Learning groups, composed of community members, university researchers, NGOs and government extension workers, have proved effective at increasing food production and incomes in a rural community in South Africa. Specifically, trench beds have been successfully adopted. Results, as measured by members of these learning groups, include improved soil nutrient and moisture levels, as well as economic benefits. This learning process is now spreading to other communities.

Feeding and watering the soil to increase food production

Photo: Authors

More efficient use of water has contributed to increased vegetable production. Here, learning group members are installing drip irrigation on one of the trench beds.

Erna Kruger, Jody Sturdy and Marna de Lange

As poverty in rural South Africa systematically deepens and peoples' meagre incomes and social grants do not cover their basic food and dietary needs, interest in homestead food production has increased, even in areas where the practice was uncommon. Homestead gardening is now being promoted by a number of different government and non-government service providers, as a food security strategy for vulnerable rural families, including those with members living with HIV/AIDS. In these communities, vegetables are mostly grown in communal gardens. But these gardens have had limited success in providing food security and increasing incomes. The groups often suffer from internal conflicts and still lack resources. Moreover, severe water shortages usually occur in the winter months, hampering efforts.

Joint learning and experimentation

Members of a small rural community called Potshini, in the foothills of the Drakensberg mountains in KwaZulu-Natal, decided to initiate homestead food production in their village. They were clear that they wanted to keep the control of food production within each homestead and family, and do their gardening in a natural way, without fertilizers and other expensive inputs. They had come across farmer experimentation as a way of learning, and wanted to continue to learn in that way. The Smallholder System Innovation Research Programme (SSI) at the University of KwaZulu Natal, focusing on rainwater harvesting, had also been active in the area. As luck would have it, we were looking for a community where, through a process of participatory development, we could jointly develop training material for agricultural water use in homestead farming systems. The fit between the expressed need from the community and our aims was good! The working team consisted of representatives from the SSI programme, the Water Research Commission (WRC), the Farmer Support Group (a local NGO), as well as the community level facilitator and the Department of Agriculture extension officer in the area. This team jointly planned and implemented the learning process.

The team worked as two learning groups (totalling 66 members) to make it easy for all participants to attend meetings, which were held at a different homestead in the area each time. Participants agreed to go home and implement the practical demonstrations shared during the learning events and to conduct certain experiments of their own. As a learning group, we jointly assessed each others' work and progress. This process was conducted over a 9 month period in 2006, covering a winter and summer growing season.

We wanted to work with the most promising techniques for improving soil fertility and rainwater harvesting and storage. We aimed at a more intensive production which maximises the use of locally available inputs, and uses resources more efficiently. Examples of methods we worked with include: "run-on" (creating channels for rainwater to flow to the plants), water storage, natural pest and disease control, and deep trenching.

The implementation and progress of the different techniques introduced were monitored during the intervention by learning group members. They reported back at every workshop on their progress. Individual householders were given advice and practical assistance. At the end of the learning process, an evaluation was held for the two learning groups where they gave an assessment of their progress and made plans for the coming year. A further seven volunteers agreed to implement some water management and fertility experiments at their homesteads. The SSI team introduced water measurement equipment in these gardens to scientifically assess the impact of the innovations and technologies.

Community opinions

Overall, most of the learning group members (73 percent) regarded the trench beds (see Box) as the most significant change in their gardens, followed by water management techniques. Yield measurements were not carried out, but learning group members based their opinions on their own observations, according to their experience and experimentation. Most members made a direct comparison between making a trench bed and their normal way of planting. The positive effect of trench beds on their production levels was obvious and very visible. Most learning group members who made trench beds have since made more and continue to use them. The community facilitator has remained active in the area and has supported individual households in a reasonably *ad hoc* way.

Results from the trench beds

Creating or maintaining optimum soil fertility is very important in an intensive production system like deep trench vegetable production. To look at the effects of adding organic matter, both trench and normal beds were tested for phosphorus, nitrogen and potassium levels. The study showed that trench beds provided high phosphorus throughout the soil profile, which should be enough for 5-10 years. This is an important advantage, because adding phosphorus later is difficult due to its lack of mobility through the soil profile. Phosphorus is often limiting in the highly leached soils in this area. Using trench beds also improved the levels of available potassium and nitrogen.

The effect of trenching and run-on on plant water stress was measured in both trench and normal beds. Readings were taken at three depths. The results were very different: trench beds were moist to a depth of 80 cm. Soil in trenched beds was able to absorb and hold rainwater for the plants. In the normal bed, however, much water would run down through the soil, and was not available to the plant. Trench beds therefore increase the water holding capacity of the soil substantially, and provide an even water balance at various depths. This reduces moisture stress for crops over a period of time.

Social and economic impact

A survey conducted towards the end of 2007 by the Farmer Support Group, draws out some of the impacts of the learning groups in terms of changed nutrition, income levels and social impact, among others. For example, regarding incomes, 63 percent of members reported an increased ability to purchase items and to save money. Members managed to save up to 1000 rand (approximately 84 euros) in a season as they are spending less on inputs and related expenses. More than half of the learning group members sell vegetables, most commonly cabbage, spinach and tomatoes. In contrast, community members with vegetable gardens, but not part of the learning groups, did not produce enough to be able to sell.

Related to nutrition, 23 of the 27 households asked reported better nutritional status in the household. This was measured in terms of having greater variety and a more balanced diet, eating fresh food, using less fat and not getting sick as often. Some households are also including nutritional aspects when planning their gardens; such as diversifying their greens and including more legumes for protein.

In terms of social impact, more than 90 percent of members felt that the project influenced how farmer groups operate. The major changes were instilling of confidence, self-reliance, motivation and independence, followed by willingness and opportunities to share knowledge and skills, and the provision of infrastructure and training.

Wider outcomes

Variations of this learning process were conducted in another five communities across South Africa, between April and December 2007. From these different experiences, some recommendations emerge:

- It is possible to run the workshops in a number of different combinations to cover content and learning process. It cannot, however, be squeezed into less than four sessions, or be conducted over less than one growing season (4 months), to ensure that some impact is realised.
- Without household experimentation, mentoring and household follow-up visits, adoption and uptake is between 0 - 30 percent.
- With mentoring and follow-up, adoption and uptake can be as high as 70-90 percent (in Potshini it was around 60-70 percent).

Learning group members are a lot more aware of the need to look after their soil and now employ a number of different ways to do this, of which the trench beds is the most popular. They are also a lot more aware of the need to include organic matter and to have dedicated beds and paths to avoid soil compaction. For community members, the focus, however, is not really about increasing soil fertility as such; rather it is that such improvements in their gardens have led to an increase in production (quality, quantity and diversity), which has had a positive impact on other aspects of their lives. ■

Our experience with making trench beds

We refined our method by observing the trench beds made by learning group members. This is a summary of a pamphlet produced with and for community level gardeners, written in the local language, and used in learning events.

- Dig a trench 60cm or deeper, and about 1m wide. Separate the topsoil and subsoil while you are digging. If your subsoil is very infertile, do not use it in the trench. Spread this soil around the garden to help channel water towards your bed.
- Place a layer of branches or old squashed food tins (about 3 tins deep) at the bottom of the trench to help with aeration and also with supply of some nutrients. (We have not found any adverse effects in using iron based tins. Results from soil samples taken from trench beds and analysed indicated a marginal increase in the iron content in these beds.)
- Fill the trench with a range of organic materials and topsoil. First add dry grass or weeds (about 10 cm deep), then add manure (about 2 cm deep). Add also some wood ash (less than 1 cm deep), then add a layer of top soil (about 5cm deep). Mix these layers with a fork, then stamp them down by walking on them. Finally, water the mixture well!
- Build up the trench bed to about 10-15 cm above soil level. Use a good mixture of topsoil and manure and/or compost. The organic material in the trench needs to decompose for about 2-3 months before planting.
- The trench bed can also be used as a seed bed. In this way, when your seedlings are ready to be transplanted, the trench bed will be ready for planting.
- It is very important that the trenches are watered well while making them, and afterwards. The organic material in the trench cannot decompose if it is dry.

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Further reading

- Mudhara, M., M. Malinga and M. Salomon, 2008. **Enhancing farmers' innovative capacity in soil and water management through participatory action research in Potshini, South Africa**. To be published in: *Physics and Chemistry of the Earth*.