Rice production in Mercosur seen through a Policy Analysis Matrix (PAM)[1]

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Abstract - The objective of this study is to evaluate the profitability and the effects of direct and indirect taxes on rice production in Brazil compared to other member countries of Mercosur. This article uses the Policy Analysis Matrix (PAM) to evaluate the economic efficiency of the production systems of the four Mercosur countries: Brazil, Argentina, Paraguay and Uruguay, measuring prices and private and social costs. The results have shown that in 2010, rice production in Argentina and Uruguay had positive social and private profitability, while in Brazil and Paraguay there were negative private results. Secondly, a simulation of an alternative scenario for Brazil was performed, considering a reduction in the direct and indirect tax burden to a similar percentage between the countries compared. Under the simulation of this new scenario, the production of rice in Brazil did not remain in deficit, but it had very low profitability. Other variables that were not the focus of this study, such as productivity development, technologies and exchange rates, also significantly affect the profitability of rice production in Brazil.

Keywords: comparative advantages, international trade, Mercosur, public policies, taxes.

Matriz de Análise de Políticas (MAP) aplicada à produção de arroz no Mercosul

Resumo – O objetivo deste estudo é avaliar a lucratividade e os efeitos da carga tributária direta e indireta na produção de arroz no Brasil frente aos demais países integrantes do Mercosul. Com esse intuito, o presente artigo utiliza a Matriz de Análise de Políticas (MAP) para avaliar a eficiência econômica dos sistemas de produção dos quatro países: Brasil, Argentina, Paraguai e Uruguai, mensurando preços e custos privados e sociais. Os resultados apontam que, na situação vigente em 2010, a cultura de arroz na Argentina e no Uruguai apresenta lucratividades privadas e sociais positivas, enquanto no Brasil e no Paraguai se observam resultados privados negativos. Num momento, procede-se a uma simulação de um cenário alternativo para o Brasil, onde a carga tributária direta e indireta é reduzida em um percentual de semelhança entre os países comparados. Sob a simulação

[1] Original recebido em 14/1/2013 e aprovado em 4/2/2013.

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deste novo cenário, a produção de arroz no Brasil não permanece deficitária, mas apresenta rentabilidade bastante reduzida. Outras variáveis, que não foram o foco específico deste estudo, como a evolução da produtividade, tecnologias e taxas cambiais, também interferem significativamente na lucratividade da orizicultura brasileira.

Palavras-chave: vantagens comparativas, comércio internacional, Mercosul, políticas públicas, impostos.

Introduction

Rice is one of the most important crops in the world in terms of economic value. Regarded as the most important food crop in several developing countries, it is one of the most consumed cereals in the world and the basic food of almost half the present world population. According to FAO estimates, by 2050, this population will double. Brazil is part of this scenario as the world's largest rice producer, after the Asian continent (FAO, 2011).

In Mercosur, Brazil is the greatest producer and consumer of this cereal, and produced 13.61 million tons of paddy rice in 2010/2011 (CONAB, 2011a). Argentina, Uruguay and Paraguay together produced about 2.7 million tons of rice in 2009 (FAO, 2011). However, the tax burden on rice production in Uruguay, Argentina and Paraguay is around 15 percent, while in Brazil it is almost 25 percent. This hinders the competitiveness of the Brazilian product and significantly affects rice producers' profitability (EMBRAPA ARROZ E FEIJÃO, 2011; FIESP, 2010; IBPT, 2011). Even with the creation of the regional economic block (Mercosur), a uniform tax policy has not been established among its members.

It is important to highlight that Uruguay and Argentina together account for about 90 percent of Brazilian rice importations. Those two countries, however, have advantages in rice production due to differences concerning production and tax costs, more competitive financing interest rates, and geographical proximity to Brazil (IBGE, 2010). The economic and competitive importance of rice to Mercosur and Brazil has motivated the present analysis.

In this setting, the following issue is addressed: what are the effects of both direct and indirect tax burdens on the profitability of Brazilian rice production in comparison to other countries in Mercosur?

Aiming at assessing this situation, this study is based on theoretical macroeconomic concepts related to public policies and comparative advantages applied to international trade, using the Policy Analysis Matrix (PAM) as analysis model. Grounded on this scenario, this study aims at determining the economic efficiency of rice production in Brazil by considering this market and its present conditions, and also taking into account the tax burden put on this production in Mercosur.

The Common Market of the South and Rice Market

The institution of the Common Market of the South (Mercosur), a process of economic integration of Argentina, Brazil, Paraguay and Uruguay, has trade freedom and bilateral opening of its member states as its goal, considering their geographical proximity and the comparative advantages existing among the countries.

The objective of this common market is to allow the free circulation of goods, services, workers and capital. However, as a consequence of the state members' peculiarities, the integration has faced some obstacles that are characteristic of economical and political integration (MERCOSUR, 2011).

In the present situation, the regional integration of Mercosur has assumed intra-sector features, and the perspectives of competitiveness of agro-alimentary systems should be highlighted. Issues concerning competitiveness of these systems comprehend several factors, such as tech-

nological variables, product and service quality requirements, logistics and market spheres, in which prices, costs and the tax burden in effect in each state member should be taken into account (FONDO MONETARIO INTERNACIONAL, 2006; MERCOSUR, 2011).

In the world rice market, the main production regions are in the Asian continent, representing 90 percent of the world production, according to data from 2009 that were recently released by FAO (2011). However, in the last three years, Mercosur has drawn the attention of the global rice market because of a 19-percent increase in production, which broadened its participation in the world market. Brazil occupies the 9th position in the world ranking.

The increasing Brazilian exportations of rice to the African continent are a tendency pointed out by IRGA (2011b). Africa is regarded as an exportation channel that has evolved from 2006. This market started purchasing broken rice, but from 2007 it has changed its profile, with a growing interest in larger amounts of higher quality rice.

In the foreign trade, the influence of the exchange rate on both rice exportations and importations must be considered. With the valorization of the Brazilian currency, exportations have decreased, since prices have become less competitive in the world market. On the other hand, this has encouraged exportations, due to the product affordability in relation to the external market.

In 2010/2011 rice crop, Mercosur faced a production surplus. Total production increased around 22 percent (total production of 17.3 million tons in Mercosur); with the consumption of 13.4 million tons, the surplus reached 3.9 million tons, the highest figure since Mercosur was created (IRGA, 2011a). In Uruguay, for instance, the production has been increasingly directed to destinations outside Mercosur, particularly Andean countries and Middle East countries, where the demand for imports is active. Taking only Mercosur countries, the main exporters are Argentina and Uruguay, which conjointly export 937.9 thousand tons to Brazil and other countries that do not participate in the block (IBGE, 2010; USDA, 2011).

Tax burden in Brazil and Mercosur

The Brazilian tax burden increased approximately 10 percent from 1990 to 2010, reaching 35.04 percent of the Gross Domestic Product (GDP) in 2010. In real terms of GDP, there was economic growth in the country, but the percentage of the tax burden on GDP was also eminent; in the last 10 years only, this percentage has increased 5 percent (BRASIL, 2010; IBPT, 2011; OECD, 2011).

It is true that the Brazilian taxation of goods and services overburdens both production and consumption; besides, in the Brazilian taxation system, taxes on the added value coexist, and this distorts the production costs. Adding to this situation, there is a cascade effect (incidence of a tax on the value of another tax). For example, the Excise Tax (IPI) integrates the calculations of the tax on operations related to the Value-Added Tax on Sales and Services (ICMS).

The prices of goods and services are affected by this tax increase, which is transferred to the production links (BRASIL, 2010; FIESP, 2010). In Brazil, tax incidence is both direct and indirect. Direct taxes are the ones that affect individuals and businesses, while indirect taxes are levied on goods and services. In this way, a tax is either direct or indirect according to its incidence, i.e. its tax basis (ATKINSON, 1977). Percentages in Brazil are comparable to the ones found in countries such as Canada and Germany, where the return of taxes to the contributors in the form of services and other benefits is clearly higher.

Differently from Brazil, Argentina, Paraguay and Uruguay have adopted similar tax systems, which are applied to consumption, according to the technique of added value (IVA), and their tax incidence is lower than Brazil's.

IVA is a tax levied on non-cumulative billing and specified in invoices, thus enabling con-

sumers to know the value of the tax that is part of the price paid for goods or services. This tax system was adopted in the European Union (EU) due to the benefit it would bring to the circulation of products, goods and services among the state members. In Mercosur, the countries that have adopted IVA are Paraguay, with the single incidence of 12 percent; Uruguay, with a reduced tax rate of 14 percent (first necessity products) and a general tax rate of 23 percent; and Argentina, with a reduced tax rate of 10.5 percent, a general tax rate of 21 percent and a maximum tax rate of 27 percent (MARTINS, 2004; MERCOSUR, 2011). Therefore, one of the debates about the process of integration in Mercosur involves the harmonization of the tax regulations. In this integration, even if the system and tax rates are not identical, the systems could be compared, as they would follow the same principles.

Rice production and taxes in Mercosur

The taxation of rice occurs along the five phases of the production chain. At the production stage, still in the rural area, farmers are taxed when they buy the inputs needed for planting and harvesting. The harvest is the second stage, which includes processing. The third stage comprises the packing process. Trade with wholesalers characterizes the fourth stage of the production cycle. The fifth stage is retailing, when the product reaches the end consumer.

In rice production, taxes are part of all the production processes and represent, as a whole, a significant percentage that heightens the product cost (Table 1).

In Table 1, it is possible to notice that both direct and indirect tax burden on rice produc-

Table 1. Summary of tax burden on rice production costs in Brazil, 2008-2009.

Abbreviations	%	Notes
IR and CSLL	1.94	Considering 25% on the net profit before IR and CSLL
IPI	1.05	Considering 4%, pesticides 5%
Cofins	2.89	Considering 3%, fuel 8.28%, seeds 0%
PIS	0.63	Considering 0.65%, fuel 1.78%, seeds 0%
IOF	0.01	Considering 0.0041 % ad
INSS	1.94	Considering 20%
FGTS	0.77	Considering 8%
Cide	0.73	Considering 4.76%
Taxes CDO	1.37	Tariff differentiated by implementation/activity
Funrural	3.97	According to rice production cost – IRGA
Environmetal license	0.13	According to rice production cost – IRGA
ISSQN	1.39	Considering 5%
Total	24.48	

Source: Based on IRGA (2011b).

Notes: IR – Income Tax; CSLL – Social Contribution on Net Income; IPI – Excise Tax; COFINS – Tax for Social Security Financing; PIS – Employees' Profit Participation Program; IOF – Tax on Financial Transactions; INSS – Social Security Contribution; FGTS – Government Severance Indemnity Fund for Employees; CIDE – Contribution of Intervention in the Economic Domain; ICMS – Value-Added Tax on Sales and Services; CDO – Fee for Cooperation and Protection of Rice Production; FUNRURAL – Rural Workers' Assistance Fund; ISSQN – Services Tax.

tion costs is almost 25 percent in Brazil. However, in Argentina, Paraguay and Uruguay, total percentages are lower: 16, 12 and 14 percent, respectively (ASOCIACIÓN CULTIVADORES DE ARROZ, 2011b; IRGA, 2011b). The differentiation of tax on production cost among the state members of Mercosur is clear.

By observing the high tax burden, it is possible to see that the Brazilian positioning in relation to this issue is the opposite of that pointed out by Rakotoarisoa (2011). The author highlights that the reduction of taxes on rice production and exportation in developing countries both encourages the adoption of new technologies and increases productivity.

Rice prices and subsidies in Brazil and abroad

The minimum price policy is an agreement between the government and producers in which the former binds itself to buy, at the latter's request, the whole production at the price set in such agreement, i.e. the producers obtain a sales right that they can or cannot exercise. As there is no financial commitment on the producers' side to obtain such right, the value involved is characterized as an implicit subsidy conceded by the government.

The minimal price entails the establishment of a minimal payment for the product. For a minimal price to be effective, it has to be higher than the market equilibrium price. However, according to the Federation of Agriculture of Rio Grande do Sul, the minimal price set by the Brazilian government does not cover the production costs (FARSUL, 2011). On the other hand, the Brazilian government has provided subsidies and subventions to harvest flow by means of auctions of Public Option Contract, Product Flow Award (PEP), Equalizing Price Paid to Producer (PEPRO) and Direct Acquisition by Producers (AGF), besides destining part of the harvest for the animal food industry, with subsidies (IRGA, 2011a).

Yet, concerning the world rice market, for example, the level of subsidies on the production is much higher in the United States, European Union and Japan in terms of monetary representativeness. While subsidies reach an average annual total of U$ 56,000 by rural unit in the United States, U$ 27,000 in Europe, and U$ 20,000 in Japan, they are around U$1,100 by rural unit in Brazil (CASAMATTA; RAUSSER; SIMON, 2011; CONAB, 2011b; RAKOTOARISOA, 2011).

Common External Tariff

The four state members of Mercosur have adopted the Common External Tariff (CET), having importation rights on each of the goods on the list called Mercosur Common Nomenclature. According to the established guidelines, CET should encourage competitiveness, and its tariff levels should help avoid the formation of oligopolies or market reserves. CET should meet the following criteria: (a) small number of tax rates; (b) low dispersion; (c) the greatest possible homogeneity of tax rates for effective promotion (exportations) and effective protection (importations); (d) defined aggregation levels for tax rates (MERCOSUR, 2011).

The Common External Tariff (CET), according to the Mercosur Common Nomenclature (MCN), is an importation tax rate that the state members have in common for specific commodities. In the case of paddy rice, it is 10 percent; for processed rice, it is 12 percent. This tax is imposed on rice imported from any country outside the block. Besides aiming at stimulating the trade interchange among the state members, CET attempts to protect the local product from subsidies at the origin and/or from exchange rates controlled by countries outside Mercosur, thus trying to heighten the cost of the product imported by the block.

Theoretical aspects of public policies and comparative advantages

In the macroeconomic scenario, public policies are associated with specific institutional trajectories and have their own dynamics. Both the formulation of alternatives and decision-making represent an important stage of the creation of public policies. According to Simon's model (SIMON, 1957), decision-making by political managers involves the choice of the best solution by considering possibilities and restrictions, such as financial resources, information, etc. In general, two activities can be highlighted in this phase: (1) formulation is the conversion of a problem into alternatives, taking into account the ways of action and intervention, as well as the strategies that support them (technical studies, conflicts, forecasts, construction of scenarios, persuasion, etc.); (2) the legitimation work, which consists of confronting a solution with criteria or rules, inscribing a solution into a particular frame. Thus, considering the actors (government agents and target audiences) involved in the formulation of public policies, the evaluations are carried out by taking into consideration the effects attributed to the government action. The evaluation is usually performed in relation to reference situations, values, norms and perceptions, and different evaluators are likely to diverge as to the actual effects of a public action (LINDBLOM, 1965).

The international trade theory stemmed from the need for understanding the processes of international exchanges. David Ricardo developed a theory of generalizations that can be applied to any country. The theory developed by Ricardo (1817) has provided an explanation for the movement of goods in international trade considering either the supply or the production costs existing in those countries. Countries that export certain products will specialize in the production of goods whose cost is comparatively lower than that of the same goods in other exporting countries. From this perspective, the difference of prices in effect in different countries stimulates external trade, by directing the products to those where prices are higher. The difference in prices, in turn, is explained by the comparative advantage, which enables some countries, due to a range of circumstances, to produce a number of exportable products at lower costs.

The analytical model: preliminary considerations

The analytical approach of this study is based on the Policy Analysis Matrix (PAM) as developed by Monke and Pearson (1989). PAM consists of an accounting and economic system that analyzes revenues and costs at both private prices and social prices by means of two accounting identities: profitability, given by the difference between revenues and costs; and the measure of divergences or distortions of policies and failures in the market. This accounting tool allows a detailed description of intra- and inter-sector interdependences of economic relationships, besides providing an evaluation of the effects of implementation of economic policies in agriculture.

PAM has been used in several works to evaluate the economic profitability and the effects of agriculture policies. For example, Nelson and Panggabean (1991) used it to analyze the effects of public policies on sugar production in Indonesia; Pearson et al. (1995) applied it to evaluate the agriculture policy in Kenya; Adesina and Coulibaly (1998) analyzed the impacts of political changes on the competitiveness of corn production under the management of alternative technology in the Republic of Cameroon; Fang and Beghin (2000) evaluated the self-sufficiency of food market and comparative advantages of the main crops in China; Yao (1997) carried out a study in Thailand using the Policy Analysis Matrix to asses rice production in comparison to soy and bean production. Yao (1997) examined the effects of price variations and externalities on the comparative advantages of rice production in relation to competing crops, by simulating scenarios and evaluating the alterations derived from these new factors.

In the proposed model, prices are evaluated from the difference that could be in effect in the absence of distortions. Profits are defined as the difference between total revenues and total costs. Each matrix contains two cost columns for costs: one for tradable inputs and the other for domestic factors; the domestic factors comprise costs of direct and indirect taxes.

The first line of PAM (Figure 1) infers the measure of private profitability. The private terms refer to received revenues (A) and incurred cost (B and C) in the country. Therefore, they reflect the prices in the domestic market (A) and evidence the production system competitiveness in the period for a given technology employed, product prices, input costs and domestic factors, including policy transfers (such as taxes and subsidies). Positive financial results show that the production system is competitive in terms of profitability, given the existing conditions, so that the agents have stimuli to carry the activity on.

The second line of the matrix shows the social valuations calculated to assess the profitability of the agricultural production system, where the concept of comparative advantage is applied as a measure of social profitability, thus indicating efficiency in the allocation of national resources. The concept of efficiency, in this model, is taken as utilization of the resources that provide higher levels of production and revenues, reflecting the social opportunity cost.

The social prices related to revenues (E), tradable inputs (F) and social valuations are the ones used in the world market. The estimate of social prices of revenues uses world prices, i.e. world prices are multiplied by the average productivity of each country.

It is thought that world prices of social costs related to domestic factors (G) are given by the estimate of the net income forgone because the factor was not employed in an alternative other than in investments in the activity (land, capital and work).

The production activity implies expenses with labor (wages and social charges), cost of depreciation of machinery and equipment, leasing of production factors, and financial resources, among others. In the estimate of social costs, the amount that could be usefully received in another activity or application of the available resources is considered as social opportunity cost.

The third identity (I, J, K, L) refers to the differences between private prices and social prices for revenues, costs and profits attributed to the effects of policies and product market.

The present study analyzes, firstly, rice production in Brazil in relation to the other state members of Mercosur by using data related to the year 2010. Secondly, this study simulates a scenario for Brazil, with a 10-percent reduction in the tax burden. This percentage was chosen for the Brazilian tax burden to become similar to the average tax on rice production adopted by the other countries in Mercosur.

Indicators of PAM used in this study

a) Private Cost Ratio (PCR = C/(A-B)) – It indicates the level of competitiveness as

Items	Revenues	Costs		
		Tradable Inputs	Domestic Factors	Profit
Private prices	A	B	V	D
Social prices	E	F	G	H
Effect of divergences and policy efficiency	I	J	K	L

Figure 1. Policy Analysis Matrix (PAM).

Source: Monke & Pearson (1989).

to the maintenance of domestic factors (land, capital and work). An indicator less than 1 is considered as a non-competitive system whose producers receive less than the normal return, thereby it is possible to infer that the activity cannot succeed without governmental interference;

b) Domestic Resource Cost (DRC = G/(E-F)) – It indicates the value added to world prices. A DRC less than 1 indicates that domestic factors provide net revenues to the country. This indicator allows us to infer whether world prices are enough or not to pay for the domestic production factors;

c) Nominal Protection Coefficient (NPC = A/E) – NPC less than 1 indicates that the value received by the chain corresponds to a value that is lower than the product market prices;

d) Effective Protection Coefficient (EPC = (A-B)/(E-F)) – It is the ratio of value added measured in private prices to value added in world prices, indicating the levels of protection of the production factors and business capacity. This instrument indicates the extension of incentives and obstacles imposed by official policies on the production systems. EPC higher than 1 means that private profits are higher in the presence of intervention policies in the markets of tradable inputs and products;

e) Profitability Coefficient (PC = (D/H)) – It measures the effect of incentives of all policies. It is the ratio of private profits to social profits. A value lower than 1 means that the production is implicitly taxed, and the profit is reduced;

f) Subsidy Ratio to Producers (SRP = (L/E)) – It measures the net transfer to the system as a proportion of total social revenues, evidencing strongly subsidized policies. Indicators lower than one show a reduced subsidy level.

Operation of PAM model applied to rice production

In this study, revenues and costs estimated refer to the year 2010. In order to estimate private Brazilian revenues (A), weighted average of prices of paddy rice in 2010 (50-kilo bag) provided by Emater-RS (2011) was multiplied by the average yield of Brazilian 2009/2010 crop provided by FAO (2011). For Argentina, Paraguay and Uruguay, prices were provided by Asociación Cultivadores de Arroz (2011a) and Brasil (2011). The yield of these three countries is also based on data provided by FAO (2011).

Values of rice production costs in Brazil (post-harvest expenses, financial expenses, depreciations and other costs) are based on data provided by Conab (2011a). The weighted average of the production costs of irrigated rice and dry rice in 2010 was estimated according to planted area, production and yield (Table 2).

The total value of private costs for Brazil (Table 2) corresponds to U$ 435.74 of tradable inputs and to U$ 1,077.49 of domestic factors, as shown in Table 4. Private costs of production in Argentina, Uruguay and Paraguay related to the year 2010 were obtained in a study by Asociación Cultivadores de Arroz (2011b), Paraguay (2011) and SIIA (2010).

For measuring social revenues (E), this study has considered the weighted average values of paddy rice established by the Chicago Board of Trade in 2010 (CME GROUP, 2011) versus the average rice production in Brazil, Argentina, Uruguay and Paraguay concerning the 2009/2010 crop, according to FAO (2011).

With the current expansion of the internationalization of Latin-American rice, as Brazil has extended its exportation destinations over the market, an instrument of protection against oscillations has become necessary, besides a reference or benchmark that is able to determine

Table 2. Estimated production cost of dry and irrigated rice in 2010/2011 crop in Brazil.

Estimated cost of production Weighted average 2010 -2011 Crop				
Dry rice		**Irrigated rice**		
Discrimination	**Average participation (%)**	**Discrimination**	**Average participation (%)**	**Private costs (US$/ hectare)**
I- Crop expenses		**I- Crop expenses**		
1- Aerial spraying	0.00	1- Aerial spraying	2.87	37.07
2- Machine operation	4.81	2- Machine operation	19.88	263.31
3- Services and machine rental	0.00	3- Services and machine rental	0.32	4.19
4- Operations with the use of animals	0.00	4 - Temporary labor	5.14	66.53
5- Labor	1.72	5- Permanent labor	1.48	22.69
6- Seeds	6.76	6 - Seeds	6.59	101.38
7- Fertilizers	26.64	7- Fertilizers	10.21	181.1
8-Fungicides and herbicides	17.00	8- Fungicides and herbicides	9.19	153.26
9- Administrative overhead	2.85	9- Administrative overhead	2.78	41.79
Total of crop expenses (A)	59.78	**Total of crop expenses (A)**	58.47	871.32
II - Financial expenses		**II- Expenses after crop**		
1- Agricultural insurance	0.00	1- Production insurance	1.17	15.13
2- Technical assistance	1.20	2- Technical assistance	1.17	17.55
3- External transportation	2.57	3- External transportation	3.61	51.86
4- Storage	5.70	4- Storage	4.22	66.2
5- CESSR	2.28	6- Environmental licence	0.05	5.2
Total of post-harvest expenses (B)	11.74	7- CDO (Fee for Cooperation and Protection of Rice Production)	1.14	38.55
		Total of post-harvest expenses (B)	11.36	194.48
III - Financial expenses		**III- Financial expenses**		4.41
1- Interests	2.18	1- Interests	3.33	47.51
Total of financial expenses (C)	2.18	**Total of financial expenses (C)**	3.33	51.93
Variable cost (A+B+C=D)	73.71	**Variable cost (A+B+C=D)**	73.16	1,117.73

Continue...

Table 2. Continuation.

Estimated cost of production Weighted average 2010 -2011 Crop				
Dry rice		**Irrigated rice**		
Discrimination	**Average participation (%)**	**Discrimination**	**Average participation (%)**	**Private costs (US$/ hectare)**
IV - Depreciations		**IV - Depreciations**		
1- Depreciation of improvements/installations	2.46	1- Depreciation of improvements/ installations	0.31	6.7
2- Implement depreciation	1.30	2- Implement depreciation	3.49	49.64
3- Machinery depreciation	2.21	3- Machinery depreciation	6.95	94.38
4- Animal depreciation	2.21			
Total of depreciation (E)	8.17	**Total of depreciation (E)**	10.76	150.71
V- Other fixed costs		**V- Other fixed costs**		
1- Periodical maintenance of machines/implementations	1.23	1- Periodical maintenance of machines/implementations	3.74	50.93
2- Social charges	1.02	2- Social charges	0.88	13.39
3- Fixed capital insurance	0.19	3- Fixed capital insurance	0.52	7.16
Total of other fixed costs (F)	2.43	**Total of other fixed costs (F)**	5.15	71.48
Fixed cost (E+F=G)	10.60	**Fixed cost (E+F=G)**	15.90	222.19
Operating cost (D+G=H)	84.31	**Operating cost (D+G=H)**	89.06	1,339.92
VI - Revenue factors		**VI - Revenue factors**		
1- Revenue expected on fixed capital	1.49	1- Revenue expected on fixed capital	4.46	60.73
2- Land	14.20	2- Land - leasing	6.48	112.58
Total of revenue factors (I)	15.69	**Total of revenue factors (I)**	10.94	173.31
Total cost (H+I=J)	100.00		100.00	1,513.23

Source: Based on data provided by CONAB (2011a).

prices in the block and relate them to the prices of other references, such as the Chicago Board of Trade (LUZ, 2011). Based on this rationale, the quote in Chicago Board of Trade was used as a parameter of world prices in this study.

For estimating social costs of tradable inputs (F) in Brazil, the world prices were considered versus the amount of seeds, fertilizers and chemicals needed for rice growth, according to data provided by CONAB (2011c) and IRGA (2011b), as Table 3 illustrates.

Table 3. Estimation of tradable inputs at social prices in 2010.

Inputs	Unit	Quantity	Unit Price (US$)	Cost (US$/hectare)
Calcium carbonate	t	1,00	28.12	28.12
Rice seed	kg	75,00	0.99	74.25
Fungicide 1 (seed treatment)	kg	0,14	111.75	15.65
Fungicide 2 (seed treatment)	l	0,14	27.21	3.81
Insecticide 1 (seed treatment)	l	1,40	26.63	37.29
Fertilizer (maintenance)	t	0,40	407.64	163.06
Fertilizer (coverage)	t	0,10	378.11	37.81
Herbicide 1	l	3,00	12.79	38.39
Herbicide 2	l	0,80	8.86	7.09
Insecticide 1	l	0,05	23.62	1.18
Insecticide 2	l	0,06	66.01	3.96
Insecticide 3	l	0,50	12.74	6.37
Fungicide 3	l	0,80	29.00	23.20
Total estimated at international prices				440.18

Source: Based on data provided by CONAB (2011b), IRGA (2011) and CEPAL (2011b).

The domestic factors (G) measured at social values were estimated by considering the opportunity costs of the application of the necessary structure, evaluated through the total value of resources available in the activity (land, capital and work).

In this study, we have used data provided by CEPAL (2011a, 2011c) related to investments in structure needed for rice production per hectare of planted area in the state members of Mercosur, multiplied by the 2010 inflation rate. For Brazil, the National Consumer Price Index (INPC) was used, as it is estimated by an official governmental agency (IBGE, 2010). The consumer price indexes from the other Mercosur countries were made available by the Economic Commission for Latin America (CEPAL, 2011b).

Results and discussion

From the analysis of results estimated for Mercosur countries, as obtained through the use of the Policy Analysis Matrix (PAM), it has been identified that the private result (U$ profit per hectare) was negative for Brazil and Paraguay, thus evidencing the comparative advantage of rice production in Argentina and Uruguay (Table 4).

In Paraguay, rice production is not as significant (219,800 tons) as in Brazil (12,651,800 tons), and productivity is lower than in Brazil (4.25 ton/ha). Argentina and Uruguay produce 1,334,160 tons and 1,287,200 tons, respectively, and Brazil is the major importer of their production. In the latter two countries, the average yield is 6.88 tons/hectare and 7.63 tons/ha, respectively, according to data of FAO (2011) related to the year 2009; hence, such productivity is far higher than the Brazilian average of 4.41 tons/ha. This difference in productivity significantly influences revenues obtained by these countries. Besides, lower prices were observed in Argentina and Paraguay. In Uruguay, an advantage in domestic costs can be noticed.

Table 4. Policy analysis matrix estimated for rice production in Mercosur. 2010 – present.

Countries	Items	Revenues (US$/ hectare)	Costs (US$/hectare)		Profit (US$/hectare)
			Tradable inputs	Domestic factors	
Brazil	Private prices in Brazil	1,371.36	435.73	1,077.49	-141.86
	Social prices in Brazil	1,864.85	440.18	1,056.35	368.32
	Effect of divergences and policy efficiency in Brazil	-493.49	-4.44	21.14	-510.19
Argentina	Private prices in Argentina	2,030.84	397.94	928.53	704.37
	Social prices in Argentina	2,914.32	481.51	642.28	1,790.53
	Effect of divergences and policy efficiency in Argentina	-883.48	-83.57	286.25	-1,086.16
Paraguay	Private prices in Paraguay	1,232.92	419.87	979.69	-166.64
	Social prices in Paraguay	1,799.78	396.18	754.36	649.24
	Effect of divergences and policy efficiency in Paraguay	-566.86	23.69	225.32	-815.88
Uruguay	Private prices in Uruguay	2,212.73	379.24	1,154.98	678.51
	Social prices in Uruguay	3,230.08	494.99	916.31	1,818.78
	Effect of divergences and policy efficiency in Uruguay	-1,017.35	-115.75	238.67	-1,140.27

Lower costs and high productivity of these countries (mainly Uruguay and Argentina) enable them to offer more competitive prices, thus increasing their exportations to Brazil. This is facilitated by the reduction of entrance tax rates in Brazil due to agreements established by Mercosur. The negative effect of this fact on the Brazilian market is that Brazilian products face competition with products from countries with lower internal tax burdens. The positive effect, however, is that consumers and the processing industry benefit from that, as the offer is broadened and prices are lowered.

In the same way, costs lower than the production factors in Argentina and Uruguay were found in a study carried out by IRGA (2011a). For example, by comparing Brazilian rental costs to Argentinean and Uruguayan ones, it was found that these values are 50 percent lower in Argentina and 66 percent lower in Uruguay. According to that study, these advantages and the cost reduction in some important inputs for rice production have attracted several Brazilian producers to Argentinean and Uruguayan lands.

In this context, the difference of tax burden on Argentinean and Uruguayan rice has been one of the factors impacting on costs, thus rendering rice produced in those countries more economically competitive than rice produced in Brazil.

By analyzing Table 4, we can see that, in Brazil, private revenues were lower than social revenues, evidencing that public policies are negatively affecting rice production.

In Brazil, the values of tradable inputs (seeds, fertilizers and chemicals) per hectare of rice (Table 4) are slightly higher than the values practiced in the country. In Argentina and Uruguay, the difference between social and private

prices was bigger, as prices practiced in those countries are lower than the ones practiced in the world.

In the present scenario, with free trade between markets, it is necessary to consider comparative advantages, so that the prices of goods, established through the confrontation of supply and demand, can direct the volume and the structure of a range of rice trade flows. In this sense, it is worth remembering Ricardo's theory, which as early as 1817 put forward the idea that, even if a country did not have absolute advantage in a certain product in the international trade flow, this would be advantageous for countries whose trade partners had different production– this is the case of Brazil, the largest rice producer in Mercosur. However, rethinking public policies that fill the demands of different commercial, governmental and social actors requires a tax evaluation, since excessive taxation may compress the demand and inhibit the country's production. This is in accordance to Rakotoarisoa's findings (RAKOTOARISOA, 2011), which show that while developed countries have strongly subsidized the production and exportation of a number of commodities, including rice, developing countries have excessively taxed their producers.

The tax issue is totally related to the public policies evidenced in this study, and the Brazilian tax burden has increased after the 1990's (OECD, 2011). This is in accordance with Lindblom's theory (LINDBLOM, 1965), which establishes that policies, as well as rules that determine decisions along the stages of creation and implementation, have a great influence on the generation of conflicts between the public and the private, since decisions related to public tax policies undergo pressures from several social actors, as it is the case of the tax incurring on rice production in Brazil. The public agent, when required to formulate a public policy, evaluates social values, objectives, alternatives and theoretical knowledge related to the problem to be solved, in a structuring and rating effort to choose the alternative that maximizes the results expected.

a) Social and private indicators of competitiveness

The comparison between private and social indicators with the use of PAM is shown in Table 5.

As to the Private Cost Ratio (PCR), the indicators found were higher than 1 in Brazil and Paraguay, evidencing that the return rate of domestic factors for rice production in these countries is lower than the normal return expected, i.e. under the conditions prevailing in 2010, the activity is not economically profitable, in opposition to the situation found in Argentina and Paraguay.

The Domestic Resource Cost (DRC) is analyzed in a way similar to private profitability, i.e. minimizing DRC is the same as maximizing the social profits. All the DRC estimated were less than 1, indicating production efficiency. Argentina and Uruguay presented high production ef-

Table 5. PAM indicators for rice production in Mercosur - current cenario (2010).

	Brazil	Argentina	Paraguay	Uruguay
Private Cost Ratio - PCR	0.00	0.57	1.2	0.63
Domestic Resource Cost - DRC	0.74	0.26	0.54	0.34
Nominal Protection Coefficient - NPC	0.74	0.7	0.69	0.69
Effective Protection Coefficient - EPC	0.66	0.67	0.58	0.67
Profitability Coefficient - PC	-0.39	0.39	-0.26	0.37
Subsidy Ratio to Producers - SRP	-0.27	-0.37	-0.45	-0.35

ficiency, with positive effects to those countries due to the obtainment of higher net revenues.

Regarding Nominal Protection Coefficients (NPC), they have shown that rice production in the year considered underwent implicit taxations resulting from political actions, given that prices are below the international prices in all of the countries. Indicators close to 0.70 point out that the prices received by producers were lower than the ones found in the world market.

Concerning the Effective Protection Coefficients (EPC), we must explain that they are limited as incentive indicators, as they do not include the effects of policies that influence the domestic prices. This omission means that the results of EPC are interpreted as partial measures of the effects of incentives of policies on the prices of products and tradable inputs. In order to overcome such limitation, the Profitability Coefficient (PC) is used as a global measure of the net transfers resulting from political intervention. EPC (Table 5) are less than 1, which means that the interventions in the rice production industry by means of public policies are reduced, that is, they indicate non-protection.

The Profitability Coefficient (PC) widens the understanding of EPC, including transfers associated with the policies that affect the utilization of domestic factors. An index well lower than 1 (-0.39 for Brazil and -0.26 for Paraguay) means that rice production in these two countries had high net taxation and the private profit decreased. As an effect of this policy, there is a transfer of revenues from the producers to society.

The indicator Subsidy Ratio to Producers (SRP) allows for comparisons of the subsidy policies related to rice production in the countries studied. The indexes of SRP seen in Table 5 indicate reduced levels of subsidies in all of the countries, particularly in Brazil, which presented an index of -0.27, evidencing disincentives to production.

From social and private indicators, it was possible to compare rice production in the four state members of Mercosur. The results showing greater profitability in Argentina and Uruguay are in accordance with the results found in studies carried out by CONAB (2011c) and IRGA (2011b).

b) Analysis of sensitivity in a simulated scenario with a 10-percent reduction in the Brazilian tax burden

Tables 6 and 7 illustrate the effects of a variation in the direct and indirect tax burden with a 10-percent reduction in Brazil. It is possible to see that, with such a reduction, the profitability of Brazilian rice production is practically inexistent, given the prices in effect in the Brazilian market in 2010. In this way, profit increase through higher prices and/or yield, as well as the reduction of other production costs, should occur for the private profits in Brazil to become more satisfactory for producers.

The indicator that had the greatest variation in this scenario (Table 7) was precisely the profitability coefficient (PC), which was negative

Table 6. Scenario 2 - Simulating the Policy Analysis Matrix estimated for rice production in Brazil with a 10-percent reduction in the tax burden.

Countries	Items	Revenues (US$/ hectare)	Costs (US$/hectare)		Profit (US$/ hectare)
			Tradable inputs	Domestic factors	
Brazil – Scenario 2	Private costs with 10-percent tax reduction	1,371.36	392.16	969.74	9.46
	Social prices	1,864.85	440.18	1,056.35	368.32
	Effect of divergences and policy efficiency	-493.49	-48.02	-86.61	-358.86

Table 7. Scenario 2 – Analysis of sensitivity of PAM indicators for rice production in Brazil with simulation of a 10-percent tax reduction.

Private and social indicators	Brazil - Scenario 2
Private Cost Ratio - PCR	0.99
Lucro Social H = E - F - G	1,790.53
Domestic Resource Cost - DRC	0.74
Transferência Liquida das Políticas TLP = I - J - K	-1,086.15
Nominal Protection Coefficient - NPC	0.74
Effective Protection Coefficient - EPC	0.69
Profitability Coefficient - PC	0.03
Subsidy Ratio to Producers - SRP	-0.19

in the situation analyzed (-0.39) and went up to 0.03 in the simulated scenario. This shows a positive result, but it is still very low.

DRC and NPC did not change in this scenario, while SRP and EPC had significant variations. SRP presented a reduced level even with the reduction of the percentage of taxes simulated in the scenario proposed.

Besides the reduction of taxation of both inputs and products, other political actions should be taken in order to improve the competitiveness of Brazilian rice, such as higher investments in research and development aiming at increasing the crop yield in Brazil, and a more effective trade policy. It is also worth highlighting that both the macroeconomic scenario and the exchange policy have a deep influence on this market.

The Brazilian domestic demand did not absorb the whole 2011 crop (IBGE, 2010), and part of it was destined to the foreign market. Broadening of Brazilian exportations to the African market, as pointed out in references used in this study (IRGA, 2011b), would have a positive effect on trade of the present and future rice crops, as it would favor the flow of the production surplus.

Therefore, increased importation of rice from Mercosur countries will cause a production surplus in Brazil and, consequently, it will reduce prices in the Brazilian market.

Conclusion

The profitability of Brazilian rice production in comparison to other Mercosur countries is rather influenced by the direct and indirect tax burden. In this sense, Brazil is in a disadvantageous position, since its tax system is more complex and its tax burden is higher than the other Mercosur members'. In order to have an equal tax incidence on the costs of rice production, there should be a reduction of the taxes that could impact on rice production in Brazil, as the production is much more competitive in Argentina and Uruguay. It is also worth emphasizing that a heavy indirect tax burden on Brazilian agriculture and cattle raising has important effects on the allocative efficiency of rice produced in Brazil.

The main effect of this tax policy is the generation of distortions in the Brazilian rice production chain. According to data found in this study concerning the tax burden on rice production in Brazil, such a burden represents almost 25 percent of the production cost. Hence, for Brazil it is more advantageous to import rice from Mercosur countries, and this causes excess supply.

Estimates simulated with the alternative scenario (Scenario 2) have shown that the effects of high taxation on rice production in Brazil have negatively affected the country competitiveness in relation to the other Mercosur state members. It has also become evident that rice prices, productivity and quality are essential in this market. We suggest that studies addressing effects related to these issues are carried out, once the commodities trade is fundamental to developing countries that depend on exportations to balance both the supply and the demand for agricultural products.

In this sense, regarding issues related to the harmonization of tax systems of the state members, there is a need for more studies to assess the validity of the adoption of Value-Added Tax.

It is a fact that political decision-making is institutionally complex, and decision-makers are strongly influenced by the pressure from interest groups in their countries. Furthermore, the way that economy will respond to changes induced by new policies depends on the intensity of reforms as well as of the market structure and functioning.

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