

ARC PLUM RESEARCH AT A GLANCE

It costs **R158 819** to establish an orchard, **45%** of which goes to plant material, land preparation and irrigation



Every year, it costs farmers **R167 000/ha** to maintain a **bearing** orchard, and **R80 000/ha** for a **non-bearing** orchard



67 100 tonnes of plums are produced annually, of which **49 000 tonnes** are exported



16 of the **39** **top plum** cultivars exported from SA were developed by the **ARC**



5000ha are currently under plum cultivation, **500x** more than in 1950



There is a **R114.23** return for every **R100** invested in plum R&D



6% of the area used for deciduous fruit in SA is dedicated to **plums**



Plum research priorities at the ARC

Obtaining the ideal bold-flavoured, firm, juicy-but-not-mushy plum that can withstand six weeks' storage at -0.5 °C is no easy task. Factor in climate and soil variations, disease, internal damage and expensive inputs like fertilisers and pesticides, and it becomes clear that farmers need technological help to become profitable. It takes many years of research and breeding to DEVELOP the ideal plum CULTIVAR.

Research at ARC Infruitec-Nietvoorbij is targeting aspects of plum breeding, pest management, and disease resistance to address these challenges. Biotechnological tools hold promise as a new way to reduce the time and cost of research and development.

One of the current priority tasks for the ARC is to breed a late-maturing cultivar to help extend the plum



harvesting period and ensure consistent supplies of plums across the growing season.

Another major focus at ARC Infruitec-Nietvoorbij is to develop improved rootstocks – the roots and trunk of a tree onto which other cultivars can be grafted. The rootstock breeding programme will contribute rootstocks adapted to varying soil conditions and able to resist various soilborne pests and diseases.

Lastly, researchers also focus on ways to manage pests such as fruit flies more effectively. One example of this is the Sterile Fruit Fly programme which releases massive numbers of sterile fruitflies every year to reduce reproductive success in the ubiquitous pest.

Funding plum research and development

In South Africa, the majority of plum breeding R&D is carried out by the public sector. This takes place principally at ARC Infruitec-Nietvoorbij, in partnership with the South African Plant Improvement Organisation (SAPO Trust) and Stellenbosch University.

Funding is allocated by fruit producer organisations under the mantle of HORTGRO, according to proposals submitted annually to HORTGROscience. Proposals must fall into the Investment Focus Areas identified by HortgroScience in 2013:

- Sustainable Farming, where R&D effort should increase the marketable tonnes of fruit per hectare over time
- Product Integrity through the chain, where R&D efforts should increase the marketable tonnes of fruit delivered per tonne of fruit loaded
- Genetic Pool Optimisation, where R&D efforts should increase the marketable tonnes of fruit delivered per tonne of fruit per hectare
- Market Alignment and Sustainable Supply Chains, where R&D efforts should increase the farm-gate returns per marketable tonne of fruit
- Capacity Building, Technology Transfer and Empowerment of the industry as a whole

Public funding in 2012 was around R1.2 million annually, and has generally increased over time in the last 20 years despite fluctuations year-on-year. This source of funding is supplemented by external income from licensing of intellectual property, contract-based R&D for the private sector, and technology transfer.

One point of concern is that government funding increases are not keeping up with the increasing real costs of research. In the long term this will lead to an investment deficit into plum R&D if the problem is not addressed.

The economic value of plum research in South Africa

Compiled by the Agricultural Research Council's Economic Analysis Unit for ARC-Infruitec



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Funds invested into plum research and development at the ARC have yielded successful new South African cultivars and an overall growth in the South African plum industry.

South Africa has been exporting plums to the rest of the world for more than 100 years. Since the 1940's, plum research and development at the ARC has played a major role in this industry, providing farmers with new cultivars that have improved flavour or horticultural characteristics.

Of the 39 most-exported plum cultivars grown in South Africa, 16 were developed as part of the ARC's breeding programmes. Despite this, it is not clear what the economic return on this long-standing investment has been.

A comprehensive investigation into the cost and value of funding plum breeding programmes has revealed that there is a return on R&D investment – a R114.23 increase in industry output for every R100 invested in research. The study also quantified the positive effects of weather, fertilisers, water, and area under cultivation, showing how these factors influenced plum industry output.

Researchers also investigated how public plum research is funded in South Africa, identifying trends and concerns in the sector. It is concerning that government funding for this work has fluctuated in recent years. However, ARC breeding programmes are addressing this by supplementing their funding with external income through licensing agreements and contract research.



The history of plum research in SA

In the spring of 1652, Jan van Riebeeck planted some apple seeds in the Cape of Good Hope. From these humble beginnings South Africa's deciduous fruit industry, mostly concentrated in the Western Cape, was born. The industry really took off in the 1800's with the advent of railroads and booming inland cities.

The first fruit to be exported from South Africa was a consignment of peaches shipped to Britain in 1892 by Percy Molteno, a Cape Town shipping magnate. Deciduous fruit remains a major South African export to this day.

In 1937, the Department of Agriculture established the Western Province Fruit Research Station, the first fruit R&D institute in South Africa. Researchers there investigated ways to improve fruit cultivation and storage in a winter rainfall region.

Researchers soon realised that cultivars imported from the USA, Australia, France and England were not well

suited to South African conditions. In 1945, the first South African plum breeding programme was developed. Almost 30 years later, the ARC released the first ever South African-Japanese plum cultivar, Songold, in 1970. Along with Laetitia (1985), and more recently African Delight, Songold remains one of South Africa's most widely-grown and exported plums.

The Western Province Fruit Research Station changed its name to the Fruit and Fruit Technology Research Institute in 1970, changed again to ARC Infruitec in 1992 and merged with ARC Nietvoorbij in 2001 to form ARC Infruitec-Nietvoorbij.

Today, research at the ARC Infruitec-Nietvoorbij focuses on improving storage technology to better protect sensitive and disease-prone plums. Breeding programmes are working on decreasing cold requirements for flowering and developing pest- and disease-resistant rootstocks.



How SA's plums compare to international markets

South Africa's major export markets for plums are the UK and Europe, where it competes with Chile, Brazil and Argentina. Chile is the largest exporter to Europe, taking up 60% of Europe's international plum trade.

South Africa exports 74% of its 67 000 tonne annual plum production, approximately half the volume that Chile exports. This was not always the case – in 1983 South Africa was the second largest plum exporter to Europe. But Chile rapidly overtook South Africa thanks to successful macroeconomic policy and good research support, based mostly on supporting small-scale commercial farmers.

This apparent setback within the South African plum sector is offset by the fact that South African plums are consistently of high quality. South African plums of the same grade as their Chilean counterparts fetch up to 50% higher prices.

Currently, the South African plum sector is facing difficulties because global plum prices are not increasing, while input costs for farmers keep rising. This can be addressed through R&D focussed on ways to decrease running costs.

The model showed that money spent on R&D affects output within the first year, and continues to have a positive impact for the next ten years. Return on investment peaks at year five, and declines based on the value of the initial input.

The model showed that 87% of variation in plum production can be explained by variation in the four inputs described above. 1% increase in fertiliser use led to a 0.9% increase in productivity, while a 1% increase in planted area improved the output by 2.1%.

As for returns on research, the model indicated a return on investment of 14.2%. This demonstrates that R&D taking place at the ARC is having a positive effect on the productivity of the plum industry.

Measuring the economic returns on plum research

Using a statistical model known as the production function, researchers have related the outputs of plum agriculture (i.e. volume of plums produced) to a particular set of inputs, namely R&D expenditure, rainfall, area planted and fertiliser costs. The model also incorporated something known as polynomial lag to account for the lag time between inputs and outputs.