

PERSPECTIVES AND SCENARIOS FOR COTTON CHAIN

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ABSTRACT

The main objective is to identify the key bottlenecks and challenges of Brazilian cotton sector and outline scenarios (optimistic, pessimistic and neutral) based on possible consequences of these bottlenecks and challenges. For the operationalization of this study it was used two main procedures: desk research and in-depth interviews. This research analyze the perspectives and scenarios through nine topics: (1) competitiveness of cotton with synthetic fibers; (2) competitiveness of Brazilian cotton in the international lint market; (3) logistics infrastructure; (4) productivity; (5) pests and diseases control; (6) management and reduction of production costs; (7) sustainability; (8) aggregation and value capture; (9) price and the market of lint and cottonseed. In

addition to identifying these points, the paper summarizes the point of view of the experts interviewed regarding their possible developments in three scenarios: pessimist, optimist and realist or neutral. Each scenario allows readers, whether researchers or professionals of the field to raise questions, assumptions or hypotheses about the future of Brazilian cotton industry. Thus, the authors hope to contribute to the emergence of future researches in the academic field and perhaps to promote discussions between entrepreneurs and policy makers of the sector.

Keywords: Perspectives and scenarios, cotton production chain, cotton industry

1. INTRODUCTION

To understand the current situation of the world cotton market it is necessary to look to the East. In the last three crops (2010/11, 2011/12 and 2012/13), world cotton market was strongly influenced by China's stock formation policy. According to estimates of ICAC (International Cotton Advisory Committee), Chinese stocks reached 9.4 million tons at the end of the 2012/13 crop, accumulating an increase of 352% compared to the volume registered at the beginning of the 2010/11 crop (ICAC, 2013), which has a huge meaning in the world market.

Despite being the largest producer of cotton in the world, in the 2012/13 crop the country produced 7.3 million tons of lint, representing 28% of world production. To achieve this buildup of lint, the Chinese had to import 12.2 million tons between 2010/11 and 2012/13 crops, which represented 45% of world imports in the period. By adding domestic consumption to buildup of stocks during these three years, it can be concluded that China has generated a demand of 33.2 million tons of lint, which is equivalent to about 42% of the total world production in the period (ICAC, 2013). Therefore, besides being a central factor in world trade of lint, Chinese demand was undoubtedly the main vector of international prices in recent years, largely from planting decisions around the world, impacting on the planting decision around the world.

Other market fundamentals have not been so encouraging for cotton producers. Compared to the international market, the Brazilian textile industry continues to consume a higher percentage of natural fibers. In 2011, for example, regarding the total consumed in Brazil, 52.9% corresponded to natural fibers whereas consumption in the world was 34% (ABIT, 2012). Due to its versatility, high availability in the international market and affordable price, polyester has gradually occupied an increasing proportion in the sector of other non-natural fibers. In 2011, when cotton prices have undergone a quick and strong appreciation, the textile industry appealed to the increase in foreign polyester purchases to replace a larger quantity of cotton fiber. However, at least for now, one cannot say that we are entering a new cycle of cotton substitution by synthetic fibers, as has already happened in the past.

The domestic market has not been encouraging either. IBGE data show that sales of fabrics, apparel and footwear in the Brazilian retail market have grown steadily over the last three years, having accumulated between January of 2010 and June of 2013, an increase of 20.6% in volume and 42.9% in nominal values. However, this good period that the Brazilian economy has gone through did not reflect in a growth of the textile industry and domestic production, since many products consumed by Brazilian families

have come from other countries. Between 2008 and 2012, the production of the domestic textile industry receded 2.2% per year. Among all items of this industry, the knitted cotton production was the one that most receded: -8.3% per year (ABIT, 2013). The high dependence on the uncertain Chinese market, the advancement of synthetic fibers and the difficulties of the domestic textile industry are just some of the challenges faced by Brazilian cotton farmers. Added to this, there are other factors such as the weak logistics infrastructure, rising production costs and pressure from society for more sustainable products.

2. OBJECTIVES

This context of increasing uncertainty and challenges to Brazilian cotton producers is the motivating factor of the research that generated this study. The main objective is to identify the key bottlenecks and challenges of Brazilian cotton sector and outline scenarios (optimistic, pessimistic and neutral) based on possible consequences of these bottlenecks and challenges.

3. PROCEDURES

For the operationalization of this study, which is a qualitative and exploratory research, it was used two main procedures: desk research and in-depth interviews. In the initial stage, the authors used secondary data sources to make a preliminary identification of challenges and bottlenecks of the national cotton industry, analyzing the current situation and trends. Databases of governmental and private organizations, producers' association reports of major producing regions of the country, journals and books on the subject were surveyed.

In a second stage of the study, in-depth interviews with 13 experts were carried out, including managers and employees of organizations belonging to the productive chain. In these interviews, respondents' point of view regarding critical issues identified in the literature was explored. Therefore, it was possible to contrast the themes identified in the desk research with the respondents' opinions, which led to the definition of a final list containing the following factors: (1) competitiveness of cotton with synthetic fibers; (2) competitiveness of Brazilian cotton in the international lint market; (3) logistics infrastructure; (4) productivity; (5) pests and diseases control; (6) management and reduction of production costs; (7) sustainability; (8) aggregation and value capture; (9) price and the market of lint and cottonseed.

Having identified the issues considered the major bottlenecks and challenges of the sector, the scenarios were speculated with the same respondents: (1) pessimistic, (2) neutral and (3) optimistic, according to the possible consequences of these nine factors.

4. RESULTS

This section begins with a brief overview of the external and internal markets of lint. Besides situating the reader in the context of the theme developed, this section of the paper aims to raise some challenges related to the lint market. These results were obtained through analysis of secondary data collected in the desk research stage. After this, the paper presents the results obtained through in-depth interviews with experts, where other challenges of cotton industry and possible scenarios were identified.

4.1 Context - the lint market

Foreign market

As cotton production expanded in the Cerrado areas, from mid-1990 Brazil reduced its import needs of the product and gradually started to retake the status of net exporter. The 2002/03 crop was the last in which imports exceeded exports. Since then, Brazil initiated a number of ascending export sales also increasing its share in world exports and in recent years, it is among the largest exporters in the world. As observed in Table 1, Brazil has been a constant presence among the largest exporters since the 2008/09 crop. From there until the 2012/13 crop, our exports grew 9.5% per year (ICAC, 2013).

Table 1 - World exports of lint and major exporters from 2009/10 to 2012/13

	2008/09	2009/10	2010/11	2011/12	2012/13	Variation per year
	Million Tons					
USA	2.887	2.621	3.130	2.526	2.860	-0.02%
India	0.515	1.420	1.085	2.203	1.620	25.8%
Australia	0.261	0.460	0.545	1.010	1.100	33.3%
Brazil	0.596	0.433	0.435	1.043	0.940	9.5%
FAC Zone*	0.469	0.560	0.476	0.592	0.770	10.4%
Uzbekistan	0.650	0.820	0.600	0.550	0.650	0.0%
Other	1.231	1.484	1.365	1.959	1.850	8.5%
Total	6.609	7.798	7.636	9.883	9.790	8.2%

* Franco-African Community: Cameroon, Ivory Coast, Burkina Faso, Gabon, Guinea-Bissau, Equatorial Guinea, Benin, Congo, Mali, Central African Republic, Togo, Niger and Senegal.
e: estimate

p: projection

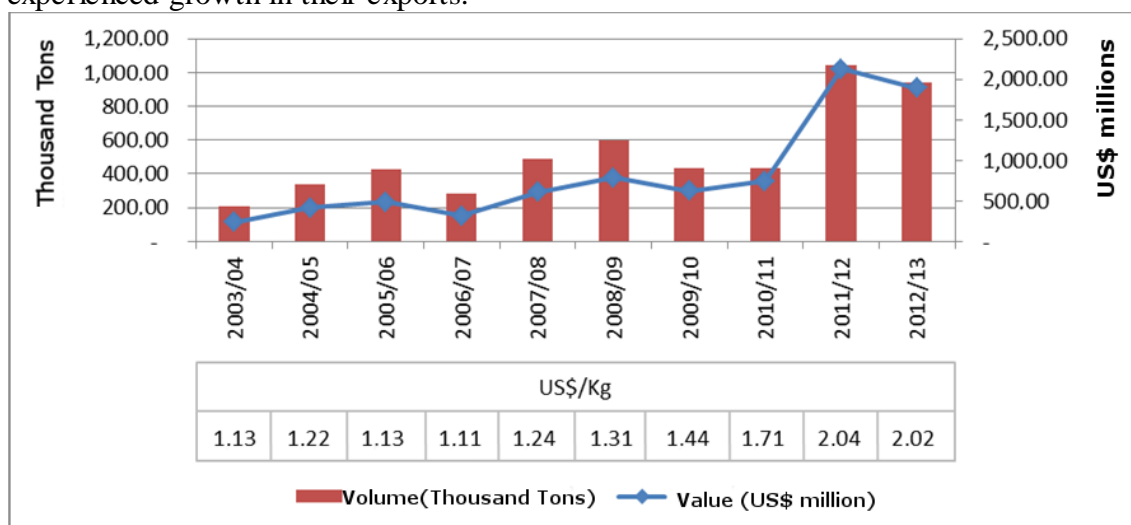
Source: ICAC (2013).

Graph 1 illustrates this national export growth since 2003/04, both in volume exported and in monetary terms (revenue from exports). With the exception of 2008/09, when Brazilian exports occupied part of the position lost by India and Australia due to production problems faced by these countries, until 2010/11 the volume exported annually by Brazil varied around 400 thousand tons (SECEX 2013).

However, in the 2011/12 crop, the increase in world imports provided mainly by China generated a foreign demand for Brazilian lint never seen before. Consequently, the volume exported increased from 435 thousand tons in 2010/2011 to 1.043 million tons in 2011/12, which was an increase of 140%. The impact on revenue generated by exports was even greater due to the increase in the average amount paid by the unit of lint from one year to another. External sales generated US\$ 2.13 billion in 2011/12, 185% higher than the value generated in 2010/11 that was worth US\$ 745.940 million (ICAC, 2013).

In 2012/13 Brazilian exports suffered a decline: a 10% drop in volume and 11% in revenue. Despite this decrease has been to some extent small and the upstream exported has remained above the average observed in the previous decade, it was significantly higher than the decline in world imports, which was only 1%. This means that Brazil has lost its position to other exporters in the international market, which is confirmed by

observing in Table 1 that the USA, Australia, Uzbekistan and CFA countries experienced growth in their exports.



Note: Exports in a crop year refer to international shipments made between August of one year and July of the next year; not to exports of cotton produced in that particular crop year.

Graph 1 - Evolution of Brazilian lint exports

Source: Secex (2013).

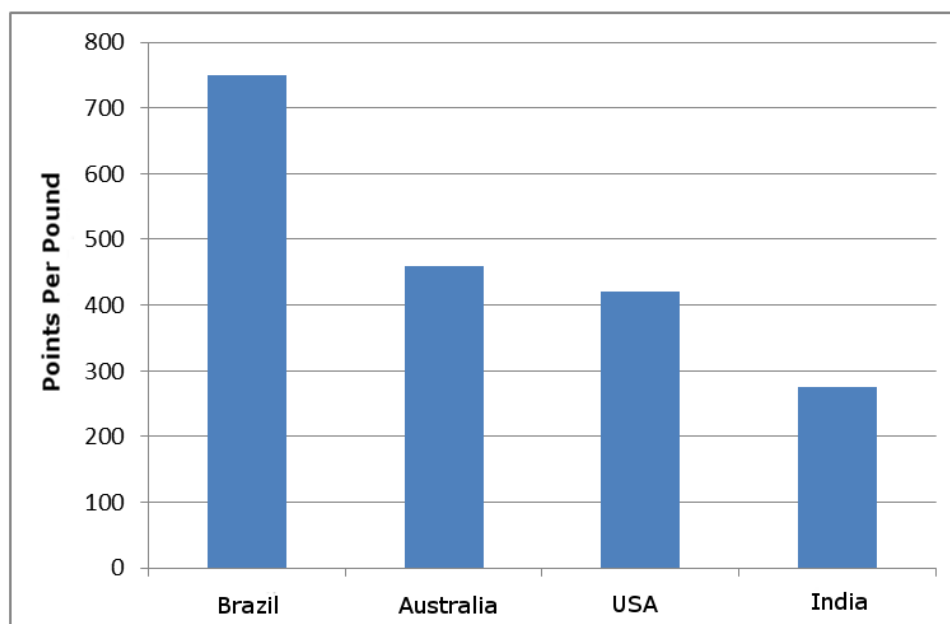
One of the main challenges of Brazilian exports is related to bottlenecks in the logistics infrastructure of the country. Of the 294,080 tons exported by Brazil between January and August in 2013, 68% were transported by the Port of Santos, which is in average, 1700 km away from the main producing municipalities in the state of Mato Grosso (SECEX, 2103), almost 2000 kilometers traveling in poor and overcrowded roads, contributing to the enhancement of the freight.

Some works that are in progress could be important alternatives to promote agility and lower the transportation cost of Brazilian cotton, but the constant delay problems mean that few improvements have “come out the paper” in recent years. Among the unfinished works that could ensure greater competitiveness of the Brazilian cotton, the paving of BR-163 highway (Cuiabá-MT to Santarém-PA) would be an especially interesting alternative for producers of the north region of Mato Grosso and the North-South railway, which will connect the west of São Paulo to Belém (PA), crossing the states of Goiás, Tocantins and Pará. Moreover, its design provides three secondary axes that would cut the states of Mato Grosso do Sul (Porto Murtinho-MS to Panorama-SP), Mato Grosso (Vilhena-RO to Uruaçu-GO) and Bahia (Alvorada-TO to Ilhéus-BA) from east to west. Therefore, the railroad would be able to meet all the major producing regions of the country.

Meanwhile, Brazilian production loses competitiveness with the increase of road freight. In 2012 Petrobras adjusted the price of diesel at refineries two times. Only the first adjustment increased the cost of fuel prices because in the second adjustment the government zeroed the Cide aliquot (acronym in Portuguese: Contribuição de Intervenção no Domínio Econômico), mitigating the impacts of price rise. In January and March of 2013, Petrobras announced new increases in diesel price, which was 6.6% and 5.0% respectively. In March of 2013, corroborating with the adjustment of diesel price in the same month, the value of freight paid from Sorriso-MT to Santos-SP per ton of lint increased 15.6% compared to February, reaching R\$ 393,00 (approx. US\$

196.50) per ton transported. However, when this data was analyzed in relation to March of 2012, the appreciation was 48.3% (CEPEA 2013).

All these logistical bottlenecks faced in the Brazilian production transportation harm the competitiveness of our lint in the international market. Graph 2 shows a comparison conducted by ICAC for internal freight costs - from producing regions to ports for export - in Brazil, USA, Australia and India, which are major exporters.



Graph 2 - Domestic freight cost in the 2012/13 crop
Source: ICAC (2013).

Domestic Market

Compared to the international market, the Brazilian textile industry continues to consume a higher percentage of natural fibers. In 2011, for example, the total consumed in Brazil was 52.9%, which corresponded to natural fibers whereas consumption in the world was 34%. The data of industrial consumption of different threads and filaments also show that the share in the consumption basket of the industry practically remained unchanged in the last five years, as seen in Table 2.

Table 2 - Industrial consumption of fiber and filaments in Brazil from 2008 to 2012

Fibers and Filaments	2008	2009	2010	2011	2012	Variation 11-12	Variation per year
						%	
Cotton	1,146,816	1,168,210	1,208,210	1,026,732	1,021,880	-0.5%	-2.3%
Other Natural	56,546	46,776	49,969	48,336	48,604	0.6%	-3.0%
Polyester	124,224	126,558	141,880	150,109	130,380	-13.1%	1.0%
Other artificial and synthetic	93,277	95,100	93,782	75,801	69,069	-8.9%	-5.8%
Total	1,420,863	1,437,263	1,493,841	1,300,978	1,269,933	-2.4%	-2.2%
Cotton participation	80.7%	81.3%	80.9%	78.9%	80.5%	1.5%	-0.1%
Polyester participation	8.7%	8.8%	9.5%	11.5%	10.3%	-1.3%	3.3%

Source: Iemi (2013)

What can be seen, although cotton participation has remained basically the same, the decrease in the total consumption of fibers and filaments in the last two years pulled down the consumption of cotton and other fibers. In these five years analyzed, there is an increase of polyester participation, which went from 8.7% to 10.3%.

The decrease in total consumption of fibers and filaments makes the situation more alarming. If this behavior becomes a trend, Brazilian producers will increasingly depend on foreign market to flow its production. This would imply some disadvantages such as the need to overcome infrastructure bottlenecks and conquer new pulverized markets, as well as higher transaction costs related to the negotiation and safeguards of international agreements.

IBGE data (ABIT, 2013) show that fabric, apparel and footwear sales in the Brazilian retail market have grown steadily over the last three years, having accumulated between January of 2010 and June of 2013 an increase of 20.6% in volume and 42.9% in nominal terms. However, this good moment of the Brazilian economy has not reflected in a growth of the textile industry and domestic production, since many products consumed by Brazilian families have come from other countries. Table 3 shows the reduction in the production of various segments of the Brazilian textile industry, while Table 4 shows the growth of imports.

Table 3 - Textile and manufactured industrial production in Brazil from 2008 to 2012

Segments	2008	2009	2010	2011	2012	Variation 11-12	Variation per year
	Tons					%	
Textile	3,463,338	3,456,825	3,577,903	3,197,447	3,105,630	-2.9%	-2.2%
Thread (cotton)	1,122,965	1,144,520	1,205,570	1,051,023	1,006,779	-4.2%	-2.2%
Thread (other)	267,962	264,232	282,072	250,634	241,596	-3.6%	-2.1%
Thread (total)	1,390,972	1,408,752	1,487,642	1,301,657	1,248,375	-4.1%	-2.1%
Fabrics (cotton)	802,005	800,807	839,365	780,995	752,879	-3.6%	-1.3%
Fabrics (other)	591,351	575,308	612,436	561,294	570,538	1.6%	-0.7%
Fabrics (total)	1,393,356	1,376,115	1,451,801	1,342,289	1,323,417	-1.4%	-1.0%
Knitting (cotton)	395,349	355,412	366,043	278,156	257,016	-7.6%	-8.3%
Knitting (other)	283,706	316,546	272,417	275,345	276,822	0.5%	-0.5%
Knitting (total)	679,055	671,958	638,46	553,501	533,838	-3.6%	-4.7%
Manufactured	1,844,293	1,850,349	1,970,871	1,899,619	1,864,088	-1.9%	0.2%
Apparel	1,135,841	1,145,861	1,245,266	1,232,312	1,188,860	-3.5%	0.9%
Socks and accessories	23,775	23,619	25,939	25,96	26,498	2.1%	2.2%
Home line	368,487	384,840	380,564	350,199	362,913	3.6%	-0.3%
Other	316,190	296,029	319,102	291,148	285,817	-1.8%	-2.0%

Source: Adapted from Iemi (2013)

Table 3 shows that, despite having presented annual variations that were sometimes significant, the production remained relatively constant. Thus, it can be inferred that the increase of consumption in retail has been met by rising imports, as confirmed in Table

4. At least, the consumption pace of families has been able to absorb imports and the current levels of domestic production. If imports grow at a faster pace than the consumption in the coming years, it is likely that the manufactured also start to have a negative growth.

This decline already occurs in the textile industry (spinning, weaving and knitting), which means that the manufactured started to use larger quantities of imported materials in the production of garments and others. The textiles that suffered the biggest decline were the knitting (-4.7% per year), and knitted cotton (-8.3% per year). Also, products made from cotton demonstrate a recoil superior to the others, although in these cases the differences are smaller.

Table 4 - Imports of textile and manufactured products from 2008 to 2012

Product	2008	2009	2010	2011	2012	Variation 11-12	Variation per year
	US\$ thousand					%	
Fibers (cotton)	56.284	20.375	70.122	396.090	16.320	-71.0%	-21.9%
Fibers (other)	184.260	139.814	167.014	204.230	185.548	0.7%	0.1%
Fibers (total)	240.544	160.189	237.136	600.320	185.548	-16.1%	-3.4%
Total fibers and filaments	881.784	715.491	998.447	1.429.572	1.074.302	21.8%	4.0%
Thread (cotton)	199.320	105.655	238.617	139.370	79.087	-60.3%	-16.9%
Thread (other)	403.411	478.101	528.230	642.188	642.571	59.3%	9.8%
Thread (total)	602.731	583.756	766.847	781.558	721.658	19.7%	3.7%
Sewing thread (cotton)	573	721	10.066	1.802	2.053	258.3%	29.1%
Sewing thread (other)	3.057	2.442	-4.828	6.938	6.621	116.6%	16.7%
Sewing thread (total)	3.630	3.163	5.238	8.740	8.674	139.0%	19.0%
Fabrics (cotton)	218.056	136.348	257.835	394.885	263.351	20.8%	3.8%
Fabrics (other)	447.256	377.371	558.053	745.832	782.140	74.9%	11.8%
Fabrics (total)	665.312	513.719	833.888	1.140.717	1.045.491	57.1%	9.5%
Knitting (cotton)	3.506	9.063	12.201	21.540	15.137	331.7%	34.0%
Knitting (other)	265.300	329.455	510.711	425.953	467.748	76.3%	12.0%
Knitting (total)	268.806	338.518	522.912	447.493	482.885	79.6%	12.4%
Specialties	520.425	411.115	604.102	718.457	767.231	47.4%	8.1%
Total of textile products	2.060.904	1.850.271	2.732.987	3.096.965	3.025.939	46.8%	8.0%
Apparel	643.713	710.160	998.887	1.592.496	2.045.295	217.7%	26.0%
Socks	12.032	15.934	19.365	37.429	41.919	248.4%	28.4%
Accessories	38.270	40.979	54.845	91.216	90.012	135.2%	18.7%
Home Line	166.604	125.601	211.207	303.585	342.017	105.3%	15.5%
Other manufactured article	47.308	38.521	51.732	71.340	78.237	65.4%	10.6%
Total manufactured products	907.927	931.195	1.336.06	2.096.066	2.597.480	186.1%	23.4%
Total fibers and filaments, textile and manufactured	3.850.615	3.496.957	5.067.470	6.622.603	6.697.721	73.9%	11.7%

Source: Elaborated by Markestrat from Iemi / Secex data (IEMI 2013).

It is noticed that textile products represent the largest share of the total imported, with 45% and about US\$ 6.7 billion that were imported in 2012. This confirms the earlier assumption that the manufacturing companies are resorting to external purchases. Even

with the stagnant manufactured production, the annual growth of imports of plain fabrics was 9.5% and knitting corresponded to 12.4%.

Among the textiles, the most significant increases were in imports of knitting and cotton sewing thread that in the five years analyzed grew 34% and 29%, respectively. With the increase, the shares of cotton products in imports of these types of textiles increased substantially. In 2008 only 16% of sewing thread and 1% of imported knitting were made of cotton. In 2012, these shares were already at 24% for thread and 3% for knitting. In the case of cotton, which already represented 33% of total imports of plain fabrics in 2008, the imported values grew 3.8% per year. As imported values with other types of fabrics grew 11.8% per year, the share of cotton fabrics in imports of this type of product increased to 25% in 2012.

Although values of imported textile products are the highest among the three segments, imports of manufactured products presented the highest growth in the series. Between 2008 and 2012, imports of these products grew an average of 23.4% per year, totaling an increase of 286%. This pace far exceeds the growth of retail consumption and enhances the probability of a production decrease of clothing industry in Brazil, as already occurs in the textile industry.

4.2. Challenges of Brazilian cotton industry

This section of the paper presents the challenges and bottlenecks collected through in-depth interviews with experts, who also indicated actions that, according to them, should be taken to overcome these challenges.

The following is a description of the points raised. Then, in Chart 1, the optimistic, pessimistic, and neutral scenarios are presented for each of the nine points below.

Competitiveness of cotton with synthetic fibers

The future of the world cotton supply chain depends, in large part, on the competitiveness of the cotton with substitute fibers and filaments, disputing for position in the consumption of the textile industry. The main substitutes/competitors of cotton fiber are fibers and synthetic filaments, standing out polyester, which is a product derived from petroleum.

With increasing oil exploration and technological advances in production processes obtained in the last decades of the twentieth century, the production cost of synthetic fibers and their use in the textile industry showed strong growth, occupying a significant position in the market, which was previously occupied by cotton fiber. Currently, the speed of replacement is slow and annual variations in the comparative consumption occur mostly due to the situational context and its impact on the prices of competing fibers. This shows that there was an accommodation on preferences of the consumer markets, and both cotton fiber and synthetic fibers have good coverage of their target markets.

Nevertheless, from the point of view of industry, synthetic fibers present some characteristics, resulting in advantages over cotton fibers with regard to ease of use in industrial processes. Among these features, it can be pointed out the greater degree of uniformity, the reduced presence of impurities and the ability to add specific properties from investments in R&D.

On the other hand, cotton fiber is characterized as a natural and renewable product. These attributes are valued by the consumer market. Furthermore, cotton fiber fabrics and knitting contain other valued attributes such as high strength, ease of cleaning, flexibility, no accumulation of static energy and freshness, which is a very important feature in tropical countries such as Brazil.

Therefore, as pointed by the experts interviewed, in order to increase the competitiveness of the cotton with synthetic fibers, it is necessary, on one side, to highlight its attributes that can get the preference of the end user and, secondly, to reduce the discrepancies in relation to the handling characteristics that the textile industry values. Thus investments in communication, research and development (R&D) are essential.

Competitiveness of Brazilian cotton in the international market

From the middle of the first decade of the XXI Century, Brazil has consolidated itself as one of the leading cotton exporters. The U.S., India and Australia were ahead in the 2012/13 crop. Despite the good position in the international market, the increasing competitiveness of Brazilian cotton is even more important in a context where the production of domestic textile industry has reduced year after year, as shown in the previous section.

For this, the domestic exporters need to overcome logistical bottlenecks and to keep production costs at competitive levels and produce fibers within the parameters of qualities demanded by export markets. The Brazilian government's role is to make the country more competitive as a whole. Besides, there is the commitment to seek progress in international negotiations to reduce distortions in world trade and, in particular, to reduce the negative impacts of the "Brazil cost" by promoting a safer business and less bureaucratic environment and stimulating essential investment in the formation of the manpower and infrastructure.

Logistics infrastructure

The need for improvements in logistics infrastructure meets not only Brazilian exports, but the domestic market, since the regions of the products are far from the main poles of the domestic textile industry. Moreover, the high dependence on a road system, which is often in poor maintenance conditions, is reflected in production costs, since the inputs used on farms are also transported by thousands of kilometers.

Investment in infrastructure has been one of the targets of the major programs of the Federal Government in the past administrations: the Growth Acceleration Program (PAC). Among its works, some stand out with regard to agriculture practiced in the regions of Cerrado in the country and to cotton such as widening and paving of BR-163 and the North-South Railway, as previously described. However, the speed that these and other works have been constructed can not keep up the pace of production growth. To provide greater speed and efficiency in these investments, some experts say it is necessary to review aspects of the state-owned investment models and Public-Private Partnerships (PPPs) and expedite the analysis of projects and issuance of permits required.

Another relevant aspect in terms of logistics is the need to expand the static storage capacity on farms, which would lead to greater opportunities for producers to choose the best seasons of lint trade.

Productivity

Cotton presented huge advances in productivity after it was implanted in Cerrado areas and began to be cultivated in high-tech production systems. However, the high level of technology already achieved makes it difficult to obtain even higher production volume performances per cultivated area.

This challenge involves developing inputs and more advanced management techniques such as the increase to use precision agriculture and improvements in thickened cotton system, advances in more productive and better cultivars adapted to the climate conditions of the producing regions, and greater efficiency in combating losses caused by pest and disease attacks.

Pests and diseases control

Although related to the productivity issue, pest and disease control is fundamental to the sustainability of the viability of the cotton activity in the short-term. The increase of production costs related to pest control has significantly reduced the profitability of cotton producers. In the 2012/13 crop, besides the pests that traditionally cause the greatest losses in cotton in the country, such as the boll weevil, in some regions was observed the increased importance of pests before considered as secondary, such as bedbugs, while in other regions the greatest damage was caused by a plague that had not attacked the culture before: *Helicoverpa armigera*.

Despite all the efforts made by producers, recurring infestation levels show that currently fighting techniques used can be improved. In this sense, producer associations, research institutes and even pesticides and transgenic cultivars suppliers have emphasized the importance of the combined use of different tools and techniques, which is called Integrated Pest Management (IPM). Besides the use of the latest technologies in pesticides and transgenic crops, IPM requires great rigor to cultivate and plant, use of refuge areas, crop rotation, cotton stalks destruction, the use of biological control, and also in the soil care. Anyway, it is a holistic view of the factors that influence the presence and development of pests and diseases, thinking not just in the short-term results.

Management and reduction of production costs

Specialists in cotton are unanimous in saying that the management and reduction of production costs are among the main and the most urgent challenges of Brazilian cotton. This increase in production costs accompanied the industry technological evolution and it was necessary for productivity evolution and quality of fiber produced in Brazil. However, it is a moment when levels of cost, which have been heavily impacted by inflation in the prices of inputs and factors of production, have not been accompanied by improvements in agricultural and financial performance.

Cost reduction depends, in part, on the capacity of the government to adopt policies that are able to curb the inflationary effect. Concomitantly, producers are seeking to increase the efficiency in the use of inputs, investing in more modern products and ways to reduce waste such as precision agriculture. Other factors related to the reduction of production costs are presented in Chart 1.

Sustainability

The concern with sustainability in its three dimensions (environmental, social and economic) is one of the main guidelines of the actions of cotton producers' associations and hence has been increasingly strong in rural properties.

There is a growing adherence of the farms to the different existing sustainability programs in the country – IAS (Instituto Algodão Social), Psoal (Programa Socioambiental da Produção de Algodão), ABR (Algodão Brasileiro Responsável) and BCI (Better Cotton Initiative) - which demonstrates the producers' awareness regarding the importance of this aspect for value aggregation, consolidation of conquered markets and even reduction of costs and risks of production in the medium and long term.

Currently, the organizations behind the initiatives cited above have worked to integrate them, unifying the criteria and indicators of sustainability in its different pillars. The objective of this action is to allow that, in conformity with a single and broad protocol, the Brazilian producer can obtain two certificates, one at national level and another at international level (BCI).

Aggregation and value capture

Although cotton is a commodity, many producers have sought alternatives to aggregate and capture value in their activities due to the increase in production costs. Investments in sustainability, in order to obtain certificates recognized by the market, are a way to add value. Furthermore, other alternatives are highlighted, including the development and cultivation of varieties of long and extra-long fibers; improvements in the management and harvest procedures; transportation and benefaction in order to increase quality; collective action via cooperatives for vertical spinning activities of lint and cottonseed crushing.

Price and market of lint and cottonseed

Among all nine items listed here, this is what the producers have less ability of influence. Since it is a commodity, cotton producers are price takers. However, due to its importance in the analysis of future scenarios for cotton production, Chart 1 presents some of the factors that have the greatest impact on the demand for fiber in the domestic and foreign markets and the cottonseed domestic market.

Among the factors mentioned in the foreign market of lint, uncertainties caused by the huge accumulation of inventories in China are highlighted, while in domestic market the main concern is related to the continuous decline in industrial production and, consequently, the levels of textile industry consumption.

Chart 1 - Scenarios for Brazilian cotton industry

		Intensity		
Key factors for the future of cotton industry	“Pessimistic” Scenario	“Expected” Scenario	“Optimistic” Scenario	
1 <u>Competitiveness of cotton with synthetic fibers</u>	<ul style="list-style-type: none"> Reduction in oil prices and the costs of synthetic fibers; Increase of disparity between investments in R&D in synthetic fibers and cotton fibers; Growing acceptance of synthetic fibers by consumers in Brazil and in the world; Inability of the global cotton chain in highlighting the social and environmental benefits of cotton compared to the synthetics. 	<ul style="list-style-type: none"> Relatively slow growth of investments in R&D in cotton fibers for the improvement of uniformity and intrinsic quality; Improvements in the cultivation, transportation, beneficiation and classification to reduce transaction costs in the textile industry by using cotton as homogeneity of batches, better classification of packages and reduced levels of impurities; Gradual achievement of a target market that values quality of cotton clothing; Gradual achievement of a target market that values the renewable nature of the cotton fiber. 	<ul style="list-style-type: none"> Increase in oil prices due to the depletion of easily exploitable reserves; Significant growth of investments in R&D to increase the quality and uniformity of cotton fiber; Significant expansion of the share of the Brazilian consumer market and world market that values the quality of cotton goods; Significant expansion of the share of the Brazilian consumer market and world market that values the renewable nature of the cotton fibers. 	
2 <u>Competitiveness of Brazilian cotton in the international market</u>	<ul style="list-style-type: none"> Growth of protectionist barriers with respect to the international trade of lint and distorted subsidies of production; Increasing production costs and transportation of cotton in Brazil compared to other exporting countries; No reduction of logistics costs, even with the expansion of logistics infrastructure; Increase of production in countries with area availability and low production cost; Increase of bureaucracy for export; Fall of the credibility of the Brazilian cotton in the international market. 	<ul style="list-style-type: none"> Maintenance of current levels of protectionist barriers with respect to the international trade of lint and distorted subsidies of production; Control of production costs in Brazil with a gradual increase in the efficient use of productive resources; Reduced costs of transporting the crop with the inauguration of road, rail and port infrastructure works; Increase of Brazilian cotton credibility with the advance of HVI classification and traceability of batches; Increase of credibility with reduction of breaches of contract; Maintenance of Brazil among the 4 largest exporters in the world. 	<ul style="list-style-type: none"> Retake and progress of WTO negotiations to reduce barriers to agricultural product trade and distorted subsidies; Reduction of production costs of the arroba of lint in Brazil; Increase of the capital volume and efficiency of investments in logistics infrastructure in Brazil; Reduction of bureaucracy for export; Increase of Brazilian fiber quality as a result of investments in R&D and improvements in the management and processes; Reduction of area planted and/or productivity in other exporter countries. 	
3 <u>Logistics infrastructure</u>	<ul style="list-style-type: none"> Non completion of logistics infrastructure works currently being built; Deterioration of current logistics equipment and growth of overloading as production grows; Regression for investment model exclusively public; Back to the prioritization of road transport; Increase of bureaucracy for the granting of permits for the construction of works; Increase of storage deficit, especially in rural properties. 	<ul style="list-style-type: none"> Slow progress of logistics infrastructure works, keeping the deficit due to the faster growth of production; Maintenance of the Public-Private Partnership (PPP) policy with relative ability to attract investors; Maintenance of the investment policy in different ways; Slow growth in static capacity storage of cotton, below the growth of production. 	<ul style="list-style-type: none"> Increase of the ability to attract private investors, with advances in the PPP model to bring more legal security and reduction in the return time of investments; Greater efficiency of bureaucracy to issue the necessary permits for the construction of logistics equipment; Upgrading of existing equipment, resulting in faster transportation of goods and better storage conditions; Expansion of static capacity storage on farms. 	

4	<u>Productivity</u>	<ul style="list-style-type: none"> Increasing variations and increase of climate risks; Increase of losses due to the infestation of new pests and diseases and the growth of populations resistant to traditional control methods; Stagnation of nutrition technology, techniques and equipment management; Reduction in R&D investments of more productive cultivars (climate adaptation, resistance to pests and diseases, increased production per plant and lint yield). 	<ul style="list-style-type: none"> Gradual increase of the management and planning capacity in rural enterprises; Reduced levels of losses by pests and diseases through collective actions and cooperation among producers; Gradual development of improved technologies in fertilizers, techniques and handling equipment; Increased adoption of precision agriculture; Maintenance of current levels of investment in R&D more productive cultivars. 	<ul style="list-style-type: none"> Greater climate stability; Major innovations in fertilizers; Major investments in the development of germplasm in Brazil; Major investments in the development of genetically improved cultivars, with incentives for innovation and protection of intellectual property rights; Increased use of irrigation systems; Rapid development and large adoption of better thickened cotton management techniques.
5	<u>Pests and diseases control</u>	<ul style="list-style-type: none"> Rapid reduction in the effectiveness of current pesticides and genetically modified crops; Slow development of new control technologies, including chemical, biological controls, and by means of genetically improved cultivars; Low adoption of integrated management practices of pest; Increase of primary and secondary infestation of pests; Emergence of new pests on cotton and slow responsiveness as release of the use of pesticides. 	<ul style="list-style-type: none"> Consolidation and expansion of the boll weevil control programs sponsored by state associations; Greater attention to secondary pests; Sharing of knowledge to combat new pests and diseases; Development of new genetically improved cultivars; Expansion of biological control techniques; Expansion of precision agriculture adoption; Expansion of adoption of the integrated management practices of pests. 	<ul style="list-style-type: none"> Expansion of public and private investments in R&D and extension; Rapid spread of collective responsibility sense in combating pests and diseases; Eradication of the boll weevil; Greater agility of institutions in the responses to combat new pests; Creation of "bio-factories" of insects, fungi and bacteria to advances in biological control.
6	<u>Management and reduction of production costs</u>	<ul style="list-style-type: none"> Expansion of dependence on imported inputs, especially fertilizers; Fast advancement of inflation and the prices of machinery, equipment and supplies; Reduction of credit supply; Increase of the tax burden; Increase of the supply of skilled labor deficit; Increase of volatility in the foreign exchange market. 	<ul style="list-style-type: none"> Better planning of crop and better trading conditions in input purchase; Expansion of precision agriculture use and greater efficiency in the application of inputs; Reduced pesticide applications with the advancement of genetically improved cultivars use and advancement of integrated management of pests; Diversification of revenue sources, with the crop/livestock integration and planting of the second crop; Increased efficiency in agricultural operations with the use of machines and larger implements; Increased efficiency in the logistics of harvesting and post-harvesting with the use of harvester and balers. 	<ul style="list-style-type: none"> Value aggregation to the cottonseed with vertical integration of processing; Reduction of inflation on input prices with the demand reduction due to the advancement of alternative management techniques such as biological control of pest and diseases; Stability in oil prices and derivatives with the exploitation of new reserves; Reduction of tax burden; Increase of credit supply; Increase of incentives and alternatives of agricultural insurance; Increase of the supply of skilled manpower by investing in education and training.
7	<u>Sustainability</u>	<ul style="list-style-type: none"> Increased consumption ruled on low cost, low valuation of sustainable products; Returns/strengthening of economic and financial crisis in developed markets; Verification of the lack of financial return on sustainability investments; Lack of coordination and alignment between different certification initiatives; Return in the adherence of producers to 	<ul style="list-style-type: none"> Verification of the return on investment in sustainability in the form of cost reductions in the medium and long term; Growing economic viability of farming techniques less harmful to the environment; Increase in safety and ergonomics at work in the field with the modernization of the cultivation techniques and equipment; Increasing investments in qualifying and training 	<ul style="list-style-type: none"> Greater appreciation by the consumer markets, distribution channels and the textile industry for natural, renewable and sustainable products; Increased incentives for sustainable production, as for reducing the tax burden on certified products, expansion and easy credit for investments in sustainable production systems; Better fit of certification programs to specific regional realities;

	certification programs.	employees;	<ul style="list-style-type: none"> • Greater coordination and policy integration at the international level to facilitate the flow of sustainable products, such as the adoption of special tariff schemes.
8	<p><u>Aggregation and value capture</u></p> <ul style="list-style-type: none"> • No market appreciation of natural, renewable and sustainable for products, even if certified; • Retraction of investments in the development of varieties of higher quality fiber adapted to cultivation in Brazil; • Retraction of use of cottonseed bran in animal feed because of concerns about the impact on the flavor of the meat; • Stagnation of biodiesel incentive policy with negative impacts in cottonseed oil market. 	<ul style="list-style-type: none"> • Continuing adherence of producers to certification programs; • Greater integration between initiatives/certification programs; • Expansion of market niches for sustainable cotton. 	<ul style="list-style-type: none"> • Increased investments in R&D for the development of cultivars adapted to long-fiber cultivars in Cerrado areas; • Major investments in extension to improve the cultivation and performance long-fiber cultivars; • Increase of prizes for certified cotton batches; • Growth retake of Brazilian cotton quality levels and consolidation of the country's image as a provider of high quality fibers; • Expansion of producers' collective actions for the forward vertical integration in the chain, with the capture of value in spinning and cottonseed crushing.
9	<p><u>Price and market of lint and cottonseed</u></p> <ul style="list-style-type: none"> • Retraction of world fiber consumption; • Continuous reduction in the production of the domestic textile industry; • Stagnation of domestic demand for the cottonseed; • Continuous distortion caused by U.S. subsidies on production; • Uncertainties regarding the availability of inventory reserves of China; • Increase in volatility with trend of lint stagnation or falling; • Increase in volatility in the foreign exchange market. 	<ul style="list-style-type: none"> • Maintenance of cotton consumption percentage compared to other fibers in the domestic textile industry, although with a decrease in the consumption total volume; • Maintenance of current levels of global consumption with annual variations depending on the situation; • Maintenance, on the short-term, of high level inventory in China; • Possible reduction of speculative impact on volatility in the market of futures in New York for the recovery of the U.S. economy; • Better management of financial risks with strategies and marketing mechanisms; • Demand growth for cottonseed oil in the domestic market, in various applications due to increasing supply with the increase of the installed capacity of crushing; • Increasing demand for cottonseed oil for biodiesel, depending on availability; • Demand growth for cottonseed bran due to the confined herd growth. 	<ul style="list-style-type: none"> • Possible compliance low level of fiber quality of Chinese stocks against the requirements of the textile industry, which may mitigate the effect of decrease in prices as stocks are available; • Increase of global fiber consumption with the recovery of developed economies; • Measures for the recovery of the domestic textile industry and consequent increase in fiber consumption; • Revision of minimum price policy for lint according to current levels of production cost; • Implementation of a contractual policy that benefits both producers and the industry regarding volatility in prices; • Compulsory increase of the biodiesel blending to fossil diesel fuel; • Development of markets for new applications of fiber and cottonseed.

Source: Prepared by the authors based on interviews with experts.

5. CONCLUSIONS

This article is the result of exploratory research and qualitative nature that had as main objective to outline major scenarios for the challenges of Brazilian cotton industry. Through collecting information of secondary sources and, in particular, in-depth interviews with industry experts, the authors reached nine points that can be understood as the most critical to the future of Brazilian cotton production: (1) competitiveness of cotton with synthetic fibers; (2) competitiveness of Brazilian cotton lint in the international market; (3) logistics infrastructure; (4) productivity; (5) pests and diseases control; (6) management and reduction of production costs; (7) sustainability; (8) aggregation and value capture; (9) price and market of the lint and cottonseed.

In addition to identifying these points, the paper summarizes the point of view of the experts interviewed regarding their possible developments in three scenarios: pessimist, optimist and realist or neutral. Each scenario allows readers, whether researchers or professionals of the field to raise questions, assumptions or hypotheses about the future of Brazilian cotton industry. Thus, the authors hope to contribute to the emergence of future researches in the academic field and perhaps to promote discussions between entrepreneurs and policy makers of the sector. After all, agribusiness is one of the most important sectors in the Brazilian economy, with cotton production being one of its most prominent segments in the international scenario.

Finally, it is noteworthy that the authors of this paper did not have the purpose of performing an exhaustive list of the challenges faced by the Brazilian cotton sector, neither to exhaust the possible scenarios for the challenges listed. The results are based on the opinions of thirteen of experts interviewed by the authors, which is also a limitation that should be taken into consideration by readers.

REFERENCES

- ABIT – Associação Brasileira da Indústria Têxtil e de Confecção. **Monitor ABIT: conjuntura da indústria têxtil e de confecção brasileira**. Ago. 2013. Disponível em: <<http://www.abit.org.br/adm/Arquivo/Servico/051212.pdf>>. Acesso em 14 out. 2013.
- ABRAPA – Associação Brasileira dos Produtores de Algodão. **Caroço de algodão**. Disponível em: <<http://www.abrapa.com.br/Paginas/default.aspx>>. Acesso em 24 set. 2013.
- ANP – Agência Nacional do Petróleo, Gás Natural e Biocombustíveis. Anuário estatístico 2013: seção 4 – Biocombustíveis. 2013. Disponível em: <<http://www.anp.gov.br/?dw=67023>>. Acesso em 14 out. 2013. Tabela 4.13 – Matérias-primas utilizadas na produção de biodiesel (B100) no Brasil – 2005-2012.
- BANCO MUNDIAL. **Commodity Markets: Historical data (XLS)**. Disponível em: <http://siteresources.worldbank.org/INTPROSPECTS/Resources/334934-1304428586133/pink_data_m.xlsx>. Acesso em 20 ago. 2013. Cotton, A Index.
- CEPEA – Centro de Estudos Avançados em Economia Aplicada - ESALQ/USP. **AGROMENSAL: Algodão**. Disponível em: <<http://cepea.esalq.usp.br/imprensa/?page=846>>. Acesso em 20 ago. 2013. Vários relatórios.
- CONAB – Companhia Nacional de Abastecimento. **Levantamentos de Safra**. Disponível em: <<http://www.conab.gov.br/conteudos.php?a=1253&t>>. Acesso em 24 set. 2013.

COSTA, S.R., BUENO, M.G. **A saga do algodão**: das primeiras lavouras à ação na OMC. Rio de Janeiro: Insight Engenharia, 2004.

ICAC – International Cotton Advisory Committee. **Cotton This Week**. Disponível em: <<https://secure.icac.org/pubdetail.php?id=P0000001>>. Acesso em 20 ago. 2013.

IEMI – Instituto de Estudos e Marketing Industrial. Brasil têxtil. **Relatório Setorial da Indústria Têxtil Brasileira**, v. 13, n. 13, p. 1-168, ago. 2013.

PESSA, João Luiz Ribas. A organização dos Produtores de Algodão. In: FREIRE, Eleusio Curvelo. (Org.). **Algodão no Cerrado do Brasil**. 2. ed. Brasília: ABRAPA, 2011.

SECEX – Secretaria do Comércio Exterior. **Exportação**: 1997 – 2013, NCM 8 dígitos. Disponível em: < <http://aliceweb2.mdic.gov.br/consulta-ncm/index/type/exportacaoNcm>>. Acesso em 20 ago. 2013.