

Highlights

CIAT in Africa

The impact of new bean technologies on rural livelihoods in seven African countries

No. 44
June 2008

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

The common bean *Phaseolus vulgaris* is a major staple food crop in Africa. In a continent where over 30% of households live below the poverty line (World Bank, 2006), beans are valued as one of the cheapest sources of protein for vulnerable sections of the population, particularly the poor. In 2005, 72% of sub-Saharan Africa bean output was produced by Burundi, Ethiopia, Kenya, Rwanda, Tanzania and Uganda (FAO, 2005). The objective of the bean research networks (Eastern and Central Africa Bean Research Network [ECABREN] and Southern Africa Bean Research Network [SABRN]) is to improve the productivity and acceptability of bean varieties. For over twenty years research has identified a number of improved varieties and agronomic practices that increase yields and resistance to pests and diseases within diverse agro-ecological environments. Bean varieties also address farmer and market preferences such as grain colour, size, and taste. Between 1980 and 2004, the bean research programmes in sub-Saharan Africa released 184 improved bean varieties in seventeen countries. On average, each of the major bean producing countries disseminated between five and twenty bean varieties.

Methods

To estimate the impacts of new bean varieties released in eastern, central and southern Africa, the Pan-Africa Bean Research Alliance (PABRA) coordinated a set of impact studies. Field research was conducted between 2004 and 2006 in Kivu province of DR Congo, Ethiopia, western Kenya, Malawi, northern Tanzania, Rwanda, and Uganda. Data for the country studies was obtained through sample surveys covering 2,476 farm households.

The studies focused on economic and social impacts and examined changes in household consumption, income, food security, gender equity, and access by the poor, as well as aggregate economic impact.

Results

Results of the seven-country study demonstrate widespread adoption of bean varieties and improved management practices. These changes led to substantial yield gains with associated economic and social benefits. By 2005 67% of farmers had adopted new varieties. Nevertheless, there was wide variation in adoption rates across the seven countries, because of different levels of investment in dissemination of new varieties. From the survey results 73% of surveyed farmers had planted a new variety for at least one season. Extrapolation from the survey results indicates that approximately 37 million people had been reached by 2005 - which is beyond PABRA's target of 10 million people by 2008. New varieties were planted on 49% of total bean acreage in 2004-05, but the proportion varied across countries (DR Congo-Kivu 68%, N. Tanzania 56%, Malawi 68%, Rwanda 43%, and Uganda 31%). The average yield increase due to new varieties was 44% in 2004-05; again the gains varied widely across countries, ranging from 2% in Malawi to 137% in western Kenya. New bean varieties also improved the resilience of bean production. Between 1995 and 2005, many regions in Africa suffered from declines in bean yield (FAO, 2005). New varieties are credited with having prevented even more severe decline in bean yields and production in the face of increasing severity of constraints to production such as drought, low soil fertility and bean root rot.

New bean varieties contributed to food security and income of farm households. On average, 42% of bean output produced in 2004-05 was sold. Bean sales contributed 24% to 47% of household income. In Tanzania and Uganda, the income of bean adopters was more than 45% the income of non-adopters. In

terms of consumption, adopters increased their household bean supplies by over 30%, and as a result, became more food secure. In contrast, non-adopters experienced declines in bean food production and associated consumption.

There are more proportionate gains in incomes and annual household consumption, but overall small gains in per capita bean consumption across countries. This does not necessarily imply reduced food security, because in most cases income is invested back into agriculture or into convertible assets as security. In fact 58% of adopters reported an improvement in food security as a result of improved varieties. The new bean technologies were equally accessible for all farmers. The economic returns to bean research investments are substantial. Investment in R&D in DR Congo-Kivu, Malawi, Northern Tanzania, Rwanda, and Uganda by CIAT and other partners is estimated at US\$16 million. The net benefit realised is approximately US\$199 million, with an average annual net benefit of US\$6.6 million. The average return on investment is 41% with variations across countries (DR Congo-Kivu 40%, Malawi 37%, Rwanda 34%, N. Tanzania 25%, and Uganda 71%). Both the internal rate of return (IRR) and rate of return (ROR) estimates to bean investments are similar to the results of other food and cash crops studies in sub-Saharan Africa. The greatest R&D benefits were realised in countries with large annual bean output, resulting from both extensive acreage and yield gains. The most substantial increases in R&D benefits and returns to investment can be achieved by increasing current adoption rates and yield gains. A 25% increase in average yields results in an almost 70% increase in benefits and a 50% increase in the ROR.

Implications

Significant impact has been realised due to wide adoption of new varieties. However, high adoption rates only occurred where explicit dissemination efforts existed and in most countries a small number of varieties were adopted. Concentration on a narrow set of bean varieties (typically between one and five) could compromise farmers' future production stability in the face of biotic and abiotic stresses. Improved varieties have performed better than local varieties (e.g. Lyamungu 90 in N. Tanzania and K132 in Uganda). Nevertheless, only 49% of bean acreage was allocated to new varieties. Therefore significant gains can be achieved by increasing the acreage under new varieties. A future challenge

is to ensure multiple varietal injections into local systems are more widely spread so that the impact realised can be sustained and increased. PABRA has initiated a 'wider impact strategy' by introducing hundreds of seed catalysing partners to supply initial bean seed. Survey results revealed that local seed/grain markets were the main channel used for introduction and diffusion of new variety seed.

Future priorities

The evident priorities for bean research and extension are: scaling out of recent research advances, increasing productivity, enhancing market linkages, and improving knowledge management and utilisation. More impact can be achieved by increasing acreage under improved varieties, and adopting improved bean management practices (IBMPs). In the medium term, investments in scaling out dissemination of recently-released varieties and IBMPs can increase bean production in the region. In the long term, sustaining benefits to producers and consumers region-wide can be achieved through investments in research to overcome major production constraints, (for example, drought, bean diseases such as root rot, and declining soil fertility).

Also the greatest impact of improved varieties is influenced by market demand (in Ethiopia, east DR Congo, northern Tanzania, and eastern Uganda). Therefore the orientation of R&D to address distinct market demands is timely and promising, but should not lose sight of farmer preferences for local varieties that are consumed at home and adapted to local farming systems. Given that potential yield gains of up to 150% are possible under optimal management, there is scope for enhancing land and labour productivity. Weak adoption of agronomic practices represents a major constraint on the yet unrealised impact of R&D on productivity.

Africa has a \$95 million bean trade deficit and produces beans for speciality markets outside the continent. Ethiopia exports white beans to the canning industry in the EU and Eastern European markets. International trade opportunities are likely to increase because of differences in national capacities to supply beans. In PABRA, for example, Burundi, Malawi and Kenya and Rwanda are regular net bean importers while Ethiopia, Tanzania and Uganda are net bean exporters. The bulk of beans traded are new varieties from a common germplasm pool that is shared between many countries. This is an important resource that can further be exploited to increase gains from trade.



For more information contact:
Robert Kalyebara
robert.kalyebara@asps.or.ug
Robin Buruchara
r.buruchara@cgiar.org

CIAT
Africa Coordination
Kawanda Agricultural
Research Institute
P.O. Box 6247
Kampala, Uganda

Phone:
+256(414) 567670

Fax:
+256(414) 567635

Email:
ciat-uganda@cgiar.org

Internet:
www.ciat.cgiar.org

We gratefully acknowledge financial support from CIDA, SDC, the Rockefeller Foundation and USAID through PABRA. The views expressed are not necessarily those of these agencies.



FAO, 2005.
www.fao.org/es/ess/top/country.html

The World Bank Annual Report 2006.