

Preliminary Evaluation of Irrigation Development in Kenya

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Summary

Sustainable agricultural development, especially in the water-scarce arid and semiarid areas of Kenya, may not be achieved without due consideration to the management of irrigation and agricultural water resources. Past irrigation interventions in Kenya have had mixed results. Hence the need to critically review and evaluate the performance and trend in irrigation development. Such an evaluation is necessary to guide future development or rehabilitation of irrigation projects.

The preliminary evaluation, based on three workshops held with irrigation officials between November 1999 and February 2000, aimed at identifying issues that required in-depth investigation to analyze factors affecting smallholder irrigation development in Kenya. The evaluation examined such diverse factors as the adoption of precision irrigation technologies, horticultural production and marketing, gender aspects, donor aid and recent trends in irrigation development.

In this paper, the current trends in irrigation development over the last decade are presented for each province. In addition, issues that emerged from the three workshops pertaining to irrigation development are discussed, focusing on problems, current status and recommended courses of action. The broad issues highlighted include project development and implementation, water resources management, marketing systems and infrastructure, advancement of irrigation technologies, socioeconomics, capacity building, and policy, legal and institutional aspects. The conclusions and recommendations provide a way forward to address constraints to irrigation and drainage development in Kenya.

Introduction

The previous update on irrigation development in Kenya, done between 1992 and 1994, resulted in the development of district irrigation profiles. A critical review of these profiles revealed the following:

- Some schemes that were working in the past are no longer operational.
- Information given in a number of districts was contradictory and inaccurate.
- The rate of irrigation development, in general, has been declining. However, some areas of the country are showing positive trends in terms of rates of irrigation expansion.

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- There has been a shift in government policy geared towards cost-sharing and cost recovery.

Therefore, for any meaningful future intervention aimed at improving irrigation development in Kenya, it is a prerequisite to address the issues and reasons for inconsistent development. In view of the existing information deficiency on the current status of irrigation development in Kenya, a preliminary evaluation was carried out.

It is for this reason that IWMI in conjunction with the University of Nairobi and the Irrigation and Drainage Branch (IDB) of the Ministry of Agriculture and Rural Development (MoA&RD) undertook a preliminary evaluation of irrigation development in Kenya. This was accomplished through a series of three regional workshops, whose outcome forms the basis of this paper. The regional workshops were held between November 1999 and February 2000. The participants of the three evaluation workshops were drawn from the IDB, the universities, IWMI, Kenya Agricultural Research Institute (KARI), Ministry of Environment and Natural Resources (Department of Water Development [DWD]) and regional authorities, among other stakeholders. The objectives of the workshops were to:

- update the district irrigation and drainage profiles
- establish the geographical positions of the irrigation and drainage schemes
- identify districts where further and in-depth evaluation would be conducted
- identify further areas of collaboration among IWMI, IDB and the national universities

Current Status of Irrigation Development

Coast Province

There is a general decline in irrigation development in the Coast province, which can be attributed to various reasons such as insecurity, salinity and sodicity problems, water scarcity and destruction of irrigation structures by El Niño floods. Further, there has been diminishing financial support, inadequate marketing and infrastructure, inadequate technical know-how and lack of both credit facilities and exposure of farmers to new irrigation technologies. The trend has also shown a shift from group-based to individual farmers and also a shift in irrigation technology from gravity to motorized pumps. The rate of irrigation development in the last decade in some districts is as follows: Kwale -40 percent, Kilifi 1933 percent and Malindi -69 percent (see appendix 1).

Eastern Province

There is a slight increase in the area under irrigation in the Ukambani districts, which could be attributed to external support and growing of high-value crops. IFAD and ADB are assisting with rehabilitation and development of irrigation projects. There is an increased demand for high-valued horticultural produce, mainly grown under irrigation, leading to a consequent

increase in incomes. This has led to increased interest in irrigation, especially individual micro-irrigation enterprises—water-saving irrigation technologies—being promoted and supported by NGOs and church organizations. The rate of irrigation development in the last decade in some districts is as follows: Machakos 6 percent, Mwingi 0 percent and Kitui 25 percent (see appendix 1).

The trend in irrigation development is expected to rise judging by the number of water resources development projects being implemented and renewed interest in irrigation, mainly for horticultural produce. However, it is evident that the number of donor-funded projects has gone down and there has been a rise in the number of independent individual smallholders. There is also a shift from group-based schemes to individual irrigators, which could be attributed to the promotion of new irrigation technologies such as the ApproTec MoneyMaker pump, and low-head drip systems, which have had a great impact, especially at household level.

Some districts within the Mt. Kenya region have recorded a significant increase in the area under irrigation, which can be attributed to financial support especially from IFAD, ADB and Plan International. There is a general increase in the number of individual smallholder irrigators. The increase in irrigation activities can also be due to well-established marketing outlets, especially for horticultural produce. Precision-irrigation technologies—low-head drip kits and treadle pumps—are being adopted in this region. Water availability and high returns from horticultural produce have contributed enormously to increased irrigation. However, environmental degradation has continued to impact negatively on the water resources and hence there is a need to promote soil and water conservation measures in the water catchment areas. The rate of irrigation development in the last decade in some districts is as follows: Mbeere 29 percent, Embu 211 percent, Meru south 200 percent, Tharaka 0 percent, and Meru north 502 percent (see appendix 1).

Isiolo district to the north of Mt. Kenya has recorded an irrigation growth of 117 percent over the last 5 years. This could be attributed to a shift in food-security strategies—adopting of irrigation by traditionally pastoral communities.

Northeastern Province

Irrigation in the province is limited to the Garissa district, in particular along the Tana river. Irrigation development in the Garissa district has increased by 161 percent over the last 5 years. The trend can be attributed to training of farmers in irrigation activities and funding for rehabilitation and development by various agencies and NGOs. However, despite the increase in acreage, furrow irrigation still predominates.

Central Province

There is a general increase in the number of group- and individual-irrigation projects mainly due to the high demand and prices for horticultural produce and well-established marketing systems and financial support for group-based smallholder irrigation schemes. Nevertheless, there are some constraints hindering irrigation activities, which include water scarcity (overcommitted water resources), inadequate funds and the high cost of irrigation equipment. The following is the rate of smallholder irrigation acreage increase for the last 5 years: Nyeri 82 percent, Kirinyaga 182 percent, Kiambu 92 percent, Maragwa 308 percent, Murang'a 1,424 percent, Thika 43 percent and Nyandarua 180 percent (see appendix 1).

Rift Valley Province

There is a positive irrigation development trend in Laikipia, Kajiado and Turkana districts, where the area under irrigation for both group-based and individual smallholder schemes is increasing. For instance, in Kajiado, irrigation area has increased by 125 percent for group-based schemes and 12 percent for individual smallholder schemes while overall irrigation development has increased by 114 percent over the past 5 years. However, the water-saving requirement by the DWD that all water conveyance systems must be lined or piped before issuance of a water permit, is likely to hinder irrigation development by local farmers.

In Laikipia, water-saving technologies, such as water harvesting and precision irrigation, are practiced. Low-head drip systems and treadle pumps are common, which have contributed to a 10-percent increase in area under small-scale farmers (micro-irrigation). Rehabilitation as opposed to expansion is currently the main activity of irrigation development. This can be attributed to the DWD requirement that all irrigation schemes must improve the efficiency of their water conveyance. Supplemental irrigation is also common in the district.

In the Turkana district, irrigation technologies are shifting from heavily mechanized to furrow and micro-basin irrigation to facilitate O&M by farmers. Formation of WUAs to handle O&M has been emphasized. Farmers have organized themselves into cooperatives that assist in acquisition of farm inputs and marketing of produce. In Samburu, the area under irrigation has decreased by 186 percent, mainly due to siltation of the dams, inadequate management, and frequent conflicts between pastoralists and farmers.

Irrigation development in the west Pokot and the Marakwet districts is decreasing largely due to insecurity, cattle rustling, poor marketing infrastructure and the insecure communal land-tenure system. For example, in the Marakwet irrigation scheme, the area of irrigation development has decreased by 76 percent. Further, there has been no notable change in irrigation technologies. In addition, irrigation development in these districts faces many constraints including lack of funds for rehabilitation of schemes, poor infrastructure, poor marketing, lack of coordination between stakeholders and limited water resources.

Irrigation development in Trans Nzoia, Baringo, Koibatek and Keiyo districts indicates an upward trend of 11 percent, 4 percent, 36 percent and 3,600 percent, respectively (see appendix 1), especially for individual small-scale farmers. The Uasin Gishu district has also experienced an upward trend. The trend could be attributed to donor funding, training and exposure and the adoption of high-value crops. However, sustainable increases have not been realized due to limited water resources, poor marketing organization and high investment costs, weak FOs and marketing organizations, low adoption of new technologies, resistance to irrigation by pastoral communities, lack of access to land by the young generation that is willing to venture into irrigation, poor infrastructure, insecurity due to frequent cattle rustling in some areas and inadequate credit facilities.

In the Nakuru district, the area under irrigation has increased by 124 percent while drainage has tremendously reduced due to tribal clashes in the Njoro area. The area now under irrigation is 3,862 hectares whereas the irrigation potential had been estimated at 1,994 hectares. The increase in area under irrigation can be attributed to improved water management practices and the use of groundwater resources, not considered in the estimation of potential irrigable area. The increasing demand for irrigated crops has also contributed to irrigation development.

Another constraint to irrigation development in some parts of the province is the availability and quality of water, especially for groundwater, which tends to be saline. Other constraints are inadequate awareness of the importance of irrigation, lack of technical know-how on the management of irrigation water, lack of capital, poor marketing and infrastructure and lack of credit facilities. It was noted that the proximity of the Eldoret airport alone is not sufficient to induce horticultural production and irrigation development in the area. So far, it is not clear whether the airport will have any effect on irrigation development.

Nyanza Province

Irrigation development in Nyanza has been slow despite the enormous potential, and could be enhanced by addressing major constraints. Appropriate technology should be evaluated and promoted. The role of stakeholders should be well defined and coordinated to sensitize their efforts. Collaboration and networking among stakeholders should be strengthened. Suppliers of irrigation equipment and rural credit institutions should also be encouraged to open outlets in the province.

In the high rainfall districts the focus has been mainly on drainage activities. Although the potential for drainage is large, to date farmers have only carried out limited irrigation and drainage works with assistance from the District Irrigation Units (DIUs). The drainage potential has not been exploited due to inadequate technical assistance leading to over-drainage and soil degradation in some areas, land tenure (poorly drained valley bottoms are officially under the county council) and types of soils (peat and planosols). The farmers need to be trained on sustainable water management practices and the potential of irrigation and drainage to boost food production.

In the drier parts of the province, irrigation activities are limited. Farmers there need to be sensitized on the need and benefits of irrigation. The use of motorized pumps is also limited despite the great potential due to low-lying land next to the rivers, especially towards Lake Victoria. The few farmers with motorized pumps hire them out to other needy farmers at a fee. Group-based irrigation has drastically declined due to poor management and weak FOs—most of them are not operational. However, individual irrigation projects are slowly picking up. Farmers face marketing problems, crop damage by livestock and wildlife, especially by hippos along Lake Victoria. Additionally, farmers lack credit facilities, face poor transport and communication infrastructure and lack a positive attitude towards irrigation, and suffer from inadequate coordination of stakeholders, inappropriate designs and in some limited technical services.

Western Province

Like the Nyanza province, the high irrigation and drainage potential has barely been exploited and in the area under irrigation, performance is low due to weak FOs and lack of credit facilities. Western and Nyanza provinces have high potential for irrigation and drainage but, ironically, they also utilize the lowest, less than 5 percent, of the potential. There is a lot that needs to be done to change the scenario. The awareness and adoption of new technologies, such as drip kits and treadle pumps, are very low and a lot needs to be done to sensitize farmers, the majority of whom use hand-watering. Besides sensitizing the farmers to change their attitudes towards irrigation and drainage, sustainable water management is a prerequisite—combined irrigation and drainage during the dry seasons and draining during the wet seasons. Most of

the farmers grow sugarcane, which, has proved to be less economical as it takes too long to mature. Hence, there is the need to promote crop diversification to address frequent food shortages and overreliance on neighboring provinces for foodstuffs.

This potential seems to have been realized by various stakeholders if the number of active external support agencies is anything to go by. However, their impact has not been forthcoming. Hence the need to evaluate their strategies with the view of developing an integrated approach for management of water resources. While individual irrigation development seems practical and ideal, individual drainage activities are not possible because not all farmers can have adequate drainage outlets within their farms.

Gender issues have also been sited as a constraint to irrigation development in western Kenya. It was noted that men take most of the benefits when maize is grown while women benefit more from vegetable production. While women favor irrigation, especially for vegetables, men, who are the dominant decision makers, are concerned more about rain-fed maize production.

Emerging Issues

These emerging issues were derived during the three regional workshops organized by IWMI in collaboration with the Ministry of Agriculture and the University of Nairobi to evaluate smallholder irrigation development in Kenya between November 1999 and February 2000. The workshops brought together District Irrigation Engineers (DIEs) and officials among other stakeholders. The workshops preceded a preliminary review of district irrigation profiles that were developed between 1991 and 1994, which portrayed an optimistic scenario warranting further evaluation. The workshop methodology included a presentation of updates by DIEs and selected persons followed by plenary and group discussions. The plenary discussions focused on seeking clarification from presenters and comments from participants. During the plenary discussions, emerging issues were identified and analyzed. The analyzed issues were then discussed in detail during group discussions and the outcome presented during the plenary discussion. This section presents a synthesis of the issues that emerged during the workshops.

Project Development and Implementation

Financing of irrigation development. In the past, smallholder irrigation development had entirely depended on donor support. However, with diminishing donor support and economic recession, the future is gloomy unless new strategies are developed. The following are some of the questions we must find answers to before any meaningful change can be achieved:

- Are smallholder irrigation schemes donor-dependent?
- What is the role of the government?
- What needs to be done to support irrigation development?

The decentralization of irrigation development to the DIUs is probably a step in the right direction. The bottom-up approach may provide a means to integrate all stakeholders at district level. Otherwise, it is time to develop strategies that enhance sustainability of smallholder

irrigation projects. The proposed establishment of district irrigation committees seems to be a good idea in order to coordinate irrigation activities and stakeholders in the district. This will contribute to the promotion of irrigation development in the region.

Overreliance on external support and funding has proven unsustainable and hence the need to change the approach to suit the prevailing conditions. The current financing of irrigation projects is mainly on cost-sharing and cost-recovery bases. The role of various stakeholders has also been changing drastically. Unfortunately, the approach by farmers has remained almost stagnant, which has negatively affected irrigation development.

In the past, external support agencies put more emphasis on new projects while the existing ones, most of which required rehabilitation, were ignored. This contributed to the declining irrigation development and poor performance, which could have led to donor withdrawal and apathy. Most projects were mainly supported only up to the project-implementation phase, the other important aspects such as O&M, monitoring and evaluation and rehabilitation being relegated. The results have been low sustainability of donor-funded smallholder irrigation projects. The inadequate project-development approach was compounded by inadequate planning data and low capacity for O&M, and a lack of credit facilities, sense of ownership and attention to rehabilitation.

Therefore, the following needs were recommended:

- Financing of irrigation projects should include all phases of irrigation development.
- Farmers' knowledge and skills need to be enhanced.
- Farmers need to be sensitized to changing government and donor policies.
- The role of all the stakeholders need to be clearly defined.
- Farmers need to be encouraged to get credits from other sources other than bank loans.
- Any perceived cause of failure during project inception and conceptualization need to be addressed.

Farmers should also be encouraged to establish an O&M fund and be trained on the essence of project sustainability. Relevant government ministries should also undertake regular project monitoring to identify and address any eventuality in the course of project development.

Between 1990 and 1992, IFAD and ADB sponsored a study on how best farmers can be assisted. The study recommended that it was not advisable to go back to grants because history had shown that immediately the donor funding ceased, problems were experienced. It was recommended that future development should incorporate farmers' participation to promote sustainability. In the Eastern Province, for example, IFAD provided funds through cooperative banks to be disbursed to the farmers at low rates of interest. Pilot projects were also implemented to try and identify constraints and assess the effect of subsidies.

The loan scheme of the SISDO, an organization formed to counter the unwillingness of banks to fund irrigation projects, was an excellent concept but channeling the funds through cooperative banks, which provided credit at commercial rates meant doom because farmers could not afford the high rates of interest. Nevertheless, there are other rural credit facilities

that have been established, such as K-REP, for funding small projects through credit. Farmers should be encouraged to consider getting credits from them. Due to fluctuations in agricultural production, farmers should be allowed reasonable grace periods before commencing repayment of credits.

Roles of various stakeholders. Irrigation development involves various stakeholders whose roles if not well defined and coordinated could be counterproductive. Stakeholders include not only those who initiate, implement and benefit from irrigation projects, but also those who are directly or indirectly affected by such projects. Nevertheless, the most essential stakeholder is the farmer, who, if not properly integrated in project development, may not feel obliged to play his/her role effectively, thus jeopardizing the sustainability of the project.

Stakeholders should be integrated from the beginning of a project and should be involved in the formation of farmers or WUAs, addressing water use conflicts, sensitizing the farmers, funding of irrigation activities, monitoring and evaluation, providing credit facilities and marketing of produce. In the past, stakeholder coordination and collaboration have been inadequate, hindering sustainable irrigation development due to conflicts among stakeholders, water not being properly managed, weak FOs, lack of monitoring and evaluation, poorly sensitized farmers, limited funding, lack of credit facilities and poor marketing.

These limitations could be addressed through effective coordination and clear definition of the roles of stakeholders, formulation of clear irrigation policy, training on the importance of FOs, formation of WUAs, use of adequate baseline information before implementing projects, availability of accessible credit facilities, diversification of credit security, collateral formation and strengthening of marketing groups to enhance bargaining power and search for new market outlets. These call for an integrated approach in irrigation development that incorporates all the stakeholders.

Sustainability of irrigation projects. To address sustainability constraints, there is a need to adopt participatory implementation approaches, formulate a comprehensive irrigation policy, and consult, coordinate and collaborate with all stakeholders, provide affordable credit facilities, build capacity of farmers to manage irrigation projects, restrain Ministry personnel on new approaches and irrigation technologies and strengthen FOs, such as WUAs, marketing groups, etc.

The sustainability of irrigation and drainage projects has been discouraging, especially those funded through the government. This can be attributed to negative political influence, weak FOs, poor management, low priority in irrigation and drainage, nonparticipatory development approaches, negative environmental impacts, low productivity and profitability of irrigation and drainage projects, inadequate credit and financing, and unclear and inadequate enforcement of bylaws for group-based projects.

These constraints have led to collapse of projects, underutilization of resources, illegal water abstraction, little involvement of stakeholders, especially women, in the decision-making process, limited funding for irrigation and drainage projects, poor farmers being disadvantaged, credit facilities not being utilized, farmers not willing to cost-share, bylaws being misused, financial mismanagement, and poor project performance below expected levels.

To address these constraints the following should be considered; sensitize farmers to enhance participation; strengthening FOs; training of farmers on leadership and project

management; encouraging farmers to establish revolving funds; enhancing stakeholder collaboration; integration of gender sensitivity and women in decision making; enforcing the Water Act; making EIA mandatory; involving all stakeholders in the formulation of the bylaws; enhancing implementation of the bylaws; promoting crop diversification; providing market information to farmers; encouraging farmers to obtain credits; etc.

Water Resources Management

Despite the recommendation by Seckler et al. (1998) that water use by the agriculture sector must be decreased to 33 percent by the year 2025 if the water demands are to be met, the Department of Water Development (DWD) estimates that the water demand for irrigation will be 73 percent by the year 2010 (NWMP 1992). This means that a serious water crisis is looming in Kenya.

Irrigation water management. To improve irrigation water management in the context of the river basin, there is a need to address watershed degradation, and monitor data on water resources, illegal water abstraction, water conflicts among users and uses, water as both a social and an economic good, and improve water use efficiency at farm, scheme and basin level. In view of the limitations on water resources, there is a need to utilize the water available for productive purposes, promote efficient technologies such as drip and sprinkler and generally train farmers on irrigation water management. Irrigation of fodder crops alongside food crops should be promoted in the pastoral areas as is being done in the Perkerra irrigation scheme to encourage the herders to adopt irrigation.

The following are some of the recommendations for addressing water management constraints: incorporate catchment conservation in water projects, sensitize the farmers on the need for improved watershed management; improve monitoring of streamflow data; ensure water permits are issued before project implementation; enforce adherence to the water allocation in the permit; improve policing mechanisms, sensitize farmers on the value of water, strengthen WUAs to resolve conflicts over water resources and ensure equitable water distribution among various users and uses and promote water-saving technologies, such as precision irrigation.

This issue of institutional collaboration is very important because the above recommendations are beyond the mandate of the MoA&RD, in particular the IDB. Such collaboration is also hampered by administrative boundaries that, in most cases, are not in conformity with hydrological boundaries.

Water harvesting and supplemental irrigation. The SIDA-supported Regional Land Management Unit (RELMA) is promoting rainwater harvesting for supplemental irrigation in Machakos and Meru South where runoff from catchments is stored in either shallow wells or ponds. The water reservoirs are used for supplemental irrigation and the rationale is that farmers can use this water to irrigate during the intra-seasonal dry spells, which would otherwise drastically affect yields. This seems to be a promising technology especially in ASAL districts. The technology has proven worthwhile and has high potential in Kenya, especially if combined with water-saving technologies, such as the low-head drip system.

In view of the diminishing water resources, water harvesting should be integrated in irrigation development, especially for supplemental irrigation. To address persistent water-scarcity problems, especially in the ASALs, water harvesting should be integrated with irrigation technologies that are compatible, such as low-head drip (bucket) kits, which have been promoted throughout Kenya. This is being promoted in Laikipia and Baringo districts and has shown promising results.

Soil and water conservation should also be considered in order to reduce the rampant siltation of irrigation canals. This problem has contributed to the abandonment of irrigation in the Turkana district. Rehabilitation should also be given priority while addressing the causes of failure in the first place.

Marketing Systems and Infrastructure

Marketing is one of the many factors influencing irrigation development. It is a major indicator and determinant of the level of development. Projects have been known to collapse due to frustration in marketing, with farmers giving up farming due to market losses. Poor marketing, which has drastically affected irrigation development, can be addressed through infrastructural development, information availability, establishing strong market groups and production management. In most parts of the country, irrigation development has been affected by low returns, mainly related to poor marketing.

The marketing infrastructure—transport, communication and limited storage facilities—have deteriorated over the years. Inadequate marketing information (pricing, supply, dealers and outlets) has also had its toll. The exploitation of farmers by middlemen and brokers has been disappointing. These constraints are compounded by inadequate production management, which has led to flooding of markets, poor quality produce and low prices.

These constraints can be addressed by improving infrastructure, such as through farmers' self-help, road maintenance and advocacy, establishing and strengthening marketing groups and networks, such as the Fresh Produce and Export Association of Kenya (FPEAK), among others, at the farmer level. Such organizations should assist farmers with information, facilitate contract farming, training and extension services, credit facilities and quality control. The role of the government in protecting the farmers against undue exploitation should be reviewed. The HCDA and FPEAK should discipline dishonest exporters who contravene agreed contracts.

Nevertheless, the brokers or middlemen should not be seen as a problem; sometimes they are a solution, especially where farmers produce in very little quantities, which may not be economical to transport to the market. In such cases, brokers usually collect these small quantities from the farmers and pay at the farm gate. What seems to be the problem is the exploitative practice of some brokers. Some brokers make sure they sign contract agreements with many farmers to ensure that the latter have excess produce with the aim of lowering the prices due to oversupply.

There are also positive experiences, as with big companies such as Homegrown. For instance, in the Laikipia district, big companies—producers and exporters of horticultural products—have been encouraging small-scale farmers by buying their produce and marketing this produce together with theirs. They have also been providing inputs to farmers who sell their produce to them. This has addressed the nightmare of marketing small quantities of produce through middlemen and brokers.

Advancement of Irrigation Technologies

The pace of advancement of irrigation technologies has been persistently slow, despite diminishing water resources and hence the need to improve water management. This can be attributed to inadequate technological transfer and adoption, cultural persistence on growing low-value food crops and the continuing emphasis by the IDB on gravity-fed surface-irrigation systems, which are perceived as cheap to implement. Other factors include inadequate financial resources, lack of information on new technologies and lack of collaboration with the private sector and technology promoters.

To address the above constraints, there is a need for flexibility in future design and rehabilitation of existing projects to encourage precision-irrigation technologies, to link technology development to the issuance of water permits and to regularly train farmers and DIU staff—to expose to new technological development, promote crop diversity to suit improved technology and streamline the policy implementation process.

The adoption of motorized pumps, sprinklers and drip systems (low-head drip kits) can be attributed mainly to individual irrigators who are able to manage them efficiently. Water scarcity and availability of alternatives are also forcing farmers to shift to water-efficient technologies. Another important driving force is demand for high-value crops, and availability of markets, which are giving farmers quick returns to their investments. More interventions are necessary to improve the water use efficiency of group-based schemes through training, strengthening FOs, rehabilitation of schemes, introduction of new technologies and improvement of marketing infrastructure and credit facilities.

Socioeconomic Issues

The socioeconomic issues identified as affecting irrigation and drainage development include insecure land tenure, weak FOs, inadequate utilization of external financing, low production and profitability of irrigation and drainage activities, overdiversified socioeconomic activities, underdiversified agriculture, alternative sources of livelihood and inadequate gender participation in decision-making processes.

These constraints have led to inaccessibility to, and affordability of, credit facilities, poor and low level of management of group-based schemes, lack of entrepreneurship, poor repayment and/or misuse of credit, low scale of operations, inadequate marketing systems and infrastructure, lack of crop diversification, low income, limited labor for agricultural activities and lack of family consensus on credit acquisition.

To address these constraints there is a need to encourage parents to subdivide and allocate land to descendants, formulate guidelines on how to create and sustain an FO, train farmers on credit utilization, retrain field extension staff and farmers on improved technologies, complement ownership, promote irrigation development and adoption as an alternative livelihood, improve transport and communication infrastructure, strengthen FOs and promote gender awareness in irrigation and drainage activities.

Irrigation economics. The evaluation of the productivity of water (yield per volume of water) at the field level has not been carried out. With better water management at the farm level, water could be saved and used to irrigate additional land. For example, the Kikima farm in Machakos, which uses water from a reservoir, has managed to attain an irrigation efficiency of

over 80 percent (Mbogo 1999) through improved water management. Economic evaluation of water at the small-scale level needs to be carried out to provide data necessary for future planning. This could provide information on the economic viability of irrigation and a basis for monitoring of irrigation performance.

In the past, irrigation economics has not been given due consideration during the initiation of smallholder projects. This has led to overreliance on government subsidies and low sustainability of group-based schemes. Inadequate consideration of irrigation economics has also led to low adoption of improved water management—water use is not related to productivity. This realization and reduced donor funding have prompted the introduction of cost-sharing policies and the setting up of SISDO to provide credit to farmers.

The expectation that the introduction of irrigation would automatically trigger socioeconomic development, especially in the ASAL regions of Kenya, has not been met. This can be attributed to constraints such as pastoralists' reluctance to adopt farming, dependency created by food schemes, cultural barriers limiting diversification and insecure land tenure.

These constraints could be addressed by creating awareness in the importance of irrigation, adopting a business approach to irrigation development, sensitizing farmers on policy changes, carrying out studies on water use and productivity, reducing levels of cost-sharing, depending on farmers' financial resources, establishing village banks, gradually introducing new policies, hastening issuance of title deeds, promoting low-cost irrigation technologies, improving rural access roads, encouraging marketing associations to emphasize irrigation development and integrating irrigation with other socioeconomic activities.

Credit facilities. It has been observed that banks are not willing to fund irrigation projects because of the high risks associated with agriculture. This prompted the formation of SISDO to promote cost-sharing in irrigation and agricultural projects through a loan scheme. However, loan recovery rates have been poor, especially due to fluctuating and unpredictable returns. In other cases, the farmers perceived SISDO as a government department and ignored loan repayments. The situation was worse for group-based projects.

SISDO's experience with credit financing of irrigation development revealed a need to review a whole chain of constraints associated with it. This could be a turning point for funding of irrigation development, which has been hampered by lack of avoidable credit facilities. The recovery of loans to purchase inputs is estimated at 70-95 percent while loans provided for infrastructure developments have proven difficult to recover (Orengo 2000).

Capacity Building

The capacity-building issues that affect irrigation and drainage development were identified as lack of adequate skills in water management (application and frequency), inadequate awareness of government legislation and policy, inadequate leadership and financial management skills, lack of an adequate information on new or improved technologies, lack of an adequate and reliable database on irrigation and drainage, inadequate practical orientation for graduates, inadequate gender awareness and inadequate extension services. These constraints have led to a lack of adequate skills, weak FOs, low adoption of new technologies, inadequate designs of projects, poorly trained staff, gender insensitivity in irrigation and drainage, limited extension services and eventually to low productivity.

To address these constraints, there is a need to expose farmers and irrigation staff through demonstration training to improve water management technologies, establish model or demonstration farms in every district, promote exchange visits, train leaders on leadership and management skills and strengthen FOs. Marketing groups should regularly update DIU staff and farmers on new technologies; farmers should be provided with information on research and manufacturers; reliable databases and information centers need to be provided; practical oriented training should be provided in the universities; on-the-job training for field staff should be encouraged; women should be encouraged to be involved in decision-making processes; and the training curriculum in public universities should be reviewed to suit the prevailing conditions.

On-the-Job Training

The syllabuses of institutions of higher learning have not been keeping pace with recent technological development; neither do they incorporate farmer-initiated technologies (Karanja 1999). Thus the MoA&RD, in particular KARI and IDB, should provide research priorities and data, as it is clear that in the past, most of the research activities had no relevance to conditions on the farmers' fields. The collaboration among MoA&RD, universities and farmers needs to be strengthened. It was noted that one way of strengthening university-farmer linkages is to encourage on-farm research activities, which will enhance capacity building and adoption of research findings. KARI's commitment to this change in the research agenda will strengthen its role in irrigation development.

Transfer and dissemination of improved technologies have been hampered by inadequate extension packages—the majority of farmers have no access to relevant information on recent technologies, irrigation water management, sources of funding, etc.,. Some of the extension officials are also not abreast with recent irrigation technologies; hence the need for continued training to enhance irrigation development.

Policy, Legal and Institutional Issues

Policy, legal and institutional issues need to be addressed to resolve conflicts over water resources, marketing of produce, planning of irrigation and drainage development activities, stakeholder coordination and collaboration, and enforcement and implementation of policies and laws. These issues have not been addressed adequately, leading to uncontrolled and illegal abstraction of water, conflicts among uses and users, poor marketing of produce, poor infrastructure, weak FOs, lack of reliable data for planning, low prioritization of irrigation and drainage, underutilization of irrigation potential, inadequate financial resources, drastic shifts in government policies, uncoordinated efforts by stakeholders, conflicts of interest among stakeholders, breakdown in law and order in most group-based irrigation schemes, low morale of DIU staff, and farmers being exposed to different project-implementation approaches.

To address these constraints, there is a need to involve all stakeholders in all facets of project development, formulate responsive and dynamic bylaws, revise the Water Act, sensitize farmers on changing government policies, encourage farmers to establish marketing groups, advocate for improved infrastructure, prioritize irrigation and drainage among other agricultural sectors, establish more reliable databases, gradually introduce new policies, consider water as a social and an economic good, establish district irrigation committees to coordinate the

activities of various stakeholders and establish WUAs and FOs to seek legal advice on the formulation of bylaws.

Policy. Policy is the main factor affecting irrigation development in Kenya. Until the policy issues are addressed fully, no meaningful progress will be realized in the irrigation sector. The issue of policy needs to be addressed urgently if the current predicament in irrigation development is to be reversed. The MoA&RD (IDB) has drafted an irrigation policy, which emanated from the 1992 irrigation workshop but this has not been adopted.

There has been a change in government policy, from donor reliance to self-reliance, from grant to cost-sharing and cost-recovery. This sudden shift in policy has impacted negatively. It is felt that the new policy was implemented too fast, farmers were not given enough time, and there was no transition period; hence farmers could not cope with the policy. Current DIU procedures require that farmers seek assistance from the DIU but the DIU staff do not look for farmers who need help. To enhance adoption, new policies should be developed with farmers and introduced gradually.

Group-based irrigation development has decreased tremendously. This could probably be attributed to a new policy by MENR (DWD) that requires improvement in the efficiency of irrigation water conveyance. Since 1997, the issuance of water permits has been tied to these conveyance improvements.

In view of the changing policies, there is a need to harmonize different approaches being used by various external support agencies (ESAs). This could be achieved through coordination of all irrigation-development activities in an area and formulation and implementation of a comprehensive policy. Some ESAs neither consider prevailing policies nor consult relevant government departments leading to confusion among the farmers.

The-cost recovery approach in financing the development of irrigation systems was adopted in 1992. Under this policy, farmers were required to meet the full cost of implementing irrigation projects through a loan from SISDO, which was based on the Grameen Bank approach in Bangladesh (Oregio 2000). However, the approach has not been successful mainly due to lack of clear policy on irrigation development; other stakeholders not promoting a cost-recovery policy; SISDO's and IDB's roles being not well coordinated; high cost of irrigation development; inequity in water allocation and hence production and repayment power; lower returns than anticipated; and high interest rates and relatively short repayment duration. Nevertheless, despite these shortcomings, it has been observed that farmers are willing to pay for irrigation services if it results in better services and higher production and returns.

Farmers in Laikipia and Nyandarua districts have been paying for services rendered by the DIU staff. Initially, farmers used to contribute only part of the cost while the IDB contributed the rest. However, IDB contributions have not been forthcoming and the farmers opted to meet the total cost. This means that the farmers value the services provided by IDB and they see irrigation as a business enterprise. They are aware of the benefits and hence are willing to pay. This is a positive turn of events that needs to be promoted if the current trends in irrigation development are to be reversed.

Legislation. It is evident that the majority of the smallholder irrigation farmers in Kenya are abstracting water illegally. A survey done upstream of the Mwea irrigation scheme (Kamundia 1999) revealed that more than 90 percent of the abstractions were illegal and the quantity of

water abstracted is not accurately measured. In addition, there are numerous temporary abstraction points—also illegal—where portable motorized pumps are being used.

This makes planning for irrigation development virtually impossible, as accurate data are not available. Cases of illegal water abstraction are rampant. While the water permit application procedures are clear, they are not strictly adhered to. The issue of continuous monitoring of water abstraction needs urgent attention to enhance water management at the river basin. Circumstances are dynamic and the upstream users of today are the downstream users tomorrow. There is a great loss of investments when no water flows to the downstream users, especially during critical crop-growth stages when irreversible losses can occur.

There is much confusion about the high-flow and low-flow abstraction requirements. In many basins all low-flow permits have been allocated and only high- or flood-flow permits are issued. These require farmers to construct a 90-day storage in order to adequately irrigate their crops. Often, farmers do not understand that their abstractions can only be made during high-flow periods. These periods are not clearly defined and enforcement is sporadic. The system, generally, results in misunderstanding and is a source of conflict.

Institutions. There is an urgent need to harmonize the operations of the stakeholders involved in irrigation development with the aim of reducing duplication of functions and confusion. Each public institution should have a clear contribution to make to the sector and linkages need to be properly put in place to ensure coordination of activities to enhance achievement of desired national goals. The public institutions should be restructured to reflect the government's emphasis on delivery of services to the people. The organizational/institutional aspects and needs of various types of small systems (group-based and private) need to be studied in a participatory manner with the farmers in the schemes.

The proposed restructuring should take into consideration prevailing government policies and legislation. For example, in this era of income generating within government departments, a conflict seems to be brewing between the MENR (DWD) and IDB with regard to design and implementation of irrigation projects. While the MoA&RD has a mandate to undertake smallholder irrigation development, the DWD has also a division dealing with minor irrigation improvement. There is a need to address this institutional confusion to minimize existing conflicts. This calls for enhanced collaboration and networking among all stakeholders.

Conclusions and Recommendations

The preliminary evaluation identifies the many constraints facing the smallholder irrigation and drainage development in Kenya. The following are a number of activities that need to be addressed by various stakeholders:

- Evaluate the past and current performance of smallholder irrigation and drainage schemes to identify what has gone wrong and suggest appropriate actions to improve the situation.
- Trends in irrigated area development in the districts are not uniform—in some districts the area under irrigation has increased, in others it is stagnant or even decreasing. Ascertain why these differences exist and learn from successes and failures.

- Build the capacity of farmers and DIEs through exchange visits, and training at demonstration centers.
- Enhance collaboration among stakeholders including farmers.
- Conduct and disseminate adaptive on-farm research on irrigation and drainage in collaboration with all the stakeholders.
- Appoint assistants to DIEs who are familiar with improved irrigation and drainage technologies.
- Make water users pay an appropriate and reasonable amount for the water they use. This should be based on policies stipulating how much of the estimated cost of the water, including costs of O&M of the system, can be brought to bear on farmers, on the general enforcement of the policies and fee collection, and on the means to measure reliably the amount abstracted by the various users.
- Build the capacity and morale of DIUs, DIDUs and extension service officials through training and financial incentives for providing good services to water users.
- Adopt viable policy changes and keep all stakeholders informed about changes in government policies.
- Encourage farmers to obtain credit and build their capacity to manage their financial resources.
- Encourage commercial farming and diversification of agricultural production.
- Improve on-farm water management and incorporate water-saving technologies.
- Strengthen FOs and WUAs through training in decision making, project/scheme management, leadership skills, financial management, record keeping and enforcement of bylaws. All training should encourage participation by both men and women.
- Encourage and improve on-farm innovations and experimentation.
- Promote local processing of farm produce to increase productivity and profitability.
- DIEs and IDB staff should be trained on GIS applications to make use of databases being established.
- Sample districts should be selected for in-depth studies whose results should evolve a strategy to raise income for farmers' irrigation enterprises. The objectives of future studies should include analysis of matching water demands and supplies, quantifying production per unit of water, the efficiency of water use in different kinds of irrigation schemes, and water use efficiency at river basin level where various systems and other water users are considered in an integrated approach.

- Examine the role of drainage in western Kenya with the aim of developing a work plan for the installation of drainage systems.
- DIES should articulate their information needs, based on the situation on the ground.
- Document the work that has been done on irrigation and drainage in the form of a bibliography.
- Strengthen the Kenya Society of Agricultural Engineers (KSAE) and also establish a Soil and Water Management Network to coordinate national initiatives.
- Address the issue of land tenure and access to water in some ASAL districts.
- Stimulate the use of water-saving irrigation technologies and disseminate information on precision-irrigation systems to individual smallholders.
- Promote bottom-up, participatory and integrated approaches in which IDB partakes as an equal stakeholder.
- Credit institutions should recognize farmers' seasonal need for money and provide a reasonable grace period for repayments.
- The government should appoint a body charged with the resolution of conflicts arising from competition for water and develop suitable guidelines for the resolution of such conflicts.
- Examine current and future irrigation water demands in the context of watershed management.
- Establish appropriate marketing facilities.
- Review the project approach to scheme rehabilitation.
- Finally, establish an Irrigation and Drainage Working Group—composed of all stakeholders—to monitor progress and advise with respect to irrigation and drainage development in Kenya.

The long list clearly indicates that it cannot be left to the government alone but that all the stakeholders should collaborate in addressing the challenges, opportunities and constraints of irrigation development in Kenya.

Some Current Trends in Irrigation Development (1999-2000)

District	Area Under Irrigation (ha)		Percentage Development
	1990–1995 ^a	2000 ^b	
Baringo	1,914	1,994	+4
Embu	18	56	+211
Garissa	537	1,400	+161
Isiolo	484	1,050	+117
Kajiado	1,993	4,274	+114
Keiyo	5	188	+3660
Kiambu	942	1,804	+92
Kilifi	6	122	+1,933
Kirinyaga	257	725	+182
Kitui	60	75	+25
Koibatek	59	80	+36
Kwale	2,526	1,511	-40
Laikipia	200	220	+10
Machakos	300	318	+6
Malindi	72	22	-69
Maragwa	256	1,044	+308
Marakwet	6,200	1,485	-76
Mbeere	528	682	+29
Meru north	166	1,000	+502
Meru south	20	60	+200
Murang'a	33	503	+1,424
Mwingi	58	58	0
Nakuru	1,725	3,862	+124
Nyandarua	200	560	+180
Nyeri	565	1,029	+82
Samburu	20	7	-186
Tharaka	260	260	0
Thika	195	279	+43
Trans Nzoia	91	100	+11

^aValues obtained from the District Irrigation Profiles developed between 1990 and 1995.

^bValues obtained from the three regional workshop reports on Evaluation of Irrigation Development in Kenya.

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