

GATEKEEPER SERIES No. 54



**International
Institute for
Environment and
Development**

Sustainable Agriculture
and Rural Livelihoods
Programme

Linking Women To The Main Canal:

Gender And Irrigation Management

MARGREET ZWARTEVEEN

This Gatekeeper Series is produced by the International Institute for Environment and Development to highlight key topics in the field of sustainable agriculture. Each paper reviews a selected issue of contemporary importance and draws preliminary conclusions of relevance to development activities. References are provided to important sources and background material.

The Swedish International Development Authority (SIDA) funds the series, which is aimed especially at the field staff, researchers and decision makers of such agencies.

Margreet Zwarteveen is working as a Gender Specialist at the International Irrigation Management Institute, P.O. Box 2075, Colombo, Sri Lanka. For the past four years, she has been involved in case studies documenting gender roles and responsibilities in irrigated agriculture and irrigation management in Sri Lanka, Nepal, Bangladesh, Niger and Burkina Faso.

LINKING WOMEN TO THE MAIN CANAL: GENDER AND IRRIGATION MANAGEMENT

Margreet Zwarteveen

Introduction

Although gender is a relatively new and often somewhat strange topic for irrigation professionals, irrigation projects have quite a reputation among gender analysis professionals. This is because irrigation projects, and particularly irrigation settlement projects, provide some of the most striking examples of how projects can fail when gender issues are not recognised or accommodated.

Despite the ‘infamy’ of irrigation projects among gender professionals, this seems to have had remarkably little influence on irrigation practice. Although a few examples exist of token women’s components that have been added on to irrigation projects (usually in the form of vegetable plots for groups of women), and although domestic uses of water are now taken into account much more often when designing irrigation infrastructures, the most important questions underlying much gender criticism are seldom addressed. These are the questions of women’s access and rights to water and land, and women’s access to decision-making, which must be addressed if irrigation is to lead to improved livelihoods for all local stakeholders or end-users.

Although a common explanation for the real gender questions not being addressed in irrigation planning, design and management is male resistance, gender advocates have also done a poor job in making themselves understood by irrigation professionals. Irrigation professionals and professionals dealing with gender-related issues often speak completely different languages, have different objectives and have entirely different conceptions of the reality of the irrigation world.

The objective of this paper is to identify the intersections between irrigation approaches and gender approaches. It will be argued that attempts to make irrigation engineers and managers (and consequently their policies, programmes and projects) more gender sensitive are destined to fail when gender interests and needs are not translated into water terms. The task of gender specialists is not limited to pointing out how and where irrigation projects have (negatively) affected women; they also have to provide creative and workable solutions and alternatives that can be easily understood and adopted by irrigation planners and managers. At the same time, it should be realised that a gender analysis of irrigation management may lead to a reassessment of irrigation goals and objectives, as well as of the strategies to achieve those objectives.

A Gender-sensitive Approach to Irrigation Management

Irrigation management is normally defined as “*a process by which institutions or individuals set objectives for irrigation systems, establish appropriate conditions and identify, mobilize and use resources so as to attain these objectives while ensuring that all activities are performed without causing adverse effects*” (IIMI, 1992). Irrigation management with a gender perspective starts by identifying the end-users, and by understanding their needs and interests. The basic premise here is that unless the actual users are willing and able to use the water delivered by the irrigation system efficiently and effectively, the objectives of the irrigation system will not be achieved. Hence, developing a gender perspective to irrigation management consists of answering the following questions:

1. What are the objectives of the irrigation system?
2. What are the needs of female and male water users?
3. To what extent are (1) and (2) compatible, or: in what ways can irrigation professionals contribute to accommodating the irrigation system to the needs of both female and male water users?

Defining the Objectives of an Irrigation System

Defining the objectives of an irrigation system is itself a controversial and difficult matter. Different parties involved will have different priorities and different interests. Among the many objectives irrigation is expected to achieve are increasing agricultural productivity, increasing political stability, decreasing poverty, achieving national food security and so on. Women in Development (WID) or gender advocates may add an additional objective to this list, which is that irrigation needs to contribute to the well-being of women, or even that irrigation should lead to the empowerment of women.

Unfortunately it is rare for all these objectives to be achieved at the same time. High productivity at the irrigation system's level does not automatically mean that all households who are involved in irrigation benefit from it, or benefit to the same extent. Nor does a high productivity or income at the household level always imply that all the household members have equally contributed and equally shared in this income.

There is no way in which all the different objectives and interests of the different parties involved in irrigation can be easily matched, or that potential conflicts of interest can be easily solved. However, to plan and implement irrigation interventions realistically it is crucial to realise that differences and potential conflicts exist. This recognition begins with bringing some consistency into the various levels of goals and objectives.

The level of satisfaction of female and male members of households using irrigation water is not only one important measurement of the effectiveness of irrigation systems (cf. Bos et al., 1994), it is also one important factor determining its effectiveness. Unless water users employ their own labour and capital in a way which makes good use of available and anticipated land and water resources, the ultimate benefits of irrigation will be restricted.

Although many differences may exist between the users of an irrigation system (based on land size, ethnicity, age, etc.), the focus here is on potential differences between male and female water users. Usually, if users' needs are taken into account at all, these are most often the male water users' needs. Women are often not considered, but there is enough evidence to substantiate the belief that they have specific needs with respect to irrigation. These needs do not necessarily conflict with those of men; they may be complementary or shared.

The Differential Impact of Irrigation on Men and Women

The direct impact most often attributed to (and aimed for) with irrigation is increased agricultural production. The literature on gender and agriculture provides a long list of examples of how women and men may differentially contribute to, and are differentially affected by, increases in agricultural production. These differences relate to:

1. The allocation of labour, land, water and other resources to the cultivation of irrigated crops; to construction and maintenance activities and to participation in users' organisations.
2. The use of the outputs of irrigated agricultural production, e.g. consumption, storage for use, exchange or sale.

Several studies of irrigation development in Africa show that women and men may be differentially motivated to invest labour and other resources in irrigated crop production. Some show how women, as a result of new irrigation interventions, have lost access to land and to the proceeds of harvests in favour of their husbands and male relatives (Box 1).

Similar examples have been found elsewhere. A study of an irrigation project in the Cameroon for example, showed that women tried to minimise their labour contributions to the newly irrigated rice crop controlled by their husbands in favour of their individually controlled sorghum production. The serious intra-household conflicts over the income from rice was a significant factor in depressing the amount of labour available to rice production, which in turn negatively affected cultivated areas (Jones, 1983; 1986).

Box 1. The Jahally Pachar Project, the Gambia

A well documented example is that of the Jahally Pachar Project in the Gambia (Dey, 1990, Carney 1988; van Hooff 1990). In this project, an initial assumption was made that men were rice growers with full control over the necessary resources. Incentive packages included cheap credit, inputs and assured markets offered to male farmers. Negotiations about the allocation of land to be irrigated were made with male elders of the villages, as a result of which land traditionally controlled by women now came under the control of men. All access to inputs, labour and finance was mediated through husbands. Women were expected to contribute their labour to the newly irrigated fields, but they became increasingly reluctant to do so as they did not directly benefit from the higher yields. They demanded compensation from their husbands for their work, in the form of cash, a share of the rice harvest or access to their own irrigated plot. If the husbands were not willing or able to provide their wives with some sort of compensation, women withdrew their labour from the irrigated plots. This had a far-reaching impact on the social organisation of the household production, and on the overall productivity of the project. In the first year of the project, when women had not yet withdrawn their labour (1984), average dry season pump-irrigated yield was 7.5 tons per hectare. In the 1985 and 1986 dry seasons, the yield averaged only 5.7 tons.

Conflicts over the use of outputs are also common as the case of the Mahaweli Ganga Irrigation system in Sri Lanka makes clear (Box 2).

Box 2. The Mahaweli Ganga Irrigation System, Sri Lanka

This project was initiated in the late 1960s with food production as the main aim. However, 10 years since the first constructions were started in the so-called H-area, this region had the highest percentage of chronic undernutrition in the whole of Sri Lanka: 38.5% compared with the national average of 6.6% (Siriwardena, 1981). The women attributed the nutritional shortcomings to the fact that they were unable to grow their own food crops in the settlement. The land had been allocated for producing cash crops from paddy, and the income from the sale of paddy was given to the male farmers. It was difficult for women to make legitimate claims to this money, and it often occurred that very little of it was spend on household needs. Traditionally, rainfed millet cultivation had been the responsibility of women, whereas men were much more associated with paddy production. In the new settlement area, women no longer had access to land for the cultivation of rainfed crops, and thus became entirely dependent on the paddy crop for feeding themselves and their families. The compound around the house was hardly big enough for a latrine and some fruit trees. According to all, the diet had severely worsened since living in the colony, and mothers complained that their pre-school children were continuously ill (Schrijvers, 1986).

Other studies document less visible and more indirect effects of irrigation development on women. Women in the hills of Nepal were very positive about new irrigation facilities, since these considerably reduced the time they needed for fetching water for domestic use

(Backer, 1992). In India, the unforeseen impact of canal irrigation on the growth of fodder was particularly beneficial for women, since it enabled them to increase their milk and ghee production through which they could earn some individually controlled income (Stanbury, 1981). The opposite effect may occur with groundwater irrigation, which may lower groundwater tables and thus reduce the growth of weeds used for fodder and trees used for fuel. This was documented in Bangladesh, where the consequent shortage of fodder and fuel significantly increased the time poor women had to spend gathering them. It gradually pushed them towards more marginal sources, such as leaves and bark of trees, which hastened the deterioration of natural resources (White, 1992).

The many direct and indirect linkages between gender and irrigation development are hard to foresee. They will be different in different cultural, institutional and environmental contexts and will vary with the type of irrigation technology used. However, the examples do illustrate that prevailing gender relations structure the direction and nature of irrigation related developments and therefore the success of irrigation interventions.

Gender analysis can thus help irrigation planners and policy makers to set achievable objectives realistically, and to assess the potential trade-offs in achieving these objectives. For example, a possible alternative approach is to allocate smaller plots to both men and women. A study in the Dakiri irrigation system in Burkina Faso shows that the allocation of plots to both husbands and wives makes sense, both in terms of gender equity, as well as in terms of returns to investments in infrastructure. In Dakiri, the total amount of labour provided to irrigated agriculture is higher for households in which both husbands and wives have plots when compared to those where only husbands have been allocated access to an irrigated plot. Women are more willing to invest labour when they can control the product of their own labour, and this is more likely to occur when they have secured access to land (Zoungrana and Zwarteveen, 1995).

Gender-specific Needs and the Outputs of Irrigation

Some of the different ways that irrigation affects women and men will be reflected in their differential needs with respect to the irrigation system's outputs. Output measures assess the nature and quality of irrigation services delivered to farm households, services which will in turn be important in determining production, income and other livelihood indicators.

How do users evaluate the outputs of irrigation systems? An important concern is the amount of water delivered, or the *adequacy* of water deliveries.¹ This may vary according to gender because men are often responsible for different crops than women. Very often, the main irrigated crop is controlled by the male member of the farming household. Women will often contribute labour to this crop, but very often they also grow crops of their own. These crops may be used for consumption, or they may be sold to provide women with a personal source of income. When there is an opportunity to do so, women will make use of irrigation water to grow these crops. They may take water directly from the channels, or

1. The set of possible measures employed by users to judge the quality of irrigation services discussed here is adapted from Svendsen and Small (1990).

sometimes they use drainage water. However, these crops grown by women are often not considered the 'main' crop, or sometimes it is not even realised that they are grown. As a consequence, their water requirements are seldom taken into account when devising water delivery schedules. In some cases, the use of irrigation water for growing crops other than the planned one, or for using water on plots outside the designed command area, will even be considered illegal.

Men and women often have different tasks, and the adequacy of irrigation delivery can be affected by these. For example, irrigation water can be used to soften soil for land preparation (Svendsen and Small, 1990). Land preparation is often done by men, so pre-season applications of water reduce the amount of male labour needed. In paddy cultivation in Asia, women may be expected to do the bulk of weeding. Unless they work as paid labourers, women are thus likely to be in favour of increasing the ponding depth which reduces weed growth. In Nepal, women reported that the increased availability of irrigation water had considerably reduced the time needed for weeding (Backer, 1992).

A second measure for evaluating the outputs of an irrigation system is *equity*. Equity refers to the spatial distribution of water across the system. However, female farmers who grow the same crops as men, and who are thus in principle entitled to receive an equal amount of water, often find it difficult to claim and receive the amount of water they are entitled to. When water is scarce, women are often in a much weaker position to obtain water than men. This is why female irrigators in Nepal, though in principle preferring an on-demand rotation system of water deliveries, nevertheless saw a clear advantage in a scheduled rotation system. This system guaranteed water, without women having to go through the hassle of negotiating for it and running the risk of not getting any water at all (Bruins and Heijmans, 1993).

Equity may also be valued differently because of differences in the nature and importance of social relations to men and women. Extra-household relations and networks may carry a specific significance, especially for poorer women, on at least two grounds. They tend to be more disadvantaged in relation to other more tangible forms of resources. Furthermore, these relationships may offer women a measure of autonomy from male authority within the household and can help furnish them with powers of persuasion in their dealings with men (Kabeer, 1992). This may be the reason that women sometimes place a higher value on equitable water distribution than do men. An example from Nepal documents:

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

The way that men and women appreciate the *timeliness* of water deliveries, which relates to the distribution of water across the season relative to some utility-based standard, may again arise because of a division along gender lines between crops and between labour peaks. In Niger for instance, it was observed that water distribution ceased when the male-controlled crop was almost ready to be harvested. The vegetables grown by women still needed water, however, and women experienced severe losses as a result (Dadi Massalachi, 1993).

The *convenience* of water delivery timing may be different for men and women. Female irrigators may have different preferred daily irrigation times because they have to plan their various productive and domestic activities alongside each other. Some of those activities have to be done at a more or less fixed time of the day, like preparing the meals. In Nicaragua, there was a marked difference in the time women and men were willing and able to start irrigating their fields. Women preferred to start later, because of the domestic duties which they had to perform early in the morning (Blaauw, 1992).

Irrigating at night may be particularly difficult for women, because of social norms which prevent them from going out at night. In Pakistan, the few women that were directly involved in irrigation would send a male relative or neighbour when their irrigation turn was at night. If there was no other possibility, they would try to be accompanied by a family member or friend (Basnet, 1992).

With regard to *water quality*, women are likely to place a higher value than men on having access to irrigation water which is clean enough to be used for domestic purposes. Also, the health hazard presented by the use of irrigation water for domestic purposes may be more of a concern for women, since they are often responsible for caring for the sick.

Women's Participation in the Organisation of Irrigation

In a way, the non-involvement of women, or of their needs and interests, in irrigation management has become a self-fulfilling prophecy. Because irrigation is commonly conceived as a male activity, and because women are not seen as direct stakeholders in irrigation systems, they have become excluded from efforts to organise water users. Since women's specific concerns thus remain outside formalised decision-making processes, they are often not recognised as 'real' concerns and remain marginal.

The inclusion of users in operating and managing irrigation systems most often occurs through the organisation of users' groups or associations. In most irrigation cases, women appear to be almost absent from those groups. This is partly because membership is often confined to one member of each irrigating household, either the official landholder or the 'head' of household. Both criteria apply to men far more often than to women; the only women who can potentially participate in water users' groups are either widows or single mothers with no adult male living in the household.

However, experience has shown that there can be many benefits from allowing women to represent households in irrigators' associations (Box 3). But while the nature of women's

Box 3. Women and Users' Associations

In the Philippines several irrigators' associations insisted on including both husbands and wives in the association. One reason for this was that it allowed for more flexibility; either the woman, the man or both would then be able to attend the meetings. Another reason was that, even though agricultural decision-making is very much a joint affair of both husband and wife, women and men have distinct domains of influence. As most women control the cash flow within the household, it was found that unless the women were involved in formulating policies regarding irrigation and membership fees collection schedules, associations encountered problems when collecting irrigation fees. Community organisers also learned that unless women were encouraged to participate, financial obligations of farming households could not be guaranteed (Illo, 1988).

An IIMI study of a farmer-managed irrigation system in Nepal showed that the discrepancy between women's involvement in irrigated agriculture on the one hand, and their absence in water users' organisations on the other negatively affected management performance. De facto female heads of farms used more water than their official entitlement, while at the same time contributing less labour to maintenance than they should. This occurred because it was difficult for the system's organisation to enforce their rules on women, who are not members. Although non-membership is thus in the interest of female farmers, because it allows them to become free riders, the long-term sustainability of the irrigation system is at risk (Zwarteveen and Neupane, 1995).

needs may make their participation in irrigation management desirable, the inclusion of women's perspectives will often not just be a matter of allowing women to become members of users' organisations.

The experiences of female irrigators who are officially entitled to join users' groups, illustrate that women often find it difficult to bring their opinions and needs forward. Attending meetings and discussing matters in public may be thought of as typical 'male' activities, associated with political gatherings which are often traditionally confined to men. In some cases, women are not expected or encouraged to speak in front of men or in public. Moreover, they frequently lack the confidence and the experience to deal with irrigation matters in public, since all interactions with outside institutions mostly take place with men, and since men often receive the bigger part of information and training. Women in Nepal were reluctant to attend water users' meetings because they were sure that nobody would listen to them (Bruins and Heijmans, 1993). In Sri Lanka, female farmers often prefer to send a male relative to meetings rather than going themselves. They may also ask a male friend or neighbour to represent their interests, send a letter to the irrigation officials, or try to meet separately with one of the office-bearers of the water users' organisation.

It may also be that participation in meetings is simply not judged to be efficient and rewarding. In Peru, women stated that it was of little use going to meetings, since the most important decisions were not taken in those meetings but during informal get-togethers of men (van de Pol, 1992).

In summary, while the differential needs and interests of women and men with respect to irrigation may call for the inclusion of both their perspectives in planning and decision-making, women and men will often have different perceptions of the costs and benefits involved in participating in users' groups. The attractiveness of participation may be less for women, partly because the costs of time spent travelling or attending meetings may be relatively higher for them, but also because social norms and values are not always supportive of women engaging in public meetings.

The inclusion of women's perspectives, their ideas, opinions, needs and interests will thus require an active and conscious effort. Women in Nepal said that they would first need to learn how to read and write, before feeling confident enough to participate in meetings. They also suggested that they should maybe get together as women, and try to organise among themselves first (Bruins and Heijmans, 1993). In an Indonesian irrigation scheme, women were first organised separately. Special training sessions were held, both for women themselves as well as for field agents and other officials. Special female staff were also appointed and trained. This made women gain confidence and helped them to overcome some of their initial reluctance to attend 'male' meetings (van Dok et al, 1992).

Making Women's Water Needs Compatible With Irrigation Objectives

The poor success achieved so far in making irrigation planning and management more gender sensitive can be partly attributed to wrong assumptions about the capacity of existing irrigation management institutions to respond to new demands. Too much emphasis so far has been given to what is desirable (empowerment of women) and too little to what is possible. Irrigation management institutions and agencies whose main task is to make sure that the right amount of water is delivered at the right time and in the right place cannot be expected to be interested in the empowerment of women, and neither do they have a real capacity to change gender inequities. What is within their reach and mandate is the satisfaction of specific needs women may have with respect to irrigation, although even this may sometimes be conditional upon changes in other sectors.

Successful recommendations to better recognise and accommodate gender needs and interests within irrigation contexts should thus be formulated in such a way that they contribute to, or at least are compatible with the objectives of the responsible institutions. The linkages between gender issues identified at tertiary unit level and more general objectives of irrigation management should thus be clarified.

Some of the examples given in the previous sections point to potential areas for improving the performance of irrigation through a better recognition and accommodation of women's water needs. Unfortunately there is not always a direct positive correlation between greater gender awareness and a better performance of irrigated agriculture. Sustaining gender biases may, in some cases, even be functional for achieving some of the irrigation system's other objectives.

Box 4. Irrigation Privatisation and Gender

Privatisation consists of turning over the operation and management responsibilities and costs of all or parts of irrigation systems to water users' associations of various kinds; pricing of water on the basis of quantity used; and establishing water markets for buying and selling water, both among individual users and the agricultural, urban and industrial sectors (cf. Seckler, 1993). The rationale is that by changing the basic structure of socio-economic relationships among irrigation agencies and users, the incentives and behaviour of both will change to create more effectively managed irrigation systems.

What is the relevance of this to gender issues? First, gendered structures of roles and responsibilities, and gender based wage differentials, may inadvertently lead to women ending up paying most of the increased costs of operating and maintaining the irrigation system. Opportunity costs of female labour being less, households may find it economically attractive to send women for maintenance work. This is the case in countries like Peru, Ecuador and Nepal, where many men are engaged in off-farm employment, leaving the responsibility for irrigated agriculture to their wives. Sometimes the cash remittances of husbands may allow female farmers to pay cash contributions to comply with their maintenance requirements, but often incomes from husbands are barely sufficient to meet basic subsistence needs. Anticipated water savings, to be achieved through some sort of water pricing mechanism, may likewise be achieved at the cost of increasing the time women need to spend on agriculture. Water savings may be achieved by cultivating different crops, which will not only have different water requirements, but also different requirements in terms of male and female labour contributions. Most crop diversification schemes in Sri Lanka, for instance, entail a shift from paddy to less water demanding crops. Many of these crops require more female labour, and unless households have the financial means to hire more labourers, increased labour requirements will be met by increasing labour inputs from female household members. Water savings may also be achieved by substituting labour for water, like in the case of reducing the ponding depth in paddy cultivation which will increase weed growth, and the time needed for weeding.

In sum, privatisation changes the basic socio-economic relationship between irrigation agencies and users. Gender analysis is needed to identify who are to be considered users. The anticipated benefits of privatisation can only be achieved when women's responsibilities and tasks with respect to irrigation are recognised and accommodated. Not doing so may distort the incentive and accountability structures, by disassociating payments from benefits.

However, in most cases gender inequities will have direct impacts on health, environmental sustainability, the productivity of other crops and so on.

It may be that the opportunities for addressing issues that are closely related to irrigation, but which as yet remain unaddressed, will increase. The shortcomings of mono-disciplinary technical approaches to irrigated agriculture have become increasingly clear. Widespread dissatisfaction with the low performance of irrigation systems, growing environmental awareness, and the trend in developing countries to privatise the management of irrigation

systems (Box 4) all call for a critical reassessment of existing irrigation management concepts, practices and institutions. This reassessment seems to offer more room for integrating gender.

The impacts of implicit gender discrimination in terms of environment and health will become more easily recognisable and visible. The inclusion of upstream watershed management in the responsibilities of irrigation institutions will give scope for recognising the links between water used for irrigated agricultural production and the availability of and need for water for other uses. And a focus on more users' participation in operating and managing irrigation infrastructures creates the possibility of discussing and analysing if and where women can and should be involved.

Conclusions and Policy Implications

How can the design, operation and management of irrigation infrastructures become more gender balanced? There are three broad areas in irrigated agricultural production systems which need attention, and where a careful gender analysis will help to create more effective and equitable designs and policies: (1) system engineering and design; (2) legal, administrative and organisational arrangements which create rights and responsibilities with respect to the use of the system; (3) system operation, e.g. cropping patterns and water delivery schedules.

- *System engineering and design.* It is important to analyse who will be using water, and who will benefit from these uses. Rather than simply designing a system on the assumption that water will be used by male farmers for irrigating the designated plots in the command area, it should be investigated whether and how both men and women need and would use water that is made available through the system, and the design should accommodate these needs. Where a design entails re-settlement or settlement of a new area, care should be taken to ensure that women are provided with secure access to newly developed land and water, especially in situations where women traditionally relied on access to land resources. Design processes should incorporate consultations with male and female users, so as to include both of their wishes, needs and requirements.
- *Legal, administrative and organisational arrangements.* Explicit consultations should be held with women users, and women's ideas and concerns should be included in water users' associations in some locally suitable way. Explicit attention needs to be given to how property and use rights to irrigation infrastructure are created and enforced, with an emphasis on gender differences in willingness and ability to invest labour or other resources in original construction and maintenance.
- *Operation.* Water delivery schedules should be devised in such a way as to accommodate both male and female needs with respect to quantity, timeliness, timing, equity and quality of water. Specific uses of water by women, like domestic uses or watering cattle, also need to be included when operating systems.

References

- Backer, S. 1992. *Women in Development (WID) Study for the Nepal SPWP*. ILO, Kathmandu, Nepal. (Draft Report)
- Basnet, K. 1992. *Beyond the Chadar and the Chardiwari: Women in the Irrigated Areas of Punjab*. IIMI, Lahore, Pakistan (unpublished report).
- Blaauw, W. 1992. *The risk of irrigation. A study on the impact of irrigation technology on the position of women in an agricultural cooperative in Nicaragua*. MSc Thesis, Wageningen Agricultural University, Department of Irrigation and Soil and Water Conservation. Wageningen, The Netherlands.
- Bos, M.G., Murray-Rust, D.H., Merrey, D.J., Johnson H.G. and Snellen, W.B. 1993. Methodologies for assessing performance of irrigation and drainage management. *Irrigation and Drainage Systems*, 7: 231-261.
- Bruins, B. and Heijmans, A. 1993. *Gender Biases in Irrigation Projects. Gender considerations in the rehabilitation of Bauraha Irrigation System in the District of Dang, Nepal*. Kathmandu, Nepal. (Unpublished report). SNV, Nepal.
- Carney, JA. 1988. Struggles over crop rights and labor within contract farming households in a Gambian irrigated rice project. *The Journal of Peasant Studies* 15(3): 334-349.
- Dadi Massalachi, F. 1993. *Integration of Women in Irrigation Management. The case of Saga*. Unpublished thesis, Faculté d'Agronomie, Université Abdoumouni Dioffo de Niamey, Niger.
- Dey, J. 1990. Gender issues in irrigation design in Sub-Saharan Africa. Contribution to the international workshop *Design for Sustainable Farmer-managed Irrigation Schemes in Sub-Saharan Africa*. Wageningen, Agricultural University, The Netherlands, 5-8 February 1990.
- Dey, J. 1981. Gambian women: unequal partners in rice development projects? *Journal of Development Studies* 17(3):109-122.
- Illo, JFI. 1988. *Irrigation in the Philippines: Impact on Women and their Households. The Aslong Project Case*. The Population Council, Bangkok, Thailand.
- IIMI. 1992. *Improving the Performance of Irrigated Agriculture: IIMI's Strategy For The 1990s*. IIMI, Colombo, Sri Lanka.
- Jones, CW. 1986. Intra-household bargaining in response to the introduction of new crops: a case study from North Cameroon. In: Mook, JL. (ed.) *Understanding Africa's Rural Households and Farming Systems*. Westview Press, Boulder, Colorado, USA.

Jones, C. 1983. *The Impact of the Semry I Irrigated Rice Production Project on the Organization of Production and Consumption at the Intra-household Level*. Agency for International Development. Paper No. 83-1, September 1983. Washington DC, USA.

Kabeer, N. 1992. Triple roles, gender roles, social relations: the political sub-text of gender training. *IDS Discussion Paper 313*. Institute of Development Studies, Sussex, UK.

Pradhan, NC. 1989. Gender participation in irrigation system activities in the hills of Nepal. In: *Proceedings of Second Annual Workshop on Women in Farming Systems*, September 1989. Institute of Agriculture and Animal Science, Rampur and USAID, Kathmandu, Nepal.

Schrijvers, J. 1986. Blueprint for undernutrition. In: Schrijvers, J. 1986. *Mothers for Life. Motherhood and Marginalization in the North Central Province of Sri Lanka*. Eburon, Delft, The Netherlands.

Seckler, D. 1993. *Privatizing Irrigation Systems*. Center for Economic Policy Studies. Discussion Paper 12. Winrock International Institute for Economic Development, USA.

Siriwardena, SSAL. 1981. *Emerging Income Inequalities and Forms of Hidden Tenancy in the Mahaweli H Area*. People's Bank Research Department, Colombo, Sri Lanka.

Stanbury, PC. 1981. *Irrigation's Impact on the Socioeconomic Role of Women in a Haryan Village*. University of Arizona, Department of Anthropology/USAID.

Svendsen, M. and Small, LE. 1990. Farmer's perspective on irrigation performance. In: *Irrigation and Drainage Systems 4*: 385-402.

van de Pol, I. 1992. *Sure, you have to fight for water. Gender roles in irrigation activities*. Draft, unpublished report prepared for SNV, Peru.

van Dok, Y., Putri, KS. and Zulaicha, A. 1992. Women in tertiary unit development. An experience from Indonesia. ICID Paper prepared for presentation at the *15th International Congress of the International Commission on Irrigation and Drainage (ICID)*. The Hague, The Netherlands, 30 August - 11 September.

van Hooff, I. 1990. Irrigation planning for women: the planning process of the Jahally-Pacharr Project in the Gambia. Contribution to the international workshop *Design for Sustainable Farmer-managed Irrigation Schemes in Sub-Saharan Africa*. Wageningen, Agricultural University, The Netherlands, 5-8 February 1990.

White, SC. 1992. *Arguing with the Crocodile. Gender and Class in Bangladesh*. Zed Books Ltd, London and New Jersey, University Press, Dhaka.