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Discover Natural Fibres Initiative

Minutes

First Breakout Session: Innovations in High-Input Cultivation Systems

Chair: Mr. Sharad Kumar Saraf, Chairman, Technocraft Industries, India
Speakers:
Luis Renato Zapparoli, AGOPA, Brazil, "Intensive Farming: A Grower's Point of View."
Allan Williams, Cotton Research and Development Corporation, Australia, "Innovations in High Yielding Cotton Cultivation: Success Factors in the Australian Production System."
M.V. Venogupolan, Central Institute for Cotton Research, India, "High Density Production System in Cotton – R&D Initiatives in India."

The world cotton yield is approximately 800 kilograms of lint per hectare, but some countries, and some individual farms within countries, achieve much higher levels of productivity. Brazil achieves the highest rain fed yield in the world, with a national average of approximately 1,500 kilograms per hectare, and Australia, where 90% of production is irrigated, achieves the highest national yield in the world of approximately 2,500 kilograms per hectare. The national yield in India is less than 600 kilograms per hectare, even though about half of all cotton area is irrigated. However, research fields in India utilizing High Density Production System (HDPS) technology achieve yields of more than 1,000 kilograms.

Double Cropping: A Key to Profitability in Brazil

Mr. Zapparoli, who is himself a farmer in the state of Goias, Brazil, reported that agriculture in Brazil was transformed by the founding in 1973 of EMBRAPA, the national agricultural research organization, combined with the advent of double cropping and expansion into the Cerrado region, in the late 1970s. By the 1980s, EMBRAPA was releasing new varieties, and in the 1990s, the national government brought economic stability to Brazil with policies to end inflation. Mr. Zapparoli noted that the boll weevil arrived in Brazil in 1983, and a rust disease affecting soybeans was identified in 2000. However, farmers learned to manage these difficulties, and with the release of biotech cotton, maize and soybean varieties in 2000, agricultural production continued to climb. The national yield for cotton climbed from 370 kilograms of lint per hectare in 1990/91 to 1,500 kilograms currently.

Mr. Zapparoli reported that double cropping (harvesting two crops from the same field each year), with cotton as a second crop following soybeans, was a key factor underlying the rise in cotton production and yields. Double cropping soybeans and cotton results in higher soybean yields because of cotton's tap root, and cotton is intrinsically more valuable than maize, giving cotton an advantage in double cropping systems.

He said that double cropping reduces input use per kilogram of lint production through more efficient nutrient utilization, reduces soil erosion by limiting the number of days each year that land lays bare, improves machinery utilization and allows the amortization of fixed costs over two crops instead of just one. However, double cropping also increases management intensity and results in greater crop sensitivity to rainfall deficits.

He also noted that average farm size in Brazil had increased dramatically since the 1990s, from about 5 hectares per household to several thousand hectares per household, and that cotton production had migrated from states in the Southeast of Brazil to states in the center and north, and these developments contributed substantially to the rise in yields.

He observed that challenges for the future include reducing energy, fertilizer, and pesticide use per kilogram of production, learning to control disease and insects without sacrificing yields or increasing input use, and developing varieties specifically bred for double cropping systems with intensive farming techniques. EMBRAPA is working on new biotech events that will impart resistance to sucking pests.

Experimentation and Technology Adoption are the Keys to Australian Cotton Success

Allan Williams observed that the key to success in Australia has been the willingness of farmers to experiment and innovate while incorporating new technologies on a whole-farming-system basis. Australian cotton yields rose from 700 kilograms of lint per hectare to 2,500 kilograms per hectare between 1960 and the present, and about half of the yield increase was due to the development of new varieties with greater disease resistance and higher ginning ratios of up to 45%, about one-fourth of the increase came from better soil, water and pest control management, and about one-fourth came from the interaction of better varieties and better management.

As an example, Mr. Williams noted that the use of biotech cotton resistant to certain insects, combined with better water management to reduce plant stress, resulted in greater retention of 1st-position bolls, helping to raise yields. Further, he asserted that 1) expanded use of crop rotations, 2) reductions in the use of heavy machinery and elimination of production practices that resulted in soil compaction, 3) the installation of global positioning system (GPS) devises on machinery to enable precision input applications and 4) to enable field mapping so as to optimize input applications, 5) better water management through the use of field leveling machinery to eliminate low spots in rows being irrigated and through better recapture, 6) the elimination of the practice of stubble burning, and 7) the automation of agronomic practices so as to ensure timely performance, such as irrigation and pesticide applications, also contributed to cost minimization and yield enhancements.

Mr. Williams indicated that sub-surface drip irrigation is little used in Australia because of installation costs. He reported that the use of round-bale cotton harvesting machines reduce equipment and labor requirements during harvesting but result in more soil compaction than lighter machines. However, he cautioned that the use of round-bale harvesters enabled farmers to harvest cotton with more than 8% moisture, threatening quality deductions.

High Density Production System (HDPS) Holds Promise in India

M.V. Venugopalan acknowledged that yields in India are below the world average, and he attributed this to long-duration cultivars that expose cotton plants to moisture, nutrient, insect and disease stress, and the use of hybrid varieties that are not well suited to certain regional situations.

Venugopalan defined HDPS as a cropping system incorporating plant densities of between 111,000 per hectare (90 centimeters between rows and 10 centimeters between plants in a row) and 222,000 per hectare (45 centimeters between rows and 10 centimeters between plants). He reported that HDPS results in lower damage from sucking pests, higher water nutrient use efficiency, greater uniformity in maturity and faster plant maturity. Because HDPS results in faster plant development, peak flowering tends to occur during the rainiest time of year in India. Consequently, yields tend to rise by 30% or more. In order to reap the greatest benefits, farmers practicing HDPS systems must ensure sowing at proper times, effective weed and insect control and timely fertilizer applications.