Cotton Situation in the World[1]

M. Rafiq Chaudhry
Technical Information Section

Abstract

The world cotton production for the year 1996/97 is currently placed by the ICAC at about 19 million metric tons to be produced from 33 million hectares in 69 countries around the world. In the last five years, five countries stopped growing cotton while some others in the Central America may do so in the next few years. Many cotton producing countries have decreased their share of world cotton area, some survived to maintain their share but some particularly the west African countries and the world's four largest producers were able to expand cotton production. The share of cotton consumption by the ten largest cotton producing countries has also increased and now estimated at 70% for the year 1996/97 as compared to 57% in 1988/89 and 68% in 1993/94. While significant increases in area are not expected in the world, production is also seemed to slow down as a result of slow increase in yield. The world cotton yields have arisen at the rate of 2% are 8 kilograms per year in the last 45 years. The current trend is not keeping up the momentum achieved as a result of development of new technologies. It seems that the available technology has been utilized thus emphasizing the need to develop new technologies for any significant improvement in yield. In addition to the world cotton production scenario, cotton production and current tendencies in cotton research are discussed in this paper.

Production, Area and Yields

The world cotton production for 1996/97 is currently placed by the ICAC at 18.9 million tons which is almost equal to consumption forecast for the same period. If ICAC projections come true, 1996/97 production will be almost 36% higher than 1980/81. During the same period the world cotton area did not increase. During 1980/81 cotton was grown on 33.7 million hectares. Low cotton prices during early 1980's depressed the world cotton area to 29.4 million hectares in 1986/97. But, the world area increased to 35.2 million hectares during 1995/96 as a result of low world cotton stocks and consequently high cotton prices.

World cotton area ranged between 29 and 35 million hectares in most years between 1950/51 and the present, with no apparent tendency to rise or fall. The 44-year regression line indicates that the world yields in 2000/01 should average about 620 kilograms per hectare. But, based on the current production trend, it seems difficult to meet this target. The current yield and long term trend (8 kilograms/ha/year) suggest that the world average yield in 2000 may be 591 kilograms per hectare. If the world area remains at the current level (33.9 million hectares), production would be 20 million tons in 2000/01 which is not enough to meet the project demand for cotton for the same year. If world area rises to the highest record (35.2 million hectares in 1995/96), production would climb to 20.8 million tons and it will be just enough to meet the world demand for cotton. But, significant expansion in the area planted to cotton during 1996/97 is not expected and emphasis lies on improving per hectare yields.

In the last 15 years, world cotton production has experienced significant increases as a result of increased yield. Since early 80's cotton yields have increased at the rate of 2% or ten kilograms per year, equal to the last 50 years average increase of 2% or eight kg/year. The decade of the 1980s experienced higher increases in yield but since 1991/92 world cotton yields have not increased. It

---

1 Presented at the Cotton Session of the All African Crop Science Congress held in Pretoria, South Africa from January 13-17, 1997.

seems that world cotton yields in most countries have entered into a slow period of growth. How long this slow growth will persist is not known.

Reasons for the comparatively slow growth may be different in different countries but the main reason is lack of new technological developments. It seems that the available technology developed by researchers has been utilized in most countries. In every country the adoption of technology is different according to different categories of farmers. The differences may be large or small but every segment has exhausted the technology at its level. The slow growth is a result of perfection in technology adoption and upward shift in categories. In order to bring significant improvement in yields, researchers have to develop new methods to realize a higher percentage of the genetic potential of the cotton plant. Conventional breeding has no control over transfer of genes. Directed breeding in the form of genetic engineering and possibilities of utilizing non species genes like in the case of Bt genes posses great hopes.

Cost of Production

The high cost of producing cotton forced many countries to abandon cotton production particularly in the Central America. High cost is also responsible for decline in cotton area in many countries. Extensive use of agrochemicals on cotton has rendered cotton production an expensive business compared with most other field crops. Due to increased use of insecticides, cotton is losing its profitability. The ICAC undertook a survey of the cost of production of cotton in 1995 and observed that insecticides and fertilizers costs are at least 1/3 of the total seedcotton cost to farmers. There was a time when they were not used. Reduction in cost of production is one of the major emphasis of production research in most countries.

Table 1: Cost of Fertilizers and Insecticides

Country	Cost (US$/ha)	% of Seed Cotton Cost
Australia (New South Wales)	241	31
Brazil (Northeast)	283	40
China (Mainland)	315	48
India (Central South)	163	39
Pakistan (Punjab)	282	40
Paraguay	156	23
Sudan (Acala)	199	37
Syria	162	13
Turkey (Aegean)	478	47
USA (National)	218	39
Zimbabwe	100	37

Farmers all over the world would be very interested in any approach which may not increase yield but reduces the cost of production thus improving the economics of cotton.

Bt Cotton

New biotechnological approaches to control insects with least use of insecticides is a step forward to decrease cost of producing cotton. Bt cotton resistant to lepidopteran insects was planted on about 740,000 hectares in the USA during 1996/97 for the first time. NuCOTN 33 alone was grown on about 10% of the total area and emerged the single largest variety in the USA. In Australia, Bt cotton has been planted on 30,000 hectares in the current season. The Bt gene produces protein toxin, CryIA(c)– found in most biological insecticides, throughout the life of the plant and is not affected by growing conditions. Many other countries will ultimately start growing Bt cotton but how it will reach developing countries is not clear at this stage. One of the possible options could be joint ventures with the owners of resistant genes and technologies. One such an agreement has recently been signed by the Delta and Pine Land Company of the USA with the Chinese companies. It is expected that transgenic Bt cotton with Bollgard™ gene may be grown on commercial scale in China. The Company is in the process of multiplying seed for planting on about 200,000 hectares in 1998/99. Herbicide tolerant cotton was also grown on commercial scale in the USA during 1996/97.

Insect and herbicide resistance is just one aspect of transgenic cotton. The foreign genes can bring in any imaginable features and characteristics to cotton. Reports show that recently a pigment alteration patent has been granted to the American company Calgene Inc. by the US Patent Office. The company owns Stoneville Pedigree Seed Company and claims that their scientists have developed blue and red fibers and now they are focussing on enhancing the shades. Pigment alteration of genetically-modified cotton plants has improved the prospects of producing naturally-colored blue jeans. Fiber quality of presently occurring naturally-colored green and brown fibers is not equivalent to white cotton. Development of pigment alteration in the genetically-modified cottons will not require additional work to improve fiber quality.

Is it possible to identify such genes which could be assigned the task to double the size of bolls without affecting boll number or double the number of bolls without affecting boll size seems to be in the dark yet. But, before such efforts are started, perhaps there is a need to improve understanding of the genetic control of boll numbers and boll size. In the absence of opportunities to enhance expressions by modifying corresponding genes for specific characters, one plausible approach is to identify already characterized genes in other species of plant kingdom, animals and microorganisms and transfer them into cotton. Such genes on transfer must be capable to synthesize new proteins or enzymes or change the substrates of existing enzymes so that a desired product is achieved.

Some private companies in the USA are working to modify cotton fiber for better spinning ability. Genetics or molecular manipulation of hormones related to the length of the fiber during its formation will contribute to producing more uniform and longer staple length cotton. Similar developments in the field of strength and other fiber characteristics are expected.

Roughly 50% of world cotton area is grown under rainfed conditions. Cotton yield under rainfed conditions is usually half the yield than under irrigated conditions. Identification of genes resistant to adverse growing conditions like drought and soil salinity and their incorporation into new varieties will have a direct impact on the productivity of the plant. These genes may not be available now, but they can be explored, most probably in wild species.

Ginning Technology

There are only two commercial systems of ginning cotton in the world: Roller ginning and saw ginning. Roller ginning is slow but most suitable for long staple and extra-fine cotton. Saw ginning is efficient but results in higher fiber breakage and more neps. Ginning technology has not changed since the invention of the saw gin in 1794. There have been some improvements in the machines but the fundamental technology has remained the same. It is time to shift to a system which can better preserve the original characteristics of the natural fiber. In the recent past, two systems have been tried in the USA. Differential Ginning having the capability of separating fibers of various lengths from the same cotton could not be pushed beyond the experimental stage. However, Cage Ginning has reached the large scale experimental stage and might be commercialized. The machine consists of a series of hard rollers mounted on the outer surface of a circular rotating cage. Air flow is directed to the center of the cage between the rollers pushing the lint to the center of the cage. Air pressure being much gentler does not form neps, prevents entangling trash with fiber and results in less fiber breakage compared with saw ginning.

High Volume Instrument Testing

It is very important for a spinner to know the actual fiber characteristics of the cotton he is going to use.

High Volume Instrument testing (HVI) provides efficient evaluation of fiber characteristics and provides more reliable results. Based on fiber characteristics, it is possible to make adjustments in spinning machines to produce more even yarn of better quality.

HVI Units in the World

Year	Units Capable of Measuring		
	L, S, M	L, S, M, C	L, S, M, C T
1989	414	382	332
1991	621	545	480
1993	883	782	697
1995	940		

(L= length, S= strength, M= micronaire, C= color and T= trash)

The use of HVI testing is steadily increasing in the world. Since 1992 all the US crop is tested on HVI machines. By the end of 1995, 940 HVI units capable of measuring at least length, strength and micronaire had been installed in the world. HVI units have more than doubled in less than five years. It is expected that ultimately all cotton in the world will be classed by HVI.

While HVI testing has improved confidence in the measurement of quality characteristics, it measures only known qualities of cotton. We still do not know all quality characteristics of cotton, a wonderful natural fiber with immense properties. We must explore the unknown fiber qualities of cotton and understand how to measure them for utilizing them in spinning.

ICAC's Collaboration With the Common Fund for Commodities

The Common Fund for Commodities is an inter-governmental organization based in the Netherlands. ICAC was recognized as an International Commodity Body (ICB) with the Common Fund for Commodities in October 1990. As an International Commodity Body, the ICAC is prepared to sponsor projects for financing by the Common Fund. Under the procedures, project proposals should be submitted to the ICAC Secretariat using a standard format which is presented in the Common Fund's manual for the preparation of projects to be financed through the Second Account. Since the recognition of ICAC as an International Commodity Body, five ICAC projects have been approved. The projects are

- Production Prospects for the Next Decade
- Integrated Pest Management for Cotton
- Integrated Pest Management of the Cotton Boll Weevil in Argentina, Brazil and Paraguay
- Genome characterization of whitefly-transmitted geminiviruses of cotton and development of virus resistant plants through genetic engineering and conventional breeding
- Improvement of the marketability of cotton produced in the zones affected by stickiness

Eighteen countries are directly involved in these five projects. Eight million dollars which is about 45% of the total cost of the projects have been contributed by the Common Fund. The Common Fund for Commodities is considering one more ICAC project on Market Development and Trade in Eastern and Southern Africa. This project will be sponsored from the first account of the Fund.

ICAC's collaboration with the Common Fund for Commodities has secured a sum of money for cotton production research. With the help of the Common Fund, the ICAC has enhanced cooperation among cotton producing countries. It has also provided an opportunity to develop regional projects and tackle them through regional cooperative efforts.