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World Cotton Yields Are Rising Slowly[1]

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The world cotton industry may have entered a five-to-ten year period of higher-than-average prices caused by relatively slow growth in world yields. Between 1950/51 and 1993/94, the average world cotton yield rose at an annual rate of 2%, or 8 kilograms per hectare per year. However, yields were below the 44-year regression line in the late 1970s and early 1980s as high cotton prices encouraged expansion into lower-yielding areas, and because cotton policies in several important producing countries, including China (Mainland) and the USSR, did not encourage intensive efforts by farmers. Between 1983/84 and 1991/92, the world average yield rose from 450 kilograms per hectare to nearly 600 kilograms largely because of productivity gains in developing countries, especially China (Mainland) and Pakistan. However, world yields since 1991/92 have been below the regression line, indicating that the most recent period of above-average gains in yields has passed; the world average yield is not expected to improve in 1995/96 because of increases in area and continued problems with disease and pests. Consequently, the world average yield is forecast to remain below the long run regression line.

World cotton area ranged between 30 and 35 million hectares in most years between 1950/51 and the present, with no apparent tendency to rise or fall. An extrapolation of the 44-year regression line through world yields indicates an average yield in 2000/01 of about 620 kilograms per hectare. If world area is 33 million hectares, production would be about 20.5 million tons in 2000/01; if world area rises to 35 million hectares, production would climb to 21.7 million tons five seasons from now. But, in order to meet 3.7 kilograms per capita consumption, world cotton use needs to rise to 23 million tons. However, to achieve 23 million tons of cotton use with yields averaging 620 kilograms, world cotton area will have to rise two million hectares above the record set in 1984/85 to 37 million hectares. Significant expansion in area planted to cotton is not expected and emphasis lies on improving per hectare yields.

Powered by near-record Chinese (Mainland) imports and a record low ratio of world-less-China (Mainland) ending stocks-to-use, the Cotlook A Index rose to an average of 92 cents per pound during the period from August 1994 through May 1995, 25 cents higher than the average during the same period in 1993/94. High prices are encouraging substantial increases in planted area in many countries, probably leading to increased world production in 1995/96 and 1996/97. However, world cotton use is also rising, and increased grain prices and continuing problems with pests may hold cotton production below consumption in China (Mainland) for several years. Further, problems with the leaf curl virus are known to persist in Southern Asia, even though rigorous control efforts are being made to minimize losses due to the disease. Economic and political difficulties in Central Asia are also affecting production. As a consequence, season averages of the Cotlook A Index are expected to remain substantially above the long run average of 73 cents for the next two seasons.

Net exports of cotton by China (Mainland) will be a key factor affecting the level of cotton prices in 1995/96 and 1996/97. World cotton prices are being boosted in the current season by inefficiency in the Chinese economy. China (Mainland) imports are rising by much more than the difference between production and consumption because of a breakdown in the system of state procurement and distribution, combined with political uncertainty and widespread fear of inflation. Imports by China (Mainland) are estimated at 870,000 tons in 1994/95, and exports are estimated at 45,000 tons, putting net exports at negative 825,000 tons; production was 100,000 tons greater than consumption in 1994/95. The result is a rise in China (Mainland) ending stocks

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of 900,000 tons this season.

Imports by China may decline in 1995/96 and 1996/97, assuming no further increases in stocks are necessary, but imports will, nevertheless, probably remain substantial. Cotton production in China (Mainland) has been equal to or less than consumption in all but two seasons since 1984/85, and production is forecast to remain below consumption during most of the 1990s as well. China does not seem to have the land base necessary to meet rising demands for bulk agricultural commodities in an economy growing by up to 10% a year. The fact that 1% to 2% of agricultural land in China (Mainland) is lost to urbanization each year suggests that competitive pressures are moving the Chinese economy away from cotton and grain production.

World cotton consumption in 1994/95 is estimated at 18.5 million tons. Because of declines in cotton use in the former USSR and Eastern Europe, combined with no growth in consumption in China (Mainland), world cotton use has not risen in eight seasons. However, stronger world economic growth in 1995 and a stabilization of industrial production in Russia and Eastern Europe are expected to lead to world cotton use of 19.0 million tons in 1995/96 and 19.5 million in 1996/97. Tight supplies may limit the rate of increase in cotton use in the USA, Pakistan, India and China (Mainland).

World stocks at the end of 1994/95 are estimated at 7.8 million tons. Two-fifths of world ending stocks were held in China (Mainland), leaving stocks outside China equal to less than five months of use. With consumption expected to nearly equal production in 1995/96, a substantial increase in world stocks is not expected for another season.

A pivotal feature of the world cotton industry during the 1980s and early 1990s was the shift in the location of mill use toward countries producing cotton. Between 1980/81 and 1992/93, cotton use in the ten countries growing the largest amounts of cotton rose from 55% of world consumption to 66%. Even though world consumption rose by 31% between the 1980s and 1992, imports of cotton increased by only 14%, and imports as a share of world consumption fell.

World 1994/95 imports are estimated at a record 6.7 million tons, but reduced imports by China (Mainland) may reduce trade volumes in 1995/96 and 1996/97. The increase in world exports during 1994/95 was the first real increase in the volume of world cotton trade since 1986/87.

Modest Increases in World Production Forecast

World production is estimated at 19.4 million tons in 1995/96 and 20.4 million in 1996/97. While representing substantial increases over 1994/95, even the 1996/97 estimate is not record high, reflecting difficulties being experienced in four of the five largest producing countries.

Weather across most of the Northern Hemisphere cotton areas in the first half of 1994 was the best in memory. Planting in Central Asia started earlier than usual, the leaf curl virus was suppressed by just-the-right-amount of humidity in Pakistan, the monsoon was good in India, a cold 1993-94 winter reduced pest populations in China and rain fell at the right times in the USA. The eventual result was a 4% increase in the world average yield. In 1995, weather has been closer to average with problems developing in several regions, and a reduced world average yield is forecast. Nevertheless, because of an increase in world area in response to the rise in cotton prices, production in 1995/96 is increasing and is likely to exceed consumption.

USA Yields Not Rising

On August 11, 1995, the USDA estimated production at 4.75 million tons for 1995/96. But due to a long dry spell, beet armyworm losses in Texas and the boll weevil in Mississippi, the USDA has revised its estimate to 4.41 million tons on September 11.. However, production is estimated at 4.8 million tons during the next two years. The USA average yield reached 791 kilograms in 1987/88 and was only 3 kilograms per hectare higher in 1994/95, seven seasons later. In the last 20 years, the average increase in yield has been less than 3%. Because of changes in economic conditions in the USA, the 1990s may be similar to the 1960s and 1970s

when USA cotton yields were flat, despite incremental annual advances in production technology.

High market prices are likely to eliminate income support payments in 1995/96 under the USA government cotton program, and the acreage reduction percentage is likely to remain at zero in 1996/97 as well. With prices likely to remain above average during 1995/96, USA area will probably expand in 1996/97 as producers gain experience with cotton and as cotton-production equipment is purchased in expanding regions. The increases in USA production will be needed. Textile producers in the USA have become among the most competitive in the world and investment in open end and air jet spinning is continuing. US mill use is expected to rise to 2.7 million tons by 1996/97, representing annual increases of 5%.

Insecticide Resistance Reduces Production in China (Mainland)

Reduced harvests caused by a bollworm Helicoverpa armigera in what were formerly the most important cotton producing provinces of China (Mainland) account for much of the rise in international cotton prices during the past two seasons. Production in the provinces of Hebei, Henan and Shandong totaled 3 million tons in 1991/92 but is estimated at 1.7 million tons in 1994/95. The problems in Eastern China appear to be of a long term nature; yields in Shandong have been declining since 1987/88, a symptom of environmental degradation. Problems in Eastern China will necessitate shifts in the location of cotton production and changes in agronomic practices in the affected areas. Current practices include the double cropping of cotton with wheat, providing a year-round habitat for bollworm and aphids, a practice which may have to be stopped.

A change in the pest complex has had a big impact on cotton production in China. During the 1950s, aphids, spider mites and pink bollworm were major insects. American bollworm was there but there was hardly a need for spraying against this insect. During the 1960s and 70s, the 2nd generation caused economic losses and the 3rd and 4th generation appeared on cotton. During the 1980s, the 2nd 3rd and 4th generation caused serious losses in yield. During the early 1990s, the 5th generation also appeared at the end of the crop season, and insect pressure on the plant further increased causing heavy losses in production. Similarly, egg counts per 100 plants increased from 200-300 in the 1950s to 925, 1351 and 2000 during 1960s, 1970s and 1980s, respectively. Now, the bollworm is also resistant to insecticides. A program “Strategies and Tactics to Reduce Cotton Bollworm” was launched in 1993 but it will take years to correct the problem.

Production in China (Mainland) is estimated at less than 4 million tons in 1995/96 because of reports of increased pest populations this year and reduced area because of high grain prices. Production may rise somewhat in 1996/97 because of increases in irrigated area and progress in controlling bollworms.

Indian Cotton Yields Remain Below World Average

Cotton area in India is expanding by an estimated 5% in 1995/96 in response to high prices, and a further gain may occur during 1996/97. However, production in India during the next two seasons may remain below the 1992/93 record of 2.4 million tons because of disease in the northern producing states which account for about one-third of national production.

Average yields in India remain lower than in the rest of the world despite the 30% of area grown under commercial cotton hybrids and expansion in the irrigated area. The main reason for low yields in India is the lack of irrigation facilities. Cotton is not a water loving plant, but a regular supply of water at specific intervals is needed. Pesticides were adopted widely in India and production technology was perfected during the 1980s. Consequently, progress was made during the 1980s, and the ratio of Indian yields to yields in the rest of the world rose from .35 in 1980/81 to .51 in 1989/90. However, since the 1980s, Indian yields have fallen back to less than half the average outside India, reflecting difficulties in recent years with the bollworm H. armigera and disease problems. The identification of the leaf curl virus in Northern India during 1994 indicates that India may face additional difficulties in 1995/96 and 1996/97 in raising production. Yet, there are no plans to fight the leaf curl virus disease; however, the situation is being seriously monitored by researchers. Commercial cotton hybrids may be extended to a larger area in the northern regions without any significant impact on yield because of other limiting factors.

Leaf Curl Virus in Pakistan

Cotton production in Pakistan is currently estimated at 1.9 million tons in 1995/96, about 400,000 tons more than required to meet domestic needs. 30%, 40% and 30% loss in production in 1992, 1993 and 1994, respectively, over 1991/92 is the result of the leaf curl disease caused by a virus. H. armigera is also said to have played a role in lowering production in Pakistan. The availability of strong chemicals showed that it is easier to fight the bollworm rather than the leaf curl virus disease. The virus affecting cotton in Pakistan has been identified as a geminivirus, but currently there is no chemical defense available to control the disease. The only option is to control the whitefly and to keep its population from exceeding one whitefly per leaf, which is very difficult. The normal threshold for whitefly in many countries, including Pakistan, is 5-6 whitefly adults per leaf. Lowering the threshold by 5 means more insecticide use, thus affecting the profitability of cotton production. However, efforts are underway to control the disease and boost cotton production. In the absence of a genetic base resistant to geminiviruses, a multidimensional approach has been adopted which includes the following:

! All cotton varieties are susceptible to the disease but some are more affected that others. Highly susceptible varieties have been banned for cultivation and selection pressure for genotypes resistant to disease has been accelerated.

! The ICAC sponsored a project , approved for funding from the Common Fund for Commodities, to develop transgenic genotypes resistant to geminiviruses. A foreign gene will be inducted into cotton which will not permit the vector to infest the cotton plant with viruses.

! Induced mutation and marker gene assisted hybridization is also being tried.

In the last four years, farmers have leaned to minimize the damage but the inoculum is still there which is a hovering threat to cotton production in Pakistan. The problem is acute and it will take years to correct it.

Mill use data from India and Pakistan indicate that consumption is holding at or above last season's levels despite the increases in domestic cotton prices which occurred in 1993 and 1994. Monthly data reinforce the observation that the textile industries in India and Pakistan remain internationally competitive.

Central Asian Production Still Declining

Production in Central Asia fell from 2.8 million tons in 1988/89 to an estimated 2 million in 1994/95 and appears headed still lower. Reductions in cotton area due to environmental concerns, civil war in Tadzhikistan and Azerbaijan, low producer prices when adjusted for inflation and exchange rates, and a failure to provide inputs and equipment to farms and farmers are the major reasons behind the declines in output. Central Asian production is not expected to rise during 1995/96 and 1996/97, despite above-average cotton prices. Reflecting a tightening of Central Asian supplies over the last several years as production has fallen, the average quote in Cotton Outlook for Central Asian middling has risen from an average of 92% of the Cotlook A Index in 1992/93 to an average of 96% through May in 1994/95.

With particular reference to Uzbekistan, in addition to above mentioned limitations, cotton production is also affected by changes in climatic conditions. Shrinkage in the length of summer conditions and a milder summer is also said to have affected yield. Short duration cotton varieties have been developed to mature in less than 120 days, but effects of such a short duration on yield also need to be kept in mind.

Technical Basis for Lower World Cotton Yields

The cotton plant is a perennial indeterminate tree and never fruits itself to death. It has been domesticated to grow and mature annually like a pseudo annual plant. But, when favorable conditions persist, it has the tendency to grow and bear buds, flowers and bolls. Formation of an additional node on the main stem or branch brings a leaf or a branch and a leaf axil always gives rise to a flower bud or a branch. Thus, the cotton

plant carries huge genetic potential for a much bigger yield than what is realized now. But, productivity is limited by external limitations or constraints. If a constraint is eliminated, yield automatically increases.

Annualization of the cotton plant is itself for the sake of improvement in productivity. But, in a broad sense, in the recent past, two major constraints were identified and eliminated. They are synthetic fertilizers and insecticides. If you eliminate these two inputs from the cotton production system, yields would revert to those of 50-60 years ago. Some micro constraints have also been identified and eliminated in various countries. Whether cotton breeding can improve genetic potential also seems controversial. Breeding is simply a selection of genotypes most suitable to the growing conditions. Genetic superiority for a better yield, if any, can easily be confirmed by testing obsolete vs present commercial varieties.

Anyhow, the identified constraints have been eliminated to the maximum extent possible in most of the countries. So, yield is becoming stagnant or rising at a very slow rate. The basis for this slow rise is perfection in the technology, but for any major improvement in yield a new constraint has to be identified and eliminated.