

Highlights

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The impact of improved bush bean varieties in Uganda

Beans are a major food and cash crop for the majority of Ugandan farmers and consumers and account for 7% of national agricultural GDP, ranking fifth behind bananas, cassava, sweet potatoes, and maize. Bean production is entirely due to small scale farming and is concentrated mainly in the central, eastern, and western regions. Most farmers grow bush beans, whereas climbers have traditionally been limited to highland areas, constituting about 20% of total bean acreage. Typically, bush beans are grown in intercroops, (with maize, cassava, cotton, bananas, and groundnuts). Climbers are mostly intercropped with maize or grown in pure stands. In the last ten years bean production has more than doubled due to area expansion and a significant improvement in yields, coinciding with the introduction of improved varieties that are more disease resistant. Nine bush and five climbing bean varieties have been released over the last ten years by the National Agricultural Research Organisation (NARO) in collaboration with CIAT and other partners. This study examined the impact of eight improved bush bean varieties and complementary management practices which were promoted between 1994 and 1999. The study was conducted by NARO in cooperation with CIAT and PABRA between July 2003 and February 2004. The objective of this study was to estimate the social and economic impact of improved bean varieties in Uganda.

Methods

The data was obtained in 2003 through a survey of 529 bean farmers over two seasons in six districts, representing six major agro-ecological zones. Additional information was obtained from key informant discussions and participatory rural appraisal (PRA). The main focus of the household surveys was the collection of data on socio-economic characteristics, bean adoption, acreage, yields, output, utilisation, marketing; and social and economic impact parameters. Benefits from adoption of improved varieties were examined from the point of view of increasing incomes to households and society from investment in bean R&D. The efficiency of technologies and R&D systems in generating surpluses was investigated. Benefits were computed from farm-level data provided by the household survey, and aggregate bean production statistics. Research and development costs were calculated using data from NARO, FAO, the Ministry of Agriculture, and the Uganda Bureau of Statistics for the period 1986 to 2003.

Results

Adoption of improved varieties

Results from a formal household survey of six districts indicate that new varieties, particularly K132 (CAL 96), K131 (MCM 5001) and NABE 2 have an average yield advantage of 37% over farmers' varieties under farmer conditions. However the observed average yield of 855 kg per hectare for new varieties is still below the potential yield of 1.5–2.0 tonnes per hectare under optimal farmer management (NARO). The most widely adopted variety is K132 because of its high yield potential and high market demand. However its acreage is declining due to its susceptibility to bean root rot. About half (53%) of the sample households had adopted at least one new variety, while 40% had adopted K132. When extrapolated to national estimates, the observed adoption of new varieties is equivalent to approximately one million households, which represents a promising step forward in achieving the PABRA goal of reaching ten million households in the PABRA region by 2008. The majority of adopters are in the 'poor' and medium wealth categories. This is indicative of the major role played by beans in poverty alleviation, and also confirms that poor households are accessing improved varieties. However benefits to the poor are limited by access to complementary resources such as land: the average bean plot for poor households is just over one

third of the average plot size for rich households.

Impact by region

The number of adopting households is lower (20-50%) in the southwest, northwest, and western regions; and relatively high (40-80%) in the eastern highlands and central regions. The distribution of new varieties depends on access to major markets, and the extent of formal seed dissemination efforts by government institutions and NGOs. There is concern that new varieties are not yet easily accessible in some areas due to limited seed dissemination and low market access.

New varieties and bean output

Survey results showed that new varieties have contributed 41% of total bean output in the sample - with K132 contributing 36% of total bean output. The increase in total bean output due to improved varieties is attributed to partial replacement of old varieties by new ones which have a 37% yield advantage.

Marketing and utilisation

There is a clear differentiation by farmers between varieties grown for sale and those for home consumption. The data confirms the previously observed trend that new varieties are mainly grown for marketing rather than for home consumption. An important finding is that the share of output sold by the poor is close to that for the rich. In Uganda this has a major implication for poverty reduction: incomes of the poor can be enhanced through improved access to new varieties.

Impact of new varieties

Average annual household bean income has more than doubled since the introduction of new varieties, while annual household bean consumption has increased by just 37%! New varieties account for 67% of annual household bean income; and 45% of household bean consumption. Poor households earned 40,000 US\$ (\$23) from beans annually, compared to 60,000-70,000 US\$ per year (\$34 - \$40) earned by wealthy households, indicating that beans contribute more to poverty reduction - given that the rich have bigger bean plots and other sources of income. Per capita bean consumption varied according to the level of adoption of new varieties. For example in Mbale (eastern Uganda) where adoption (of K 132) was high, adopters consumed more beans (50%) than non-adopters. However, there was no difference in per capita bean consumption between adopters and non-adopters at a national level. This is

partly explained by the fact that adoption levels varied widely across the country, with areas which had low access to improved varieties (and therefore low adoption) consuming more traditional varieties per capita. The other reason was that a larger proportion of the main new variety adopted (e.g. K 132) was sold because of its high market demand.

Reaching disadvantaged groups

Reaching disadvantaged target groups is a key pillar of CIAT's efforts to eradicate poverty. In 41% of surveyed households, women were responsible for decisions to continue growing new varieties. It confirms the notion that because beans play a major role in household food security, many decisions related to beans lie in the hands of women. The total area sown to beans is much larger for women as compared to men. The survey revealed that between 1998 and 2002, the women from three pilot villages in eastern Uganda increased the area under beans four-fold (to 19 ha) while during the same period, men increased their acreage by about 0.2 times (to 5 ha). This confirms that women still maintained significant control of bean output as its level of commercialisation increased.

Growing new bean varieties was perceived by farmers as having had positive welfare effects through increases in household income, increased availability of food during periods of food scarcity, improved family health, and reduced amount of fuelwood required for cooking. Increased bean production had negative impacts too, by increasing the amount of work done by women, and reducing average bean prices.

Returns to investments in bean R&D

The net present value (NPV) at 2003 of benefits to Uganda from public investments in bean R&D by Uganda alone for the 25-year period from 1986 to 2010 is approximately 476 million dollars with an average return of 16 million dollars per year. The internal rate of return (IRR) from the investment at a nominal market interest rate of 15% is 41%. This is higher than the IRR found by Laker-Ojok (1994) for competing crops (maize 27%, groundnuts 23%, and sesame 27%). Wessler et al. (1999) observed a similar IRR of 45% for improved bean varieties in Uganda. This confirms that investment in bean R&D is beneficial to society, based on the assumption that research costs of international centres are sunk costs. It is not known how profitable bean research would be if developing countries were to fund their own breeding programmes and pay royalties for imported germplasm.



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