

Rejuvenating faba bean in Egypt

Egypt's faba bean production, which was seriously impacted by low yield, plant diseases and weed infestation as a result of rising temperatures and changing precipitation patterns, is being rejuvenated through improved crop varieties and an integrated pest management package.



Project context

Faba bean, one of the most important leguminous crops for human nutrition, is also strategic due to its income contribution in Egypt. It is significant for soil fertility and in the intensification of the wheat based system in the country.

However, there was a considerable decline in faba bean cropping in Egypt. Average crop yields in farmers' fields were low, ranging from 3.78 tons per hectare in old lands to 3.60 tons per hectare in new lands and 3.2 tons per hectare in Upper Egypt. Most of the varieties grown by farmers were susceptible to plant diseases, insect pests, and shortage of water availability in the new reclaimed lands. These were the consequences of changing climate. Egypt has experienced a rise of 0.34° C per decade in mean maximum air temperature and 0.31° C per decade in mean minimum air temperature. According to the Intergovernmental Panel on Climate Change (IPCC), it will probably get hotter and drier.

Faba bean production also declined as a result of susceptibility to foliar diseases and

effects of parasites such as *orobanche*, aphids, chocolate spots and rust diseases. High cost and lack of availability of good seeds and low faba bean producers' prices also contributed to low production. Farmers suffered losses due to *orobanche* ranging from 7 to 80 per cent depending on the severity of the infection. *Orobanche* expansion was mainly due to the use of non-certified seeds harvested by farmers, wind movement, changes in rainfall patterns and increasing temperatures that affect the parasite phenology and changes in farming systems.

The country's self-sufficiency in faba bean went from 99 per cent in the late nineties to 31 per cent in 2012. Increasing faba bean production and improving yield quality was thus crucial to meet the demand of the increasing Egyptian population.

Research programmes to enhance faba bean production

Egypt partnered with ICARDA in an IFAD-funded project on 'Enhancing Food Security

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The European Commission has funded over €200 million in research in collaboration with IFAD and the CGIAR system in order to increase the resilience of smallholder farmers to climate change and to improve food security. Projects have been undertaken in many countries to bring the power of science to bear on developing solutions that can be scaled up to reach millions of people.

The International Center for Agricultural Research in the Dry Areas (ICARDA) is the global agricultural research organization working with countries in the world's dry and marginal areas to deliver sustainable systems solutions that increase productivity, improve rural nutrition, and strengthen national food security. ICARDA's integrated approach includes new crop varieties; agronomy; on-farm water productivity; natural resources management; rangeland and small ruminant production; and socioeconomic and policy research to better target poverty issues and accelerate technology adoption. A member of the CGIAR Consortium, ICARDA works closely with national agricultural research programs and other partners in more than 40 countries across North and Sub-Saharan Africa, and Central, South, and West Asia.

in the Nile Valley and Red Sea Region: Technology generation and dissemination for sustainable production of cereals and cool-season food legumes' (2002-2008). A major component was the development of faba bean breeding lines for *orobanche* resistance. Crop management practices that conserve soil moisture and increase the efficiency of water use were also identified.

This was followed by another EU/IFAD-funded project on 'Enhanced smallholder wheat-legume cropping systems to improve food security under changing climate in the Drylands of West Asia and North Africa', in which scientists worked with farming communities, government research and extension agencies, universities and NGOs to identify, test and promote a range of new technologies for various crops, including faba bean.

In response to new challenges and constraints posed by climate change, varieties which were higher yielding and adapted to both biotic and abiotic stresses were further screened, developed and demonstrated. Early maturing faba bean genotypes were developed that were resistant to chocolate spot and *orobanche* and had low water requirement.

The varieties released in 2011 were crosses between ICARDA genetic resources and landraces collected in Egypt. Five high potential varieties were used by farmers in technology demonstration platforms. These new varieties were combined with integrated pest/disease management techniques for key diseases, insect pests, and *orobanche*. These varieties were demonstrated in the target regions of Dakahlia, Kafr El-Sheikh, Sharkia, and Al-Mansura (Old lands), Nubaria (New lands), and Assiut (Upper Egypt). On average, improved varieties and a recommended package of interventions achieved yields that were 22.5 per cent higher than more traditional varieties. Individual demonstrations at Sharkia recorded even 38 per cent higher yields. These varieties are now a part of ICARDA's gene bank and have been safely duplicated at the Svalbard Seed Vault in Norway.

Results and impact

Egypt's self-sufficiency in faba bean production which had seen a decline in 2011-2012, improved in 2013-2014 and is on the increase. The data from 1997-2014 shows that total productivity with improved varieties has increased by 2 to 3.53 tons per hectare, despite the decrease of faba bean cultivation

area (from 135,290 to 51,680 hectares). It was found that the recommended technology package increased farmers' grain yield by 256 kilograms per hectare and reduced production costs by US\$350 per hectare. The end result was an increase in net revenue by US\$550 per hectare. From the samples of 695 surveyed farmers, 46 per cent were using new varieties and parts of the technology package and 14 per cent were using the full technology package.

Increased faba bean production has reduced Egypt's import dependence on international markets. Rough estimates suggest that Egypt has saved around US\$14 million, as a result of the increase in its domestic faba bean production from 139,000 tons in 2011-2012 to 182,000 in 2013-2014, thus improving food security.

Successful results of the released varieties have encouraged the Egyptian Academy for Scientific Research and Technology (EASRT) to fund and initiate a 'National Campaign on Faba Bean Rehabilitation' for the coming season, involving around 180 demonstrations on 370 fields across 19 governorates. Half the demonstrations will involve faba bean production and the other half will involve intercropping with faba beans – a proven means of fixing nitrogen in soil and improving fertility as well as erosion control. Capacity-building of farmers, extension agents and field technicians, farmer field schools, field days, harvesting days and national workshops with stakeholders will also be a part of this national campaign. These contributions have thus provided a sustainable way forward for Egypt with enhanced faba bean productivity despite climate related challenges and the country is progressing well on the road to self-sufficiency.

Future directions and scaling up

With substantial efforts towards seed production of new varieties, it is estimated that in 2015 around 4,660 farmers will be directly exposed to the faba bean related improved technologies. This is expected to increase technology adoption rates and impact production (food security), income of farmers, markets, policy makers and other value chain actors.

If conditions are made conducive for farmers, and production growth continues, as was witnessed in 2011-12 and 2013-14, by 2018 the production of faba bean will exceed 238,000 tons. This will be a huge step in the direction of ensuring food and nutritional security even amid growing concerns of climate change.

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