

Releasing new cultivars in a changing world

By Dr Daniel Ploper, EEAO, Argentina, and Dr Francois Koekemoer, Sensako

Worldwide the genetic improvement of soya beans is a challenge that both private companies and official institutions continue to address in order to develop cultivars that meet current and future market demand.

It is essential to continue investing in research to release new cultivars adapted to a changing world characterised by climate change, a growing requirement for food, consumer expectations for improved nutritional quality and food safety, and public demand for sustainable production.

Development of new varieties

For the abovementioned reasons, processes that involve developing new soya bean varieties that meet all these requirements, should not be interrupted. Genetic improvement programmes involve great effort. These programmes include the hybridisation of selected parental lines and stabilisation of progeny, evaluating these new materials over time in different geographical and climatic environments, and the selection of the most adapted lines in terms of each location.

This laborious process culminates in the formal registration of new cultivars, followed by seed increase before being marketed and offered to farmers. Each new variety must be accompanied by a technological package of management practices that will allow it to express all its genetic potential. Aspects such as planting systems, row spacing, nutrition, irrigation, maturity group, seed production, pest management and production costs should be considered in soya bean production.

Furthermore, it is important to consider the entire production system in each field. This includes different crops and their

management over several cycles, with their interactions and effects.

South African genetics

Over the past decade, the Protein Research Foundation has been incorporating selected soya bean germplasm from different origins, especially Argentina. This has enabled the selection of cultivars adapted to different production areas and planting dates. We believe that germplasm currently being produced in South Africa has not been properly tested and thus the full yield potential of these varieties has not been exploited.

However, to qualitatively increase current capabilities, it is necessary to lay the foundations for new approaches in genetics and breeding, especially concerning the field of 'omics'. This field includes massive phenotypic, genotypic, metabolomic and proteomic approaches and provides a huge amount of data that must be analysed together.

It is also important to deepen the knowledge of the soya bean genome by not only considering public databases, but also by sequencing specific genotypes. CRISPR-Cas9 technology has emerged as one of the most promising methods that would allow genomes to be manipulated through genome editing. This will make it possible to modify specific target sequences to achieve the desired effects.

The way forward

Efficient and sustainable soya bean production will require improved agronomic management and cultivars with high yield potential and resistance or tolerance to biotic and abiotic stresses. The integration of conventional breeding with state-of-the-art biotechnologies,

such as the latest generation of phenomic and genomic approaches, is critical for the development of such cultivars.

Although the soya bean market, which currently stands at around 700 000ha, has grown significantly over the past decade, it is still small compared to Argentina, Brazil and the United States. More than 20 companies sell soya bean varieties in South Africa. This leads to a fragmented market with high levels of farm-saved seed and low profit margins on certified seed. In order to justify a soya bean breeding programme in South Africa, a market share of 40 to 50% is required to break even.

Therefore, 95% of all cultivars currently being produced in South Africa are foreign and are mostly licensed from Argentinean companies. One of the largest Brazilian soya bean breeding companies recently informed Sensako that it would not be supplying new germplasm to be tested in South Africa, because it will not be breeding varieties with Roundup Ready 1 (RR1) technology.

Therefore, it is critical that the end point royalty for soya bean continues successfully and that compliance for paying levies on farm-saved seed, remains above 90% in order to attract investment from international role-players for the newest seed technology.

If the economic situation in the South African soya bean market does not improve drastically soon, owners of new technology need to be incentivised to deregulate or commercialise these technologies for the South African market. 🌱

For more information, send an email to Dr Francois Koekemoer at francois.koekemoer@sensako.co.za.