

Better seeds, better yields

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Food and nutrition security is a major challenge facing the world's governments, especially in developing countries. Sustainable improvement of crop productivity is necessary to address this challenge, and this relies on using species and varieties that are adapted to the growing environment and provide products suitable for the intended end use. Considerable effort is put into breeding improved varieties in developing countries and around the world – in terms of yield and tolerance to production limitations such as drought, diseases and

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Box 1. Informed farmer choice

Species: A recent article in the newsletter of the International Crops Research Institute for the Semi-Arid-Tropics (ICRISAT)¹ highlighted how shifting from growing sorghum and mungbean to pigeon pea enabled a smallholder farmer to increase her income significantly. Such progress is only possible when farmers know of the species suitable for their situation, so that they can take decisions about how to grow, harvest, use and sell a new crop.

Variety: Choosing the right variety of an appropriate species can enable smallholder farmers to more than double their productivity, even under very limiting conditions.² Information about which variety to choose needs demonstration/trial fields that showcase and compare available varieties, explaining what inputs are needed to grow them.

pests. However, challenges remain in transferring knowledge about these advances to the wider agricultural sector and supplying actual seed for farmers to grow. As a result, most farmers lack information about the range of species and varieties suitable for their farms, and still grow a narrow selection of old, inferior varieties.

To help address these issues in developing countries, the National Institute of Agricultural Botany (NIAB) recently completed a year-long scoping project funded by the John Templeton Foundation's Biosciences for Farming in Africa initiative (www.B4FA.org). The foundation, which is based in Philadelphia, USA, is an independent charity with no association with the plant-breeding industry.

The project assessed how showcasing genetic innovation in crop breeding could help smallholder farmers in African countries in their choice of improved varieties by raising farmer awareness and adoption rates of improved varieties in three target countries. The work was carried out in Ghana, Kenya and Uganda.

We had previously applied a similar approach successfully to improve the adoption of plant genetic innovation in the UK through the model of the NIAB Innovation Farm (Box 2).

Case study: maize in Ghana

While improved varieties are available for almost all staple crops in Ghana, the majority of smallholder farmers (more than 70 per cent) use seed of a narrow selection of varieties from their previous harvests or other unregulated sources. This leaves farmers uncertain about variety identity and seed quality such as disease and pest infestation, genetic and physical purity and germination rate. This makes it difficult for them to adopt optimum production practices – seeding rate, fertilisation, disease and pest control – and realise the full potential of their investment. At the same time, the formal seed sector can only provide for a fraction of the certified seed requirements for most species.

Box 2. NIAB Innovation Farm, Cambridge, UK

Established in 2009, the NIAB Innovation Farm (www.innovationfarm.co.uk) is a unique knowledge exchange facility. It helps bridge the gap between scientific research and agricultural practice in the UK, building on NIAB's unique knowledge and skill base.

The facility helps address drivers and constraints to innovation application; including policy, legislation, market and economic factors. Its themed plant genetic innovation exhibitions and workshops help broker connections between farmers, the general public, small to medium-sized enterprises, policy makers and researchers, amongst others.

Annually, the NIAB Innovation Farm attracts about 2000 visitors to its purpose-built demonstration and conference facilities established with funding of £ 2.7 million (€ 3.3 million) from the NIAB Trust and the European Regional Development Fund.



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As a result, the market for maize seed, the most important cereal crop in Ghana, is dominated by open-pollinated varieties, mainly Obatanpa. This variety, released in 1992 after development from material originally generated by the International Institute of Tropical Agriculture (IITA) and the International Maize and Wheat Improvement

Center (CIMMYT), accounted for more than 90 per cent of all certified maize seed production in 2012, two decades after its release.² This is despite the fact that 18 other maize varieties have been released since then. In addition, using certified seed of improved hybrid varieties has been shown to be more profitable than using certified open-pollinated varieties or farm-saved seed.²

Knowledge exchange for better yields

To improve awareness about improved staple crop varieties and their use among farmers, key players in Sub-Saharan African seed systems – comprising inter-related components for variety selection and breeding, seed production and marketing, and rules and regulations governing these two activities – need to work together for better provision of plant variety evaluation, demonstration and knowledge dissemination. On the basis of our findings in the three countries, we propose an approach that addresses the whole seed system rather than individual players, incorporating the input of various stakeholders – farmers, seed merchants, input dealers, researchers, public bodies, product dealers and processors, amongst others.

The proposed approach has the following three practical aspects:

- 1 *Research and development (R&D) and training to improve procedures and processes for variety registration and seed certification.* In line with the possibility of private-sector involvement in some aspects of seed certification

presented by seed regulations in many Sub-Saharan countries, there is room for working with the seed trade in the liberalisation of seed regulatory services. Structures could be established that offer or coordinate the provision of private plant inspection and seed testing services, following the South African National Seed Organization (SANSOR) model.³

2 *Optimisation of crop variety performance assessment and cataloguing.*

Neutral-variety advisory literature is virtually non-existent for most crops in Sub-Saharan Africa, and is only made available for specific projects and crops or is replaced by marketing material from individual seed companies. There is a need to establish objective and regularly updated descriptive catalogues of all registered varieties. This initiative will build upon existing comparative multi-location trials which test new crop varieties in most Sub-Saharan African countries. It will depend on independent systems for producing datasets on agro-economic performance of plant varieties and cultivation systems relative to farming conditions.

3 *Dissemination of know-how, communication with stakeholders and training of farmers.*

There is a need to publish annually updated recommended lists of varieties, based on trials that assess the balance of features such as agronomic performance, yield and quality, likely to be of benefit to the industry. These should be published in useable formats and ensure wide accessibility to farmers, farmer advisors, researchers and seed companies. An important part of this activity would be farmer training and advisory services delivered through a network of trial and demonstration sites, an experience we have learned at the NIAB Innovation Farm.

Conclusion

We have found a willingness to address the proposed approach highlighted above in all three target countries. Several governmental and non-governmental initiatives already trial or showcase plant varieties to farmers in Ghana, Uganda

and Kenya. However, the initiatives mostly revolve around demonstration plots, field days, media campaigns and printed promotional material. They are in need of better resourcing and coordination to improve message accuracy and coverage, and impact on the development and adoption of plant varieties.

The approach we propose is for the public and private sectors to engage with these practical issues together. In this way farmers' efforts will not be let down by growing the wrong species or variety in the wrong place, or sowing poor-quality seed and reaping disappointment.

References

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