WATER HARVESTING:

A KEY TO FOOD SECURITY FOR AFRICA?

A team of Free State researchers believe they have found an affordable and effective tool to significantly increase food production in Africa. With the water harvesting technique they have enhanced, the productive potential of millions of the continent's semi-arid hectares can be unlocked. Marleen Smith reports.

One may just as well describe it as a wage which is sweeping across the former homeland villages of Thaba Nchu, east of Bloemfontein.

A water harvesting technique being developed by a team of researchers from nearby Glen is making productive again village land which has been lying fallow for ages. Probably the most talked about part of this revolution is how it provides food and income where there was either none or too little before.

Best of all is that it costs very little apart from manual labour in an area where jobs and wage money are almost as scarce as food.

Researcher Cobus Botha says the evident success of the technique is selling it fast among villagers.

Botha is leader of the water harvesting research projects executed by the Agricultural Research Council's Institute for Soil, Climate and Water at Glen.

The research project, with a total investment of more than R10 million, is being funded by the Water Research Commission, and has been expanded to focus on other techniques and provinces within South Africa.

One of the backyard farmers, Daniël Mutaung from the village Feloané near Thaba Nchu, on his maize plot which was cultivated conventionally (without the use of the water harvesting technique).

Daniël Mutaung on his maize plot in which he used the water harvesting technique. Both pictures were taken on the same day.

Botha says the six villages who employed the technique as part of the research project during the previous production season, has increased to 32 this year. More than 230 backyards in these villages have been prepared by their owners to use water harvesting in the coming season to grow food crops.

TECHNIQUE

The technique is simple: A field is divided into 3 m wide contour strips. The 3 m strips are further divided into two areas – a 2 m run-off strip and a 1 m water-collection strip, consisting of a shallow furrow No tillage is practised on the run-off strips. One of the most important farming activities is to keep these strips clean of weeds. Crops are planted in rows on both sides of the basins.

During a rainstorm, run-off water from these 2 m strips is collected in the basins.

In the basins, the water percolates deep into the soil, from where it does not evaporate.

Botha says this is critical, especially during the fallow period between crop growing seasons. Rainwater stored in the soil during this period gives the crop a significant pre-planting water advantage. Further adaptations of the technique include the use of organic mulches and/or stones to prevent evaporation and facilitate infiltration in the basins.

Run-off, and therefore soil erosion, is completely stopped by the basins. Evaporation is reduced significantly by the mulch and stones, which lower the temperature of the soil surface.

Stones can also be used on the run-off strips between the crop rows to improve movement of the water to the basins, Botha says.

The technique is especially suitable for the Thaba Nchu and neighbouring Botshabelo area, where soils are predominantly marginal, with a high clay content and low infiltration rate. Surface crusts form easily on the soil, inducing runoff. Annual rainfall is low and erratic, with low humidity levels and high temperatures during the summer. Around 75% of the rainfall in the area occurs during high intensity thunderstorms, which increases runoff and crust-formation.

With the water harvesting technique these environmental attributes, which normally have a negative impact in conventional crop production systems, are turned into benefits for the farmer.

The technique capitalises on the negative soil characteristics such as low infiltration rate and crusting. It also optimises the use of soil's high water storage capacity and fertility.

Furthermore, the technique frees farmers from unaffordable mechanical dependence to produce crops.

OXEN

As Esau Motlalile, one of the villagers, explains "livelihoods in the area had depended for years on croplands and livestock farming. Oxen were mainly used to prepare the croplands. Modernisation then changed this into the use of tractors, with oxen being considered outdated. This was also due to the deteriorated quality of their livestock.

However, very few had the money to continue farming due to the high mechanical costs.

Masses of our people neglected the use of their cropland due to a lack of finance and agricultural equipment."

HOMESTEAD TRIALS

Homestead trials are far more convincing to villagers than the ARC team's initial cropland trials in water harvesting, says team leader Cobus Botha.

"The backyards are the most effective point of departure, from where villagers can be convinced to employ the technique on their croplands as well," he says.

This is because the villagers are more involved in the homestead production than in crop production on fields far away from their houses.

"When they open their doors in the morning, they look onto their water harvesting plots. In the evenings it is the last thing they see before turning in."

"When it rains, they see exactly how the water collects in the basins on their plots outside. They discuss with guests and neighbours how their backyard crops are growing."

Given the fact that no demonstrations with vegetables were provided by the ARC research team, the villagers became 'researchers' in their own right. They themselves proved that vegetables could also be successfully grown with the new technique.

Many of the farmers also stopped producing crops due to continuous crop failures, attributing it to the low and erratic rainfall and marginal soil quality.

The water harvesting technique overcame these problems, making their land productive again, Motlalile says. So much so that the communal and backyard farmers experience yield increases described by some as miraculous. They have even moved from planting mainly traditional crops such as maize and sunflower to a range of vegetables.

In demonstration trials on village croplands the water harvesting technique out-yielded conventionally produced crops with as much as 50% for maize and 55% for sunflower.

In general, the average improvement was 40% on maize croplands, and 25% on sunflower croplands.

Consequent demonstrations in village backyards proved to be even more convincing. During one such trial, maize produced with the water harvesting technique yielded 1438% more than plots which were conventionally treated. For dry beans a mean advantage of 322% was obtained in the backyards.

INCOME

The new technique not only improves the area's food security as far as both quantity and quality are concerned; it also provides additional financial income.

Last season, Samuel, a backyard farmer, harvested 45 large watermelons from an area of 150 square meters. He sold them for an average R14 each, earning R630. Several other villagers earned extra money by selling what they could not eat themselves.

Dr Malcolm Hensley initiated the water harvesting research projects at Glen.

Veteran soil scientist, Dr Malcolm Hensley, initiated the water harvesting projects at Glen six years ago. Hensley, now retired from his ARC post, believes this technique can make not only large tracts of sub-Saharan Africa, but of the whole continent self-sufficient in food production.

He quotes Nobel Prize winning agronomist Norman Borlaug, who has estimated that 600 million hectares of unploughed land in Africa is actually arable. A considerable part of this vast area is probably suitable for application of the water harvesting technique, Hensley believes.

Currently cultivated land in South Africa comprises around 12 million hectares, which is enough to make the country self-sufficient in its food production.

If Borlaug's estimate is correct, it seems that Africa can easily be self-sufficient with regard to food production - if only the correct cultivation methods are employed and the necessary fertilisers are available, Hensley says.

He started researching water harvesting in the late eighties, when realising there was not enough food and work for all in South Africa.

Dr Leon van Rensburg, head of the ARC group of researchers at Glen, in an on-station trial plot used for the water harvesting projects.

The water harvesting research team of the ARC's Institute for Soil, Climate and Water at Glen. From the left are, in front: Naphtaly Mokgohloa, Tshepo Moshonyane, Daniël Thuthane and Elias Sebolai, all technical assistants; behind: Dr Leon van Rensburg, head of the ARC researchers at Glen, Cobus Botha, leader of the water harvesting projects, Trix de Bruin, administrative assistant, Kobus Anderson, Malerata Macheli and Petrus van Staden, researchers, and Thomas Mandries and David Thamae, technical assistants.

He realised that this age old principle, which has been used for centuries in regions like the Middle East, could just as successfully be introduced to African conditions.

For the future, Hensley also wants to see more work being done on techniques to harvest water from outside a field, like from rooftops, streets or adjacent kopjes. Water harvested in this way is already being used successfully in other countries. For Botha, a further avenue is integration of the water harvesting crop production with villagers' existing stock farming.

He also wants to work towards commercialisation of the technique so that it could also be employed in larger scale farming enterprises. Taking into account the large tracts of marginal land not being cultivated currently by commercial farmers, water harvesting on a commercial scale might well be just as big a success as in rural villages.

SA'S POVERTY PROBLEM

Water harvesting technology is very important in South Africa, where the majority of the poor rely on rainfed agriculture, says Water Research Commission research manager Dr Sizwe Mkhize.

"If they can effectively use rainwater, we'll directly or indirectly address the country's poverty problem."

Mkhize says most homesteads have corrugated iron roofs and water tanks which were used in the past to harvest rainwater for domestic use. This is not necessary any more as the majority of settlements now have potable water schemes.

"That investment in corrugated iron roofs and water tanks has to be redirected now, and if it could be to produce food, all the better," Mkhize says.

ENQUIRIES:
Cobus Botha - Tel 082 4144 386
Marleen Smith - Tel 083 459 1408