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## ANALYSIS OF THE GENERATION OF FORMAL EMPLOYMENT BY THE SOYBEANS PRODUCTION CHAIN IN THE RIO GRANDE DO SUL STATE/BRAZIL: 2002-2015

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### ABSTRACT

The objective of the present paper is to characterize the Soybean Production Chain in Brazil, according to the activity codes of the Brazilian National Classification of Economic Activity (CNAE) and to measure the generation of formal jobs in Rio Grande do Sul State/Brazil. Proposes to identify the formal jobs generated along the soybean production chain to contribute to the performance of the formal labor market and to an economy of the municipalities. The definition of the productive chain has as its point Starting the PENZA (Agribusiness Knowledge Center) method and quantifying the results through the Programa de Disseminação de Estatísticas do Trabalho (PDET) from Brazilian government. Among the main results, we can mention the growth without number of jobs in the farm production and a great participation of the inputs to farming, responsible for providing seeds, machinery, fertilizers and other inputs for a soybean crop. The study concludes that the production chain in question is important to generation of formal employment of many municipalities in the Rio Grande do Sul State, Brazil.

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### INTRODUCTION

In recent years the Brazilian and world economies have faced considerable challenges, mainly as a result of the 2008 international financial crisis. Among the negative impacts of the economic crises are the loss of employment and income and the consequent reduction of social well-being. In this scenario, agribusiness plays an important role, since its economic performance contributes to the increase of production (agricultural, livestock and agro industrial) and the generation of new formal jobs. In this perspective, the objective of the present article is to measure the socioeconomic relevance of the Soybean Production Chain, mainly in relation to the generation of formal work stations.

Globally, soy assumes a role of importance for food security, because once processed, it gives rise to the soybean oil and soybean meal, used as animal food to poultry, pigs, fish, dairy cattle and cut, between others. This results in the supply of meat, eggs and milk, which are used as inputs for the production of various by-products or consumed in natura. Also, from the technological advances and possibilities resulting from food engineering, soybean derivatives have been used for the composition of various food products such as pasta, biscuits, chocolates, breads, cereals and nutritive drinks, among others (Costa and Santana, 2015). Soybean Production Chain provided economic and social changes in the State, such as increased services and marketing, the evolution of industrial processes with soybeans as raw material, increased poultry and swine meat production, development of road, port and logistics infrastructure (Brum et al., 2005).

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Although highly technified, soy processing agroindustry demands labor, just as it occurs in the activities developed along the production chain. In this context, the present study also proposes to characterize the Soybean Production Chain, based on the Brazilian National Classification of Economic Activity (CNAE) codifications and to measure the number of employees in this chain, as well as the total wage bill and the number of establishments in the state of Rio Grande do Sul. With this, it is hoped to analyze a part of the social and economic importance of this one that is the main productive chain of the agribusiness in local. In a special way, this study was guided by the following question: to what proportion the formal jobs generated along the soybean production chain, contribute to the performance of the formal labor market in Rio Grande do Sul. The research is segmented into four sections considering the introduction. The second presents the theoretical-methodological reference and the fourth, the results and discussions. The fifth section summarizes the final considerations of the study.

### Theoretical-Methodological Foundation

**The concept and the systemic nature of agribusiness and the soybean production chain:** Agribusiness is characterized by the systemic economic relations that include the various food and fiber production chains. In this process, the activities developed in farm production are seen from their potential to stimulate the segments that supply inputs and those that benefit the production (food processing). In this process, Research, Development & Innovation (P, D & I) assumed a fundamental role, since it was from the technological advances in the different links of the productive chains that it became possible to increase the productivity of food, fibers and energy and the expansion in possibilities of agricultural production (KING *et al.*, 2010).

This perception of the role of technological innovations in the development of economic activities was analyzed by Schumpeter (1988), who concluded that technological changes led to changes in the use of natural resources, in productivity growth, in production costs, and in generation of income. In Brazil, this process of development of agribusiness and promotion of P, D & I can be analyzed from three phases, which mark the development of modernization in the national territory: a. the emergence of Agroindustrial Complexes (CAIs); b. the manufacture of agriculture and; c. the consolidation of financial capital. In the case of soybeans production chain, it is identified that include several agents, farmers, organizations, cooperatives and agroindustries, who inter-relate by promoting the dynamization of the soybean agroindustrial complex. Also, the soybean production chain can be defined as the set of activities that involve the supply of inputs, production, processing, commercialization and distribution of soybean and its derivatives to the final consumer. The soybean production chain is conceptualized as a sequence of linked activities that starts in the segment that produces and supplies inputs for the crop, aggregates the production inside the farm, the processing agroindustry and other industries that use soy and derivatives for the intended production to final consumption. In this, there are sets of factors that have a direct influence on competitiveness levels, actors establish governance strategies and the relationship with foreign trade is a highlight, mainly for the export of grain, bran and oil, by the cooperatives, tradings and agroindustries that are in operation in the different regions of Brazil.

According to ZYLBERSZTAJN (2005), productive chains have been reinventing themselves due to technological innovations and changes in the profile of consumers. Economic agents are interconnected and transform a given input into a final product assigned to the final consumer, which can be a service or a good. It is therefore a sequence of operations, covering the technical stages, from the production of raw materials to distribution.

### The labor market associated with the Soya Production Chain

As in all economic activity, labor is essential and is present at all stages of the soybean production chain. For Najberg and Pereira (2004) the jobs can be classified in:

- **Direct Labor:** Supplementary labor, necessary to supply the increase of production, which is influenced by the increase of the demand of a given product. Only in direct employment can there be variation in levels of jobs dependent on the demand for each sector.
- **Indirect Employment:** They arise in the middle of the links that make up the productive chain, originating from the inputs needed to generate a final product. Generating, thus, increase of jobs along the productive chain.
- **Employment income-effect:** Transformation of income into consumption of goods or services, increasing the supply of employment in different sectors. In the companies occurs through the sale of products and by-products and the receipt of fees, turning into the billing of workers and entrepreneurs.

### Methodological course: a proposal to estimate the jobs generated by the Soybean Production Chain

According to the taxonomy presented by Sampieri, Collado and Lúcio (2013), this is an exploratory and descriptive research that is characterized by its non-experimental character, since the researcher does not control the variable or its effects. This provides the possibility of observing the phenomenon in its original nature, but it is possible to analyze variables susceptible to environmental effects. The research was delineated from five stages:

- The first was to describe the soybean production chain taking into account all the economic activities recorded in the Brazilian National Classification of Economic Activities (CNAE). The Pensa method, described by Neves (2004), was used to define the activities that integrate the productive chain.
- In the second stage, through bibliographic research and theoretical consultation to specialists, the codes of economic activities that were considered as part of the soybean production chain were validated;
- In the third stage, the research accessed the database of the Labor Statistics Dissemination Program (PDET), with access to the Annual Information of Social Information (RAIS) for the measurement of employment (direct labor), income and establishment;
- The fourth step included the classification of the data and quantification of the following indicators:
  - a. Number of active jobs (direct labor): represents the number of formal employees hired by the Brazilian

- Consolidation of Labor Laws (CLT) with active jobs on December 31 of each year analyzed;
- b. Number of establishments: it depicts the number of active and / or public organizations active on December 31 of each year analyzed;
- c. Wage mass: is the sum of all wages paid to workers, with reference in the month of December of each year;
- d. Average Income: is obtained by quotient of the number of active jobs by the Payroll.
- In the fifth stage, the results and discussions were presented and the importance of the soybean production chain for the formal labor market of Rio Grande do Sul was identified. The data from 2002 to 2015 of all the municipalities of Rio Grande do Sul were analyzed.

## RESULTS AND DISCUSSIONS

This section is divided into two subchapters. The first presents the characterization of the soybean production chain, in line with the economic activity classes of the Brazilian National Classification of Economic Activities (CNAE). In the second sub-chapters, the frequency of jobs generated by the soybean production chain in the state of Rio Grande do Sul was presented.

### Characterization of the Soybean Production Chain in Brazil

The concept of agribusiness was proposed by Davis (1956) and Davis and Goldberg (1957) and contemplates, in essence, the systemic and broad approach of an economic environment characterized by a complex number of market relations. Similarly, the Soybean Production Chain, which together with the other food, fiber and bioenergy production chains, makes up the agribusiness, is integrated by the economic activities related to the production and supply of inputs for the soybean crop (farming production), by the activities that occur in the interior of the rural establishments that produce soybeans, the food processing industry and other industries that use the soybean meal and soybean oil for the production of final goods. The characterization of this, which is one of the chains responsible for a significant volume of exports and income is important, since it can subsidize specific analyzes with the bias of the formulation of public policies and actions for the management and competitiveness of chains (Costa and Santana, 2015)

In this research, the Pensa method, described in Neves (2006), was used to characterize the Soybean Productive Chain. In this context, initially, a preliminary system of the production chain based on Costa and Santana (2014) was designed. Based on this and based on the Brazilian National Classification of Economic Activities (CNAE 2.0), stratified activities that have a direct relationship with the soybean production chain. Table 1 presents the CNAE 2.0 activities linked to the production chain and which are upstream of soybean production. Economic activities related to the production of inputs for the soybean crop in Brazil according to the CNAE 2.0 code: 2006 to 2015.08.91-6 Mineral extraction for the manufacture of fertilizers and other chemical products:

- 08.91-6 Mineral extraction for the manufacture of fertilizers and other chemical products;
- 20.12-6 Manufacture of intermediates for fertilizers;

- 20.13-4 Manufacture of fertilizers;
- 20.51-7 Manufacture of pesticides;
- 28.31-3 Manufacture of agricultural tractors;
- 28.32-1 Manufacture of agricultural irrigation equipment;
- 28.33-0 Manufacture of agricultural and forestry machinery and equipment, except for irrigation;
- 46.11-7 Trade representatives and agents engaged in trade in agricultural raw materials;
- 46.61-3 Wholesale of machinery, apparatus and equipment;
- 46.83-4 Wholesale trade in pesticides, fertilizers, fertilizers;
- 46.92-3 Wholesale trade in general merchandise, agricultural inputs;
- 47.32-6 Retailing of lubricants;
- 52.11-7 Storage;
- 77.31-4 Renting of agricultural machinery and equipment without operator.

Among the economic activities stratified and characterized as suppliers of inputs for soybean cultivation and registered in the CNAE, it was possible to observe the presence of several industries, such as fertilizers, pesticides, machinery, equipment and service activities, especially commerce. In the central link of the production chain, besides the code related to soybean cultivation, the production of seeds, support and post-harvest activities

Economic activities related to soybean cultivation in Brazil: 2002 to 2015.

- 01.15-6 Soybean cultivation;
- 01.41-5 Production of certified seeds;
- 01.61-0 Support activities for agriculture;
- 01.63-6 Post-harvest activities.

The downstream link of production was characterized by activities related to the production of vegetable oils, margarine and other vegetable fats, and the manufacture of biofuels.

Economic activities related to soybean processing in Brazil: 2002 to 2015.

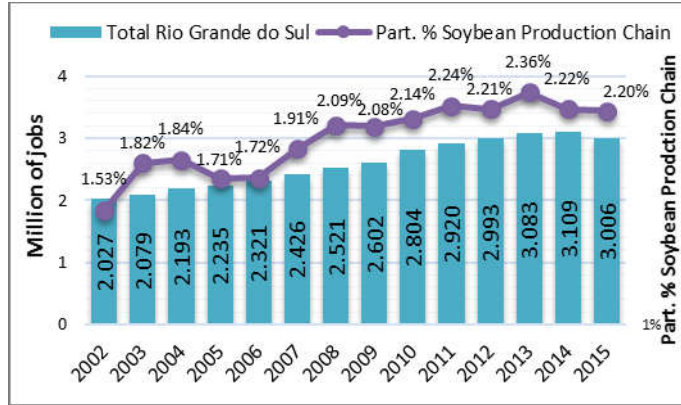
- 10.41-4 Manufacture of raw vegetable oils, other than maize;
- 10.42-2 Manufacture of refined vegetable oils other than maize oil ;
- 10.43-1 Manufacture of margarine and other vegetable fats 19.32-2 Manufacture of biofuels, except alcohol.

Considering that the historical series analyzed in this study began in 2002 and that until 2005 was the CNAE 1.0, being replaced by CNAE 2.0 from 2006, the economic activity codes linked to the soybean production chain in the years prior to 2006 correspond to the codes of CNAE 1.0, according to the table of correspondence between CNAE 1.0 x CNAE 2.0 (BRASIL, 2006).

### The formal labor market of the Soybean Production Chain in Rio Grande do Sul/Brazil

In order to analyze the formal labor market in the Rio Grande do Sul State and measure the importance of the Soybean Production Chain for the same, it was calculated the frequency of active jobs of all classes of economic activities. Data were

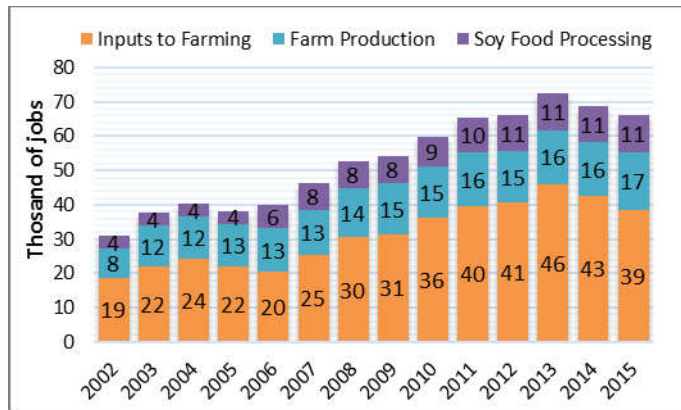
obtained from the Annual Social Information Relation (RAIS), available in Brazil (2016). The analysis showed the growth in the number of formal jobs in the Rio Grande do Sul State, which increased from BRL 2.03 million to BRL 3.01 million in the period 2002-2015. In this interval, the share of the Soybean Production Chain increased from 1.53% to 2.20%, as can be seen in Figure 1.



Source: Elaborated by the authors from Brazil (2016).

Figure 1. The Formal Labor Market of Rio Grande do Sul State/Brazil: 2006-2015

Part of the growth can be explained by the intensification and formalization of activities in sector of inputs to farm, from about 19 to 39 thousand jobs between 2002 and 2015. It has also been possible to identify that formal linkages in the farm production increased from 8.4 to 16.8 thousand, and in soy food processing, growth was 180%, from 3.8 to 10.7 thousand in the period analyzed (Figure 2).

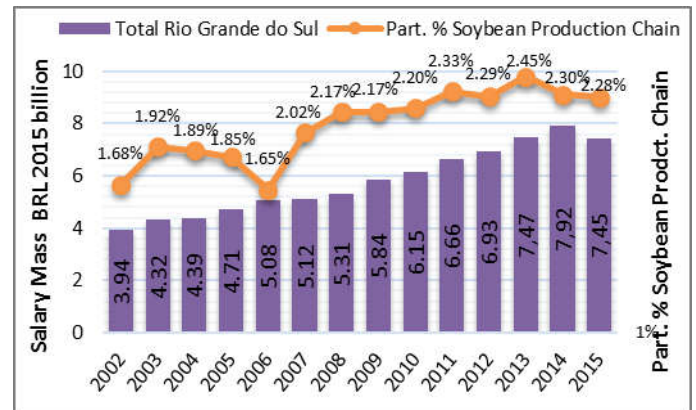


Source: Elaborated by the authors from Brazil (2016).

Figure 2. Number of jobs in the Soybean Production Chain in Rio Grande do Sul: 2006-2015

In relative terms, the chain achieved greater importance in the following municipalities: Não-Me-Toque (54% of formal jobs), Independência, Jari, Tupacireta, Panambi, Coxilha, Nicolau Vergueiro and Boa Vista do Cadeado, both with a percentage between 34% and 30% of total active jobs. In nominal terms, the municipality of Panambi is the one that generated the most jobs in the soybean chain (4,407). Não-Me-Toque (3,926), Rio Grande (3,876) and Passo Fundo (3,075), after Panambi, were the municipalities with the highest number of registered jobs. Together, the municipalities of Panambi, Não-Me-Toque, Rio Grande, Canoas, Passo Fundo, Santa Rosa, Horizontina and Porto Alegre account for 51% of the jobs generated in the segment that supplies inputs to the crop. Not by chance, they constitute in the segments of

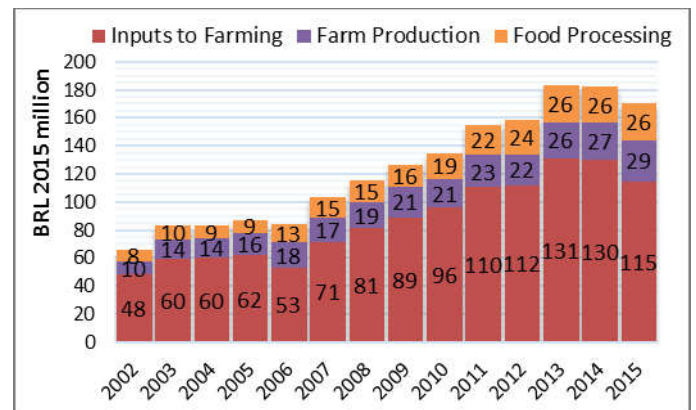
machinery and equipment for agriculture and fertilizers. On the other hand, the municipalities of Tupanciretã, Cruz High, Passo Fundo, Carazinho, Barra do Ribeiro, Porto Alegre, Júlio de Castilhos and Santa Cruz do Sul account for 25% of the posts generated in farm production. In Rio Grande, Sarandi, Ijuí, Cachoeira do Sul, Veranópolis and Canoas, there are approximately 29% of the formal work posts that are food processing, mainly related to the wholesale soybean trade and the manufacture of soybean meal and soybean oil. This performance caused the soybean chain to account for 2.28% of the RS salary mass in 2015, compared to 1.68% in 2002, as can be seen in Figure 3.



Source: Elaborated by the authors from Brazil (2016).

Figure 3. Total Salary Mass (BRL 2015 billion) Rio Grande do Sul State/Brazil and Soybean Production Chain: 2002 – 2015

In real terms, these jobs were responsible for a wage bill of BRL 170.1 million in the economy of the state of Rio Grande do Sul in 2015 and injected BRL 183.4 million in 2013. From Figure 4 it is possible that the bulk of the wage bill is in the inputs to farming sector, but the farm production and soy food processing are also important as they have significantly increased their wage masses and in 2015 they accounted for BRL 29.4 and 25.9 the local economy.

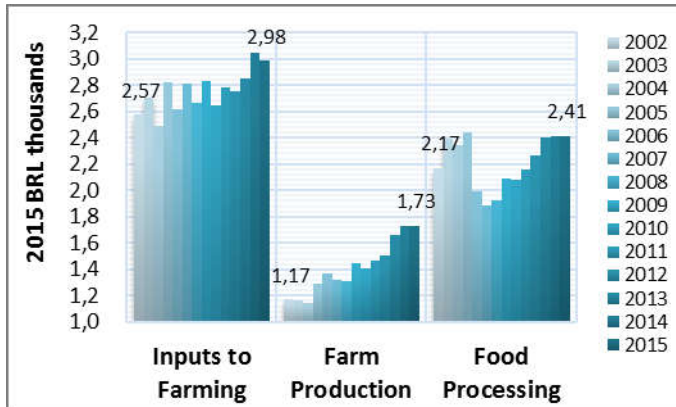


Source: Elaborated by the authors from Brazil (2016).

Figure 4. Wage Mass (2015 BRL million) of the Soya Productive Chain Formal Employees in Rio Grande do Sul: 2002 – 2015

The data show that in at least 442 municipalities in the state of Rio Grande do Sul, work portfolios signed with codes linked to the soybean production chain were identified. Also, for 74 municipalities, the salary mass of the soybean production chain represented at least 10% of the total. In municipalities like Não-Me-Toque, Horizontina and Panambi, the wage bill in the production chain represented 63%, 42% and 40% of the

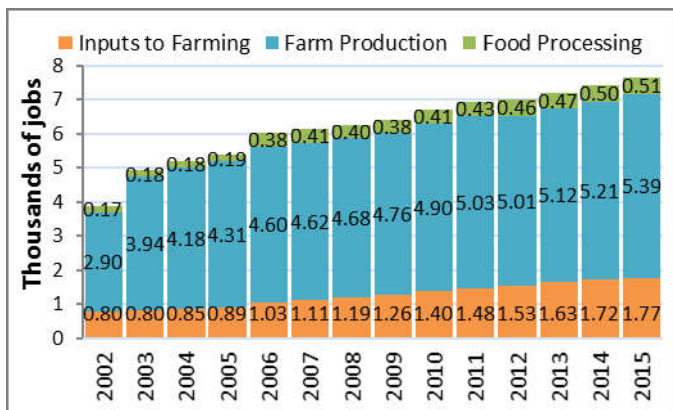
total, respectively. In average terms, the highest wages are in the link that supplies inputs to the crop, which in 2015 was BRL 2,983.87. The soy food processing has a relatively lower average salary of BRL 2,411.06, while the average salary of employees on farms is BRL 1,731.21. On the other hand, it was identified that the highest wage gains were achieved by employees who are in the production link, which gave a real increase of 48% in the analyzed period (Figure 5).



Source: Elaborated by the authors from Brazil (2016).

**Figure 5. Average salary (2015 BRL thousands) of the employees of the Soybean Production Chain of Rio Grande do Sul: 2002 - 2015**

Regarding the number of employers, it was possible to identify growth from 3,865 to 7,660 in the analyzed period, with emphasis on the production link that was responsible for about 70 to 80% of chain establishments (Figure 6).



Source: Elaborated by the authors from Brazil (2016).

**Figure 6. Number of Employers in the Soybean Production Chain in Rio Grande do Sul State/Brazil: 2002 - 2015**

The municipalities of Cruz Alta, Tupanciretã, Carazinho, Júlio de Castilhos, Passo Fundo, Viamão, Santa Barbara do Sul, Cachoeira do Sul, Palmeira das Missões, São Luiz Gonzaga, Espumoso and Jóia are the ones that have more agricultural establishments that employ with portfolios signed work. In the downstream segment of production, the low number of companies in the year 2015 is noteworthy. Only seven companies with the code "biofuels manufacture, except alcohol" were identified, two in the municipality of Ijuí and the other in Erechim, Fazenda Vilanova, Passo Fundo, Rosario do Sul and Veranópolis; in the CNAE code "manufacture of Margarine and Other Vegetable Fats" it was possible to identify one company in Frederico Westphalen and another in Estância Velha. On the other hand, there were identified 60 establishments linked to the CNAE classification "manufacture

of crude vegetable oils, except 18065-18070 corn oil" and 429 organizations related to the "manufacture of crude vegetable oils, except corn oil". Having said that, it is worth highlighting, based on the reading of the data aggregate, the growing participation of the Soja Productive Chain in the formal labor relations of Rio Grande do Sul. Also, the systemic character of the activities that make up the Productive Chain, once which a considerable part of them also compose other productive chains. As a result, to some extent the measurement performed overestimated the data, but on the other hand, the statistics do not consider the labor relations not formalized, which underestimates the job creation potential of the chain. Therefore, the interpretation of these data imposes some limitations, but the selected economic activity codes allow progress in the analysis of the process of formalization of work along the chain and its contribution to the generation of jobs and increase of income in the economies of the Gaúcho municipalities.

### Final considerations

The present study proposed a reflection on the characterization of the soybean production chain and the analysis of its contribution to the formal labor market. Even in times of economic crisis, the potential for generating formal jobs and income for activities related to the chain was identified. Given the scenario, it should be noted that the economic performance of the analyzed chain provided an increasing generation of formal jobs, a real increase in the salary mass and the average salary. This attests to the relevance of the socioeconomic relevance of the chain in question, especially for municipalities that house machinery and equipment industries and other segments that provide inputs to the crop. The main conclusion of the study is that the soybean chain accounts for approximately 2.20% of the formal work posts and 2.28% of the wage mass in the state of Rio Grande do Sul. Data from the Labor Statistics Dissemination (PDET) program associated with the Pensa method experience allowed us to meet the research objectives. The results of the research reinforce the systemic character of the economic relations related to the soybean crop and show that associated to the cultivation of the main Brazilian agricultural commodity there is a considerable contingent of people and companies that contribute to the generation of employment and income in the great majority of the municipalities of the state of Rio Grande do Sul.

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