

ECONOMIC EVALUATION OF BEAN-RESEARCH INVESTMENT IN MEXICO

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In Mexico, dry beans are the second most important crop after maize, both in terms of production and consumption. During the 1990s, the harvested bean area averaged 1.9 million hectares, with an average yield of 632 kg/ha, and an average production of 1.2 million Mt. Approximately 85% percent of the country's bean crop is grown under rainfed conditions. During the 1996-2000, the total harvested bean area decreased by 2.0%, average yield decreased by 2.5%, and production declined by 4.5%, compared to 1990-1995 (SAGAR 2000). As a result, there has been an increasing trend in requiring bean imports to meet domestic demand, especially after Mexico joined NAFTA in 1994. During the 1990s the Mexican government, through the Secretariat of Agriculture (SAGAR), started two programs—PROCAMPO and Alliance for the Countryside—to support farmers and promote the adoption of improved varieties for most important crops through the Kilo per Kilo subprogram.

In 1982, the Bean/Cowpea Collaborative Research Support Program (CRSP) signed an agreement with Mexico's National Research Institute for Forestry, Agriculture and Livestock (INIFAP) to collaborate in developing improved bean varieties for the semiarid highlands of Mexico's North-Central region. During 1990-2000, INIFAP released several improved bean varieties that were distributed via the Kilo per Kilo program and adopted by farmers in the semiarid region.

Numerous studies have demonstrated the critical role that increasing agricultural production plays in the process of economic development and the key contribution of research in promoting growth in agricultural production (Alston *et al.* 1998, 1999). However, now facing tighter budgets, research administrators are increasingly being asked to provide evidence that the costs of public-sector funded research are justified by the benefits.

Thus, the government of Mexico needs to justify its investments—as do other governments and donors—because the economic value of public investment may not be obvious. It is particularly difficult to observe the impact of bean research because the benefits are diffused over many years and millions of dispersed producers and consumers. Without an economic analysis, it is difficult to assess the social value of new technologies and to make informed judgments about the trade-offs in allocating scarce scientific resources (Alston *et al.* 1998; Masters 1996). An economic impact assessment of bean research is essential to provide decision-makers with information needed to improve the allocation of research resources.

This study generates insights that meet the information needs of the main stakeholders of bean research investments: 1) government decision-makers, who desire information on the payoff of agricultural research, since it competes with alternative uses for public funds; 2) research administrators, who desire information on the expected payoffs from funds allocated to alternative research investments, and 3) the general public (consumers and producers included),

who has become increasingly concerned about the productivity of their tax payments and government investments (Norton and Davis 1981).

The objectives of the study were to describe Mexico's bean subsector, analyze the factors associated with adoption of the improved bean varieties released by INIFAP in the 1990s, identify factors that contributed to explaining the participation of farmers in the government's seed distribution program (Kilo per Kilo), and estimate the net social gains generated by public investment in agricultural research and extension to develop and distribute improved bean varieties in northern Mexico.

The study area includes the states of Chihuahua, Durango, and Zacatecas, which account for 62% (1.15 million hectares) of the Mexico's rainfed bean production area. The results reported in this study include a rapid appraisal assessment of the bean subsector, an evaluation of government support policies affecting the bean subsector, a statistical and econometric analysis of improved bean seed adoption and farmer participation in the Kilo per Kilo program (based on survey data), and an estimation of the economic returns to public investment in bean research and extension (using the economic surplus method). The farmers' survey focused on analyzing the adoption of the improved bean varieties released by INIFAP during 1990-1996: three pinto beans (Pinto Villa in 1990, Pinto Mestizo in 1996, and Pinto Bayacora in 1996); two black beans (Negro Altiplano in 1996 and Negro Sahuatoba in 1996); and one light-colored bean (Flor de Mayo M38 in 1994).

The adoption analysis indicates that the improved bean varieties Pinto Villa and Pinto Mestizo have been widely adopted in Chihuahua and Durango, that these varieties have yields that were 20.6% higher than traditional pinto bean varieties, and that the yield difference was statistically significant. The economic analysis indicates that if a closed economy model is assumed, the financial (US\$ 1,853,360) and economic (US\$ 3,083,879) NPVs are positive and the IRRs are 17.5 and 21.4%, respectively. If an open economy model is assumed, the financial (US\$ 2,760,108) and economic (US\$ 2,558,186) NPVs are positive and the IRRs are 21.3 and 20.7%, respectively. The results from both models are consistent and suggest that public investment in bean research and extension was profitable (opportunity cost of capital=10%). Thus, the government should continue investing in bean research in northern Mexico to promote agricultural development and to improve the level of welfare of farmers under rainfed conditions and low-income consumers.

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