Competitiveness and efficiency of feed corn agribusiness in Brazil

Recebimento dos originais: 20/05/2014
Aceitação para publicação: 30/08/2015

João Batista de Freitas
PhD in Agribusiness
Instituição: State University of Rio Grande do Norte (UERN)
Endereço: BR 405, Km 03, Bairro Arizona, Pau dos Ferros/RN.
CEP: 59900-000.
E-mail: **freitasjb.brasil@gmail.com**

Jean Philippe Palma Revillion
PhD in Agribusiness
Instituição: Federal University of Rio Grande do Sul (UFRGS)
Endereço: Av. Bento Gonçalves 9500, Porto Alegre/RS.
CEP: 91501-970.
E-mail: **jeanppr@gmail.com**

Luiz Clovis Belarmino
Master in Applied Economics
Instituição: Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA)
Endereço: BR 392 Km 78, Distrito de Cascata, Pelotas/RS.
CEP: 96001-970.
E-mail: **luiz.belarmino@embrapa.br**

Leandro Pessoa de Lucena
PhD in Agribusiness
Instituição: Federal University of Mato Grosso (UFMT)
Endereço: Rodovia Rondonópolis-Guiratinga, Km 06 (MT-270), Rondonópolis/MT.
CEP: 78700-000.
E-mail: **lepecena@hotmail.com**

Abstract

The objective of this paper is to analyze the competitiveness of Brazil's corn crop of 2009/10, through the Policy Analysis Matrix (PAM) in the light of the New Institutional Economics (NIE). The method used was the instrument of Policy Analysis Matrix (PAM), developed by by Monke y Pearson (1989). The model is based on economic indicators, drawn from feed corn agribusiness in Brazil, with the following data: income, costs and revenues. To Develop the study, the data used corresponded to the 2009/10 crop year. The results indicate that there is private profitability in Brazil's region; however, the index of Rates of Subsidies to Producers (RSP) confirms that the agricultural corn production systems in Brazil were net taxed and private profits were reduced, compromising its production and commercialization. Finally, it is concluded that the distorting policies associated to market imperfections directly affected the corn production systems, according to the corn PAM in Brazil. Parallel to this, the literature of the New Institutional Economics explains that the state can act in this context, in order to establish harmony between the market behavior and its agents which are inserted in this setting.

Keywords: Policy Analysis Matrix. Market imperfections. New Institutional Economics.

1. Introduction

Corn is a notable cereal in the agribusiness world, given that it is the most widely consumed grain in the world, as it is considered of high nutritional content for both humans and animals. Currently, Brazil is the world's third largest producer and exporter of this grain, in this context, the research gave rise to the following question: In what condition do we find the dynamic structure of Brazil's corn trade, considering the State's performance as institutional agent in this market?

The importance of corn as raw material is unquestionable. Industry uses it for making biscuits, breads and other food products, it is also used as raw material in the production process of feedstock. In addition, there is a constant and representative demand by the United States of America for the production of ethanol.

According to World Agricultural Supply and Demand Estimates – WASDE (WASDE, 2011), Brazil is the world`s third largest producer of corn, with 58.41 million tons of grain produced, second only to China, with 163.63 million tons of grain produced, followed by the United States, with 348.76 million tons of grain produced. The production of the 2009/10 harvest was of approximately 1,110.17 billion tons of grain produced.

The corn production chain in Brazil represents an important sector of the national agribusiness, because besides contributing significantly both in the construction of the Gross Domestic Product (GDP), as well as generating employment and income among its federal units, the industry is also responsible for a substantial portion of tax revenues in the country. Considering a historical series of national corn harvests of 1976/77, when the average yield was 27.2 bags/ha (bushel/acre), values are only greater than 60 bags/ha from the 2006/07 season onwards, after this period, income has been appearing progressively more positive each year (CONAB, 2010b).

Currently, Brazil's corn production is absorbed by the following segments: poultry (44%), pork (25%), cattle (5%), other animals (2%), industrial consumption (9%), human consumption (1%), loss/seeds (1%), export (13%) (ABIMILHO, 2010). This represents directly or not a product whose function in human feeding is predominant. However, there are

also serious challenges for the sector, such as the logistical infrastructure (ports, roads and warehouses); taxation, lack of credit destined for costs; planting and investment, among others.

In relation to the taxes levied on corn, they befall on the entire supply chain flow (processing and marketing), occurring cumulatively, which contributes to the increased cost of production resulting, subsequently, in considerable increases in their prices. Therefore, to understand the impact that taxes have on the final price of food, it is necessary to analyze the mechanisms and taxation levied on every step of the production chain.

In general terms, there are a significant number of embedded taxes on food, which have particular and specific variations in relation to the collecting sources, i.e., the federal states of Brazil. Note that, due to multiplicity of taxes, tax rates and their impact on the raw materials, indirect taxes resulting from this complex system are far from being transparent. With respect to foreign market, there is an exemption on primary and semi-prepared manufactured commodities regarding the collection of the Tax on Circulation of Goods and Services – ICMS (value that can range up to 25%), assured by the Complementary Law Nº 87 of 13 September 1996 (Act Kandir).

As we can see from above, Brazil has a unique role in food production on the world stage, according to the agricultural outlook for 2011-2020, which indicates its potential and importance in this context, particularly in the grain market (OECD/FAO, 2011); therefore, this scenario demonstrates the relevance of studies on agricultural production systems in Brazil. In this sense, the article aims to analyze the competitiveness of corn in Brazil, through the Policy Analysis Matrix (PAM), developed by Monke y Pearson (1989), in light of the New Institutional Economics.

Given the importance of the corn agribusiness in Brazil's food scope, the application of the PAM model as an analytical tool Identifies a series of elements that are intrinsic to the production chain, at the same time verifying the effects of policies on private profitability, besides analyzing impacts on society (KYDD et al., 1997; BERNAL et al., 2011). Henceforth, this research contributes to reflection on the theme presented, with the understanding that specificity and particularity in agricultural policies can contribute to the consolidation of the agribusiness corn, resulting in a more efficient and competitive business dynamic in the world food trade.

2. Materials and Methods

The analytical instrument used in this study was the Policy Analysis Matrix (PAM), developed by Monke y Pearson (1989). The model is an accounting tool That Gives consistency to the analysis of economic policies, Which AIMS to present a detailed description of the systemic structure on the basis of the Incidence of incentives or disincentives to Economic agents, as well as to analyze the impact of direct policies at chain level (in the form of taxation, subsidies, trade restrictions and distortions in the exchange rate), whose attention is directed to efficient patterns of production and price which, in turn, has an effect on the competitiveness of the chain (Table 1), by Monke y Pearson (1989).

2.1. Operationalizing the model

The first step is the selection of production systems most representative of the agricultural sector, to better meet the objectives of this study. The second step is to collect data which, in turn, are: price (private and social), quantity of production, input and services used (private and social); at that juncture, it becomes necessary to determine a parameter which will be the basis of analysis in the matrix, thus this element becomes thus the most efficient production system of the same activity/sector, so that this parameter will take social values and, thus, the model is replaced by the "private values" that correspond to the agricultural production system, object of study, and the "social values" that correspond to the most efficient agricultural production system, ie., parity prices (or even international prices in each level called "border prices").

Production costs are classified as "tradable inputs" that correspond to the raw material used in the production process, and "domestic limiting factors" that correspond to productive resources covering: land, capital, labor and technology. Input prices abroad are converted into international currency, so this is done considering the CIF (cost insurance and freight) prices of imported inputs and prices FOB (free on board) for the exportable. Social values are important measures of efficiency for production systems, because these parameters are used to reflect the scarcity or the social opportunity costs in alternative activities.

The first identity of the matrix is formed by: A, B, C and D, and these refer to the values corresponding to the agricultural production system studied. The second identity

formed by: E, F, G and H, corresponding to the values of agricultural production system on parity at the international level. The third identity formed by I, J, K and L, are the elements which refer to the differences between private and social values of revenues, costs and profits.

Table 1: Policy Analysis Matrix (PAM)

	Revenue	Production Costs		Profits
		Tradable Inputs	Domestic Inputs	
Private Prices	A	B	C	D
Social Prices	E	F	G	H
Effect of divergence and efficiency policies	I	J	K	L

A (revenue of the agricultural production system studied); **B** (inputs spent on the agricultural production system studied); **C** (production factors spent on the agricultural production system studied); **D** (profit of the agricultural production system studied); **E** (revenue of the agricultural production system over parity at international level); **F** (inputs spent on the agricultural production system over parity at international level); **G** (profit of the agricultural production system over parity at international level); **H** (profit of the agricultural production system studied over parity at international level); **I** (revenue transfers = A - E); **J** (input transfers= B - F); **K** (factors transfers = C - G); **L** (net transfers = D - H ou I - J - K).
Source: Monke y Pearson (1989)

Note: In superscript listed below, the d Indicates that the variable value is observed (market price) and the superscript s indicates the social value of the parameter

1- **A** = $p^d q^d$, private revenue, in which p^d: private price of the product; q^d: total quantity of the product;
2- **B** =$\sum p_j^d q_j^d$, private cost of tradable inputs, in which p_j^d: private price of input i; q_j^d: quantity of input i used.
3- **C** =$\sum w_j^d l_j^d$, private cost of domestic inputs, in which w_j^d: private price of input j; l_j^d: quantity of input j used;
4- **D** = $\eth^d$, private profitability = A - B - C;
5- **E** = $p^s q^s$, social revenue, in which p^s: social price of the product; q^s: total quantity of the product;
6- **F**= $\sum p_i^s q_i^s$, social cost of tradable input, in which p_i^s: social price of input i; q_i^s: quantity of input i used;
7- **G**= $\sum w_j^s l_j^s$, social cost of domestic input, in which w_i^s: social price of input j; l_j^s: quantity of input j used;
8- **H** = $\eth^s$, social profitability = E - F - G;
9- **I**, transfers associated with production = A- E;
10- **J**, transfers associated with the cost of tradable inputs = B - F;
11- **K**, transfers associated with the cost of domestic factors = C - G;
12- **L**, net transfers = D - H ou = I - J- K.

The PAM results in some indicators, which can be understood in Table 2, below:

Table 2: Synthesis of the Indicators of the Policy Analysis Matrix (PAM)

Indicator	Purpose	Result
Private Profit **(LP)** = A-B-C	It serves to show the competitiveness of the agricultural system, given the technologies and production values and costs of production.	Positive value (D> 0), agents are earning extra profits. Negative value (D<0), agents will be encouraged to abandon the activity if there is no factor to change their profitability.
Social Profit **(LS**) = E-(F+G)	Measures the efficiency of the production chain and its comparative advantage in agricultural system under analysis.	Positive value (H> 0), the system under consideration will spend scarce resources to produce, at social price, which will fall far short of private, negative (H <0),will be beyond the resources of the private costs.
Policy Net Transfer **(TLP)** = D-H ou **(TLP)** = I-J-K	Indicates the sum of all the policies considered, i.e, effects on the price of the product, the cost of tradable inputs and the factors cost.	Positive value, the government transferred certain monetary value. to the chain, through public policies, Negative value, the government transferred from the chain, through public policy, certain amount of income.
Private Cost Ratio **(RCP)** = C/(A-B)	The indicator measures the profitability of the production system considering the private cost figures.	The lower this ratio, the greater the competitiveness of the system. Minimizing the RCP means maximizing the chain's private profit.
Domestic Resource Costs **(RCD)** = G/(E-F)	The indicator allows us to evaluate each chain and compare chains or systems that produce different products. The lower this ratio, the greater the competitiveness of the system.	Should it be equal to the unity, the value added at international prices is exactly equal to the corresponding value of domestic inputs used in production. Minimizing the RCD means maximizing the chain's social profit.
Nominal Protection Coefficient **(CPN_p)** = A/E	It serves to compare the revenues, or be it, of the private price revenue to the social price (international equivalent).	Value greater than the unit indicated, positive protection occurs. Less than 1 (one), there is a lack of protection or a form of implicit taxation.
Nominal Protection Coefficient **(CPN_i)** = B/F	It is used to compare expenses on tradable inputs (international equivalent).	Value greater than the unit indicated, deprotection occurs. Less than 1 (one), positive protection received by the chain occurs.
Effective Protection Coefficient **(CPE)** = (A-B)/(E-F)	It indicates the extent of incentives or taxation the system receives from policies targeted to the product.	Value greater than the unit, the product is being protected and domestic factors are being paid above international prices; the value being less than the unit, the system is receiving returns lower than those that could be obtained in the absence of distortions.
Profitability Coefficient **(CL)** = (A-B-C)/(E-F-G) ou D/H	It measures the total effect of the incentive of the policies and serves as a "proxy" for the policy net transfer.	Positive value, the activity is net subsidized. Negative value, the activity is being net taxed.
Ratio of the Subsidy for Producers **(RSP)** = L/E ou (D-H) /E	It shows how much incentive or disincentive the system is receiving, through comparisons of the extent in which policies subsidize systems.	Positive value, there are chain subsidies. Negative value, there is chain taxation.

A (revenue of the agricultural production system studied); **B** (inputs spent on the agricultural production system studied); **C** (production factors spent on the agricultural production system studied); **D** (profit of the agricultural

production system studied); **E** (revenue of the agricultural production system over parity at international level); **F** (inputs spent on the agricultural production system over parity at international level); **G** (profit of the agricultural production system over parity at international level); **H** (profit of the agricultural production system studied over parity at international level); **I** (revenue transfers = A - E); **J** (input transfers= B - F); **K** (factors transfers = C - G); **L** (net transfers = D - H ou I - J - K).
Source: Adapted from Monke y Pearson (1989)

It is noteworthy that, said matrix is relevant worldwide due to their applicability and their contributions to society, as seen through the following most recent scientific publications: (Mane-Kapaj et al., 2010; Barrera-Rodriguez et al., 2011; Currid-Halkett y Stolarick, 2011; Martin y Van Noordwijk, 2011; Picazo-Tadeo y Wall, 2011; Rastegaripour et al., 2011; Sabaouhi et al., 2011; Sousa et al., 2011; Ernesto Bobadilla-Soto, Espinoza-Ortega y Ernesto Martínez-Castañeda, 2013; Katic et al., 2013; Sirajuddin et al., 2013; Soares et al., 2013; Zheng et al., 2013).

2.2. Delineation of data sources

To Develop the study, the data used corresponded to the 2009/10 crop year. Therefore, the private and social values referring corn production in Brazil Were Collected from Various sources (Table 3). To this end, the monetary values Were Adopted converted U.S. dollars, and the conversion parameter was bags per hectare.

Table 3: Origin of data sources

Agricultural Systems	Source: production cost	Source: prices per stock exchange listing
North Region	(CONAB, 2010a)	(SAFRAS, 2011)
Northeast Region	(CONAB, 2010a)	(FAZENDEIRO, 2011)
Midwest Region	(CONAB, 2010a)	(IHARA, 2011)
Southeast Region	(CONAB, 2010a)	(SAFRAS, 2011)
South Region	(CONAB, 2010a)	(FAZENDEIRO, 2011)
Brazil	(CONAB, 2010a)	(FAZENDEIRO, 2011)
International Market	(WASDE, 2011); (USDA, 2011).	(CBOT, 2011)

CONAB = National Supply Company; WASDE = World Agricultural Supply and Demand Estimates; USDA = United States Departament of Agriculture; Fazendeiro = Fazendeiro"*homepage*"; IHARA = Iharabras S/A Chemical Industries; SAFRAS = Agroeconomics Consultancy Group; CBOT (Chicago Board of Trade) = Chicago Stock Exchange

Brazil is a continental country, thus the agricultural production systems present diverse and particular characteristics, therefore, studying the production of corn at the national level is a complex activity. For this purpose, the methodology developed was focused in order to minimize these differences so that the result becomes closer to reality. Thus, the data were

formatted in three steps, until the time they were inserted in the PAM. After the structuring of the matrix, relevant analysis was carried out in the section "discussion of the results."

Initially, Phase - 01 came about with the definition of the costs of corn production by region. It was Observed that the production costs collected were, in fact, municipal, agricultural systems, these in turn had higher yields than the average per hectare in their regions, according to data from 2009/10 (CONAB, 2010a), hence, we Adopted the equity principle for the metrical production costs of these Municipalities to determine the values of each region, therefore, municipality was defined from the principle of randomness, to represent their respective region with this, pondered average was applied to the data Collected (Table 4), considering the average income of the respective regions, which corresponging values for each region, so we allowed us to establish the adopted the same criterion to define the production costs of the corn agricultural system in Brazil (Table 4).

For Phase - 02, we adopted as parity data referring to the costs of "tradable inputs" of corn in the productive system of the United States of America - USA, 2009/10 yield, since according to the precepts of the PAM, the parity values must match the efficiency parameters, either in import or export levels, so the type of product studied is what determines the references. Regarding the international price of corn, we adopted the listings of the Chicago Stock Exchange, at a value of US$: 17.76 per bag per hectare, on the date of 08/26/2011.

Since the USA is the world's largest exporter of corn, it has been used with reference to the FOB values, w hose exchange rate in US dollars was of US$: 1.605, on the date of 08/26/2011. It is worth mentioning that the parity values of tradable inputs used in the USA correspond to the Heartland region, which is the biggest producer of corn in the country and represents 22% of the properties, moreover, the region recorded a yield of 161 bags per hectare.

For the definition of social values relating to "domestic factors" we considered the respective costs of private domestic factors existing in Brazil, and added an index which was used to readjust savings amounting to 7.1785% per annum, commensurate to the one accumulated in the previous 12 months. The index was obtained through the Central Bank of Brazil, so we adopted the understanding that this readjustment would present a panorama of opportunity cost.

The development of Phase – 03 came about from the price of corn in the five regions of Brazil on 08/26/2011, followed by its conversion into US dollars, whose value was US$: 1.605 on the same date (Table 4). The price of corn for Brazil was defined using an arithmetic

average of the five regions studied, also for the respective date. The value of corn in the international market was quoted by the Chicago Stock Exchange *(*Chicago Board of Trade - CBOT*)*.

Table 4: Set of private values to be used in the Policy Analysis Matrix (PAM)

Regions	Production in thousand tonnes	P.p-rg in %	Rd-rg in kg/ha	I.C-rg in $/ha/	F.D-rg in $/ha/	Valor in $/sc	I.C-BZ in $/ha/	F.D-BZ in $/ha/	Value BZ/$/SC
North	1,286.50	02	42*	343.67*	167.65*	14.02 *	6.87	3.35	0.28
Northeast	4,273.60	08	27*	259.25*	83.41*	14.95 *	20.74	6.67	1.20
Midwest	16,906.80	30	76*	578.54*	368.92*	15.26 *	173.56	110.67	4.58
Southeast	10,715.60	19	85*	670.82*	466.18*	16.51 *	127.46	88.57	3.14
South	22,835.60	41	95*	789.96*	434.09*	15.58 *	323.88	177.98	6.39
BRAZIL	56,018.10	-	81*	-	-	-	652.51*	387.25*	15.58*

*values used in the PAM
P.p-rg = Proportional Production per Region; Rd-rg = Yield per Region; I.C-rg = Inputs Traded per region; F.D-rg = Domestic Factors per Region; I.C-BZ = Traded Inputs used by Brazil; F.D-BZ = Domestic Factors used by Brazil.
Source: Adapted from CONAB (2010a)

To meet the objective of this article, the data were put into operation with the support of Microsoft Office Excel 2010, regarding the tabulation of values and basic calculation operations. The treatment was done through content analysis.

2.3. Conceptual basis

The economic performance of an agricultural sector is the result of a set of actions and interactions made by agents in the form of institutions, whether formal or informal, that result in the supply of a product (goods /services); however, parallel to this context, convergences and divergences of interests occur between agents, which results in a complex and, at the same time, sensitive environment. From the point of view of competitiveness and competition, the New Institutional Economics (NIE) contributes to this analysis of economic transactions, whose configuration can change relationships and behavior among the agents.

The NIE is an analytical tool that allows us to understand the behavior and the factors that shape and define the interactions and interventions between agents, in addition, the conceptual basis allows for the assessment of market imperfections and the distorting policies that cause economic inefficiency on the market (NORTH, 1987).

At this juncture, according to the object of this study, it is understood that the agricultural systems of corn production in Brazil present diverse characteristics in different aspects, ranging from: economic, educational, social, environmental and cultural factors. Given these characteristics, it is expected that through the NIE the research may comprehend the information provided by PAM on the corn production systems in Brazil.

2.4. Context of taxation and of corn agricultural policies

The Tax System in Brazil presents a complex field of analysis, in the case of industrialized food products, there is a greater incidence of taxes when compared to fresh food; in the case of corn, some taxes are incorporated and these have their scopes at federal, state and municipal levels, involving the production and marketing (Table 5).

Table 5: Taxation on Rural Producers

TAX	Rural Producer Taxation - PF		Rural Producer Taxation - PJ	
	Domestic Market	Export	Domestic Market	Export
IRPF	15% or 27.5%	15% or 27.5%	2% or 25%	2% or 25%
CSLL	n/a	n/a	1.08% or 9%	1.08% or 9%
PIS/Pasep	n/a	n/a	0.65% or 1.65%	n/a
COFINS	n/a	n/a	3% or 7.6%	n/a
INSS	2.3% over gross revenue 2.7% over the remuneration	2.3% over gross revenue 2.7% over the remuneration	2.85% over gross revenue 2.7% over the remuneration	2.85% over gross revenue 2.7% over the remuneration
ICMS	(*)	n/a	(*)	n/a
IPI	n/a	n/a	n/a	n/a
CTF	**20% or 32.5%**	**20% or 32.5%**	**12.28% or 48.80%**	**8.63% or 39.55%**

(*) = value that can range (up to 25%) amongst the Brazilian federation states
PF = an individual, PJ = a company, IRPF = Income tax over an individual, IRPJ = Income tax over a company, CSLL = Social contribution over net profit, PIS = Contribution to the Program for Social Integration/Pasep = Asset Formation of the Civil Servant, COFINS = Contribution to the Financing of Social Security, INSS = National Institute of Social Security, ICMS = Value Added Tax (VAT), IPI = Tax over Industrialized Products, CTF = Tax Total Cost.
Source: Passos y Sticca (2006)

End consumers of food in Brazil bear a very high tax cost, approximately 19% when compared to the USA, where the incidence is 0.7%, taking into account that in 34 American states there is a full exemption from taxes on food, moreover, in Europe, the incidence of taxes on food is 5% (GERALDES, 2011). The fact is that the system has several limitations, specially considering that the collection of taxes by the Brazilian government does not result

in provision of service worthy of its population given that the country has serious problems of social diets inequalities.

Currently, the impact of certain taxes and contributions that significantly affect the cost of corn stands out, they are: Tax on Goods and Services - ICMS, Contribution for the Financing of Social Security - COFINS, Contribution to the Social Integration Program – PIS and of the patrimony formation of the civil servants (Pasep), but the number is more extensive, such as: Tax on Industrialized Products – IPI, Tax on Services - ISS, Territorial Rural Property Tax - ITR, National Institute for Social Security – INSS, Company Income Tax - IRPJ, Individual Income Tax – IRPF, Social Contribution on Net Income – CSLL (SEFAZ, 2011).

When corn becomes an input in other production processes, the effect becomes progressive and extensive during the production chain, in reality, the product derived from corn will add a socially unjust value and in this scenario the consumer is the most penalized. Because it is a product common to the population, the most efficient tool to counter this imbalance becomes the exemption in the form of a tax reform, since the poorest would be the greatest beneficiaries, because in a perspective of " income transfer " the effect is felt directly and immediately throughout this layer of society, especially if the average is extended to food products that make up the monthly basic foodstuffs. On the other hand, the exemption encourages the development of agribusiness, which may contribute to the food supply for consumers.

The existing agricultural policies in Brazil are presented with some specific purposes, but their effectiveness has not reached competitive levels expected by economic agents so far; the country has agricultural characteristics, but the production bottlenecks which have existed for decades have not been suppressed, as in the cases of: infrastructure, credit, tax reform, labor reform, political reform, land reform and social security reform, i.e. the Brazil Cost is too high which hinders the level of competitiveness of agricultural enterprises.

The most significant policies related to corn agricultural activities in force are: Rural Insurance, Rural Credit, Minimum Prices Guarantee Policy (PGPM), Food Acquisition Program (PAA), National Program for the Strengthening of Family Farming (PRONAF), Kantir Law and the Agriculture and Livestock Plan (PAP). In parallel to the policies presented, there are some tools that support the institutional context, as are the case: Product Flow Award (PEP) and the Product Value Flow (VEP). In addition, there are free trade securities which represent the promise of cash payment, as are the case: Rural Product

Certificate (CPR), Rural Mortgage Certificate (PRC), Rural Credit Note (NCR), Certificate of Deposit and Warrant of Agriculture and Livestock (CDA/WA), Certificate of Agribusiness Credit Rights (CDCA) and Letter of Agribusiness Credit (LCA).

3. Results and Discussion

In Table 6 we present the results of the corn PAM in Brazil, through which were estimated private and social indicators contained in Table 7. The PAM results from the analysis of the productive chain of corn produced and marketed in the five Brazilian regions, as well as on a Brazilian level, as seen in Table 6, below:

Table 6: Policy Analysis Matrix (PAM) - production of corn, Brazil, 2009/10 (ha)-(hectare)

	Revenue	Production Costs		Profits
		Tradable Inputs	Domestic Factors	
NORTH				
Private Prices	588.79	343.67	167.65	77.46
Social Prices	746.02	175.74	179.69	390,59
Effect of Differences	(157.23)	167.93	(12.03)	(313.13)
NORTHEAST				
Private Prices	403.74	259,25	83.41	61.08
Social Prices	479.58	112.98	89.40	277.21
Effect of Differences	(75.85)	146.27	(5.99)	(216.13)
MIDWEST				
Private Prices	1,160.12	578.54	368.92	212.67
Social Prices	1,349.94	318.01	395,40	636.54
Effect of Differences	(189.82)	260.53	(26.48)	(423.86)
SOUTHEAST				
Private Prices	1,403.43	670.55	466.18	266.69
Social Prices	1.509.80	355.67	499.65	654.49
Effect of Differences	(106.38)	314.89	(33.46)	(387.80)
SOUTH				
Private Prices	1,479.75	789.96	434.09	255.71
Social Prices	1,687.43	397.51	465.25	824.67
Effect of Differences	(207.68)	392.45	(31.16)	(568.96)
BRAZIL				
Private Prices	1,261.98	652.62	387,25	222,11
Social Prices	1,438.75	338.93	415.05	684.78
Effect of Differences	(224.76)	440.89	(27.80)	(462.67)

In light of the results, it was observed that the Private Profitability - LP (LP = A – B - C) of the corn production and its trading in the national context presented are all positive in agricultural systems, with respective valuesof US$: 77. 46 (North Region), US$: 61.08 (Northeast Region), US$: 212.67 (Midwest Region), US$: 266.69 (Southeast Region), US$: 255.71 (South Region) US$: 222.11(Brazil), per hectare. However, the corn produced and marketed in the agricultural system of the Northeast Region had the lowest private profitability per hectare; this can be justified, in principle, by the value of average income of the region, 27 bags per hectare, with yields that are presented below the Brazilian regional and international parameters. It is noteworthy that corn production in the Northeast Region accounted for 8% of national production, 2009/10 harvest.

As to the aspects of production costs, there was a superiority of private costs related to tradable inputs, it can then, be inferred that part of the competitiveness in the productive system was significantly related to the costs of these inputs (NELSON y PANGGABEAN, 1991; MAITHYA et al., 2006; BERNAL et al., 2011).

The Social Profitabilities - LS (LS = E - F - G) were all positive, which meant an economic efficiency in corn production in Brazil, the values follow the following order: US$: 390.59 (Northern Region), US$: 277.21 (Northeast Region), US$: 636.54 (Midwest Region), US$: 654.49 (Southeast Region), US$: 824.67(Southern Region), US$: 684.78 (Brazil) per hectare. The figures signaled that the systems in question spent scarce resources on the production, at social prices, which fell short of the private, the most sensible would be an egalitarian behavior between values, when compared with private values (REIG-MARTINEZ et al., 2008).

In comparative terms, the production f corn in the Southeast Region had the largest private profitability, while the South had the highest social profitability, both regions showed higher rates of income per kilogram of corn per hectare, it demonstrated the efficiency and the level of competitiveness of these production systems.

The figures concerning the regions studied all showed to be negative, with values of US$: 313.13 (Northern Region), US$: 216.13 (Northeast Region), US$: 423.86 (Midwest Region), US$: 387.80 (Southeast Region), US$: 568.96 (Southern Region), US$: 462.67 (Brazil) per hectare. Even considering the negative values, agricultural production systems were profitable, according to the LP analysis of their systems (Table 7), but farmers had their profits reduced, which may be related to the taxation imposed at production process level (ADESINA y COULIBALY, 1998), as well as at marketing level

However, profitability is the major stimulus to agricultural producers (ODENDO et al., 2006), which in turn will allow a breakthrough in the levels of production scale, but in contrast the relationships between the actors which are related at market level should contribute for greater fluidity in these interactions, in this context, it is expected that the government intervenes providing mechanisms that contribute to the strengthening of the sector, and for this, effective measures are necessary so that tradable inputs and domestic factors are cost relieved.

The private and social indicators resulting from the PAM under consideration allow for an assessment of the economic efficiency of corn production system in Brazil at level of competitiveness, which can be seen in Table 7, below:

Table 7: Coefficients of the profitability of the corn agricultural production system, Brazil, 2009/10, (hectare)

Private and Social Indicators	North	Northeast	Midwest	Southeast	South	Brazil
RCP = C/(A-B)	0.68	0.58	0.63	0.64	0.63	0.64
RCD = G/(E-F)	0.32	0.24	0.38	0.43	0.36	0.38
CPNp = A/E	0.79	0.84	0.86	0.93	0.88	0.88
CPNi = B/F	1.96	2.29	1.82	1.89	1.99	1.93
CPE = (A-B)/(E-F)	0.43	0,.39	0.56	0.63	0.53	0.55
CL = D/H	0.20	0.22	0.33	0.41	0.31	0.32
RSP = L/E	(0.42)	(0.45)	(0.31)	(0.26)	(0.34)	(0.32)

RCP = Private Cost Ratio, RCD = Domestic Resources Costs, CPN_p = Coefficients of Nominal Protection of the Product, CPN_i = Coefficients of Nominal Protection of the Input, CPE = Coefficients of Effective Protection, CL = Coefficient of Profitability, RSP = Producer Subsidy Ratio.

According to the indexes of Private Costs Ratio - (RCP = C/A-B) presented, it was observed that all were competitive enterprises, moreover, the systems showed similar rates according to respective values, North Region (0.68), Northeast Region (0.58), Midwest Region (0.63),Southeast Region (0.64), Southern Region (0.63), Brazil (0.64), per hectare. In this context the feasibility, corn production systems had returns higher than normal, being a profitable activity from an economic point of view.

However, when comparing the six systems of corn production, one could observe the competitiveness of the Northeast Region (0.58), it was found that 58% of its value added were used as payment of domestic factors, which indicates that the domestic factors present a lesser value than the other regions, therefore, this percentage represented the difference between revenue and costs of inputs traded, which indicated the economic viability of the enterprise. In

the national context, Brazil (0.64) appeared as a competitive enterprise, so that the activity is able to produce to pay for the domestic factors, which results in economic and regional development, because the indicator deals with a contextualized sample panorama, this sample indicates that Brazilian farmers have a positive outlook in the sector, which has boosted production to meet the domestic and international demand for corn.

The values corresponding to the Domestic Resources Costs - (RCD = G/EF) were all positive and smaller than the numeric index one (1), according to their respective values in the North (0.32), Northeast (0, 24), Midwest Region (0.38), Southeast (0.43), Southern Region (0.36), Brazil (0.38) per hectare. Thus, the values indicate productive efficiency and the existence of competitive advantage in the corn production systems. Therefore, there was a net gain, even in the regions where corn was not exported, since from US$ 0.24 to US$ 0.43 were spent on domestic resources to generate US$ 1.00 of foreign exchange through.

The Nominal Protection Coefficients - (CPNp = A/E) were all positive and smaller than the numeric index (1), according to the respective values 0.79 (North Region), 0.84 (Northeast Region), 0.86 (Midwest Region), 0.93 (Southeast Region), 0.88 (Southern Region), 0.88 (Brazil) per hectare. In this way, the indicators found showed that the production and commercialization of corn in the regions were unprotected, ie, there was a lack of protection of domestic prices, since these were lower than prices prevailing in the international market, thus resulting in lower values received by farmers. Therefore, the taxations show that the agricultural systems received a lower value than the one traded in the international market, which corresponds respectively to 21% (Northern Region), 16% (Northeast Region), 14% (Midwest Region), 07% (Southeast Region), 12% (Southern Region), 12% (Brazil) per hectare.

Hence, the Southeast Region (0.93) presents itself as a more balanced market in terms of price received in the domestic market, however, the Northern Region (0.79) has performed in an adverse context, because the price received was lower than the price traded among other domestic markets. The index of Brazil (0.88) indicated that, currently, corn producers have a deficit of 12% on the value received for the product, when equated to international prices, a fact that resulted in implicit taxations, the result of policies, given that their prices have not reached an equilibrium level of parity, which would be a numeric value equal to one (1).

The results presented through the Nominal Protection Coefficients (CPNi = B/F) were all positive and greater than the numeric index (1), in accordance with their respective values: 1.96 (North Region), 2.29 (Northeast Region), 1.82 (Midwest Region), 1.89 (Southeast

Region), 1.99 (South Region), 1.93 (Brazil) per hectare, so the national tradable input costs were high and these were higher than international standards, something that compromised the efficiency of corn agricultural system. It was observed that the figures were the result of taxations, therefore there is an income transfer from producers to society, this scenario resulted in the political intervention that directly affected the costs of these inputs, which in turn were allocated to products compromising the competitiveness of systems.

The indicator's resulting information is extremely relevant, since measures should be developed, otherwise the regions will have major challenges, given that spending on tradable inputs is inevitable, and these, at deregulated prices compromise competitiveness, in extreme cases this may be the decisive variable for the continuation or discontinuation of the farmer's enterprise (YAO, 1997; 1999).

The Effective Protection Coefficients (CPE = A-B/E-F) were all positive and less than the numeric index (1), in accordance with their respective values: 0.43 (North Region), 0.39 (Northeast Region), 0.56 (Midwest Region), 0.63 (Southeast Region), 0.53 (South Region), 0.55 (Brazil), per hectare. It was observed that the values indicated high lack of protection or taxation on the productive sectors, this fact revealed that the penalty situation in which the corn chain is inserted, specifically with regard to distorting policies. It is noteworthy that the CPE does not incorporate the effects of policies that affect the prices of domestic factors, but they indicate the extent of incentives or disincentives that the production systems have received from official policies, i.e., in the case of the corn productive chain the results of the CPE are related to monetary values received by corn (private and social) versus the value of the monetary costs of tradable inputs (private and social) received.

Given these results, it is possible to infer that the corn production systems presented additional values at private prices, which corresponded, respectively, to 57% (North Region), 61% (Northeast Region), 44% (Midwest Region), 37% (Southeast Region), 47% (South Region), 45% (Brazil), per hectare, lower than those added, without political interference. In this context, the Northeast Region was the most penalized, while the Southeast Region had their situation aggravated, but nationally, the situation was very worrying, since Brazil presented an indicator of 45% corresponding to lack of protection or taxation on corn productive sectors.

The corresponding values for Coefficients of Profitabilities (CL = D/H) were all close to the numerical index of zero (0), in accordance with their respective values: 0.20 (North Region), 0.22 (Northeast Region), 0.33 (Midwest Region), 0.41 (Southeast Region), 0.31

(South Region), 0.32 (Brazil), per hectare. These rates were lower than the numeric index one (1), which are found in the range of 0.20 to 0.41, which means that the corn agricultural production systems were liquidly taxed and that private profits were reduced, affecting the production and marketing of the product. The figures highlight that the entire corn production chain found itself in an unprotected condition.

The North Region presented the most serious picture; in this context, the index was 0.20 which characterized the full lack of protection over the production and marketing of corn in this region. In the national context, Brazil's index of 0.32 pointed out that there was the presence of: misguided policies, significant price distortions, inefficient protectionist measures (subsidies on production and/or marketing) and imbalances in the tax system, so that the private sector profit was reduced, which resulted in the transfer to society.

According to the indexes of Ratio of Subsidies to Producers (RSP = L/E) they were all negative and close to the numerical index of zero (0), according to their values: -0.42 (North Region) -0.45 (Northeast Region), -0.31 (Midwest Region), -0.26 (Southeast Region), -0.34 (South Region), -0.32 (Brazil), per hectare, meant that the production systems analyzed had undergone some taxation, which could be ratified by the negative values. Thus, these values indicated that the agricultural systems had taxation or reduction in their revenues.

Therefore, as a result of then negative RSP indicators relating to the production systems under consideration, it is understood that it is necessary to apply subsidy in order to balance the existing distortions in the corn chain in Brazil.

4. Final Considerations

The survey results allow us to conclude that the objective of this article was reached and the problem has been answered. In the regional context, it was possible to established that all corn production systems in Brazil show private profit, but the Nominal Protection Coefficients (CPNi = B/F) and Nominal Protection Coefficients (CPNp = A/E),indicate serious bottlenecks in the production systems. Therefore, the rates of Ratio of Subsidies to Producers (RSP) point out that the production systems analyzed have undergone some taxation, which can be ratified by the negative values.

Distorting policies associated to market imperfections directly affected the corn production systems, according to the corn PAM in Brazil. Parallel to this, the literature of the New Institutional Economics explains that the state can act in this context, in order to

establish harmony between the market behavior and its agents which are inserted in this setting (NORTH, 1987). This way, the state as an agent has the power and the duty to make use of instructional tools to promote balance in the market (YAO, 1999), striving for the maintenance of the internal corn trade, since it deals with the economic efficiency of the corn production systems . From the moment the state treats the consumption of food as a citizen's right and concentrate efforts to reduce inefficient barriers so the situation can be reversed; thus efficient tax policies can be incorporated as social policies, as the merit reaches the social sphere, supplying the most basic of all rights, food.

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Acknowledgements

The National Council of Scientific and Technological Development (CNPq) for the funding.