

# Environmental Impacts of *Bt* Eggplant in the Philippines

*Sergio R. Francisco\**

Fruit and shoot borer (FSB) is one of the major pests of eggplant. Reported estimates of yield losses due to FSB ranged between 20 - 90 percent. Farmers normally apply frequent and heavy doses of pesticides in futile attempt to control FSB. Many farmers spray their eggplant two or more times a week; some even spray 60 - 80 times during the production period. Pesticide use is expensive and potentially damaging to human health and the environment. Unsystematic and excessive use of pesticides kills beneficial insects, causes environmental pollution, enhances resistance of pests to the chemicals and resurgence in insect population, and poses risks to humans and animals.

Current research initiative at the Institute of Plant Breeding, University of the Philippines Los Baños focuses on the development of FSB-resistant (*Bt*) eggplant. This involved genetic modification of eggplant conferring



resistance against FSB. *Bt* eggplant has the potential to increase farmers' income while significantly reducing pesticide use. This study assessed the potential health and environmental impacts of *Bt* eggplant currently being developed in the Philippines.

## Assessment Approach

Different methods were applied to quantify potential health and environmental benefits of *Bt* eggplant. The objectives are to assess the potential value of health cost savings and environmental improvements resulting from reduced pesticide use due to the adoption of *Bt* eggplant. The methods employed include estimation of risks avoided and farmers' willingness to pay, application of a health cost model, and calculation of an environmental impact quotient (EIQ). Economic valuation of health and environmental impacts of reduced pesticide use due to *Bt* eggplant adoption is accomplished by estimating a) the impacts of *Bt* eggplant on the risks caused by pesticides to various non-target species, including humans and b) society's willingness to pay to reduce these risks. In addition, the health cost model was used to determine *ex-ante* the health cost savings that would accrue to farmers and pesticide applicators due to *Bt* eggplant adoption. EIQ provided estimates of environmental footprints associated with pesticide use. This indicator integrates the

various environmental impacts of individual pesticides into a single field value per hectare. The data used in the analysis were gathered through survey of farmers in four eggplant producing provinces, namely, Pangasinan, Nueva Ecija, Batangas, and Quezon.

### Health and Environmental Benefits

Farmers apply pesticides an average of 42 times during the production period to control FSB. The average volume of pesticides applied was 65.6 liters per hectare, with total active ingredients (a.i.) of around 12 kg. a.i. per hectare. Farmers are spending PhP28,000 per hectare on pesticides, about 30 percent of the total production costs to control FSB.



The use of *Bt* eggplant can significantly reduce pesticide use as the technology replaces broad spectrum pesticides. The estimated value of the reduction in pesticide usage with the adoption of the technology amounted to PhP2.1 million - PhP2.5 million in health costs savings and about PhP6.8 million in environmental benefits in terms of reduced harm to farm animals, beneficial insects and avian species.

### Environmental Footprint

*Bt* eggplant can reduce pesticide use by as much as 48 percent. Pesticide usage in non-*Bt* eggplant was 11.98 kg a.i. per hectare while only about 6.22 kg. a.i per hectare in *Bt* eggplant. The estimated field EIQ for the non-*Bt* eggplant was 245 per ha while that of *Bt* eggplant was 198 per ha, or a reduction of 19.5 percent in environmental footprint.

### Concluding Comments

*Bt* eggplant is expected to bring about increased marketable yield and profit to resource-poor farmers. The technology can also contribute to a significant reduction in health and environmental impacts resulting from reduced pesticide

### Reduction in environmental footprint from changes in pesticide use associated with *Bt* eggplant adoption

Particular	Without <i>Bt</i> eggplant	With <i>Bt</i> eggplant	Difference
Pesticide use (kg a.i./ha)	11.98	6.22	5.76
Field EIQ	245.59	197.75	47.84
% change in pesticide use			48.08%
% change in EIQ footprint			19.48%

use. Other benefits can also be derived from the technology as demonstrated elsewhere.

Locally developed *Bt* eggplant varieties are currently being tested in the field and may see commercialization in the near future. Results of this study, together with the agronomic and direct economic benefits, reinforce the need for continued support for the development, commercialization and promotion of *Bt* eggplant in the country. Further analysis of the potential benefits from the technology could also usefully include other environmental indicators such as impacts on biodiversity and benefits to consumers.



---

*\*Program Leader, Impact Assessment and Policy Research Program, Philippine Rice Research Institute (Philrice), Muñoz, Nueva Ecija, 3119 Philippines. For correspondence, e-mail [srfrancisco@philrice.gov.ph](mailto:srfrancisco@philrice.gov.ph) or [srfrancisco72@yahoo.com](mailto:srfrancisco72@yahoo.com)*