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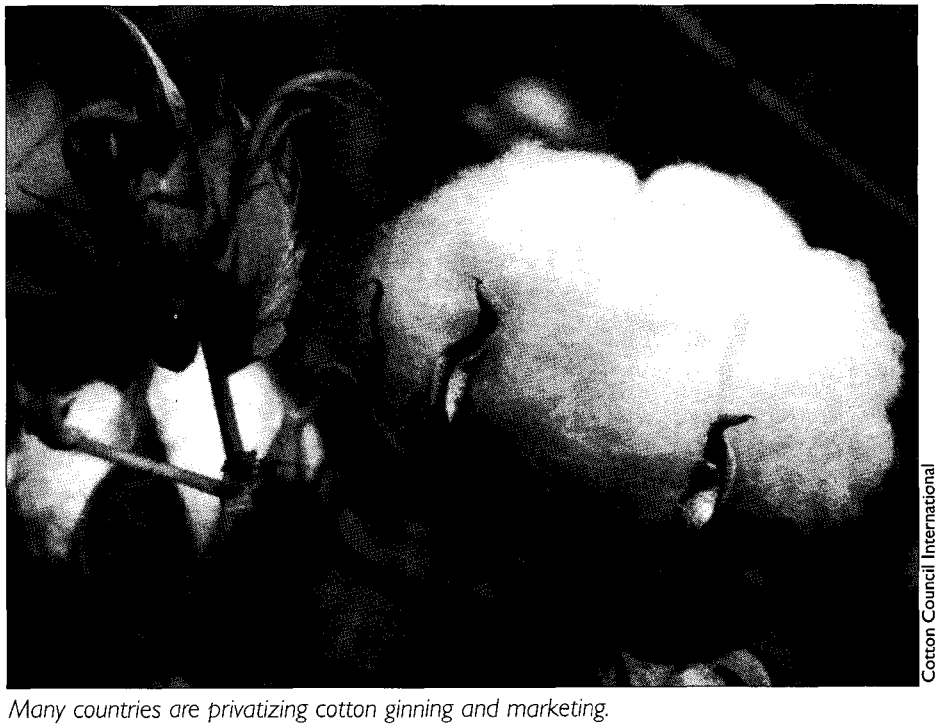
Cotton

Production and Marketing Fundamentals

Five countries (China, India, Pakistan, the United States, and Uzbekistan) account for over 70 percent of world cotton production. This crop is also an important source of foreign exchange and employment in many smaller cotton-producing countries and considerable World Bank lending has gone for cotton-related project components. Because cotton industries are complex, this Note highlights the basic features of cotton production and marketing, including structural and policy issues important for efficient industry development.

Cotton production, processing, and marketing are particularly strongly integrated, and at the same time are undergoing significant structural change. Many countries are privatizing cotton ginning and marketing. Since cotton is the primary raw material for the spinning industry there are several externalities that need careful consideration in the privatization process. Increasingly, as trade is liberalized, as environmental and health concerns over pesticide use grow, and as competing demands for irrigation water increase, different agronomic practices will be required to sustain cotton production.



Cotton Council International

Many countries are privatizing cotton ginning and marketing.

Importance of Cotton

Cotton is a leading source of exports and employment in many countries. The cotton sector in Uzbekistan, for example, provides 75 percent of all export earnings and employs 40 percent of the workforce. Fifty million Chinese households grow cotton, which occupies roughly 3 percent of the cultivated land but accounts for between 7 and 10 percent of agricultural output. The textile industry employs 9 million workers and accounts for about 25 percent of total export value. The cotton textile industry in Pakistan employs over 35 percent of the industrial labor force and accounts for over two-thirds of total exports, while cottonseed oil accounts for 85 percent of the vegetable oil produced. In India, no crop competes with cotton for value added in processing and over 60 million people derive an income from the cotton textile sector.

Cotton is equally important in the smaller cotton-producing countries. For example, Tanzania's cotton sector provides a living for 40 percent of the population and accounted for 15 percent of the export earnings during the past decade. The annual income of Mali's cotton zone is five times the national average. The cotton sector in that country has grown at 8.4 percent per annum and accounts for 50 percent of all exports.

Cotton Policy

Cotton policies are largely determined by the trading objectives of the country concerned. Some countries export raw cotton

Public Disclosure Authorized

The World Bank has provided approximately $3.7 billion for cotton-related financing in the last eight years.

Since 1988, the World bank has funded 51 projects involving credit, irrigation, research and extension, integrated pest management (IPM), or agricultural sectoral restructuring with a total investment of $6.6 billion. Of this, the World Bank has provided $3.7 billion that directly or indirectly involves cotton. Specific cotton development projects have been initiated since 1988 in the Central African Republic, Togo, and Uganda involving a total investment of $91.4 million. A cotton improvement project in Uzbekistan involving a total investment of $84.6 million (of which the World Bank will provide $66.0 million) is being negotiated.

Source: Author

while others have strong textile sectors, exporting value-added cotton yarn, fabric, or piece goods. Uzbekistan exports mainly raw cotton, while China produces cotton cheifly to supply the domestic textile industry, which produces finished piece goods for the domestic and export markets. India also produces cotton largely for the domestic textile industry, while Pakistan exports cotton yarn.

Cotton production cannot be studied in isolation from cotton-consuming industries. This is because of the close links between cotton production and the cotton textile industry, and the effect of the end use of raw cotton on government policies. Any changes in government policies should be considered in terms of their effect on the growers, on the textile industry, and on international trade.

For example, privatization of marketing in many countries has resulted in uncontrolled movement of seed cotton, leading to increased variability due to varietal mixing both in the bale and in planting seed. In the absence of crop hygiene, privatization could also contribute to the dispersion of certain pests and diseases. In order to minimize variability, varieties should be grown in selected areas, particularly by smallhold-farmers. At the very least, in a given area all varieties should have similar fiber properties.

Government price interventions, either through a declared price in advance of the season or a minimum floor price which only comes into play if the world price is lower, absorb the price risk but also isolate producers from market signals. Removal of government price interventions passes the risk to the growers.

Requirements of the Textile Industry

Traditionally, length, grade (color plus trash), and micronaire (a value influence by fineness and maturity) have determined the price of cotton. Fiber length is closely correlated with fineness, is variety-dependent, and determines the end use of the crop. Color often indicates damage caused by diseases, insects, or the weather, while trash indicates the efficiency of picking and the extent of cleaning during ginning. High-volume instrumentation (HVI) provides a rapid assessment of these and other fiber qualities and has increased the awareness of plant breeders, growers, and ginners to the needs of spinners.

Cotton spinners desire cotton with high spinnability, delivered as contracted at a reasonable price. By producing the type of cotton that the spinners want and ensuring a regular supply, producers can expect higher prices and little difficulty in marketing their produce. In the past, this has been achieved in many countries through price interventions by governments and by mandated single-variety areas and ginneries.

Cotton Price

There are two major price indices for cotton, both continually updated by the publication *Cotton Outlook* (Liverpool). Both are widely used as indicators of international offering prices. The Cotlook A index is the average of the cheaper quotations, (CIF northern Europe in U.S. cents per pound) of 14 growths of Middling (1 3/32" quality) cotton. The Cotlook B index is the similar average of a number of growths of Strict Low Middling (1 1/32" to 1 1/16" quality) cotton.

Farmgate prices may be quoted either in lint or seed cotton. Caution is necessary as to what price is quoted to avoid misinterpretation. The determination of the farmgate price from the lint price is given in the box on the next page.

The lint-equivalent farmgate price can be used to calculate the producer's share either of the lint export or mill price or of the end product's price (yarn or piece goods) at the point of export. Any costs beyond the farmgate are regarded as marketing costs. In some countries, seed cotton is collected in the village, in which case the farmer does not incur any transportation costs and the producer price is the same as the farmgate price. In other countries, however, the farmer has to deliver seed cotton to a collection center or ginnery and incurs transportation costs which may be substantial. These marketing costs should be deducted from the price the farmer is paid to determine the farmgate price.

Reliable international comparisons require the use of the same producer price, or at least identification of the farmgate price or producer price at the ginnery. In calculating the farmer's share, the prices used (annual averages or prices taken at a certain time of the year) should be identified since the season and supply situation exert a significant influence on the market price and hence on price ratios.

Large-Scale vs. Smallholder Cotton Production

Large-scale mechanized cotton production usually leads to higher yields than small-scale manual production because of timely, more efficient field operations. Smallholders give food security precedence over cash crops, leading to reduced yields attributable to late planting, thinning, and weeding.

Smallholder tractors and equipment are precluded in many developing countries by lack of workshops and fuel. Animal traction could improve timeliness in field operations but competition for labor for cultivation remains a constraint.

Utilization of animal-drawn equipment for all crops should improve overall farming standards.

Consolidated cotton plots, treated as single units, provide advantages of scale. Shared equipment, labor and resources facilitate a restricted planting period, an important aspect of integrated pest management (IPM).

Large-scale producers enjoy marketing advantages. Based on a world average yields it takes about 37 hectares produce 100 bales (21.7 metric tons net), the size necessary for a forward price contract. Large-scale growers produce sufficient cotton to make forward contracts for their crops, but it would take 75 to 150 smallholders, averaging this yield on one-quarter to one-half hectare each, to produce 100 bales, precluding forward-contracting by individual farmers. Cotton that is produced by many smallholders has to be combined into marketable lots by a private or public entity. Marketable lots are essential for both forward and cash marketing.

Determination of the Farmgate Price of Cotton from the Lint Price

	CIF price
–	Shipment, insurance, costs, etc.
=	FOB price in exporting country
–	Lint ,marketing costs (transportation, storage, handling, etc.)
–	Trader's profit
=	Lint price at ginnery
+	Value of cottonseed
–	Ginning costs
–	Seed cotton marketing costs (transportation, storage, handling, etc.)
–	Levy (if applicable)
–	Trader's profit (if applicable)
=	Farmgate price per unit of lint (lint equivalent price)
x	Ginning outturn (GOT)
=	Farmgate price per unit seed cotton

Source: Gillham and others 1995

Biotechnology and Variety Improvement

Successful variety improvement depends on clearly defined objectives, adequate genetic variability, and appropriate instrumentation and evaluation methods. More breeding programs have failed through lack of objectives than from lack of genetic variability. Nonetheless, biotechnology provides the breeder with a means to widen variability and to introduce specific characters into the base genotype. This supplements but does not replace traditional breeding.

The main developments in transgenic cotton have been the introduction of a genetic mechanism from *Bacillus thuringiensis* (Bt) to enable the cotton plant to produce endotoxins that control certain lepidopterous insects (such as moths) and to develop resistance to a range of herbicides. Cotton that can resist a wide range of herbicides can survive spraying to control less-resistant weeds. Bt-type cotton could play an important role in IPM, but unless resistance management techniques are applied, pests will develop resistance to the endotoxins within two to three years, rendering not only the Bt cotton varieties but also Bt-based pesticides ineffective.

Quality Planting Cottonseed

Timely availability of quality planting seed is essential for successful cotton production. Poor-quality seed leads to poor crop establishment, reduced yields, and increased fiber variability. Poor-quality seed also leads to excessive seeding rates. Unless quality is corrected, efficient seed multiplication programs are not feasible.

With the exception of Mali and Mexico, seed supply is weak in many cotton-growing developing counties. Seed supplies in Mali are handled by the parastatal marketing organization CMDT which has a vested interest in ensuring the timely supply of quality seed to ensure regularity of supply and quality, while Mexico relies largely on commercial companies in the United States for seed.

Irrigation and Drainage

Cotton requires more water than many other crops. Irrigation has increased cotton production by enabling the crop to be grown in arid areas where it would otherwise be impossible or by increasing yields of rainfed crops. Improper irrigation can degrade the environment, however, both on and off the farm.

Many major irrigation schemes, notably in Western China, Egypt, the Sudan, Pakistan, Central Asia, the United States, and more recently Turkey, were developed specifically to produce cotton. These schemes are in arid or semi-arid areas and have experienced problems with soil degradation due to waterlogging and salinity. Uzbekistan faces not only these problems but wider environmental degradation due to the dessication of the Aral Sea, a direct result of expanding irrigated area for cotton farming. Cotton has been blamed for the problems arising from both the excessive use of water and pollution of waterways. The problems are not necessarily related to cotton *per se* but to excessive use of water, poor water delivery, poor application techniques and systems, or inadequate drainage.

Salinity is an inevitable threat where irrigation plus rainfall is less than the evaporative demand, as it is in arid areas. If irrigation plus rainfall exceeds evaporative demand (usual in humid areas), there is a net descent of water through the soil that leaches out salts. Without exception, all the countries with desert and Mediterranean climates in the broad belt of irrigated cotton that stretches from

Spain to Central Asia and those with similar climates in North and South America have salinity problems.

Cotton production is not sustainable when it depletes or degrades either nonrenewable resources that are used in cotton production or those affected by cotton production. Irrigation has a potential to have a major impact on the environment through salinity and rising water tables, contamination of groundwater, or degradation of wetlands and lakes (or all of these). These factors have to be taken into account in all irrigation schemes and require action by both the farmers in improving irrigation efficiency and by the engineers operating the systems through improved design and operation.

Cotton Council International

Large-scale growers produce sufficient cotton to make forward contracts for their crops.

Integrated Pest Management

Over-reliance on chemical pest control causes resurgence of harmful pests by eliminating natural enemies and causing pesticide resistance. IPM integrates cultural, biological, natural and chemical control measures and is the key to sustainable cotton production.

IPM strategies, adapted to local conditions, usually incorporate chemical control, crop residue destruction, and often regulation of seed cotton movement to prevent dispersion of pests and diseases. Chemical control requires timely application, based on action thresholds, of the most effective chemical against the pest, at an appropriate rate, with efficient, properly calibrated equipment. Also, insect population dynamics generally necessitate regional IPM measures covering all crops, often across political boundaries.

Pesticide registration should take account of both the efficacy of the product and its toxicity. The license on many older, more toxic products has expired, permitting wide production, marketing and utilization with insufficient regard to health hazards. The quality of pesticides, particularly when imported in bulk and repackaged, should be monitored to ensure that the product reaching farmers is what it purports to be and that the concentration is according to specification. Unregulated pesticide distribution is incompatible with IPM and has contributed to pyrethroid-resistant bollworms, *Helicoverpa armigera*, in China and India. Rational pesticide use requires registration and area wide regulation of appropriate pesticides for specific situations.

Quarantine regulations are necessary to prevent the spread of insect pests and diseases in seed cotton or cottonseed that is moved both within and between countries.

This note has been based on research sponsored by the International Cotton Advisory Council, the Canada Egypt McGill Agricultural Response Program, the Common Funds for Commodities, and the World Bank that was published as a World Bank Technical Paper (Gillham and others 1995).

Recommended Reading

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Agriculture Technology Notes provide up-to-date information on selected agricultural topics to World Bank professionals. This note was prepared by Fred Gillham, consultant. Further information on cotton production and marketing contact Johannes ter Vrugt x32382. To obtain copies of this or other Notes, or to inquire about Agriculture Technology Notes, please call (202) 473-9406. Other Notes in this series are: "Sustainable Agriculture," "Reform of Seed Regulations," "Information Technology and Rural Development," "Simple Animal Health Techniques," "Competitive Research Grant Systems," "Provision of Mineral Supplements," "Integrated Pest Management," "Privatization of Animal Health Services," "World Fisheries," "National Seed Systems," "Participatory Rural Assessment," "Integrated Soil Management for the Tropics," and "Biotechnology." Layout and design by Peter Wiant.