



# INTERNATIONAL COTTON ADVISORY COMMITTEE

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## COTTON PRICE FORECASTS: WHAT HAS THE ICAC LEARNED & WHAT CAN INDUSTRY EXPECT?<sup>1</sup>

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### Structural Change Leading to Lower Prices

The price of cotton, adjusted for inflation, is tending downward over the long run. This is a phenomenon common to many primary commodity industries and results naturally and inevitably from market forces in a competitive world economy. If inflation is considered, cotton prices have been falling since the 1950s. Estimates of average prices were more than \$3 per pound of lint in today's prices in the early 1950s, prices fell to between \$1 and \$2 in the 1970s, and the average Cotlook A Index this season will be between 50 cents and 60 cents per pound. In nominal prices, or not adjusted for inflation, the Cotlook A Index averaged 70 cents per pound during the thirty-year period from 1973/74 through 2002/03. However, while there is always substantial year-to-year variation, average cotton prices are forecast to be 10 to 20 cents per pound lower than the average of the last thirty years during the current decade.

### Technology

The long run decline in real commodity prices is linked to technology change and competition with substitutes. Since World War II, agriculture has been transformed by increased mechanization, expanded use of chemical fertilizers, the development of pesticides and in developed countries the extension of electricity to rural areas. The process of technology change is continuing, and may even be accelerating.

The most visible of the new technologies is biotechnology. Biotech cotton varieties already account for 21% of world cotton area and about one-third of world production and trade. Biotech cotton is primarily risk reducing and cost reducing, leading to larger area and greater production. Production in East China, affected in the early 1990s by resistance among bollworms, climbed about 300,000 tons between 1999/00 and 2000/01 largely because of the adoption of Bt varieties, and biotech varieties in China are now planted on 60% of cotton area. GE varieties account for about 30% of area in Australia, three-fourths of area in the USA, and field trials are underway in other producing countries. Biotech cotton varieties will probably account for half of world production by 2007.

Incremental advances in proven technologies such as irrigation management, pesticide formulations and pesticide applicators, low till and no till production systems, crop rotations and other management techniques are also contributing to lower production costs and expanded cotton production. All of the technologies are being enhanced by the revolution in information technology, making possible great improvements in management efficiency and control of input applications. The new technologies result in an expansion of supply at each level of cotton prices, resulting in lower average prices.

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<sup>1</sup> Paper presented to the Centenary Conference of the International Textile Manufacturers Federation, 26 September 2004, Lucerne. The International Cotton Advisory Committee is an association of 41 governments of cotton producing and consuming countries. The Secretariat of the Committee publishes information related to world cotton production, supply, demand and prices, and provides technical information on cotton production technology. Information is available at [www.ICAC.org](http://www.ICAC.org).

## Polyester

Competition is at the heart of a market economy. Timber must compete with fabricated wood products and the development of plastics. Coffee and tea must compete with each other, and with milk, soft drinks, powdered drinks, orange juice and other choices. Copper must compete with fiber optic cables. Sugar competes with corn sweeteners and artificial sweeteners. Cocoa must compete with other types of candies. Grains compete with each other and with oilseeds, and other examples of competitive pressures affecting natural commodity industries abound.

For cotton, competition with polyester is an insidious challenge that is accelerating as chemical fiber production technology results in lower costs of polyester production and an increased range of uses for chemical fibers. Cotton's share of world fiber use exceeded 60% in the 1960s, fell to 50% during the 1980s and currently stands at 39%. While cotton use is rising in absolute terms, the rate of increase over the last ten years was just 1.3% per year, compared to world population growth of 1.7% per year, resulting in reduced consumption per capita and declines in market share. Many factors affect end-use demand, including income and consumer preferences, but cotton as a commodity industry must remain price competitive with polyester and other chemical fibers, and so cotton has experienced declines in real prices over time.

Consequently, one of the first points in any discussion of expectations of the future of cotton prices is that in the long term, they will be lower. The Cotlook A Index averaged 55 cents per pound between 1999/00 and 2003/04. Over the next five years, the average Cotlook A Index may be lower, resulting in average prices in today's dollars of between 45 cents and 55 cents per pound.

### **Outlook for 2004/05**

Within a long term trend of declining real prices and average prices of between 50 and 60 cents per pound forecast for this decade, the cotton industry experienced strong demand linked to record imports by China (Mainland) in 2003/04 resulting in relatively attractive prices for producers. However, production is responding to last season's relatively higher prices, resulting in lower prices over the next several years.

Net imports by China (Mainland) rose from essentially zero three seasons ago to 520,000 tons in 2002/03, and to 1.9 million tons in 2003/04. Imports by China (Mainland) alone accounted for one-fourth of world trade in cotton, and because of strong imports, the average Cotlook A Index was 68 cents per pound in 2003/04, compared with 55 cents the previous season and 42 cents two seasons ago.

The rise in prices is leading to increased production, and world cotton area is expected to rise in 2004/05 to the highest level since 1995/96. World production is forecast at 23 million tons, up 2.5 million tons from 2003/04, and the largest crop on record. Part of the increase in production will be in China (Mainland), and imports by China are expected to decline to 1.5 million tons, still substantial, but down from last season. World cotton consumption is rising in 2004/05 to an estimated 21.6 million tons, a record but still lower than production.

With rising production and reduced import demand, the Cotlook A Index is expected to average 52 cents per pound in 2004/05, down approximately 16 cents from last season.

### **Modeling Cotton Prices**

The ICAC price model relates season averages of the Cotlook A Index to a ratio of stocks-to-use outside China (Mainland) and the ratio of net exports (exports minus imports) by China (Mainland) to use outside China<sup>2</sup>. In general, or as a simple rule of thumb, other things equal, an increase in production or decrease in consumption of 100,000 tons outside China (Mainland) results in a decline of about one cent per pound

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<sup>2</sup> ICAC, COTTON: Review of the World Situation, Vol. 53, number 6, July/August 2000.

in average cotton prices. A decrease in net exports by China (Mainland) of about 100,000 tons causes season average cotton prices to drop by about one and one-half cents a pound. This model explains about 80% of the year-to-year variation in average cotton prices, meaning that even if supply and use statistics were known perfectly, we could still have errors between forecasts and actual average prices of about 20%.

The model is based on concepts that have been known by commodity analysts and economists for approximately a century. Cotton industry newsletters from before WWII talk about stocks and the availability of supply, and the modern econometric techniques used to quantify the relationships between supply, demand and prices were developed in the 1940s. Computers make these calculations easy today, but the basic theoretical concepts are the same as those understood a century ago.

For most commodities, prices are related to a single variable, the ratio of world ending stocks to world use. As the stocks-to-use ratio rises, prices tend to fall, and vice versa. For many commodities, the biggest problem in forecasting prices is gathering the basic data on stocks and use, and for cotton, measures of stocks in China (Mainland) are probably inaccurate. Therefore, an innovation used in the ICAC price model is that the ratio of world stocks to use is disaggregated into two variables, the ratio of non-China stocks-to-use and the ratio of China net exports-to-use. Arithmetically, the two ICAC variables are equivalent to the world ending stocks-to-use ratio because net exports from China add or subtract from world ending stocks. But by forming the model as we do, the ICAC avoids the empirical difficulty of having to rely on estimates of ending stocks in China (Mainland), probably the least-accurate number for major producers and consumers on the cotton supply and use balance sheet. The tradeoff is that while we have accurate data on China (Mainland) cotton imports and exports after the fact, out-of-season forecasts of China (Mainland) trade are often very wrong.

### **Sources of Price Forecast Error**

The ICAC Secretariat has been forecasting the season average Cotlook A Index for 16 years since 1988<sup>3</sup>. Forecasts made in September for the current season have been too low 6 times and too high 9 times, and the September forecast was actually right once, in 1995/96. The average error is 5% of the eventual true number. Forecasts made in September for the following season have been too low six times and too high six times, they were within 1% of being right three times (there is one less year of data), and the average error is 9%.

There are two sources of error in any statistical modeling exercise, the model itself and the variables used in the model. The ICAC statistical model is statistically unbiased, meaning that the model itself does not tend to over-predict or under-predict. At the end of each season, when supply, use and trade statistics are known, the average residual with the model is about 7 cents and the residuals are random.

The second source of error is the statistics themselves that are used in the model, and this is the greater source of forecast error for cotton and for most commodities. The biggest problem for the ICAC has been forecasting net trade by China (Mainland). More than half the time, China imported more and exported less than we forecast at the start of the season. Since 1988, the ICAC forecast of net exports by China (Mainland) in September for the current season has been too high 11 times, and the average error is 70%! Even more embarrassingly, ICAC forecasts of China (Mainland) net exports each September for the season ahead have been too high 12 times, and the average error is 290%. A cynic would note that the best way to forecast China (Mainland) net exports is to take the ICAC estimate and divide by 3. (In defense of the Secretariat, I note that estimates by others have been as wrong or worse.)

Estimates of other variables on the cotton supply and use table are usually more accurate. Over the last 16 years, estimates of world production made each September for the same season have been too low 7 times, too high 4 times, and correct five times, and the average error is zero. For the season ahead,

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<sup>3</sup> A history of ICAC forecasts of prices, production, consumption and trade for major countries is published twice each year in COTTON: WORLD STATISTICS, available at [www.ICAC.org](http://www.ICAC.org).

forecasts of world production made in September are also nearly equally distributed above and below the final correct figure, and the average forecast error is 2%.

For world consumption, forecasts are also usually pretty accurate. Because of trend increases in population and income, ICAC forecasts of world mill use are almost always up or unchanged, and so when we err it tends to be on the high side during years of economic recession. However, errors in forecasts of consumption are relatively small. The average forecast error in September for the same season is only 1%, and the average error for the season ahead is 2%. Estimates of production and consumption in individual countries are less accurate than estimates of the world totals. Estimates of world totals benefit from offsetting errors; we might overestimate in one country but underestimate in another, and the world total will come out about right.

In evaluating price-forecasting techniques for cotton, it is important to realize what is not included and what is not possible.

- The ICAC price model does not explicitly include non-cotton market variables such as macroeconomic indicators and competing crop prices. We realize that interest rates, inflation, prices of energy, GDP growth, the prices of competing crops such as wheat, soybeans, sugar and rice, and other variables affect the cotton market. However, those macroeconomic and cross-commodity impacts are linked to changes in prices of cotton through their impacts on cotton production and consumption. Therefore, the Secretariat considers GDP growth when estimating consumption, and we consider soybean prices when estimating production in Brazil for instance. To the extent that cotton supply and use are estimated correctly, the likely impacts on cotton prices of macroeconomic indicators and competing crop prices can be anticipated, but they are not explicitly included in the price model.
- The ICAC price model does not acknowledge technical chart patterns, price cycles, random walk variables or lagged dependent variables as valid predictors of future cotton prices. Such models are often developed by mathematicians and statisticians to predict future commodity prices based on patterns in past prices. Innumerable examples of correlations and patterns in prices can be proven, after the fact. Since such models have limited foundation in theory and are of no use in explaining fundamental changes in cotton supply and use and their impacts on prices, they are not relevant to the objective of the ICAC, which is to provide greater transparency to the world cotton market. The Secretariat is not aware of any mathematical price model that can correctly forecast price changes any better than models based on market fundamentals.
- The ICAC price model cannot be adapted to predict monthly or quarterly prices. The model is estimated based on annual data, and efforts to develop explanatory variables for a quarterly or monthly model have not yielded useful results. However, when the annual model is indicating a season average price above the current price in any season, it is valid to infer that market forces will tend to cause prices to rise over the coming months, but the pattern of monthly price movements cannot be predicted solely with the annual model.

### **Expectations of Future Accuracy**

Accuracy in cotton price forecasting depends crucially on accuracy in forecasts of supply, use and trade, and in particular forecasts of China (Mainland) net exports. Therefore, improvements in forecasts of annual average prices will depend on improvements in Secretariat estimates of supply, use and China (Mainland) trade.

Structural changes can occur in the cotton market that requires modifications to the price model itself. For instance, in the early 1990s, the breakup of the Soviet Union led to surges in exports from Central Asian countries of cotton previously held in a state reserve, with many of the exports moving under barter arrangements. The ICAC price model was modified to include a variable for barter sales for several

seasons until barter sales were essentially discontinued. Price modeling is not a one-time exercise, and the Secretariat re-estimates the model to update coefficients and test potential variables routinely. However, it is unlikely that a fundamentally more accurate statistical model will be developed to lead to improved price forecasts.

Improvements in Secretariat forecasts of China (Mainland) net trade will be difficult to achieve. Improvements could be the result of better analysis of data by the Secretariat, better sources of data from China or better luck. As with all professions, better analysis is based on better training, better judgment borne of experience, and focused efforts. The Secretariat strives for improved performance through analysis of past performance and consultation with peers. However, better judgment based on imperfect data will still be imperfect.

Improvements in the availability and reliability of data from China (Mainland) are possible as the Chinese economy becomes more transparent and competitive, but this is likely to be a long process. One of the most promising developments in China in terms of improved statistics in recent years is the start of trading on the China National Cotton Exchange (CNCE) and futures trading in Zhengzhou. The CNCE provides a vehicle for licensed traders in China representing buyers and sellers to make cash forward purchases of cotton for future delivery. Trading in futures contracts began June 1, 2004 on the Zhengzhou Commodities Exchange.

The existence of trading in cotton in China provides a source of demand for market-relevant accurate statistics on a timely basis, and both private and government-associated organizations in China are developing to supply such information. Coupled with the availability of data on the Internet, an improved flow of data on planted area, crop conditions, harvest progress, mill use and stocks may develop. Nevertheless, while improvements in data availability and accuracy are possible, such changes are not imminent. All aspects of the cotton economy in China (Mainland) remain heavily regulated. Statistics on the quantity and quality of cotton held in stock are still officially classed as state secrets. There is not the statistical capacity in China to conduct the equivalent of an objective yield survey as is done in many countries each month during the growing season to assess crop conditions prior to harvest. The Government of China (Mainland) is concerned only with yarn production; government agencies make only disjointed effort to measure fiber mill use directly. Consequently, efforts to measure supply and demand in China, and to use those estimates to forecast net trade, will remain difficult.

Therefore, while we hope for better performance in the future, and while we work to recognize sources of error in an effort to avoid repeating mistakes, the cotton community can probably expect the same degree of accuracy and error in price forecasts in the future.

#### Forecasts Serve as Indicators and Benchmarks

Given that price forecasts tend to be wrong, it is reasonable to wonder what is the value in making forecasts. The work of the ICAC Secretariat serves the world cotton community, including the textile segment, in two ways. First, ICAC forecasts are accurate reflections of fundamental market conditions at the time they are made. By providing an explicit price forecast based on current best information available about likely supply and use, the ICAC price forecasts serve as **valid indicators** of where prices will tend based on current information. Second, the ICAC serves as a **benchmark** from which other estimates can be drawn. Most participants in the cotton market have their own views on cotton supply and use in various countries. The ICAC price model can be boiled down to two simple relationships. A change of 100,000 tons in non-China (Mainland) production or consumption changes season average prices by one cent from the ICAC estimate, and 100,000 tons of net exports by China (Mainland) changes prices by one and one-half cents from the ICAC estimate. Therefore, anyone with an opinion on cotton supply and use different from the ICAC Secretariat can use the price forecast as a starting point to develop their own estimate relatively easily.



International Cotton Advisory Committee

**COTTON PRICE FORECASTS:  
WHAT HAVE WE LEARNED,  
WHAT TO EXPECT**

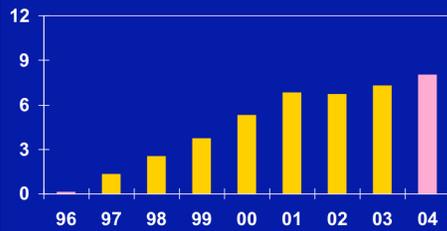
## COTLOOK A INDEX

2004 Cents per Pound



## BIOTECH COTTON AREA

Million Hectares



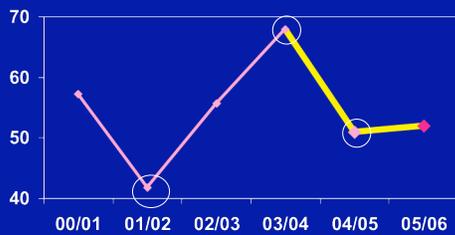
## FIBER COMPETITION

Cotton's Share of World Fiber Use



## COTLOOK A INDEX: ANNUAL AVERAGES

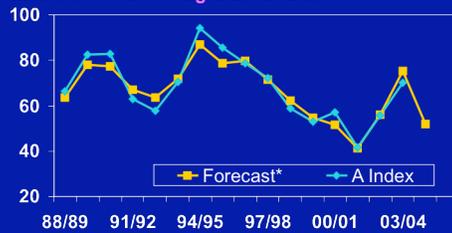
Cents per Pound



## COTLOOK A INDEX MODEL

Cents per Pound

Model Forecast Using Current Data



## COTLOOK A INDEX MODEL

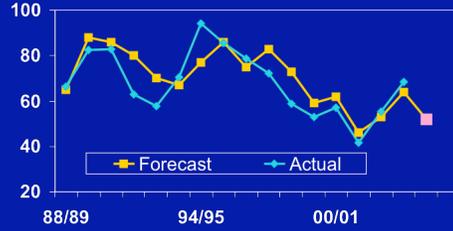
X1: Non-China Stocks/Non-China Use

X2: China Net Exports/Non-China Use

## COTLOOK A INDEX

Cents per Pound

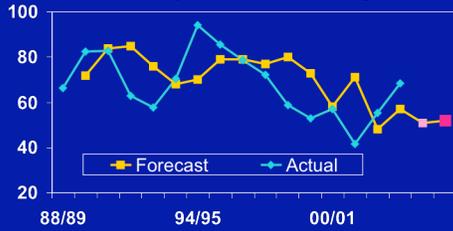
Forecasts as of September



## COTLOOK A INDEX

Cents per Pound

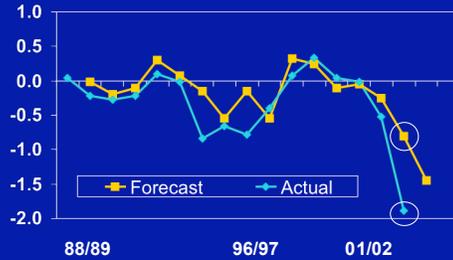
Forecasts as of September for Following Year



## CHINA (M) NET EXPORTS

Million Tons

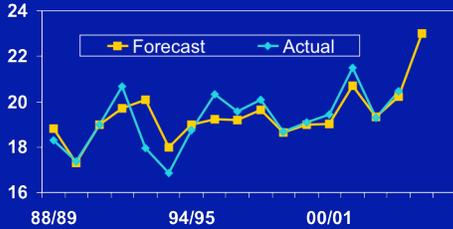
Forecasts as of September



## WORLD PRODUCTION

Million Tons

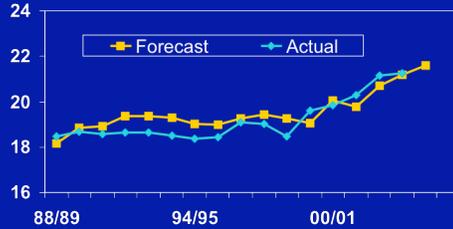
Forecasts as of September



## WORLD CONSUMPTION

Million Tons

Forecasts as of September



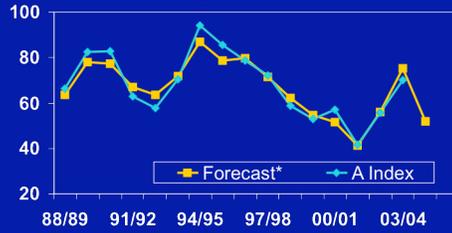
## COTLOOK A INDEX MODEL Does Not Have:

- Non-Cotton Market Variables
- Technical Variables
- Not a Monthly or Quarterly Model

## COTLOOK A INDEX MODEL

Cents per Pound

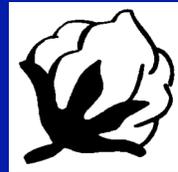
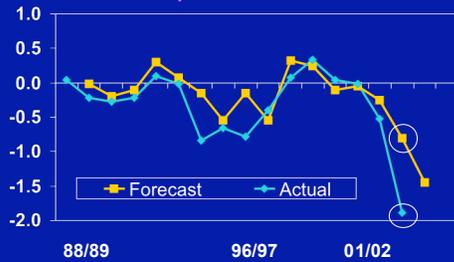
Model Forecast Using Current Data



## CHINA (M) NET EXPORTS

Million Tons

Forecasts as of September



International Cotton Advisory Committee

Valid Indicators

Price Benchmarks