IAEA Technical Cooperation Programme

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Developing maize that is tolerant of drought and low soil fertility in Zambia

The challenge…

Maize is the most important cereal crop in the Southern Africa Development Community (SADC) region and also the most preferred staple food in Zambia. Grown primarily for human consumption throughout the country, it is also widely used as livestock feed and in industrial products. However, maize in Zambia is characterized by low productivity due to low soil fertility, drought, floods and under-usage of inputs like costly fertilizers. In the SADC region, its yield averages 1.2 tons/hectare compared to the potential yield of over 6 tons/hectare from improved maize varieties.

Drought and low nitrogen fertility are the two most important factors affecting maize production. Zambia's warming climate and declining rainfall will further reduce the productivity of maize in the country. To increase and stabilize maize production in southern Africa, it is necessary to develop locally adopted maize varieties with considerably improved tolerance to drought and nitrogen stress.

The project…

The IAEA's technical cooperation programme provided staff at the University of Zambia's School of Agricultural Sciences and the Ministry of Agriculture and Cooperatives with training in various techniques and topics related to the nitrogen stable isotope technique and carbon isotopic discrimination for assessing nitrogen use efficiency. Other areas covered included mutation induction and using molecular techniques for mutant characterization, the development of molecular markers for tolerance to drought stresses, and doubled haploid techniques to shorten the breeding cycle and their application in breeding programmes.

With IAEA assistance, a study was carried out to evaluate how the use of nitrogen (N) stable isotope could determine the optimal application rates of slow-release coated fertilizers.

Essential equipment was provided through the project to upgrade laboratories.

Examining maize crops grown under the project.

The impact…

The study showed that coated fertilizer technology can be highly effective in increasing maize grain yield at lower rates of N in medium to high pH soils. High grain yields (5 tonnes/ha) could be obtained at half of the recommended rate of nitrogen (100 kg N/ha) which translated to a significant saving in terms of N fertilizer inputs and hence expenditure for an area of 500 000 ha of maize. The study results are likely to shape policy on the type of fertilizer used and fertilizer imports in Zambia.

Collaboration with the IAEA offered new technologies and possibilities for increasing crop productivity and reducing the negative environmental effects of other agricultural practices. A maize mutation breeding programme was initiated to develop more nutritious, drought tolerant maize varieties with good performance and acceptability under poor farming conditions in southern Africa. The project has benefitted small and medium scale producers who cannot afford irrigation for maize production.

Technical cooperation project ZAM/5/027: Developing Maize Genotypes for Drought and Low Soil Fertility Tolerance