

Outlook for Cotton Production and Developments in Production Research

By

M. Rafiq Chaudhry
Head, Technical Information Section
International Cotton Advisory Committee

Production and Prices

The latest ICAC estimates suggest that 26.0 million tons of cotton will be produced in the world during 2007/08, only 50,000 tons more than what was produced in 2006/07. Cotton production will be lower in the USA by almost 600,000 tons due to lower area planted to cotton. An increased emphasis on ethanol production is driving growers away from cotton production. Lower production in the USA and elsewhere will be compensated by higher production in China (Mainland) and India in 2007/08. While increases in production in China (Mainland) are coming from more area planted to cotton, India continues to benefit from biotech cotton. Consumption in 2007/08 is estimated at 27.4 million tons. Though the figures are estimates as the crop is not yet harvested in most countries, consumption will be higher by 1.4 million tons over production, a good indication for higher prices this season.

The Cotlook A Index measures the international cotton price. The long-term average for the Cotlook A Index from 1973/74 to 1997/98 was 74 cents per pound. The average from 198/99 to 2006/07 was only 56 cents per pound. The Cotlook A Index for 2006/07 was 59 cents per pound. The main reason for lower international prices has been higher ending stocks in the world, over 12.5 million tons since 2004/05. Ending stocks in 2007/08 are expected to decline by almost 10% to 11.7 million tons. International cotton prices started moving up in 2006/07. Prices will continue to recover during 2007/08 and ICAC estimates suggest that the season average will increase to 67 cents per pound, 8 cents per pound more than in 2006/07.

Recently, ICAC introduced a new model for forecasting prices. The ICAC 2007 price model takes into account the stocks to use ratio in the world less China (Mainland) in the current season, the stocks to use ratio in the world less China (Mainland) in the previous season and the stocks to use ratio in China (Mainland) in the previous season for forecasting prices for the current season. It is expected that the new model will help the ICAC to forecast cotton prices better in the future.

Consumption

On average, about 60% of total production in the world was consumed in the producing countries until late 1990s. About 6-7 million tons was traded in the international markets every year. How much is left at the end of the season to be added to the world supply in the next year has a significant impact on international prices. The volume of cotton traded in the international market has changed a lot due to lower consumption in the USA and higher consumption in China (Mainland), India and Pakistan. Consequently, the impact of trade by China (Mainland) in forecasting world cotton prices has been reduced.

World cotton consumption increased at an average rate of 0.3% during the 1990s. It is estimated that 26.3 million tons of cotton was consumed during 2006/07 as compared to 24.9 million tons consumed in 2005/06. ICAC estimates suggest that consumption in 2007/08 will once again be a record and 27.4 million tons of cotton will be consumed in the world. Demand for cotton has performed below the demand for other fibers for over three decades and as a result cotton lost its share against other fibers. The market share of cotton in 2005 was over 40%, a reverse in the trend after over 20 years. Lower cotton prices, among other factors, are responsible for reversing the trend, but it is not expected that cotton will sustain this increase.

Yields

Cotton production increased from 13.8 million tons in 1980/81 to 26.0 million tons in 2006/07. There have been periods of slow growth but yields showed an increasing trend for the last 50 years. During the same period, there was no increase in the area devoted to cotton. Thus, all the increases in production have come from increases in yields. World cotton yield rose at an average rate of about 2.5% per year or 11 kilograms/ha/year between 1971/72 and 1991/92, hitting a new record at least once every three years. In 1991/92, world production hit a record of 20.7 million tons with a world yield of 598 kg/ha. The average yield in 1998/99 was only 551 kg/ha but surpassed 700 kg/ha for the first time in history in 2004/05. The average yield of 757 kg/ha in 2006/07 was a new record. It is expected that average yield in 2007/08 will also be a new record, 773 kg/ha. Expanded use of biotech cotton and lower insect pressure are responsible for these increases. A critical analysis is not available yet, but global warming seems to have a positive impact on yields.

The five largest cotton producing countries of the world, China (Mainland), India, Pakistan, USA and Uzbekistan, share about $\frac{3}{4}$ of the world total production. Cotton yields in Pakistan and Uzbekistan will be lower by 5% and 7% respectively. Cotton yields in China (Mainland) will be slightly lower in 2007/08. Favorable rains and lower area in the USA are expected to benefit yields by about 6% in 2007/08. India continues to reap the benefit of biotech cotton, and the average yield is expected to be 555 kg/ha or 7% higher over 2006/07. Cotton yields in India have increased by over 60% since the adoption of biotech cotton in 2002/03. Cotton yields have not increased in the West African countries for the last 25 years. Unlike other cotton producing regions, there are only small differences in yields among countries, except Chad, in the Central and West African region.

The reason for no increase in yields is that agronomic management of the cotton plant has not improved over years. The nature of limitations to higher productivity is different in different regions but it seems that the available recoverable potential under most production conditions in the Central and West African countries has not been utilized yet. Thus, these countries need a change in production technology to overcome a long period of no growth in yields.

Transgenic Cotton

Development of transgenic cotton and other transgenic biotech crops has opened a new era in crop breeding. Now techniques are available to isolate non-cotton genes and induct them into the cotton plant for specific objectives. Currently, two types of such cottons are grown on a commercial scale in many countries, Bt cotton resistant to insects and transgenic cotton resistant to herbicides. The United States commercialized transgenic cotton in 1996/97 and 93% of total area was planted to biotech varieties in 2007/08. In addition to the USA, Argentina, Australia, Brazil, China (Mainland), Colombia, India, Mexico and South Africa have also commercialized biotech cotton. Some other countries are assessing the economic value of transgenic cottons for their countries.

Many countries still do not have access to the technology, nor do they have any plans in place to do so. Biosafety regulations, apprehensions about the technology, private control of biotech genes, etc., are some of the important reasons that more countries have yet not commercialized biotech cotton. The ICAC estimates that 40% of world area and half of cotton traded in the international market in 2007/08 will have come from biotech varieties. There are no price differences between biotech and non-biotech cotton in the international market. The development of new varieties in cotton is progressing toward directed breeding where genes (species or non-species) could be inducted or deleted (made dormant or ineffective) from varieties. It is not yet clear what will be the next product coming out of biotechnology applications in cotton, but a lot of work is going on and new generations of such seeds are not far away.

Cost of Production

The ICAC undertakes a survey of the cost of production of cotton in the world every three years. Thirty-one countries that planted 30.1 million hectares, or 88% of the world cotton area in 2006/07, participated

in the survey completed in October 2007. The average cost of producing a kilogram of seedcotton comes to US\$0.34, which is one cent higher than the cost in 2003/04. The net cost of producing a kilogram of lint averages to US\$1.04 compared to US\$1.01 in 2003/04 and US\$0.83 in 2000/01.

The thirty-one participating countries were divided into six groups: North America, South America, Asia, West Africa, Other Africa and Australia. The average cost of production of seedcotton among regions is close, except in Australia, and ranges from 31-36 cents/kg of seedcotton. However, the cost of production of lint per hectare varies greatly among regions. It is most expensive to produce a kilogram of lint in North America followed by West Africa. It is least expensive to produce a kilogram of lint in Other Africa and Asia, US\$0.80/kg and US\$0.94 respectively.

Cost of production of Cotton by Region (US\$)

Region	Cost/kg Seedcotton	Cost/kg Lint
North America	0.29	1.43
South America	0.31	1.01
Asia	0.36	0.94
West Africa	0.35	1.32
Africa	0.32	0.80
Australia	0.19	1.23
World Average:	0.34	1.04

The average cost of planting seed comes to 9 US cents per kilogram of lint. The cost of irrigation is 11 cents per kilogram of lint. The average cost of insect control is 14 cents per kilogram of lint. The cost of fertilizers is on the increase, and in 2006/07 averaged 23 cents per kilogram of lint. The cost of weed control operations, which includes hoeing, inter-culturing and herbicides, was 11 cents/kilogram of lint. The cost of harvesting averaged 14 cents per kilogram of lint. The cost of ginning came to US\$0.11/kilogram of lint.

The net cost (total cost less land rent and income from seed sold after ginning) of producing a kilogram of lint showed huge differences among countries. The cost of producing a kilogram of lint is over two US dollars in Bulgaria and Israel. It was not possible to calculate net cost per kilogram of lint for all 31 countries that participated in the survey. The net cost per kilogram of lint in the USA is US\$1.42/kg as against US\$0.90/kg in China (Mainland) and US\$1.63 in Turkey (GAP). The net cost/kg is only US\$0.67 in Pakistan. Assuming the ginning cost in India is equivalent to the cost in Pakistan, the net cost in the North region of India equates to US\$0.50/kg of lint. Net cost per kilogram of lint is lower in India due to recent increases in yields, and also the higher value for cotton seed after ginning. The cost of production data from Kazakhstan, Tajikistan and Uzbekistan showed that the cost of producing a kilogram of lint is the lowest in the Central Asian countries as a region.

Role of Insecticide in Production Technology

According to Cropnosis, insecticides worth US\$32.2 billion were used in the world in 2006. Applications on cotton accounted for US\$ 2.7 billion for insecticides, herbicides, fungicides and others chemicals in 2006. 8% of pesticides, and 18% of insecticides (by value) were used on cotton. Herbicides are more popularly used on other crops like maize and soybeans, and cotton accounted for only 5% of herbicides used in the world (by value) in 2006. Insect pressure increased to such an extent during the 1970s and 80s that insecticides became an integral component of cotton production systems throughout the world. Governments provided subsidies and encouraged extensive use of insecticides to escape huge losses. Lately, it has been realized

that extensive use of insecticide is not necessary, and cotton can be grown successfully by employing non-chemical control measures and using insecticides only as a last resort. Consequently, pesticides sales data for the last several years show that pesticide use is not increasing in the world. The cost of production data also showed that the emphasis on insecticides has decreased, and fertilizer use is getting more attention. Future lines of action in production research will be the utilization of various forms of integrated pest management and minimization insecticide use. Biotech cotton is one option for a successful IPM strategy and there is a need to explore more such technologies. It is possible that insecticides may be ultimately eliminated or at least reduced to the minimum from cotton production systems.

Cotton Breeding Should be Privatized

Development of new varieties and their adoption has two stages, development of new varieties and production of planting seed. Extremely good varieties become useless if there is not a successful seed production system. Similarly, a highly successful seed production system has no meaning if there are no good varieties. Most of the cotton breeding in the world is done by the public sector, while most planting seed production is done by the private sector. There is no doubt that both together under one control system could perform better. The development of new varieties should be transferred to the private sector. However, the public sector should remain involved in the development of germplasm and the variety approval process. This will make sure that substandard varieties with low fiber quality are not produced in any country. There are at least two reasons why variety development should be privatized.

1. Most biotech technologies are working in the private sector and newer technologies are going to come from the private sector. Private variety development will be helpful for easy and quicker spread of new technologies.
2. Most research funds in the public sector are spent on development of varieties. ICAC surveys show that breeders form the largest team among cotton researchers in the public sector research programs. The resources spared from breeding could be used to focus on other disciplines.

Seed Value After Ginning

Cotton is grown primarily for lint, but seed also has a value. The ICAC survey on cost of production showed that on average a cotton grower makes US\$237/ha from selling seed after ginning. A kilogram of seed fetches 18 US cents per kg, which is a good income for the grower. The data by region showed that cotton seed has a higher value in Other Africa and Asia where a kilogram is sold at 22 cents/kg and 20 cents/kg respectively. A kilogram of cotton seed after ginning is sold at 13 cents in North America (average of Mexico and USA) and 10 cents/kg in South America (average of Argentina, Brazil and Colombia). Farmers may not be selling seed directly but they share the benefit if it is sold at a higher price. Cottonseed prices are the lowest in West African countries where a kilogram of seed is sold at 7 cents/kg.

On average, a sample of cotton seed yields 16% oil, 27% hull, 46% cottonseed meal, 8% linters and there is always some trash, which is estimated at 3%. Cotton seed oil makes about one-fifth of total food oil production in the world. Cotton seed oil ranks second among the five major oil seeds, which are soybean, cotton seed, peanut, sunflower and rape seed oil. In some countries like India and Pakistan where soybean yields are not very high, cotton seed is the main source of vegetable oil. Linters, meal and hull have their own multiple uses. Gossypol contents in the seed are injurious for non-ruminants and have limited the use of cotton seed. Now, biotechnology applications have developed a genotype that has gossypols in all plant parts except seed. The technology is not commercially available yet, but the technology has already been patented. It is a great opportunity for West African countries to enhance the use of cotton seed and secure additional income for cotton growers.