Highlights
CIAT in Africa

Regional bean variety testing in southern Africa

No. 20
December 2004

The Highlights series summarises research results and policy implications from the work of CIAT and its partners in Africa

Common bean is an important food legume in many countries of the Southern African Development Community (SADC) where it is commonly eaten as an accompaniment to maize, the main staple. The Southern Africa Bean Research Network (SABRN) and the Centro Internacional de Agricultura Tropical (CIAT) are working together to support efforts in bean research and development (R&D) by theNational Agricultural Research System (NARS) in each country. Improved bean germplasm is provided to all participating countries by SABRN. This germplasm is used for regional variety testing – the development of new bean varieties with various attributes which meet the specific needs of the national bean research and development programmes. For example, new bean varieties may need to be tolerant to low soil fertility or drought, and resistant to insect pests and diseases.

The major objective of SABRN is to share germplasm within the network so that each national programme or the private sector can benefit from improved bean varieties developed by others in the region

The second function of CIAT's work in the region is to support evaluation of bean varieties in multi-environment trials (MET) in collaboration with NARS partners in various countries within the SADC region.

Regional variety testing

The regional variety testing work is particularly useful to those NARS who have yet to develop their own bean-breeding programmes. SABRN coordinates the regional germplasm nurseries and trials, which contain improved lines and released varieties (contributed by some NARS bean-breeding programmes, the private sector, SABRN and CIAT). The major objective is to share germplasm within the network so that each national programme or the private sector can benefit from improved bean varieties developed by others in the region. In this way benefits are shared across the region, with those NARS who are not yet running their own full-scale breeding programmes standing to benefit most of all.

Adaptation and stability of varieties

Testing potential new varieties in diverse environments can reveal wide-or specific-adaptation of variety performance. Developing varieties with wide adaptation or stability across seasons (i.e. those that perform well in nearly all environments), is important but is not an easy task. It is simpler to breed for specific adaptation (i.e. varieties that are adapted to specific subsets of environments within a target region).

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Variety-by-environment interactions (VEI)

The performance of a particular variety is influenced by its environment. A single variety, selected for good performance at one location, could not be expected to perform equally well elsewhere. Testing for Variety-by-Environment interactions (VEI) is always necessary. Where the VEI are of large magnitude, assessing the variety by its average performance across environments is not useful, because varieties perform differently in different environments. This calls for the development of a range of varieties for specific environments. By the same token, strong VEI across countries necessitates the establishment of a regional breeding or variety-testing programme.

Southern Africa regional bean yield trials (SARBYT)

Since 1994, SABRN, in collaboration with various NARS has routinely conducted bean variety performance tests across various locations in the SADC region, through the Southern Africa Regional Bean Yield Trials (SARBYT). Different sets of varieties were assembled by the network each year and distributed to NARS partners for variety performance tests. During the period from 1994 to 2002 data was collected on the performance of bean varieties across the region. Such data has provided useful information which is currently used to enhance the efficiency of the variety-testing programme across the region.

General versus specific adaptation

While variety improvement for performance can be promoted by simultaneously accumulating genes for yield and tolerance to all adverse factors, packaging all improvements into one variety is an almost impossible task. For this reason it is important to have both widely adapted varieties and varieties with specific adaptation. The extensive testing of bean varieties in SARBYT offered opportunities to assess bean varieties for both general and specific adaptations. It was possible to identify cultivars that had general adaptation across locations and those with specific adaptations to particular locations.

Choosing test locations

Selection of test locations, representative of conditions and practices of a given area can be a challenging task in a variety-testing programme. Evaluation of locations offers opportunities to breeders to determine if cultivars are being sufficiently differentiated at all locations and see if differentiation is similar between two or more locations. Because breeders must contend with limited resources, it is useful to identify locations or environments that are similar or that provide little or no differentiation among tested varieties. Several locations - Harare (Zimbabwe), Umbeluzi (Mozambique), Mangcongco (Swaziland), Bvumbwe (Malawi) and Misamfu (Zambia) did not add value to the differentiation of the varieties. The data showed that greater use should be made of test locations that showed greater differentiation among cultivars, such as Bembeke and Chitedze in Malawi, and Delams in South Africa.

The power of networking

Through the regional exchange of bean germplasm in SARBYT, several promising varieties have been identified by different national programmes, leading to the release of varieties in all countries within the network. Some varieties, such as A 286 have been released in more than one country. This suggests that some countries have similar bean production ecologies, implying that varieties selected in one site can serve other sites. The multiple country release of varieties is particularly important for regional trade, as it attracts the interest of the private seed industry.

Conclusion

The SARBYT data also showed that there were considerable variety-by-environment interactions in the test locations within SABRN, justifying the need for a regional bean variety-testing programme. A few varieties showed some elements of general adaptation while the majority were specifically adapted to some environments. The data also showed that a number of test locations were duplicates, and could effectively be reduced to three: Bembeke and Chitedze (Malawi) and Delams (South Africa). Varieties selected from these three sites could then be used in other sites within the region. This would reduce the cost of running multi-environment trials, without compromising on the variety selection programme. The exchange of bean germplasm within SABRN has proved to be beneficial to most NARS, who have released bean varieties accessed through SARBYT.

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We gratefully acknowledge financial support from CIDA and SDC through PABRA. The views expressed are not necessarily of those agencies.