kwamen deze subsidies echter vaak bij de rijkeren terecht.

In particuliere irrigatie zijn lange-termijn kredietfaciliteiten wezenlijk. In de studie in Bangladesh werd gevonden dat de armen zelfs aanzienlijke risico's nemen zodra deze kredieten beschikbaar zijn. Optimale keuze van de technologie, goede haalbaarheidsstudies en vangnetten zijn onontbeerlijk.

Voor de armsten der armen is het uitgesloten dat zij eigenaar worden van moderne infrastructuur, omdat hen zelfs het minimum reguliere inkomen ontbreekt om kredieten terug te betalen. Voor hun toegang tot geïrrigeerd land en water blijven zij sterk afhankelijk van inspanningen van irrigatie-instanties om hun steun op deze doelgroep te richten en van de voorwaarden die eigenaren van infrastructuur stellen bij de verkoop van het water.

Terms and abbreviations

boro	winter season / rice grown in the winter
Tk	Taka unit of currency 1 $ = Tk 38 (1994)
BADC	Bangladesh Agricultural Development Corporation
BIDS	Bangladesh Institute of Development Studies
BRAC	Bangladesh Rural Advancement Committee
BRDB	Bangladesh Rural Development Board
CARE	Committee for American Relief Everywhere
DTW	Deep Tube Well
GKF	Grameen Krishi Foundation
IG, FIG, MIG	Irrigation Group, Female IG, Mixed-sex IG
IMT	Irrigation Management Transfer
KSS	Krishok Samobai Samity (Farmers Cooperatives of BRDB)
LLP	Low Lift Pump
LOTUS	Landless Operated Tube well Users Support Project
MSTW	Mini Shallow Tube Well
NGO	Non-Governmental Organisation
OR	Opération Riz, Projet de Développement de la Riziculture dans la Province de la Comoé Burkina Faso
PROSHIKA	Proshika Manobik Unnayan Kendra Centre for Human Development
RDRS	Rangpur Dinajpur Rural Service
SAED	Société Africaine d'Etudes de Développement
SNSP	Shaptagram Nari Swanirvar Parishad
STW	Shallow Tube Well
VO	Village Organization of BRAC members
WAU	Wageningen Agricultural University

About the author

Barbara van Koppen was born in Amsterdam, the Netherlands, in 1955. After graduating Gymnasium B at the Sint-Michiellyceum in Geleen in 1973, she became a student of Wageningen Agricultural University. Her specializations were Gender Studies in Agriculture, Rural Extension and Human Nutrition.

During the three years after these studies, from 1982 to 1985, she was the coordinator of the Farm Women's Group, a section of the 'Boerengroep' in Wageningen. Action-research was carried out in close collaboration with Dutch farm women.

From 1985 tot 1990 she worked in Burkina Faso. As an employee of SNV, the Netherlands Development Organization, she was the technical advisor of the project *'Promotion Féminine dans la Province de la Comoé'* of the Regional Department of the Ministry of Agriculture and Livestock. She followed this by advising the women's section of the small-scale irrigation project *'Sensibilisation et Formation des Paysans autour des Barrages'*.

She joined the Department of Irrigation and Soil and Water Conservation at Wageningen Agricultural University in 1990, where she was lecturer and researcher on gender issues in irrigation and soil and water conservation. Besides teaching and supervising of MSc theses, she carried out missions to irrigation projects in India, Indonesia, Tanzania, Niger and Tunisia. The research in Burkina Faso for this thesis was done in the context of the larger research project of this university *'Aménagement et Gestion de l'Espace Sylvo-Pastoral au Sahel'*. In Bangladesh she was the expatriate coordinator of the research project 'Female landless irrigation groups'. This was funded by the Special Program Women and Development of the Netherlands Ministry of Foreign Affairs.

In September 1998 she took up the position of Coordinator of the Gender and Water Program of the International Water Management Institute in Sri Lanka.