INDIGENOUS CROPS

Why 'forgotten' foods are a key ingredient to food security

Lablab, spider plant, and taro might feel like foreign words on South Africans' tongues today, but once, these crops were staples on local plates. Instead, we now prefer imported crops that have become indigenised over the years, like maize and wheat, but decades-long research has now proven beyond a doubt that our forgotten foods should be brought back for a sustainable and healthy future. So writes Petro Kotzé.

So-called neglected and underutilised crops refer to those edible plants that were once popular within certain geographies and communities, but have been displaced by mainstream crops, explains Prof Tafadzwanashe Mabhaudhi, who has been studying these plants since 2008 when he started his Master's on a WRC-funded project on their water use and tolerance to drought. Mabhaudhi, Co-Director of the Centre for Transformative Agriculture and Food Systems at the University of KwaZulu-Natal (UKZN), refers to sorghum as an example. The crop is popular in some countries, he says, but underutilised in southern Africa relative to its potential and the levels it was used historically, before the introduction of maize.

We are not alone. Nearly the entire global population relies on a relatively small handful of food choices, far removed from local biodiversity and traditions. This dependence on global cultivars is one result of the Green Revolution, a movement in the sixties that transformed how and what we eat, in an attempt to thwart global hunger.

We are not what we eat

The revolution involved the scientific adaptation of select crops to flourish far beyond their natural ranges. When high-yield varieties of cereal crops such as rice, wheat, and maize were combined with the ideal mix of chemical fertilizers and exact

irrigation needs, global food production sky-rocketed. It tripled in the sixties, feeding a population that more than doubled in the same time, on only 15% more land. Today, 75% of the global food supply comes from only 12 plant-, and five animal species. Just three crop types (rice, maize, and wheat) make up nearly 60% of the plant-based calories for the near-8 billion people on Earth.

In South Africa, a megadiverse country that harbours a majority of the Earth's species, bread (from wheat native to West Asia), rice (believed to be first domesticated in China), potatoes (native to the Peruvian-Bolivian Andes), and ***mieliepap*** (corn is widely agreed to hail from Mexico) are the most popular starches enjoyed. In research conducted by Nielsen, commissioned by Knorr on our eating habits, ***mieliepap*** is identified as the most popular traditional or indigenous food consumed in the country – proof of how indigenised alien crops have become.

The Green Revolution had several unintended consequences. We lost agricultural diversity, biodiversity, environmental and socio-economic sustainability, especially among the rural poor who cannot easily enter the value chains of a globally commercialized agricultural system. Over and above, the considerable progress towards combating food and nutrition insecurity on a global scale was not distributed equally. In sub-Saharan Africa, 23.8% of the region is undernourished and most countries identify as food and nutrition insecure.

Furthermore, our major crops are input-intensive. For optimal yield, they need optimal water and fertilizer. For sub-Saharan Africa especially, the warning flags have been raised. Water is set to be a major constraint for agriculture in the region, where the impact of low rainfall in general, will likely be exacerbated by climate change. Additionally, the amount of people in the region that need to eat is fast increasing. But a food secure future goes beyond filling people's tummies.

According to the Food and Agriculture Organization of the United Nations (FAO) "food and nutrition security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life."

"The aim is to build a foolproof argument that these crops can address food insecurity within hotspots, or projected future hotspots from both a quality and quantity perspective."

In South Africa, we have now laid a solid case in support of a return to our roots to achieve this. "Indigenous crops are the food for the future," says Dr Luxon Nhamo, WRC Research Manager for Water Utilisation in Agriculture. Thanks to early support from the WRC, among others, our country has been at the fore of what has slowly become a global movement that increasingly recognises the potential of so-called 'forgotten crops'.

Minette Lontsie

Taro (amadumbe) being sold at a local market.

As a result, we have largely overcome one of the biggest hurdles to introducing 'new' crops to our shelves – namely, the necessary research. Major crops dominate the market thanks to the support of sustained scientific knowledge, says Prof Albert Modi, UKZN Deputy-Vice Chancellor and Head of the College of Agriculture, Engineering and Science. With scientific support, certain crops like maize have outcompeted others, like sorghum, that could provide the same value, he says. Now, we have the facts in hand to prove that forgotten crops deserve a space on our plates once again.

The research that makes a case for traditional crops

Initially, WRC funding was geared towards establishing the water use of underutilised crops in comparison to locally adapted, common crops, explains Nhamo. People were saying that indigenous crops were more drought-tolerant, Mabhaudhi explains, and initial research questions aimed to build up empirical evidence to confirm or dispel such anecdotes. "In many cases, we found them to be true."

"We then added a nutrition dimension to crops that were drought and heat-stress tolerant," Mabhaudhi says. Researchers found several of the crops to be nutrient dense. These crops fit in that aspect of food security beyond simply filling tummies, says Modi, who was an early champion of neglected and underutilised crops in South Africa. "More than access to energy or caloric value, they provide access to the nutrients and other elements essential to help people survive."

The work resulted in a list of 13 priority underutilised crops for South Africa, published in 2017. "These crops present the most potential for success," Mabhaudhi says, and they recommend that resources should be targeted on improving and developing value chains for them.

The list also aims to dispel the perception that these traditional crops offer fewer returns on investment than major crops. The identified traits (drought and heat-stress tolerance and nutrient density) promise prospects for success even over major crops.

Researchers then turned their attention to the crops' performance under future climate change predictions. In work that is close to completion, they investigated whether the crops' water use and efficiency will likely increase or decrease and if the areas suitable for their production will shrink or expand. "By

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A closeup of Jews mallow.

and large the results are promising," notes Mabhaudhi. "In most instances, the crops will be able to expand into new areas for production, and there will be some gains in productivity, both from a yield and water productivity perspective."

The next step, set for completion next year, is to link this information to food insecurity hotspots in the country. The aim is to build a foolproof argument that these crops can address food insecurity within hotspots, or projected future hotspots from both a quality and quantity perspective, Mabhaudhi says.

The bricks in the research foundation to build a new food future with the help of underutilised crops are now standing strong. Scientists have proven that several of our forgotten crops are drought and heat stress tolerant, resistant to pests and diseases, adapted to semi-arid and arid environments, and nutrient dense. They are suitable for marginal conditions, suggesting they could be used to champion sustainable and resilient agriculture and food systems for smallholder farmers residing in these environments.

"We are at the point where we have done enough research to prove beyond any doubt that these crops can be commercialised, be of nutritional value and the water use is such that it deserves space in the South African agricultural industry," says Nhamo. "The remaining, fundamental question," he adds, "is how to mainstream these crops into the food chain."

Tentative steps have already been made in this direction.

Remembering our forgotten crops

For one, ***amadumbe*** (taro) has made it from the small-scale farmer's field to store shelves nationwide. The flagship uMngeni Resilience Project, the first to be funded in South Africa by the Adaptation Fund, is another example. The project saw more than US$ 7 million channelled towards efforts to increase the resilience of vulnerable communities in the nMgungundlovu District Municipality in KwaZulu-Natal through interventions

Lablab, also known as hyacinth bean, with its distinctive purple pods.

Table 1. Priority drought tolerant and nutrient dense underutilised crops for South Africa

	Common name	Scientific name
Cereals	Sorghum	*Sorghum bicolor*
	Tef	*Eragrostis tef*
Legumes	Bambara groundnut	*Vigna subterranean (L.)*
	Lablab	*Lablab purpureus (L.) Sweet*
	Cowpea	*Vigna unguiculata (L.) Walp*
	Marama bean	*Tylosema esculentum*
Root and tubers	Taro	*Colocasia esculenta*
	Sweet potato	*Ipomoea batatas*
Leafy vegetables	Jews mallow	*Corchorus olitorius*
	Spider plant	*Cleome gynandra*
	Amaranth	*Amaranthus sp.*
	Nightshade	*Solanum nigrum*
	Wild watermelon	*Citrullus Lanatus L.*

such as early warning systems, climate smart agriculture, and climate-proofing settlements. Mabhaudhi, the Project Director, says it offered them the opportunity to implement the existing research into practice.

"As part of building resilience in smallholder farming communities we reintroduced some of these crops that we know from our research," he says. The project provided a myriad of support mechanisms to make it happen, including seeds and training to grow the crops, how to harvest and use them. It highlighted a serious concern. In many cases, people have forgotten how to use the crops, Mabhaudhi says. "The knowledge has been lost."

"We're left with one or two generations of people in the rural areas that know these crops, notes Modi. "When they die, the next generation won't even know the names of wild, edible crops and underutilised indigenous crops."

If this knowledge disappears, South Africa will suffer a great loss, according to Modi. Indigenous knowledge includes the ability to feed ourselves and to protect ourselves from diseases. It gives us a place in the economy of the world, he says, and taps into vastly different aspects of our livelihoods. Modi points out that the danger goes beyond the knowledge on the propagation and use of the plants disappearing. Ignored, unknown and undervalued, the plant populations themselves might dwindle to the point of extinction and with it, we also risk losing the associated biodiversity that depends on them.

Research alone cannot change the fate of these crops. South Africans' mindsets need to change too. "There's a huge need to address how these crops are perceived in society and to change the narrative of them being viewed as poor people's or as poverty crops," says Mabhaudhi. Instead, Nhamo says, South Africans should be proud of the cultural heritage embedded in our traditional foodstuffs.

While research has created the space to talk about the crops' potential, we need to get to the stage where this potential is being realised, Mabhaudhi adds. To make this happen, partnerships are essential.

A possible plate of the future

Moreso than research, the realisation of the potential that traditional crops hold for our future, calls for a broad range of actors. These include communities, policy practitioners, and private-public entities, "all of them," Mabhaudhi says. If, he points out, policy changes for maize meal to be mixed with 5% of millet, that would change things overnight. Or, to take another example, if McDonald's served a meal that featured indigenous food, it would change the narrative completely. That happened, he says, when Woolworths, a brand associated with quality products, started stocking ***amadumbe***.

These crops will not replace maize, or common vegetables like cabbage, Swiss chard, and spinach, Modi explains. Those have been scientifically proven to make a significant contribution to our diet but, he says, they have limitations. Instead, their research has proven that underutilised crops can complement the value of our current diet, even in small amounts. Even more so, you can create new opportunities for economic growth at the household level, especially in poor households. Then, there is the matter of germplasm resources, Modi explains. These crops, including crop wild relatives, could be used to improve the traits for nutritional value and stress tolerance of future crops.

For a sustainable future in South Africa, the food system has to change, adds Nhamo. "We do not only have to change what the system feeds us, and how, but also the role that we play in this system."

After decades of shining the light on underutilised and traditional crops, Modi says he would now like to champion broader participation in research on the topic, opening the door for ordinary citizens to become involved too. You might not know it yet, he says, but you are part of this project too.