

Cotton's Future Trends

An Address by Lawrence H. Shaw,
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The cotton plant is the most technically demanding of all major agricultural crops if a good yield is to be obtained. Cotton is naturally vulnerable to a variety of insects and diseases and as a result has become the largest consumer of insecticides of all the crops. The good thing about the cotton plant is that it is very responsive to changes in growing conditions. Increasingly, however, if good yields are to be obtained it has become important to know more than "how to grow cotton," to know "how cotton grows."

Over 200 institutions in over 40 countries are engaged in cotton production research. The largest number of researchers are engaged in the fields of breeding and genetics, entomology and agronomy. Uzbekistan and China have the largest teams of researchers working on cotton. In China, India and Pakistan breeding and genetics is the major emphasis; in Australia and the USA, entomology receives the largest emphasis. Biotechnology research is done in 14 countries. Work on transgenic cotton is limited to Australia, China, Egypt, France, India, USA and Uzbekistan.

Future Trends in Research

While genetics as a science is about 100 years old, it has only been recently that we have learned that the expression of characters in plants is controlled by genes, DNA and enzymes produced by genes. For years researchers have been playing with a certain set of chromosomes and exchanging them at one time. Now it is possible to isolate a desired gene from cotton, from any plant, animal or microorganism, and induce it into cotton to have a desired effect. The technology has become commercially available and extensively used in a number of countries in medicine and agriculture. This fundamental change in the understanding of the genetic control of characters and their directed manipulation will have an enormous impact on cotton.

The 1996/97 crop season is a special year in the history of cotton. In the USA two types of transgenic Bt cotton will be grown on significant area for the first time. Two Deltapine varieties with the Bollgard gene resistant to lepidoptera are expected to be grown on 800,000 hectares. These varieties -- according to Deltapine -- do not require insecticide applications against tobacco budworm, cotton bollworm and pink bollworm. It is also claimed that these varieties will produce higher yields. A second type of Bt cotton, BXN, resistant to broad leaf herbicides, is expected to be grown on 450,000 hectares this coming season. In 1997/98, 30,000 hectares of Bt cotton resistant to bollworms will be grown in Australia. This is only the beginning. I am sure that many things that exist only in imaginations today will be available in the next century.

With chemicals we have continually fought the battle of resistance. Even in countries with advanced technology, it has been difficult to prevent insect populations from developing resistance. In less developed countries, the marketing system for agricultural chemicals has actually promoted the development of resistance as local dealers have diluted chemicals to non-lethal doses in China and elsewhere, actually creating the ideal conditions for the development of resistance. No one expects the Bt toxin, which the cotton plant will produce due to the induction of the gene from *Bacillus thuringiensis*, will be immune from resistance. Currently, planting 4 acres of unprotected cotton or 25 hectares of non-Bt cotton using conventional plant protection measures is recommended for each 100 hectares of Bt cotton planted. Obviously, these quantities are only a guess. Deltapine is working to incorporate multiple resistant genes in the cotton plant to delay the development of resistance to Bt.

Hopefully resistance can be delayed. It is not inconceivable that Bt cotton resistant to whitefly, boll weevil and other insects will become available in the next ten years.

Biotechnology also offers solutions to problems which do not have other known remedies. Virus-related diseases spread by whitefly are an example. It is not possible to control whitefly to the level where it would not spread the virus. The development of a transgenic cotton resistant to the leaf curl virus in Pakistan is the goal of a Common Fund project being sponsored by the ICAC. Colored cotton in hues other than brown and green is another area of promise. Currently only brown and green occur naturally. Work is currently underway to develop blue cotton, and the day that denims can be produced in a natural blue color without dyes is not too far away.

In addition to biotechnology, there are many other developments in the pipeline, too numerous for me to mention here. Stickiness, associated with the whitefly, is the research problem to which ICAC members have given the number one priority. The Common Fund project for the development of novel insecticides and improved spraying techniques for the control of whitefly, in which this association is participating along with Israel and Egypt, has as its aim a low-cost, effective and environmentally sensitive solution to whitefly problems. It is not often that we can talk about solutions to environmental problems which incorporate the three adjectives low-cost, effective and environmentally sensitive in the same package.

Two other developments which will likely come along in the near future are cage ginning and 100% classification of cotton by HVI.

The cage gin if adopted widely would represent the first basic change in ginning in 200 years. In the cage gin, air flow is used to push lint to the center of a circular rotating cage while seeds are removed by rollers mounted on the outside of the cage. The process is gentle, nep formation is greatly reduced, trash is not entangled with fiber and there is much less fiber breakage. I have heard spinners complain about neps, trash and short fiber for as long as I have been in the cotton industry. The cage gin would be a way to make significant progress toward reducing these problems.

Spinners are also able to spin more uniform yarn if they know the detailed characteristics of the cotton fiber that they are using. The HVI machine has provided a way for spinners to reduce their costs and improve their quality. The number of HVI units in the world have doubled in the last five years. There are probably a thousand such units capable of measuring length, strength and micronaire now installed. The reproducibility of the results of these machines has improved, as has strength measurement (one of their weak points). Ultimately, it is expected that all cotton in the world will be classed by HVI.

Future Trends in Supplies

Research is of course related to the problems of producers. Insects, disease and water supplies are probably the main problems and they color the outlook for future cotton supplies.

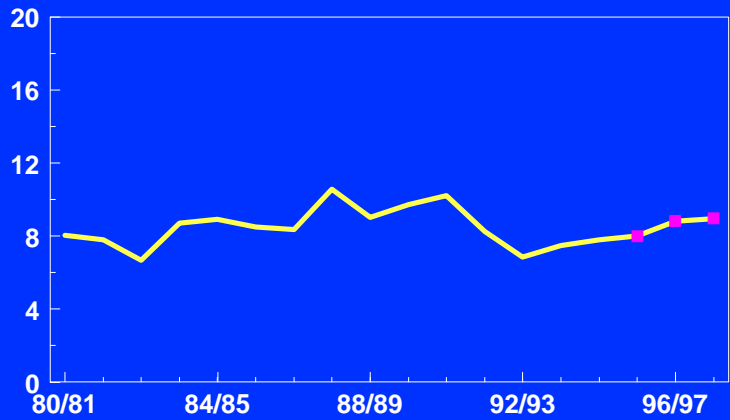
Currently, in the 1995/96 season which we take as ending on July 30 of this year, following the Northern Hemisphere definition which dominates because the Southern Hemisphere generally represents only 10% of world production, production should be about 19.3 million tons, 650,000 tons more than in the previous season. 72% of the total is likely to come from the five largest cotton producing countries -- China, the USA, India, Pakistan and Uzbekistan. Most of the increase in production came from the smaller producers, however, as higher world prices have encouraged increased plantings.

Yields in the largest countries have declined or shown little increase in the last five years. In China, which was still largest producing country in 1995/96, though it may be replaced by the USA in 1996/97, yields are lower than they were ten years ago. Yields have been boosted as production has moved from eastern China to Xinjiang in totally irrigated western China. This increase has offset part of the decline in yields in eastern China where insect resistance has developed.

According to its State Statistical Bureau, which seems to be a thorough and competent crop estimator, China produced a surprising 4.5 million tons of cotton in 1995/96. The amount was surprising because

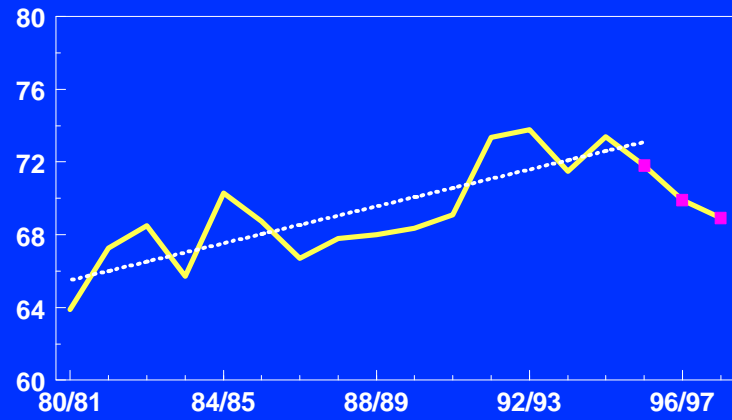
SOUTHERN HEMISPHERE

Percent of World Production



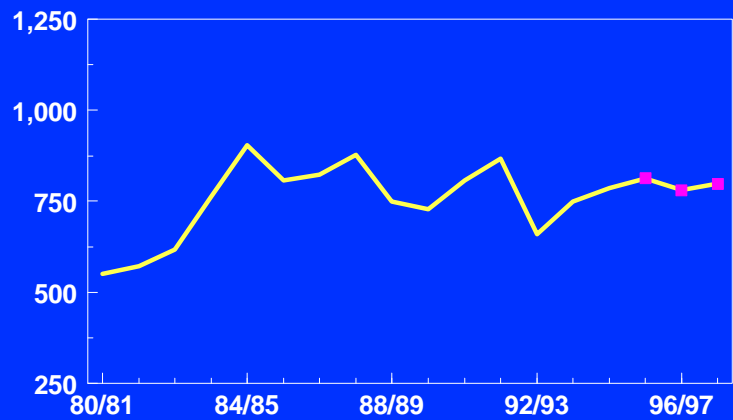
TOP FIVE PRODUCERS

Percent of World Production



COTTON YIELDS: CHINA (M)

Kilograms per Hectare



populations of bollworms were known to have been higher than in the previous season and the proportion of resistant bollworms had increased. State procurement prices for cotton -- all cotton in China must be sold to the State -- rose substantially on September 1, 1995, and there were some who wondered if some of this year's cotton was actually produced in 1994 and sold in 1995 at higher prices. The crop estimate also seems large to some who ponder why China would import cotton at high prices just to add to stocks.

We currently expect Chinese production to decline in 1996, to about 4.1 million tons. We are worried about the resistant bollworms, whose impact on the crop may show up when there aren't substantial price changes. Area is expected to decline in China as grain prices have increased (only a portion of grain is sold to the State) and cotton prices haven't.

High grain prices are also expected to lead to a decline in cotton plantings in the USA. Maize, wheat and soybean prices are all historically high compared to cotton; farmers with the options to devote a larger portion of their land to these crops this season probably will. In the past, US farmers would have lost government benefits if they didn't grow cotton; however, this year, and for each of the next six years, US farmers who have been growing cotton will get cotton benefits whether they grow cotton or not and whether cotton prices are high or low.

When I left the US about half the US crop was planted. However, it won't be until the end of June when the government survey of actual plantings is released. West Texas was generally quite dry, and it won't be until the end of June until we know if sufficient rain is received. Until that time we expect the US to produce 4.2 million tons this season, up from 3.9 million last season. A 20% increase in yields (due to less insect damage) is expected to offset an 11% drop in area.

India is the world's third largest producer, growing 2.49 million tons in 1995/96. Output is expected to decline slightly in 1996/97 to 2.46 million tons. Production increased last season because of expanded area in response to higher prices in the Indian market. Cotton prices in India are lower now than they were a year ago, and planted area may decline. Yields in India have advanced very slowly in the last seven years. Resistance to pesticides has also occurred in Indian high yielding areas. The leaf curl virus which has reduced Pakistan's potential has likely spread to the Indian Punjab, although authorities there are keeping a close watch.

Pakistan's cotton production rose to 2.2 million tons in 1991, as yields rose to record levels. Unfortunately, there was an outbreak of the leaf curl virus in 1992, which led to a 30% drop in output. Output fell again to 1.4 million tons in 1993, but has since risen back to 1.7 million tons. The high-yielding, heat resistant varieties which led to the 2.2 million ton crop were unfortunately not resistant to leaf curl virus, which spread under optimum conditions for whitefly in 1992. Wet conditions kept whitefly and whitefly-spread leaf curl virus under control in 1993 but a wet September led to bollworm problems. Planting leaf curl resistant varieties, which have lower yields, and better spraying for bollworm have led to some yield improvement since, but a return to crops in excess of 2 million tons is not expected in the immediate future. Production in 1996/97 is forecast at 1.76 million tons.

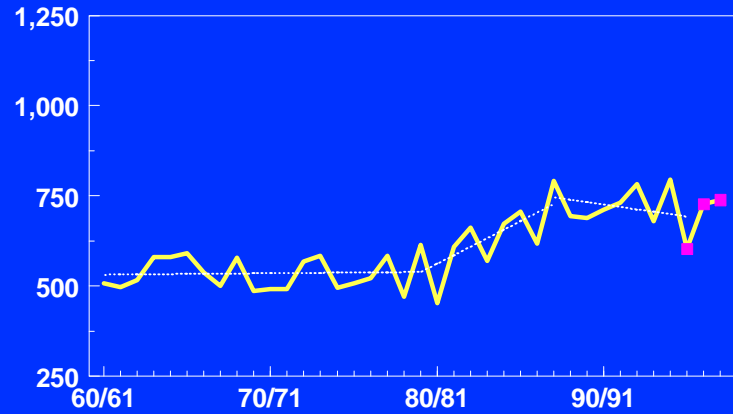
Uzbekistan's production was 1.26 million tons in 1995/96 and a similar crop is expected this season. Area planted to cotton has continued to decline and yields have not risen to offset the loss. Output at the 1.2 to 1.3 million ton level is expected for the next several years.

In 1996/97 production in other countries is expected to rise 9 percent to 5.9 million tons, representing 30 percent of the world total, up from 28% in 1995/96. Production in countries other than the big five has increased from 4.7 million tons in 1992/93, when international cotton prices were low. A further increase to 6.2 million tons is expected in 1997/98.

World cotton area was 35.6 million hectares in 1995/96; it is expected to decline to 34.6 million hectares in 1996/97. 35 million hectares is generally considered a high level for cotton area. Yields have not increased much since the peak in 1991/92 of 597 kgs due to the influence of the larger countries where yields have

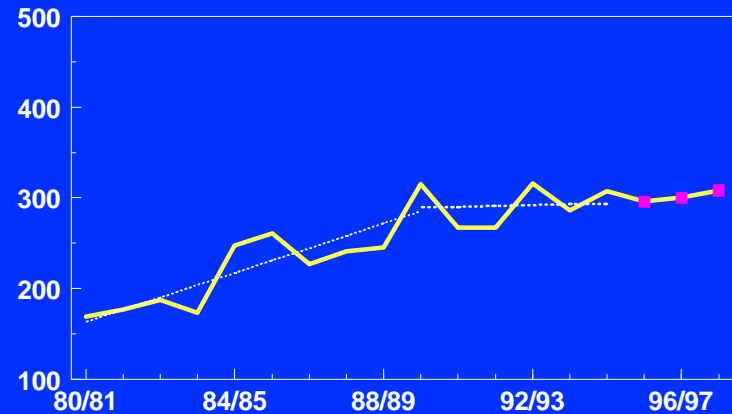
COTTON YIELDS: USA

Kilograms per Hectare



COTTON YIELDS: INDIA

Kilograms per Hectare



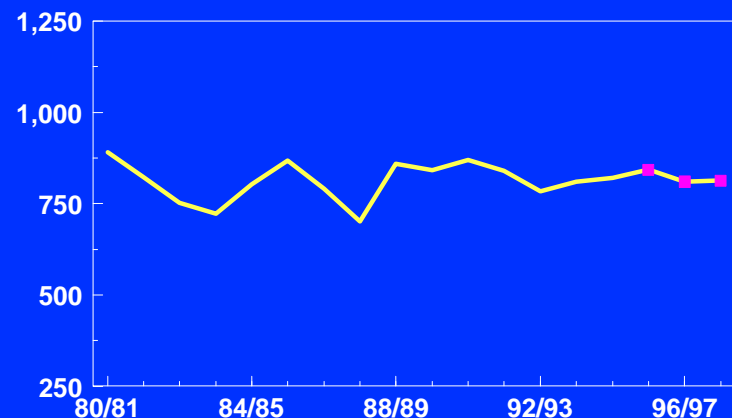
COTTON YIELDS: PAKISTAN

Kilograms per Hectare



COTTON YIELDS: UZBEKISTAN

Kilograms per Hectare



been stagnant. Yields in 1995/96 averaged 542 kgs; yields are expected to rise to 569 kgs in 1996/97.

World production in 1996/97 should reach 19.6 million tons; our preliminary projection for 1997/98 is an output of 20 million tons.

Future Trends in Consumption

World cotton consumption is lagging a bit behind production. In 1995/96 the world should use 18.7 million tons. We currently expect cotton consumption to rise to 19.2 million tons in 1996/97 and 19.5 million tons in 1997/98. After a surge in the mid-1980s, cotton consumption has been rather flat.

There have been special factors involved. First, the bloom of the growth of the Chinese cotton textile industry is off. Chinese cotton consumption grew from 2.5 million tons in the mid 1970s to 4.5 million tons in the mid 1980s. Since the mid 1980s, however, there has been no growth at all, partly as the Chinese turned to producing other goods and partly as non-cotton textile fiber consumption increased. Secondly, the collapse of the Soviet Union and its trading arrangements with Eastern Europe, Cuba, Vietnam and the Democratic Peoples Republic of Korea, known as COMECON, led to a collapse of the textile industries in a major part of the cotton consuming world. These countries now have to pay cash for their cotton. Cotton consumption in the COMECON countries dropped from 2.8 million tons in 1989 to only 1 million tons in 1995.

If we look at the rest of the world, there has been pretty constant growth of about 2% per year. And it is this kind of growth we can expect in future years. COMECON's decline is now over. We anticipate 3-4% growth in cotton use in these countries in the 1996-98 period as the most of the economies have begun to grow again and consumer purchasing is increasing. China's cotton consumption is not anticipated to change much in the near future and will continue to be somewhat of a drag on the world total.

The most important factor determining cotton consumption in the next several years will be whether cotton can hold share of market. Non-cotton fiber consumption has not been flat in recent years. Cotton has lost share of market from 48% in 1993 to 46% in 1994 and 45.5% in 1995.

Part of the decline in cotton's share has been due to shortage of supplies and the rationing of these supplies through higher prices. A year ago, lack of supplies led to reduced cotton consumption in many countries, particularly those who had expected prices to be low. But part of the reason could be the lack of sufficient international support for cotton promotion. The International Institute for Cotton, which Zimbabwe supported until its end in 1994, always had a small budget, but was a visible force promoting cotton particularly in Western Europe. And it is Western Europe where cotton's share has declined most rapidly. Fortunately, for all cotton countries, the cotton farmers of the USA continue to support a major cotton promotion program, one which is now mandatory for all domestic cotton producers and for importers of cotton products -- a scheme very similar to the one proposed by the IIC. The funds for this program have increased from less than \$20 million to more than \$60 million (10 times the largest budget of IIC) and are now supporting increased cotton consumption not only in the USA but in Europe, the Far East and Latin America as well. I think I don't have to mention that, with these dollars being spent, cotton's share of market in the USA is at record levels.

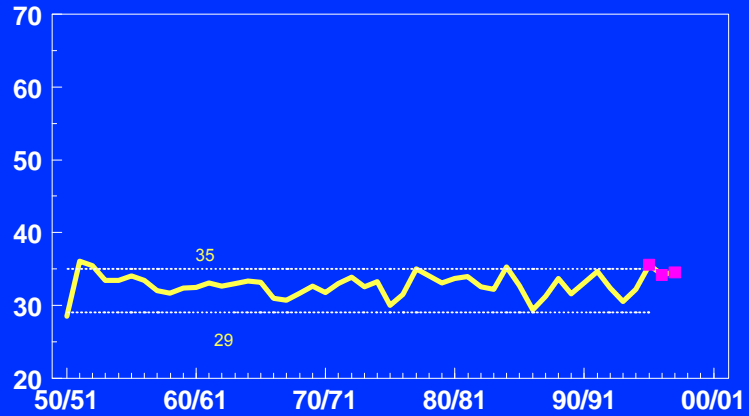
Future Trends in Prices

Enough about world production and consumption. Let's get down to the important subject -- Prices. The major factor determining prices is available supplies on the market relative to demand.

Many traders look at a simple variable, the difference between world production and consumption. If production is larger than consumption, prices will fall; if consumption is larger than production, prices will rise. It's not such a bad indicator, but we try to be a little more sophisticated in our analysis at the Secretariat of the ICAC. We realize that needed stocks depend on the size of the industry. Therefore we look at stocks

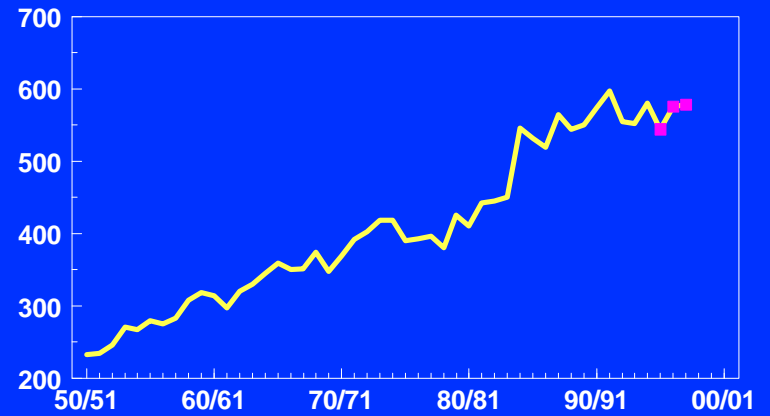
WORLD COTTON AREA

Million Hectares



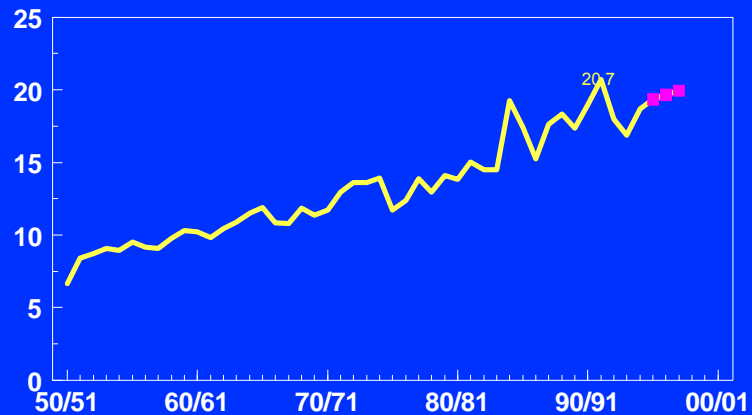
WORLD COTTON YIELDS

Kilograms/Hectare



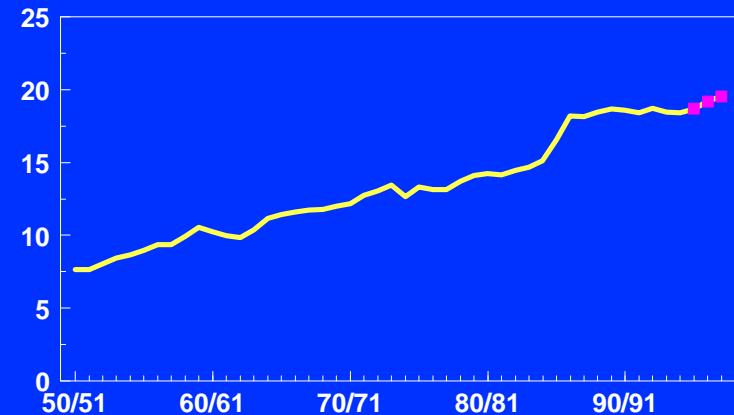
WORLD COTTON PRODUCTION

Million Tons



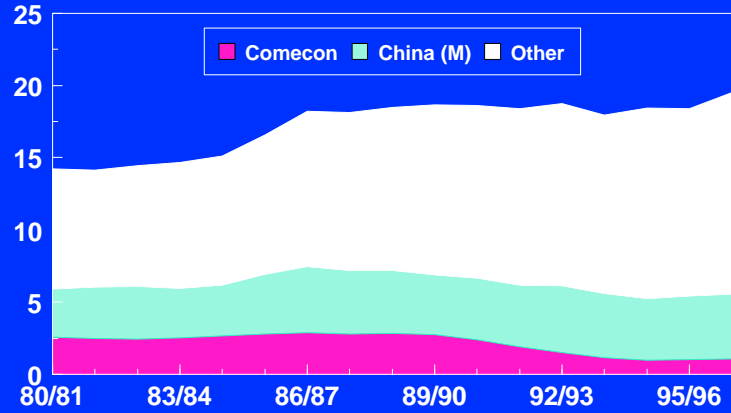
WORLD COTTON CONSUMPTION

Million Tons



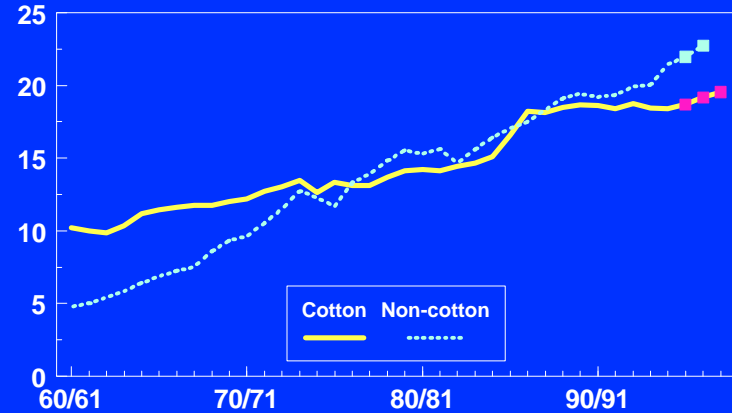
COTTON CONSUMPTION

Million Tons



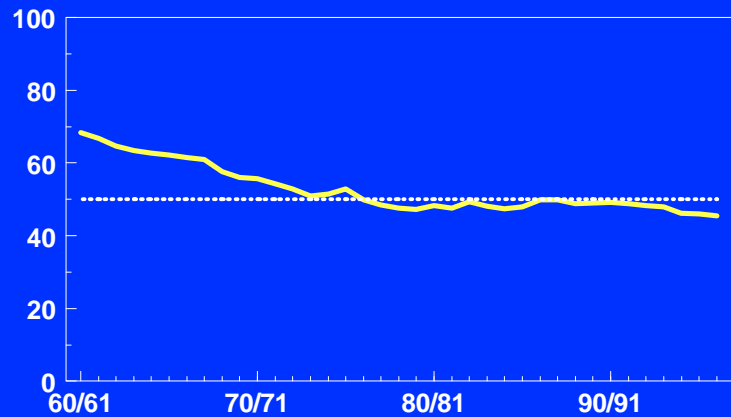
WORLD FIBER CONSUMPTION

Million Tons



COTTON'S SHARE OF FIBER USE

Percent



of cotton in the market at the end of the season as a ratio to the amount of cotton used in the season.

Before China came on the cotton market like gangbusters in the late 1970s, the ratio worked well on a world basis. China, however, began to import cotton in a very big way to fuel its textile industry as an engine of growth for the Chinese economy. At the same time China decided to pay its farmers sharply higher prices for cotton. Eventually China produced an enormous crop and became a potential exporter. Having too much cotton they reduced the incentives and production fell, imports were needed and the cycle repeated. As most of the decisions regarding cotton production and consumption were both large in world terms and not market related, we found that the world stocks to use ratio didn't work. However, if we took the Chinese factor out separately, the stocks to use ratio for the rest of the world continue to be a predictor of prices.

For the Chinese factor we decided to concentrate on their impact on world markets through trade. Chinese net exports as a ratio to the rest of the world's consumption was found also to be a good predictor of prices (as long of course as we could predict Chinese imports with accuracy). If the Chinese export, they are adding to available supplies in the rest of the world; if they import they are taking supplies away from the rest of the world. The need to separate out the Chinese factor was never more evident than in 1995. Chinese production and consumption were in balance, yet China imported 600,000 tons of cotton and prices skyrocketed.

Later, in the 1990s, when the breakup of the Soviet Union led to new marketing arrangements for Central Asian cotton, it became necessary to consider new factors as well in forecasting prices. A barter variable was added to reflect the impact of barter trades on world prices. As most of this business is going back to cash transactions and, as Central Asian discounts to other cottons diminish, this variable may not be necessary in the future.

We have also added some price expectations variables to help explain cotton price movements, looking specifically at changes in New York cotton futures prices in the February-November period in the current and previous seasons.

What do these factors say about cotton prices in the 1996/97 and 1997/98 seasons?

First because production is expected to exceed consumption, we expect stocks to increase. Stocks outside China (Mainland) are expected to rise from 4.8 million tons to 5.5 million tons, or as a ratio to cotton consumption outside China (Mainland) from .38 to .39. Stocks are expected to increase an additional 500,000 tons in the 1997/98 season and the ratio is expected to rise to .42. This factor alone is expected to lead to a decrease in the average Cotlook A Index of 6 cents in 1996 and 5 cents in 1997.

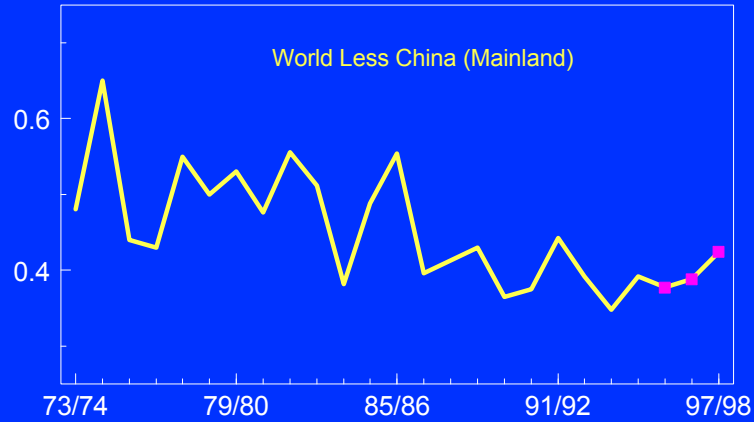
Secondly, due to the stock buildup in China this season with a large crop and large imports, we expect little Chinese demand for cotton next season. China may also decide to turn this lack of need for cotton to a political advantage by announcing that it will not buy any US cotton in the next year, as retribution for trade sanctions likely to be imposed over copyright violations. Net imports are expected to decline from 520,000 tons to 150,000 tons. This factor would by itself lead to another decline of about 9 cents in 1996. As we don't expect China to be able to continue to produce enough cotton for its textile industry, even with stable demand, increased imports are expected in 1997 when Chinese net imports are forecast at 400,000 tons, leading, considered by itself, to an increase in prices of 5 cents.

At the same time the decline in barter sales in Central Asia is expected to bolster cotton prices in 1996/97 and later years.

In sum, we expect the Cotlook A Index in the August 1996-July 1997 period to average 76 cents, compared to 82 cents currently and an average of 87 cents expected for the 1995/96 season. In 1997/98, our forecast is for the Index to remain at 76 cents, as the impact of higher world stocks will be offset by increased Chinese imports.

STOCKS-TO-USE

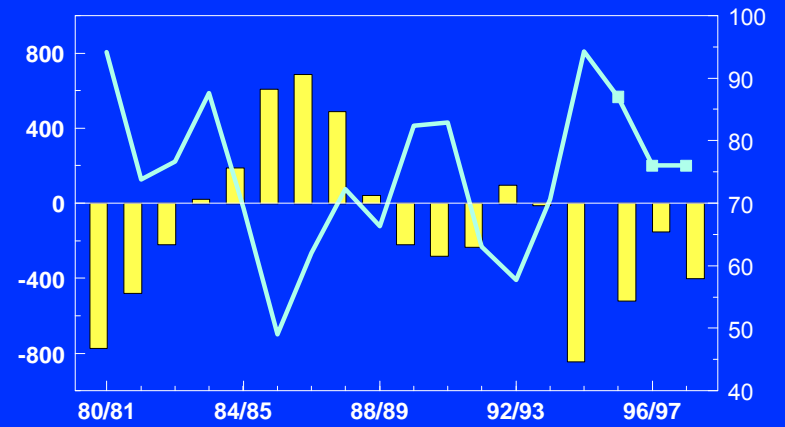
Ratio



CHINA (M) AND COTTON PRICES

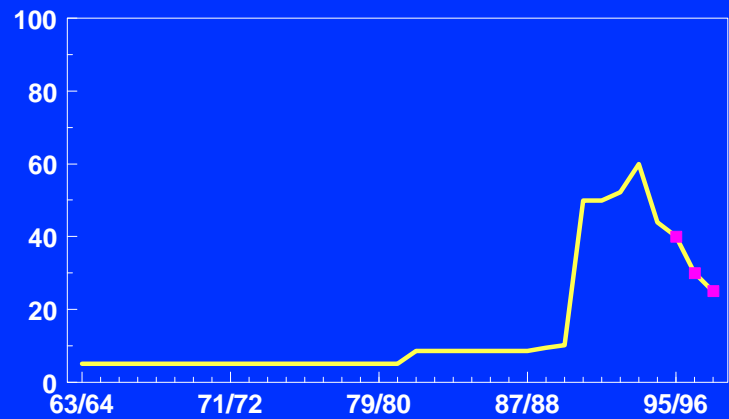
Net Exports, Million Tons

A Index, Cents per Pound



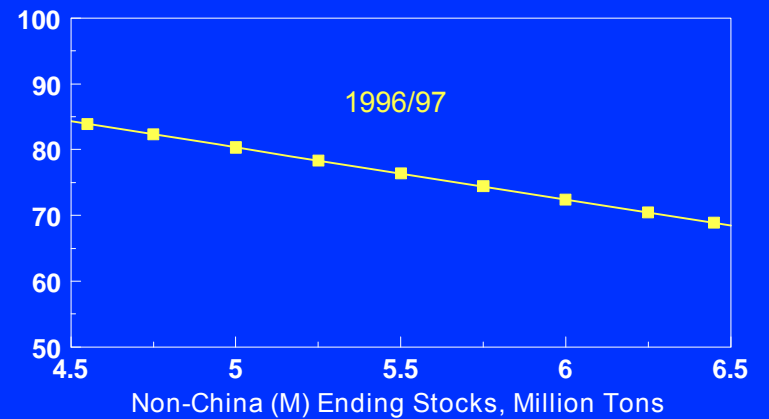
CENTRAL ASIAN BARTER

Percent of Exports



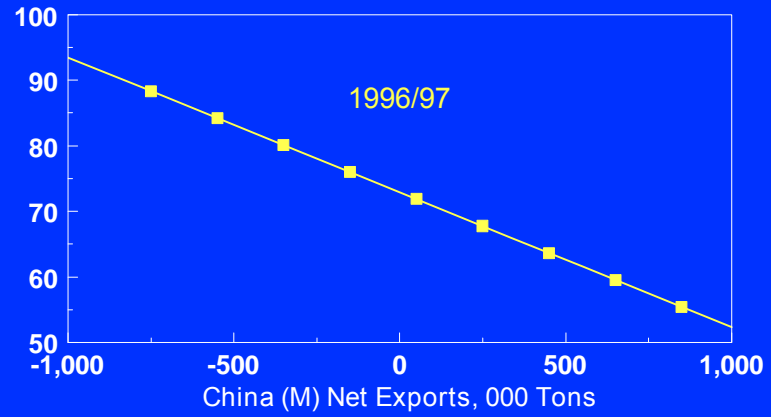
IMPACT OF NON-CHINA (M) STOCKS

A Index, Cents per Pound



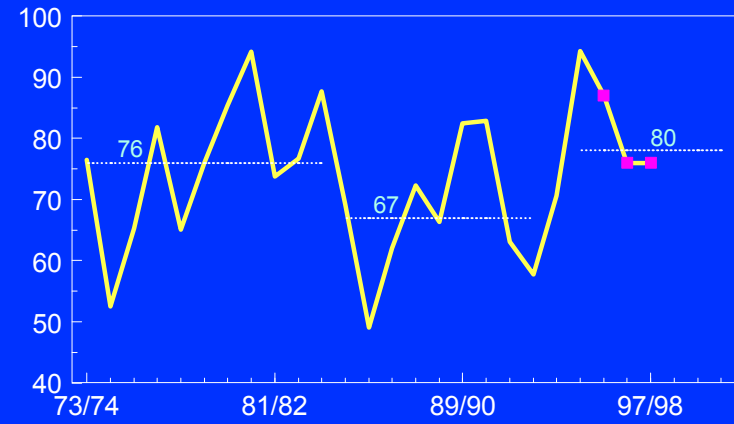
IMPACT OF CHINA (M) TRADE

A Index, Cents per Pound



COTLOOK A INDEX

US Cents per Pound



Looked at in the perspective of the last 25 years, prices in the next two seasons and probably through the end of the century will likely be above average. In the period from 1973 to 1984, the Cotlook A Index averaged 78 cents. From the mid 1980s until the early 1990s, the Index averaged 67 cents. We expect the average from 1993 to 2000 to be 80 cents.

Price forecasts change. The Secretariat of the ICAC releases a new forecast for the current and prospective season at the end of each month in our COTTON: Update of the World Situation which is faxed to ICAC member governments and subscribers or made available on the Internet.

Each day brings new information about production or consumption in some part of the world. It is our job to bring this information together in a way that it can be useful for the participants in the world cotton market. There is nothing more useful than a price forecast which distills the impact of these changes into something very concrete.

Forecasts aren't without error. We have discussed our errors at length in COTTON: Review of the World Situation which is published bimonthly in paper and on the Internet. Once the facts are known, the errors in the price forecast are generally small. However, getting the facts right can be a problem and our constant efforts are devoted to quantifying how much is produced, how much is consumed, how much is traded and how much is left over. Because what is left over -- stocks at the end of the season -- is the key to world prices.