In areas where government intervention is being contemplated, or if proportioning weirs are to be installed in an existing irrigation system, one should first analyze the existing water allocation principle, the needs of the irrigators, and existing local technology. Once the farmers determine that it is advantageous to install a proportioning weir, a description of the hydraulic command area and land information are required. Sectors and subsectors of a hydraulic command area should be grouped according to the geological features which facilitate easier water distribution.

- **Naresh Pradhan**
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INDIGENOUS FARMER-MANAGED IRRIGATION IN EAST AFRICA

FMIS in Sub-Saharan Africa

The potential contribution of small-scale farmer-managed irrigation to rural development and welfare in sub-Saharan Africa is increasingly being recognized by aid donors and national governments. Indeed, small FMIS already play an important role in sub-Saharan irrigation. In 1986, the FAO Investment Section estimated that just under half of sub-Saharan irrigation (2.57m ha) was comprised of "small-scale or traditional" irrigation. The small-scale or informal irrigation sector dominates every sub-Saharan country except Sudan. Despite the extent of current interest in small-scale irrigation, there is little research on it within Africa. There is little hard evidence on the way small-scale irrigation schemes are run, or how they perform and there are few explicit comparisons between large- and small-scale projects. Data which do exist concern primarily formal small-scale irrigation projects, usually those run by governments or development agencies. However, such projects make a relatively small contribution to the total area under small-scale irrigation in sub-Saharan Africa, and indeed they suffer from many of the same problems as larger projects in the form of economic, social and environmental problems, costly bureaucracies, inappropriate mechanization and lack of farmer participation.

In contrast, informal irrigation, involving technical or management input from outside the farming community, seems to offer a cheap and effective alternative approach. It is this which has attracted the attention of development agencies and commentators. However, very little is known about it. Urgent questions arise in particular over:

* The extent of informal irrigation;
* The technical performance of informal schemes;
* The economics of informal schemes and their economic context;
* The management of informal schemes;
* The nature and success of government intervention in informal schemes.

FMIS in Kenya. Kenya provides a good example of the nature and importance of FMIS in sub-Saharan Africa. Much of Kenya is too arid to support rain-fed cropping, and its population growth is rapid. However, although the area irrigated in Kenya increased in the 1970s, only 2.1 percent of the cropped area is irrigated, compared to 3.7 percent in sub-Saharan Africa as a whole. The medium- to large-

scale government schemes, and the existence of private sector irrigation, for example of coffee, are relatively well-known. However, there is also an extensive, informal, small-scale irrigation sector. Estimates by the FAO place the area under informal "traditional" irrigation at up to 57 percent of the irrigated area in Kenya, amounting to 28,000 ha.

There was irrigation in Kenya well before the present century. Some former, irrigation systems have effectively disappeared, such as the irrigation of the Il Chamus on the Njemps Flats near Lake Baringo. Others, however, have persisted to the present day. These include the Marakwet and Pokot systems in the northern Rift and the Taita of the Taita Hills.

Research on systems of this kind could make a significant contribution to the wider debate about the future of irrigation in African development, for three reasons. First, informal, small-scale irrigation systems represent successful adaptations over long periods to changes in environmental and social conditions. They may therefore offer insights into ways in which the design of large, modern projects may be more robust and effective in conditions of drought and economic and social change. Second, the management systems of informal, small-scale irrigation systems (especially those of construction and maintenance, water allocation, labor use and land rights) have also adapted over time. Such systems have therefore proved themselves to be both resilient and robust, and may again offer insights useful in the management of modern schemes. Third, informal, small-scale irrigation systems have survived and grown without formal "development." Their apparent success needs to be analyzed in terms of economic and technical efficiency, and compared with existing studies of the performance of modern formal schemes.

To date however, much of the interest in informal, small-scale irrigation is built on a very shallow knowledge base. A series of critical questions therefore needs to be asked:

* How extensive are the small-scale irrigation systems, and how significant are they in terms of overall national irrigation objectives?;

* How efficient are they technically in terms of their system management? How is water used, and with what water use efficiency?;

* How do informal schemes perform economically, and in particular how do they fit into their local and regional economies? What impacts do outside economic changes have upon them?;

* How well do their management systems function and how are they responding to contemporary pressures (e.g., the growth of regional markets and a cash economy, rural depopulation, etc.)?;

* How do formal development initiatives relate to these informal irrigation systems? How easy is it to introduce new technologies or materials, or to replicate their experience in new sites?

Kenyan Rift Valley Furrows. In several parts of the Kenyan Rift Valley, there are furrow irrigation systems (as they have confusingly been called by most researchers)

superficially similar to the hill irrigation systems of Nepal, Bhutan, or the Karakorum. Dams of brushwood, mud, and stones divert water from streams descending the escarpment, fed by rainwater on the hills behind, into man-made channels. These run across and down the escarpment to the dry valley some 1,500m below. The channels sometimes take the form of a banked ditch, sometimes a wooden or brushwood aqueduct or other structures to cross gullies or rock faces. Irrigation takes place primarily at the escarpment foot.

These irrigation systems have been recognized for sometime. In Marakwet, for example, they are described as long furrows and occur over a long stretch of the escarpment. Some 40 furrows have been mapped, totaling 250km in length along the 40km length of the escarpment between Arror and Tot. Some extend to 14km in length, and descended 1,400m.

The basic alignment and engineering design of the furrows and their control structures are known, and there are some observations of water flow rates and losses. General principles of water use and system management have also been described by researchers. This work concentrates on the system level, but includes some consideration of domestic and irrigation water use, the management of conflict between irrigators, and the response of the systems to technical and socioeconomic change.

New research is now needed to establish the extent of the irrigated area, the nature of irrigated agriculture, the way in which water is allocated and the ways that unpredictability in supply are dealt with, both at the farm level and at the system level. New research is also needed to determine the problems of maintaining the channel system under conditions of environmental and socioeconomic change.

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FMIS WORKSHOPS

Three workshops have been held since 1989 dealing with FMIS issues as part of the Network program. The first was held in 1989 in Khon Kaen, Thailand and dealt with "The Role of Social Organizers in Farmer-Managed Irrigation Systems." The second, held in late 1989, dealt with "Design Issues in FMIS," while the third, held in May 1990 in Rabat, Morocco, dealt with FMIS issues related to North and West African irrigation systems. Unfortunately, the proceedings from the first two workshops are still in the publication process and by the time this newsletter is published, they should be available. The following are reports on all three workshops.

The Role of Social Organizers in Farmer-Managed Irrigation Systems

The regional Workshop on "The Role of Social Organizers in Farmer-Managed Irrigation Systems," included participants from nine countries and was held in Khon Kaen, Thailand, in May 1989. Countries represented included Bangladesh, Bhutan, Thailand, Indonesia, Laos, Nepal, Pakistan, the Philippines, and Sri Lanka. The workshop was sponsored by the FMIS Network and organized jointly by the International Irrigation Management Institute (IIMI) and the Thailand Research on Irrigation Management Network (TRIMNET).