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Discover Natural Fibres Initiative

**Minutes**

Fourth Breakout Session: Best Practices in Cotton Ginning

Chair:

Speakers:
Dr. Sheraz H. Siddiquee, Textile Engineering Department, NED University of Engineering & Technology, Karachi, Pakistan, “Cotton Quality a Real Challenge for Ginners."
Dr. Assad Farooq, In charge, Department of Fibre & Textile Technology, University of Agriculture, Faisalabad, Pakistan, “Investigating fiber-to-machine interaction during ginning process.”
Engin Dirik, Mechanical Engineer M.Sc., Balkan Cotton Ginning Machinery Ltd, Turkey, "High Speed Roller Ginning versus Conventional Ginning Methods of Upland Cotton."
Dean Ethridge, Director, Fiber & Biopolymer Research Institute, Texas Tech University, USA, "Ginning for Best Fiber Quality: Technical vs Economic Feasibility."

**Best Practices in Cotton Ginning**

Dr. Siddiquee emphasized that incentives must be aligned with desired cotton quality attributes. He noted that farmers and ginners are often separated by middlemen, sometimes called country merchants. Middlemen drive from farm to farm with a truck, buying small lots of a few hundred kilograms of seed cotton at a time, before delivering truckloads to gins. Because of the physical disconnect between textile mills, ginners and farmers, it is essentially impossible to reward farmers delivering higher-quality, cleaner seed cotton with premiums or to discount lower-quality and trashier or contaminated seed cotton.

He suggested that the marketing system needs to be restructured so that quality premiums can be communicated to farmers and ginners. In addition, he suggested that better education of ginners, farmers and pickers as to quality characteristics desired by spinning mills could help improve cotton quality in Pakistan.

Dr. Farooq observed that the ginning process damages fibers by reducing fiber length and strength and creating short fibers and neps. Poor ginning damages fibers unnecessarily. There are about 1,200 gins in Pakistan, mostly saw gins using parts locally manufactured or imported from China. The overall ginning process in Pakistan is oriented toward production volume, not protection of fiber quality.

The University of Agriculture, Faisalabad has undertaken a study of the structure and design of gin saws available in Pakistan, optimum operating speeds, feed rates and moisture management on saw life and fiber quality. Saws available from four domestic manufacturers and one Chinese supplier were studied.

Results show that faster gin speeds and increased feeding rates (increased ginning intensity, meaning the number of saw points per gram of fiber) result in increased Short Fiber Content (SFC) and reduced length (UQL). However, increased ginning intensity resulted in increased

trash removal. Therefore, an optimum speed of 750 revolutions per minute with 12" saws is recommended for Pakistan. The number of saw points per gram of fiber should be in a range between 2,500 and 3,500 per minute. Less-mature cotton, usually from the first pick, should be ginned at slower speeds around 700 rpm.

Saw wear resulting in a reduction in diameter of 1/16$^{th}$ of an inch resulted in appreciable losses in lint turnout and increased power consumption. Curved saws with higher tooth angle performed better than other saws. Saws must be sharpened routinely and installed properly with the correct gauging between ribs. In a typical gin producing 10,000 bales per year, proper sharpening and alignment can increase production by 8 bales per season. Since it is difficult to sharpen saws properly, saws should be replaced after 5,000 to 6,000 bales. Saws with more than 15 broken or missing teeth should be replaced immediately.

There is a tradeoff in managing moisture between trash removal and the creation of short fibers. Dry cotton results in increased grades and lower trash, but increased short fibers and neps. High moisture results in increased trash but fewer short fibers and neps. The University recommends that cotton should be ginned at 9% moisture. Less-mature cotton can be ginned at a higher moisture level around 10%.

Dr. Ethridge noted that most agronomic practices during each season do not involve tradeoffs between quantity of production and quality. However, at the end of each season in Texas where all production is mechanized, there are tradeoffs between yield and fiber quality, and therefore choices have to be made when terminating, harvesting and ginning the crop.

Fiber length distribution is always damaged by ginning. Operational choices facing ginners include processing speed and fiber moisture content. Slower speeds result in better fiber properties but increase energy consumption and ginning costs per kilogram. Moisture affects fiber strength and elongation, but moisture management is expensive. Ginners with moisture management capabilities should increase the moisture percentage in seed cotton entering the gin stand, reduce moisture during pre-cleaning and ginning, and then increase moisture again as lint enters the bale press.

Dr. Ethridge noted that small improvements in length distribution result in big improvements in yarn performance, but that an accurate and fast instrument to measure length distribution in the gin is not available. Therefore, management of gin speeds and moisture are based on average or expected fiber quality results, combined with expected price premiums for improved quality. If the cotton marketing system does not reward improved fiber quality, ginners will have no incentive to optimize ginning speeds and moisture content. Cotton suffers in competition with man-made fibers because quality premiums are poorly communicated to farmers and ginners by most marketing systems.

Mr. Dirik reported that there are about 500 gin plants in Turkey, each producing an average of 6,000 bales per year. 90% of cotton in Turkey is machine harvested, and all cotton is Upland. The ginning season lasts between 45 and 75 days in each region.

Mr. Dirik noted that there has historically been a tradeoff between saw ginning and roller ginning, with roller ginning being slower and more expensive but producing higher quality fiber. However, new high-speed double-roller gins with capacities of 400-600 kilograms of lint per hour can bridge the difference with saw gins. The operating costs per kilogram of new high-speed roller gins operating at 600 kilograms of lint per hour are half the cost of previous roller ginning systems. According to Mr. Dirik, rotary knife roller gins are suitable for use on Upland cotton and can be cost competitive with saw ginning while maintaining the traditional fiber quality advantages of traditional roller gins. He forecast that high-speed roller ginning will begin to supplant saw ginning for medium staple Upland cotton varieties.

In response to questions, panelists noted that roller ginning is more sensitive than saw ginning to changes in the moisture content of cotton, and that with cotton that is high in trash, more pre-cleaning is needed with roller ginning. According to Mr. Dirik, optimum moisture for roller ginning cotton in Turkey is 9% to 12%. Dean Ethridge noted that ideally, seed cotton is dried to 4% as it entered saw gins in the United States, moisture is increased to 7% or 7.5% going into the gin stand, and then dried again to 5% to run through lint cleaners, and then brought back to about 7.5% prior to going into the bale press. However, he emphasized that these steps require extensive energy use and substantial investment in moisture management systems, and often costs are perceived to exceed benefits. Accordingly, optimum moisture management is not always achieved.