

* Flood Water Irrigation in Africa

Millions of people living along Africa's major rivers practice a type of irrigation requiring little in the way of physical infrastructure, depending upon the seasonal rise and fall of flood waters. A recent visitor to IIMI, Dr. Thayer Scudder, talked about the potential of this type of irrigation in Africa's agricultural development. Dr. Scudder is professor of Anthropology at the California Institute of Technology, and is an associate director of the Institute for Development Anthropology in the United States.

"To give you just one example of the importance of flood water irrigation, in Nigeria the latest assessment is that there are approximately 800,000 hectares under flood water agriculture, and the potential is estimated at another 1.2 million hectares which could be put under flood water agriculture. This is obviously one reason why flood water agriculture is important. It's there and there are a large number of people who are practicing it.

Flood water agriculture is demand driven; the incentive to practice it comes from the producing household, and I think this is of tremendous importance. During the recent drought (not just the classic drought beginning in 1968 in the Sahel and going up to the 1970s but the more recent drought of 1981-84 which stretched across to Kenya), a lot of small-scale government irrigation projects were established as a government solution to the problem of drought. The cost per family of these small-scale irrigation projects over \$30,000, and the yields were very low (in the Village Irrigation Projects of

the lower Tana River in Kenya). These systems are tremendously unsuccessful. Why? Because the farm incentives in terms of prices could not compare with wage labor. A significant number of the manpower is away working as labor migrants.

In This Issue

Flood Water Irrigation in Africa	1
Editor's Corner	5
Strengthening Water Users' Associations in Indonesia	7
Farmer-Agency Meetings in Sri Lanka	9
Research on Large-Scale FMIS	10
Non-conventional Technology	12
Announcements	13
Country Notes	14
Reports & Papers	16
FMIS Rehabilitation: A Moroccan Perspective	17
Research Results from Bangladesh	20
Lift Irrigation Cooperative Societies	21

But 10 miles away, on the north part of the delta, is a beautiful indigenous system of "flood rise" irrigation. The Tana floods biannually, and when the flood comes down it is diverted by 30 channels into beautiful bunded fields for the double cropping of rice. Along the bunds is agro-forestry, a whole range of fruit trees and trees for production and housing. This particular system is also linked to the rise of the tides. Tidal movements are used to push fresh water into the paddy fields. Labor migration rates in these areas are very low, less than 10%. These villages required no drought assistance during the drought of the late 1960s and no drought assistance in the 1980s.

So we have this kind of contrast. The question I want to address is, "To what extent can flood recession irrigation be intensified?" But before I do that let me make a few statements about African river basins in general. Most people don't realize that most African countries have just one river basin, which is usually the heartland of the country, or the future heartland. So there is a very high cost to not applying multi-objective planning to try to work out the integrated development of those basins.

Most of Africa's major rivers have a flood regime whereby three quarters of the flow is concentrated during two or three months. In other words, during the flood period the flow will increase by a factor of 10 over the low water period. The local systems of production are absolutely dependent on this flood regime, either through cultivation on the rising flood, or cultivation on the receding flood. But the flood waters don't create a situation of paradise, because maybe one year out of three the river floods early and high, and wipes out the crops along the river bed. Or maybe one year in five, there's a drought. The irregularity of the regime is a critical constraint to increasing productivity.

The *Farmer-Managed Irrigation Systems (FMIS) Newsletter* is published by the International Irrigation Management Institute on behalf of the FMIS Network. Its purpose is to provide a link among staff of planning and implementing agencies and researchers concerned with understanding and assisting the farmer-managed irrigation sector. The objectives of the FMIS network are both to disseminate existing knowledge and experience, and to foster the development of new approaches for improving and sustaining the economic and social benefits of irrigation systems whose management lies outside the direct jurisdiction of government agencies.

Financial support for the *Newsletter* is provided by the International Fund for Agricultural Development (IFAD) and the Federal Ministry for Economic Cooperation (BMZ), West Germany.

The *Newsletter* is published quarterly and provides a forum for Network members to communicate with one another. Please contribute announcements, comments, ideas, questions, news items or brief articles to:

David Groenfeldt, Editor
FMIS Newsletter
I.I.M.I.
Digana Village, via Kandy
SRI LANKA.

Telephone (8) 32491/(1) 586135
Telex 22907 IIMIHQ CE
Fax (94)-(1)-502457

But the nature of the regime is also absolutely essential to the existing systems of production.

In Nigeria alone, there are well over 10 million people dependant on the annual flooding of the Niger River. Unfortunately, river basin development in Africa has largely ignored the populations within the river basin.

There are at least three reasons that river basin agriculturalists have been overlooked. First of all, the rural-urban terms of trade throughout Africa are highly unfavorable to farm producers. The production costs of government-sponsored projects in Mali, for example, exceed the price that the government pays the producer. Now that's an extreme example, but indicative of a general problem. And I don't really see much future for agriculture in Africa until basic structural policy changes occur.

The second reason that river basin agriculture has been overlooked is that Africa has about 30% - 40% of the world's hydro-electric potential. Rivers are seen primarily as least cost solutions to the energy problem. Dam construction has been primarily for hydro-electric power rather than the integrated development of the river basin.

And a third reason why African river basins have not been emphasized in terms of integrated development is the general perception of them as "hostile" habitats with irregular flooding, and ridden with disease. They are difficult places to live, of course, but they also support millions of people.

Systems of Flood Water Irrigation

Now let's look at some of these systems of flood water irrigation. As far as distribution is concerned, they are found throughout sub-Saharan Africa. My guess is that you find

them distributed along every major river in Africa but I don't know that for a fact because so little research has been done on this topic.

Flood water agriculture is part of a much more complex and dynamic system which involves (in order of importance): rain-fed agriculture, wage labor, then flood water agriculture, fishing, livestock, a wide range of small scale commercial activities, gathering, and hunting. The same population may be practicing all of these various components, and shifting the emphasis depending on environmental conditions from one year to another. There is also ethnic specialization to some extent; some groups focus more on fishing or herding or agriculture.

Over the millenia, these people have domesticated their own species; for example, African floating rice was domesticated in West Africa over two thousand years ago. So you've got floating rice which is cultivated on the rising flood, and then there are another group of cultigens that have been adapted for receding flood conditions.

Now let me just briefly divide flood water irrigation into three categories of which the most important is flood water recession. In all these rivers that I'm talking about, people plant a series of crops on the receding flood as the water goes down. It may be riverine, along the banks of the primary channel, or on extensive flood plains if they exist. Then there is a much more limited distribution of flood rise irrigation, and this is where the floating rice is used. Flood rise irrigation is pretty much restricted to West Africa. In Kenya and perhaps in Tanzania, there is a somewhat different version which I've just mentioned where, when the flood is coming down, the tides are used to force fresh water into the paddies. Then there is a third and very compli-

cated system, which virtually no one has written about, and that is tidal irrigation in mangrove swamps.

Impact of River Basin Development

The impact of river basin development on flood water irrigated agriculture has so far been negative, because the emphasis has been on dams for hydropower. The dams have been used to regularize, to eliminate the annual flood. The result of that, of course, is that the productivity of these indigenous systems is very seriously adversely affected. Not only flood agriculture, but fishing and herding have badly hit. If you wipe out the annual flood, you literally wipe out the grazing potential in these areas.

That's the background; what can we do about this? There's a very strong "anti-dam" movement, of course, as voiced by the journal, The Ecologist. They want to stop all large dam construction, which is a very strong viewpoint in the environmental movement. The approach I want to suggest would be the development of the uniquely African type of irrigation which would involve millions of people and millions of hectares, and it would be relatively low cost. And it would work very simply.

Controlled Floods for Irrigation

According to my proposed scenario, you have to have water management, so you need tributary and main stream dams. The major purpose of the dams would continue to be hydropower production, because that has to pay the bills. Let's say that 75% of the water is passed through the turbines. I'm thinking now of the Manantali dam on the Senegal River. The other 25% of the water would be used for controlled down-river floods.

The flood would be released on a given date; farmers would be alerted two or three months ahead of time.

You would know how many hectares could be irrigated in a given year, depending on the amount of water stored behind the dam. So you could flood specified areas. Research by FAO suggests that with improved water management (which the controlled flood would help provide), and use of fairly simple improved techniques and varieties, yields could be increased by a factor of three. Since yields under flood water irrigation are currently quite low (about one half to one ton per hectare for rice), this approach could bring it up to about one and a half to three tons per hectare.

At the same time, this controlled annual flood would provide grazing, and maintain fisheries productivity. In other words, the controlled flood would be a boon to the entire riverine production system. In Senegal, for example, there are half a million people who, prior to the drought, were dependent on the annual flood. That number is significantly less now, because they have gone off as labor migrants to various places. But recent research suggests that they would come back.

Along with the controlled flood would be a controlled draw-down in the reservoir, where the local population is practicing flood recession agriculture. This draw-down area could also be of tremendous importance in grazing, if properly synchronized with downstream releases.

The first experiment which is possible to test this idea is about to start on the Senegal River where the Manantali and the Diama dams have recently been constructed. Donor money was available for the dams, but no donor came up with money for the turbines. The governments have agreed that until the turbines are installed (and the first one is anticipated to be operational in 1993), there will be a controlled down river flood

for a minimum of 50,000 hectares in Senegal and Mauritania.

The Institute for Development Anthropology (IDA) has recently been awarded a contract from USAID to monitor the use of this flood by the local population. We will utilize SPOT imagery and aerial video imagery to find out exactly what areas are flooded at maximum flooding, what areas are cultivated at maximum cultivation, and then go into the reasons why there is not a closer correspondence; there will certainly be labor and various other constraints. Hopefully, there will also be studies by environmentalists and by engineers, of ways to enhance the flood utilization.

I think there is a tremendous potential of using high technology--these big dams; Africa cannot afford to not manage these rivers. The combination of regulated floods for recession agriculture, and then the development of village irrigation projects (or federations of them) can enhance and build upon the strengths of millions of farmers whose production systems at the moment are being eliminated by dam construction.

For more information contact:

Dr. Thayer Scudder
Institute for Development
Anthropology
99 Collier Street
P.O. Box 2207
Binghamton, NY 13902
USA.