Researching water resources in Zimbabwe

Ian Scoones, of the Zvishavane Water Resources Project, describes how a detailed picture of topography and land use was assembled through group workshops and individual interviews. With this knowledge it has been possible to use a variety of water harvesting and pumping techniques in a number of situations.

THE ZVISHAVANE Water Resources project started during 1987. Much headway had been made in rural water-supply provision in Zimbabwe since Independence; however, the focus had been on the supply of deep boreholes and dams for irrigation. These had been carried out by the government with the support of donor agencies. There had been fewer attempts at mobilizing local initiative for resource management with simpler technologies and lower investment. In a semi-arid area which suffered serious drought for years during the 1980s, the needs were clear and great enthusiasm for this approach to complement the outside assistance was evident during initial research work.

Since 1987, the project has adopted a number of technologies for water pumping, distribution, and management that are widely applicable in the project area. However, at each site the combinations of technology options have been carefully investigated with the local community. This article describes the research process that is helping provide this insight and outlines some of the research-extension methodologies that have proved particularly useful. It also explores the factors that have proved key determinants in the choice of technologies.

Generating local debate

The aim of the project's research and extension approach is to stimulate local discussion of water resource management and supply issues. The information generated is then useful for local planning and deciding which technologies might be locally appropriate. The primary focus for these discussions are group workshops. These are supplemented by occasional short appraisals and individual interviews by the community workers and village researchers.

People may be called together for research workshops to discuss particular issues, or for training workshops for the discussion of development problems and opportunities, and for practical skills development for village community workers.

A workshop may be open, or for specific participants: the structure is dependent on the initial aims and expected outcomes. For occasions aimed at exploring particular problems, a specially invited group, for example women, is helpful. For workshops aimed at generating community involvement and general insight, a larger gathering with open sessions, perhaps combined with smaller working groups, is preferable.

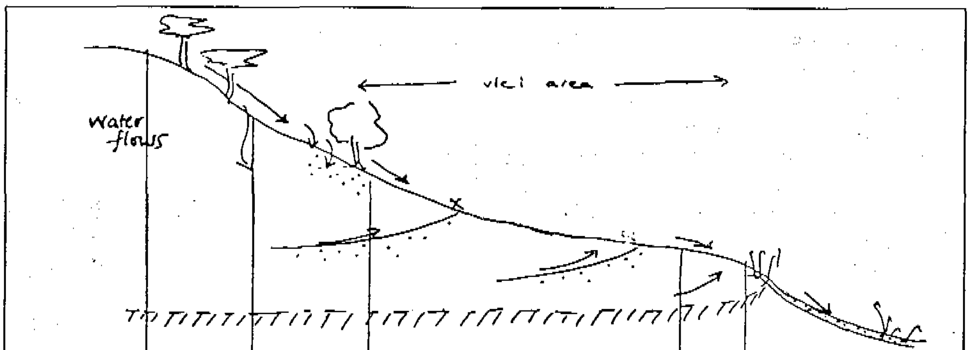
The length of a workshop also depends on the context. Research workshops are generally intense and heated and last about half a day. Training workshops that combine group work, practical demonstrations, and visits can last several days. Exchange visits between farmers in different parts of the project area allow the interchange of ideas and the linking up of innovations. In a different environment, new insights and renewed enthusiasm are generated.

All of the project staff carry out interviews as part of their work. The community workers carry these out on an *ad hoc* basis at all of their project sites. Discussions with individuals uncover information that might not be revealed in a group workshop. Sensitive information which has the potential for conflict and dispute, and differences in attitudes within the community may be revealed with sensitive probing by a local person.

Short appraisals

The village researcher groups are involved in more specific research interviewing. They

Ian Scoones can be contacted at the International Institute for Environment and Development, 3 Endsleigh Street, London WC1H ODD, UK.



WATER AVAILABLE	RUN-OFF	DRY, HIGH INFILTRAT'Y	WETTER – ESP WET POINTS	DRY	SEASONAL STREAM FLOW
SOIL AT SURFACE	GRANITE ROCK	SAND	HEAVY CLAYS (MATORO)	SAND	MIX – SAND + ALLUVIUM
GRASS SPP		NHANDIRA SHANJE	SHAVAHURU, GONDYA	NHANDIRA SHANJE	SHANGA
TREES	MUTONDO MUSUSU MUKARATI	MUHUHWA MUCHAKATA MUPFURA	MUONDE MUKUTE		
CROPS		MHUNGA RUKWEZA MAPFUNDE	MAIZE, RICE, VEGETABLES	MAIZE	
LIVESTOCK	WET-SEASON CATTLE		DRY-SEASON CATTLE		DRY SEASON
FERTILITY		POOR – ADD MANURE/TERMITARIA	NO MANURE	ADD MANURE	
EROSION RISK		*** LOOSE SOILS		** LOOSE SOILS	*** GULLEYS AT STREAM HEAD

Figure 1. Vlei transect in Murowa, Mazvihwa Communal Area. (From appraisal carried out with Department of Natural Resources officers, 1987)

focus on key issues identified by the project staff. Research is carried out on valley-bottom wetland cultivation and use, on attitudes to well-building, and the monitoring of project successes and failures. The village researchers are local people with basic secondary school education; they work part-time and are supervised by the project administrator. The results of village research are used for project publications, the assessment of technology needs and the direction of the project in the future and for project monitoring and evaluation.

Occasionally, the project has carried out short appraisals on key issues. These are a useful complement to the process of group and individual interactions described above. The construction of maps and diagrams is a useful way of depicting information generated by interviews. They can then become the focus for discussion and analysis by the group and can feed back to the community in workshop sessions.

An example of a transect diagram depicting water flows in a *vlei* is shown in Figure 1. The description is derived from the farmers' understanding of agro-ecology, hydrology and pedology. The diagram then provides insights into the pattern of water flows and points to potentials for water management and erosion control. This can be complemented by information on seasonal use patterns presented in the form of a calendar (Figure 2). Visual representations can then act as a useful focus for future discussion with farmers on possible interventions.

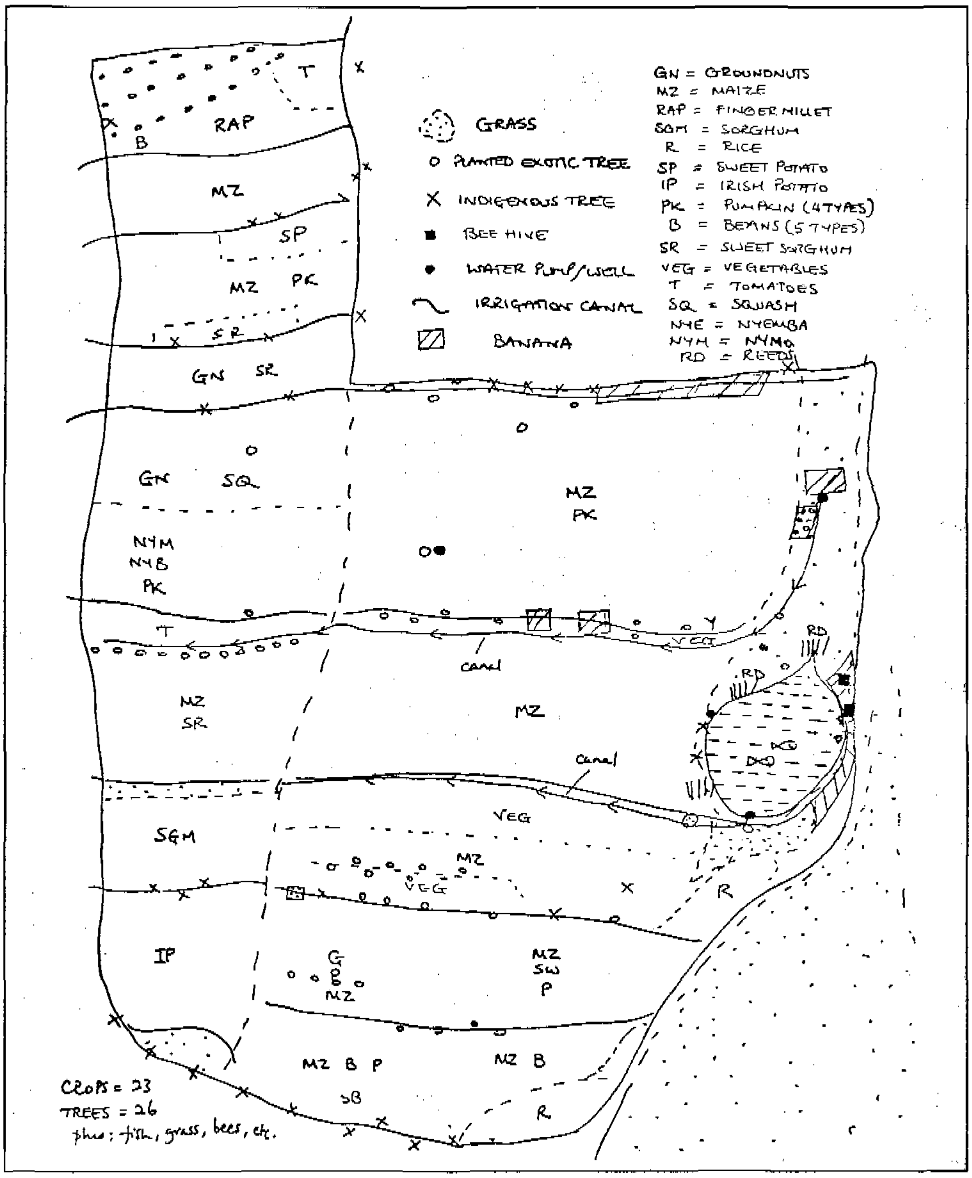


Figure 2. Water resources on the dryland farm of Z. Phiri Maseko (approximately 2.5ha).

Understanding local constraints

The availability of water varies considerably within the project area and is largely dependent on the underlying geomorphology (Figure 3). In Mazvihawa, two distinct systems can be identified. In the granitic hill areas, water flows from hill catchments to *vlei* areas and into small streams; in these areas, surface or sub-surface water supplies are available virtually throughout the year. By contrast, in the clay plains areas, the water table is deep, and accessible water is to be found only under sand in dry river beds. The opportunities for low-input water development are clearly very different in these two areas. This article concentrates on the problems of the clay plains.

A major dry season activity is small-scale vegetable gardening in these areas. Areas of fertile soils allow reasonable returns, as long as water is available. However, the only source is in the river bed which may be 140m distant and 30m down from the garden. With water requirements at 72 buckets per gardener per week, the labour involved is considerable.

Access to water is made particularly difficult because pits must be dug in the sand to a depth of one metre or so by the end of the dry season. When people and stock use them heavily these collapse and must be regularly redug. A simple innovation encouraged by the project was the reinforcement of these *mifuku* with concrete rings. Concrete rings one metre in diameter can be made locally at a nominal cost. Once installed, the site must be dug only once a year and the yield of water is increased dramatically, and a full bucket can be drawn on each occasion, rather than filling the bucket slowly with scoops of a small plate.

This simple innovation has assisted garden watering in these areas. These *mifuku* are also used for domestic water, although, being open, wells do not provide satisfactory drinking water.

The provision of clean water from shallow water sources and lifting water up the river bank using low-cost methods remain important challenges. Deep boreholes and diesel-pumping devices are not possible without extensive outside support. Some simple water-harvesting techniques have been tried in these areas to tackle these problems.

The construction of small dams is very popular and a number of have been initiated by communities. A judicious choice of site allows the distance and height from the water source to the garden to be reduced so that low-cost pumping technologies such as the rope-and-washer pump can be used.

However, techniques for sand extraction from filled dams remain a further question. Domestic water provision can be assisted with roof catchment rainwater harvesting systems.[1] These are particularly relevant to people with non-thatch roofs and are being experimented with at schools.

System dynamics

Among the features which are important to note on Figures 1 and 2 are the areas of susceptibility to erosion, the sites and timing of mid-*vlei* upwelling and the slopes of the surrounding land. From this, plans can be made to protect against erosion by establishing shallow bunds, kikuyu grass or banana groves.

Ponds and wells can be sited where water is already upwelling. The harvesting of water and the enhancement of seepage increases the dry season moisture content of the surrounding land and surrounding dry fields to be irrigated. The rope-washer pump has proved to be an excellent low-cost option for *vlei* pond irrigation systems.

A knowledge of the seasonal rise and fall of the water-table gives an indication of the type of domestic water supply pump that will be appropriate and where it should be sited. The 'bucket pump' (developed by the Blair Institute of the Zimbabwe Ministry of Health) has been chosen by the project as a useful technology for this type of shallow well pumping for domestic use. Capitalizing on the water-table rise at the end of the dry season, which local research indicates is typical of dryland *vleis*, is particularly important.

This type of analysis went into the development of Z. Phiri Maseko's farm in Runde Communal Area. Figure 4 is a sketch map of the area which totals about 2.5ha. It illustrates how the technologies introduced and the management system adopted fits with a close understanding of the ecological and hydrological dynamics. With the effective exploitation of existing water supplies, a diverse production system on a smallholding can be developed, even in semi-arid conditions. This farm evolved over a period of time as a result of experimentation and much hard work. 'Research' was not explicit, but an investigative and experimental approach, so characteristic of many African farmers, drove the project forward.

Getting the technical parameters right by understanding local constraints and systems dynamics is, however, insufficient on its own for effective development. Historical precedents are critical factors in determining what happens in future development.

Vlei cultivation is effectively prohibited by law in Zimbabwe. This arose from fears about degradation and the colonial authorities' desire to suppress peasant agriculture, stimulate migrant labour, and protect white commercial farming markets during the 1930s and 1940s. These laws are a serious block to the development of these crucial dryland areas of the country. Laborious procedures for exemption orders have to be gone through before the farmer is allowed to develop a pond-water harvesting and distribution system of the type described above and shown in Figure 4.

Local beliefs and attitudes

The type of technology that is acceptable is dependent on socio-cultural beliefs and attitudes to water resource use. Research into past well development efforts in the area revealed that people resented the use of concrete in the construction of wells at certain sites. Further exploration of this reaction revealed that certain well, pool, and *vlei* areas are regarded as sacred and protected by ancestral spirits.

These spirits legitimize political control of these key resources and a set of taboos have arisen that reinforce this. These include washing practices, use of particular water-drawing vessels and the prohibition of 'salty' concrete that is believed to offend the spirit guardians of the resource.

After careful research with the community, two options emerged for further developing these water sources. Either consultation with the ancestral spirits can take place, with a supplication ceremony through a medium to ask whether a concrete well lining and modern pump is acceptable, or a traditional stone-lined well can be constructed. Without such an approach, the failures documented by other projects in the area would be repeated.

Research is an essential component of development. It need not be a one-off affair conducted by outsiders on an appraisal or evaluation mission. It can be part of an ongoing process of inquiry conducted with and by local people. The discussion, debate and insight generated are critical contributions to an adaptive and participatory development process. Many techniques exist for facilitating this research-extension integration; many examples fall within the collection of 'Rapid Rural Appraisal' techniques. The Zvishavane Water Resources project uses a few of these.

The project also illustrates how a process of research and extension helps to pinpoint gaps and the potential for further technology development. It is this alliance between farmer knowledge, locally based research and technology development that it is so important to forge. ●

Acknowledgements

The Zvishavane Water Project is based in southern Zimbabwe and works with communities in Zvishavane and Chivi Districts. Its full-time staff are Z. Phiri Maseko, C. Hungwe, J. Munatsi, and R. Ndatschana. The project is supported by Oxfam (UK) and a micro-projects grant from the EEC. This paper owes a lot to the work of K. Wilson, B. Mukamuri and other members of the Mazvihwa research team.

References

1. A. Pacey and A. Cullis, *Rainwater Harvesting: the collection of rainfall and runoff in rural areas*, IT Publications, London, 1986.

Letters to the Editor

Dear Editor,

If a piece of appropriate technology can stand the test of time it is an indication of its worth.

I recently read an item of news (*Daily Mail* 1 November, 1989) about the development of a form of dehydrated egg which has both cholesterol and sources of infection removed for use as a 'health food'. A German manufacturer has re-introduced this useful form of food preservation which was a wartime expedient used in Britain and has thus come to the rescue of civilian life some forty years later.

Perhaps the Swiftlea Mixer, which was devised to help with preparing foods in dehydrated form, will do the same (see *Appropriate Technology* vol. 10 no. 3 September 1983, page 12).

Nicolas Holliman
4 Wharton Street
London WC1X 9PX, UK

Dear Editor,

After reading Will Critchley's article in the September 1989 issue of *Appropriate Technology*, allow us a few comments.

We like the definition of rainwater harvesting as 'productive soil-and-water conservation'. If natural resources conservation techniques are going to be adopted by the people of the Sahel, they *must* be productive and the benefits should be important and immediate. We worked for over three years with World Vision in Mali, doing soil-and-water conservation or water harvesting amongst Tuaregs in the Menaka area in the north-east part of the country. During this time we were able to regenerate pasture and grow sorghum with RH techniques on hundreds of hectares of land that many thought were hopelessly desertified.

When we started our programme, we intended to use RH techniques to regenerate forests and pasture. We naturally thought that the local Tuareg pastoralists who disdain farming (according to every anthropologist who has ever studied them) would appreciate this end use. The fact of the matter is that not only is Tuareg society quite mixed to begin with, but Tuaregs are in a period of transition after seeing their pastoral livelihoods decimated by recent droughts. In other words, there are some Tuaregs, especially the former slave class, that do not have great reservations about cultivating the soil.

Finally, we heartily agree with the list of guiding principles. We would, however, add two items that we have found to be especially important.

Since the first rainwater harvesting projects will serve as demonstrations for all observers, it is important that they make a significantly observable impact. We had some fairly good results on some of our initial projects, but interest in the programme only really caught on in the third season after we had constructed a system that flooded over 100 hectares of desert land and permitted farmers to harvest sorghum yields of 1.7 tonnes/ha where no crop had ever been grown before. The key factors in this success were good soils, a gradual slope that allowed for a large flooded area with a minimum of construction, and a 'before' situation (barren, eroding soil) that made the 'after' situation all the more remarkable.

Attention should be paid to land tenure systems. Some agricultural areas have land-tenure systems that discourage investment in conservation systems. Sometimes the land is owned by the 'chief' or rented out to the landless by the rich. In pastoral areas, the problem is often worse, as usually all grazing land is common property. We helped solve this problem by formulating contracts signed by local government authorities in which all rights to the benefits from improvements made to the land reside with the person or community making such improvements. ●

Barry and Janine Rands
B.P. 10853, Niamey, Niger.