POLICY BRIEF

October 2021
The WRC operates in terms of the Water Research Act (Act 34 of 1971) and its mandate is to support water research and development as well as the building of a sustainable water research capacity in South Africa.

Water use for food and nutrition security at the start-up stage of food value chains

Unlike most of the southern African countries, South Africa is largely food secure at a national level. However, access to this food by poor households is a serious issue where more than 14 million people struggle daily to access food. Homestead gardening plays an important role in contributing to the food security status of poor households in developing countries, including South Africa. Effective water use at the household level would mean increased production of food, which may guarantee an adequate supply and open up selling opportunities of any surplus, thus allowing the poor to enter the agricultural value chain and earn an income. A recently completed study funded by the Water Research Commission (WRC) investigated the water use for food and nutrition security at the start-up stage of food value chains. The study makes several recommendations towards the improvement of household food security.

Background

The project focused on water use for food and nutrition security status at the start-up stage of food production. It was a four-year project, based in KwaZulu-Natal and the Free State. The rationale for the project was the food and nutrition deficit of the very poor, where poverty and food insecurity are expressed by an endless cycle of malnutrition and poor societal and economic development.

The high rates of malnutrition in rural communities are a stark reminder that the link between agriculture and nutrition is broken. There is no value chain system between seed and plate and where farmers and poor households purchase most of their fresh produce.

Given the high unemployment rate in rural communities in KwaZulu-Natal and the Free State, many families suffer from hunger and poverty daily. Although some of these families receive a form of government grant and help from a school feeding scheme, they are not food secure and do not have sustainable livelihoods.

Malnutrition and the role of homestead gardens

Malnutrition negatively affects all aspects of an individual's life and households suffer long-term effects and irreversible changes because of poor nutrition in early life. Homestead gardening plays an important role in contributing to the food security status of poor households in developing countries, including South Africa. Effective water use at the household level would mean increased production of food, which may guarantee an adequate supply and open up selling opportunities of any surplus, thus allowing the poor to enter the agricultural value chain and earn an income.

Agricultural value chains in South Africa are driven by agri-business with negligible contribution from smallholder farmers, yet most vulnerable households (rural and peri-urban) depend on produce of smallholder farmers for access to extra food albeit not adequate, nutritious and not always safe food. It is thus important that the contribution of food production in homesteads is explored.

Water is very important for value chain development in agriculture, but it is a scarce resource. Therefore, water use productivity must be enhanced using climate-smart technologies (CST) so that yield and nutrition outcomes can be improved.

A mixed-methods research approach was used for this project to attain a comprehensive understanding and observation of performance of the technologies. Monitoring of field trials and the learning of the farmers and extension officers formed part of the study. The impact of agronomy treatments on nutrient content was analysed by planting vegetables rich in Provitamin-A and the concentration of

the nutrient along each CST treatment was assessed during planting.

This multi-pronged approach to data collection and analysis helped illuminate the processes that might enhance the agency and empowerment of farmers, households and communities in their journey towards attaining improved water and land-use security.

The major findings of the study can be organised into three main groups, described below.

Climate smart technologies (CST's)
Results from on-farm demonstration plots have showed increase of yields from homestead garden production and smallholder farming plot is considerable through the use of appropriate CST's. In Swayimane, yields increased by 45% and 55% on respective two demonstration sites compared to their normal farming practices.

Similar improvements were also observed in the homestead gardens, where a variety of vegetable crops were produced through the use of in-field rainwater harvesting (IRWH) alongside recommended crop and soil management practices.

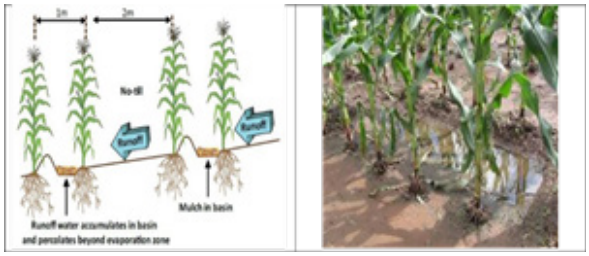

Figure 1: Diagrammatic representation of the IRWH technique.

In Gladstone (Site 3 & 4) homestead gardens were utilised as demonstration plots for vegetable production. No field crops were planted due to restricted land. The yield increases for spinach at the same sites were 60% and 96%, respectively, indicating the beneficial effect of IRWH, which further stopped ex-field runoff completely.

This helped to increase the water available for plant growth and increased yields. The results further show benefits of combining IRWH with sound management practices, including mulching and fertilizer application, shown by the beetroot yields increase of 236% compared to the control at 68%.

The research demonstrated that resource poor farmers can improve yields and thus incomes through the use of IRWH and sound management practice and thus it is recommended that the technologies be promoted, particularly in low-rainfall areas. Insufficient rainfall is the most limiting factor for crop production, to improve their food production and household food security status.

Institutional arrangements
Institutional arrangements were studied and analysed for natural resource management, human resources and markets for this study. For natural resources, the Bio-resource Data (Swayimane) and the SASCS (Gladstone) were used to distil the natural potential of each area to assess the human and market related resources for ensuring food and nutrition security.

In human resources, various demographics were analysed. In both areas of study, older people dominated the groups (older than 40). Frequency of ill-heath was expressed by participants. In both areas of study, the household food insecurity access scale (HHFIAS) indicated that households experience food insecurity, but that in Gladstone the households were more food insecure.

There were differences in the farming systems in the two sites to water availability, but largely due to land usage.

In KwaZulu-Natal, there were smallholdings for farming and food gardens, while in the Free State only food gardens were applicable to the study since croplands were not used for more than thirty years. In Swayimane, all community members have very big gardens that can be classified as croplands, based on their size (1 - 8 ha and more). The large sized lands were being used effectively in Swayimane. In Gladstone, only 0.5 - 1 ha land was utilised.

Both study sites are still governed by traditional leadership. The traditional authority in Swayimane facilitates and manages access to and the use of communal land, which is ultimately held in trust on behalf of the community. Similarly, in Gladstone, the land was in trust by Barolong-Boo-Seleka Traditional Council.

In both areas the traditional authorities are consulted on access and use of land. Therefore, implications on interventions in the food gardens and field must be considered.

Loose and non-identifiable arrangements were found for water use in both study areas, indicating a need for intervention. The institutional arrangements were also weak

for enterprise development and great intervention will have to be embarked on, based on the findings.

With regards to institutional arrangements for marketing, they were poor to non- existent. Although farmers in Swayimane were part of co-operatives, these were for primary production. No secondary co-operatives existed for there were no marketing committees and crop scheduling was not a concept that was understood. Marketing of crops was uncoordinated and largely at farm gate, through external merchants and traders known as "bakkie/van" traders due to them arriving in loading vans.

Nutrition and food security

CST's implemented in the study included combining IRWH technology with sound management practices. These included mulching and fertilizer application. Vegetables were harvested and analysed to assess if the agronomic treatments and water use had any effect on nutrient profiles of the various vegetables.

The results indicate that there were significant differences in the nutrient composition of vegetables cultivated in two seasons (season 1: February to May and season 2: September to December). Overall, vegetables produced in the first season showed higher nutrient content.

In general, the treatment combination's IRWH and mulching resulted in the highest ash, fibre and iron content, compared to the other treatments.

Enhancing nutrient content of vegetables

Generally, the results imply that the nutrient content of vegetables can be enhanced using different agronomic treatments. The overall nutrient content of different vegetable types was better when planted under the IRWH technique during the summertime.

In winter, due to less rain, this was not the case. For Provitamin-A, it was found that the level of Provitamin-A varied among the vegetables assessed. In the first season, the Provitamin-A level for both cabbage and beetroot did not significantly change as a result of agronomic treatment and water use.

However, in the second season, a significant variation in the levels of Provitamin-A was observed among the treatments for all tested vegetables. In the second season, when spinach and beetroot were cultivated under CON with the combination of organic and inorganic fertilisers, there was a significant improvement on the level of Provitamin-A content.

This implies that the Provitamin-A content of spinach and beetroot increases as vegetables are cultivated under drought stress conditions. The opposite was true for sweet potato, as the Provitamin-A content was highest when the vegetable was produced under the IRWH technique with the combination of inorganic fertiliser.

The season of planting had significantly affected the Provitamin-A content of beetroot. Overall, higher levels of lutein, zeaxanthin and Provitamin-A content were recorded from the beetroot cultivated in the second season. While lutein and zeaxanthin are types of carotenoid pigments, they do not possess Provitamin-A activity.

Marketing

Marketing of crops was uncoordinated, was largely at farm gate, through external merchants and traders known as "bakkie/van" traders due to them arriving in loading vans.

Unsurprisingly, both areas studied find it difficult to access these lucrative markets, despite being close to urban areas that have large retailers and wholesalers for fresh produce. This is the outcome of smallholder farming and not occupying a niche market.

The crops planted by farmers in both study areas are common; therefore, they struggle to attract demand from larger markets. However, a few successes by knowing an external merchant that buys directly from them.

In Swayimane, there are weak market networks and links, which results in a high proportion of co-operatives not selling their vegetable produce to large formal markets. In Gladstone, there are no existing markets apart from informal markets where prices are sometimes set by the buyer instead the seller.

Many Swayimane smallholder farmers sell their produce informally to middlemen, neighbours, pension markets, and street vendors on the roadside in Pietermaritzburg, Dalton and Wartburg. Other available markets for smallholder vegetable farmers in and around the area are government schools through their feeding schemes. Potential exists in producing niche crops such as Madumbe. An application-based platform as already started buying niche crops from Swayimane.

Facilitating market access

Facilitating market access and improving value chains can be improved. A process called Smallholder Horticulture Empowerment Promotion (SHEP) adopted from Japan was revitalised and by this project. Extension officers have been

trained and refreshed on the process and getting farmers ready.

Farmers have been engaged and training has been scheduled in the participating farmer groups. Farmers already benefiting from the SHEP model are being identified for farmer-farmer learning in Swayimane. In the Free State, a SHEP co-ordinator has been identified but difficult to locate and engage.

Conclusions and recommendations

The study shows that IRWH combined with agronomic management practices including mulching increased yields, improved mineral and Provitamin-A in various vegetables. Planting vegetables with the use of IRWH is the first season improve Provitamin-A in sweet potato and various minerals in the other vegetable.

It is recommended that water harvest technologies, particularly the IRWH be upscaled and supported by extension services and other lead farmers. Increased water availed by the IRWH technology availed more nutrients hence the improved nutrient profile in the vegetable.

Upscaling the use of IRWH is encouraged to be implemented by farmers with the support of extension officers. Increased yields mean farmers can sell more produce for improved income and improve food security and livelihoods.

However, institutional arrangements related to water and water should be strengthened to improve access to these resources in order to afford farmers an opportunity to improve their opportunities for income. Market access needs to be improved through improving current value chains and accessing establishing others.

The SHEP process is one model that should be strengthened for farmers and extension officers to co-identify opportunities and niche markets for farmers.

Related report

Water use for food and nutrition security at the start-up stage of food value chains (**WRC Report No. 2555/1/20**). To download the report, Visit: www.wrc.org.za