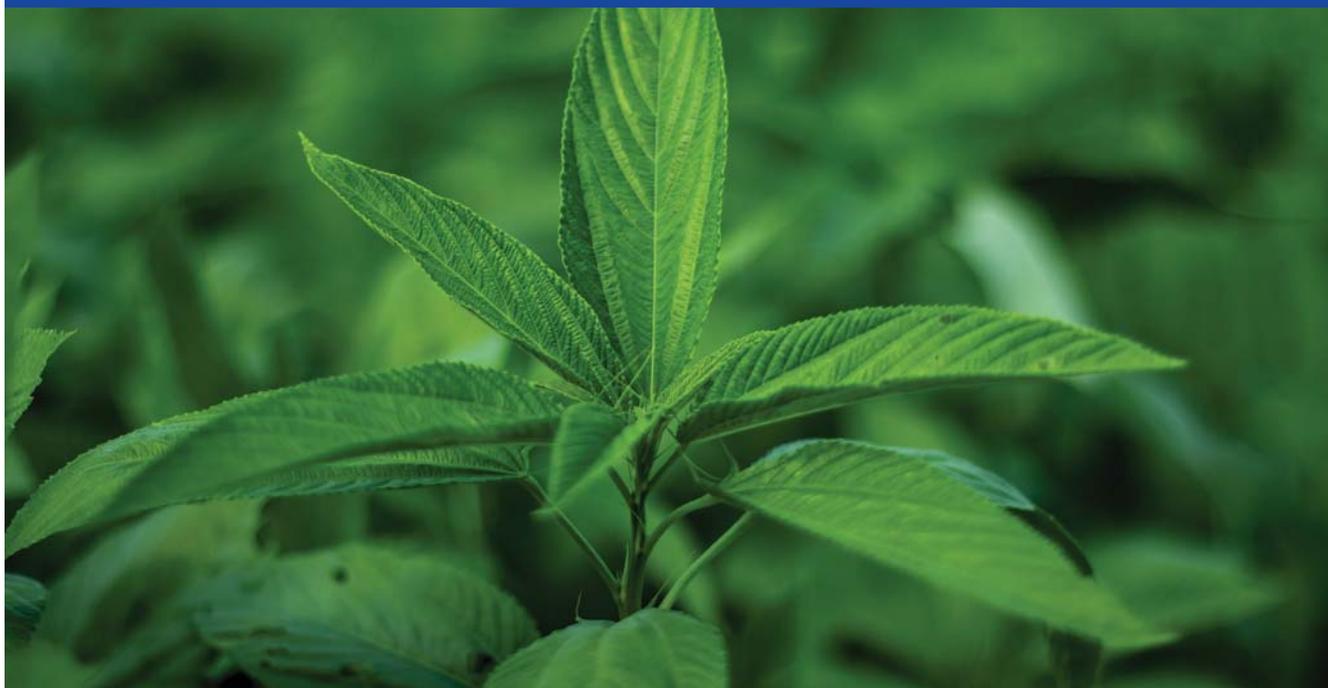


UNDERUTILISED CROPS

Clicking the puzzle pieces in place to commercialise indigenous crop production

Tomatoes, potatoes, onions, spinach and bananas are likely food items in homes all over South Africa but, millions also browse the options at bustling roadside stalls for home-grown crops such as nightshade, pumpkin leaves, lablab and Bambara groundnuts. Once, a helping of amaranth would have been common but our dinner plates are now piled with widely available, commercially produced exotic produce like corn and rice. It's little wonder that our local crops are dubbed 'forgotten', so writes Petro Kotzé.



Yet, many still remember. "Their documentation has been neglected, but for consumers, they are very relevant," says agricultural economist and senior lecturer at the University of South Africa (UNISA) Graduate School of Business Leadership, Dr Binganidzo Muchara. They lack scientific scrutiny in comparison to conventional and commercial crops, he explains.

However, on a mission to help ensure that each South African has access to sufficient, safe and nutritious food for active and healthy lifestyles at all times, the WRC has turned back to South Africa's agricultural roots. For decades, the organisation has geared significant funding towards filling the scientific knowledge gaps in the way of the uptake and commercialisation

of indigenous crops. This January, another integral piece of the puzzle has been slotted into place, documenting a major aspect of our domestic 'super foods' for the first time.

What we know, and what we need to know

So-called 'neglected and underutilised' crops refer to those edible plants that were once popular within certain geographies and communities but have since been displaced by mainstream crops (as reported in the March/April 2022 edition of *The Water Wheel*, **Why 'forgotten' foods are a key ingredient to food security**). They include cereals like sorghum and tef; legumes like Bambara groundnut, lablab, cowpea and Marama bean; roots and tubers like taro and sweet potato; and, leafy vegetables

like Jews mallow, spider plant, amaranth, nightshade and wild watermelon.

Numerous research projects have proven the value of these crops. We now have empirical evidence that many of them are more drought and heat-stress-tolerant than commonly available commercial crops. They are often exceptionally nutrient-dense and offer elements essential to people's survival. We also know that most of these crops will be able to expand into new production areas and that there will be some gains in yield and water productivity under predicted future climate conditions. A list of 13 priority underutilised crops with the most potential for success has already been identified. The underutilised crops identified by the WRC are not easily attacked by diseases and pests so far, they use less water but produce high yields.

"From the laboratory perspective, we understand what the nutritional values are and what the agronomic water use at the farm level is," Muchara says. "But none of those studies yet pursued the post-harvest value chain." The most recent project, for which Muchara was the project leader, dug into that. The project (WRC project no. K5/2715/4), titled 'Water use in food value chains of indigenous crops with special focus on production and post-harvest handling of food products' was undertaken by the Independent Institute of Education MSA (IIE-MSA) in collaboration with researchers from Cape Peninsula University of Technology (CPUT) and UNISA.

The researchers were Muchara, Morris Fanadzo, Bimo Nkhata and Linda Downsborough with contributions from Derek Mavesere, Joseph Kamfwa and Tshepiso Sithole.

The objectives of the project were to provide a detailed review of water use in the production, use and post-harvest handling processes and value chains of indigenous crops, specifically legumes, tubers and leaf vegetables. Another was to understand how the crops are handled, marketed and consumed. The last was to develop an action plan to enhance the uptake, commercialisation and use of the crops in South Africa.

"If we understand the production patterns, post-harvest issues and what the value chain looks like we can better advise farmers and policymakers about how the economy and specific producers can benefit," Muchara says. If we understand this value chain, we can see how and where farmers can access markets, and further grow the uptake of the crops locally, nationally, regionally and internationally. The impact, he says, will then be improved nutrition and food security and resilience to climate change.

However, being a relatively 'new' field of formal scientific study, there is precious little published data to lean on. If you expect to find data on the yield of an indigenous crop the same way that you would find some for, say, tons of maize in a certain silo, you will be disappointed, Muchara notes. However, the problem is not a lack of information, he adds, but that it just has not been captured in a scientifically robust format. Instead, the data sits in the minds of the people and the communities.

"Most of these underutilised crops are managed by farmers with their own traditional way of understanding agricultural

activities or management, but this kind of knowledge is not documented," confirms Prof Sylvester Mpandeli, Executive Manager for Water Utilisation in Agriculture at the WRC. Not only is this challenging from a research perspective, but it has become hugely problematic when older generations pass away and this knowledge is lost, he explains. "We have decided to start documenting this indigenous knowledge so that the future generations would be able to access it too, and, to combine this traditional knowledge with conventional research in order to make it scientifically robust."

Combining conventional and traditional knowledge For their data, the research team had to go directly to the people that grow and manage the crops. They conducted their work with the Ha-Mapila and Luvhada communities in the Vhembe District in Makhado, Limpopo and Dingleydale and New Forest communities in Bushbuckridge in Mpumalanga. Data for leafy vegetables, including Chinese mustard, black nightshade, jute mallow and pumpkin leaves, were collected mostly from the Limpopo sites, while data for legume and tuber crops were gathered from the Mpumalanga sites.

"We took the time to go into the field and understand what is actually happening," Muchara says. First, they had to introduce themselves to the Agricultural Extension Officers, who then introduced them and their objectives to community members. The project also employed local matriculants and unemployed



Brand SA

A strong case is being built for indigenous crops to contribute to South Africa's future food security.



Exotic crops have become staples of our meals, but we are missing out on the multiple advantages of indigenous crops.

graduates to help with translation, tabulation, interviews and questionnaires.

In order to define the water use along the value chain, the project team needed to understand the activities that take place after the crops have been harvested and the produce is taken by the farmers or traders, or sold at the farm gate. Most of the crops are often simply picked from the wild, Muchara says, but they also worked with farmers that are growing the crops under irrigation. Their fieldwork thus entailed time spent in communities, smallholder irrigation schemes and selling points, and speaking to and observing growers, traders, sellers, and middlemen. This allowed them to document activities from the farm gate, to where the produce is moved to a trading stall by the roadside or market and eventually bought by the final user.

The post-harvest value chain of indigenous crops in South Africa

In terms of fertilisers, producers of black nightshade and Chinese mustard mainly used conventional fertiliser to supplement soil nutrients while those that produced pumpkin leaves and jute mallow used organic fertilisers such as compost and manure. In addition to the above, Limpopo farmers who produced Chinese mustard and nightshade under irrigation accessed their inputs from retailers around Thohoyandou and Makhado towns.

The study revealed that the major motives for growing and marketing indigenous crops among smallholder farmers are for home use and to potentially sell for extra income. When sold, the vegetables are harvested from the fields to various markets, to consumers. Several actors participated in the post-harvest value chain from production to marketing. For leafy vegetables, people mostly use informal channels whereby the producer sells directly to the customer and incurs lower transaction costs.

Because the value chain is short and informal, the produce was not processed.

About 54% of farmers in Limpopo sold their leafy vegetables to hawkers, who are the biggest actors in the post-harvest value chain apart from farmers themselves. Pricing is determined by both farmers and hawkers. Although the quality required by hawkers is not as high as that for formal retailers, they do give preference to farmers who produced better quality vegetables. Most hawkers used water for cleaning and maintaining value at their respective selling points, and most of the water was reused throughout the day as hawkers tried to sell all their stock. Cassava and Bambara nuts were rarely washed before being sold.

The distance from the farm gate to the market affected the amount of water used. Farmers who travelled longer distances by public transport and those that used wheelbarrows often used water during the transportation of their stock from the farm gate to the market. Most hawkers, however, used public transport to carry their vegetables to the market.

The formal channel is dominated by retailers such as Pick 'n Pay, Spar, Shoprite and Choppies. Farmers delivered their own products to shops at an agreed market price. Consumers, the final link in the value chain investigated, purchase vegetables either from the roadside, farm gate or retailer. They are mostly individual households in rural and urban areas.

Mapping the movement and players involved in the production of the crops allowed the researchers to identify various bottlenecks and opportunities to improve along the way.

For one, farmers say that seeds are not commonly stocked by retailers and can be difficult to come by. Post-harvest losses were another common concern. There is also a lack of appropriate market infrastructure for handling perishable produce and weak links between supply chain actors, including input suppliers, producers and markets. High transaction costs result from unreliable market information and support systems, no guaranteed market prices, farmers' low bargaining power and institutional policies that do not effectively enhance production and marketing.

Over and above, the study has also highlighted the huge scope for market expansion, with both Mpandeli and Muchara pointing out the large potential for producing and marketing processed goods derived from the crops.

Looking beyond water for a food secure future

Mpandeli says it is apt to wonder why the WRC is funding projects that seem to reach so far beyond traditional freshwater issues. "The Water Research Commission has decided to go beyond its traditional scope of funding research, in order to make a real impact, and change the lives of South African people," he says. "Whatever research we derive must create job opportunities for people too." It is believed that the indigenous crops if marketed properly could create job opportunities for our people, stimulate local economy and also improve the livelihoods of our people.

Over and above that, Mpandeli points out statistics that show



Black nightshade (Solanum retroflexum) is an annual herb-like plant that originated in South Africa. It is also known as sunberry, nastergal, Umsobo, muxe, umsobo wesinja, umosobosobo and lintsonso.

how many South Africans go to bed with empty stomachs. According to Statistics South Africa, food insecurity in the country is increasing, and almost 23.6% of South Africans in 2020 were affected by moderate to severe food insecurity, while almost 14.9% experienced severe food insecurity.

Instead of looking at conventional crops to meet that need, Mpandeli says, “let’s rather try to come up with alternative and practical solutions, and diversify in order to also minimise risk to climatic variability and change.”

Our aim at the WRC has expanded, he adds. Over and above aiming for a water-secure future, we want to help ensure that each and every household has access to sufficient, healthy nutritional food. The organisation believes unlocking the potential of indigenous crops will help them get there.

For more information, refer to **WRC Report No. 2715/1/22, *Water use in food value chains of indigenous crops with special focus on production and post-harvest handling of food products.***



Cowpea pods ready for harvesting.

Flying the banner for South Africa’s indigenous natural heritage

The WRC is funnelling substantial funding towards unlocking the potential that lies in our indigenous crops, trees, and livestock. The WRC’s Prof Sylvester Mpandeli explains that the organisation follows a three-pronged approach. The first focuses on underutilised crops, and research projects are now ongoing in all nine provinces in order to cover all agroecological zones.

A second focus is on indigenous livestock, such as traditional goats, which also potentially offer resilience against the detrimental impact of climate change in future.

The third component entails research on indigenous fruit trees. For example, *Water Use and Yield of Selected Indigenous Fruit Tree Species in South Africa (WRC Report No. 2720/1/22)* was completed in August 2022. The project aimed to quantify water use by selected species and to understand how these respond to variables, including soil conditions and climate so recommendations could be made on species suited to specific areas. Results indicated that some indigenous fruit trees use less water than the exotics in commercial orchards.

Other projects are investigating the medicinal value of certain plants and trees and the potential for agro-processing (deriving processed goods from agricultural materials). Extensive research has already been conducted and, Mpandeli says WRC are now pulling results together to see how they can be applied. Among other goals, “we want to make sure that our communities are aware of the opportunities to make edibles or other products that can be taken to formal markets,” he says.