Highlights
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Farm level impacts of improved bean varieties and agronomic technologies in Rwanda

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In the period August to December 2004 researchers from the Rwanda Agricultural Research Institute (ISAR) and CIAT conducted a nationwide survey of 383 farm households in Rwanda. The study was designed to estimate the social and economic impact of improved bush and climbing bean varieties and associated crop management practices at farm level. The research aimed to estimate the adoption of improved bean varieties and their contribution to the social and economic welfare of households.

Data was collected with the aid of PRA survey tools and a formal household survey. A structured questionnaire was used to collect data on socioeconomic characteristics, the performance of local and improved bean varieties in various bean production systems, and farmers' perceptions of social and economic impact, bean production, food consumption patterns and incomes.

Results

The World Bank reports that 66% of Rwanda's rural population were living below the poverty line in 2000 (World Bank, 2006). Based on results of wealth ranking, according to locally accepted criteria, 82% of rural farm households in Rwanda are considered to be poor; 18% were classified in the medium wealth category, and less than 1% of all households were classified as 'rich' by rural standards.

Approximately 86% of farmers reported growing beans, mainly intercropped with maize, especially in the low altitude zone. Other popular intercrops were banana, cassava, and sweet potato. As expected, bush beans were mostly grown in the low altitude zone while climbers were grown in the high altitude zone. Fourty percent of households in the sample grew bush beans, 33% grew climbers, and 27% grew bush and climbing varieties. As previously observed, most Rwandan farmers (71%) prefer to grow mixtures of varieties (average of five varieties in a mixture).

The range of average yields of new varieties (7 – 11 kg per are[1]) as reported by farmers[1] is similar to that of local varieties (6 – 10 kg per are). The highest yielding varieties under pure stands were: Ngwinurare (23 kg/are), Decelaya (14 kg/are), and Mamesa/G2331 (12 kg/are). Under intercropping the highest yielding varieties were: Kiryugaramye (20 kg/are), Ngwinurare (9 kg/are), and Vuninkingi (6 kg/are). The yield estimates were generally higher than the average national yield of 6.4 kg/are, reported by FAO for the period 2003-05 (FAOSTAT, 2007), and indicate a marked increase from an average of 7 kg/are for the years 1995-06 (FAOSTAT, 2007). The small yield gain due to new varieties is due to an outbreak of bean root rot on the most popular improved varieties (especially Umubano). Promotion of resistant varieties was at early stages of development at the time of the study.

Variety adoption and diffusion patterns

The adoption rate of new bean varieties by farmers is high (65% of all households). The adoption rate of climbers was 94%, compared to 26% for bush varieties. There are no major differences in adoption rates between different wealth categories; however there are regional differences. Adoption is much higher (86%) in the major climbing bean growing regions in the north western highlands of Rwanda, and low (43%) in the low altitude areas where bush beans are dominant. This could be due to the small number of improved bush varieties available for lowlands, and a low level of variety dissemination.
Older improved varieties released in the late 1980s and early 1990s (Cajamarca,

Decelaya,Vuninkingi and Umubano) were the most popular of all varieties adopted. Only 30% of farmers grew newer varieties released after 1995, indicating that these varieties have not been well diffused. The majority of farmers (85%) got their first seeds through buying from markets or shops and gift or exchange with fellow farmers. The key role played by farmer networks suggests that a community-based approach would be effective in technology dissemination.

Household bean consumption and income

Rwanda has the highest per capita bean consumption (0.919kg/capita) in the world. Data from this study shows that households on average consume 197 kg of beans annually. Considering an average household of 6 persons (two adults and four children), the average per capita consumption is 38 kg of beans per person per year from beans produced by the household.

Beans occupy on average 40% of total land cultivated by a household. The average household produces 285 kg of beans annually on an average plot of 21 Ares (0.21 hectares). Results of the survey show that on average 70% of total bean output is consumed at home, and only 13% is sold. Only 31% of sampled households reported selling any beans in a year, mostly to purchase goods for their essential survival needs. Most households (74%) have to buy beans to supplement their own production, and 69% of households buy beans for home consumption. Thirty percent of the very poor buy beans more than half the days in a six month period. It is therefore evident from the data that the extent of the bean deficit in Rwanda is far reaching and severe.

Despite the overall improvement in annual bean consumption, per capita bean consumption has remained static over a five-year period for adopters, and declined for non-adopters. The poor reported the highest consumption gains from the new varieties, which ensured food security especially during the dry (lean) seasons. Generally adopters buy beans as often as non-adopters, implying that growing new bean varieties has not made households self sufficient in beans; rather it has reduced the food deficit for adopters. Thus the main effect of increases in bean production was consumption smoothing with production gains filling hunger gaps.

No major change in gender relations was observed as a result of introduction of new bean varieties. New varieties give higher production levels, resulting in more beans for consumption which has contributed to better health in children. An analysis of Rwandan children showed that as the amount of beans consumed increased, their weight increased also. However bean consumption accounted for 10.3% of the variability in weight in children.

Conclusions

There is no doubt that research and extension investments by CGIAR centres and NARS over the past fifteen years have made a significant contribution towards poverty reduction in Rwanda. Empirical evidence is clear: 65% of farmers have adopted improved varieties, 94% of climbing bean farmers have adopted improved climbers, productivity gains have resulted in improved food security, and the poor have achieved relatively bigger consumption gains compared to other households.

The main concern from this study is that the gains in bean production are small and 74% of rural households still face a bean deficit. In addition, productivity gains are being eroded due to increasing losses from pests, diseases, drought, and declining soil fertility; coupled with slow dissemination of new resistant varieties. The lessons learned point to the following areas of intervention:

i) Major gains in impact will be achieved through intensified dissemination of newly released bean varieties. Their adoption is still less than 30% due to limited dissemination. Due to the well-known yield advantage of climbers over bush beans, intensifying efforts to identify and disseminate lowland climbers would be very beneficial.

ii) The estimated yield difference between local and improved varieties was only 10-30%. Research to produce bean varieties with improved yields holds the greatest hope for achieving greater impact.

iii) Specific recommendations need to be formulated on optimal intercropping practices for Rwanda.

iv) Most of the variety diffusion has occurred through market channels and social networks. There is need to strengthen rural institutions that link farmers to markets. Such institutions are the future drivers of technology dissemination.

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

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[1] 1 are = 0.01 hectare

FAOSTAT, 2007. FAO Statistics database (FAOSTAT). FAO, Rome, http://faostat.fao.org.

World Bank, 2006. World Development Report. The World Bank, Washington D.C.