

Research Application Summary

Innovative breeding for drought tolerance and fertilizer use efficiency in maize

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Abstract

This paper highlights outcome of research that was initiated as part of a graduate PhD research thesis, but has today led to development of commercial maize varieties in Southern Africa. It clearly demonstrates that university-based research does indeed contribute to solving development issues and has economic benefit to society.

Key words: Dwarf maize, PhD research, Southern Africa

Résumé

Ce document souligne les résultats de la recherche qui a été lancée dans le cadre d'une thèse de recherche de doctorat, mais aujourd'hui a conduit au développement de variétés de maïs commerciales en Afrique australe. Il démontre clairement que la recherche universitaire en effet contribuer à résoudre les questions de développement et a des retombées économiques pour la société.

Mots clés: Maïs nain, thèse de doctorat, Afrique australe

Background

Maize is an important grain in all sub regions of Africa particularly in Eastern and Southern Africa. The crop performs best under good moisture and fertilizer regimes but because of farmer's preference it is grown under all agro ecological zones. In the light of poor resource base of most of the African farmers, the Author designed a breeding programme with emphasis on manipulation of plant traits that improve crop productivity in stress environments such as plant nutrient shortage and drought.

Evidence from PhD research results of the author revealed that small high yielding plants were more drought tolerant compared to their tall counter parts. This led to the initiation of the innovative breeding programme whose development involved introduction of a dwarfing gene into selected local and exotic maize germplasm. After a series of crosses and backcrosses a range of short statured maize inbreds and hybrids were obtained and evaluated. These are now being adopted in Southern Africa.

Research Application

The release of three dwarf maize hybrid varieties in the Southern Africa region has already caused a great deal of interest among rural farmers. The major advantages are: reduced variation in crop performance that result from climatic deviations, and superior fertilizer use efficiency. Other advantages include: resistance to stem and root lodging; resistance to leaf diseases such as grey leaf spot, turicum leaf blight and rust; the “stay green” characteristic which apart from enhancing grain and stover quality is also associated with stress tolerance; plant architecture lends itself to mixed cropping or integrated farming which offers enhancement of crop production and protection of the environment; and, leaves of unusual dark green colour contribute to the attractiveness.

Dwarf maize varieties have been tested (and marketed) in Angola, Botswana, DRC, Malawi, Mozambique, Namibia, South Africa, Zambia and Zimbabwe. Observed yield ranged from 1t/ha in poor soil and drought conditions to more than 10t/ha in optimal environments. To date quantity of seeds marketed has failed to match demand because of inadequate capacity for foundation seed production. As more farmers are exposed to the novel varieties, the demand has already far outstripped the seed supply.

The challenges and opportunities for ACFD (African Centre for Fertilizer Development) are to (a) diversify the brand and increase the range of varieties available on the market for different agro ecological zones of Africa, (b) enhance capacity to produce increase volume of seed, and (c) undertake details studies on water and fertilizer use efficiency to realize potential productivity and assist farmers with more appropriate recommendations. To scale up these processes ACFD is linking with African universities and research institutions, and also private seed companies. This linkage, as well described by Blackie (2010, this volume) is critical for enhancing scalability of agricultural innovations and achieving impact at a scale needed to address food insecurity problem in sub-Saharan Africa.

Reference

Blackie, M. 2010. Never sail by someone else’s star: Agricultural education for Africa. RUFORUM Working Document Series (this volume).