

Droughts - just poor rainwater management?

'We must do away with the notion that droughts we face from time to time in many parts of the country are caused by shortage of rainfall. With a good programme of harvesting rainwater we can avoid droughts even in times or places considered to have low rainfall' - *Hansard Records, Tanzanian Parliament, June 18th, 2001*

Can better rainwater management help to reduce the impact of droughts in semi-arid regions? It is well known that only a small fraction of the rainfall reaches and remains in the soil long enough to be useful to crops while up to 70 percent can be lost as it runs off the fields. So it is often argued that poor crop yields and crop failures are not so much the result of low rainfall but of too much wastage of valuable rainwater. Interestingly, no one doubts the critical importance of rainfall but, over the years, few policy makers have recognised the importance of runoff. It is often seen as the cause of soil erosion and so as a hazard rather than a useful resource. But in Tanzania, farmers are showing that managing rainfall by harvesting it can make more water available for their crops and produce significant increases in crop yields and farm incomes.

RAINWATER HARVESTING IS...

Rainwater harvesting is about collecting rainwater and making better use of it. It may be collecting it just where it falls around individual plants or collecting it from a large catchment area and channelling the runoff so that it increases the water available in a smaller growing area. There are micro-catchment

systems, which are modest in size, where water is collected from land adjacent to the farm and channelled directly on to the fields. But there are also macro-catchment systems with large water collecting areas, often some considerable distance from the farming areas, which can serve many farms.

CHANGING PERCEPTIONS

In Tanzania, farmers have for some time recognised and exploited the natural concentration of rainwater in valley bottoms and local depressions, yet the overriding perception, which has often driven government policy is that runoff is a hazard rather than a resource and gives rise to concerns about soil erosion. But this perception is now changing, primarily as a result of the research undertaken since 1992 by Sokoine University of Agriculture in Tanzania and University of Newcastle in UK on the management of rainwater to improve maize yields in the semi-arid areas of the country. This is now receiving attention at the very highest levels of policy making. During the recent marathon budget session of the Tanzanian parliament, the first Member of Parliament to stand up and debate the budget speech spoke of the importance of rainwater harvesting. This was the beginning of



many questions and comments by MPs. One suggested that 'rainwater harvesting should be the starting point in our agriculture strategy because without an adequate supply of water, even if we provide credit, mechanisation and extension, there will be no development in agriculture.' (Hansard Records, Tanzanian Parliament, June 18th, 2001)

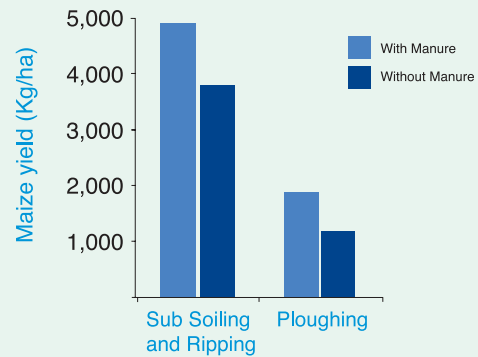
At the beginning of the research programme, work on the technical aspects of rainwater harvesting demonstrated the benefits of this approach to farming. More recent work has helped not only to raise the profile of rainwater harvesting among policy makers but also to provide farmers with the technical knowledge and the skills they need to put the new systems into practice.

WHAT FARMERS ARE DOING

In order to encourage farmers to take up new technologies it is important to understand what they are already doing. A survey of farmers in the semi-arid areas of the country found that more than 70 percent already practice some form of

The government will strengthen and promote the use of rainwater harvesting technology, in both urban and rural areas - Prime Minister of Tanzania

rainwater harvesting. More than 55 percent were using the most cost-effective method of simply capturing rainwater where it falls and storing it in the crop's root zone. By ripping the soil at depth, rather than just surface ploughing, and by adding manure, the water retaining capacity of the soil can be significantly increased. Runoff is reduced and water percolates deep into the soil where it is stored and is available for uptake



by plants. This approach has greatly improved maize yields and increased productivity of water from 1.5 to 4.0 kg/ha/mm of rainwater.

Some farmers were using macro-catchment systems to capture runoff from large areas often some distance from their farms. This approach, known locally as *majaluba*, was introduced by Indian immigrants in the 1920s to improve the yields of rainfed rice. It is now gaining popularity among maize growers who prefer this large-scale approach in spite of the complexities of managing sudden large flows and distributing it to large groups of farmers.

Farmers were also quite innovative in exploiting runoff from unusual sources. One example is the practice of using water that concentrates alongside roads and railways. Drainage works, constructed to remove surface water from roads, were installed on the principle of 'save the road and let it flow'. Little thought was given to the water after it left the road and it often eroded huge gullies downstream. A survey along 160 km of road showed that over 65 percent of the drainage works were concentrating runoff and at many sites farmers were exploiting this resource. They had worked together to construct crude diversion systems to channel the water into their farms. In one village alone some 700 ha were being watered in this way with a reported increase in maize yield of 2.5 t/ha, an increase

in gross margin of \$220/ha; an increase in return to labour of \$5/person day and a benefit cost ratio of 1.55.

The survey also showed that some farmers had introduced more conventional water storage into their water harvesting systems and were using less wasteful water application methods. In one area farmers are storing harvested water in small ponds and scheduling the water applications to grow onions. The result is a high gross margin of US\$2,750/ha and a return to labour of over US\$13/person day.

SPREADING THE WORD

Disseminating information to both policy makers and to farmers is the main objective of the current phase of research. A special issue of the Tanzania Journal of Agricultural Sciences was recently devoted to rainwater harvesting and a planning guide handbook on rainwater harvesting was produced. Both were widely distributed throughout Tanzania and have played an important role in raising awareness among policy makers. Training programmes were also organised for government extension staff and NGOs who work directly with farmer groups.



In the parliamentary debate the Prime Minister of Tanzania said 'starting the 2001-02 financial year, the government will strengthen and

promote the use of rainwater harvesting technology, in both urban and rural areas.'

The minister responsible for water development elaborated on this by saying 'in order to ensure that rainwater harvesting is widely used in rural areas, my ministry will work with District Councils to ensure that it is included in development plans of the councils.'

On the farms the commitments of government are beginning to show. The training of trainers programme has so far reached some 224 people in 42 districts. New agricultural programmes being developed by districts now include rainwater harvesting.



The change in attitudes has been nothing short of remarkable. There is now a real demand for the technology. But

more work remains to be done. There are some who are voicing concerns about how this innovation might seriously divide rural communities and they advocate an examination of the social institutions to ensure that the benefits of rainwater harvesting are available for everyone and not just a few.

At farm level, research is needed to improve the productivity of water. At the river basin level, the success of many small schemes can lead to large-scale water management problems that give rise to some environmental concerns. It is timely to seek ways of managing these wider issues in order to ensure equity and environmental stability.

R7888 Promotion of rainwater harvesting systems in Tanzania

Nuhu Hatibu

Soil-Water Management Research Group

Sokoine University of Agriculture

Morogoro

Tanzania

Email: nhatibu@suanet.ac.tz

John Gowing

Centre for Land Use and Water Resources Research

University of Newcastle

Newcastle upon Tyne NE1 7RU

Email: j.w.gowing@newcastle.ac.uk