

Distribution of Benefits

Farmers gained an average profit of US\$ 335.45 per ha though there was a wide variation between 1997 and 1998. It is estimated that a total of more than US\$6 million in economic surplus was produced, of which about 86% went to farmers and 14% to the developers of *Bt* cotton. After subtracting the cost of seed production, it is estimated that the developers of *Bt* cotton were left with a net revenue of roughly US\$100 per ha.

Mexican farmers have demonstrated that *Bt* cotton is a valuable technology in controlling major insect pests of cotton. But more significant is the increased profitability and competitiveness of farmers using the technology.

Suggested Readings

- Falck-Zepeda, J.B., G. Traxler and R.G. Nelson. 2000. Surplus distribution for the introduction of a biotechnology innovation. *American Journal of Agricultural Economics*, 82: (2) 360-69
- Sánchez Arellano, J. 2000. Situación actual de la campaña contra las plagas del algodón en la Región Lagunera. Draft publication, Regional Plant Health Office, Torreón, Coahuila, Mexico
- Traxler, G. S. Godoy-Avila, J. Falck-Zepeda, and J. Espinoza-Arellano. Transgenic cotton in Mexico: Economic and environmental impacts. *In* Nicholas Kalaitzandonakes (ed). *Economic and Environmental Impacts of First Generation Biotechnologies*. (In Press)

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Bt Cotton in Mexico





Background

Cotton production in Mexico is intensive with more than 90% of cotton area under irrigation. The area planted to cotton was highest in 1996 at 315,000 hectares and lowest in 2000 at about 80,000 hectares. Yields are high by world standards. However, cotton area declined due to insect infestation and other factors.

In 1996, Mexican farmers were introduced to *Bacillus thuringiensis* (*Bt*) cotton. This insect protected cotton contains a naturally occurring substance, *Bt* protein, which has been the active ingredient in safe and effective biological sprays for over 50 years. *Bt* cotton now occupies one third of the country's total cotton area, up from only one percent in 1996.

Agricultural economist Greg Traxler of Auburn University, US and colleagues discuss the impact of the introduction of *Bt* cotton in the Comarca Lagunera region in North Central Mexico. Insect infestation in cotton fields in this area almost always reached critical levels before the introduction of *Bt* cotton. Survey information was collected from both small and large scale farmers.

Benefits of *Bt* Cotton

Effective Pest Control

Bt cotton has been found to be extremely effective in controlling two major pests: pink bollworm, and tobacco budworm. It is highly effective in controlling cotton budworm, and is partially effective in suppressing fall army worm.

Lower Chemical Pesticide Use

The use of *Bt* cotton greatly reduced pesticide application resulting in pesticide costs savings. In the 1980s, an average of nearly 14 kgs/ha of active ingredient was applied to cotton. Presently, only about 2 kgs/ha is needed, thus reducing pesticide use by more than 80%. In 1999, *Bt* cotton required only 3.5 applications compared with 6 for conventional crops. For 2000, *Bt* cotton needed 2 applications versus 3 for conventional crops (Table 1). It is evident that pest infestations decreased through the years. Producers are becoming increasingly reluctant to use chemical pesticides for fear of upsetting the new equilibrium between beneficial and destructive insects.

Adoption, Productivity and Economic Benefits

In 1997, the *Bt* variety was grown on 52% of cotton area, while two conventional varieties accounted for the remaining 48%. Yields were about the same for both types of cotton, but conventional cotton was valued slightly higher. As a result, conventional cotton produced nearly US\$50/ha higher revenue than the *Bt* variety. However, *Bt* cotton needed 2.26 fewer insecticide applications than conventional cotton. Total chemical insecticide costs per ha were US\$ 153.91 less for *Bt* cotton, and total pest control costs, including seeds, were US\$ 92.66 less. *Bt* cotton had a US \$44.15 advantage in net profitability.

In 1998, adoption of *Bt* cotton varieties increased to 72%, and average *Bt* yields were 0.29 t/ha higher than for conventional varieties. Lint quality was higher for *Bt* cotton, giving it a US\$543.56/ha revenue advantage. An average of 2 fewer insecticide applications were used on *Bt* than conventional cotton, and total seed and insecticide costs were US\$ 83.19 less. The net profit advantage for *Bt* cotton in 1998 was US\$ 626.74.

Table 1. Average number of insecticide applications on conventional and *Bt* cotton, Comarca Lagunera, 1999-2000.

Pest	Number of Applications of Insecticide			
	<i>Bt</i> Cotton		Conventional	
	1999	2000	1999	2000
Pink bollworm	0	0	4	0
Tobacco budworm	1	0.5	1	1.5
Conchuela	2	1.6	1	2
Fall army worm	0.5	0.2	1	0.5
White fly	1	0	1	0
Total	3.5	2	6	3



Source: Sánchez-Arellano, 2000. Data from Plant Health Authority insecticide use records.