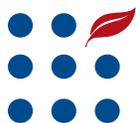




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Brazil's Cotton Industry

Economic Reform and Development

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Approved by USDA's
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Abstract

Brazil is one of the world's leading cotton producers and an important competitor of the United States in Asian and European cotton markets. This situation has come about as a result of trade liberalization, structural transformation of the Brazilian economy, and the emergence of new cotton producing regions using advanced technologies and benefiting from targeted government support. Brazil's access to additional agricultural land and recent favorable cotton prices suggest the country's cotton production could rise even more than previously expected.

Acknowledgments

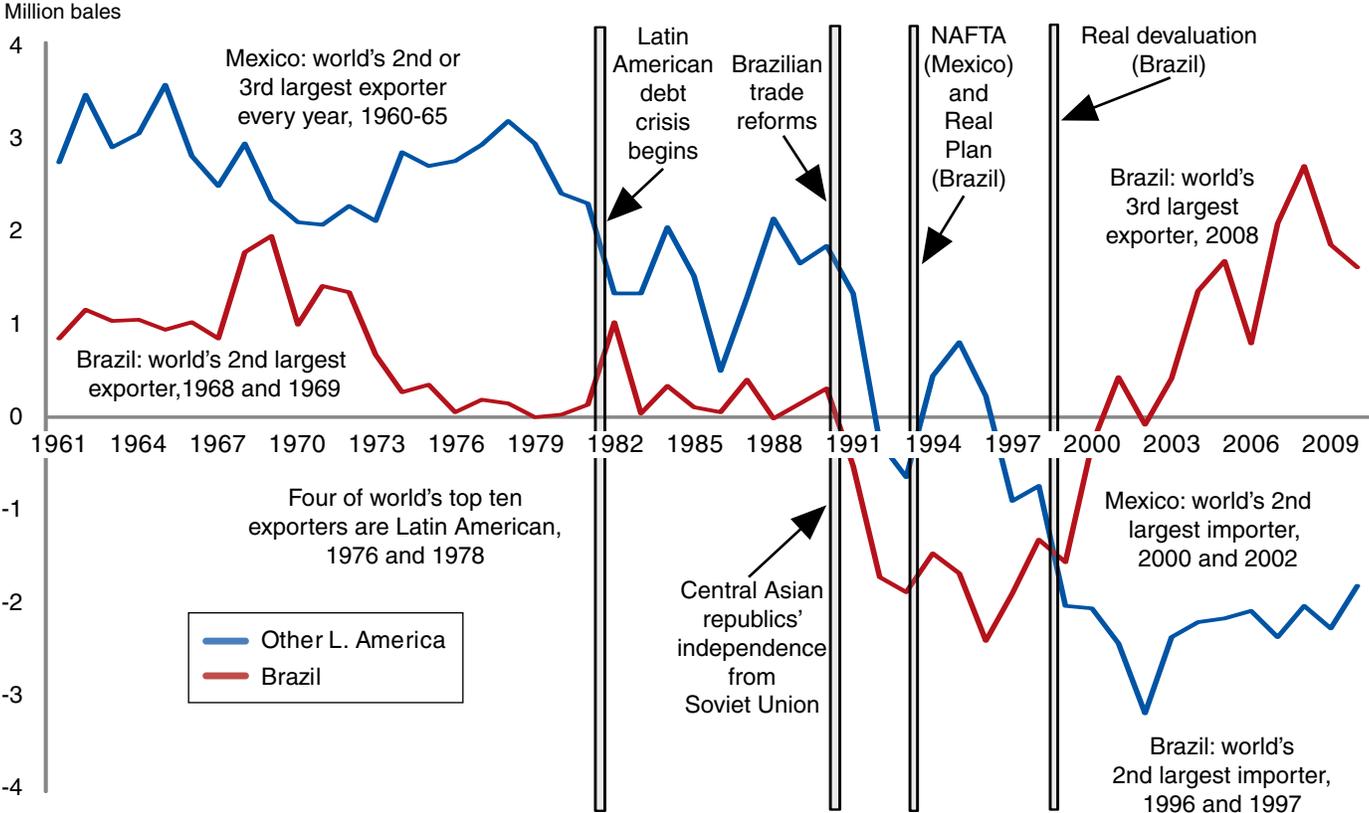
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Introduction

Brazil is one of the world’s leading cotton producers and an important competitor of the United States in cotton trade. Since marketing year 2006/07, Brazil has ranked fifth among world cotton producers, and accounted for at least 5 percent of world cotton output. Brazil has ranged from the world’s third largest to fifth largest exporter in recent years, accounting for as much as 9 percent of global cotton exports. Brazil competes with the United States in cotton markets in Asia and Europe.

Cotton contributes significantly to Brazil’s agricultural output and foreign exchange earnings. In 2009, the value of cotton production reached \$3.5 billion, representing 3 percent of the country’s total agricultural output. Annually, over 6,800 farms are involved in cotton production on about 800,000 to 1 million hectares (IBGE, 2010). Cotton exports valued at \$685 million in 2009 represented 1.5 percent of Brazil’s agricultural exports (GTIS, 2010). Brazil is also one of the world’s largest consumers of cotton fiber, ranking fifth in consumption since 2007 and accounting for about 4 percent of world use.

Figure 1
Economic policy shifts drive net cotton export changes in Brazil and other Latin American countries



Source: ERS calculations based on PSD Online, November 2010.

From the 19th century until the 1990s, Brazil was a net exporter of cotton and often a major source of world cotton supplies. Brazil maintained this position despite decades of import-substitution policies aimed at nurturing industrial development at the expense of agriculture. However, economic reforms and trade liberalization in the late 1980s and early 1990s drove cotton production downward and increased imports at first, but also led Brazilian cotton farmers to look for new producing areas and new management techniques that led to a resurgence in production (fig. 1).

This report identifies the factors contributing to the cycles in Brazil's production and exports that have made it both an important market for U.S. cotton exports and a competitor with U.S. cotton producers since 1990. Reviewing developments in Brazilian economic policy, agricultural policy, and technical change offers insights into the likely future trajectory of Brazil's cotton industry. Over the next decade, Brazil's cotton industry is expected to keep evolving to meet increased domestic consumption and foreign demand, adopting new technologies and exploiting the vast potential of Brazil's uncultivated, arable land in the Center-West region.

Cotton Cultivation and Production in Brazil

Brazil is endowed with a large arable area with regional differences in climate, topography, soil, and natural vegetation. The timing of cotton planting and harvesting can therefore differ widely between states and regions, and extends throughout much of the year on a national basis. Cotton planting in the Center-West State of Mato Grosso starts in December and harvests begin in June (table 1). In the Southeastern State of São Paulo, planting is in October and harvest in March/May. In Mato Grosso and Bahia, the planting of a second crop (called *safrinha*) takes place around February/March, usually double-cropped with soybeans or corn.

In 1990, most of Brazil's production took place in the South and Southeast (fig. 2 and table 2). Since then, cotton production has shifted to Brazil's interior. Mato Grosso and Bahia now account for about 80 percent of Brazil's cotton production. Mato Grosso and the major cotton-growing areas of Bahia lie within the vast area of the *Cerrados*,¹ which consists primarily of savannahs and grasslands and occupies 197 million hectares, or about 23 percent of Brazil's land. The region is characterized by soil, temperature, and rainfall patterns that, with the appropriate technology, are ideally suited to high-yielding cotton production. Temperatures in Mato Grosso have monthly means that remain in a narrow band throughout the year, 73-82° F (23-28° C). The result is a long growing season—up to 210 days—that revolves around the timing of monsoonal rains. From October to March, average monthly precipitation ranges from 4 to 8 inches, before tapering off to virtually zero in July, the peak harvest month (table 1). The combination of regular rainfall throughout the growing season and sandy, well-drained soils means yields for rainfed cotton in the *Cerrados* surpass irrigated yields in many parts of the world. Well-drained soils mean that fieldwork is seldom impeded by rainfall, and the virtual absence of rain during harvest minimizes crop damage. One drawback of the climate is the lack of a cold period to induce winter-kill of harvest pests. As a result, insecticide expenditures per hectare are among the world's highest (ICAC, 2007).

¹The *Cerrados* is irregularly distributed across 10 Brazilian States: the State of Goiás and parts of the States of Mato Grosso, Mato Grosso do Sul, Minas Gerais, São Paulo, Bahia, Piauí, Maranhão, Tocantins, and Rondônia.

Table 1

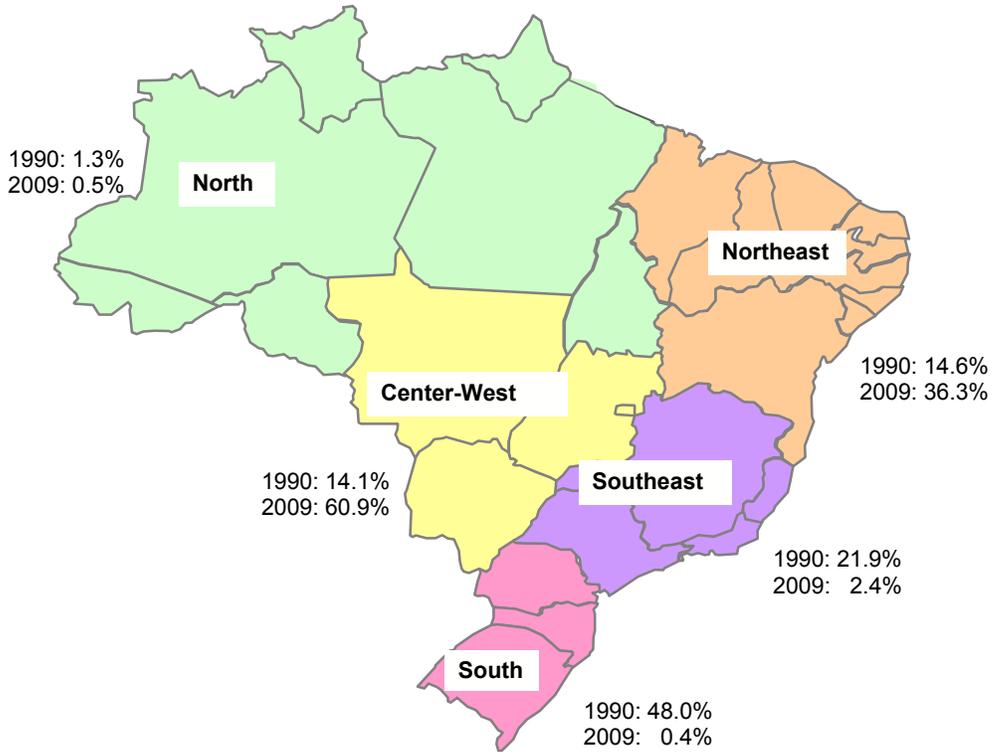
Brazil's cotton crop calendar by State

Region/State	Planting	Harvesting
<i>Northeast</i>		
Bahia	November-December	June-July
<i>Center-West</i>		
Goiás	November-December	June-July
Mato Grosso do Sul	November-December	June-July
Mato Grosso	December-January	June-August
<i>Southeast</i>		
Minas Gerais	November-December	May-July
São Paulo	October-November	March-May
<i>South</i>		
Paraná	September-November	March-May

Source: ERS compilation based on various reports by Brazil's National Supply Company, *Companhia Nacional de Abastecimento* (CONAB).

Figure 2

Cotton producing regions (share of production), 1990 and 2009, and area of *Cerrados* (inset)



Source: IGBE & ERS calculations based on data from CONAB.

Table 2

Brazilian cotton by State and region, 1990/91, 2000/01, and 2009/10

States by Region	Area planted (1,000 hectares)			Area growth (Avg. percent)	Yields (Kg/ha)	Production (1,000 bales)
	1990/91	2000/01	2009/10	1990-2009	2009/10	2009/10
NORTH	16	3	4	37	1,346	25
Rondônia	16	3	0	0	0	0
Tocantins	0	0	4	82	1,346	25
NORTHEAST	804	151	288	-2	1,504	1,991
Maranhão	2	2	11	21	1,486	72
Piauí	112	8	6	-5	1,363	37
Ceará	226	29	3	-14	263	3
Rio Grande do Norte	115	20	3	-5	175	2
Paraíba	100	8	1	-10	64	0
Pernambuco	52	7	3	2	210	3
Alagoas	22	21	2	22	105	1
Bahia	175	55	261	8	1,560	1,868
CENTER WEST	171	542	523	10	1,389	3,338
Mato Grosso	71	392	428	15	1,363	2,680
Mato Grosso do Sul	48	50	39	6	1,445	256
Goiás	52	98	57	6	1,542	401
SOUTHEAST	363	104	20	-11	1,424	130
Minas Gerais	120	39	15	-8	1,458	101
São Paulo	244	66	5	-14	1,318	30
SOUTH	572	68	0	-16	779	23
Paraná	572	68	0	-16	779	0
BRAZIL	1,939	868	836	-2	1,429	5,484

Source: *Companhia Nacional de Abastecimento (CONAB)*, 2010.

Yields and Technology

Although soil conditions in the *Cerrados*² were initially very poor, advances in soil technology and the development of new crop varieties have enabled higher cotton yields in the region. Brazil's cotton yields—which remained mostly flat from 1960 until the mid-1990s (table 3)—began to rise rapidly after 1996/97.

Cotton yields in Brazil have risen the fastest of major world producers in recent years. Brazil and India had similar yields in 1992, both below the United States and the world average (fig. 3). With the adoption of modern, large-scale farming and improved access to inputs—and due to the extremely favorable climate in Brazil's new production regions—Brazil's cotton yields have surged to more than double the world average. Today, Brazil's average yields are second only to those in Australia and Israel, where production is almost entirely irrigated. Brazil's 2009/10 cotton yield is estimated at 1,498 kilograms per hectare, only 14 percent below yields in Australia and Israel (USDA, FAS, 2010).³

²The *Cerrados* soil is deficient in nitrogen and phosphorus; advances in soil management techniques and the ample application of phosphorus have significantly improved the *Cerrados* soil quality.

³The producers with the next highest yields in 2009/10 were Turkey (10 percent lower than Brazil) and China (12 percent lower), and both are also largely irrigated producers. For further background, see <http://www.ers.usda.gov/Briefing/Cotton/trade.htm>.

Table 3

Brazil's cotton production, 1990/91-2009/10

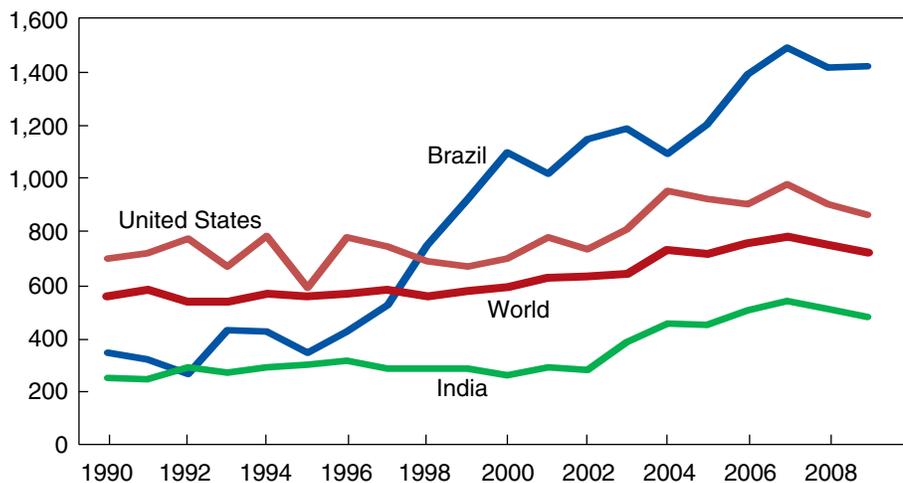
Year	Area	Yield	Production
	1,000 ha	Kg/ha	1,000 480-lb bales
1990/91	1,939	370	3,292
1991/92	1,971	338	3,064
1992/93	1,277	329	1,930
1993/94	1,238	391	2,223
1994/95	1,229	437	2,467
1995/96	953	430	1,883
1996/97	658	465	1,405
1997/98	880	467	1,888
1998/99	694	750	2,389
1999/00	824	850	3,216
2000/01	868	1,081	4,312
2001/02	748	1,025	3,519
2002/03	735	1,153	3,893
2003/04	1,100	1,190	6,014
2004/05	1,179	1,101	5,965
2005/06	856	1,212	4,767
2006/07	1,094	1,393	7,000
2007/08	1,077	1,487	7,360
2008/09	843	1,439	5,575
2009/10	836	1,429	5,484

Source: *Companhia Nacional de Abastecimento* (CONAB), 2010.

Figure 3

Cotton yields in Brazil, the United States, India, and world average, 1990-2009

Kilograms per hectare



Source: USDA, Interagency Commodity Estimates Committee.

When major cotton producing countries like the United States, China, Australia, and India adopted the use of genetically modified (GM) cotton in the early 1990s, Brazilian officials resisted. Although not scientifically based, Brazil's main objection against GM varieties in Brazil was that such genes could be transferred across similar species, posing potential hazards to human, plant and ecosystem health. Much of the argument was, however, politically based. With mounting pressure from Brazil's cotton industry lobbyists and with increasing evidence of the cost savings and yield benefits of Bt cotton production, Brazilian officials have begun to liberalize the use of GM cotton seeds. The legal introduction of GM cotton was delayed until 2005, and the first year of widespread legal plantings was the 2006/07 crop year. Illegal use of GM varieties had been noted in earlier years, and estimates of the GM share of the crop ranged as high as 30 percent (USDA, 2005). With legal commercialization, GM varieties are expected to account for the majority of the Brazilian crop in the near future.

Production and Marketing Costs

Production costs for cotton—particularly the price of fertilizer—have increased significantly in recent years. The Cotton Growers Association of Brazil (ABRAPA) estimates national average cost of production at \$2,500 per hectare (\$1,011 per acre); estimated costs in Mato Grosso were \$2,373 per hectare (\$961 per acre) in 2009 (table 4).

Yields in Mato Grosso are high: 1,400-1,550 kg/ha (1,250-1,383 pounds/acre), offsetting high production costs. Comparing costs with the United States—Brazil's major export competitor—is best done using the International Cotton Advisory Committee's tabulations, which show *Cerrados* total costs at \$705/acre in 2006. Variable cash costs alone were an estimated \$586/acre, or 46.1 cents/pound,⁴ which compares with the U.S. average of \$459/acre (48.5 cents/pound) in 2006.

In addition to high insect control costs, another drawback of *Cerrados* agriculture is its enormous distance from ports and Brazil's industrial regions. The average distance to ports is over 1,000 kilometers, and port costs are higher than in other countries due to poor port infrastructure and generally higher costs of doing business in Brazil (the *Custo Brasil* or "Brazilian cost")⁵ (Valdes, 2006). Infrastructure development has severely lagged the expansion of agricultural output. Transportation from Mato Grosso and Bahia is almost entirely by truck, and only 10 percent of Brazil's roads are paved. A recent study found that soy producers in western Brazil spent four times as much as U.S. producers to export (Moreira, 2009), and Brazilian cotton producers are at a similar disadvantage.

Brazilian producers are also hindered by the lack of an effective domestic futures market for hedging. While a domestic cotton futures contract was launched at Sao Paulo's Commodities and Futures Exchange (*Bolsa de Mercadorias & Futuros*-BM&F) in 1996, its use is limited. Speculative interest in the contract has been limited—possibly by its similarity to the IntercontinentalExchange's contract traded in New York (Guitchounts, 2008)—so hedgers find the market thin and are reluctant to risk exposure.

⁴USDA's cost of production estimates include economic and opportunity cost calculations. These are typically not included in estimates from other countries, so comparison of full costs is difficult. For more information, see <http://www.ers.usda.gov/Data/CostsAndReturns/methods.htm>

⁵*Custo Brasil* is a term that has come to denote general cost of inefficiency from production and distribution bottlenecks, including the various logistical transactions associated with exports.

Table 4

Cost of conventional cotton production in Mato Grosso, Brazil, 2010/11

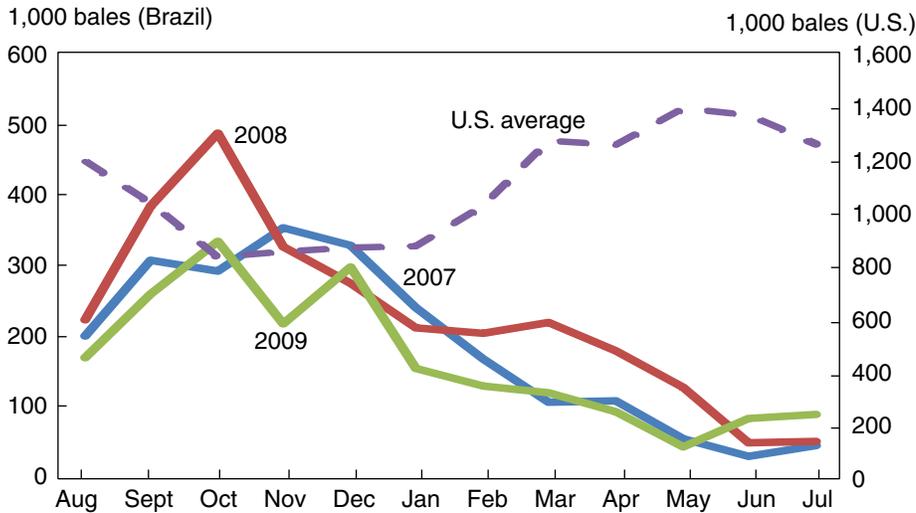
	Average value (\$/acre) ¹
1. SUPPLIES	489.20
Seeds	24.30
Cottonseed	13.50
Seed millet	10.70
Fertilizers	214.40
Corrective soil	18.10
Macronutrient	160.40
Micro	36.00
Defensive	250.50
Fungicide	32.30
Herbicide	60.60
Insecticide	134.50
Other	23.30
2. AGRICULTURAL OPERATIONS	167.80
Labor	18.50
Soil preparation	27.00
Fertilizing and seeding	15.40
Application of pesticides	14.20
Air application	10.90
Manual weeding	17.70
Harvest	52.00
Post-harvest management	12.10
A. OPERATIONAL COST (1+2)	657.00
3. OTHER COSTS	288.40
Technical	4.90
Production transport	25.50
Storage and processing	93.50
Taxes	90.60
Insurance	8.50
Financing	51.80
Administrative costs	13.60
B. VARIABLE COSTS (1+2+3)	945.40
C. FIXED COSTS	180.20
Depreciation; machine and equipment	48.40
Land	131.80
TOTAL COST (B+C)	1,125.60

¹Average of Southeast (Campo Verde), West (Sapezal) and North-Central (Sorriso).

Source: ERS calculations based on Agricultural Economics Institute of Mato Grosso (IMEA), May 2011.

Figure 4

Brazil and U.S. monthly cotton exports, 2007-2009



Source: Global Trade Information Services, Inc. (2011). World Trade Atlas, Internet version 4.6b.

As a result, producers⁶ and others must rely on the U.S. futures market for hedging purposes, with the attendant basis risk.

Brazil does have one important marketing advantage over U.S. producers, however. Brazil is a Southern Hemisphere country that plants most of its crop by December-January and harvests by June-July. Monthly cotton exports usually peak between the months of August and December. This pattern contrasts with the seasonality of U.S. cotton exports, which peaks between May and July (fig. 4). Since 90 percent of global cotton production is located in the Northern Hemisphere, the seasonal timing of production means Brazilian producers benefit more from market and price information from Northern Hemisphere competitors than vice versa. Since Southern Hemisphere producers plant after much of the Northern Hemisphere's crop has been determined, Brazilian farmers can adjust acreage and other inputs in response to global supply signals. Since the Southern Hemisphere accounts for only 10 percent of world cotton production, Brazil has limited influence on the price. However, Brazil's ability to respond to Northern Hemisphere production shocks helps cushion volatility in world cotton markets to some degree.

⁶Brazilian cotton producers typically sell their production in advance.

Policy Overview

Macroeconomic and Trade Policy

From the 19th century until the 1990s, Brazil was a net exporter of cotton and often a major source of world cotton supplies. Brazil maintained this position despite decades of import-substitution policies aimed at nurturing industrial development, often at the expense of agriculture. Many countries, particularly in Latin America, pursued similar policies, with varying degrees of success. The late 1980s and early 1990s saw development strategies shift in Brazil and elsewhere. In Brazil, the shifts first drove cotton production downward, and at times led to increased imports, but also laid the foundation for a resurgence in cotton production.

The import-substitution industrialization (ISI) approach from the 1930s through the 1970s facilitated Brazil's rapid economic growth and industrialization⁷ (Barros, 2009). During this period, the cotton sector was at times subject to significant regulation and occasional export taxes, export licensing, and export quotas. But intervention in agriculture was extensive, and at times favored cotton. For example, efforts to reduce dependence on coffee exports in the 1960s included an agricultural diversification program, which led to a surge in area planted to cotton in Sao Paulo and Parana.

In certain respects, Brazil's ISI policies were successful for a number of years. Brazil realized outstanding economic performance, created modern industries and companies that remain world leaders today, and for a time was described as the "Brazilian miracle." While the oil price shocks of the early 1970s increased the costs associated with the ISI approach, for a time Brazil appeared to have mastered living with high inflation and the predictable tradeoffs of limiting competitive international trade (Dornbusch and Cline, 1997). However, as Brazil postponed the transmission of world oil price shocks to domestic markets, its international debt climbed. The 1982 onset of the Latin American debt crisis found Brazil facing both high inflation and austerity in government spending imposed by circumstances (see box, "Debt Crisis Pivotal for Brazilian and Global Economies"). Brazil's trade policy response to the debt crisis initially emphasized intervention to encourage exportable products and limit imports. Trade policies included an expanded list of prohibited imports. Intervention remained extensive; in 1986, the Government subsidized exports of 459,000 bales of cotton, and imposed temporary export bans on beef, corn, and soybeans amid tight supplies to control inflation.

By the mid-1980s, the Brazilian Government's financing ability collapsed, and agricultural credit was severely curtailed. Paralleling a worldwide shift away from ISI policies at that time (this shift became known as the "Washington Consensus"⁸), Brazil undertook a significant reorientation of its economy and agricultural sector away from this kind of intervention. Export licensing was removed in 1987 and Brazil started tariff reforms in 1988, first bringing its average most favored nation (MFN) tariff down from 57 percent in 1987 to 40 percent. Following reforms in 1989 and 1991, the average tariff was below 20 percent by 1992. The initial round of reforms left a host of nontariff barriers (NTB) in place, but in 1990 and 1991 these were

⁷While the national development strategy of import substitution was in many respects an outcome of decisions during the 1950s, the foundation of the shift from an agrarian to an industrializing nation was laid during the 15 years of the Vargas Government starting in the 1930s.

⁸The Washington Consensus refers to a series of measures including fiscal reforms, establishment of competitive exchange rates, trade liberalization, deregulation, privatization, and elimination of barriers to foreign investment (Williamson, 1990).

Debt Crisis Pivotal for Brazilian and Global Economies

During the 1980s, often called the “lost decade,” Brazil and many other Latin American countries suffered a severe economic recession and an escalation of foreign debt. Decreased exports, combined with the appreciation of the dollar and high interest rates in the early 1980s, caused debtor countries to deplete their foreign exchange reserves (compounded by massive capital outflows) and ultimately default on their foreign loans. Latin American countries adopted various approaches to deal with the crisis, but most implemented market-oriented policy reforms, including trade reforms, privatization, and opening up to foreign investment (Williamson, 1990).

These events had global implications as well. The crisis was in part triggered by monetary policy shifts in the United States and other industrialized countries aimed at reducing inflationary expectations, and the difficulties faced by the Latin American region saw parallels in many other countries. The resulting steep declines in commodity prices and the drying up of international bank lending were also factors in the eventual collapse of the Soviet Union in 1991 and a global reorientation away from import substitution policies (Kotkin, 2001). The collapse of the Soviet Union particularly affected cotton producers as cotton from Central Asian countries like Uzbekistan flooded the world market in the early 1990s.

largely removed (Moreira, 2009). Furthermore, restrictions on the access of foreign institutional investors to domestic stock markets were lifted in 1991, and limits on portfolio composition and minimum holding periods for investments abolished. In 1992, foreign financial institutions (mutual funds, investment companies) were authorized to operate in the options and futures markets for securities and foreign exchange (Agénor et al., 1997). With these changes, the private sector took regional development and investment into its own hands. The modernization of agriculture in Brazil can be attributed largely to the international integration begun in the 1990s (Barros, 2009).

Finally, in 1994, the “Real Plan” succeeded where a host of predecessor plans since the mid-1980s had not, and brought inflation and Brazil’s fiscal standing under control for a time. In 1999, the fixed exchange rate portion of the Real Plan was jettisoned in the aftermath of the Asian financial crisis, and the transformation of Brazil’s economic policies was in an important sense complete (see “Trends in Exports and Imports” for further discussion of exchange rates).

Brazil’s trade and investment policy reforms coincided with similar reforms around the world. They also coincided with the collapse of the Soviet Union, which released Central Asian cotton onto world markets with unprecedented discounts (MacDonald, 1997). During this period, Brazil switched from being a net cotton exporter to becoming the world’s second largest importer in 1996-97. Like Brazil, Mexico and a number of other traditional cotton exporters in Central and South America curtailed or halted exports. Only Brazil has reclaimed a prominent export role.

Economic reform opened Brazilian agriculture and cotton to world competition, investment, and inputs. The macroeconomic reforms reduced relative

land prices as investment was no longer focused on just physical assets but also flowed to financial instruments (OECD, 2005). The removal of tariff and nontariff barriers to imports of inputs and machinery was also an important reform. These changes enabled Brazilian farmers to mobilize land with international investment, inputs, and technology. Without these changes, Brazil's expansion in agriculture and cotton would almost certainly have not occurred over the relatively short timeframe between 1995 and 2005. Brazil's endowment of arable land in the *Cerrados* is the ultimate source of Brazil's surge in cotton production, but only with the reforms of the 1990s has its potential begun to be realized.

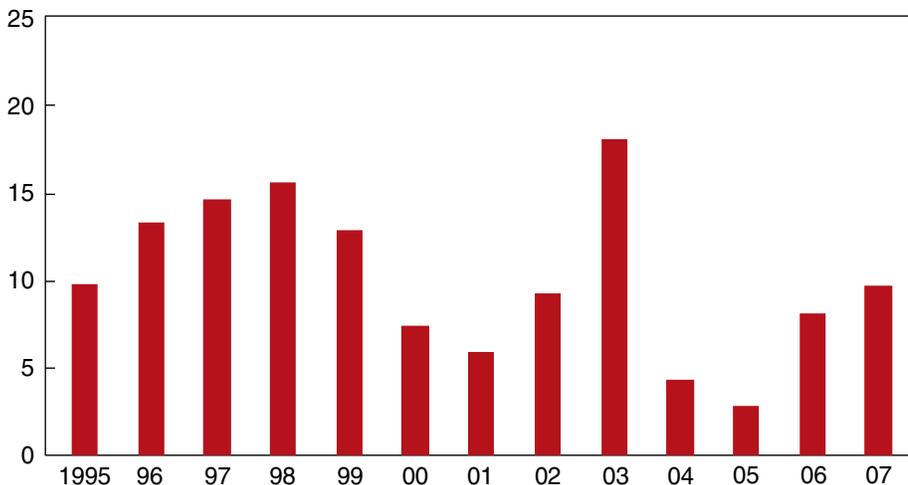
Agricultural Policy in Brazil

Brazil's decades under the ISI paradigm saw significant government intervention in agriculture. Brazil long used minimum prices, government stock accumulation, and subsidized credit to compensate agriculture for the pro-industrial tilt of its economic policies, and to ensure sufficient supplies of locally produced food at reasonable prices. Mirroring the Government's goals of "fair" prices for food, a goal of cotton policy was to ensure domestic availability at low prices to support the textile industry. Simultaneously, Brazil pursued its long-term national economic development plan to incorporate intensive agriculture systems in the agricultural frontier in the country's Center-West region and the *Cerrados* area, with concurrent infrastructure investments.

With fiscal austerity and a dramatic economic reorientation, Brazil briefly suspended much of the support provided to agriculture. Minimum prices had been frozen for years, and by 1990 they had fallen to almost half of their 1981 levels in real terms (OECD, 2005). Price support operations were essentially suspended in 1990 and 1991, but as the economy recovered they were subsequently renewed and then expanded, as reflected by Brazil's producer subsidy equivalent⁹ (PSE) for cotton, which averaged 15 percent during the second half of the 1990s (fig. 5). During this period, while wheat, coffee, and sugar

Figure 5
Percentage PSE for cotton, 1995-2007

Support as percent of the value of production



Source: OECD (2005) for 1995-2004. ERS calculations for 2005-07.

⁹The PSE is a measure of agricultural policy that summarizes the value of all explicit and implicit income transfers to agriculture; it is calculated as the ratio of total monetary transfers to the total value of production for each individual commodity.

policy underwent what the OECD referred to as “consistent and profound liberalization,” cotton and other basic commodities saw the reinstatement of support. In 2002-03, cotton was one of the most highly supported commodities in Brazil, second only to rice, with support reaching 21 percent PSE in 2003.¹⁰

Brazil’s support for agriculture has two major components: subsidized credit and price support programs. The current structure of support policies has been largely in place since 1996. That year saw the recalibration of the marketing credit program (EGF, or *Empréstimo do Governo Federal*) to end stock accumulation, requiring loan repayment in cash rather than through forfeiture. That year also saw the introduction of the Program for Product Flow (PEP—*Prêmio para Escoamento do Produto*) price support program, which in its current incarnation (PEPRO—Equalizing Premium Paid to Grower, or *Prêmio Equalizador Pago ao Produtor*) remains an important program for cotton producers.

Credit Programs

The primary policy instrument for supporting agriculture in Brazil is subsidized credit, and the value of working capital and marketing credit provided by the Brazilian Government to cotton producers has risen to about 40 percent of the value of the crop in recent years. A legacy of macroeconomic instability and a thin market for private sector bank lending means Brazilian farmers face high commercial lending rates. Offsetting these costs is one rationale for Brazil’s official lending programs through its National Rural Credit System (SNCR—*Sistema Nacional do Crédito Rural*). The SNCR provides about 28 percent of farm sector credit needs (OECD, 2005), with the rest coming from private sources. Economic liberalization has given Brazilian producers access to credit from traders, processors, and input manufacturers, especially for modern, export-oriented sectors like cotton.

The SNCR is administered by the Central Bank in coordination with Banco do Brasil, Banco de Crédito da Amazônia, Banco do Nordeste do Brasil, and Banco Nacional de Crédito Cooperativo. These credit resources are offered to Brazilian cotton (and other agricultural) producers at subsidized interest rates; for the 2010-11 crop year, the subsidized interest rates ranged between 5 and 7.5 percent, compared with market rates of 20-25 percent. Low-income cotton growers receive an interest rate of 5 percent for both operational and investment credit resources.¹¹

Producers have access to three kinds of credit through government programs: production, marketing, and investment credit. Production credit loans are used to buy inputs for planting with a loan period around 9 months, and are repaid when the production is sold. Cotton producers in Brazil rely less on these programs than do producers of other crops, such as corn, coffee, soybeans, and rice (Nassar and Ures, 2009). Official production credit for cotton producers averaged under \$200 million per year during 1999-2007 (table 5).

Marketing credit programs have been heavily used by cotton producers, particularly during 2002-04 when domestic minimum cotton prices announced by the Government were significantly below market prices (fig. 6).

¹⁰See ERS’s Brazil Briefing Room for further background on Brazil’s agricultural policies: <http://www.ers.usda.gov/Briefing/Brazil/domsupport.htm>.

¹¹These rates apply to 70-75 percent of a farmer’s loans, while the remaining credit is offered at market rates (USDA, 2010). For cotton producers, credit was limited to R\$600,000 (about \$285,000) per farmer for the 2010-11 crop year.

Table 5

Subsidized credit for cotton production and marketing, 1999-2007

Year	Production credit		Marketing credit					Total credit
	Working capital	Ginning	EGF ¹	Pre-marketing	NPR ² & DR	CPR ³	Stocks build-up	
	\$ Million U.S.							
1999	106	0	124	0	4	1	-	235
2000	154	7	263	2	6	16	-	447
2001	127	1	306	0	7	40	-	481
2002	115	0	244	0	10	49	-	417
2003	187	0	204	0	15	60	-	466
2004	270	1	181	0	16	111	-	579
2005	195	6	163	1	22	102	3	492
2006	263	28	223	5	66	9	4	597
2007	340	0	255	2	79	0	10	685

¹Empréstimo do Governo Federal (Federal Government Loans).

²Nota Promissória Rural/Duplicata Rural (Promissory Note/Rural Duplicate).

³Cédula de Produto Rural (Rural Product Note).

Source: ERS tabulation of data from the Banco Central do Brasil.

The value of a marketing credit loan is based on the quantity of output owned by the farmer times the minimum pre-established price for the crop year; the typical loan term is 180 days. Because of the link with the level of production, Brazil has declared this credit program to the World Trade Organization as an amber box program.¹² Since 1999, the share of the cotton crop financed by EGF has varied between 10 and 46 percent. Cotton has been the major beneficiary of this marketing program among the participating commodities, accounting for as much as one-third of annual allocations (OECD, 2005).¹³

Investment credit is provided through a variety of programs administered by the National Development Bank (BNDES). The largest is the *Programa Modernização da Frota de Máquinas e Equipamentos Agrícolas* (MODERFROTA), for agricultural machinery. The program is aimed at medium- and large-scale producers and was an important component of the opening of new production areas in Brazil in the 1990s. Other investment programs are specific to irrigation or to cooperatives and to other agricultural sectors. About 20 percent of all SNCR credit is investment credit, and these programs have helped mechanize Brazilian agriculture since the mid-1990s (Brandão and Rezende, 2004). Investment credit in Brazil is almost entirely provided by the official credit system, although large farming enterprises have also tapped domestic and international financial markets to raise investment capital.¹⁴ The large scale of Center-West cotton production is well documented, suggesting access to these latter sources of investment is probably greater for cotton producers than for Brazilian agriculture in general. Investment credit through SNCR for cotton producers has been less significant, averaging only about \$11 million per year during 1999-2007, and allocated to cotton producers in the Northeast region rather than the Center-West (*Banco Central do Brasil*, 2010).

This variety of investment sources for capital-intensive cotton production in the Center-West makes it difficult to pinpoint the role of subsidized credit

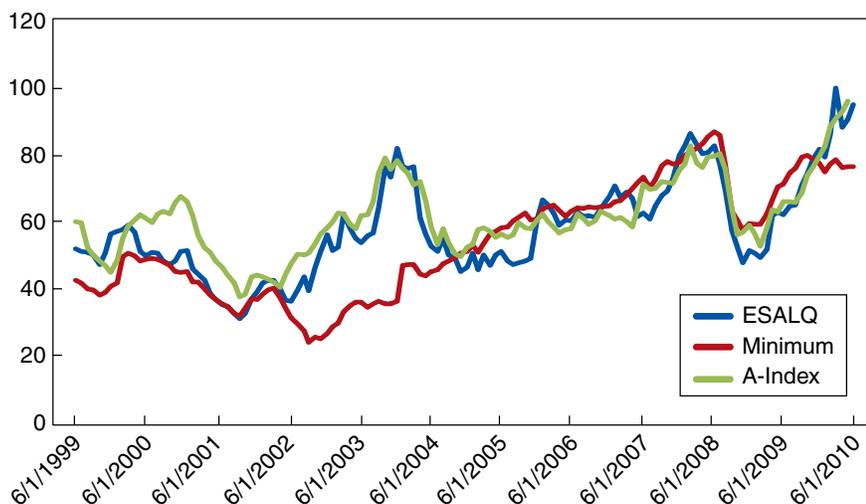
¹²Defined by the WTO as “domestic support for agriculture that is considered to distort trade and therefore subject to reduction commitments.” See ERS’s World Trade Organization Briefing Room for more information, <http://www.ers.usda.gov/Briefing/WTO>.

¹³Other marketing credit programs also exist, but are currently small compared with the EGF. One is the Rural Product Note (*Cédula de Produto Rural, CPR*), which played a larger role in 2004 and 2005. Another is the Rural Promissory Note/Rural Duplicate (*Nota Promissória Rural, NPR/Duplicata Rural, DR*) (see table 5).

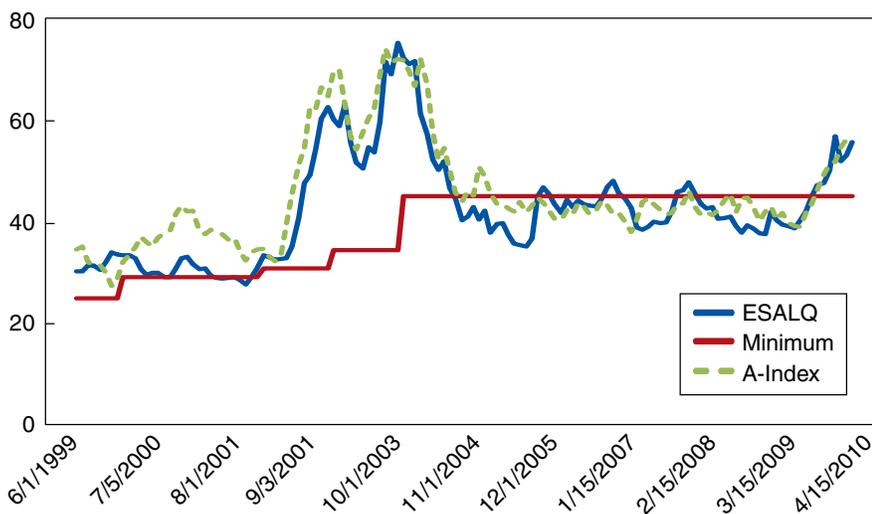
¹⁴An April 14, 2003 article from *Gazeta Mercantil/SABI* provides examples of large Brazilian farming enterprises going directly to capital markets: “Grupo Andre Maggi raised US\$70mil resources through a syndicated loan led by the German group WestLB. . . . Multigrain raised US\$50mil in an operation led by WestLB. In May, it intends to raise further US\$50million.”

Figure 6
Brazilian and world cotton prices, 1999-2010

U.S. cents per pound



Real per arroba (approx. 15 kg)



Notes: ESALQ is a Sao Paulo price and is higher than farmgate prices in the Center-West, especially during harvest. The A-Index, sourced from Cotlook, is the average of five least-priced quotations from selected upland cottons that are internationally traded.
 Source: CONAB, International Monetary Fund, and Cotlook Ltd.

in the expansion of Brazil's cotton production. In addition, the Government of Brazil has periodically underwritten rescheduling of debt for Brazilian farmers since the mid-1990s. According to the OECD, approximately half of the overall benefit to Brazilian farmers over 1995-2004 stemmed from the restructuring of large farmers' debts accumulated in the late 1980s and early 1990s. Thus, while the Brazilian Government's support of credit was not the primary cause of Brazil's rebound in cotton production, it likely affected at least the timing of the recovery.

Domestic Price and Marketing Support

In Brazil, price support programs for cotton and other commodities are based on a system of minimum guaranteed prices. The current system of

price support was established in 1996 and for cotton revolves around auctions of premiums between the minimum and market prices. Minimum support prices for seed cotton and cotton lint, and the portion of the crop eligible for the program, are announced in the annual agricultural economic plan. The minimum price for cotton lint as of October 2010 (R\$44.6/arroba, or 76 U.S. cents/pound) had been in effect since January 2004. Minimum support prices were generally above market prices during 1999-2008, except for 2002-04. Support through this program has increased since 2004 as the share of the crop eligible for program participation has increased (fig. 6).

The leading income support program for cotton is PEPRO (*Prêmio Equalizador Pago ao Produtor*, or Equalizing Premium Paid to Grower) (table 6). In various incarnations, this program has been operating since 1996.¹⁵ The PEPRO allows individual growers or cooperatives to sell cotton for a return greater than the market price by receiving an “equalizing premium” from the Government. In a reverse auction that occurs at several scheduled points during harvest, farmers willing to accept the smallest premium win the right to receive payments. The PEPRO program was available for over 45 percent of cotton production in 2006 and 2007, and 64 percent of the 2008 crop. This is well above the proportions of crop participation by other commodities (Nassar and Ures, 2009).

The Brazilian Government still maintains publicly owned stocks of cotton acquired through purchasing programs. However, the level of these stocks is negligible—the 2,000 tons in stock as of December 2009 is typical, and equals less than 0.2 percent of that year’s output. Prior to the reforms of the early 1990s, the Government held as much as 300,000 tons (April 1991) in an effort to support prices (CONAB, 2010). The programs leading to stock acquisition are:

- **Federal Government Acquisition - *Aquisição do Governo Federal—AGF*.** Through this mechanism, the Government purchases the product at the minimum guarantee price (higher than the market price); farmers

¹⁵Initially, the Program for Product Flow (PEP—*Prêmio para Escoamento do Produto*) served a very similar purpose, from 1996 to 2006. It was supplemented in 2005 by the *Risk Premium to Purchase Ag. Products/Private Selling Option Contracts –PROP*, and then in 2006 superseded by PEPRO.

Table 6
Brazil’s price support for cotton by program, 1999-2008

Year	PEP/PROP/ PEPRO ¹	AGF ²	Contract option acquisition ²
	<i>\$ Million U.S.</i>		
1999	0.1	0.4	1.8
2000	31.1	0.3	2.9
2001	35	0.3	4.7
2002	7.9	17.5	28.6
2003	0	32.7	11.2
2004	4	17.2	1.2
2005	84.8	5.3	0
2006	81.4	0.5	0
2007	279.2	1	6.6
2008	212	0	0

¹Spending.

²Dollar figures are program turnover. This is the value of cotton traded. The government support offsets only a fraction of the contract costs.

Source: ERS tabulation from *Companhia Nacional de Abastecimento* (CONAB).

store the product they intend to sell to the Government in a warehouse accredited by CONAB. Before the reforms of the 1990s, this was a prominent component of Brazilian support policy. The program is not completely dormant for cotton, but has been limited. In 2003, \$33 million of cotton was purchased through AGF, but resale of public stocks usually recovers most of the expenditure (table 6).¹⁶

- **Selling Option Contract of Agricultural Products - *Contrato Governamental de Opção de Venda***. The Selling Option Contract of Agricultural Products serves as insurance for low market prices. Individual farmers and/or cooperatives buy or sell option contracts through public auction, pay a price (called a premium), and have the right to sell their production at a pre-set value (called an exercise price) on the date the contract expires. This program has been primarily used by corn producers. At its recent peak, contracts for cotton worth \$29 million were executed, but the cost to the Government was far lower.

Agricultural Policy and the Development of the Center West

Brazil's efforts to settle and develop the Center-West have been assisted through government policy since the 1930s. The shift of the national capital to Brasilia in 1960 symbolized Brazil's commitment to the integration of this region into the national economy. During the 1970s, high levels of subsidized credit encouraged expansion into the region. To facilitate the opening of the frontier, the Government provided subsidized credit for land clearing, machinery, and production through several regional programs to develop agriculture in frontier areas in the *Cerrados*. These included the Program for Development of *Cerrados* (*Programa para o Desenvolvimento do Cerrado*, POLOCENTRO), which operated from 1972 until 1985, when many development programs were terminated. Following the revitalization of SNCR credit in the mid-1990s, new programs were instituted, such as the MODERFROTA and MODERAGRO programs to subsidize the purchasing of equipment for planting, harvesting, and processing of agricultural commodities, including cotton.

The opening of the agricultural frontier proceeded in conjunction with Brazil's Corporation for Agricultural Research (*Empresa Brasileira de Pesquisa Agropecuária*, EMBRAPA), the agricultural research agency linked to the Ministry of Agriculture and Food Supply. Founded in 1973, EMBRAPA's research has focused on the development of high-yielding cultivars specifically adapted to the tropics of the frontier lands, and development of drought- and pest-resistant/cost-reducing cultivars. As with soybeans, cotton farmers in the State of Mato Grosso were encouraged to invest in large properties in Brazil's *Cerrados*, where topography, climate, and soil characteristics are ideal for large-scale, highly mechanized farm operations. Cotton production in Brazil is concentrated in the Center-West *Cerrados* region, with acreage increasing by several hundred thousand hectares between 1990 and 2009 (table 2). With this shift, Brazil is once again an important source of world cotton exports, after a brief hiatus as a large net importer.

¹⁶Some sources even reported that resale prices exceeded purchase prices in 2005 (ICAC, 2006).

Support Programs and the Growth of Brazil's Cotton Industry

Given the high cost of specialized equipment for cotton production, subsidy and investment programs have helped engineer the rebirth of Brazil's cotton industry. Similarly, with the large fluctuations in world cotton prices during the 1990s, the price support programs lifted the incomes of Brazilian cotton producers in lean years.

But the role of these programs is overshadowed by the impact of broader reforms that opened Brazil to global capital markets and by the availability of a unique land resource and the technology to exploit it. While government policy facilitated the opening of the *Cerrados* to development and facilitated the creation of the agricultural technology to harness its potential, none of the increases seen in Brazilian cotton production and exports in recent years would have been possible without this unique natural endowment.

Trends in Brazilian Cotton Production and Use

Trends in Brazilian Cotton Production

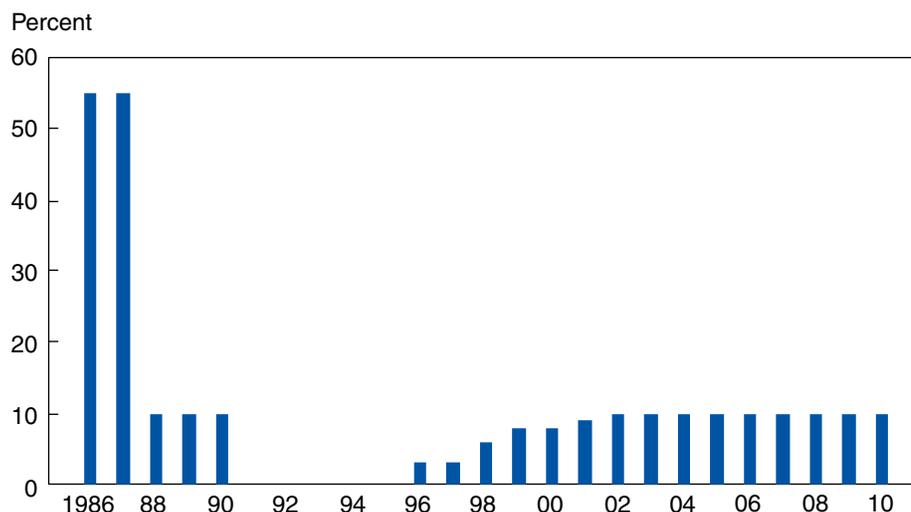
Cotton cultivation in Brazil, mostly short and medium staples, expanded during the 1960s and through the 1980s, growing 1.4 percent per year. Harvested cotton area increased from 2.3 million hectares in 1960 to almost 3 million hectares during the late 1960s and early 1970s. Until 1972, Brazil was an important cotton exporter, but in response to volatile cotton prices in 1972 and 1973, the Brazilian Government imposed export taxes and then occasional export prohibitions during the 1970s. This spared Brazil's textile industry from international competition for cotton grown in Brazil, but with limited cotton profits under the policies, farmers began shifting from cotton to soybeans and corn (Filho, 1994).

Cotton area stagnated during the 1980s and then fell dramatically after the 1988 and 1991 trade reforms. While Brazilian cotton production—primarily in southern States—remained as high 3.9 million bales in 1987, output dropped to 3.0 million bales in 1989 and then plummeted to 1.9 million bales in 1992 (table 3). Trade liberalization resulted in the decline of the cotton import tariff from 55 percent to 10 percent in 1989, and then to 0 in 1991 (fig. 7). Lacking the government support provided before the austerity imposed by the 1980s debt crisis, and then lacking tariff protection from international trade during a period of low prices, Brazil's cotton production collapsed in the early 1990s as local textile mills switched to imported fiber (Filho, 1994).¹⁷

Trade liberalization did benefit cotton production in the long run. The removal of nontariff barriers for agricultural inputs like pesticides and machinery crucial to modern cotton production was particularly important for production in new, tropical States like Mato Grosso with significant insect

¹⁷Imported cotton also had the benefit of longer-term, lower-cost financing than was available in domestic markets for domestic fiber.

Figure 7
Brazil cotton import tariff reform



Source: USDA, FAS attache reports, various.

pressure. In 1996, the 13-percent value-added tax for interstate movement of products was eliminated for unprocessed agricultural products—including cotton—destined for export.¹⁸ Furthermore, the reductions in impediments to investment enabled modern, large-scale farming in these new regions.

Since bottoming out at 1.4 million bales in 1996, cotton cultivation in Brazil has increased with the shift in production from the traditional South and Southeastern regions to the Center-West *Cerrados* region in the early 1990s. Center-West production began in the State of Goiás during the 1970s and 1980s, aided by State government policies, only to be surpassed by Mato Grosso in 1990. By 1997, the impact of investments in new technology was realized in Mato Grosso as State average yields rose by 36 percent in that pivotal year (fig. 8). Within another 3 years, Mato Grosso’s yields had risen by more than 100 percent, and Brazil was on its way to becoming a net exporter once again.

In 2009, cotton occupied 836,000 hectares, equivalent to 2 percent of total crop area planted in Brazil, a very small area compared to other commercial crops such as soybeans (23.6 million hectares), corn (13 million hectares), and rice (3 million hectares) (CONAB, 2011).

Cotton production reached 7.4 million bales in the 2007/08 marketing year—the highest on record (fig. 9, table 3)—but fell subsequently as world prices plunged due to the world financial crisis. In 2010/11, Brazil’s crop is estimated at a record 9.0 million bales.

¹⁸Supplementary Law (*Lei Complementar*) 95—widely known as *Lei Kandir*, after its author, Deputy Antonio Kandir—also had a significant impact on Brazil’s soybean exports. See Warnken, 1999.

Figure 8
Brazil cotton production shifts to Center-West

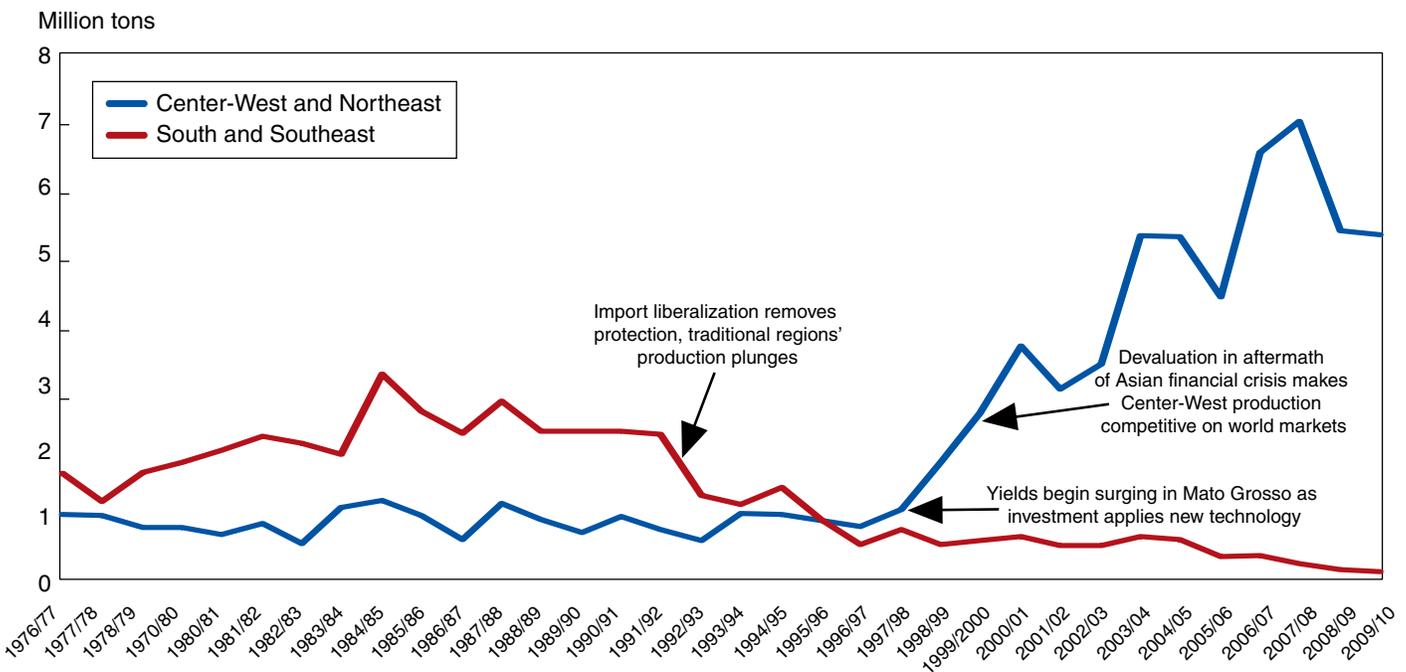
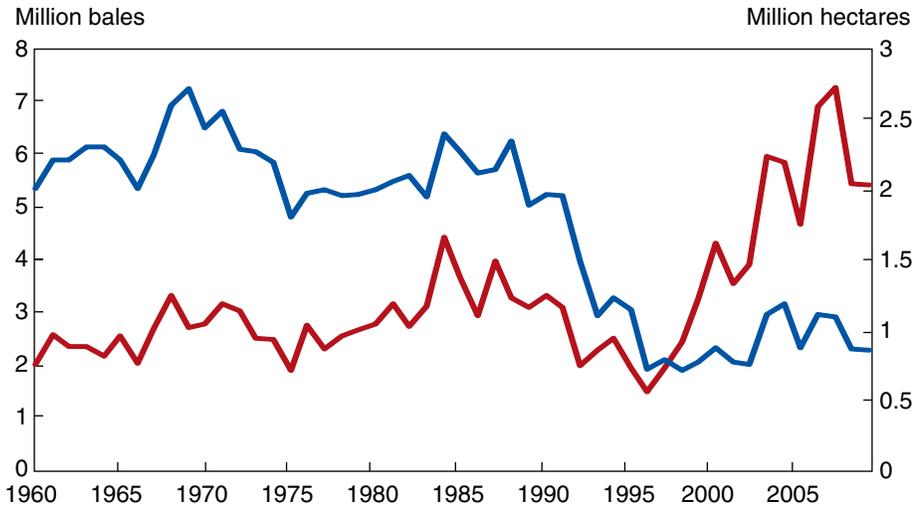


Figure 9

Brazil's total cotton area and production, 1960-2009



Source: USDA, Interagency Commodity Estimates Committee.

Trends in Brazilian Cotton Consumption

Today, Brazil's textile industry is the world's fifth largest cotton consumer, ranking just behind China, India, Pakistan, and Turkey. Over the past decade (1997/98 to 2009/10), Brazil has averaged 4.2 million bales of domestic cotton consumption per year. In 2009/10, Brazil's mill use was an estimated 4.4 million bales, slightly higher than in the preceding year. Brazil's share of world mill use was estimated at 3.7 percent in 2009/10, compared with 3.3 percent in United States. While Brazil's share of global cotton consumption has held steady over the past 5 years, mill use in the United States has been declining. While the enormous expansion of spinning in China, India, and other countries benefitting from the end of global textile trade quotas under the Multi-fibre Arrangement (MFA) has significantly reduced mill consumption in the United States and the European Union, Brazil's consumption has continued to grow.¹⁹ An estimated 70 percent of fiber usage in the Brazilian textile industry is derived from cotton, 25 percent from synthetics, and 5 percent from wool, silk and other natural fibers.

In the 1980s, Brazil's textile industry was limited to the domestic market, with little or no competition from imports due to trade barriers put in place by Brazilian officials. This squelched incentives to invest in technical upgrading and product quality, and investment lagged (Strolz, 1994). With open trade policies and the Real Plan in the 1990s, exposure to competition and strong exchange rates caused Brazil's textile industry and cotton consumption to contract. The adjustment process was eased by the implementation of the Brazilian Program for Quality and Productivity (BPQP), designed to improve the production standards of the textile (also footwear, automotive, and food products) industry in terms of quality and productivity. With investments in infrastructure, the modernization of plants, quality improvements in textiles, and cost reductions through vertical integration, the textile industry was able to compete internationally and cotton consumption resumed its upward trend. However, Brazil's industrial use of synthetic and

¹⁹Under the Uruguay Round Agreement, the textile import quotas maintained by the United States, the European Union, and Canada under the MFA were phased out between 1995 and 2005. Without the protection from competition offered by the quotas, textile imports rose in these countries, and their textile industries shrank. See MacDonald and Vollrath (2005) for more information.

artificial fibers has increased nearly 5 percent annually in the past 15 years, well above cotton's 1.5-percent growth rate over this period (USDA, FAS, 2007).

Trends in Exports and Imports

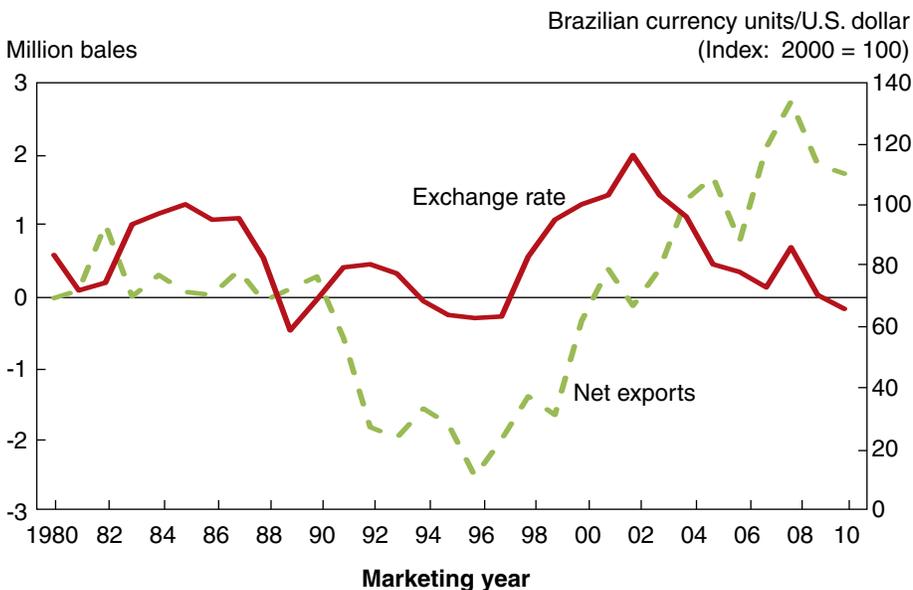
Between 1960 and 1990, Brazil was a large and consistent net exporter of cotton, shipping a total of 21.4 million bales, while imports totaled a mere 2.2 million bales in that same period. In more recent years, Brazil's trade position has undergone large swings.

Net exports were positive and relatively steady between 1980 and 1990, but cotton production plunged over the next 10 years, requiring a record 2.4 million bales of imports in 1996/97 (fig. 10), making Brazil the world's second largest importer that year. Brazil regained net exporter status in 2001 and has maintained that position since 2003, exporting an all-time high of 2.75 million bales of cotton in 2008. Macroeconomic reforms, open trade, flexible exchange rate regimes, and the development of cotton varieties suitable to Brazil's *Cerrados* area have helped Brazil become one of the world's top producers and exporters of cotton.

Exchange rates were a significant factor in the year-to-year shifts in Brazilian cotton trade. During the latter half of the 1990s, Brazil fought inflationary expectations by pegging its currency to the U.S. dollar. As a result, the value of the *real* on foreign exchange markets was high relative to earlier years, and by some measures the currency was overvalued. After the Asian financial crisis of 1997-98, Brazil relinquished the peg with the dollar in January 1999, and the *real*/dollar exchange rate depreciated significantly. The U.S. dollar strengthened against a number of other currencies during this time as

Figure 10

Brazil's net cotton exports and exchange rates



Sources: Instituto de Pesquisa Econômica Aplicada and PS&D Online.

Brazil's World Trade Organization (WTO) Dispute Regarding U.S. Upland Cotton

In 2002, Brazil initiated a WTO consultation process claiming its cotton exports had been reduced due to subsidies by the United States. At that time, U.S. cotton production received support through several mechanisms, including the marketing loan program, direct payments, countercyclical payments, crop insurance, and user marketing certificates. User marketing certificates are generally referred to as “Step-2 payments,” and were unique to cotton; the remaining programs apply to a range of grains and oilseeds (see the ERS Cotton Briefing Room for more information on U.S. commodity programs and the special provisions that apply to cotton: <http://www.ers.usda.gov/Briefing/Cotton/Policy.htm>).

In June 2004, a WTO dispute settlement panel ruled that the U.S. cotton program significantly suppressed Brazilian cotton prices. The United States appealed this ruling, but a 2005 appellate body report supported the panel findings. Subsequently, the United States ceased operating the GSM-103 and Supplier Credit Guarantee (SCGP) programs, two of three export credit guarantee programs that Brazil challenged as being prohibited export subsidies. The sole remaining export guarantee program (GSM-102) was modified. The panel found that the Step 2 program was both a prohibited import substitution subsidy and a prohibited export subsidy. The United States terminated the Step 2 program at the beginning of the next marketing year.

Brazil regarded these changes as insufficient, and requested a WTO compliance panel (Schnepf, 2010). The panel's report in 2007, and the subsequent appellate body's report in 2008, found that the United States had not fully complied with the WTO's 2005 ruling. These findings cleared the way for Brazil to pursue retaliatory measures, which were submitted to the WTO's Dispute Settlement Body, and resulted in an unappealable ruling from an arbitration panel in August 2009. The ruling's awards specified the level of countermeasures that Brazil could impose against U.S. trade, annually in two parts: (1) a fixed amount of \$147.3 million for the cotton payments and (2) an amount for the GSM-102 program that varied based upon program usage. According to the Office of the U.S. Trade Representative, the total of authorized countermeasures was more than \$800 million (USTR, 2010).

The arbitrators also ruled that Brazil could impose countermeasures in sectors outside of trade in goods, specifically intellectual property and services).¹ These cross-sectoral countermeasures were permitted in accord with annual thresholds related to total countermeasures. Of the approximately \$820 million in countermeasures Brazil could impose in June 2010, about \$260 million of that could be cross-sectoral.

In 2010, the United States and Brazil reached an agreement under which the United States agreed to further changes in the GSM-102 program, agreed to set up a technical assistance fund for Brazilian cotton growers of \$147.3 million annually, and agreed to a process for continued discussions of reducing support for cotton in the next farm bill. Under the agreement, Brazil suspended its retaliatory measures, until a mutual agreement is reached or the agreement is terminated.

¹Retaliation for violation of WTO obligations concerning trade in goods under the General Agreement on Tariffs and Trade has traditionally been confined to countermeasures with respect to trade in other goods. Cross-sectoral countermeasures are instead directed at trade in non-goods sectors, such as services and intellectual property, in response to a violation in the goods sector (USDA, ERS, 2010(a)).

well, and Brazil's net exports rose. The newly favorable exchange rate helped Brazil reap the benefits of the policy reforms of the previous 15 years and increase cotton exports significantly.

Since 2004, the *real* has strengthened significantly (fig. 10), which has both positive and negative implications for cotton exports. While this raises the cost of Brazilian products on world markets, including cotton, it reduces the cost of imported inputs and reduces shipping costs for Brazilian cotton exporters by increasing the availability of shipping containers. Partly in response to the strengthening exchange rate, the Government has moved to increase support to Brazilian cotton. The share of production eligible for

price support has been increased, rising to 64 percent in 2008. The result has increased government funds flowing to cotton producers, sustaining Brazilian cotton production and exports at higher levels.

Major markets for the country's cotton exports include Pakistan, Indonesia, South Korea, Argentina, Japan and Taiwan. Together, these countries typically account for an estimated 75 percent of annual Brazilian cotton exports (table 7). Brazil is a key member of Mercosur, a trading bloc, also known as the Common Market of the South. Like NAFTA and the EU, Mercosur seeks primarily to promote international trade among its members²⁰ through the free movement of products, inputs, and capital. Mercosur regulates trade and tariff policies among the members and arbitrates trade disputes. Brazil is the top exporter of cotton to Argentina, but Brazil's exports to Mercosur countries accounted for only 9 percent of all its exports, on average, in 2006/07 and 2007/08.

Brazil's cotton imports averaged only 6 percent of consumption between 2006 and 2009. Imports are highly seasonal (peaking in May/June), and are supplied mainly by the United States, Paraguay, Mali, and Benin.

²⁰Brazil, Argentina, Uruguay, and Paraguay are full members, while Bolivia, Chile, Colombia, Ecuador, Peru, and Venezuela are associate members.

Table 7
Brazil's cotton exports, by destination, 2008-09¹

Country	Tons	Bales	Share
Indonesia	227,929	1,046,869	22%
South Korea	177,574	815,591	17%
Pakistan	151,888	697,616	15%
China	83,782	384,808	8%
Thailand	68,053	312,565	7%
Taiwan	50,634	232,560	5%
Japan	39,328	180,632	4%
Turkey	33,206	152,514	3%
Argentina	32,403	148,826	3%
Switzerland	29,738	136,586	3%
North Korea	29,148	133,876	3%
Vietnam	22,823	104,825	2%
Malaysia	11,584	53,205	1%
Ecuador	10,243	47,046	1%
Other	61,225	281,204	6%
Total	1,029,558	4,728,721	100%

¹Export volumes are aggregates for marketing years 2008/09 and 2009/10.

Source: Global Trade Information Services, Inc. (2011). World Trade Atlas, Internet version 4.6b.

The Future of Brazil's Cotton Industry

Brazil still has untapped potential in world cotton production and trade. Gains in cotton output are expected as new area continues to come under cultivation. Only an estimated 25 percent of the *Cerrados* land is under cultivation, and Brazil's Ministry of Agriculture estimates that an additional 120 million hectares could come under crop production (Valdes, 2009).

Brazil is expected to maintain its current suite of relatively open investment and trade policies (USDA, ERS, 2010 (b); Food and Agricultural Policy Research Institute (FAPRI), 2010). Brazil's exchange rates are projected to remain strong with respect to the U.S. dollar over the next decade, as are the currencies of other cotton producers and exporters. While Brazil's currency is expected to appreciate against the dollar, in trade-weighted terms for cotton it is expected to be more stable (USDA, ERS, 2010 (c)).²¹

To mitigate infrastructure bottlenecks, the Government of Brazil has taken steps to decongest roads and expedite transportation by constructing waterways to ports. In 2005, the Government began implementing a \$40 billion program to construct railroads, highways, gas and power lines, hydroelectric facilities, and river channels that cut across several points in the Amazon. In Mato Grosso until the early 2000s, almost all cotton produced in the State was hauled by road to ports in Parana and Sao Paulo over 2,000 kilometers away. Now Mato Grosso growers are able to access the government-funded Madeira-Amazon²² waterway, which originates in the States of Rondonia and Amazonas. Cotton arriving from Mato Grosso and other cotton growing districts is loaded on containers and transported by ships via the Amazon River and the Atlantic Ocean. To date, only a small volume of cotton is exported through this route to date, with the traditional coastal ports of Santos and Paranagua continuing to dominate.

At the farm level, technical change is expected as well. When other major cotton producing countries such as the United States, Australia, China and India adopted GMO varieties, Brazilian authorities made the use of such varieties illegal (USDA, FAS, 2005). In recent years however, legal constraints against the use of GMO cotton have been relaxed (USDA, ERS, 2004 (b)). Brazil started to legally grow biotech cotton in 2006/07. In 2008/09, Brazil accounted for only 1 percent of global biotech cotton area, with India, China and the United States accounting for 48 percent, 29 percent and 20 percent of the total (Gruère, 2009). Brazilian growers have been increasing the use of other high-yielding cotton varieties. Currently approved cotton varieties include Monsanto's pest-resistant Bollgard 531, Monsanto's Roundup Ready MON 1445, Bayer's ammonium- and herbicide-tolerant LibertyLink cotton, and Dow's Wide Strike. However, GM cotton varieties do not address all of the pest issues faced by Brazilian farmers, given the tropical climate in the Center-West region. In 2008/09, GM cotton seed accounted for an estimated 25 percent of total area in Brazil, and that share was expected to double in the 2009/10 marketing year (USDA, FAS, 2009).

²¹Trade-weighted exchange rates can diverge significantly from bilateral exchange rates, like the real/dollar rate. See ERS's Agricultural Exchange Rate Data Set for discussion of these different measures of exchange rates: <http://www.ers.usda.gov/Data/ExchangeRates/>.

²²This waterway is named after the Madeira and Amazon Rivers in northern Brazil

With its wide expanse of untapped area suitable for cultivation of cotton and other crops, Brazil's cotton production growth is expected to outpace gains in global cotton production and consumption (USDA, ERS, 2010 (d)). With prospects for additional technical change as well, USDA's Baseline projections show Brazil increasing its shares of world production and exports as well as planted area.²³ But competition for resources to produce other commodities like soybeans is expected to moderate these gains. According to USDA's Baseline projections, by 2019/20, Brazil's exports are expected to grow slightly faster than those of the United States, with exports about 60 percent the size of India's and one-quarter the level of U.S. exports (USDA, ERS, 2010 (e)).

²³FAPRI's (2010) projections show similar trends.

Conclusions

World commodity markets have become unusually dynamic, and agricultural prices have risen sharply in recent years. Brazil's remaining expanse of untapped arable land in the *Cerrados*, and its relative openness to international trade and agricultural investment flows, means that it is well suited to respond to global price shocks. Cotton is far from the only crop grown in the Center-West, and Brazil's future role in world cotton markets will be influenced by the prices of other products such as soybeans—as well as cotton.

Cotton prices regained ground relative to competing crops between the fall of 2009 and the fall of 2010, and are forecast to maintain this position during the rest of 2010/11. The USDA and Food and Agricultural Policy Research Institute (FAPRI) projections from early 2010 indicate a growing role for Brazil in world cotton markets. USDA and FAPRI also predict that Brazil's share of world soybean markets will grow faster than its cotton trade. However, if the recent price shift in favor of cotton persists, Brazil is well positioned to play a larger role in world cotton markets. India, the largest exporter after the United States, has instituted a series of export bans and licensing arrangements for cotton exports since April 2010. Uzbekistan, the next largest exporter, is traditionally unresponsive to world price shifts, and Australia may be responding to years of chronic droughts by shifting water allocations from rural to urban users.

Our review suggests that Brazil has laid the foundation for a strong cotton sector that can respond to advantageous shifts in world markets. Their broad macroeconomic policy encourages trade and investment in cotton, and their agricultural policies provide a safety net during periods of low prices. Income support programs like PEPRO have helped offset low market prices, sustaining the industry. With the prevailing high prices of cotton, transfers through such programs are expected to decline significantly. However, with the strong resource base in the *Cerrados* and the ability of large-scale farms to tap technological improvements like GMO cotton and attract investment, Brazil could see a larger share of world cotton trade in the years ahead than had been foreseen when cotton prices appeared chronically depressed.

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