RESEARCH REPORT

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# Institutional Alternatives in African Smallholder Irrigation

## Lessons from International Experience with Irrigation Management Transfer

Tushaar Shah, Barbara van Koppen, Douglas Merrey, Marna de Lange and Madar Samad

International Water Management Institute

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*Research Report 60*

# *Institutional Alternatives in African Smallholder Irrigation: Lessons from International Experience with Irrigation Management Transfer*

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*Cover photograph* by Herre Levite shows a woman farmer in Steelpoordrift smallholder irrigation scheme, South Africa.

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# *Summary*

This report reviews several decades of global experience in transferring management of government-run irrigation systems to farmer associations or other nongovernment agencies in an attempt to apply the lessons of success to the African smallholder irrigation context. Based on a comparative study of the experience of several countries, analysts have suggested that Irrigation Management Transfer (IMT) works provided certain preconditions are met, viz., supportive legal-policy framework; secure water rights; local management capacity building; and an enabling process to facilitate management transfer. This paper reasons, however, that straightforward IMT—even with all these conditions fulfilled—is unlikely to work in the African smallholder context. It suggests that institutional alternatives most likely to work in this context are those that successfully deal with the entire complex of constraints facing African smallholders and help them move to a substantially higher trajectory of productivity and income from where they can absorb the additional cost and responsibility of managing their irrigation systems. In developing such institutional alternatives, rather than focusing only on direct transfer of irrigation management, African governments need to begin by enhancing the wealth-creating potential of smallholder irrigated farming by strengthening market access, promoting high-value crops, and improving systems for providing extension and technical support to smallholder irrigators.

# *Institutional Alternatives in African Smallholder Irrigation: Lessons from International Experience with Irrigation Management Transfer*

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## *Review of International Experience*

Irrigation management reform has a history of more than 50 years. It has gathered momentum during the past 20 years. Irrigation management reforms are a key component of government policy in almost all countries with a significant irrigation sector. The overall experience has been varied and mixed in the approach adopted in designing and implementing the reform, the extent of the reform, and the impacts of reform on irrigation system performance as well as on farmers. Since the mid-1980s, the centerpiece of the reforms invariably has been the transfer of management (in rare cases, along with the ownership) of irrigation systems—wholly or in part—to Water Users Associations (WUAs) or other nongovernmental agencies, combined with the downsizing or withdrawal of the government role in operation and maintenance (O&M), fee collection, water management and conflict-resolution.

The driving force behind the reforms is the need to reduce the government's recurrent expenditures for irrigation. Irrigation systems in many developing countries were established with substantial financial contributions from international donors. It was assumed that enhanced financial gains from improvements in productivity levels of irrigated agriculture would enable the government or water users to meet the O&M costs of the systems. This assumption has very often proved unfounded; public irrigation systems in developing countries have seldom performed to their design potential. Many schemes have failed to generate returns commensurate with expectations. Moreover, in most developing countries, governments have failed to set up irrigation charges that cover actual O&M costs and even more so in collecting these charges.

Some of the key stated and unstated assumptions underlying the recent reforms are:

a. government management is neither a viable nor an ideal and sustainable approach to managing irrigation projects;

b. most irrigation schemes are, in principle, financially and economically viable or have the *potential* to be so under reasonable management;

c. transferring the management of irrigation systems, partly or wholly to WUAs, would result in better O&M of the systems, improved water management, conflict-resolution, improved fee collection, and enhanced productivity of land and also contribute to food and livelihood security of the farmers in the schemes;

d. management transfer takes time and requires capacity building, and succeeds to the extent the enabling conditions ("supportive socio-technical context," legal framework, water rights, and so on) are in place to ensure their success ( see Vermillion 1996; Vermillion and Sagardoy 1999; Frederiksen and Vissia 1998).

Early arguments in favor of irrigation management transfer (IMT) were based, in part, on the reported successes with private irrigation. It is widely documented that, at least in Asia, private pump irrigation from groundwater and surface water bodies is far more productive and financially viable compared to public irrigation systems Dhawan 1990, Kolawalli and Chicoine 1989, Shah 1993. Many others have shown that private small-scale pump irrigation—from groundwater and surface water sources—is several times more productive compared to canal irrigation and is almost always financially viable and self-governing. Lowdermilk et al. (1978) report similar results for Pakistan. There are also examples of privately catalyzed collective management: Farmer-managed irrigation schemes (FMIS) in the hills of South Asia, tubewell companies in north Gujarat, lift irrigation schemes built and managed by sugar cooperatives in Maharashtra, deep tubewell cooperatives in northwestern Bangladesh—all of which show that well-managed collective irrigation by farmers lies at the heart of a process of transforming their livelihoods (Tang 1992; Lam, Lee and Ostrom 1997). In the Sahel too, Brown and Nooter (1992) wrote for the World Bank that "most successful irrigation in Africa has been done by private individuals."

Much of the early discussions envisaged that farmer management of public irrigation systems would enhance their performance and bring about wide-ranging socioeconomic changes that would enable farmers to substantially improve farm incomes. In more recent years, management transfer was considered to be beneficial even if it just saved the government money, improved cost-effectiveness of operation and maintenance while improving, or at least not weakening, the productivity of irrigated agriculture (Vermillion 1996). The drift of the IMT discussion, in recent times, has been more towards getting irrigation off the back of governments than towards improving the lot of the farmers and the poor, the original goal to which much public irrigation investment was directed over the past 50 years.

Numerous case studies of the process and impact of management transfer are now available. There are also some attempts at synthesis and review of recent research on the subject (Vermillion 1996; Fredericksen and Vissia 1998; Vermillion and Sagardoy 1999). These deal mainly with two aspects, the impact of IMT and the conditions that increase the chances of its success, and almost always assume that successful management transfer to user organizations is *in principle* viable provided the "process" is right and favorable socio-technical, legal and political conditions are created ( Vermillion 1996; Fredericksen and Vissia 1998; Vermillion and Sagardoy 1999).

Interest in IMT has been growing despite moderate expectations about impacts. However, global experience with IMT has been far from uniform and reassuring, especially in low-income societies. An exhau,stive review of IMT impacts in several countries by Vermillion (1996), a pioneer in IMT research, for example, conveyed a mixed picture. The IMT programs in Turkey, Mexico, USA, and New Zealand are considered as successful examples. Elsewhere, especially in the developing world, the picture is less clear. Different performance indicators show improvement in some schemes and countries but a decline in others. Major reductions in government staff were reported in the Philippines, Columbia basin of the USA, Mexico

and in Colombia. In some countries, there has been an increase in O&M charges borne by farmers, especially in pump schemes, improved cost-effectiveness of irrigation, improved collection of water fees, and diversification of income sources for WUAs. However, major maintenance has often tended to be deferred even in some of the more successful cases, including those in high-income countries. For example, in Turkey, one of the prominent "temples" of management turnover, there were "indications that farmers may tend to underinvest in the long-term physical sustainability of infrastructure" (Editor's note to Svendsen and Nott 1997). Where this has not happened, fee collection often became an end in itself. Panella (1999) notes that in the Philippines, a pioneer in irrigation management transfer, the key achievement of 20 years of IMT has been improved fee collection performance. Despite this, the National Irrigation Administration (NIA), the high profile agency that managed IMT, has not become truly viable. Over half of its operating budget is covered by hidden donor subsidies (ibid, p.13). NIA's emphasis on viability has led to extreme cost cutting, severe underinvestment in operation and maintenance, and staff orientation towards collection at the expense of operation and maintenance" (ibid, p.37; also see Hayami and Kikuchi 2000; and Fujita, Hayami and Kikuchi nd).

The impact of management transfer on agricultural productivity and farm incomes is equally unequivocal. In the Dominican Republic, farmers realized increased yields of 40 percent. In Mexico, there was no change; and in Senegal valley, there was a decline in cropping intensity and expanded irrigated area. Improved water delivery to middle-reach and tail-end farmers was reported in the Kano Project in Nigeria and in Bihar, India in the early years after transfer. But the gradual dissipation in performance gains over the years suggests it may take a long time for the culture of collective self-management to take hold in contexts where dependency on parastatals has long been part of farmers' lives.

A study by Vermillion et al. (1999:2) of Indonesia's 10-year old program of turning over small-scale pump irrigation schemes in West and Central Java—where agricultural productivity was already quite high (with paddy yields ranging from 5.2–6.2 tons/ha) concluded that the management transfer did not increase irrigation costs to farmers, nor lead to a decline in the quality of irrigation service; but no significant productivity improvements were achieved. Similar results were noted elsewhere (see, for example, Johnson III 1997, Kloezen, Garces-Restrepo and Johnson III 1997 and Kloezen and Garces-Restrepo 1998 for the Mexican experience and Samad and Vermillion 1999 for the Sri Lankan experience).

Many overarching patterns that seem to emerge from a reading of the international experience with IMT seem relevant to Africa, but have not received adequate attention in the literature. IMT has tended to be smooth, relatively effortless and successful where: irrigation is central to a dynamic, high-performing agriculture; average farm size is large enough for a typical or a significant proportion of farmers in the command area to operate like agri-businessmen; backward linkages with input supply systems and forward linkages with output marketing systems are strong and well-developed; and the costs of self-managed irrigation are an insignificant part of the gross value of product of farming. These conditions prevail in Mexico, Turkey, USA, and New Zealand where IMT has been a success. Counter-intuitively, many situations where IMT seems to have succeeded are also marked by highly unequal distribution of land ownership. In the Andean region of Colombia where IMT has been successful, farmers mostly grow commercial crops—mainly banana and oil

palm—for the external market. About 66 percent of the farms in this region are 5 hectares or less in extent; however, some 40 percent of the land is owned by 2.8 percent of the farmers each owning 50 hectares or more (Ramirez and Vargas 1999:14).

In South Africa, numerous Irrigation Boards—Water Users Associations par excellence—have managed irrigation systems successfully for long; but their members are all white, commercial, large farmers operating profitable well-capitalized farms. In Turkey, 40 percent of the irrigated area consists of farm holdings that are 5–20 hectares in extent and where farmers cultivate high-value crops for export to Europe. It can be argued that in Turkey IMT succeeded because, as with South African Irrigation Boards, in many respects, there was a 40-year tradition of farmer participation in the maintenance of the canal system through informal village-level organizations. Equally, irrigation fees under self-management in Turkey are 2 percent or less of the value of production per hectare, 3.5 percent or less of the total variable cost of cultivation and less than 6 percent of gross margin (Svendsen and Nott 1997:14). In South Asia where smallholder farming dominates, the experience is mixed. A good example of a successful IMT-cum-rehabilitation in small farmer context is the Panchkanya System in Nepal (see Starkloff et al. 1999). In this system, following management transfer, the area commanded increased to 600 hectares against the design command of 420 hectares. Prior to transfer the area commanded was 270 hectares. Farmers in the scheme perceived that crop yields increased after transfer. The area under cash crops too increased. A notable development following the transfer was the increase in farmer participation in decision making and management at all levels. Nepal hills have other such examples of successful farmer management of irrigation. The relatively high performance of farmer management in South Asian hill irrigation schemes may be attributed to the tradition of collective self-management of irrigation that prevailed here for several hundred years. The Panchkanya system itself was originally built 115 years ago by the Tharu community, which also operated it as a Farmer-managed Irrigation System (FMIS) until the Department of Irrigation built a *pucca* head-works and took over its management. About 84 percent of the holdings in the scheme's command are owner-operated. A majority of WUA members are full-time farmers, deriving all or a very substantial part of their livelihood from irrigated farming. There is a critical mass of medium-sized holdings that range from 1 hectare to 20 hectares. The design of the WUA too contributes to performance: shares are issued in proportion to land owned and, water allocation is linked to shares owned and is ensured only to members in good standing, that is, who pay up their dues and contribute to maintenance and repair works. Finally, and importantly, the volume of the benefits that membership of the scheme offers is much greater than the irrigation fees. All that a member has to pay is a one-time entry fee of less than US$2 to enroll and an annual maintenance fee of around US$7 or three man-days of labor![1] Against this, all members take three irrigated crops every year for water charges ranging from US$1.5–3.00 per hectare. This largely explains the high demand for shares in the Panchkanya scheme.

In general, then, IMT has worked in situations where individual stakes are high and the irrigation community has been able to take the additional burden of self-management—financial and managerial—in its stride. This ability is strongly

[1]Notably, 70 percent of members prefer to pay up rather than work, which is an indirect indication that the opportunity cost of landowners' labor exceeds Nepal R 100/day (US$1.00 = Nepal R 69.00).

linked with the microeconomics of irrigated production, which propel the economy upward by generating powerful incentives for self-management. In sum, international experience with IMT suggests that four conditions must be met before a farming community makes success of an IMT intervention:

1. it must hold out the promise of a significant net improvement in life-situations for a significant proportion of members,

2. the irrigation system must be central to creating such improvement,

3. the economic and financial cost of sustainable self-management must be an acceptably small proportion of improved income, and

4. the proposed organization design must have—and be seen to have—low transaction costs.

All these conditions are met by South Africa's irrigation boards, as well as by canal irrigators in the US and New Zealand. In Turkey, sufficient proportion of irrigators who are commercial exporters are willing to be the "champions" of farmer management, as is the case for many Latin American countries. One might suggest that the prospects for IMT are bright even in the Pakistan Punjab on a somewhat perverse logic; with its large inequalities in landholdings, large landholders in the Indus system who make a decent living from farming would produce the champions needed to make IMT succeed, even if through oligarchic WUAs. But a hard look at any smallholder IMT program in Asia or Africa will show that it satisfies none of these conditions; therefore, it is not surprising that small farmers here are lukewarm to IMT of government-built systems.

IMT faces problems in smallholder communities not because they are less able or less cooperative but partly because most of them are not full-fledged farmers and more importantly, because the management cost of a government-built irrigation system—like most service institutions—increases more rapidly with the number of customers than with the volume of business. A 1,500-hectare system that serves 1,500 irrigators costs much more to manage—in terms of the logistics of service delivery, fee collection, maintenance, and so on—than a similar system that serves 5 large farmers. Moreover, it is a lot easier for 5 large farmers to come together and agree to the rules of self-management than for 1,500 smallholders to do. This broader perspective should be taken into account in our assessment of the prospects of successful management transfer of government irrigation schemes to African smallholder communities, who in some ways are worse off compared to South Asian smallholders.

## *African Smallholder Irrigation Context*

In many aspects, the sub-Saharan African smallholder situation differs from situations where IMT worked and was sustained. Some of these aspects are discussed below.

### *History of Dependency*

The discussion of IMT in the African context, in recent years, began with management reforms

that entailed drastic curtailment of the functions of the parastatal agencies that were responsible for the provision of support services and management of irrigation schemes. Examples of such paratstatal agencies include the Agriculture and Rural Development Corporation (ARDC) in the Northern Province of the Republic of South Africa (RSA), the White Nile Agricultural Services Administration (WNASA) in Sudan, and the Society for Land Management and Development of the Senegal and Falme River Valley (SAED) in Senegal (Wester et al. 1995). Although they are smallholder irrigation schemes, the parastatal agencies managed them in an "estate mode" in which they centralized input supply and output marketing functions to such an extent that farmers often got reduced to being workers on their own land.

In South Africa, for instance, the ARDC and its predecessors have, for over 30 years, managed smallholder irrigation schemes through an elaborate top-down command and support system, which has eventually proved to be unsustainable. Under a version of contract farming system, irrigation was fully subsidized. The ARDC organized mechanized cultivation, planting and fertilizer application. All that the plot-holders or farmers did was weed, harvest and move the irrigation pipes around. They did not invest much working capital; nor did they need to make any decisions about farm management. The parastatal also organized the marketing of pooled produce. It deducted all its expenses and the residual sum was given to the farmers. Under this arrangement the plot-holders are neither farmers nor wage-laborers. They do not take any entrepreneurial or managerial decisions. In reality, they only collect wages for weeding and harvesting and managing field irrigation. However, they share the risk of crop yield variability, and in that sense, are not pure wage-laborers.[2] As Bembridge (1999:11) notes: "Scheme managers have been attempting to 'manage' farmers rather than encouraging entrepreneurial development." The situation was similar in other African countries.

The abrupt withdrawal of parastatal agencies from the management of irrigation schemes and the elaborate institutional support systems they provided has had serious impacts on smallholder farmers in many African countries.[3] In the Arabie-Olifants scheme in the Northern Province of South Africa, the gross cropped area declined to 30 percent of the total arable land a year after the withdrawal of ARDC as plot-holders were unable to mobilize working capital to pay for inputs and services (Shah and van Koppen 1999). Attempts were made to obtain crop loans from the Land Bank. Although the bank agreed in principle to provide loans, the farmers were not provided credit as they did not have legal claim to their lands;[4] and the Bank was unwilling to accept other forms of loan guarantees.

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[2]As a World Bank study on the organization of settlement farming in West Africa concluded: "Problems are encountered … when the so called 'farmers' are settled on centrally managed estates, where the 'farmer' has no decision making power, yet carries the risks of failure."

[3]For example, the Northern Province ADRC's budget has been reduced progressively over the past 3 years: from R 90 million in 1997-98 to R 45 million and to R 23 million in the current year. ARDC had a staff of 1,200. It has been cultivating some 120,000 hectares of government farms besides providing a range of services to farmers. Its salary bill alone was R 22 million. As a result, the ARDC had to levy a fairly high service charge on the farmers.

[4]Banks would not lend because land under communal tenure is no use as collateral. Plot owners do not have rights to dispose of their land to settle their obligations. As an alternative, the Land Bank in South Africa has recently initiated a "step-up loan," which is given without collateral. It starts at US$36 per person and is paid back in monthly installments. Once it is repaid, the person can borrow double the amount, etc. up to a ceiling of US$2,570. However, agricultural loans require higher initial amounts and seasonal rather than the monthly repayments required for step-up loans.

In many African countries the management of smallholder irrigation schemes by parastatal agencies have left behind a legacy of a dependent and impoverished group of farmers.[5] In many situations, such management had degenerated into oppressive "spoils systems" that destroyed all pre-existing informal institutions. Nowhere is this more vivid than in the descriptions of the Mwea irrigation and settlement scheme in Kenya. The scheme showed signs of success in the early period of its establishment. But, over time mismanagement of the scheme by the National Irrigation Board (NIB) led to the impoverishment of the farming community whose earnings were barely sufficient to satisfy basic subsistence needs (Muchai 2000a and Muchai 2000b). Management transfer should have left Mwea farmers rejoicing but the reality was they were miserable. As Muchai (2000a: 21) noted, "as much as the farmers loathe the NIB, replacing it has proven to be tall order. The demands of running the scheme are far greater than the monetary cost."

## *High Cash Costs due to Mechanization*

Smallholder irrigated farming in Africa emerged as a highly mechanized and capital-intensive activity under parastatal management. The ARDC in South Africa used heavy equipment for ploughing and land preparation, spraying and harvesting. With the withdrawal of parastatal management hiring farm machinery and equipment at affordable rates has become a major problem. The development of equipment rental markets at the local level has been slow and variable. The rental rates are high. As a result, the rising cost of production has not only eroded the margin from irrigated farming but has also increased working capital requirements. Most importantly, the high fixed costs have made smallholder farming extremely risky, with net gains plummeting far more rapidly than yields in a bad year.

In the Arabie-Olifants scheme of South Africa, net incomes (excluding electricity) for wheat computed from ARDC records tended to be 20–25 percent of the cash costs of farming, which is less than the interest charged by private money lenders for short-term loans to farmers. In the same scheme, farm budgets computed by Tren and Schurr (2000) showed that gross margins per hectare of wheat and maize were a mere US$2 (R 14) and US$289 (R 2,021), respectively. Besides, these small farms face much higher "operating leverage"[6] compared to Asian smallholders because the latter incur much lower cash costs. As a result, net income per hectare shows extremely high variability with respect to changes in yields. According to a document from South Africa's Department of Water Affairs and Forestry, for example, gross margins per hectare of maize, onions and potatoes are R 408, R 1,487 and R 5,739, respectively, at normal yields. But they reduce to R 0 at 50 percent yields; and for tomatoes, the gross margin falls from R 13,227/ha to a mere R 765/ha with the halving of the yield/ha!

## *Absence of Credit, Input and Output Markets*

Most smallholder schemes in South Africa are located in former homelands in remote areas away from towns and cities with which they often have poor linkages. With the rise of the

[5]For the Nigerian experience in this respect, see Ogunwale, Maurya and Owonubi 1994.

[6]'Operating Leverage, the opposite of break-even volume, is defined as fixed costs (contribution/ha). For the Asian smallholder, a crop failure implies wasted human and animal labor both of which have low opportunity cost, but no major cash costs from borrowed funds. For a comparable African small farmer, a failed crop is significant cash loss and the risk of falling into a debt-trap.

"estate mode" of farming under parastatals, such markets, as existed previously, gradually disappeared; and now that the parastatals have withdrawn, there is a huge institutional vacuum. Based on a field assessment of the prospects of IMT in Dingleydale and New Forest, two of the better schemes in the Northern Province of South Africa, Merle and Oudot wrote: "Access to inputs is difficult. A lot of farmers fetch them from Hoedspruit or Hazyview with important transportation costs. Hiring a *bakkie* (small pickup truck) for 20 bags of fertilizer costs between R 100 and R 150 (US$14–21)." Moreover, "Traditional markets that were available seem to have disappeared. The farmers are nowadays in direst need of markets especially for the winter crops. A lot of vegetables get rotten in the fields due to lack of buyers. The potential of the area for subtropical fruit trees must be accompanied by corresponding markets."

## *Land Tenure Issues*

One conclusion of international IMT research suggests that for farmer management to work, it is important to assign clear water rights. In the African smallholder context, besides water rights, land rights pose an additional intricate challenge (Lahiff 1999). Insecure tenure limits farmer incentives to make long-term development investments on their land (Bembridge 1999). Moreover, the present arrangement does not provide much room and incentive for uninterested farmers to sell out, and to interested and capable ones to expand their holdings (ibid.). Nor does it lead to the emergence of flexible rental markets in irrigated land, thus keeping it from achieving its full productive potential.[7] As already mentioned the inability to offer land as collateral for obtaining credit is another disadvantage. Often, the lack of clarity among the plot-holders about what their rights precisely are with respect to their plots seems more problematic than the absence of ownership. In Dingleydale and New-Forest Schemes in the Northern Province of South Africa, Merle and Oudot (nd), noted: "Some farmers do not know if they are allowed to rent their land, and are unwilling to discuss the matter in any detail. Some people are very reluctant to let someone crop on their field because they are afraid not to be able to get it back. The land is lent to a trustful person, such as an influential person, friend or relative."

In different ways, tenure uncertainty does enter into the discussion of IMT in African smallholder irrigation. In a study of the transfer of pump irrigation schemes in Niger, Abernethy et al. (2000:8) found lack of clarity about land rights an important issue and noted: "The precise ownership rights on the irrigated lands remain unclear. Former owners dispute the action of a past government in taking over their land without compensation. The present users of the land are not true owners, since they cannot sell the land if they wish to do so. The irrigators' organizations are, to some degree, in the position of owners of the land, since they can charge the irrigators a fee for using it and can evict and replace irrigators in certain circumstances." In Zimbabwe, under the Control of Irrigable Area Regulations of 1970, every plot-holder is issued three permits, which have to be renewed every year: a permit to reside,

[7]Land tenure is a major institutional issue, which has important implications for irrigation management institutions in Africa. In principle, farmlands are communally owned but, especially in irrigation schemes, state influence is overpowering. Within customary arrangements, farmers feel they have secure tenure on the plots assigned to them, as emerged in the Arabie-Olifants Scheme study by Lahiff (1999) and Mpahlele et al. (1999). In a more wide-ranging review, Rukuni (1997) suggests that communal ownership of land and the present tenurial arrangements would promote productivity and efficiency enhancement if only the communal ownership was secure. In his assessment, problems of tenurial insecurity arise primarily because when communal land tends to be viewed as state-owned, it gives every bureaucrat the power to intervene at will and tinker with the communal lands.

another to graze their stock and yet another to cultivate. Withholding the issue of permits is a powerful instrument for securing the compliance of farmers (Manzungu et al. 1999:6).

## *Irrigated Holding Size and Smallholder Hedgehog Behavior*

Literature documenting international IMT experience suggests that all or a majority of farmers in successful IMT cases are full-time farmers deriving a substantial proportion of their livelihoods from irrigated farming. This builds their stake in self-management and committing time and resources to it. In the African smallholder context, farmers who work tiny plots are forced to pursue what Chambers (1983) calls the "hedgehog strategy" of depending on a variety of sources to earn a livelihood. In Senegal's Village Irrigation Schemes (Périmètres Irrigués Villageoises), the plot size varies from 0.1–0.4 hectare (Wester et al. 1995:3). In a sample of smallholder schemes studied of the Niger valley, the plot size was 0.25 hectare or less (Abernethy and Sally 1999). In the Nyanyadzi scheme in Zimbabwe, it ranges from 0.76 to 1.1 hectares (Manzungu et al. 1999). In the five schemes proposed for rehabilitation in the Northern Province of South Africa, the plot size is about 1 hectare (NPDALE 1999). In the Arabie-Olifants scheme studied by IWMI and partners, barring a few farmers, most work 1.25-hectare plots and a much larger number of tiny food plots and vegetable gardens as in Sepitsi (Shah and Van Koppen 1999; also see Mpahlele et al. 1999). In South Africa as a whole, of the total of 37,108 farmers involved on 202 smallholder schemes in the former homelands of Lebowa, Ciskei, Transkei, Kwazulu, Venda, Gazankulu, Bophuthatswana, Qwaqwa, as well as Kangwane and KwaNdebele, 63 percent are tiny food plot cultivators, mostly women farmers.

Inability to depend upon irrigated farming for a substantial proportion of their livelihood needs modifies the incentives and behavior of the smallholders. It is common for men to seek urban jobs while the women cultivate the plots. The smaller the plot, the stronger this tendency (Mpahlele et al. 1999; Ngqaleni and Makhura 1996). Many plot-holders keep cultivating their plots until they are too old to work them. In the Arabie-Olifants Scheme, a large number of plot-owners depend on pensions as the main source of income. In a rural community in Northern Province studied by J Kirsten (cited in NPDALE 1999), 75 percent of the households earned income from cropping but this amounted to just 5.8 percent of their total income. Nevertheless 66 percent got remittances, which constituted 33 percent of the total income. In Niger's river lift irrigation schemes with 0.25-hectare plots, Abernethy and Sally (1999) found irrigated farming on these is just one of the several livelihood activities farmers pursue, including rain-fed farming, animal husbandry, fishing, trading, and government jobs. A household survey in Saga irrigation scheme in Niger reported that barely 25 percent of net household income depended on irrigated farming (Abernethy et al. 2000:8). In a study of smallholder irrigation in Zimbabwe, Manzungu et al. (1999:31) noted: "A variety of livelihood strategies based partly on irrigated farming, partly on dry land cultivation, migrant labor, gardening and sub-leasing of plots has emerged."

This has many implications. First, plot-holders are often more interested in keeping their plots as insurance rather than working them to their full productivity potential. According to Crosby (2000), a South African observer, "Their plots are some sort of security although few are interested in active farming … there is danger of losing their holdings if they do not use them." Second, there are stringent limits on the amount of investment of time, effort

and resources a typical smallholder irrigator might be willing and able to make on activities associated with the irrigated plot if it involves sacrificing other livelihood options. Third, the large number of members, even on a small scheme, would greatly increase the invisible "transaction costs" of collective self-management—such as of fee collection, responding to complaints, delivering water to each user, extracting consensus on key decisions, of checking "wanton irrigator misbehavior of blocking canals, cutting off embankments, illegal lifting of water by pumps or siphons and breakage of control structures" (Ogunwale, Maurya and Owonubi 1994:11)—all invisible costs that vary directly with the number of irrigators served by the scheme and inversely with the average landholding.

## *High Cost of Pump Schemes*

African smallholders seem to have got more than their fair share of pump irrigation schemes, which are more costly and difficult to operate and maintain than gravity schemes. As outlined earlier, an aspect of successful IMT experience worldwide is that operation and maintenance costs are an insignificant proportion of total income—typically less than 5 percent of the gross income from farming. In many African pump irrigation schemes, this proportion is far higher. If the Arabie-Olifants scheme were to be turned over to farmers in today's conditions, running it would cost 20–25 percent of the total value of irrigated output the scheme produces (Shah and van Koppen 1999).

In the Nyanyadzi scheme in Zimbabwe, maintenance fees introduced in 1984 were a whopping Z$145 per hectare, way above the highest we hear about in Asia, and yet covered less than one quarter of the operation and maintenance costs (Manzungu et al. 1999:16). In Nigeria, where farmers paid 100 Naira per hectare (US$52) towards the irrigation fee, Ogunwale et al. (1994:11) found "frequent breakdown of pumps and sprinkler lines and poor availability of spare parts" to be one of the key reasons for the decline of smallholder schemes after government withdrawal. In Senegal Valley's small-scale pump schemes studied by Wester et al. (1995:8), the only pump mechanic left, after the parastatal SAED fired its team, established a pump repair and maintenance monopoly on which 55 pump schemes became dependent. Farmers had to go 350 km to
Saint-Louis or 650 km to Dakar to obtain spare parts. Farmers did form some kind of "maintenance associations" but "increased need for cash led to organizational problems within farmer groups and long delays in getting the pump engine repaired" (ibid, p. 8). Wester et al. (1995) noted: "All farmer groups interviewed stated that their engines are breaking down more often. None of them is actually saving money to buy a new pump engine."

In a recent analysis of smallholder schemes in Burkina Faso and Niger, Abernethy and Sally (1999) estimated that in the five Burkinabe schemes, all of them gravity, the water fee ranged from 4.6 to 18.6 percent of the gross value of product (with a mode of around 5.5 percent) but in four schemes in Niger, all pump-based, the ratio ranged from 12 to 22 percent with a modal value of around 18 percent (ibid, p. 220). And even after paying such high fees, Abernethy and Sally (1999) concluded that "none of the nine organizations which have been studied in the two countries seem to be sustainable in the long run, because none can undertake necessary major maintenance and renewals of equipment or facilities" (ibid, p. 216). If net income is 20–25 percent of the gross income and if irrigation fees under self-management are as high as 15–20 percent of gross income, the implications are that most turned-over pump

schemes would leave the farmer in the red, unless gross income increased substantially before the turnover.

Despite this, pump schemes offer a window of opportunity for farmer management because, if maintained well, they offer better quality irrigation and also, by their design, they help impose a certain financial discipline. Gravity systems generally cost more to build but less to run than pump schemes. However, many invisible transaction costs involved in farmer management of gravity systems probably tilt the balance in the other direction. As Abernethy and Sally (1999) record, as fuel costs are recurring and have to be paid fast, the Niger pump schemes have evolved more formal accounting and book keeping systems, but the Burkinabe gravity systems are quite primitive in their financial management and, therefore, have serious sustainability problems. Every time flooding occurs, the irrigators turn to government for doles and are unable to internally generate the resources needed. In general, with a favorable economic environment and high land and water productivity, pump schemes, though costlier to run, may well be more amenable to farmer management than gravity schemes because the transaction costs of the latter are high (ibid, p.210). The problem in African smallholder pump schemes is that they cannot use the unique managerial advantages offered by pump schemes because of low farm productivity and income.

## *Downward Ratchets*

Crosby, Charles (2000) reviewing the prospects of smallholder irrigation in the Northern Province, South Africa, writes: "It is unbelievable that with the exception of sugar projects there are virtually no schemes that have been successful ... (and) the pattern of failure is so similar that it is not really necessary to undertake a needs analysis for individual projects" (ibid, chap. 9). This similar pattern of failure is what we refer to as "downward ratchets."[8] The overall microeconomic dynamic is such that piecemeal interventions with marginal benefits will, most likely, fail to relaunch the smallholder schemes into a significantly higher trajectory of productivity and farm incomes from where the irrigation community can take the additional costs and effort of self-management in their stride. In Crosby's (2000) analysis, the downward ratchets are evident in the "common aspects (which) are: total dependence water→supply infrastructure dilapidated →ineffective water management →low production levels→little knowledge of crop production or Irrigation→ ineffective extension→lack of markets and credit→difficulty in sourcing inputs→expensive and ineffective mechanization services→ unrepaired fencing→damaged soils." (ibid, p. 3).

Other observers have concluded similarly on conditions elsewhere in South Africa and Africa as a whole[9] and found that farmers in smallholder schemes need and want support

[8]After "ratchet effects" used by Robert Chambers to describe how the operation of multiple constraints disable poor people "like movements down past a cog which are difficult or impossible to reverse, making poor people permanently poorer." (Chambers 1983: 115).

[9]For example, writing about the state of Nigerian smallholder systems, Oguwale et al. (1994) note: "The government (did) not only operate and maintain these schemes but provid (ed) the agro-support services such as land preparation, seeds, fertilizers and chemicals to farmers. Farmers virtually (had) no role to play except to divert water from channels and operate their respective farms … The interaction between farmers and government could be classified as a benevolent patron-client relationship. The governments have particularly withdrawn from providing funds and services since 1988, and the managing agencies are expected to be self-sufficient and self-sustaining. The dwindling operating funds and the government's abrupt withdrawal have contributed to serious deterioration of most systems' structures."

systems that go far beyond just irrigation, if they are to significantly improve their livelihoods. In their interaction with Nigerian smallholders, Ogunwale et al. (1994) found that "farmers viewed the availability of other agricultural inputs and services (especially fertilizers, tractors and harvesters) as more important to them than irrigation water or irrigation systems' effectiveness." Based on focus-group discussions with nine groups of small-scale irrigation farmers in Free State, Mukhala and Groeneweld (Mukhura and Mamabolo 2000) concluded: "Although they are highly motivated to become prosperous farmers, they need considerable land, funding, extension marketing and credit services." A study of 66 households from Sepitsi and Veeplaats farms of the Arabie-Olifants smallholder irrigation scheme by Maluleke (Mukhura and Mamabolo 2000) found that "farmers with access to credit (2.5 ha and 5 ha farmers) produced and sold more than the food plot farmers who did not receive credit;" and that "lack of extension, poor infrastructure and institutional support for input supply and marketing, expensive equipment services, lack of entrepreneurial skills, lack of credit and poor irrigation services were major constraints to smallholder development."

Many observers focus on the high productivity of tiny holdings and this is supported by a good deal of empirical evidence. A case study of the Rural Women's Association in Northern Province, South Africa, shows the value of the productivity per hectare to be remarkable for manually irrigated vegetable crops on 100 square meter plots (IWMI 2000). Similarly, Mpahlele et al. (1999) estimate the gross margin per hectare of vegetable crops to be R 8,800–20,500/ha for tiny food plot owners but less than R 600/ha for wheat and R 1,500 for maize for 2.5 ha and 5 ha farmers (US$1=R 7). Rukuni (1997) also lays a great deal of emphasis on high productivity of intensively worked smallholdings. Nobody can gainsay this internationally supported negative relationship between farm size and productivity. The point is that smallholder irrigated farming income *per* household for food plot owners as well as so called small-scale commercial farmers remains too low for them to meet all their subsistence requirements and generate the surplus needed for development. As a result, food plot farmers who achieve high productivity as well as 2.5-hectare plot-owners who do not "could be classified as poor or vulnerable to poverty" with their average household income hovering around R 740 (US$106) per month, the South African poverty line (Mpahlele et al. 1999: 23). The issue in making a success of IMT in African smallholder irrigation thus is not getting the "process right" or getting laws and rights right but, in addition, of devising a "lift strategy" to replace the downward ratchets by upward ones.

Consider the Sudanese experience that IWMI has studied in some detail (see, for example, Narayanamurthy et al. 1997). Like the Northern Province of South Africa, Sudan too has over 250 smallholder irrigation schemes along the White Nile and Blue Nile serving some 200,000 tenant farmers. Since 1982, farming in these schemes has been managed as a three-way partnership with the state providing land and water, the White Nile Agricultural Services Administration (WNASA), a parastatal, providing inputs and services, and tenant-farmers providing labor and being the "residual claimants." [10] In response to a declining economy, in 1991, 70 percent of the staff of the White Nile Agricultural Services Administration (WNASA) was retrenched. The

[10]This arrangement has perpetuated and reinforced the "downward ratchets" not only in smallholder schemes but even in the much-admired Gezira scheme where farmers accumulated a debt of over US$1 million to the Gezira Board (Narayanamurthy et al. 1997:14).

management of 38 schemes was retained with the restructured and downsized WNASA. Around 50 schemes were given over to the private sector. In one province, a few schemes were brought under a farmer-management organization that was formed hastily by the local political authority. However, in the majority of the schemes, farmers took up limited rain-fed cultivation or abandoned cultivation altogether.

The smallholder schemes in the former homelands of South Africa have a lot in common with those on the White Nile in Sudan. Both have: long histories of dependency on parastatals; extremely high level of mechanization of smallholder cultivation; poor infrastructure and institutional arrangements for input supply and output marketing for smallholder farmers; comparable conditions with respect to land-tenure insecurity and ambiguity about land rights. In some ways, the Sudanese smallholders were better off than farmers in South Africa's former homelands in that they had access to institutional credit—albeit very expensive—under the so called *salam* (repayment-in-kind at a predetermined value) contract. Moreover, in many Sudanese schemes, smallholders had 5–15 hectares each, which is uncommon in South African schemes. But, then, all White Nile schemes were pump schemes that doled out very costly irrigation. Naranayamurthy et al. (1997) explored the prospects of viable management of these schemes by WUAs, and concluded that at current levels of productivity, irrigation fees account for 20–22 percent of gross income and total cash-costs of farming range from 65–90 percent of gross income. As a result, net returns from wheat, the main irrigated crop, range from barely US$7/ha to US$42/ha, excluding taxes and the subsidies hidden in current water charges. Further, their calculations showed that "even if wheat yields double, the cash surplus will barely suffice to pay for the fuel to operate the pump." Their conclusion: "Merely changing the mode of management does not necessarily result in improved performance (and) ... withdrawal of state management before the necessary support services are in place and available can be counterproductive"(ibid, p. 22).

Similar experience is recorded in Zimbabwe. Assessing the economic viability of six smallholder irrigation schemes, Shumba and Maposa (Makhura and Mamabolo 2000) found that "only one out of the six schemes realized a profit margin of more than Z$223/month/plot-holder (which is the minimum wage rate for agriculture workers) after O&M costs (currently met by the government) were deducted." Constraints on improved viability included working capital scarcity, unreliable water supplies, difficulty in accessing inputs, and limited market outlets and poor roads.

Manzungu et al. (1999) chart the interesting story of farmer-managed smallholder irrigation in the Musengezi scheme, which was established in 1989 by the government of Zimbabwe with government and Danish International Development Agency (DANIDA) funding. The scheme used electric pumps and sprinklers, and was designed in such a way that all sprinklers had to be operated simultaneously when the pump was switched on. One hundred and eight farmers were settled on 127 hectares with land sizes ranging from 0.5 to 2 hectares of irrigated plots and 5 hectares of rain-fed plots. The scheme idled for the first 4 years due to the lack of rain, and had to be rehabilitated with additional external funding. A federal organization was created with democratically elected members, but it was not legally registered. The story of Musengezi scheme is illustrative of the operation of the "downward ratchets" in many African smallholder irrigation schemes. During a decade of operation, there was not even a single year when the farmers

were able to achieve viability and meet, besides the costs of inputs, the costs of operating the scheme, which included electricity bills, maintenance and repair of pumps and sprinklers. They found new sources of borrowed funds every year and regularly defaulted. The propensity to default was attributed partly to acts of God and partly to their own omissions and commissions. The original idea was that farmers would repay the capital costs in installments and routinely service their O&M obligation. As it turned out, the installments had to be paid off by DANIDA. Crop loans provided by the parastatal remained unpaid. As guarantor for the farmers, the local member of parliament had to pay the electricity bills. During 1995–1999, farmers entered into contract farming agreements with five different companies. None of them worked with companies swindling the farmers some of the time and farmers cheating the companies rest of the time. In the meanwhile, for the lack of maintenance, the pumps and the sprinklers began breaking down in 1998. And, as a result of not settling the bills, the power supply was cut off. With a track record of unpaid debts and unkept contracts, no bank or company was willing to do business with the farmers of Musengezi. Manzungu et al. (1999) concluded: "The schemes with their heavy reliance on pumps were doomed to be financially unviable, and thus unsuitable for an experiment in turnover." This is the pathology of decline in all attempts for farmer management in the context of low-level equilibrium and operation of downward ratchets.

Wester et al. (1995) offer an interesting comparative analysis of state "disengagement" from smallholder pump irrigation schemes in two areas of the Senegal Valley. In the Douè Region, the abrupt withdrawal of SAED's comprehensive and subsidized support system led to the decline of the schemes. But in Ile à Morphil, a donor-supported project attempted to cushion the effect of abrupt disengagement and create farmer organizations to provide the institutional support. Wester et al. (1995) conclude that, "thanks to the project intervention, the negative impact of 'disengagement' was less serious in Ile à Morphil than in the Douè region." However, they also found that the "project faced great difficulties in organizing farmers to take up activities formerly performed by the state." One reading of their evidence is that it is particularly more difficult to organize small farmers in separate bodies, i.e., one to provide credit, another to supply inputs, and yet another to maintain pumps, and make each of these viable and sustainable. It seems important to devise new, more farmer-centered institutional models to operate the "estate-mode of farming" more efficiently and to the advantage of the farmers.

In our analysis, then, the only way farmer management of African smallholder irrigation can be sustainable is for management transfer to be part of a larger "lift strategy" that can dramatically enhance economic returns to smallholder farming. But, such a lift strategy will have to include much more than just irrigation management transfer. It will need to effectively deal with the whole host of constraints that African smallholder schemes are facing. As Crosby (2000) has asserted: "Sustainable irrigation farming is only possible if the production levels attained make it affordable. This implies favorable natural resources, knowledge, motivation, management and the essential independent support services."

## *Institutional Support Systems for Sustainable Farmer-Management*

Throughout Africa, there are hardly any cases of successful and sustainable farmer-management in smallholder irrigation schemes; and there are hardly any cases of *institutional failures* in farmer management of irrigation schemes by Irrigation Boards involving large, commercial farmers. Putting in bold relief the importance of upward and downward ratchets in shaping successful turn over, table 1, based on Tren and Schurr (2000) summarizes the results of two Irrigation Boards (Loskop and Hereford) and two smallholder schemes (Hindostan and Coetzeesdraai in Arabie-Olifants Scheme) in South Africa's Northern Province. In the smallholder schemes, farmers pay little or nothing for irrigation, whereas the Irrigation Board farmers pay for irrigation on a full cost of O&M basis and they will pay much more for water itself once the RSA government's new full-cost water pricing policy comes into force. Yet, farmer management in smallholder schemes is deemed to be a failure, whereas Irrigation Boards are highly successful.

The most important distinguishing factor is the *stake*s of farmers in their farming and in the irrigation system: farmers in the Irrigation Boards have reasonably large farms, access to capital to invest in commercial crops, and average farm incomes in the range of R 1–2.5 million. Farming is the only or the primary source of livelihood and income for these farmers and in their case, the double-coincidence of need and capacity is well established. A well-functioning irrigation system is central to their livelihood (need). They have the resources, significant interests as well as the management skills (capacity) for trouble-free and sustainable management of large systems. Smallholder groups have neither; their present tiny farms give them little net income (some suggest it is negative if full value of family labor is costed), and they do not have the resources and management capacity to operate their schemes viably. A Policy Proposal prepared by a group of RSA's most experienced scholars appropriately asserts that: "Irrigation farming can be very remunerative provided the following are present: high quality management, markets and infrastructure, and sufficient equity capital"(Backeberg et al. 1996: vii). Africa's smallholder irrigation farmers have none of these; and without these, IMT can easily become a "millstone around the neck."

Fortified by strong upward ratchets, Irrigation Boards of South Africa are able to take many an adversity in their stride. For instance, the Central Steelpoort Irrigation Board is confronted with nitrate contamination of groundwater and water shortages in the silted up Steelpoort River, but the irrigation system stays reasonably well-run, offering a relatively trouble-free service to its members. Similarly, Watervals Irrigation Board is faced with problems of leaking canals and water shortages, but the irrigation system performs pretty much to its design potential. In contrast, the operation of downward ratchets in smallholder systems is at the heart of their dependency on public systems. Recent field research by a group of researchers at the Agricultural Research Council-Institute of Agricultural Engineering at Pretoria (Stimie et al. 2000) in the Steelpoort River basin puts into bold relief how inability to commit small expenditures on repair and maintenance by small farmers in the former Lebowa territory rendered many irrigation and drinking water supply systems defunct. Nigeria's smallholder schemes began facing as far back as 1988 the "withdrawal symptoms" that South African smallholder systems have just begun to face.

It is evident that farmer management of smallholder irrigation schemes can become viable and sustainable, but only as an element in a broader "lift" strategy that attacks at once an entire complex of constraints (including

TABLE 1.
Features of four Irrigation Organizations in the Northern Province, South Africa.

| Scheme characteristics | Loskop | Hereford | Hindostan | Coetzeesdraai |
|---|---|---|---|---|
| No. of members | 626 | 42 | 45 | 126 |
| Design command (ha) | 16,110 | 3,426 | 56 | 158 |
| Actual command area (ha) | 33,000 | 3,426 | 56 | 158 |
| Average farm size (ha) | 35 | 81.5 | 1.25 | 1.25 |
| Range of farm sizes (ha) | 30–40 | 5–900 | 1.25 | 1.25 |
| Water right($m^3$/ha) | 7,700 | 7,700 | | |
| Nature of the irrigation system | Gravity flow; individual sluices | Gravity flow; individual storage tanks | Pump lift | Pump lift |
| Main crops | Wheat: 25%<br>Citrus and Grapes: 24%<br>Cotton and Tobacco: 36%<br>Vegetables: 15% | | Winter Wheat,Maize | |
| Water application technology | Flood/furrow irrigation? | Drip, sprinkler, center pivot from 85 storage dams | Overhead irrigation sprays | Overhead irrigation sprays |
| Range of farm sizes (ha) | 30–40 | 5–900 | 1.25 | 1.25 |
| Present water fee (R/ha) | 24.30 | 150 | 0 | 0 |
| Estimated full cost of irrigation (R/ha) | 539 | 308 | 600 | 600 |
| Wheat yield mt/ha (net margin, R/ha) | 5.5 (2,045) | 5.5 (2,045) | 2.5 (14.4) | 1.5 (-1,035) |
| Maize yield mt/ha (net margin, R/ha) | 8 (2,276) | 8 (2,276) | 8(3,846) | 6 (2,021) |
| Tobacco yield mt/ha (net margin, R/ha) | 2.2 (4,800) | 2.2 (4,800) | Nil | Nil |
| Citrus yield mt/ha (net margin, R/ha) | 45 (54,000) | 45 (54,000) | Nil | Nil |
| Estimated net farm income (R) / farm/ year | 1.1 M | 2.8 M | 2,000[a] | 1,100[a] |
| Other income/ farm household | Nil | Nil | 6,600[b] | 6,600[b] |
| Irrigation Cost / farmer without subsidy (R/ha) | 18,865 | 25,102 (0.9%) | 600 | 600 |
| Full cost water fee as % of Gross income/farmer | <1% | <1% | >12% | >16% |
| Full cost water fee as % of (Gross income- cash input costs) | 1.5% | 1% | >30% | >35% |

[a] These figures of net margin contain the family labor wage component; so the actual margin is smaller than this.
[b] State Pension.
*Source*: Tren and Schurr 2000.
*Note:* R = South African Rand

capital scarcity, low enterprise and risk-taking capacity, shortage of machines, and poor market-linkages). From the data available it is clear that when farmer organizations are designed to work on this broad array of constraints rather than just manage the irrigation system, smallholder schemes in Africa, although lacking in experience, tend to survive.

The irrigation fee at Saga, the pump irrigation scheme in Niger that Abernethy et al. (2000) studied, worked out to a whopping US$425/ha when converted at PPP rate[11]

[11]Purchasing Power Parity exchange rate.

(compared with Niger's per capita income of US$750 at PPP rate) and exceeded 20 percent of the gross value of output. Nevertheless the scheme survived because irrigated farming, despite high irrigation fees, is a profitable proposition. The net revenue derived per person, per day of family labor in irrigated farming is 2.19 times the market wage rate (Abernethy et al. 2000:20). Another reason is that the organizations that manage the schemes are integrated rice-producing cooperatives, that provide farmers inputs on credit as well as market their outputs. In effect, then, irrigation charges also absorb some of the overheads of other services provided, which makes the smallholder irrigated farming enterprise viable as a whole. Similarly, in the much talked about Mwea scheme in Kenya with 60,000 people subsisting on a command area of 6,000 hectares, a major revival of the stagnating scheme is being spearheaded not by an IMT initiative but by an agribusiness intervention by Mwea Rice Growers Multipurpose Cooperative (MRGM). The MRGM has taken over the management of the irrigation scheme from the National Irrigation Board, the parastatal that has been managing irrigation schemes, besides running a rice production monopoly (Muerto and Kabutha nd).

If the Burkinabe and Nigerian smallholder irrigation systems are still able to survive after turnover, it is because they collect US$50–270 per hectare season toward irrigation, a level of water fee unheard of in smallholder irrigation outside Africa. And if farmers still participate in irrigated farming, it is because the Water Users Associations provide a range of nonirrigation services to members, such as supply of fertilizers and seed, especially in remote locations where farmers do not have access to markets. "Some associations also have equipment for hire to members, some organize common rice nurseries, some perform land preparation for members' land, and some organize marketing and purchase crops from their members for transport and sale. Associations generate income not only from water fees but also from fines, profit on input sales, hiring of equipment and marketing of rice" (Abernethy and Sally 1999: 212).

In South Africa, there are sugar projects where smallholders enjoying access to a broad-based credit, input supply and market access, have been able to take in their stride the hassle and costs of farmer-managed irrigation. In a rare such case, Pike (Makhura and Mamabolo 2000) has analyzed how the Small Grower Development Trust, a bottom-up farmer organization, has evolved a unique clutch of financial, training and other support services, which lie at the heart of the success of some 42,000 smallholder sugarcane growers in Natal/Kwazulu and KaNgwane regions. And, for the purposes of this analysis, it matters little that these sugar projects are selling sugar at twice the world price. These exceptions prove the rule that even small-scale, resource-poor farmers will manage their irrigation schemes provided these offer the promise of viability and livelihood improvement. Straightforward IMT clearly does not offer this promise for the simple reason that most of the schemes would not have been built—at least, not built the way they were, if their planners/designers had originally planned them for management by the smallholders.

In sum, then, plain IMT—with all the accent on "process," capacity building, getting the right socio-technical conditions in place, and so on—is by itself unlikely to work in the context of African smallholder schemes. Successful IMT will have to be accompanied by a quantum jump in smallholder productivity and incomes; and unless communities feel confident about managing these schemes viably, they will be reluctant to accept IMT. In South Africa, for example, the government of the Northern Province has selected 11 schemes for IMT on a

pilot basis. The most promising among these are Dingleydale and New Forest schemes where the cost of rehabilitation is estimated at R 3,000/ha compared to net income per hectare of R 13,000. Being gravity schemes, farmers should be confident and happy to take over their management. But according to Merle and Oudot (nd) who interviewed farmers in the schemes about the prospects of management transfer, "Farmers feel distraught, facing the removal of every kind of support (tractor, inputs supply, marketing etc.)... (and) progressive removal of all the rules on the scheme: rules concerning land, water, cattle and people." Northern Province Department of Agriculture, Land and Environment (NPDALE) estimates that the income per hectare in these schemes can increase to over R 28,000 with sufficient water and to R 63,000 if commercial production levels are achieved. There seems little doubt that smallholders making R 63,000/ha from irrigated farming will be far keener to manage and finance their irrigation schemes that sustain household incomes of this level. But approaching anywhere near this potential will require much more than smooth transfer of these irrigation schemes to farmers. It entails removing a host of other constraints.

## *The Way Forward*

Under intense budgetary pressure to curtail expenditures on O&M, many African countries have taken recourse to plain abandonment of smallholder schemes, which have gradually collapsed. In South Africa, the latest to initiate state withdrawal, this implies virtually writing off, as sunk costs, over R 2 billion of past investments of public funds in the smallholder irrigation sector. Instead of abandonment, however, South Africa has chosen a more positive and proactive stance towards the management of state withdrawal from smallholder irrigation schemes. According to NPDALE (1999), the macropolicy of the Northern Province Department of Agriculture, Land and Environment is "to create an enabling environment through which beneficiaries can, by means of a systematic take-over program, assume full responsibility and control of these schemes in a sustainable manner." We found the turnover program being piloted on a first group of 11 of the 171 schemes in the Northern Province extremely process-savy. Hardly any of the process-related conditions for success that have been identified by researchers studying IMT worldwide has been overlooked, if the analysis by Lexton, Venn and Associates (2000: pp. 2–5) is any guide.

However, in our assessment, besides getting the process right, South Africa—and the rest of Africa—also need to focus on evolving the right IMT strategy that addresses the entire complex of constraints that smallholder irrigation schemes are facing, replacing the so-called downward ratchets by strong upward ones. In order to do this the tenor of discourse in the whole of African smallholder irrigation context needs to shift from institutional reform of smallholder irrigation management to institutional intervention designed to significantly enhance smallholder productivity and incomes. Institutions appropriate for this are probably not pure Water Users Associations (for example, the Irrigation Boards), but either farmer-controlled organizations with a much bigger mandate and capacity, or strong institutional linkages with agribusinesses to play a central role in executing a lift strategy.

Regrettably, there are not many examples of such broad-based smallholder support systems

that have succeeded and proved sustainable, especially in Africa. But we can suggest that central to an effective lift strategy for African smallholder communities is to help them find stable, reliable markets for value-added products; once this is ensured, much else follows. The sugar projects funded by the Department of Agriculture in Kwa-Zulu-Natal have been far more successful than smallholder irrigation schemes elsewhere "largely due to better support services and a readily available market" (Bembridge 1999:6). There are also scattered emerging examples of smallholder irrigation communities that have successfully created their own new upward ratchets. One such community is a group of smallholders at the Hereford farm in the Arabi-Olifants, Northern Province in South Africa. With timely and intelligent support from Africare, a nongovernmental organization, some of these farmers were able to develop a contract-farming arrangement for vegetables for a wholesaler that exports to Hong Kong and France as well as supplying South Africa's national market. The Hereford smallholders rapidly learnt to grow quality vegetables following a strict planting program provided by the company, and to their delight, found their farm incomes soaring. This year, when we visited them, we found that the company has offered to include more of the Hereford smallholders in the contract. Particularly in South Africa, with a dynamic agribusiness sector, opportunities for such collaboration between agribusiness and smallholder irrigators may offer a big window of opportunity for enabling the latter to grow and take over the management of irrigation. Many such agribusiness firms have a special commitment to support smallholders. One such firm, Capstan Group, identified 27 smallholder projects from which they hoped to export 700,000 cartons of citrus produced by smallholders in 2000 (Nufarmer and African Entrepreneur: 2000:20).

Africa is replete with many examples of contract farming that have failed, but it is not clear if the potential offered by this institutional alternative has been explored fully, especially in the context of smallholder irrigation schemes. Doing this is important because in the African smallholder irrigation context, agribusiness companies have operated farmer support systems akin to what the erstwhile parastatals were originally to offer. In a recent article, Coulter et al. (1999) have explored "contract default," both by the company as well as the farmers, as the major impediment to developing the agribusiness path to smallholder farming. They have suggested that one reason why farmers as well as companies default on their commitments is that the farmers are not organized. According to them, when Companies make input supply, credit and marketing commitments to a self-help group or a cooperative of small farmers, peer-pressure can be made to work to check individual default. Equally, organized groups of small farmers with their superior bargaining power can extract more favorable terms for contract farming and guard against company defaults. With organized small farmer groups, there is also room to design and introduce self-enforcing incentives and penalties with respect to honoring of the contract, thereby reducing drastically the monitoring and contract enforcement costs that scares agribusiness companies away from smallholders.[12]

In conclusion, our review of global and African experience suggests that nowhere in

[12]Our brief experience of exploring cotton farming in Arabie-Olifants Scheme under contract with LONRHO suggested an important opportunity wasted. Veeplaats farmers we met did not have a clearly formed assessment since it was their first year with LONRHO. Naturally, in all contract farming, productive, inventive and disciplined farmers gain much more than lazy, sloppy and the risk-averse. Accordingly, we did find that some of the Veeplaats farmers would do very well with this contract and that over time, if the average performance could be improved, such a contract might be the "win-win" arrangement that could work best. Unfortunately, we understand, most farmers defaulted on their repayment obligations and LONHRO has withdrawn from credit and input supply facilty although it is still willing to buy their produce (Shah and van Koppen 1999).

Africa is there a significant body of positive experience to suggest that straightforward IMT will work in smallholder irrigation as it has with large, commercial farmers of USA, Mexico, Turkey, New Zealand and Columbia. Indeed, it would be surprising if IMT, with its stress on "process" and capacity building, will meet even the moderated expectation of IMT success, that it "saves the government money, improves cost-effectiveness of operation and maintenance while improving, or at least not weakening, the productivity of irrigated agriculture." (Vermillion 1996:153). This is because of the entire complex of institutional constraints that raises important questions about the viability of most smallholder farming itself, leave alone irrigation systems. Institutional alternatives that have the greatest chance to work in this situation are those that help smallholders move to a substantially higher trajectory of productivity and income from where they can take in their stride the additional cost and responsibility of managing their irrigation system. And the best place to start seems to be markets; bring smallholder communities in contact with stable, reliable markets for value-added products. This will help install upward ratchets and once their irrigated holdings help them make decent livelihoods, African smallholders will be ready and eager for IMT.

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