In developing countries, fruit and vegetable consumption is only **20-50%** **of WHO recommendations**

Food production in Africa needs to **triple** to meet demand in 2050

The ARC genebank holds **54** **commercial breeds** in **10** **different plant groups**, the most common being **potato** and **sweet potato**

The ARC has developed **26** **sweet potato cultivars,** **21** of which are **commercially available**

Local seed companies are responsible for **37%** of all vegetable cultivars developed in South Africa

The ARC spent **R22 million** on **vegetable research in 2012**, up from **R7 million** **in 2009**

65% **of research income** came from **parliamentary grants** in 2012

Investment into vegetable research at the ARC resulted in a **return of** **R140** **on every** **R100** **invested** from 1980 to 2012

Research staff working on vegetable breeding at the ARC has reduced from **100** people in 1992 to **34** **in 2014**

The vegetable research programme at ARC-VOP

Vegetable research at the ARC-VOP falls into five categories: vegetable breeding, crop science, genetic resource conservation, plant protection, and biotechnology research.

Vegetable breeding: this section once conducted breeding programmes for tomatoes, dry peas, pumpkin, green peas, green beans, cauliflower, squash, and broccoli. Now, however, the only breeding programmes are for onion, potato, sweet potato and tomato. Recently, researchers have also started breeding indigenous vegetables and medicinal plants.

Crop science: This section has been going since the 1940's and focuses principally on the development of good agricultural production systems (GAP) for commercial and indigenous vegetables as well as medicinal plants. Another recent focus area has been agro-processing technology and new product development from medicinal and vegetable plants.

Genetic resource conservation: the ARC-VOP has collected and stored plant material since the 1950's, both as a resource for developing new cultivars and in order to maintain the quality of existing cultivars.

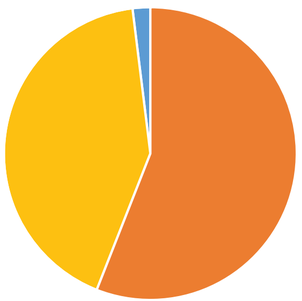
A major focus of this section is conserving potato genetic resources for commercial farmers – the ARC is the sole provider of potato planting material in South Africa.

Sweet potato genetics is also very important to the institute. The ARC-VOP holds genetic material for more than 500 sweet potato varieties, and is the principal supplier of planting material in the country, for both commercial and subsistence farming.

Plant protection: covering plant pathology, virology, nematology, and entomology, this research is all about understanding threats to vegetable production. From an expansive research division in the 1980's, this section now focusses on fungal and viral diseases in sweet potatoes, potatoes, vegetables, indigenous vegetables, medicinal and ornamental plants, as well as insect and nematode pests.

Biotechnology research: this research focusses on using molecular and laboratory methods to improve crop plants or combat disease. In particular, researchers have identified useful molecular markers – short stretches of DNA that indicate specific plant traits. This can help speed up cultivar trials. Researchers work in close collaboration with the ARC Biotechnology Platform, which focusses on full genome sequencing of plant pathogens.

ARC-VOP research spending in 2012



Indigenous plants **56%**
Vegetables **42%**
Ornamental Plants **2%**

The economic value of vegetable research in South Africa

Compiled by the Agricultural Research Council's Economic Analysis Unit for ARC's Vegetable and Ornamental Plant

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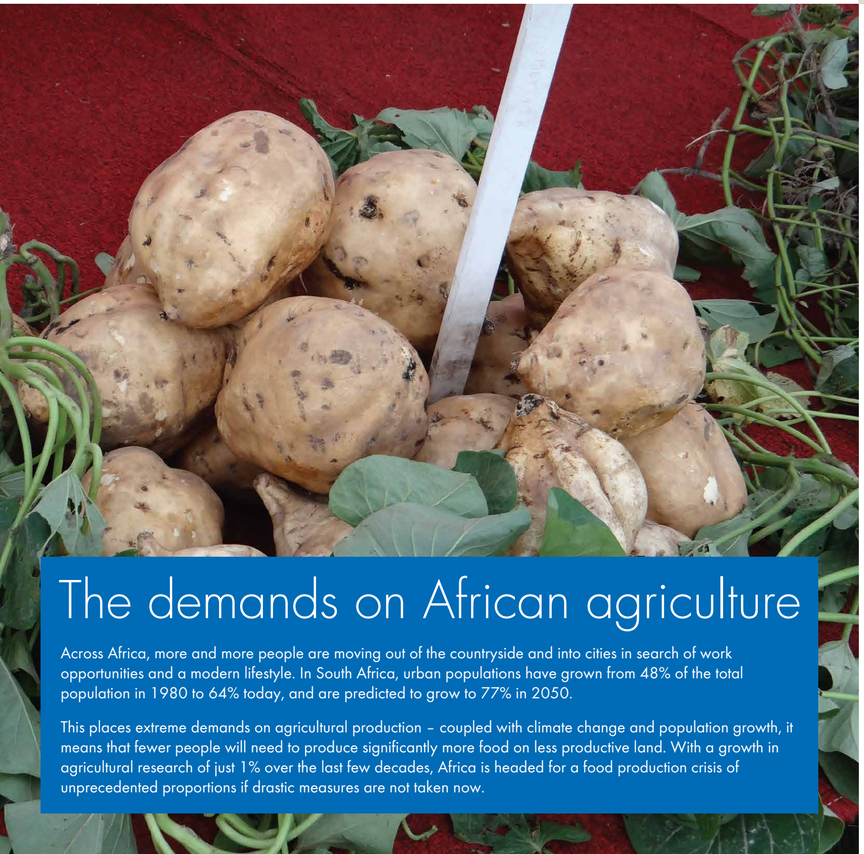
The history of the ARC-VOP

The history of vegetable research in South Africa starts with the Transvaal Department of Agriculture in 1902, which set up a Division of Horticulture to develop improved planting material and improve crop techniques in the region. When World War Two broke out in 1939, a local seed industry grew to address the vegetable seed shortage in SA, supported by evaluation at the Division of Horticulture.

The Horticultural Research Institute was founded in Roodeplaat in 1949 to continue this work; the ARC-VOP is still found in the same location today.

In the 1980's, fruit research was shifted to the Fruit and Fruit Technology Research Institute, while potato research came to the institute from the then Transvaal region. Around the same time, it was renamed the Vegetable and Ornamental Plant Institute (VOPI). In 1992, it became part of the newly formed Agricultural Research Council, to become the ARC-VOP as it is now known.



The demands on African agriculture

Across Africa, more and more people are moving out of the countryside and into cities in search of work opportunities and a modern lifestyle. In South Africa, urban populations have grown from 48% of the total population in 1980 to 64% today, and are predicted to grow to 77% in 2050.

This places extreme demands on agricultural production – coupled with climate change and population growth, it means that fewer people will need to produce significantly more food on less productive land. With a growth in agricultural research of just 1% over the last few decades, Africa is headed for a food production crisis of unprecedented proportions if drastic measures are not taken now.

Vegetable research funding and capacity at the ARC has diminished significantly in recent years, and the institute is at risk of not providing the research required to maintain a viable agricultural sector in the face of growing food production demands. This is in spite of the clear positive impact that research investment has had in the sector.

Research shows that people in developing countries eat less than 50% of the recommended amount of fruit and vegetables every day. In addition, the changing demographics of the African and particularly South African population over the next 30 years is set to have a major impact on food demand and production in the region.

This illustrates the important role of vegetable research and agriculture in supporting South African communities now and in the future. However, public investment in agricultural research in sub-Saharan Africa has grown at just 1% per year over the last four decades.

To quantify the value of vegetable research to the South African agricultural sector, this study measured the economic impact that ARC research has had on South African agriculture in the last 30 years. In addition, it looked at funding and research capacity at the ARC's Vegetable and Ornamental Plants (ARC-VOP) institute where this research takes place.

Researchers found that while the ARC-VOP once conducted research on a wide range of vegetables – tomatoes, dry peas, pumpkin, green peas, green beans, cauliflower, squash and bitter cucumber to name a few – the institute now conducts research on onions, tomatoes, potatoes, sweet potatoes, indigenous African vegetables, medicinal plants as well as ornamental plants.

Similarly, research capacity at ARC-VOP has decreased from approximately 100 researchers in 1992 to 34 in 2012. The biggest personnel losses were in plant breeding, plant biotechnology, and crop protection research. In recent years there has been a significant increase in crop sciences and agro-processing research.

In 1992 the ARC-VOP shifted its research focus to the development of indigenous crops. Research on ornamental plants decreased due to a lack of funding, while breeding of vegetables was also scaled down due to insufficient research staff and decreased funding. Funding in general at the ARC-VOP has been inconsistent and declined over the past 10 years.

Despite this loss of capacity and funding, the study found that what money was invested in vegetable research had a major positive impact on commercial agriculture. For every R100 invested in vegetable research at the ARC, researchers saw a R140 improvement in the industry as a whole. This is a very positive rate of return, and shows that investment in vegetable research should be increased significantly to help grow the sector.

Measuring the economic returns on vegetable research

To understand what impact the ARC-VOP's research had on the agricultural sector, researchers used a mathematical model called a production function. This looked at how factors such as weather or investment in vegetable research affected the total vegetable output (in tonnes of produce) over the period 1980-2012.

Potatoes, onions, tomatoes and sweet potatoes were included as these were the vegetables with the most consistent research programmes over the period, and are now the only commercial vegetables that the ARC-VOP is still researching.

Researchers found that increases in R&D expenditure and area planted both increased the volume of vegetables produced. Similarly, favourable weather conditions increased production while bad weather decreased it. R&D had a 15-year impact on vegetable production, while weather and area planted had an effect in the same year, demonstrating the long-term value of R&D funding.

Money invested in R&D showed a return on investment of 39.68% - for every R100 invested in research, the sector saw an economic return of R140. This indicates that there is a significant return on investment in vegetable research and that R&D expenditure should be increased to support and grow South Africa's vegetable industry.

Research funding for the ARC-VOP has been inconsistent over the last two decades