

**TECHNOLOGY CONTRIBUTIONS TO THE COMPETITIVE SITUATION OF THE MEXICAN
AGRICULTURE: THE COTTON CASE IN THE STATE OF CHIHUAHUA, MEXICO**
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Abstract

The cotton acreage in Mexico has declined significantly. The reasons of this situation are the low international price, high production costs, low yields and increasing imports. Mexico share of world production is low and Mexican changes in production have no effect on the world price. However, there are production technologies such as narrow rows able to reduce costs and increase yields. In this paper are presented the results of the use of this technology versus the traditional system in the Meoqui, Jimenez, Ascencion and Juarez counties in the state of Chihuahua, Mexico. Using narrow rows production costs are reduced 30% and the production value rose 28%.

Introduction

Although cotton use in Mexico has significantly increased, acreage and production have declined. Consumption increased from 800,000 bales in 1994 to 2.5 millions in 2000, while production decreased from 549,300 bales to 382,473 bales for the same period. 2000 imports account for about 2 millions of bales (Fernández-Aguirre, 2001). Cotton area during the early 60s was on an average of 800,000 ha. However, during the late 60s, 70s and 80s a continuously declining trend characterized cotton harvested area (SAGARPA, 2002). In 1992 and 1993 cotton area in Mexico almost disappeared and Mexico changed from exporter to an importer country. On the other hand, yields have continuously increased. From an average of 1 ton/ha (raw cotton) during the 60s increased to 3 ton/ha in 2001 (figure 1). In 2001 the state of Chihuahua was the most important state with a share of about 35% of national acreage (figure 2). Other important cotton areas in Mexico are the States of Baja California Norte, Sonora, Tamaulipas and La Laguna. Chihuahua is located at northern-central part of Mexico. Cotton production in Chihuahua faces several problems. In the economical side stand out low product prices, high production costs and increasing imports. In the technical side stand out pest problems and an inefficient production system characterized by low yields and excessive use of water, pesticides and fertilizer. A proposed alternative to solve these problems was the technology known as "narrow rows." This technology is characterized by a reduction of distance among rows and plants increasing the number of plants by hectare (Godoy-Avila, 1998). This technology was originally developed in United States and evaluated and adapted to the arid and semiarid conditions of Mexico by the National Institute of Agricultural and Livestock Research (INIFAP). The objective of this paper is to show the economic and technical results of the use in 2001 of this technology by selected cotton farmers of Meoqui, Jimenez, Ascencion and Juarez counties in the state of Chihuahua, Mexico. The promotion of this technology was under a Technology Transfer Project sponsored by the "Fundación Produce Chihuahua" and conducted by researchers of INIFAP.

Materials and Methods

The evaluation consisted in a technical and economical comparison between the "narrow rows" and "traditional" production systems. Data on costs, input use and yields were collected during the growing season. The narrow rows technology was used in an area of 500 ha during the spring-summer 2001 season. The traditional system was used as a control treatment.

Results and Discussion

Results of technical and economic evaluation are shown on tables 1-4. On table 1 are shown technical results of both production systems. Comparison variables on this table are amounts of seed and fertilizer, excess of plants elimination, number of water applications, number of pest control applications, growing season, number of mechanical harvests and raw yields. The amount of seed used in the traditional system was 22 kg/ha while in the narrow rows it was 12 kg that means savings of 10 kg/ha. This difference is because of the use of precision planting machine in the narrow rows system. The amount of urea (46-00-00) is the same for both systems (200 kg/ha), however, for the phosphate of ammonia (18-46-00) in the traditional system are used 300 kg/ha while in the narrow rows are used only 100 that implies a saving of 200 kg/ha. In the traditional system it is still common to manually eliminate the excess of plants, while in the narrow rows system it is not necessary to do this practice because it is used the required amount of seed to have the appropriate number of plants. This implies an extra labor cost for the traditional system. The number of days from the planting to harvesting date is 160 in the narrow rows system and 210 in the traditional system. The earliness in the narrow rows system allows farmers to reduce the number of water applications from 6 to 3 and the number of pest applications from 10 to 3.8. These advantages of the narrow rows system make important environmental contributions to reduce water extraction and air, water and soil pollution. Yields are also different in both systems. In the traditional system yields of raw cotton were 3.5 ton/ha while in the narrow rows yields were 4.5 ton/ha, this is a 29% increase. Savings on production costs and value of production for both systems are shown on tables 2 and 3. On table 2 are shown costs and savings

of concepts where both systems differ (first column). On columns second and third are shown costs of traditional and narrow rows systems respectively and savings for using narrow rows in the fourth one. Total savings are \$ 504 USD/ha, equivalent to one third of total production costs under the traditional system. Pest control and water applications are the most important savings for the cotton farmer under the narrow rows system. Value of production under narrow rows (table 3), because of higher yields and better quality of fiber increased \$ 357/ha, this is a 28% increase. Finally, on table 4, considering reduction in costs (table 2) and production value (table 3) a comparison is made with and without the technology transfer project. Results indicated that even without government subsidies cotton farmers of Chihuahua using narrow rows got profits of 43% over costs. On the other hand, farmers using traditional system, without subsidies, lost 23% of production costs.

Conclusions

1. The technology transfer project based on the narrow rows production system was able to reduce costs and increase yields making cotton production in Chihuahua a profitable activity.
2. It was possible to get profits because of the reduction of 30% on production costs and an increase of 28% on production value.
3. This project made a contribution to the environment through reduction of water extraction and pest control applications.
4. It is not necessary to make additional investments to use this technology. So it is easy to use by other cotton farmers of Chihuahua.
5. Even though market conditions for cotton have been adverse, farmers were able to get profits. This implies that under better market conditions, government support programs and appropriate technologies, cotton production can be a profitable activity.

References

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Table 1. Technical Evaluation of the Project.

Concept	Traditional system	Narrow rows
Amount of seed	22 kg.	12 Kg.
Fertilizer	300 kg. de 18-46-00 200 Kg. de 46-00-00	100 kg. de 18-46-00 200 Kg. de 46-00-00
Excess of plants elimination	Yes	not
Number of water applications	6	3
Pest control applications	10	3.8
Growing season	210 dap	160 dap
Number of mechanic harvests	2	1
Raw yields	3,500 kg/ha	4,500 kg/ha

Table 2. Partial costs of Traditional and Narrow Rows Production Systems (2001=100).

Item	Traditional System	Narrow rows	Savings/ha under narrow rows system
Seed (sack of 22 kg. = 65 dls)	65.1	35.5	29.5
Fertilization	176.3	110.0	66.3
Excess of plants elimination	31.6	0	31.6
Water application (\$36.84/application)	221.1	110.5	110.5
Insecticide (\$31.57/application)	315.8	120	195.8
Harvest (mechanic)	250.0	180.0	70.0
TOTAL SAVINGS UNDER NARROW ROWS =			\$503.7/ha

Table 3. Value of Production (fiber + seed).

	Traditional System	Narrow rows	Additional revenue/ha under narrow rows system
Value of Production ¹ (\$/ha) (Without government support)	\$ 1,241.2	\$ 1,597.9*	\$ 356.7

(1) Based on the following prices: fiber: 33 U.S.dls/hundredweight, seed: \$168.42/ton

(*) 5% of overprice because of better fiber quality.

Table 4. Economic Evaluation with and without the Project.

Concept	Without project (traditional)	With project (narrow rows)
Value of production (\$/ha) (Without government support)	\$ 1,241.2	\$1,597.9
Production costs ² (\$/ha)	\$ 1,618.4	\$1,114.7
Profits (\$/ha) (Without government support)	\$ -377.26	\$ 483.2
Profitability (%) (Without government support)	- 23 %	+ 43 %

(2) Includes post-harvest and financial costs.

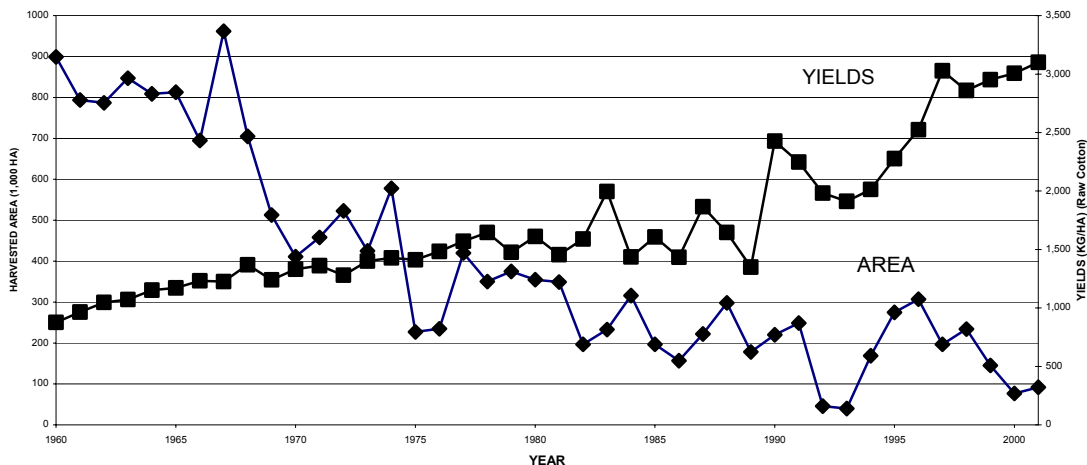


Figure 1. Harvested area and yields of cotton in Mexico (1960-2001).

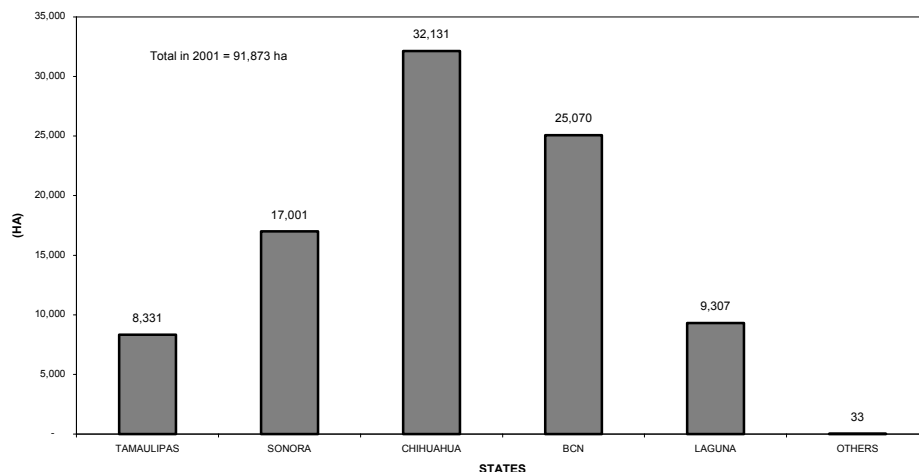


Figure 2. Area of cotton in Mexico by state (2001).