

## Sudan looks to nuclear technology to double farmers' income and grow peanut exports

Sudanese farmers in areas prone to drought now have a drought-tolerant peanut variety that will improve their livelihoods and increase the country's peanut exports. This new variety has shown up to 27% improvement in yields while needing less water and has the potential to double farmers' income. It was developed using nuclear techniques with the support of the IAEA, in cooperation with the Food and Agriculture Organization of the United Nations (FAO).

"Farmers in the rainfed areas of North Kordofan State used to grow fewer peanut crops, as they generally believed the environment was unsuitable," said Elgailani Adam Abdalla, Director of the El-Obeid Agricultural Research Station in the west of Sudan, adding that instead they

had to rely on less lucrative produce, such as watermelons. "With this new variety, they have seen for the first time that peanut crops can grow and produce high yields even in harsh conditions."

Peanuts, also known as groundnuts, are commonly pressed into oil or used in various local dishes, including salads, soups and stews. Their leaves and stems, as well as cakes pressed from peanuts, are popular for livestock feed.

Sudan used to be one of the world's top exporters of peanuts, but its ranking has fallen in recent years. Traditional, small-scale farming in Sudan's western states produces 70% of the country's peanut supply. Since peanuts depend on rainfall to survive, devastating droughts in these regions

have significantly affected farmers' ability to produce high yields.

The government is now looking to regain its footing as a top exporter while improving the livelihoods of subsistence farmers. Achieving this goal requires a crop variety that can produce high yields in these drought-prone areas. After a decade of research at the El-Obeid Agricultural Research Station, Sudan's Ministry of Agriculture and Forestry released a variety named Tafra-1 in 2018 and is now in the process of multiplying its seeds for large-scale distribution to farmers.

### Developing the variety

Scientists used irradiation as an initial step in plant breeding to develop this



(Photo: IAEA)



(Photo: IAEA)

new variety. Irradiation accelerates changes in the genetic make-up of crops, so scientists can select lines with desired traits, such as drought resistance, and eventually obtain the best variety. While crops can take several centuries to adapt to changes in the environment through spontaneous mutation and natural selection, irradiation speeds up this process. This is also how this variety got its name: ‘Tafra’ means mutant in Arabic.

The IAEA, in cooperation with the FAO, supports countries, including Sudan, in adapting their agricultural practices to climate change. “Climate change causes increasingly significant damage to agriculture, putting food production at risk in various parts of the world, including Sudan,” said Fatma Sarsu, a plant breeder and

geneticist at the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture. “Increasing agricultural production and productivity, in addition to adapting crops to variations in climate, is critical to ensuring food and nutrition security. Our collaborative work has contributed to crop adaptation to climate change in Sudan through the development of a new peanut variety.”

Support, delivered through the IAEA’s technical cooperation programme, included fellowships, training courses and equipment, such as a rainout shelter and a sprinkler irrigation system. The IAEA also supported Sudan by dispatching international experts to assist with the development, evaluation and selection of an improved peanut variety.

## A participatory approach

Researchers were in charge of developing several potential varieties, but it was up to farmers to decide which ones worked best in their fields.

“We included farmers from the early stages of the research process so they could actually select the variety that best fits their needs,” said Abdalla. This demand-driven research process also leads to a better chance of farmers adopting and using the variety once it’s been developed, he added.

Farmers tested several peanut varieties across seven villages in North Kordofan State, one of the most vulnerable to drought in Sudan, monitoring them with researchers over four years to assess the outcome.

They were looking for certain desirable traits such as high and stable yields under various climate conditions and tolerance to terminal drought, the most common type of drought in the region, where dry spells coincide with the end of the growing season when the peanut plants are nearly mature.

In the end, the farmers and researchers came to the same conclusion: Tafra-1 was the clear winner, favoured for its tolerance to drought and ability to produce high yields with little rain.

## Benefitting farmers and the economy

The new variety can grow with less than 250 mm of rain per year compared to the 350 mm needed for the traditional one, Abadalla said. It also produces yields that are 11% higher on average than the traditional variety — 1024 kg/hectare versus 926 kg/hectare — and, in some locations, yields have risen by as much as 27% in tests during the last three years.

Higher yields mean higher incomes for Sudan’s small-scale farmers, who make up around 12% of the country’s total population. Yield estimates across multiple growing seasons and locations indicate that, by using the new variety, peanut farmers could make up to US \$28 more per hectare

per harvest. This is a significant increase given that a farmer's average income from a single season of peanut crops is roughly US \$26 per hectare.

Eight hectares of the variety have been planted at present, and the Ministry of Agriculture and Forestry is working to multiply the seeds for large-scale use, Abdalla said. Meanwhile, the variety's high performance has prompted farmers to start multiplying seeds on their own.

But it won't be long before there are plenty of these seeds to go around.

"In 2020, we will give seeds to 100 farmers," Abdalla said. "But, in only three years, we expect to have multiplied enough seeds to supply all 230 000 potential groundnut farmers in North Kordofan State. We will then be able to produce enough for domestic consumption and the external market."

In the meantime, the IAEA is continuing to support projects in the country to help further improve crop productivity and the livelihoods of small-scale farmers in drought-prone areas. "We are very pleased with the

success of this new groundnut variety, but further multiplying the variety and expanding outreach is vitally important to scale up the impact on livelihoods," said Solomon Haile, the IAEA Programme Management Officer responsible for projects in Sudan.

— *By Kendall Siewert*

## Second shipment of low enriched uranium completes IAEA LEU Bank

The IAEA on 10 December 2019 received the second and final shipment of low enriched uranium (LEU) at a purpose-built facility in Kazakhstan housing the IAEA LEU Bank, which was established to provide assurance to countries about the supply of nuclear fuel. The delivery completes the planned stock of the material that the IAEA LEU Bank will hold, following the first shipment in October.

Kazakhstan's JSC National Atomic Company Kazatomprom — the world's largest producer of natural uranium — delivered 28 cylinders of LEU to the facility at the Ulba Metallurgical Plant (UMP) in the city of Ust-Kamenogorsk. The uranium originated from Kazakhstan and was enriched at a facility in the neighbouring Russian Federation before the LEU was transported by train to the site in eastern Kazakhstan,

where it was checked and officially accepted by IAEA experts.

Owned by the IAEA and hosted by Kazakhstan, the IAEA LEU Bank is one of the IAEA's most ambitious undertakings since it was founded in 1957.

"With the arrival of the second shipment, the IAEA LEU Bank stock is now complete," IAEA Director General Rafael Mariano Grossi said.



(Photo: IAEA)