

Women irrigators and operation and maintenance of small-scale smallholder schemes in Africa

Le rôle des femmes dans l'exploitation et la maintenance des petits périmètres irrigués en Afrique

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Abstract

The formal role of women in operation and maintenance (O&M) on small-holder irrigation schemes in Africa is minimal and belies the role women play in irrigated crop-production. This is a factor constraining small-holder irrigation performance. There are ways to deal with this mismatch and to increase women's participation. Better approaches will take account of men's and women's objectives in their wider cultural and livelihood environments, not simply the irrigation sector. By increasing their contribution to maintenance, women could strengthen their rights to land and water, and their influence on management, while significantly improving sustainability.

The priorities of agencies promoting turnover will differ from those in the receiving communities. While people deal with immediate issues such as food security and financial viability, equality and empowerment may be ignored or sidelined. If it is demonstrated that viability and commercial success of schemes benefit from increased gender-awareness, these risks are reduced. Maintenance of small-scale, small-holder irrigation schemes has been drastically inadequate. Many schemes are rundown and pose huge challenges to their users. Significant improvement is crucial to these schemes' survival. The paper suggests an approach relying on motivating men and women to discuss and develop participation in O&M, and find appropriate solutions. Making and sustaining links with private sector service-providers will be key activities. Participatory research, training, and dissemination of lessons learned among irrigators should all be encouraged.

Résumé

Le rôle des femmes dans l'exploitation et la maintenance des petits périmètres irrigués en Afrique témoigne le rôle minimal qu'elles jouent dans la production irriguée. C'est un facteur qui contraigne la performance de ces périmètres. Afin de remédier à cette situation et accroître la participation des femmes, il faudra adopter des approches qui tiennent compte des objectifs spécifiques des hommes et des femmes relatifs à leurs environnements cultureux et économiques et non seulement le secteur d'irrigation. En s'impliquant davantage à la maintenance, des femmes auront la possibilité de renforcer leurs droits d'accès à l'eau et à la terre, d'augmenter leur influence dans la gestion et d'améliorer de manière significative la durabilité des systèmes. Les priorités des organisations qui promeuvent le transfert des périmètres irrigués sont différentes de celles des communautés bénéficiaires. En se préoccupant des aspects immédiats tels la sécurité alimentaire et la viabilité financière, on risque de s'éloigner les notions d'égalité et de renforcement des capacités. Mais si on arrive à démontrer qu'une plus grande sensibilité aux aspects genre peut améliorer la viabilité et la réussite commerciale, ces risques peuvent être réduits. La maintenance des petits périmètres irrigués n'a pas été assurée pendant longtemps qui résulte en des aménagements délabrés et qui posent d'énormes difficultés aux usagers. L'amélioration de telles situations est extrêmement importante pour la survie de ces périmètres. Cette communication propose une approche dont le principe est d'encourager des femmes et des hommes à davantage de discussion et de participation en vue de trouver des solutions adaptées aux problèmes d'exploitation et de maintenance. L'établissement des liens avec les fournisseurs de biens et services du secteur privé est primordial. La recherche participative, la formation et la diffusion de leçons parmi les irriguants sont à encourager.

1. Introduction

Smallholder irrigation is favoured in sub-Saharan Africa for a number of reasons: small-scale development is physically appropriate to the resources available and suits traditional farming practices. Despite its small scale, smallholder irrigation is complex. Success and sustainability demand careful

cash, and training and advice. Women, therefore, generate a very limited demand for private sector services. Their increasing numbers mean that weak demand will persist and will potentially limit private sector involvement and expansion, and constrain women's ability to increase productive resources and establish a role in future irrigation. However, there is much that can be done to alter such predictions, particularly if account is taken of women as skilled managers and people who have great capacity to raise funds and establish commerce locally (Spring 2000).

Several factors contribute to the difficulties men and women have in establishing service links:

- Land tenure;
- The dispersed and remote nature of small-holder irrigation;
- The relative poverty of rural areas and of small-holder irrigators, particularly women;
- Mismatches between technologies in use and users' needs;
- Poor organisation within schemes for routine operation and care of equipment and infrastructure.

In the following sections, constraining factors will be discussed from a gender perspective. Strategies that potentially serve the farmers are considered alongside gender aspects of farmer-managed schemes. Strategies that mobilise women's contribution in a beneficial way, and strengthen women's participation and rights in smallholder irrigation, are of special interest.

2. Land tenure differences between men and women

Land tenure is often cited, as limiting women's access to resources, and it is true that, in the majority of government smallholder schemes, land ownership is vested in male household heads. Nonetheless women secure user rights to use irrigated land and are major users of irrigation, often relying on it exclusively to feed themselves and their families.

Two major issues illustrate the disparity between men and women in relation to land:

- User rights for women are less secure, depending largely on the relationship of women with husbands and male relatives. This limits women's motivation to maintain and invest in their land.
- Production is limited by resources and social norms and determines the value of land as a livelihood asset.

These differences must be considered when developing strategies for irrigation turnover.

However, the situation is constantly changing. Women are increasingly allocated land, and entire schemes are dedicated to women for food production. NGO developments often favour women, and private donors respond to women's requests. In Eritrea, women have influenced local land allocation by proving themselves capable in both O&M and commercial activity. In some places, working as groups, they have been granted rights to cultivate that are better than those currently available to local men (EU 1998).

However, the scale of women's schemes tends to be small, as are the plots allocated to women and women's groups within larger schemes. In relatively secure tenure conditions, women show themselves competent to produce high yields on small plots. They often form savings groups to finance inputs because their lack of land ownership makes it difficult to obtain loans. Similarly, they organise and fund O&M effectively on small schemes, despite difficulties in accessing services and spares. There is also change in women's domestic situation with increasing numbers of women taking responsibility for whole families. For these women, subsistence irrigation no longer meets their need for cash income to fund the upbringing and education of their children. As women increasingly find themselves the major breadwinners, there is growing demand for stronger rights to land to enable them to obtain loans, invest, and grow on a commercial basis.

holistic design. Experience suggests that review of institutional capacity and human capital is a key indicator for efficient operation (Barghouti and Le Moigne 1990).

However, in Southern Africa in the past, schemes were imposed on users, sometimes quite overtly, as in the case of resettlement schemes, and sometimes in well-meaning attempts to reduce poverty. In all cases, design of schemes centred on water and plants and not on people. The political objectives had strong welfare overtones; management was centralised, and was funded and resourced from central monies. Irrigation departments or agencies organised operation and maintenance of smallholder, small-scale irrigation. The cost associated with this system was high, information was not highly valued, and adjustment to change was slow. Dialogue between agency and farmer was directed at male plot-owners, seldom involving women in technical choice or organisation of O&M. Assumptions were wrongly made that African women and men held the same views, that women would not understand technical issues, and that men regularly pass information to their wives and consult them (Merrey et al. 1998; Jones 1999). Participation was so neglected that it is doubtful if the needs of either men or women irrigators were taken into account. Now, as governments withdraw their support from these costly schemes, the difficulty of handling these irrigation enterprises with the reduced resources available is a major issue (Chancellor and Hide 1997a; Ubels and Horst 1994; Vermillion 1997).

For many years, the state has devolved more and more responsibility for operation and maintenance of irrigation infrastructure to farmers. Despite farmers' high motivation to maintain, they face a difficult task to meet costs, provide labour, and organise. Few small schemes can support the cost of full-time professionals; thus farmers must provide management as well as labour. Although women farmers contribute to manual labour for scheme O&M, and women-headed households pay their contribution to costs, women's participation in decision-making about and prioritising of O&M tasks is low.

The history of government smallholder schemes has not encouraged women to take part or to demand roles other than the most menial, but now, to achieve sustainability, schemes must find ways to benefit from women's contributions to decisions and management. Farmer management cannot follow the model of agency management and must devise a new, more appropriate method that will serve their objectives with the resources available.

Schemes already turned over to farmers must review objectives, which are often vague or have been foisted upon them at the time of turnover by the departing agency, before they can address short-term management and maintenance issues. However, to assist the process of review, farmers need to understand desired levels of maintenance, what needs to be done and why, how often, the consequences of neglect, manpower requirements, skills, materials, sources and costs. Decisions about priority tasks, who is responsible for them and who contributes to their cost, can then be addressed. Unfortunately, most retiring agencies don't have this information to offer to those taking over.

Until recently, there has been little incentive for the private sector to provide irrigation services for smallholders, or to retail equipment needed for service and repair of infrastructure. Thus, when responsibilities are devolved, a gap is revealed between the farmers' need for maintenance skills and materials, and the reality of obtaining them from the private sector. Although non-government schemes tend to use lower-tech methods, they too find it difficult to get access to reliable, affordable services. Establishing commercial markets in which smallholder irrigators can buy appropriate services and materials is a key priority. In Africa, the total amount of smallholder irrigation is relatively small. In Southern and Eastern Africa the percentage of agricultural land under irrigation varies from as little as 3 percent to as high as 30 percent in Swaziland (Osoro 1996), although much of the Swazi total is irrigated, estate-grown, sugarcane. Thus the pull of the smallholder irrigation sector for private service providers is weak. Countries such as Nigeria, Zambia, and Ghana, in which there are large numbers of individual irrigators, outside irrigation schemes, may present better opportunities for expansion of the private sector.

The dramatic rise in the number of women *de facto* farm managers and the number of women-headed households in sub-Saharan Africa has an impact. The percentage of women in rural areas managing alone is said to be over 31 percent. These changes in intra-household arrangements have had a profound impact on the role of women in African agriculture (FAO 1998). This trend also has impacts on the demand for irrigation equipment. Women are now often the buyers of equipment, but they remain disadvantaged in relation to access to land and productive resources, especially

3. The impact of location on men and women irrigators

Generally, distance to the nearest town is the determining factor of remoteness and influences farmers' ability to access both inputs and markets. However, other factors, such as the availability of transport and infrastructure, influence remoteness. Schemes near main roads generally have sufficient access to transport and passing customers to overcome these difficulties.

Kibirigwi scheme in Kenya straddles a main road about 10 km south of a market town. Farmers have little difficulty to obtain spares or equipment and have good links to suppliers. The area supports a mix of 'individual' and 'scheme' irrigators. Sustainability, however, hinges on marketing and maintenance (Chancellor and Hide 1997b). In contrast, Rufaro scheme in Zimbabwe which is only 15 km from town, in an area of low economic activity, has poor road access, poor transport and lacks links to services. Farmers are unable to maintain the system (Chancellor et al. 1999b).

Transport affects men and women differently. Women often find it harder than men to leave family obligations for long periods, despite strong support networks, or they may have less cash to pay fares and buy their share of privately offered lifts and hires. As a result of infrequent visits to local trade centres and low spending power, rural women have fewer urban and commercial links than rural men do. Thus the remoteness of schemes is not only a matter of distance but depends on infrastructure, the gender composition and wealth of the membership and the general economic activity of the area. Remoteness impacts differently on different subgroups.

Chikava, a remote CARE-assisted women's scheme in Zimbabwe,

- Women have little access to transport and must use buses.
- Local buses are often too full to stop, or refuse to carry produce.
- Buyers of surplus produce must be within walking distance.
- Women seldom visit town.

Consequently, women have limited access to:

- Inputs.
- Equipment.
- New ideas.

Despite diligent attention to maintenance tasks, they have limited capacity to improve production, invest in labour-saving equipment or gain new experience.

In places like Chikava, CARE (Cooperative for American Relief to Everywhere) draws on international experience and funds to address these issues through "agency" programmes with local retailers and with intensive attention to market information and training. In contrast, local irrigator associations, despite detailed local knowledge and close ownership of projects, encounter problems due to lack of experience and information. The widespread scarcity of resources means that schemes rarely can afford to learn from experience. For women, scarcity of resources is generally more acute than for men.

At Apel irrigation scheme, a remote, private initiative of the Rural Women's Association, in Northern Province, South Africa, irrigation depends on pumps.

- The women are not trained to maintain, troubleshoot or repair pumps.
- They are totally reliant on distant private-sector operators.
- Women contribute regularly for maintenance, fuel and small repairs.
- The women are innovative in obtaining inputs and serving local markets.

Pump breakdown jeopardises the scheme. The women have little experience or appreciation of repair and transport costs and, in arguing the repair price and arrangements, incur delay and water shortage. The losses of revenue and subsistence that result probably outweigh the extra cost of prompt attention.
(IWMI 1999)

In contrast, peri-urban irrigation is characterised by individuals or small groups acquiring equipment; the urban location allows wide choice of suppliers. Irrigation costs are often subsidised by other income-earning activities, but surprisingly less through paid employment than expected. The urban growers face more difficulty in acquiring water, and in securing crops and equipment, than in accessing technology and markets. In Nairobi, a survey of peri-urban irrigators, of whom 63 percent were women, found that 38 percent had invested in and were using small pumps (Hide and Kimani 2000). The irrigators were young and relatively inexperienced but entrepreneurial compared to older, experienced farmers in rural Kenya. Most peri-urban irrigators use land illegally, thus advisory services bypass them. But conditions are sufficiently favourable for irrigation to contribute positively to livelihoods, despite limited information, advice, and risk to health from use of poor-quality water.

Women are potentially more restricted than men in remote areas by difficulty in accessing services, markets, and profits. Women in women's schemes take on O&M successfully, but modern technology, for which specialist services might be needed, increases women's difficulties disproportionately in remote areas. Lack of knowledge and the personal contacts that people rely on in making arrangements remotely, are the main limiting factors. Improved access to training for women, combined with targeted outreach by private-sector service providers could address these constraints. Difficulties associated with technology and access to services and markets are less acute for peri-urban women irrigators. Women in remote mixed irrigation schemes generally take part in maintenance as part of their labour contribution, but often in an informal way and in unskilled roles such as labouring; they seldom make decisions related to maintenance.

4. Poverty

Poverty affects irrigators in two ways; firstly, poverty among irrigators reduces the potential for production and, secondly, poverty in the surrounding communities reduces the potential for profit. In addition, structural adjustment has already significantly raised the costs of inputs, affecting women disproportionately because they are among the poorest irrigators, in relation to both cash and resources.

On all irrigation schemes there is a range of wealth among the farmers. Women's poverty relative to the whole group of irrigators is generally a result of social norms, particularly those relating to land tenure, education and paid work. Ownership and permits to occupy or use land are often in male hands, and restrict the rights of women to realise cash from crops they have grown. Women's bargaining position within households is weak and the *status quo* is supported by strong traditional views in the community at large. Married women complain that while a crop is in the ground and needs their care, relations with their husbands are amicable, but when the crop is harvested and ready to sell, attitudes harden against them. Husbands who sell the crop at a distance often return home without a share of the profit for the wife and her children and for next season's planting.

Women who farm as household heads exert more control over resources and benefits, but suffer disparity in their ability to access services, water, and advice. Women tend to sell crops locally because of the time, linkages, and resources required for distance selling. They have considerable

insight into local markets and they often develop successful strategies such as selling in very small quantities, selling at local gathering points and taking produce to the buyer's door.

An example comes from Apel: One of the Rural Women's Association enterprises is poultry. Chickens are reared to be ready for sale when pensions are distributed. People feel well-off that day and the chickens sell easily.

Another example from South Africa: A man who has an irrigated orchard fills his small truck with apples and takes them to a particularly poor township. There he swaps the apples individually for empty bottles. He delivers the empties to the depot and collects the refund money. This option is probably not open to women, who could never afford the truck, but the idea is innovative.

In Zimbabwe: Women in a remote scheme barter irrigated vegetables for the use of draft animals for land preparation. Although this helps their resource problem, it does not solve their cash problem.

In general, cash-poverty restricts production among women, but innovative marketing on their part makes the best of local markets and helps to ameliorate the effects of limited productive resources and opportunities to travel.

Lack of resources among irrigators is particularly acute among *de facto* women-headed households, and limits the amount of irrigated land that is used. As the amounts of land available to women may be small already, this is very restrictive. Women often lack resources for land preparation and may have to wait to the end of the queue for ploughing services. The late planting that results disrupts watering schedules and leads to lower yields or poorer quality produce. The overall effect is lower revenue.

Although poor women are skilled in mobilising local savings, and achieve reliable repayment on group loans, and although credit providers are therefore becoming more willing to extend loans to women's groups, this does not necessarily overcome the social forces that push them to the end of queues.

Another aspect of women's poverty is their high workloads due to their triple roles as reproducers, domestic providers, and agricultural workers. Limited access to resources further contributes to women's heavy workload. Women prepare land by hand, or walk long distances to acquire essentials such as drinking water. Irrigation intensifies the drudgery in their daily routine.

Women's labour is disproportionately increased by irrigation because of:

- the year-round nature of cultivation (men may remain in the seasonal rain-fed sector).
- the extra weed growth resulting from applying water (traditionally, women weed).
- the extra burden of land preparation and levelling (now increasingly the responsibility of women).

The additional workload does not always bring proportional increases in benefit.

Where smallholder irrigation is set in poor rural areas, with low levels of economic activity, which is often the case due to earlier policies, irrigators face low levels of local demand, particularly for high-value products. Peri-urban irrigators are less affected, due to the proximity of a wide range of consumers and the greater opportunity for sales.

Contracts between irrigators, usually male plot-owners, and private commercial companies or entrepreneurs are often seen as a solution to distance marketing (SIBU 2001). It is not clear how

private-sector entrepreneurs view women producers. While women, given equal access to resources, produce as well as men, it is also realistic to recognise that they are disadvantaged in terms of resource control. Even where the entrepreneur provides packages of seed, fertiliser and spray, women's limited ability to command ploughing services and water supply renders their production more prone to risk. There is potential for improvement in two aspects: firstly, women becoming more active in ensuring reliable water supply and secondly, groups of women acting together to secure contracts.

At Thabina, in South Africa, a few irrigators grow high-value horticultural crops. The major constraint is marketing. Many factors contribute to high costs, such as land preparation, input costs, transport costs, maintenance, and security for the growing crop. Women find it hard to compete in this market.

Local conflict, lack of commercial links and agricultural advice, and lack of demand contribute to low incomes for women irrigators. Emphasis on production of locally popular, low-priced produce, such as maize cobs sold off the field, may prove a viable alternative. High transport costs are avoided, as are lack of demand, lack of commercial links and agricultural advice. Some women grow and sell maize, others sell small quantities of vegetable on-scheme (SIBU 2001).

Where poverty is widespread, the level of reliable income needed to plan is elusive, and many scheme committees can only pursue crisis management. This sort of management works against women too by bringing decision-making into informal male domains and by prioritising the needs of those with most to lose (usually men with large landholdings and more resources invested in inputs). The result is very uneven production over the scheme and over time. There is evidence to suggest that good maintenance, good organisation of repair, and trouble-shooting not only improve production by reducing the risk of water shortage, but also reduce workloads, particularly for women.

5. Technology

Reliable, affordable and easy water delivery is crucial to irrigation sustainability. The water delivery technology must therefore meet user needs. To match technology to users, the day-to-day users must be identified and their skills and resources taken into account. A survey in a Zimbabwean scheme revealed that men and women perceive and report their work differently, and there is constant change in the allocation of work from season to season and place to place, depending on the outcomes of intra-household bargaining and changing social norms. Irrigators themselves are close to these changes but generally need help to analyse the dynamics and articulate the results when they are required to participate in decisions to match technology and people.

Many irrigation management committees would benefit from a method that would assist them to forecast areas of potential conflict, such as the timing of agricultural tasks. Irrigators are not a homogeneous group: social, ethnic, religious, gender, and economic differences influence attitudes and behaviour. Thus farmers and irrigation professionals must take account of sub-groups, gender aspects and power structures in order to make sense of the situation. On-going, inclusive participation is essential (Chancellor et al. 1999a).

The fact that land levelling is often a 'woman' task, and increases women's workload in irrigation gives us one example of the sort of complexities that arise. Sprinklers are seen as a solution to land levelling problems, and therefore as a woman-friendly technology. However, women face particular problems in relation to advice on sprinkler-technology use, and in availability and cost of spare parts.

Pumps are a significant source of problems and disparity between men and women, either when used in conjunction with sprinklers or to feed gravity distribution systems. Reliability is crucial to smallholder irrigation, yet many pumps perform poorly. The causes of poor performance are generally lack of regular care and inappropriate operation, poor service availability and poor organisation. However, women are seldom included in training for servicing, operating, or managing pumps. They are therefore put into a position of dependency (either upon male relatives or outside help that must

be contracted and paid). Serious interruption to water supply results, reducing yield and, in the worst cases, causing total crop failure.

Where pumps are operated and maintained by agencies, organisation is often inappropriate and requires the negotiation of bureaucratic hurdles. Problems become acute if more than one agency is involved. Users may find that in case of breakdown the task of contacting the appropriate agency is insurmountable. The opportunity exists to improve performance by developing communications and streamlining practices. Poor institutional arrangements make it difficult for users to approach responsible departments and request essential repair. Women, who have difficulty travelling to distant towns to tangle with bureaucracy, suffer disproportionately from poor communication (Chancellor et al. 1999b).

Social factors strongly influence arrangements for pump operation and management in communities. Although men are keen to own pumps, they are often unavailable to deal with breakdown, leaving poorly equipped women to cope, or to suffer water shortage. Training in mechanical skills to deal with routine maintenance and simple breakdowns seldom has been targeted to women, and as such, slow, expensive, external repairs are the only option. Where women's technical training has been possible, particularly in the Water Supply and Sanitation sector, women prove to be conscientious students and are more likely to remain in and serve their community. In The Gambia, women were selected and supported by communities for training in the use and care of hand tractors for just these reasons.

The running costs and maintenance needs of pumps and other modern technologies are often unclear to users, who are unfamiliar with the rationale for timely repair and replacement. Although it is tempting to substitute technology for labour, when rehabilitating or planning schemes, change must be approached with caution, and support strategies adequately prepared if such substitution is to be successful (Berejena et al. 1999).

In general, maintaining infrastructure or machinery used on a communal basis is problematic: planning, organising contributions and allocating responsibilities are fraught with difficulty. These problems are exacerbated when the organisation is voluntary, as is often the case in farmer-managed systems. The disparity between men and women in relation to objectives, workloads, resources and access to benefits, leads them to prioritise different tasks and contributes to operation and maintenance problems.

At a Zimbabwe irrigation scheme, men wanted to use the tractor for journeys to town (a mix of agricultural and social objectives, say the women), and women wanted the tractor on-site to plough. This conflict resulted in both men and women being reluctant to co-operate to fund maintenance of the tractor.

It is widely asserted that improved performance results from gender-balanced participation in project design. Research undertaken by the DFID (British Department for International Development) Gender-sensitive Design Project supported this view, but highlighted the need for significant improvement in the way participation is planned, carried out and resourced. Gender disparity in participation was identified as a major source of poor design decisions, and gender-blindness in institutions as a major contributing factor to the continued marginalising of women (Chancellor et al. 1999b). The interaction between farmers and designers was also identified as a key process. Not only are farmers presently ill-informed about the requirements and limitations of technology, but also designers are ill-informed about agricultural practices and the impact of their technology on workload. Good communication is another key requirement and the use of lay terms should be encouraged where possible to assist both farmers and planners towards more sustainable irrigation technology choices.

6. Participation and organisation

It is important to create an enabling environment for participation: relevant information, effective communication, and awareness-raising among all stakeholders were seen as crucial preliminaries to participatory activities, as is inclusion of women in all levels of participation. Bringing irrigation issues

into public debate, involving a wide selection of stakeholders and discussion of irrigation issues in a livelihood context encourage effective participation.

Detailed participation, if it takes place, is generally between a headman, or a mainly male committee, and male developers. Women and poor people's "best interests" are considered, but without their participation. The importance of intra-household decision-making is ignored. Many irrigators are left out, for a variety of reasons, and gain no experience of participation and no confidence in their own ability to participate. Participation is often frustrated by lack of confidence to an extent that drives the community to hand over decisions to agencies or development authorities, saying, "we will be guided by you." This phenomenon is common when people lack information, cannot understand the information they are given, or do not want to take responsibility for technical choices. Unfortunately, dodging the responsibility of choosing often means that farmers are saddled with choices made by someone who knows about technology but not about farming and businesses. Despite the perceived superiority of the person's qualifications, his or her choice may be wrong. Where responsibilities are the issue, there is usually some good, but not necessarily obvious, reason for avoidance.

Agencies are not well motivated to enforce good participation practice, despite their nominal commitment to the process. Agency staff often feels participation is not the work they trained for. Participation delays them in achieving set goals (implementing or rehabilitating an irrigation scheme) that have to be reached in a set time. Reticent women present barriers and delays; it is tempting to leave them out. After all, the long-term success of schemes has little bearing on the careers of agency staff. In addition, agencies find it conceptually and financially difficult to take participation to a deep enough level. Participation with subsets of stakeholders and with households is often neglected or cut short before deeper levels are reached, because the process is overtaken by the administrative or budgetary constraints. Conversely, among NGO staff, motivation, funding, and participation skills are generally good but poor technical skills sometimes spoil project results.

At scheme level, lack of participation makes it difficult for scheme organisations to be clear about what they are doing. Within the scheme, individual irrigators are clear about objectives, but it is unusual to find similar clarity in irrigation scheme organisations. Most organisations have very laudable mission statements that lack detail (SIBU 2001). These general statements do not provide a tool for the decision-makers against which to measure the impact of decisions. The objective of a scheme cannot simply be a scaling-up of individual objectives, as these all differ. Scheme members face a fundamental difficulty: whilst they must co-operate to maintain the scheme and share water effectively; they must also compete to sell produce. Each scheme must decide what is the appropriate level of co-operation needed for the scheme to be sustainable. For many, more communal activity might be appropriate; for others, less. These decisions are rare because there is seldom an effective mechanism by which they can be reached.

Features common to Southern African Schemes:

- Lack of individual title to lands.
- Sharing common water source.
- Common commitment to shared primary infrastructure.
- Low levels of asset accumulation.
- Labour intensive methods.
- High involvement of women in production.
- Lack of commercial links and credit.
- Absence of marketing groups and co-operatives.
- Negative marketing experiences.

(SIBU 2001)

People must reach consensus about what they want out of the irrigation scheme, in order to determine what form communal action might take. They must seek a collective objective, or range of objectives, that meets the needs of the members. It is clear that few farmer committees formally, or even

informally, adopt targets, or even consider such approaches. Women's participation in the forming of consensus is poor and it is important that irrigators appreciate that the poor performance of smallholder schemes is linked to this. If the aspirations of more than half the people working in irrigation are ignored, poor commitment to decisions is inevitable. And if the committees adopt no targets then no-one's needs are served.

Consensus about the desirability of reliable, equitable and relatively cheap water is easy. Good operation and maintenance are key requirements for achieving this goal: the difficulties arise on the detail of how good operation and maintenance are to be achieved.

In South America, investigation of irrigation in an Andean community highlighted the crucial role of adequate organisation among the irrigators. Organisations must command respect and exert discipline if they are to work. Creating or adapting a system of rights and obligations is crucial to giving people a framework in which they respect and accept discipline. The core idea behind the organisation is that irrigation system maintenance entitles irrigators to maintain their rights. People are obliged to maintain in order to remain members. The whole construct is supported by capacity-building, training, and communication, much of which is specifically designed to meet the needs of the women irrigators and to continue to meet their changing needs on an on-going basis. The project community decided on this emphasis after careful participatory analysis of the earlier system shortcomings. (Boelens and Apollin 1999). Social constructs of this type are suited to small communities where people are aware of each other's activities and know each other well. Women can take advantage of opportunities to contribute to maintenance and sustainability and improve their status and rights through adoption of similar constructs.

Outside of smallholder schemes, supporting organisations are needed to provide structures to help irrigation committees and managers to co-ordinate activity, take part in catchment-management decisions, and benefit from the experience of other irrigators. Government departments, WUAs, or Catchment Authorities might take this role. It is important that supporting and co-ordinating bodies are gender-balanced, gender-aware and provide a mechanism by which experiences can be shared. Publicity about women's success in technical fields is a great boost to the confidence of women irrigators and increases innovation.

7. Training

Men and women need training to develop and focus organisational skills, to address long-term needs, and to improve performance and agricultural and mechanical skills. Specific vocational training is needed but must be supported by management and business skills. Sustainability, ostensibly the goal of IMT and private sector involvement, demands that this happen extensively and quickly.

The quality of training offered is crucial and the questions of what training is needed and who should be trained must be answered before a training programme is established. Equally important is establishing how training will be provided and funded. In project work, funds are set aside to meet very specific training needs, but there are serious difficulties with scaling up this sort of provision. Not least is the difficulty of identifying the appropriate providers. It is hard to envisage how training can be provided on a "user pays" basis; equally hard to visualise is government budgets that cover training for new skill needs of men and women.

Private-sector individuals, that is irrigators, have an interest in promoting sustainable smallholder irrigation because they live by irrigation. Private-sector corporations, on the other hand, will only become involved if a profit motive exists. Hitherto motivation for involvement has been weak and demonstrated success is needed to encourage expansion. The expansion of private-sector companies will stimulate smallholder production but it does not come with guarantees of gender equity or poverty alleviation.

Interestingly, in a few South African smallholder schemes, women's gangs carry out maintenance on a paid basis and with on-the-job training. In The Gambia, women were selected to go for specific technical training. The community provided support so that women could leave their homes for residential training in the use and maintenance of hand tractors. In Eritrea, women were supported while they undertook training in hand-pump repair. Subsequently, communities or Water Supply and Sanitation committees pay them for their repair work. This provides a dual benefit for women in terms of income and status and a benefit to the community in reliable service availability.

In the Andean projects, the use of scale models was central to training. The models facilitated awareness-raising and discussion, allowing people to illustrate their points easily, particularly with reference to design and technology. The understanding of all the participants was greatly helped by running water through the model. The approach was particularly effective for women, who had limited literacy skills but on whom future irrigation would depend because of the high rate of male out-migration (Boelens and Apollin 1999). The approach was thought-provoking and highly inclusive but relied on heavy investment in staff time provided by the project. It provided an opportunity for men and women to discuss options and ideas together and to benefit from each other's experience. The inclusion of women, particularly in Southern Africa, is complicated not only by men's views but by the attitudes of women themselves, and particularly by the reluctance of older women to embrace new freedoms, torn as they are by ambitions and fears for their daughters.

Outsiders are not necessarily the best people to introduce new approaches. Research on information sources in the agricultural sectors in Uganda and Ghana concluded that group membership was an important determinant of confidence among farmers, particularly women. The study highlighted the importance of animators and people who can "read for the group." Among the factors influencing information flows and empowerment were confidence, two-way interaction with trusted people and a sense of common purpose. It was recognised that empowerment followed a gradual slope to the point where a group became an agent of empowerment itself. Extension and local innovators were significant sources of information (Carter 1999).

The extent to which government and policy makers should lay down a framework for action, within which women's training and education can be promoted by irrigation agencies or catchment authorities, is not clear. There is evidence to suggest that engendered approaches and women's inclusion are not priority activities in farmer-managed schemes.

Research in 14 schemes in Zimbabwe and South Africa revealed widespread gender disparity and identified the main issues of concern at each scheme. Arranging schemes according to management type, the data showed that women voiced fewer gender-based concerns in government schemes. There is a danger that this indicates that women's aims are presently better supported by government than by local communities.

8. Discussion

In the last quarter century, maintenance of small-scale, smallholder irrigation schemes has, for many reasons, been drastically inadequate. Many schemes are rundown and pose huge challenges to their users. Rehabilitation in advance of transfer sets out to reduce the immediate task facing farmers in management turnover. Nonetheless, significant improvement on the standard of O&M recently achieved by government is crucial to the survival of small schemes after turnover. If farmers have to achieve this with little outside assistance, they must mobilise as many stakeholders and skills, as efficiently as possible. In this respect, it is important to look at men's and women's present roles and consider what changes might be appropriate.

The distinction between informal and formal inclusion is important. The informality of women's activity in smallholder irrigation allows their contribution to go unrecorded and undervalued and provides no mechanism for them to benefit from the work they have done. This is true at both household and scheme levels. Lack of formality makes it difficult for women to contribute to decision-making. Given the dominant role of women in the day-to-day work of irrigating, their lack of input to decision-making is likely to render those decisions less relevant to sustainable irrigation.

The informal and unpaid nature of women's work allows increases in their workload to go relatively unnoticed. It also allows delays, caused by poor O&M and their impact on workloads and productivity, to be largely ignored by men, and little thought to be given to improving these aspects of production. Low gender-awareness, and low capacity to analyse, constrain performance and, ultimately, irrigators' ability to market products successfully. Sustainability is reduced by these impacts.

Formalising contributions can be addressed: firstly, by recording people's activities in a simple way, recording who takes part in meetings and O&M; and secondly, by payment for services rendered for

the common good. The two strategies should benefit both men and women and provide management information. A system of payment requires members to contribute regularly to a central fund, which in turn requires transparent administrative practices and members' confidence in the responsible individuals.

Irrigators are likely to give priority to risk reduction, particularly where food security and financial viability are perceived to be important issues. On the other hand, the priority for the retiring managers may be to achieve transfer quickly and to gain as much kudos from the procedure as possible. This can lead to rhetoric on gender equity and women's participation, which may be rejected by the incoming farmer managers because it is perceived as an additional risk in an already frighteningly risky situation. It is important, therefore, that the champions of women's inclusion also take a gender-analytic approach that includes men's issues and demonstrates the impacts of gender considerations on responsibilities as well as rights.

8.1 Improving participation

Prior to transfer of irrigation schemes, agencies should reconsider their assumptions about goals, objectives, and performance of smallholder irrigation and compare them, in a participatory setting, to the assumptions and goals that will be appropriate in future for the agency and the farmer managers. Old priorities such as good water-use efficiency, and practices to support that objective, might not equally serve for managers whose objective is creating sustainable livelihoods. Where new practices are needed alternative management ideas must be explored. Central issues would include:

- Identifying necessary changes in participation and responsibility within the scheme (primary stakeholders);
- Identifying an appropriate level of affirmative action in relation to gender-awareness;
- Including a wider range of local establishments (secondary stakeholders) such as local government, women's clubs, schools, churches, and private-sector service providers.

Support of local organisations is likely to be crucial in the absence of government support. Review can and should contribute significantly to understanding stakeholders' motivation in the wider context and thereby assist in development of more effective participation.

Private sector companies and the transferring agency must interact with farmers to improve understanding and communication, and to provide opportunities for new links during the transfer process. Smallholder farmers cannot afford delays. The process has already begun in many countries where the private sector works closely with irrigation departments in pre-turnover rehabilitation.

8.2 Private sector

The private sector must invest if irrigation is to continue. Some investors will be private individuals investing in their own production system, in the systems of neighbours they perceive to be successful or in in-field services for which they can predict demand. Some investors may be private companies investing in future customers. It remains to be seen whether private-sector businesses consider the potential returns to be sufficient for this level of investment. It is possible that, initially the state will have to offer some inducements to stimulate private companies' interest, but more information is needed about smallholder prospects and private-sector objectives before predictions on post-transfer developments can be made.

The transfer process should provide a forum for exchange of views and information, and encourage dialogue on issues of gender balance and poverty alleviation.

In Kenya, indigenous "jua khali" industries have sprung up to supply smallholder irrigators' equipment needs, such as sprinkler replacements. The relationship is successful. The "jua khali" versions are a commercial response to demand on the part of irrigators. "Jua Khali" products cost significantly less than imported hardware and are affordable for both men and women farmers. Locally-based, they provide the multiplier effects so sought after in rural development theory. In Zambia and Malawi, promotion of treadle pumps in remote areas has gone hand-in-hand with distribution of spare parts to private-sector distributors. Parts are relatively cheap and many parts can be manufactured locally.

Thus individuals and small groups of men and women are able to repair them without trouble (Chancellor and O'Neill 1999).

In Zimbabwe, CARE promotes agency outlets to overcome the problems of access to inputs for farmers in remote irrigation schemes. Local shopkeepers are given opportunities to increase trade in seed, fertiliser, and small equipment. They are encouraged to stock tools for cultivation and for O&M. The volume of trade, however, will only reach satisfactory levels if farmers are able to market their crops successfully and earn reliable incomes. These examples illustrate that commercial links at individual level are developing. There is a difference between this and "scheme" needs for services, in that the customers are individual and decisions intrinsically simpler.

Provision of ploughing services in South Africa is rapidly moving from the state to the private sector. The private service is presently more expensive for farmers than previously, but timeliness may improve profitability enough to justify the added cost. Government extension staff are key to making the arrangements between the schemes and the providers. There is little evidence of similar arrangements developing for marketing, where arrangements are made between individuals and external buyers.

8.3 *Developing effective O&M training programmes*

Breakdown of water delivery systems causes conflict and the link between effective O&M and farmers' ability to produce crops to meet market demand is clear. Not quite so clear is the relationship between physical breakdown and management breakdown. There is low appreciation among small-holders of the risks that go with avoiding maintenance and proceeding with crisis management tactics. To assist farmers in identifying the trade-offs that exist between expenditure and risk, they need training, and they need to be involved in review processes.

It is important that the attention of men and women is drawn to management training, including gender-awareness, not as a separate optional issue but as an integral part of addressing O&M. However, it is not clear how this is best approached.

Firstly, the objectives of the training have to be established and the links to actions to achieve objectives understood. This process should establish the essential features of training content and "best bet" target groups from which candidates must be selected.

Secondly, consideration should be given to who will provide the training and where training will take place. It is important to remember that women are easily excluded at this stage because of the difficulty they have in leaving their homes and families. Hitherto it has been assumed that training should be delivered by existing irrigation agencies, but it is questionable whether this is an appropriate strategy. Evidence should be sought on quality and delivery before a provider is selected.

8.4 *Formalising the role of women*

Gender disaggregated data is still scarce in the irrigation sector. A general lack of performance information was highlighted in the recent debate on irrigation management transfer. Participants predict that high management costs will deter farmer managers from investing in monitoring. Decisions will become less supported by fact, and gender aspects are likely to remain invisible. It will be difficult to achieve equity in these circumstances. Yet equity will be crucial in systems that rely on user payments to fund recurrent cost and investment. Although this may be an overly pessimistic view, governments may initially need to set quotas for women's participation and recommend minimum levels of recording if the role of women is to be realised and formally recognised.

There is potential to promote fundamental and widespread change. Potentially, where women are employed in O&M, not only is a job done reliably but also women gain a source of regular income, which they can use productively. The skills they develop serve both them and the community. Women prove to be adept and reliable in maintenance of small pumps in India, in care and operation of hand tractors in the Gambia and of hand pumps in Eritrea. They fix and replace sprinklers in Kenya and Zimbabwe. However, the drive to encourage women to enhance their technical skills mainly comes from projects and largely remains there. Wider publicity about the changing role of women is needed, in a manner that stimulates farmers to take a more innovative approach to gender issues in their own schemes.

More information is needed about the perceptions of men and women on maintenance issues, about the performance of men and women in specific maintenance tasks. Evidence is needed about the changes in reliability and adequacy of supply resulting from changed O&M arrangements. Information of this type should be used to inform and encourage the private sector to provide affordable training. It is in their interests to promote sustainability and thus future business.

8.5 Linking rights to human capital inputs

Irrigation cannot be considered as an isolated activity, but should be set in the context of other important areas of stakeholder interest. Employment, farming, forestry, water supply and sanitation, education and other locally important activities must be taken into account. Without the total picture, it is difficult to understand either men's or women's objectives or what motivates them to take part in irrigation. It is also important for communities to decide what level of welfare is acceptable or necessary for them to run the system. Some communities will opt for "user pays" systems with high degrees of equity while others might choose systems that allow farmers to operate at different levels, with a degree of subsidy within the scheme that still allows poorer farmers to function. This will be very important in areas with high numbers of women- and child-headed households.

In either case, a system that links O&M contributions to rights to participate in making decisions could be valuable. At the individual level, such a system would allow poor people and women to maintain or improve their status within the scheme. It encourages those who do not prioritise O&M to pay others to fulfil their obligations; thereby creating jobs that might benefit women. It helps people to decide if they want to continue to irrigate and might potentially encourage renting of irrigated plots, whilst still maintaining rights. Extra land for rent benefits women, and young people.

At the scheme level, such a system might increase participation in O&M, increase the amount of maintenance done in a season, and the area of land cultivated and thereby the maintenance contribution. It coincides with the "user pays" concept while being flexible in application.

Rhetoric on empowerment of women is often met with strong resistance in the farming community itself. Communities often claim that their culture does not favour changes in the dynamics between men and women. However, careful analysis of who does what, particularly if it is done in a participatory (and humorous) way, often reveals considerable potential for flexibility. However, the existing gender bias (if that is the case) is condoned, if not encouraged, by the attitudes in irrigation departments and agencies. Professionals, while playing lip service to the importance of gender-awareness, recommend that important issues of increased production and rehabilitation must be addressed first. They cite the importance of income and food security to support their approach ignoring the potential for women's inclusion to improve performance in just these aspects. Past reluctance to invest in women's training and participation has had plain results, however, change is perceived to be hard work. Farmers and professionals must be convinced that the hard work will achieve long-term benefits. Women must also be proactive in making their contribution visible and negotiating acceptable terms for continued and increased contributions.

9. Conclusions and recommendations

Concerted involvement and action by stakeholders are crucial to ensure that turnover to community management and private business involvement is a catalyst for women's greater involvement, rather than a missed opportunity. At present, women's involvement largely comprises effort at field level and fails to give them sufficient voice in determining the future of irrigation as part of their livelihood. Women's lack of voice is a constraint to sustainability as well as a frustration to women. The stakeholders must at least include the presently responsible agency, the men and women of the irrigation scheme and the private sector, but a wider representation should be encouraged.

Private sector involvement in smallholder irrigation in Africa provides an opportunity for change. If women are to benefit from the changes and increase their contribution, they must extend their activities from the field level into management, service provision, and communications, internal and external to the scheme. One possible strategy to start the process would be to focus women's attention on O&M. This would give them an opportunity simultaneously to improve the performance of their scheme, develop skills, confidence, and participatory techniques, and change attitudes towards their future participation in decision-making.

It is not suggested, and is in no way sustainable, to simply increase women's workload further, by adding O&M, without recognition and benefit. Ideally, payment for work should be clearly established and, where this cannot be arranged, an acceptable alternative reward must be agreed. This principle is fundamental and must apply equally to men and women. The concept that farmers, men or women, should run irrigation schemes for the common good by voluntary contribution of their time to either management or maintenance is unlikely to result in a sustainable and effective organisation.

Changes in behaviour are needed. Firstly, by the transferring agencies in getting to grips with the changes that must be promoted for schemes to survive in the commercial world. Secondly, among both men and women irrigators, in the way objectives are set, and co-operation and conflict at household, group or scheme level are handled. In order to achieve these changes, people must develop analytic skills, management skills, their own monitoring systems, and confidence in their judgement and ability to deliver results. They will need assistance. The form of assistance and the best providers still need to be identified.

9.1 Greater attention and resource for participation

Standards for participation need to be raised if a great deal of money is not to be wasted. Participation is all too often carried out in a vacuum, without monitoring of impacts. There is a general failure to clarify the objective of the scheme, as opposed to the objectives of individual members. When the objectives of powerful members become "scheme objectives" by default, arrangements will not work in favour of women and the commitment of the majority of the workforce will be weak.

Awareness-raising, gender-sensitive approaches and relevant, clear information are essential preconditions for good participation, but they need resources. The quality of participation will not improve without application of skills and resources specifically for that purpose. Where participation has to compete with hardware and operational demands for resources, it will remain under-resourced. Specific participation funds must become routine in budgeting the cost of transfer and should allow for special attention to the dissemination of relevant information, awareness-raising initiatives and purposeful inclusion of women.

9.2 Wider dialogue

Management transfer cannot be viewed simply as a transfer from agency to private farmers, nor can irrigation expansion be planned only with irrigators. Other actors are involved and their contributions have impacts on sustainability. It is crucial therefore not to limit the debate to irrigators and would-be irrigators on the one side or to government departments on the other. It is also important to include both formal and informal farmer groups. Among these women's groups deserve special attention if the dialogue is to reflect women's views adequately. Mixed groups and mass meetings cannot be relied upon to reflect the aspirations of sub-groups and are easily hijacked by powerful people and holders of traditional authority. All community members will have useful views. In the case of women agricultural workers, views and reactions are key to the success of the turnover process, because of their direct impact on scheme performance.

Private sector corporations, agri-business, consumers, government departments, and local authorities all have roles. Profit motives will be weak as turnover occurs, because of the subsidies that previously existed. Private-sector business will only be motivated to participate if a profit motive is identified. Wide dialogue is difficult to organise but, if handled well, contributes significantly to the success of the change process and can avoid misunderstanding.

9.3 Governance of the private sector and provision of training

It may be necessary for the state to protect the welfare interests of vulnerable groups by providing rules and recommendations for the private sector. Quotas are one example of this type of rule. However, education must be the basis of progress and quotas should only be used to support it, and not be a replacement for it. It is therefore necessary to recognise women's specific need for education in technical and managerial aspects of irrigation to enable them to fulfil their responsibilities and claim their rights.

Attention must be given to increasing women's uptake of training and addressing social and cultural norms that link men rather than women with technology. Private sector provision of training, if

necessary in partnership with national, provincial and local authority, is an opportunity to promote change that should not be overlooked. There is scope to guide provision by research if the private sector is linked to research. Identification of levels of O&M that are consistent with sustainability would improve training. Comparative analysis of successful O&M on the basis of involvement and responsibility of key sub-groups such as women, the elderly and youth groups in O&M should be given priority before widespread policy changes are recommended. Training could potentially be improved in two aspects: firstly, women trained to actively ensure reliable water supply, and secondly, groups trained to secure and fulfil contracts. Inducement to the private sector initially to develop training materials might be required.

9.4 Lessons from other PPP and PFI initiatives

In parallel, identifying lessons from other sectors where public-private partnerships have been established or where private finance initiatives have replaced government investment programmes is useful. Lessons from other sectors that have positively increased the participation of women in O&M tasks might yield important pointers as to where changes have benefited or been disadvantageous to women. Developments in the Water Supply and Sanitation sector, where women have in some cases established formal roles and in other cases have not, are likely to yield information to help develop effective policies for smallholder irrigators. Dissemination of findings from other sectors, however, should encourage men and women farmers and communities to discuss the issues in a structured and analytic way and to use that analysis to assist in selecting sustainable strategies themselves.

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