

Investment in R&D pays off, study proves

There is ample evidence that R&D is vital to a robust agricultural sector. Economist **Aart-Jan Verschoor** looks at a South African study into the benefits of research.

In a collaborative study, the Agricultural Research Centre (ARC) and the University of Pretoria (UP) have investigated investment returns generated by agricultural research in South Africa. Researchers have presented evidence that investment in agricultural R&D, specifically in plant breeding, is likely to result in higher and more stable crop yields.

The initial results of the study show that R&D, by helping to improve crop productivity, is crucial to improving South Africa's food security and competitiveness, and to reducing poverty.

The study demonstrates that investment in agricultural R&D in general and in cultivar improvement specifically is fully justified.

In South Africa, research into wheat breeding resulted in increased yield and intensified food production of the country's second-most important food crop. And in several other countries, evidence from studies showed

that an increase in public agricultural investments increased productivity and therefore, output.

Agricultural scientists are united in their opinion that demand for agricultural products will increase to such an extent that improving crop yields through plant breeding should be a key focus area.

BREEDING AND RESEARCH

In the ARC/UP study, the economic benefit of research into varietal improvement in wheat was the specific focus of the UP's department of agricultural economics, extension and rural development, with the period under review being from 1980 to 2008.

There are between 5 000 and 6 000 commercial wheat producers in South Africa, farming mainly in the Western and Northern Cape, the Free State and North West. Public and private sector wheat researchers focus primarily on varietal improvement. This field is dominated by the ARC's Small Grain Institute (ARC-SGI) and two private companies, Sensako and Pannar.

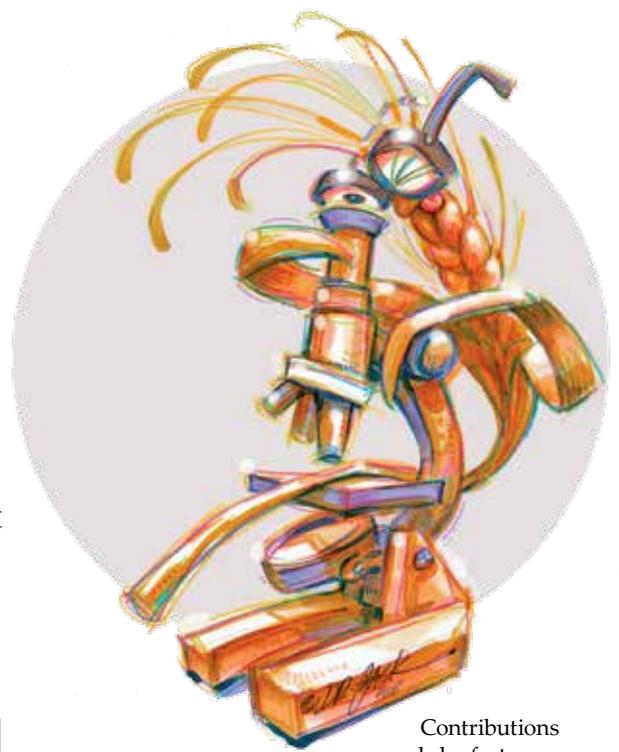
The first scientific grain breeding in South Africa began in 1903 at the Robertson Experiment Station, from which the first 'Union' varieties were selected. This research continued from 1912 at Elsenburg and expanded in 1950 to include research into grain diseases.

IN 2007/2008, SA SPENT 0,93% OF GDP ON R&D. THE USA SPENT 2,79%

Research accelerated in the 1970s. Between 1970 and 2008, ARC released 43 wheat varieties. Private sector participation started in the 1990s.

METHODOLOGY

To measure the benefits of breeding research, ARC/UP researchers isolated other variables influencing yield. Data on area planted per cultivar was sourced from the SA Grain laboratory and cultivar evaluation trial data. By combining wheat cultivar production statistics and commercial cultivar yields, the area planted to different varieties could be estimated.



Contributions made by factors

other than varietal improvement research were accounted for, based on expert opinion. Data was compared at provincial level and cultivars produced by breeding institutions were used.

INCREASES IN YIELD

Between 1970 and 2008, commercial wheat yield in South Africa increased by nearly 300%, between 1990 and 2000 it improved by 137%, and between 2000 and 2008 there was an 11% increase. A significant portion of yield growth in the 1970s and 1980s is explained by improved farm management and production practices, although research also played an important role.

Increased wheat yields in the 1990s came, to some extent, from deregulation, which stimulated an international flow of genetic material.

Between 1980 and 2008, commercial yields in the winter rainfall area increased by more than 173%, with a total benefit from cultivar improvement of R2,6 billion in real terms. In the dryland summer rainfall areas, commercial yields increased by 153% – from about 0,79t/ha in 1980 to 2,65t/ha in 2008. South Africa's commercial wheat yields grew by 209% between 1980 and 2007 – from 0,91t/ha to 2,97t/ha on average. Recently, experimental yields of up to 4,65t/ha have been achieved, indicating that even more growth can be gained through varietal improvement.

FINANCIAL BENEFITS

Globally, breeding research demonstrates major benefits to the sector and the SA study is no exception.

The financial advantage to South Africa due to wheat yield growth from 1980 to 2007 was estimated to be R23,3 billion in real terms. The benefit due to yield growth in the winter rainfall region was estimated to be R12,7 billion in real terms. The yield of irrigated wheat, which grew by a remarkable 405% from 1980 to 2008, resulted in a total benefit due to yield growth of R7,9 billion.

In monetary terms, R13,8 billion of the total yield increase in the wheat industry over this 28-year period can be attributed to varietal improvement. This amount is about five times the gross value of the annual wheat harvest in South Africa.

The researchers also established the contribution of the various players in wheat breeding. Sensako was the dominant force in 2007, with a market share of 64%, while the ARC had a 24,3% share and Pannar 11,5%. The ARC has been active in varietal research longer than the others, and considerably more hectares have been planted to ARC cultivars. During the period under review, 58,43% of the wheat area was planted to ARC varieties, 39,14% to Sensako cultivars and 2,43% to Pannar cultivars. The ARC was responsible for 61,34% of the benefits derived from varietal improvement. Between 1980 and 2007, the ARC wheat breeding programme resulted in a direct monetary benefit to the country of R8,5 billion.

R&D SPENDING

South Africa's expenditure on R&D in 2007/2008 was R21 billion, about 0,93% of our GDP. The researchers argue that this is insufficient, being much lower than many of our trading partners.

According to the World Bank, the US spent 2,79% of its GDP on R&D in 2008, while the UK spent 1,77%, Israel 4,66%, China 1,47%, Brazil 1,08%, Australia 2,35%, Russia 1,04% and Korea 3,36%. Public funding accounted for 40% (R8,5 billion) of the investment in R&D in South Africa.

Roughly 7% of South Africa's national investment in R&D in 2008 was spent on agricultural research. Several industry stakeholders recently expressed concern about the level of investment in agricultural R&D. Work by Dr Frikkie Liebenberg of the University of Pretoria's department of agricultural economics indicates that spending on agricultural research grew erratically from 1910 to 1971. Since 1972, spending on public agricultural R&D declined by an average of 2,9% per year to R893,8 million in 1980, after which it recuperated to reach R1 082 million in 2010 (amounts in real terms, in 2005 prices). Agricultural R&D spending for every year in the entire 1971 to 2010 period, if income generated by the ARC is excluded, was less than the inflation-adjusted 1971 average of R1 246,2 million. Similarly, the 2007 share of spending in agricultural R&D reflected only 70% of the 1971 average, implying a decrease in inflation-adjusted government investment in agricultural R&D of about 30% from 1971 to 2007.

A positive trend in real terms has been observed since 2004, unfortunately interrupted by the 2008 financial crisis. Let us hope that the tide has turned.

• *The views expressed in our weekly opinion piece do not necessarily reflect those of Farmer's Weekly.* ■FW

