Revista SODEBRAS – Volume 12
N° 138 – JUNHO/ 2017

COMPETITIVENESS OF THE SOYBEAN COMPLEX IN BRAZIL: ENHANCERS AND INHIBITORS

COMPETITIVIDADE DO COMPLEXO SOJA NO BRAZIL: FATORES DE ESTÍMULO E DE INIBIÇÃO

MARCOS ANTONIO CAMPOS[1]; ALCIDO ELENOR WANDER[1,3]; CLAUDIA REGINA ROSAL CARVALHO[2]; BENTO ALVES DA COSTA FILHO[1]
1 – UNIALFA; 2 – UNIVERSIDADE FEDERAL DE GOIÁS; 3 – EMBRAPA
marcosantonio.campos99@gmail.com; alcido.wander@alfa.br; clregina@hotmail.com, bento.filho@alfa.br

Abstract *- The objective of this study was to analyze the competitiveness of the soybean complex in Brazil from 2002/2003 to 2012/2013, assessing the likely rational grounds for explaining this evolution. Using the Revealed Comparative Advantage (RCA) model, as an indicator of competitive measure, we found that the soybean complex exports hold a strong position in the worldwide context for the years under consideration. This study proposes that the main reasons or enhancement factors for this progress may be based on two factors: knowledge & technology, and legislation. Despite the fact that soybean complex has evolved considerably in the past decades, there are inhibitors to be considered, such as problems in transport logistics and storage capacity limitations, both challenging issues which the last government mandates have been struggling with.*

Keywords: Soybean Complex. Competitiveness. Revealed Comparative Advantage.

Resumo *– O objetivo deste estudo foi analisar a competitividade do complexo soja no Brasil de 2002/2003 a 2012/2013, avaliando os possíveis motivos que explicam esta evolução. Usando o modelo Vantagem Comparativa Revelada como indicador de medida de competitividade, foi identificado que as exportações do complexo soja detêm uma forte posição no contexto mundial para os anos considerados. Este estudo propõe que os elementos de incentivo para este progresso podem estar assentados em dois fatores: conhecimento/tecnologia e legislação. Apesar de o complexo soja ter evoluído bastante nas últimas décadas, existem aspectos inibidores como o problema de logística de transporte e limitação da capacidade de armazenamento, ambas questões desafiadoras com as quais os governos têm lidados em sucessivos mandatos.*

Palavras-chave: Complexo Soja. Competitividade. Vantagem Comparativa Revelada.

I. INTRODUCTION

In recent decades the production of soy and its derivatives has been among those economic activities which showed the most significant growth rates. According Shurtleff & Aoyagi (1989), the exponential and sustained growth of world soybean production has been unmatched, not seen for any other global crop, making it one of the world's most traded commodities.

This is because soybean is used not only as a crop for grain production and for animal feed and aquaculture, but also as a good source of protein for human consumption and as raw material for bio-fuels. These characteristics have promoted the development of a strong international market commercializing soybean complex agro-industrial products, thereby consolidating soybean as an important source of vegetable protein, which has been able to meet the growing demands of the sectors linked to the production of animal-derived products or vegetable oil production both for human consumption and as a source for bio-fuels.

According to Hartwig (1979), soybean cultivars grown commercially in the United States represented approximately 40.5% of the grain and 21.0% oil protein, based on dry product; this characteristic has meant that granular soybean has become responsible for protein and oil supply at a relatively low cost, and apart from the socioeconomic factors, has led to concentration in its supply structure and global demand.

The world production of soybeans in the 2012/2013 harvest reached 267.83 million tons. Of this total, production in the United States, Brazil and Argentina, the largest producers, corresponded to 30.80%, 30.59% and 18.39% respectively, that is, 79.78% of all global production. These same countries also accounted for 85.0% of exported granular soybean volume worldwide.

For the same year, the percentage destined for export was 51% for Brazil, 43.69% for USA and 15.7% in Argentina. These figures show how important soybean is to the trade balance of its largest exporters, mainly the South American countries, whose economic structures depend more heavily on commodity transactions.

Parallel to the concentration of world supply of soybeans (granular), much of the demand for the product *in natura* is restricted to only a few countries, characterizing this type of international market as a concentrated structure in terms of sales and purchasing. In summary, Chinese and European Union imports of the 2012/2013 harvest were, respectively, 62.5% and 13.0% of all soybean imports worldwide. When these countries are taken together with Japan and Mexico, the quantities purchased by the four main importers exceed 82.0% of foreign trade involving granular soybean.

With regard to this, the strong and recent increase in overall volume traded, linked to the average growth rate of 6.2% p.a. for the period 2000-2010, has been mainly driven by the growing demand from China, whose imports went

ISSN 1809-3957

from 13 million tons in 2000 to 59 million tons in 2012, representing 61.32% of world imports.

Strong Chinese demand is based on meeting its domestic consumption through the crushing of soybean to produce oil and meal intended primarily for its large swine and poultry production chains. This strong demand has been key to the dynamics of the soybean market mainly because European and Japanese imports have presented relative stagnation in the period.

In the global context, Brazil has been responsible for a significant share in the supply and demand of the agro-industrial soybean product complex. This has been made possible by the establishment and continued progress of a well-structured supply chain, and has played a key role in the economic and social development of several regions of the country. To highlight the importance of this complex for the national economy, the following basic statistics are available. In the 2013/2014 harvest, soybean occupied only 3.5% of the whole country and 8.9% of the harvesting area of Brazilian agro-industrial establishments (IBGE, 2014; CONAB, 2014). Even so, exports originating in the soybean complex totaled nearly US$ 31 billion and accounted for 31.0% and 12.8%, respectively, of total exports from national agribusiness and the country as a whole (BRAZIL, 2014); the soy agribusiness complex was thus consolidated as a major exporter of agricultural products.

The soybean complex is clearly of great importance both domestically and externally. The evaluation of competitiveness using market share indicators permits inferences to be drawn about competitiveness and other factors possibly influencing Brazilian exports of this commodity.

The explanation for this positive evolution the soybean complex has enjoyed in the country in the last four decades is the main focus of the study. The proposition is that this good performance has been due mostly to two important factors or enhancers: knowledge & technology, and legislation. Knowledge and technology are represented by all the research and development efforts made since the 1970's up to the present, initially through state initiatives until the 1990's and then by private firms and entities, attracted by the new legal framework provided by the Variety Protection Law established in 1997. Although the general results have been favorable to the soybean complex, there are important inhibitors to be considered, such as problems in logistics infrastructure represented largely by an insufficient road system; and limited storage capacity for grains.

II. THE COMPETITIVE INDEX

According to Jank & Nassar (2000), competitiveness is a term that has no precise definition. In global markets, competitiveness in economic sectors is determined by their ability to expand against the best international competitors. It can also be understood as market survivability and growth resulting from the competitive strategies adopted by companies. These strategies include cost control, productivity, research and development and training, among other variables.

Ferraz *et al*. (1995) identify two different ways of understanding the concept of competitiveness; in one of them competitiveness is seen as "performance" of a business or product. In this case, the results of the analysis are reflected in determining a certain revealed competitiveness. The main indicator of revealed competitiveness, according to this method of assessment, is linked to the participation of a product or company in a particular market (market share).

The use of market share as a measure of competitiveness is the most useful and widely used contribution of neoclassical economics to competitiveness studies. According to this view, the market is in some way sanctioning the strategic decisions taken by the actors. The share of exports in a given sector in the relevant international market is an appropriate indicator of international competitiveness. The competitiveness of a nation or sector is thus the result of the individual competitiveness of the agents within the country, region or industry (FERRAZ *et al*., 1995).

Ferraz *et al*. (1995, p.3) present the following definition of competitiveness: "... the company's ability to formulate and implement competitive strategies that enable it to expand or retain, on a lasting basis, a sustainable position in the market". For Lazzarini & Nunes (1998), the competitiveness of the soybean complex is revealed through a series of performance indices in international markets, including: i) the share of domestic production relative to world production; ii) performance in foreign trade; iii) the growth of the production and marketing of substitute products; iv) productivity indices; and v) the rate of return of the companies in the sector.

Farina (1999) sets forth the proposition that current market share derives from past competitiveness resulting from competitive advantages previously acquired. The capacity for strategic action and investments in human resources, equipment and management determine future competitiveness since they are associated with preservation, renovation and improvement of dynamic competitive advantages.

In the global context, Brazil has territorial, climatic and technological advantages in the production process of soybeans. However, these advantages are reduced when the soybean complex is considered as a whole. Among the main factors associated with this decrease are transport logistics and shortcomings in storage capacity (DALL'AGNOL & HIRAKURI, 2008), issues considered inhibitors in the analysis undertaken in this study. In this context, Brazil has been very competitive in exporting raw soybean grains (FIGUEIREDO *et al*., 2015). Medina *et al*. (2016) bring up some worries regarding the internationalization of capital involved along the soybean chain in Brazil.

For Farina (1999), although several companies are not able to survive on the market, the segment may be being competitive, and the indicator therefore shows growth, or at least stability, of production market share in relation both to external markets and to domestic markets.

In this respect, Kupfer (1993) states that competitiveness is measured by the market share that the product attains in foreign trade. A company or product may thus be considered competitive when it expands its share of foreign trade. This is a broad concept of competitiveness which facilitates the elaboration of indicators and covers not only production conditions but also all the factors that might interfere with enabling or hindering exports (GONÇALVES, 1987).

The Revealed Comparative Advantage or Relative Export Advantage Index is widely used as an indicator of competitiveness, because by consulting it, we can verify the competitive ability of any product, region or country.

ISSN 1809-3957

Revealed Comparative Advantage is calculated by equation 1:

$$RCAI_j = \frac{\frac{X_{ij}}{X_i}}{\frac{X_{wj}}{X_w}} \quad (1)$$

where:
X_{ij} = Value of Brazil soy exports;
X_i = Value of Brazilian exports;
X_{wj} = Value of the world's soy complex exports;
X_w = Value of world exports.

Dias *et al*. (2006), Carvalho *et al*. (2005) ,and Gasques & Conceição (2002) contributed to the definition of competitiveness indicators used in this work. They are indicators that, using this method, assess the competitiveness of the soy complex in international trade from 2003; these are, namely:

a) Participation in world trade - Market Share

$$S_{ki} = \frac{X_{ki}}{X_{kc}}.100 \quad (2)$$

Where *X* is the value of exports, *k*= soybeans, *i*=Brazil, *c*= world.

This measure, expresses as a percentage how much the country participates in the global market for a particular product; as the factors are expressed as a percentage, the values of this measure range from 0 to 100, the higher the value being equal to greater participation in the country's market for the product market being considered.

b) Participation in the soy complex export basket

$$X_{ki} = \frac{X_{ki}}{X_t}.100 \quad (3)$$

Where X_{ki} is the total value of exports of the Brazilian soybean complex and X_t is the total value of Brazilian exports.

This measure expresses as a percentage how much the soybean complex participates in the total value of the country's exports; as the factors are expressed as a percentage, the values of this measure range from 0 to 100, with the higher the value being equal to the greater importance of exports of the product relative to the other products exported by the country.

c) *k* trade share in the total trade of agricultural products

$$q_{ki} = \frac{X_{ki} + M_{ki}}{X_i + M_i}.100$$

This measure indicates the importance of product *k* in total trade of the country's agricultural sector.

d) Share of the trade balance of *k* in the agricultural GDP

$$y_{ki} = \frac{(X_{ki} - M_{ki})}{Y_i}.100$$

where:
Y = agricultural GDP, *M* = value of imports.

This measure indicates the importance of the trade balance of k in the country's agricultural GDP.

III. THE COMPETITIVE POSISION OF SOYBEAN COMPLEX

Based on the Revealed Comparative Advantage Index we can assess whether the soybean complex Brazil is competitive or not in the export of its products as compared with Brazilian exports in general.

In Table 1, the Revealed Comparative Advantage of the Brazilian soybean complex as compared to total Brazilian exports during the period from 2003 to 2013 was calculated; for each year the index was higher than one, thus demonstrating that the Brazilian soybean complex was competitive in the export of its products when compared to Brazilian exports in general.

Table 1 - Revealed Comparative Advantage Index Calculation.

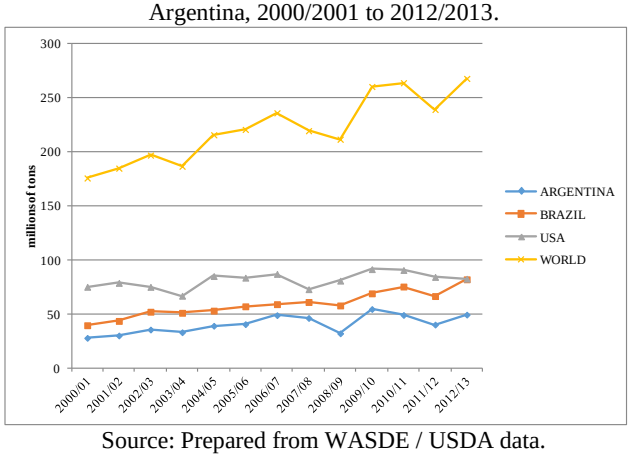
Year	Brazil Total Exports (US$ 1,000)	Brazil Soybean Complex Exports (US$ 1,000)	Brazil Total Exp. /Share (%)	Total World Exports (US$ 1,000)	World Soybean Complex Exports (US$ 1,000)	Share (%)	Revealed Comparative Advantage Index
2003	73,203,222	8,125,367	11.10	7,589,000,000	37,863,737.64	0.50	22.25
2004	96,677,499	10,047,892	10.39	9,223,000,000	39,577,841.65	0.43	24.22
2005	118,529,185	9,476,727	8.00	10,508,000,000	37,567,871.98	0.36	22.36
2006	137,807,470	9,311,250	6.76	12,130,000,000	37,745,353.26	0.31	21.71
2007	160,649,073	11,386,108	7.09	14,022,000,000	56,135,740.22	0.40	17.70
2008	197,942,443	17,986,409	9.09	16,159,000,000	76,220,518.43	0.47	19.26
2009	152,994,743	17,250,858	11.28	12,554,000,000	65,380,589.21	0.52	21.65
2010	201,915,285	17,114,802	8.48	15,300,000,000	71,374,097.46	0.47	18.17
2011	256,039,575	24,154,416	9.43	18,328,000,000	78,397,301.63	0.43	22.05
2012	242,579,776	26,121,995	10.77	1,8404,000,000	88,698,312.65	0.48	22.34
2013	242,178,662	30,965,500	12.79	18,816,000,000	90,072,113.02	0.48	26.71

Source: Compiled from USDA, MDIC / Secex, World Bank, WTO and FAO data.

Analyzing Brazil's position in world soybean production, it can be seen from Figure 1 that in the harvest period from 2000/2001 to 2012/2013, world soybean production showed an increase of 61%, with Brazilian production increasing 122%, while US production increased by 61.32% and the increase in Argentina was 92.4%.

In Figure 1, the evolution of the position in the world market (Market Share, Ski) of each of the major world producers during the period in question can also be observed, where the 2000/2001 Argentina harvest accounted for 15.82 %, Brazil for 22.47% and the US for 42.7% of world production. This compares with the 2012/2013 harvest where Argentina accounted for 18.4%, Brazil for 30.61% and United States for 30.82% of world production. These percentages indicate a strong trend towards increasing soybean production in South America and especially in Brazil, which was the country that showed the highest growth rate for the period.

Figure 1 - Soybean production in the World, the US, Brazil and Argentina, 2000/2001 to 2012/2013.



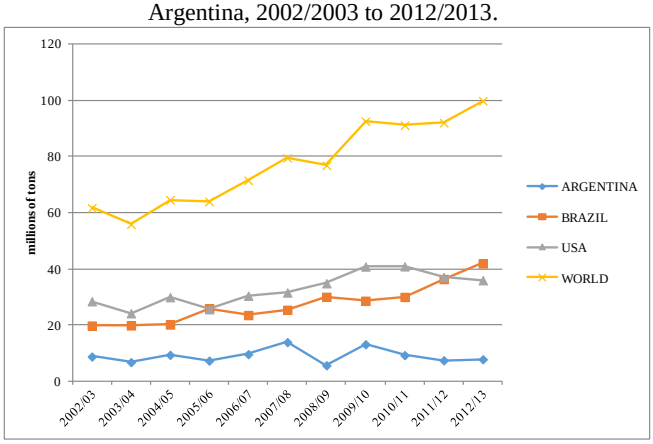
Source: Prepared from WASDE / USDA data.

ISSN 1809-3957

As in soybean production, Brazilian grain export growth was much higher than its competitors, as we can see in the figures presented in Figure 2, which shows a significant increase of Brazilian granular soybean exports, with an increase of 112% between the 2002/2003 and 2012/2013 harvests, where in the same period the increase in volumes exported by the US was 62% and in Argentina there was a fall of 11% in volume; this means that in the 2012 / 2013 harvest, Brazil took over the position of leading world exporter of soybeans.

In Figure 2 the evolution of the worldwide market position - Market Share of each of the world's leading grain exporters can also be observed during the period in question, where the 2002/03 Argentina harvest was responsible for 14.12%, Brazil for 31.98% and the United States for 46.07% of world exports, in comparison with the 2012/13 Argentina harvest which accounted for 7.75%, Brazil for 41.96% and the United States for 35.96% of world exports. These percentages indicate a strong upward trend in the export of soybeans from Brazil at the expense of Argentina and the United States.

Figure 2 - Soybean Export in the World, the US, Brazil and Argentina, 2002/2003 to 2012/2013.



Source: Compiled from WASDE / USDA data.

The same performance is not perceived in exports of bran, where the participation of Brazil in the 2012/13 harvest was 25.17%, the US 15.15% and Argentina 44.65%. And in soybean oil, where the participation of Brazil in the 2012/13 harvest was 22.26%, the US 7.77% and Argentina 44.64%.

This fact can be explained by two things; the first is the regulatory question, because the effects of the Kandir Law (complementary Brazilian Law No. 87) which came into force on 13 September 1996 in Brazil, and which deals with state and Federal District tax on transactions involving the movement of goods and services(ICMS). The Kandir Law exempted goods and services for export from this ICMS tax. This law exempted export of raw materials (granular soybean), but did not exempt industrial production for export, generating accumulation of tax credits, creating a raw grain export friendly environment.

The second aspect concerns the increase in domestic consumption of both bran and oil. In the case of bran, products are widely used in animal feed, Brazil in 2013 being the third largest animal feed producer in the world. And in the case of oil, apart from human consumption, Brazil uses soybean oil as the main source of raw material for the production of biofuel, and this demand has grown significantly.

Progress in domestic demand for both products, where in the period 2003 to 2012, export of bran increased 3.7% and during the same period domestic consumption increased by 79.08%; in the case of oil exports, there was a decrease of 25.19%, with domestic consumption during the same period increasing by 79.33%.

Regarding the participation of the soybean complex in the Brazilian export basket (X_{ki}), that the soybean complex share index in the country's total exports was 6.8% in 2006 and in 2012 reached 10.8%, i.e. an increase of 62%.

One consequence of the increase in the soy complex participation in the Brazilian exports agenda is also the increase in the share of exports of the soybean complex in the export basket of Brazilian agribusiness (q_{ki}), its share of 25.29% in 2002 rising and reaching 31.75% in 2013.

The competitive gains of the soybean complex and its growing importance for the Brazilian economy are also evident when analyzing the share of the soybean trade surplus in the agricultural GDP (y_{ki}), rising from 23.88% in 2004 to 26.48% in 2011.

All data presented demonstrates the meaningful participation of Brazilian soybean in the international trade of this product and also its importance on the national scene, as a stimulator of the trade balance, as an ingredient used in the composition of other products (soybean meal - animal feed), or even as a promising source of energy.

IV. ENHANCERS AND INHIBITORS OF COMPETITIVINESS

As mentioned at the beginning of the paper, our proposition is that two important factors accounted for the success of the soybean complex in Brazil in the last four decades. The first factor named here, knowledge & technology, is related to the extensive research and development efforts undertaken by public and private agents since the 1970's, concentrating on both the transformation of poor lands into fertile ones (specifically in Central Brazil in the Cerrado) and the development of new high productivity cultivars of soybean seeds. The second factor, new legislation governing the issue, was introduced to reinforce the first: the Cultivar Protection Law, established in 1997, with the aim of protecting the investments of agents (firms, research institutes, growers) in exploiting the commercial possibilities of a new cultivar of soybean seeds.

Kiihl & Calvo (2008) proposed that the reasons for the success of soybean in Brazil are due to a group of factors, namely: (a) competencies in terms of human resources with proper knowledge and skills; (b) research and improvement in genetics developed by highly skilled people supported by a pool of institutions, public at the beginning and private afterwards, following the change in the regulatory environment at the end of the 1990's; (d) mechanization and automation of high precision harvesting machines; and (e) the establishment of the Cultivar Protection Law in 1997.

Long before the beginning of the expansion of soybean cultivation in the 1960's and 1970's, there was an extended period of experimentation involving technicians and researchers concentrated in the states of São Paulo and Rio Grande do Sul. In Rio Grande do Sul efforts were initiated in the 1930's at the experimental stations sponsored by State Secretary of Agriculture which ran out of financial support and from then on counted on help from the *Instituto Privado de Fomento à Soja* (Private Institute for the Promotion of Soybean), which became the leading institution of research

ISSN 1809-3957

efforts at that time. In the state of São Paulo, soybean research started in the 1920's, led by Henrique Lobe at the Experimental Station of São Simão (linked to the Ministry of Agriculture). These developments evolved throughout the 1930's, 1940's and 1950's, entities such as the I*nstituto Agronômico de São Paulo*, State Secretary of Agriculture (Sao Paulo), Vegetal Oil Industry Union, among others, contributing greatly. All these pioneer movements targeting soybean research and development provided not only the necessary technical information but also contributed to the formation of an important group of technicians and researchers who later founded the today world-renowned Embrapa Soybean, a decentralized unit of the no less respected *Empresa Brasileira de Pesquisa Agropecuária*, which has become an international reference in its area (KIIHL & CALVO, 2008).

The Brazilian Agricultural Research Corporation (Embrapa) was founded on April 26, 1973, and is under the aegis of the Brazilian Ministry of Agriculture, Livestock, and Food Supply. Since its foundation, and with its partners from the National Agricultural Research System (NARS), the organization has taken on the challenge of developing a genuinely Brazilian model of tropical agriculture and livestock to overcome the barriers that limited the production of food, fiber, and fuel in our country.

Research in genetics and other improvements accounted for much of soybean productivity advances in Brazil. The country presented the best average genetic gains in yields when compared to the USA, India and Canada, with 26.4 kg/ha per year (KIIHL & CALVO, 2008). In terms of technological contributions, breeding for genetic potential of yield has been by far the most important issue in the soybean culture. And other relevant benefits may be emphasized. One innovation that deserves special mention is the adaptation of the soybean cultivars from temperate weather (chiefly USA) to a low latitude climate (KIIHL & CALVO, 2008). Due to this adaptation, a vast area in Central Brazil called the Cerrado, until recently unsuitable for agriculture due to poor soil conditions, became a new frontier in the production of grains.

Another important innovation that must be cited was the improvement in the genetic resistance to the most common pests specific to soybean culture (*Xanhomonas axonopodis*, *Cercospora sojina*, *Diaporthe phaseolorum*, among others). These pests were all combated through the extensive efforts of breeders and Plant pathologists. Technological advances in the harvesting field should also be commented on since now high precision planting machines carry out satellites controlled seeding work even with no lights at night.

In April 1997, the Brazilian government issued a regulation aimed at protecting the intellectual property of agents, guaranteeing the right to use and exploitation of new versions of cultivar seeds of plants or parts of them – the Variety Protection Law (BRAZIL, 1997). Because it guaranteed the right of the developer, investors became motivated to do inversions, concentrating on new improved seeds that could be commercially exploited. The repercussion of the law when we compare the years before, from 1968 to 1997, to 1998 and the following years; the number of new cultivars launched after the regulation multiplied by six. This law can be seen as a watershed moment in research and development activities. From that point on, private enterprise began to participate actively in the production of new species, targeting a profitable market worldwide for exportation of commodities. According to Tavares (2004), no one is interested in financing the necessary research to obtain a new cultivar without having the incentive of exclusive exploitation for a certain period of time.

Interestingly, the Cultivar Protection Law favored a partnership between public and private entities. This regulation was responsible for the beginning of work shared by public and private players which contributed to the widening of a web of experimenters and resulted in cultivars which were more adapted to the varied conditions of a continental-size country like Brazil. Tavares (2004) also contended that the application of the Law resulted in high performance varieties with gains in quality and productivity.

It is difficult to say precisely how much these two factors – knowledge & technology and legislation - presented in this study, accounted for the gains in productivity the soybean complex has experienced in the last decades. Nevertheless, the numbers produced via the Revealed Comparative Advantage model, in item 3 before, show that the soybean complex has experienced a boom in the last four decades. By the same token, the interest aroused after the Protection of Cultivar Law at the end of the 1990's was reflected in the number of certificates of new varieties launched, especially in the private sector, encouraging the inference that the new regulation has strongly contributing to the knowledge & technology factor.

In the case of public entities, state companies like Embrapa are still playing an important role in the research and development area, partnering public and private enterprises, giving space to new varieties which will be able to keep pace with recent innovations. Concerning the private sector, players like Monsanto are aggressively investing in new cultivars of soybean, also using acquisition strategies; recently Monsanto bought FT Sementes, an important producer of soybean seeds. According to Carvalho *et al*. (2007), this company has two thirds of the foreign companies' share of certificates of new soybean cultivars.

Although the soybean complex has been performing very well in the last decades, some problems stand in its way. There are inefficiencies with storage of grains and with the movement of the cargo from producer to exporting points. The main inhibitors of competitiveness relate to logistics, including storage and transportation. Long distance transportation of soybeans is done in large proportion by road (trucks). Roads are responsible for 67% of soybean transportation in the Central-West (Cerrado) region (TAVARES, 2004). Water ways and railways are insufficient to reduce truck participation by road. This method of transportation, combined with long distances between growing regions and sea ports limits global competitiveness by increasing costs.

V. CONCLUDING REMARKS

The competitive position of the Brazilian soybean complex has been attested in this paper using the Revealed Competitive Advantage Index and its derivations. Based on market share as a main indicator, the analysis showed the country as a strong international player going head on with vigorous producers like Argentina and United States, the most important exporters in the world. The information extracted from the RCA Index figures identified continuous performance improvement from the 1970's, which

ISSN 1809-3957

accelerated from the end of the 1990's until 2013, with China as one of the pillars of world demand for this specific kind of grain.

Explaining this milestone was the challenge assumed in this paper. The arguments were constructed to support two principal motives as the main factors justifying the success that the Brazilian soybean complex has achieved up to the present: firstly, knowledge & technology, as characterized by all the effort made in research and development; and secondly legislation, which provided the necessary incentives for new players, especially private enterprises, to invest in new high performance varieties of soy seeds.

Attaining the current favorable situation was based on the hard work of pioneers, something which agricultural history recognizes today. Soybean expertise had its origins mainly in the Southern states of São Paulo and Rio Grande do Sul in government research stations in the 1920's and 1930's, when the initial challenge was to adapt seeds from a temperate climate to a subtropical environment. All those hard working technicians and researchers, supported by research institutes and governmental departments, were the creative forces for entities which are renowned today, such as Embrapa and its subdivisions, e.g. Embrapa Soybean, and others. The development of a body of scientific knowledge was not due to random events or luck, but as a result of the work of those pioneers focused on experimentation. Along the way a great deal of this knowledge was transformed into applicable technology when high performance seeds became reality and could then be commercialized to farmers.

On the regulatory side, the issue of the Variety Protection Law in 1997 proved to be a watershed moment because of the incentive it provided to agents, especially private ones, by protecting their investment for a certain period (on average 10 years), permitting the exclusive commercial exploitation of new varieties of soy seeds.

These two factors combined probably account for a considerable part of the success that the Brazilian soybean complex is enjoying today, and they certainly represent important enhancers of competitiveness in the agricultural business environment. Other problems, however, such as logistics infrastructure inhibitors cannot be overlooked; limitations in storage capacity and a deficient road system are challenges which will have to be dealt with; but when appropriately dealt with, these inhibitors will undoubtedly become enhancers, and not only for the soybean complex.

VI. REFERENCES

BRAZIL. **Law 9,456 from April 25, 1997 (Variety Protection Law)**. Brazilian Federal Government. 1997.

BRAZIL / Ministry of Agriculture, Livestock and Food Supply. **Proteção de Cultivares no Brasil**. Brasília: MAPA/ACS, 2011.

CARVALHO, M.A. DE; SILVA, C.R.L. DA; GHILARDI, A.A. Competitividade da soja e a geração de divisas. **Revista de Economia e Agronegócio**, v.3, n.3, p.301-321, 2005.

CARVALHO, S.M.P. DE; SALLES-FILHO, S.L.M.; PAULINO, S.R. Propriedade intelectual e organização da P&D vegetal: evidências preliminares da implantação da Lei de Proteção de Cultivares. **Revista de Economia e Sociologia Rural**, v.45, n.1, p.9-26, 2007.

DALL'AGNOL, A.; HIRAKURI, M.H. **Realidade e perspectivas do Brasil na produção de alimentos e agroenergia, com ênfase na soja**. Londrina: Embrapa Soja, 2008.

DIAS, L.C.; GIBBERT, G.M.; SHIKIDA, P.F.A. Competitividade do açúcar brasileiro no mercado internacional. **Revista de Economia e Agronegócio**, v.4, n.4, p.457-484, 2006.

FARINA, E.M.M.Q. Competitividade e coordenação de sistemas agroindustriais: um ensaio conceitual. **Gestão e Produção**, v.6, n.3, p.147-161, 1999.

FERRAZ, J.C.; KUPFER, D.; HAGUENAUER, L. **Made in Brazil**. Rio de Janeiro: Campus, 1995.

FIGUEIREDO, A.M.; DOS SANTOS, M.L.; LÍRIO, V.S. Análise de market-share e fontes de variação das exportações brasileiras de soja. **Revista de Economia e Agronegócio–REA**, v.2, n.3, p.335-360, 2015.

GASQUES, J.G.; CONCEIÇÃO, J.C.P.R. DA. **Indicadores de competitividade e de comércio exterior da agropecuária brasileira**. Texto para Discussão 908. Brasília: IPEA, 2002.

GONÇALVES, R. Competitividade internacional, vantagem comparativa e empresas multinacionais: o caso das exportações brasileiras de manufaturados. **Pesquisa e Planejamento Econômico**, v.17, n.2, p.411-436, 1987.

HARTWIG, E.E. Breeding soybeans productive with a higher percentage of protein. In: **International Symposium Seed Protein Improvement in Cereals and Grain Legumes, 1978 Neuherberg**. International Atomic Energy Agency, Vienna, p.59-66, 1979.

IBGE. **Agricultural Census 2006**. http://www.sidra.ibge.gov.br. Accessed 04 Sept. 2014.

JANK, M.S.; NASSAR, A.M. Competitiveness and globalization. In: ZYLBERSZTAJN, D.; NEVES, M.F. (orgs.). **Economics and management of agro-food business: Industry of inputs, agricultural production, distribution**. São Paulo: Pioneira, 2000. 428p.

KIIHL, R.A. DE S.; CALVO, É.S. A soja no Brasil: mais de 100 anos de história, quatro décadas de sucesso. In: ALBUQUERQUE, A.C.S.; SILVA, A.G. DA (eds). **Agricultura tropical: quatro décadas de inovações tecnológicas, institucionais e políticas**. Brasília: Embrapa Informação Tecnológica, p.199-218, 2008.

KUPFER, D. **Patterns of competition and competitiveness**. Rio de Janeiro: IEI/UFRJ, 1993.

LAZZARINI, S.G.; NUNES, R. Competitiveness of the agro-industrial system of soybean. In: FARINA, E.M.M.Q.; ZYLBERSZTAJN, D. (orgs). **Competitiveness in Brazilian Agribusiness**. São Paulo, IPEA/PENSA/USP, p.194-420, 1998.

MEDINA, G.; RIBEIRO, G.; BRASIL, E.M. Participação do capital brasileiro na cadeia produtiva da soja: lições para o futuro do agronegócio nacional. **Revista de Economia e Agronegócio–REA**, v.13, n.1/2/3, p.3-38, 2016.

SHURTLEFF, W.; AOYAGI, A. **History of Soybeans and Soyfoods**. 1989.

TAVARES, C.E.C. **Fatores críticos à competitividade da soja no Paraná e no Mato Grosso**. CONAB. 2004. http://www.conab.gov.br/download/cas/especiais/Trabalho%20sobre%20Competitividade%20Soja%20MT%20e%20PR.pdf. Accessed 15 March 2007.

VII. COPYRIGHT

Submetido em: 28/04/2017
Aprovado em: 08/05/2017