MINISTRY OF AGRICULTURE, LIVESTOCK AND FOOD SUPPLY
STRATEGIC MANAGEMENT ADVISORY BOARD

BRAZIL AGRIBUSINESS PROJECTIONS
2010/2011 to 2020/2021

Brasília June 2011

BRAZIL AGRIBUSINESS PROJECTIONS 2010/2011 to 2020/2021

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Brasília June 2011

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Legends:

ABIOVE - Associação Brasileira da Indústria de Óleos Vegetais (Brazilian Association of the Plant Oil Industry)

ABRAF- Associação Brasileira de Produtores de Florestas Plantadas (Brazilian Association of Producers of Planted Forests)

AGE - Assessoria de Gestão Estratégica (Strategic Management Advisory Board)

BRACELPA- Associação Brasileira de Celulose e Papel (Brazilian Association of Cellulose and Paper)

CECAT - Centro de Estudos Estratégicos e Capacitação em Agricultura Tropical (Center of Strategic Studies and Capacity Building in Tropical Agricuture)

CNA - Confederação da Agricultura e Pecuária do Brasil (Brazilian Confederation of Agriculture and Livestock)

CONAB - Companhia Nacional de Abastecimento (National Supply Company)

EMBRAPA Gado de Leite - Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA Milk Cattle - Brazilian Institute of Agriculture and Livestock Research)

FAO - Food and Agriculture Organization of the United Nations

FAPRI - Food and Agricultural Policy Research Institute

FGV - Fundação Getúlio Vargas (Getúlio Vargas Foundation)

IBGE - Instituto Brasileiro de Geografia e Estatística (Brazilian Institute of Geography and Statistics)

ICONE - Instituto de Estudos do Comércio e Negociações Internacionais (Commerce and International Negotiations Studies Institute)

IFPRI - International Food Policy Research Institute

IPEA - Instituto de Pesquisa Econômica Aplicada (Applied Economic Research Institute)

MAPA - Ministério da Agricultura, Pecuária e Abastecimento (Ministry of Agriculture, Livestock and Food Supply)

OECD - Organization for Economic Co-Operation and Development

ONU - Organização das Nações Unidas (United Nations)

SGE- Secretaria de Gestão Estratégica (Secretariat of Strategic Management)

UFV - Universidade Federal de Viçosa (Federal University of Viçosa)

UNICA - União da Indústria de Cana-de-açúcar (Sugar Cane Industry Union)

USDA - United States Department of Agriculture

BRAZIL AGRIBUSINESS PROJECTIONS
2010/2011 to 2020/2021

1. INTRODUCTION

This Report is an update and review of the study Projections of the Agribusiness - Brazil 2009/10 to 2019/20, Brasília – DF, June 2010, published by the Ministry of Agriculture, Livestock and Food Supply. As the prospective view is not static, periodic reviews are necessary due to the internal and external environment. For this reason, institutions which work with the long term view have the concern to update systematically their projections. The projections of this report were prepared in January 2011.

The world goes through a period of great apprehension, particularly after the outbreak of the financial crisis in the United States, in September 2008. The links of the productive chains of the agribusiness must review frequently their planning for the most adequate decision-making possible.

The work has as objective to indicate possible directions of the development and provide subsidies to the public policy makers in relation to the trends of the main products of the agribusiness. The results seek, also, to fulfill a great number of users from the several different sectors of the national and international economy to whom the announced information is of great importance. The indicated trends will allow the identification of possible itineraries, as well as to structure future views of the agribusiness within the world context so that the country continues growing and conquering new markets.

Projections of the Agribusiness – Brazil 2010/11 to 2020/21, is a prospective view of the sector, base for the strategic planning of MAPA - Ministry of Agriculture, Livestock and Food Supply. Reports from Brazilian and International organizations were consulted for its elaborations, some of them based on projections models of projections.

Among the consulted institutions the studies from Food and Agriculture Organization of the United Nations (FAO), Food and Agricultural Policy Research Institute (FAPRI), International Food Policy Research Institute (IFPRI), Organization for Economic Co-Operation and Development (OECD), United Nations (UN), United States Department of Agriculture (USDA), Brazilian Confederation of Agriculture and Livestock (CNA), Getúlio Vargas Foundation (FGV), Brazilian Institute of Geography and Statistics (IBGE), Commerce and International Negotiations Studies Institute (ICONE), Applied Economic Research Institute (IPEA), National Supply Company (CONAB), Embrapa Milk Cattle, Energetic Research Company (EPE), Sugar Cane Industry Union (UNICA), Brazilian Association of Producers of Planted Forests (ABRAF), STCP Consulting, Engineering and Management, Brazilian Association of Cellulose and Paper (BRACELPA), Brazilian Association of the Plant Oil Industry (ABIOVE) and Brazilian Association of Agribusiness (ABAG) stand out.

This 2011version counted with the fundamental collaboration of a technicians and researchers group from EMBRAPA, which cooperated in the several phases of the work in discussions and suggestions, and especially in the support for adjustments of the econometric models.

This Report also benefited from the valuable contribution from people/institutions which analyzed the preliminary results and informed their comments, points of view and ideas on the results of the projections. The observations in relation to these collaborations were

included in the Report, without naming the collaborators, but the institutions to which they belong to.

2.   THE AGRICULTURAL PRICES AS PART OF THE PROJECTIONS SCENARIOS

During the preparation of this report the discussions on agricultural prices were intensified, not only as one of the items pressuring the internal inflation indexes, as well as an international concern with the rise of the food prices. The agricultural prices in Brazil, for several products, were in 2010 and in the beginning of 2011 above the historical prices. The nominal price raised by Cepea/USP (2011), for sugar, average 2010/2011, is 107.6% higher than the historical price; the coffee price is higher in 54.3%; the price of the cattle is of 63.0%, and the soybean, 28.5%.

According to FAO the international prices have never been so high, and according to Botelho (2011) a huge network of factors influences the prices and production. Among these, the ones which stand out the most are severe climate change in some countries, low world stocks of corn, rice, wheat and soybean, pressure from the biofuels, increase of the world income and increase of the population.

The projections announced in January by institutions with tradition in prospective works indicate the trend of increasing prices in the next years. The United States Department of Agriculture in its report from February 2011 says that the agricultural prices are projected to remains above the pre-2006 level during the next decade. The main indicated factors for this increase are the increasing world demand for grains, oleaginous and livestock products; depreciation of the American dollar; the energy prices are kept high; the increase in the biofuels production. The same trend of high prices is being projected for plant oils and meat (USDA, 2011).

The increase of food prices is also dealt with concern by IFPRI (2011) in the report agriculture, food safety and climate change until 2050. In the several scenarios presented, rises in the prices of grains in the next years are shown. IFPRI says that the world prices are useful indicators about the future of agriculture. Rising prices indicates the existence of imbalances between supply and demand, and increasing scarcity of resources, originated by factors related to the demand, such as income and increase of the population, or by factors related to the productivity due to the climate changes. But the most relevant point which the IFPRI Report shows is that different from the 20th century, when the real agricultural prices were decreasing, the scenarios of prices presented in the study show increasing prices between 2010 and 2050 (p.20).

Finally, the study from Foresight (2011) shows that with great probability, it is far from the agricultural prices being low at a long term, and that there is a significant probability that the prices of the main crops will rise, dramatically throughout the next 40 years.

3. METHODOLOGY

The projections period goes from 2010/11 to 2020/21, therefore a period of eleven years. In general, the period which constitutes the base of the projections covers 34 years. The projections were performed using specific econometric models. They are models of time series which have great use in series forecast. The use of these models in Brazil, for the

purpose of this work, is unprecedented. We do not have knowledge of studies published in the Country which have worked with these models.

Three statistic models were used: Exponential Smoothing, Box & Jenkins (Arima) and State-Space Model. There is a methodological note (Attachment 1) where the main characteristics of the three models were presented.

The projections were carried out for 22 products from the agribusiness: corn, soybean grain, wheat, orange, orange juice, chicken meat, beef, pork, sugar cane, sugar, cotton, soybean meal, soybean oil, fresh milk, beans, rice, potato, cassava, tobacco, paper and cellulose.

In the report, however, not all the products were discussed, but their data is found on the tables which are part of the study.

The choice of the most likely methods was done in the following manner:

1. Coherence of the results;

2. International comparison of the data for production, consumption, exports, imports and trade in the countries and in the world;

3. Past trend of our data;

4. Growth potential;

5. Consultations to experts.

The projections were made in general for production, consumption, exports, imports and planted area. The trend was to choose more conservative models and not those which indicated more daring growth rates. This procedure was used in the selection of most of the selected results.

The projections presented in this Report are national, where the number of studied products is wide; and regional, where the number of analyzed products is restricted and have specific interest.

The projections are accompanied by forecast intervals which becomes wider throughout time. The greatest amplitude of these intervals reflects the greatest degree of uncertainty associated to forecasts which are more distant from the year 2010.

4. RESULTS OF THE PROJECTIONS BRAZIL

4.1. Cotton

Currently, the cotton production in Brazil occur predominantly in three states, Mato Grosso, Bahia and Goiás, as can be seen in the map below.

Cotton	Harvest Year 2010/2011	%
	Thousand tons	
National Production	4,990.30	100.00
BA	1,511.30	30.28
MT	2,549.30	51.09
GO	389.00	7.80
Others	540.70	10.84

SOURCE: CONAB - Research: Feb/2011.
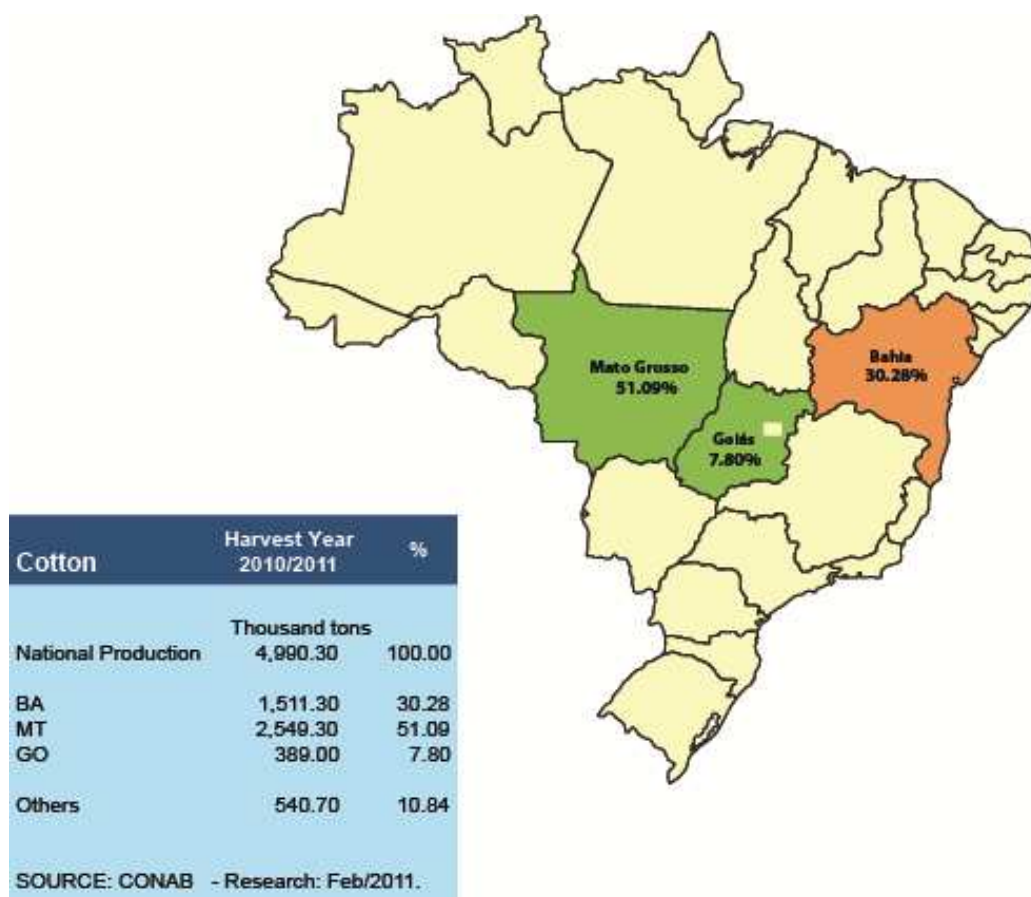
The projections for cotton indicates an increase in the production from 1.6 million tons in 2010/2011 to 2.4 million tons in 2020/2021. This expansion corresponds to a growth rate of 4.3% per year during the period from 2010/11 to 2020/2021. The consumption of this product in Brazil must grow at an annual rate of 1.0% within the next eleven years reaching a total of 1.1 million tons in 2020/2021. In relation to national exports a volume of 885 thousand tons is projected for this same harvest year.

The estimation for planted area with cotton indicates that at the end of the projection period 892 thousand hectares will be cultivated. This is equivalent to a reduction of 3.63% in comparison to the planted area in 2010/11.

Table 1 - Cotton Production, Consumption and Exports

COTTON (thousand tons)

Year	Production			Consumption			Exports		
	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L
2010/11	1,588.3	1,117.2	2,059.3	993.7	872.0	1,115.4	521.2	337.9	704.4
2011/12	1,671.7	1,195.7	2,147.8	1,003.6	880.6	1,126.5	554.6	369.3	739.8
2012/13	1,755.2	1,273.7	2,236.7	1,013.4	889.0	1,137.8	588.0	400.6	775.3
2013/14	1,838.7	1,351.2	2,326.1	1,023.2	897.3	1,149.1	621.4	431.7	811.0
2014/15	1,922.1	1,428.4	2,415.9	1,033.0	905.5	1,160.6	654.8	462.7	846.9
2015/16	2,005.6	1,505.2	2,506.0	1,042.9	913.6	1,172.2	688.2	493.4	882.9
2016/17	2,089.1	1,581.5	2,596.6	1,052.7	921.6	1,183.8	721.6	524.1	919.0
2017/18	2,172.5	1,657.6	2,687.5	1,062.5	929.5	1,195.6	755.0	554.6	955.3
2018/19	2,256.0	1,733.2	2,778.8	1,072.3	937.3	1,207.4	788.3	584.9	991.8
2019/20	2,339.5	1,808.6	2,870.4	1,082.2	945.0	1,219.3	821.7	615.2	1,028.3
2020/21	2,422.9	1,883.6	2,962.3	1,092.0	952.6	1,231.4	855.1	645.3	1,065.0

Source: Elaborated by AGE/Mapa and SGE/Embrapa with data from CONAB.

* Models used: For production, consumption and exports State-Space model.

Figure 1 - Cotton Production, Consumption and Exports
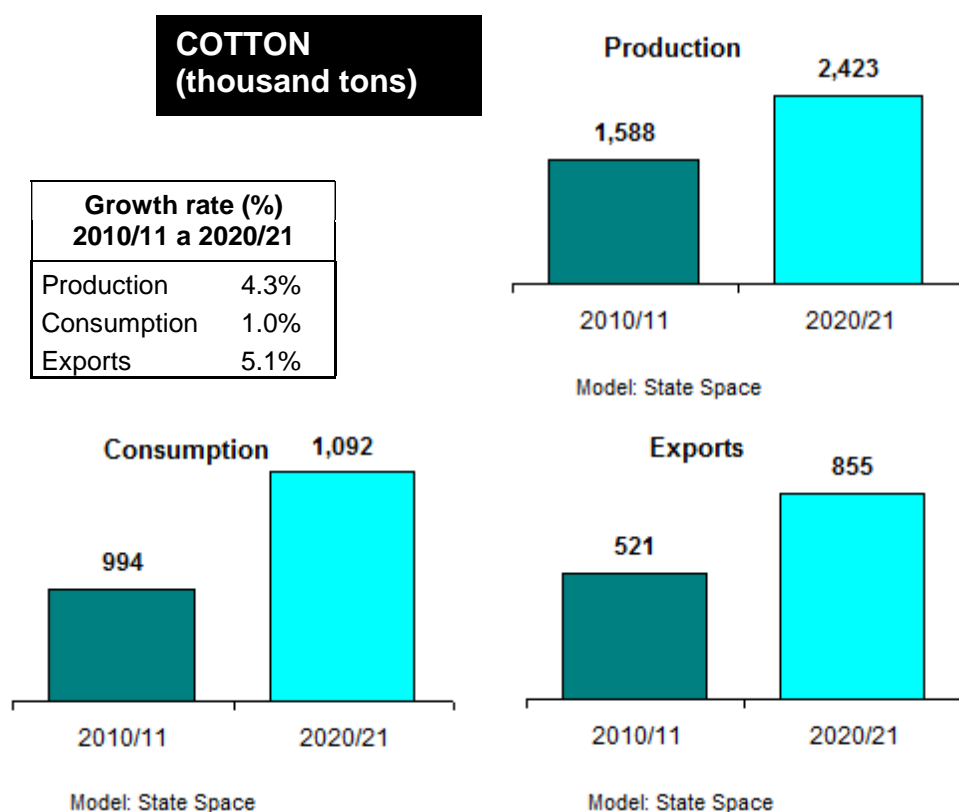
Source: AGE/Mapa and SGE/Embrapa

4.2.   Rice

The national rice production is distributed among the following states: Rio Grande do Sul, 64.4% of the national production, Santa Catarina, 8.3%, Mato Grosso, 5.4% and Maranhão, 4.4%.

Rice	Harvest year 2010/2011	%
	Thousand tons	
National Production	12831.40	100.00
Main Producing states		
MA	566.90	4.42
MT	687.40	5.36
SC	1058.10	8.25
RS	8256.80	64.35
Others	2262.20	17.63
SOURCE: CONAB - Research: Feb/2011.		

The projections for production and consumption of rice shows a tight situation between these two variables, having the need to import rice within the next years. The projected production for 2020/2021 is of 13.7 million tons, being equivalent to an annual growth in the production of 1.0% from 2010/2011 to 2020/2021. This production increase must occur especially through the growth of the irrigated rice, since the rice from dry lands has reduced its expansion in Brazil due to a lower incorporation of new lands in agricultural border areas.

The rice consumption must follows the production. The consumption is stabilized within the interval from 12.5 to 13 million tons per year. An annual rate for the next years of 1.0% is projected reaching the volume of 14.0 million tons in 2020/2021. This way the consumption in 2020/2021 will be able to be fulfilled by private and public stocks and some imports.

Figure 2 – Rice production and consumption

Source: Elaborated by AGE/Mapa and SGE/Embrapa

The estimations for the projection of planted area of rice shows that a reduction of area must occur within the next years. The area must go from 2.6 million hectares in 2010/2011 to 1.6 million hectares in 2020/2021, a reduction, therefore, of 1.0 million hectares of rice. As it will be seen, this area reduction should not occur in Rio Grande do Sul, main national producer of this product. The forecasts from ICONE (2011) do not indicate area decrease, but the stability.

Table 2 - Rice Production, Consumption and Imports

RICE (thousand tons)

Year	Production			Consumption			Imports		
	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L
2010/11	12,503.1	10,411.9	14,594.4	12,632.3	12,211.2	13,053.4	214.8	124.3	1,862.4
2011/12	12,570.2	9,773.4	15,367.0	12,787.5	12,109.3	13,465.7	346.0	-	2,115.3
2012/13	12,715.9	9,525.6	15,906.1	12,924.1	12,057.4	13,790.7	442.2	-	2,256.7
2013/14	12,803.6	9,314.5	16,292.7	13,066.0	12,051.8	14,080.2	517.5	-	2,417.2
2014/15	12,948.1	9,148.3	16,748.0	13,198.7	12,062.0	14,335.4	579.9	-	2,544.0
2015/16	13,083.1	8,991.1	17,175.0	13,334.4	12,084.8	14,584.1	637.6	-	2,662.3
2016/17	13,213.7	8,853.5	17,573.9	13,470.7	12,116.9	14,824.5	690.7	-	2,773.9
2017/18	13,343.8	8,732.6	17,955.0	13,606.8	12,156.6	15,057.1	739.9	-	2,880.1
2018/19	13,475.3	8,625.2	18,325.4	13,742.7	12,202.2	15,283.2	786.0	-	2,980.5
2019/20	13,606.8	8,528.8	18,684.9	13,878.7	12,252.8	15,504.5	829.5	-	3,076.3
2020/21	13,738.2	8,442.0	19,034.3	14,014.6	12,307.7	15,721.5	976.6	-	3,168.0

Source: Elaborated by AGE/Mapa and SGE/Embrapa with data from CONAB.
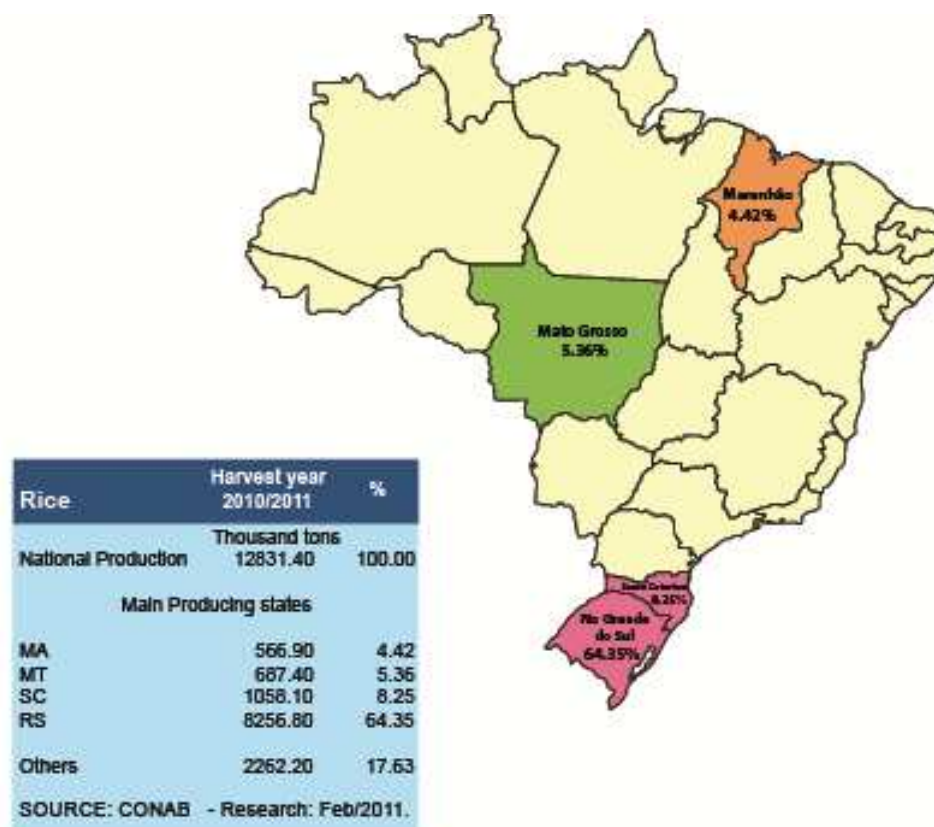* Models used: for the production, consumption and exports State-Space model.

Figure 3 - Rice Production, Consumption and Imports
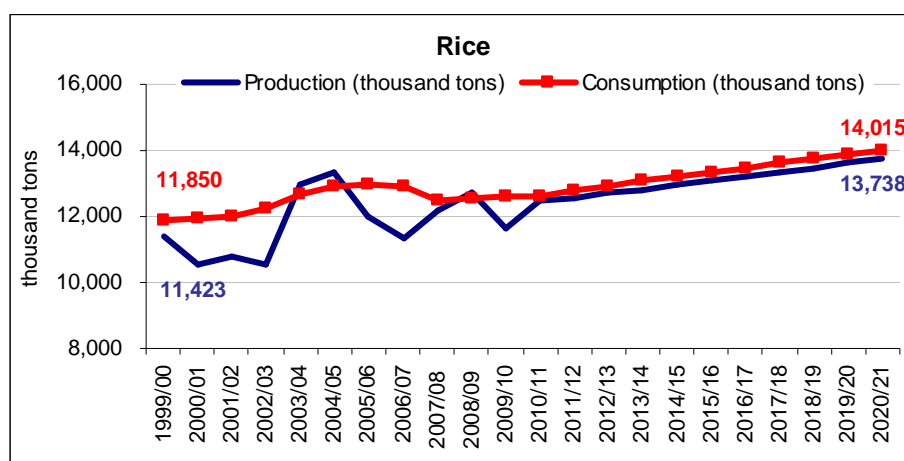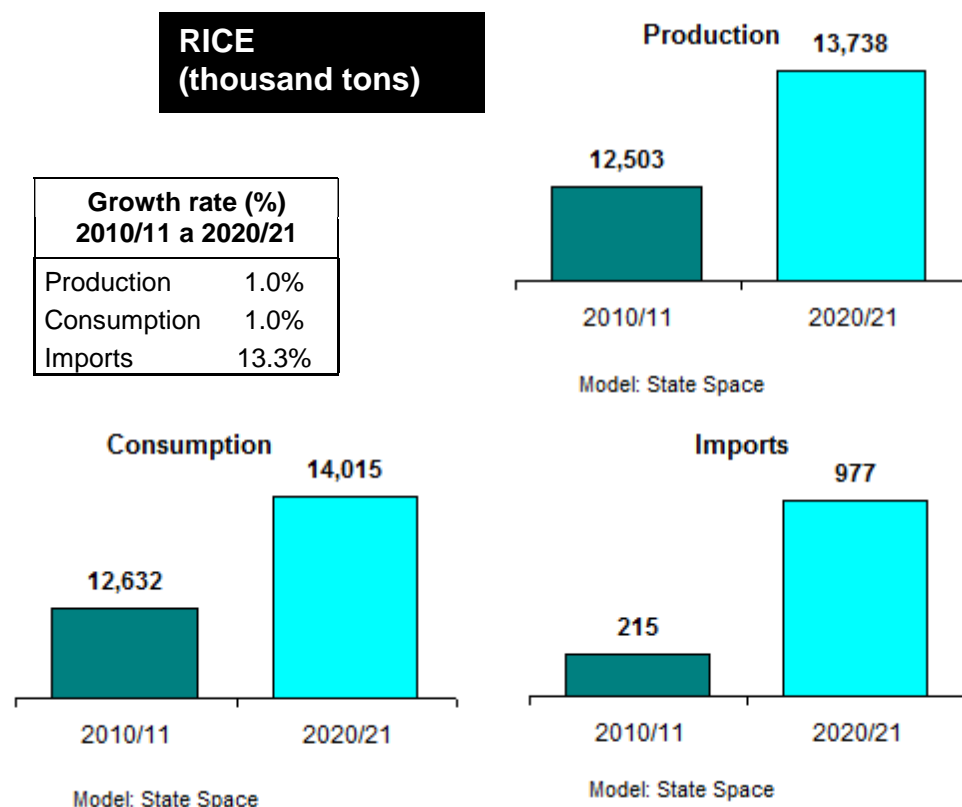

Source: AGE/Mapa and SGE/Embrapa

4.3. Beans

Such as rice, beans are part of the basic food basket for the Brazilians. Beans have a projected annual rate for production of 0.9% and consumption around 1.1% per year, for the period 2010/2011 to 2020/2021. The beans production is much adjusted to the consumption (IBGE/Cepagro - Minutes of January 06, 2011). The annual average consumption of this product has been of 3.5 million tons, requiring small quantities of imports. The projections for production and consumption indicates that there might be some imports of beans in the next years. However, the magnitude of the imports numbers, between 150 thousand and 200 thousand tons corresponds to more than what has been imported in Brazil in recent years (See CONAB, 2011).

Table 3 - Beans Production, Consumption and Imports

BEANS (thousand tons)

Year	Production			Consumption			Imports		
	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L
2010/11	3,512.8	2,885.0	4,140.7	3,527.4	3,051.9	4,002.9	193.6	100.2	286.9
2011/12	3,567.2	2,930.7	4,203.8	3,553.7	2,999.4	4,107.9	155.6	54.5	256.8
2012/13	3,513.8	2,874.2	4,153.5	3,600.4	2,938.9	4,262.0	166.0	63.1	268.8
2013/14	3,584.9	2,866.7	4,303.1	3,639.0	2,899.5	4,378.5	190.4	71.0	309.9
2014/15	3,639.9	2,901.3	4,378.5	3,680.8	2,865.7	4,496.0	180.0	51.4	308.5
2015/16	3,643.7	2,894.3	4,393.2	3,721.4	2,839.0	4,603.8	182.0	49.6	314.5
2016/17	3,683.2	2,901.1	4,465.3	3,762.4	2,816.8	4,708.0	196.1	55.1	337.2
2017/18	3,727.9	2,922.6	4,533.1	3,803.3	2,798.7	4,807.8	196.3	47.5	345.0
2018/19	3,752.6	2,931.1	4,574.0	3,844.2	2,783.8	4,904.5	197.9	44.1	351.7
2019/20	3,785.6	2,941.8	4,629.5	3,885.1	2,771.8	4,998.4	206.4	46.3	366.5
2020/21	3,823.8	2,958.7	4,688.9	3,926.0	2,762.1	5,089.9	210.0	43.5	376.5

Source: Elaborated by AGE/Mapa and SGE/Embrapa with data from CONAB.
* Models used: For the production State-Space model and for the consumption and imports Arma model

Figure 4 - Beans Production, Consumption and Imports
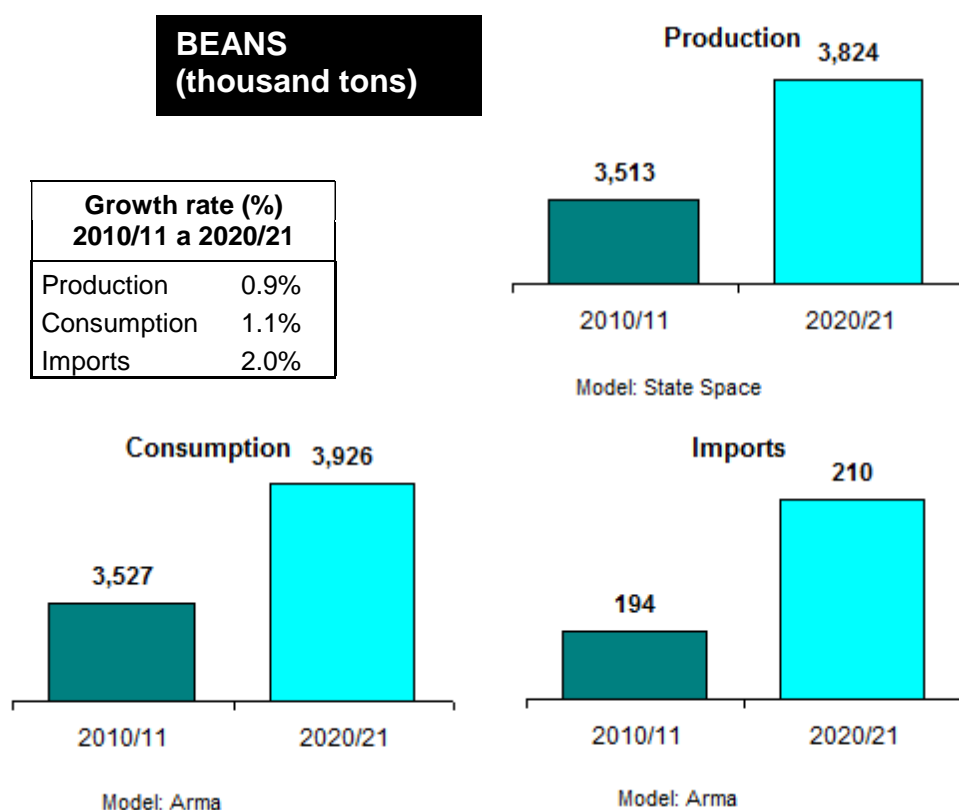
Source: AGE/Mapa and SGE/Embrapa

The average income consumption elasticity of the income strata is (-0.072). This negative value of the elasticity indicates that if the income increases the consumption of beans decreases (Hoffmann, 2007). Even with the negative income elasticity, the increase of the consumption for the annual imports, are justified due to the population growth. Within a broader context, IBGE noted through the Family Budget Research - POF, which in Brazil the

share of the group Food is decreasing in the total expenses of the families - it represented 33.9% in 1974/75, and it decreased to 19.8% of the total expenses in 2008/09 (IBGE, June 23, 2010).

4.4. Corn

The national corn production is relatively dispersed in the country. The main producing states, Paraná and Mato Grosso, concentrate 35.9% of the national production, as can be observed in the map.

Corn	Harvest Year 2010/2011	%
National Production	54,496.50	100.00
	Thousand tons	
	Main Producing states	
BA	2,329.20	4.27
MT	7,644.30	14.03
MS	3,781.10	6.94
GO	4,996.90	9.17
MG	6,291.40	11.54
SP	4,279.70	7.85
PR	11,929.70	21.89
SC	3,427.60	6.29
RS	5,007.70	9.19
Others	4,808.90	8.82
SOURCE: CONAB - Research: Feb/2011.		
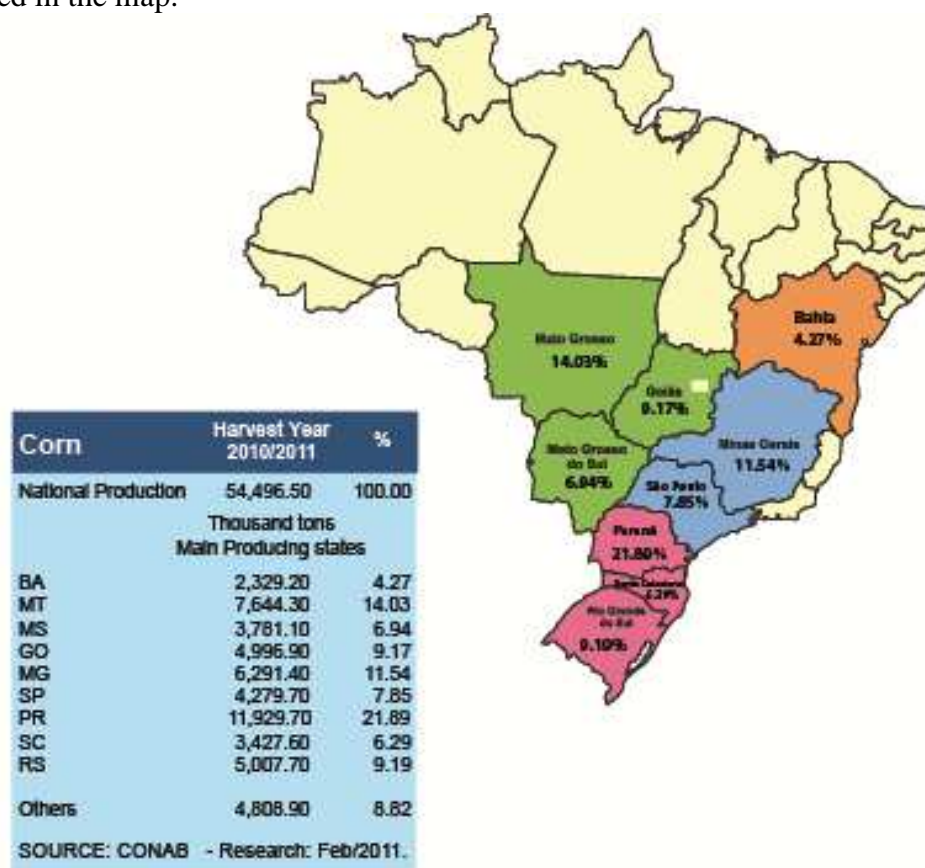
The projections for corn production in Brazil indicates an increase of 12.7 million tons between the harvests of 2010/2011 and 2020/2021. In 2020/2021 the production must be situated in 65.5 million tons, and the consumption in 56.0 million. These results indicate that the Country must perform adjustments in its supply, in a way to guarantee the internal market supply and obtain some surplus for exports, estimated in 14.3 million tons in 2020/2021.

Figure 5 – Corn Production and Consumption
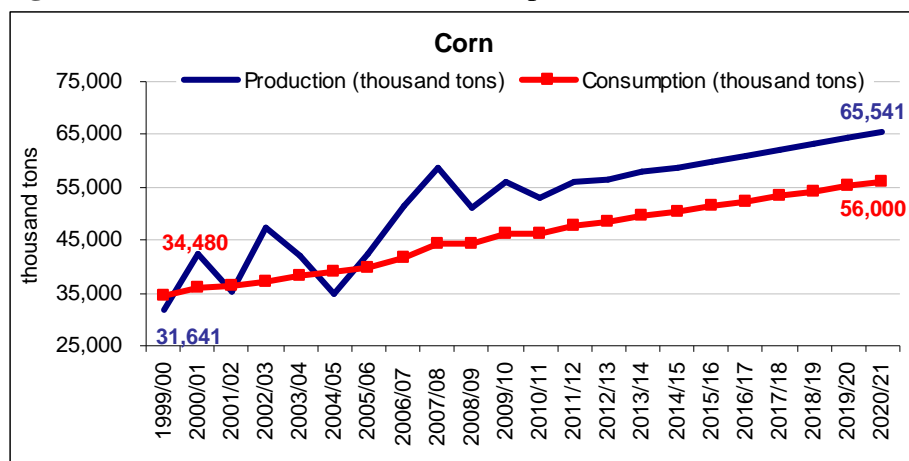
Source: Elaborated by AGE/Mapa and SGE/Embrapa

This corn exports forecast must occur starting from an annual growth rate of 4.6%. But for not having problems in the internal supply there will be the need to expand the production in a way that it gets close to its superior limit, which is more than the forecasted 65.5 million.

The forecasts indicate that in the next years, around 86.0% of the corn production will be destined to the internal market, to fulfill the human consumption and manufacturing of animal feeds, especially for swines and poultry.

Table 4 - Corn Production, Consumption and Exports

CORN (thousand tons)

Year	Production			Consumption			Exports		
	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L
2010/11	52,853.7	43,609.8	62,097.5	46,385.1	43,631.4	49,138.8	9,139.5	3,006.6	15,272.3
2011/12	56,226.8	45,080.7	67,372.9	47,863.0	44,047.6	51,678.4	9,188.0	2,503.0	15,872.9
2012/13	56,369.9	43,204.3	69,535.6	48,295.6	43,385.0	53,206.2	11,159.2	4,451.4	17,866.9
2013/14	57,848.5	43,047.1	72,649.9	49,620.0	44,302.6	54,937.4	11,105.7	3,268.6	18,942.7
2014/15	58,835.5	42,543.3	75,127.7	50,262.3	44,508.8	56,015.8	10,921.4	2,350.2	19,492.7
2015/16	59,987.2	42,331.8	77,642.7	51,462.1	45,417.0	57,507.2	12,156.2	3,458.9	20,853.5
2016/17	61,088.7	42,168.7	80,008.6	52,200.0	45,738.6	58,661.3	12,674.3	3,476.8	21,871.8
2017/18	62,203.8	42,098.1	82,309.6	53,298.4	46,488.5	60,108.3	12,655.6	2,829.3	22,481.9
2018/19	63,315.8	42,090.7	84,540.9	54,101.8	46,897.3	61,306.3	13,416.9	3,350.2	23,483.7
2019/20	64,428.3	42,139.9	86,716.7	55,145.9	47,623.3	62,668.6	14,093.1	3,696.8	24,489.5
2020/21	65,540.9	42,237.7	88,844.1	55,999.5	48,146.7	63,852.4	14,299.4	3,418.9	25,179.9

Source: Elaborated by AGE/Mapa and SGE/Embrapa with data from CONAB.

* Models used: For the production State-Space model and for the consumption and exports Arma model

Figure 6 - Corn Production, Consumption and Exports
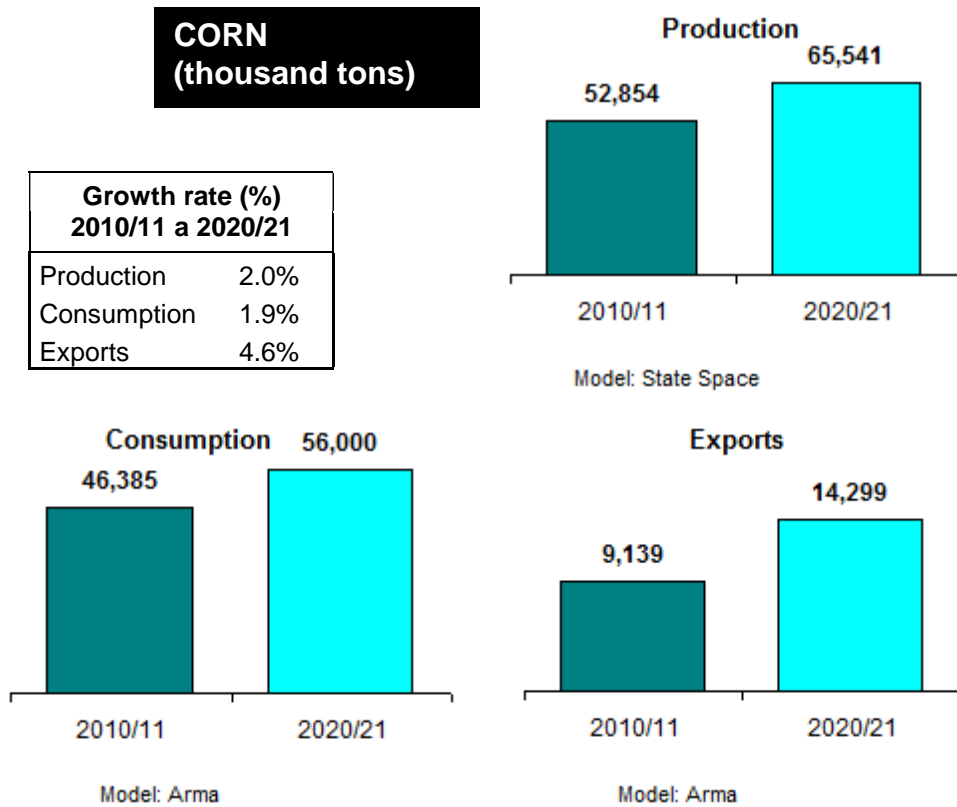
Source: AGE/Mapa and SGE/Embrapa

While the corn production is projected to grow 2.0% per year in the next years, the planted area must increase 0.3%. As it can be observed in the Figure, the planted area of corn must increase around 500 thousand hectares in the next years. The corn productivity has grown in the last 35 years at 3.2% per year (CONAB, 2011), and it is forecasted to grow 1.68% per year in the next years. But this rate can be higher because the projected production is conservative, and the product has great potential of growth in the country. Its performance in the next years is linked to the meat sector and to the exports.

Figure 7 – Planted Area of Corn
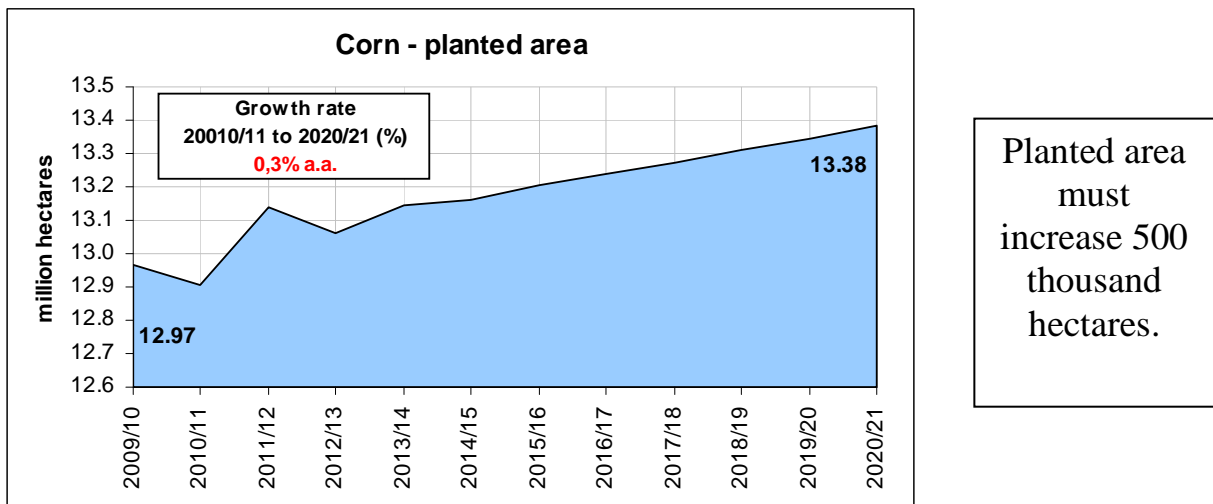
Source: AGE/Mapa and SGE/Embrapa

4.5.   Wheat

Currently the wheat production in the country is concentrated in the Southern region, in the states of Paraná, 56.4% and Rio Grande do Sul, 33.6%. The participation of other states is still little, as observed in the map.

Wheat	Harvest Year 2010/2011	%
	Thousand tons	
National Production	5,881.61	100.00
Main Producing states		
PR	3,314.82	56.36
RS	1,974.82	33.58
Others	591.97	10.06

SOURCE: CONAB - Research: Feb/2011.
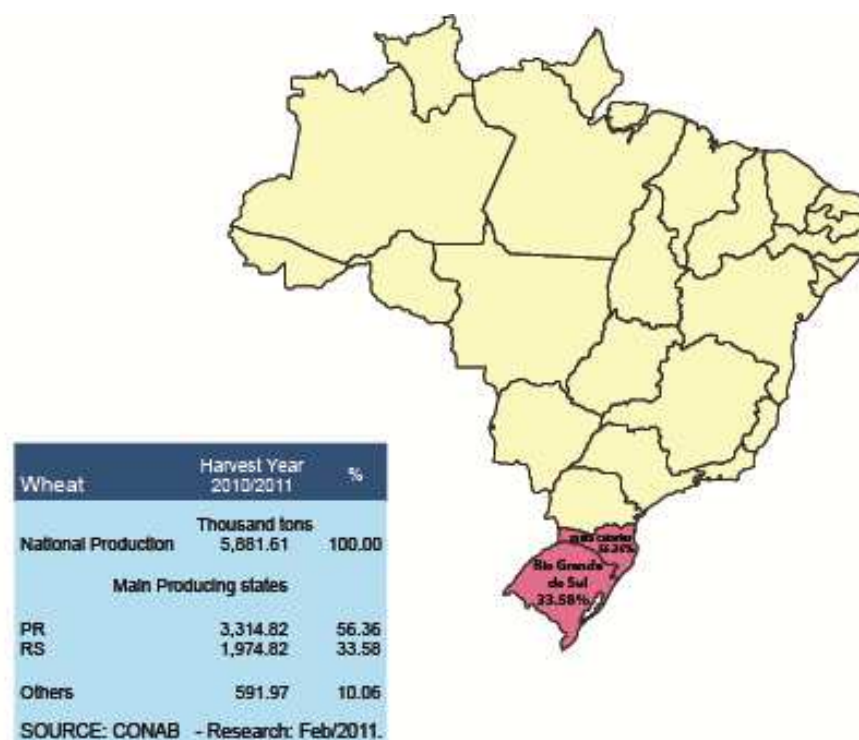
The projected wheat production for 2020/2021 is 6.2 million tons, and a consumption of 11.7 million tons in the same year. The internal wheat consumption in the Country must grow at 1.2% per year, between 2010/11 and 2020/2021. The internal supply will require imports of 6.7 million tons in 2020/2021. The wheat production is increasing in the next years faster than consumption, even though Brazil will likely remain as one of the main world importers of wheat.

There might be reduction of the wheat imports in the next years due to expected increase of the internal production. Brazil, according to CONAB technicians, has potential to expand the production and the wheat produced has been of great quality. But, in general, the national wheat is used by the industry for the production of pastas. It is presented as one of the most relevant products among the grains produced worldwide. For being of much importance in the consumption, especially human, it represents a product of high strategic importance.

Table 5 - Wheat Production, Consumption and Imports

WHEAT (thousand tons)

Year	Production			Consumption			Imports		
	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L
2010/11	5,302.7	3,054.2	7,551.3	10,353.1	9,487.3	11,218.8	6,040.0	4,267.3	7,812.8
2011/12	5,291.2	2,011.9	8,570.6	10,489.3	9,256.6	11,722.0	6,119.2	3,206.8	9,031.7
2012/13	5,428.2	1,362.9	9,493.5	10,625.4	9,112.2	12,138.6	6,186.7	2,365.3	10,008.1
2013/14	5,500.7	779.0	10,222.4	10,761.6	9,012.3	12,510.9	6,250.5	1,671.0	10,830.0
2014/15	5,602.1	304.4	10,899.7	10,897.7	8,940.6	12,854.9	6,313.3	1,077.2	11,549.3
2015/16	5,690.6	-	11,507.3	11,033.9	8,889.0	13,178.8	6,375.7	554.7	12,196.7
2016/17	5,784.9	-	12,078.0	11,170.1	8,852.5	13,487.6	6,438.0	85.1	12,790.9
2017/18	5,876.6	-	12,612.5	11,306.2	8,828.1	13,784.4	6,500.3	-	13,344.0
2018/19	5,969.4	-	13,120.8	11,442.4	8,813.4	14,071.3	6,562.6	-	13,864.2
2019/20	6,061.8	-	13,605.7	11,578.5	8,806.9	14,350.1	6,624.9	-	14,357.4
2020/21	6,154.3	-	14,071.5	11,714.7	8,807.5	14,621.9	6,687.1	-	14,827.8

Source: Elaborated by AGE/Mapa and SGE/Embrapa with data from CONAB.

* Models used: For the production State-Space model and for the consumption and imports Arma model
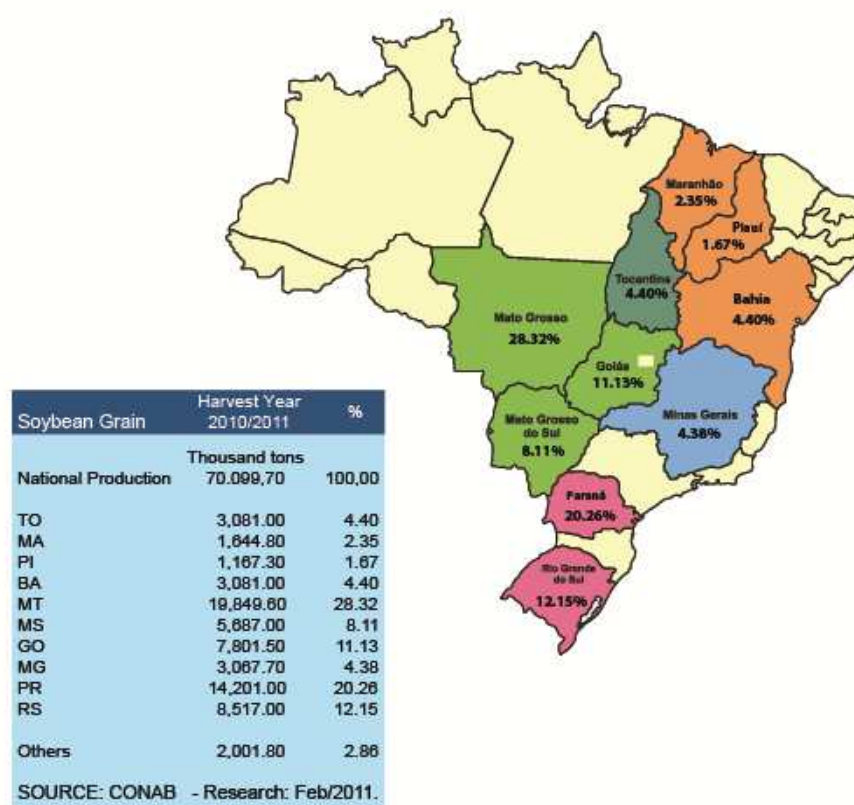
Figure 8 - Wheat Production, Consumption and Imports
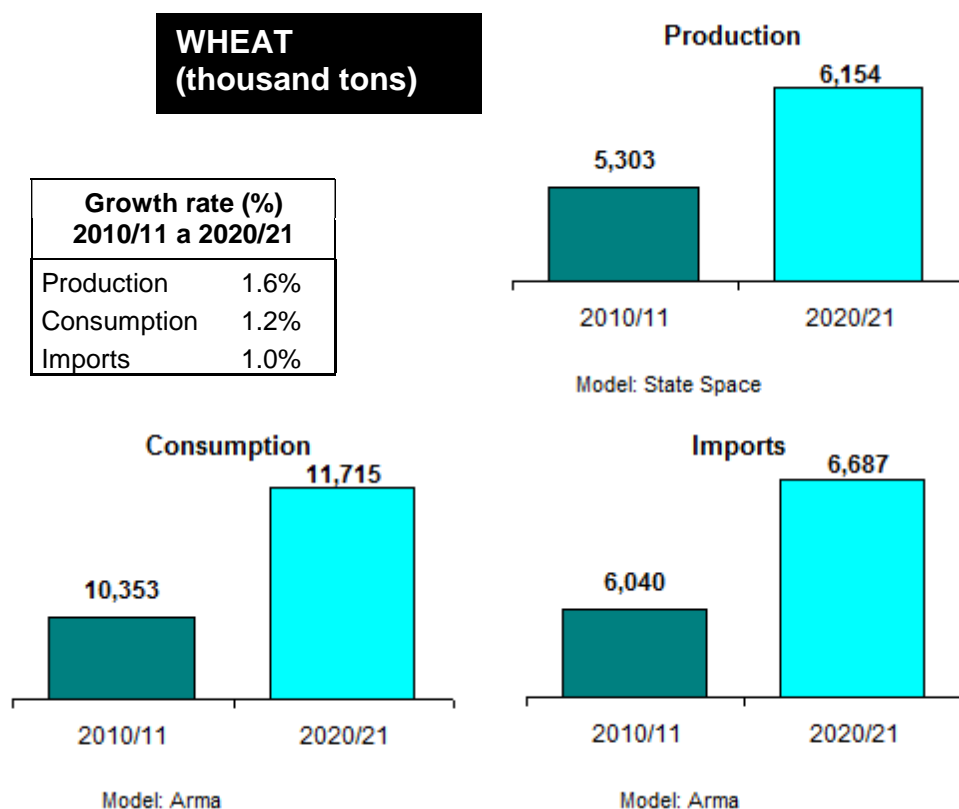
Source: AGE/Mapa and SGE/Embrapa

4.6.   Soybean Complex

Soybean Grain

Currently the soybean production in Brazil is led by the states of Mato Grosso, Paraná, Rio Grande do Sul and Goiás. These states produces 82.0% of the national soybean. But, as observed in the map, the soybean production is also expanding to new areas in Maranhão, Tocantins, Piauí and Bahia, which responds to 13.0% of the Brazilian production.

Soybean Grain	Harvest Year 2010/2011	%
	Thousand tons	
National Production	70.099,70	100,00
TO	3,081.00	4.40
MA	1,644.80	2.35
PI	1,167.30	1.67
BA	3,081.00	4.40
MT	19,849.60	28.32
MS	5,687.00	8.11
GO	7,801.50	11.13
MG	3,067.70	4.38
PR	14,201.00	20.26
RS	8,517.00	12.15
Others	2,001.80	2.86
SOURCE: CONAB - Research: Feb/2011.		

Map labels: Maranhão 2.35%, Piauí 1.67%, Tocantins 4.40%, Bahia 4.40%, Mato Grosso 28.32%, Goiás 11.13%, Minas Gerais 4.38%, Mato Grosso do Sul 8.11%, Paraná 20.26%, Rio Grande do Sul 12.15%

The estimations for soybean grain indicates a Brazilian production of 86.5 million tons in 2020/2021. This projection is 17.8 million tons bigger than Brazilian production of the 2010/2011 harvest year. The forecasted annual growth rate for the production is 2.3% within the projection period, 2010/11 to 2020/2021. This rate is close to the world rate for the next years, estimated by FAPRI (2011) at 1.4% per year.

The domestic consumption of soybean grain must reach 45.6 million tons at the end of the projection, representing 52.7% of the national production. A growth at an annual rate of 1.9% for the consumption is projected. Soybean is an essential component in the manufacturing of animal feeds and it acquires increasing importance in human food.

Figure 9 – Soybean production, exports and consumption

Source: Elaborated by AGE/Mapa and SGE/Embrapa

The projected soybean exports for 2020/2021 are 40.7 million tons. They represent an increase of 11.7 million tons in relation to the quantity exported by Brazil in 2010/11. The projected annual rate for soybean exports in grain is of 3.2%. This rate is smaller than the world rate projected by FAPRI (2011) for the next years, of 1.7%.

Table 6 - Soybean Production, Consumption and Exports

SOYBEAN (thousand tons)

Year	Production			Consumption			Export		
	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L
2010/11	68,721.9	61,470.0	75,973.7	37,622.3	33,919.2	41,325.4	29,299.6	25,745.7	32,853.6
2011/12	71,140.8	61,651.2	80,630.5	38,611.4	33,904.8	43,318.0	30,898.7	25,872.6	35,924.7
2012/13	72,764.7	61,176.9	84,352.4	39,349.0	33,725.9	44,972.2	32,985.5	26,829.9	39,141.1
2013/14	74,531.2	61,196.3	87,866.0	40,140.8	33,748.6	46,533.1	33,573.3	25,990.3	41,156.3
2014/15	76,241.0	61,344.5	91,137.4	40,921.0	33,839.2	48,002.7	34,262.6	24,693.8	43,831.4
2015/16	77,958.6	61,650.0	94,267.2	41,703.6	33,994.5	49,412.7	35,705.5	24,497.3	46,913.7
2016/17	79,672.0	62,062.8	97,281.3	42,485.8	34,196.5	50,775.0	36,972.7	24,235.3	49,710.1
2017/18	81,385.8	62,565.6	100,206.0	43,268.0	34,436.6	52,099.4	37,671.2	23,258.6	52,083.8
2018/19	83,099.3	63,141.3	103,057.2	44,050.2	34,708.1	53,392.3	38,595.2	22,438.5	54,751.9
2019/20	84,812.7	63,778.5	105,847.0	44,832.4	35,006.1	54,658.7	39,774.6	22,022.7	57,526.5
2020/21	86,526.2	64,468.1	108,584.2	45,614.6	35,326.9	55,902.3	40,744.4	21,430.0	60,058.8

Source: Elaborated by AGE/Mapa and SGE/Embrapa with data from CONAB.

* Models used: For the production State-Space model and for the consumption and exports Arma model.

Figure 10 - Soybean Production, Consumption and Exports
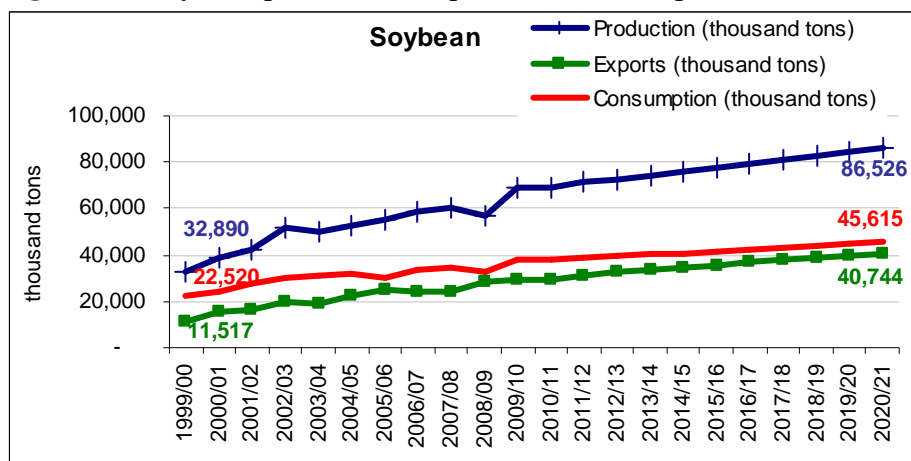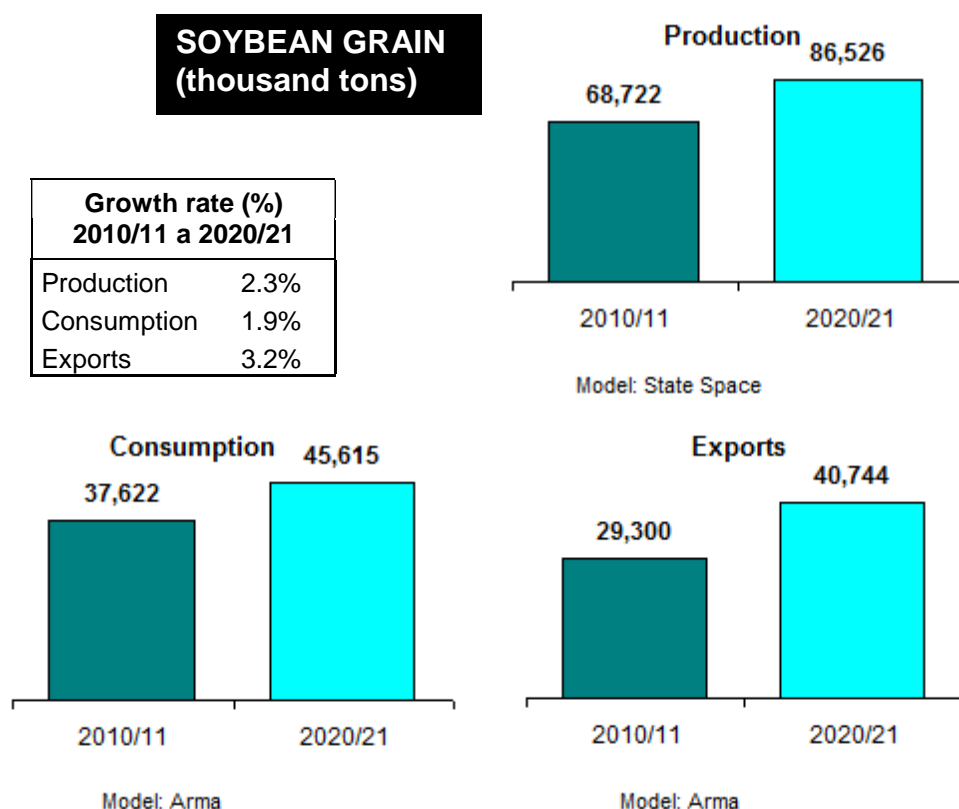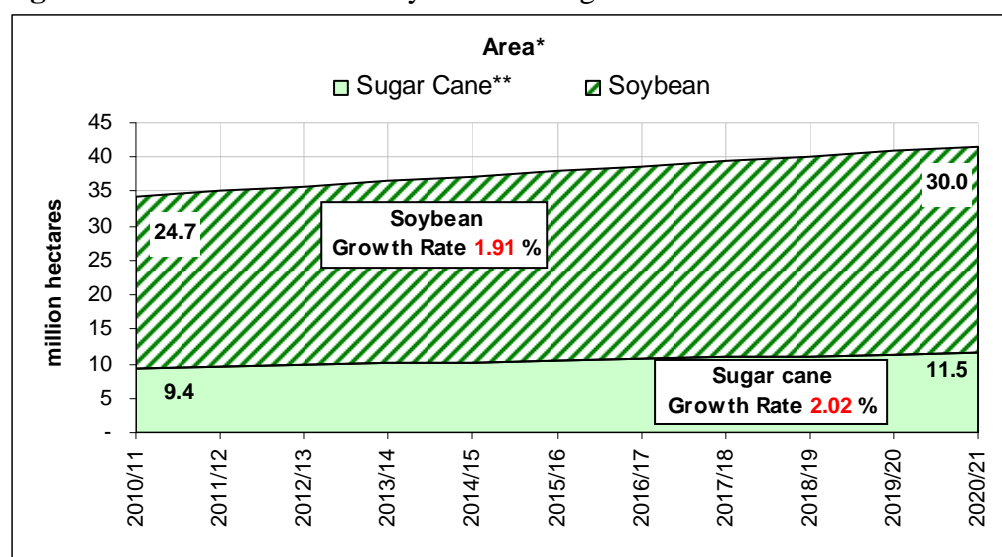

Source: AGE/Mapa and SGE/Embrapa

The projections for planted area of soybean show that the area must go to 30.0 million hectares in 2020/2021. It represents an increase of 5.3 million hectares in relation to the forecasted area in 2010/2011. The soybean production expansion in the country will be due to the combination of area and productivity expansion. While the forecasted production increase is 2.0% per year, in the next years the area expansion is of 1.9%. In the previous years the soybean productivity has been kept stable at 2.8 tons per hectare, and this number is being kept in the 11 next years.

The soybean must expand through a combination of border expansion in regions where there is still land available, occupation of grazing lands and by the substitution of crops where there is no land available to be incorporated. The Figure illustrates the area expansion projections for sugar cane and soybean, which are two activities that compete for area in Brazil.

Together, they must present in the next years an area expansion of 7.4 million hectares, being 5.3 million hectares of soybean and 2.1 hectares of sugar cane. The other crops must have small changes of area in the next years. But, it is estimated that this expansion must occur in areas with great productive potential, as the savanna (cerrado) areas comprised in the region which is currently called Matopiba, for comprising lands situated in the states of Maranhão, Tocantins, Piauí and Bahia. Mato Grosso must lose power in this process of new area expansion, mainly due to the prices of lands in this state which are more than twice the price of crop lands in the states of Matopiba (FGV - FGVDados). As the developments in these new regions comprise areas of great extension, the land price is a decisive factor.

Figure 11 – Planted Area of Soybean and Sugar Cane

Source: AGE/Mapa and SGE/Embrapa

*For soybean it was used planted area and for sugar cane harvested area

**it refers to the sugar cane destined to the production area for sugar and ethanol and other purposes, such as forages, cachaças, etc.

Soybean Meal and Soybean Oil

The soybean meal and soybean oil shows moderate dynamism in the next years. The meal exports must grow at 1.1% a year and the soybean oil, 0.5%. In both products, the internal consumption must grow at high rates in the next years. The soybean oil consumption must grow at an annual rate of 2.2% in the period 2010/11 to 2020/2021, and the soybean meal must grow at 2.5% per year. This data reflects the dynamism of the internal market for these products, generated by the human and animal consumption.

Table 7 - Soybean Meal Production, Consumption and Exports

SOYBEAN MEAL (thousand tons)

Year	Production			Consumption			Exports		
	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L
2010/11	26,710.6	24,059.5	29,361.7	12,549.4	12,089.8	13,009.0	13,867.0	11,803.7	15,930.3
2011/12	27,487.1	24,006.5	30,967.6	12,864.4	11,993.7	13,735.2	13,888.4	11,075.4	16,701.3
2012/13	27,948.8	23,787.4	32,110.2	13,212.3	11,978.4	14,446.1	14,131.5	10,706.8	17,556.1
2013/14	28,540.0	23,816.2	33,263.8	13,554.9	11,995.6	15,114.2	14,261.5	10,315.5	18,207.4
2014/15	29,069.8	23,843.6	34,296.1	13,904.9	12,056.4	15,753.3	14,435.8	10,022.9	18,848.7
2015/16	29,624.8	23,944.3	35,305.3	14,254.3	12,145.5	16,363.1	14,587.1	9,750.5	19,423.7
2016/17	30,167.4	24,066.6	36,268.3	14,605.4	12,260.0	16,950.7	14,746.8	9,519.0	19,974.6
2017/18	30,714.9	24,221.8	37,208.1	14,956.5	12,393.8	17,519.2	14,901.8	9,309.7	20,494.0
2018/19	31,260.0	24,397.0	38,122.9	15,308.0	12,543.8	18,072.2	15,058.5	9,123.8	20,993.1
2019/20	31,805.9	24,592.2	39,019.6	15,659.6	12,706.9	18,612.2	15,214.1	8,955.5	21,472.7
2020/21	32,351.3	24,803.3	39,899.4	16,011.2	12,881.1	19,141.3	15,370.0	8,803.4	21,936.7

Source: Elaborated by AGE/Mapa and SGE/Embrapa with data from CONAB.

* Models used: For the production, exports and consumption State-Space model

Table 8 - Soybean Oil Production, Consumption and Exports

SOYBEAN OIL (thousand tons)

Year	Production			Consumption			Exports		
	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L
2010/11	6,844.1	6,195.4	7,492.9	5,218.1	4,895.2	5,541.1	1,447.5	759.7	2,135.4
2011/12	7,015.8	6,169.4	7,862.1	5,379.5	4,856.2	5,902.8	1,416.4	492.4	2,340.4
2012/13	7,156.9	6,142.8	8,171.0	5,512.8	4,832.5	6,193.2	1,430.6	280.0	2,581.2
2013/14	7,302.5	6,145.8	8,459.2	5,637.6	4,825.7	6,449.6	1,429.7	103.3	2,756.0
2014/15	7,444.7	6,161.1	8,728.2	5,761.3	4,835.8	6,686.9	1,445.2	-	2,935.7
2015/16	7,588.3	6,189.3	8,987.3	5,883.8	4,856.7	6,910.8	1,451.5	-	3,084.7
2016/17	7,730.9	6,225.3	9,236.5	6,006.5	4,887.1	7,125.9	1,464.3	-	3,231.9
2017/18	7,874.1	6,269.0	9,479.3	6,128.9	4,924.1	7,333.6	1,472.9	-	3,363.5
2018/19	8,016.9	6,318.0	9,715.8	6,251.4	4,967.1	7,535.8	1,484.3	-	3,491.5
2019/20	8,160.0	6,372.3	9,947.7	6,373.9	5,014.5	7,733.2	1,493.9	-	3,610.6
2020/21	8,302.9	6,430.6	10,175.2	6,496.4	5,065.9	7,926.8	1,504.7	-	3,725.9

Source: Elaborated by AGE/Mapa and SGE/Embrapa with data from CONAB.

* Models used: For the production, exports and consumption State-Space model

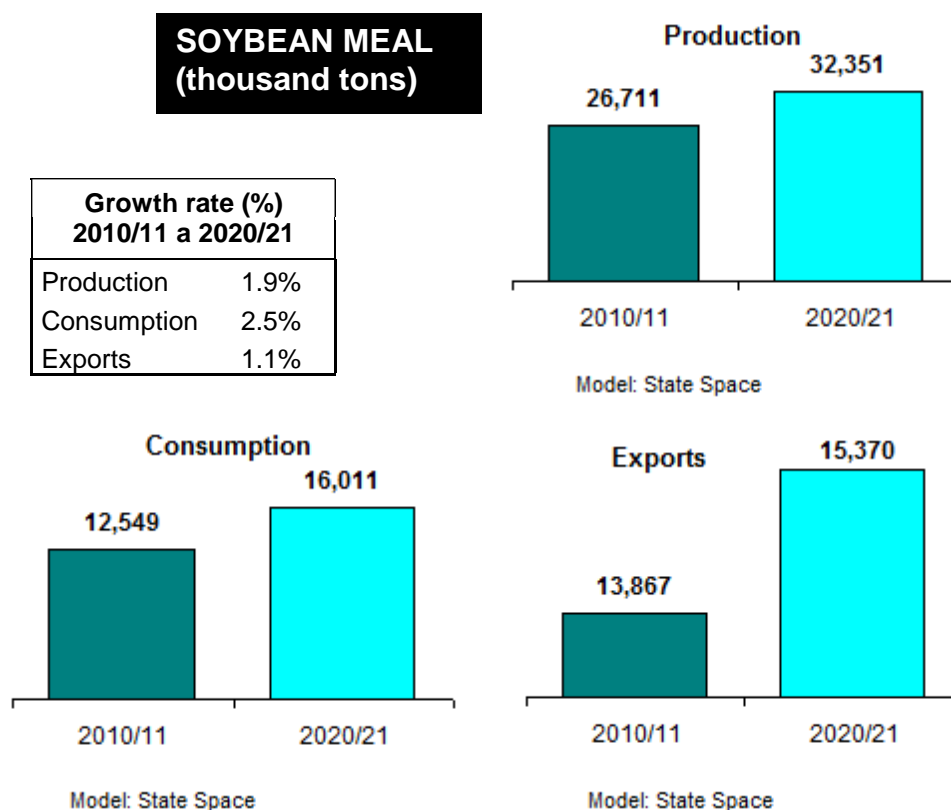**Figure 12** - Soybean Meal Production, Consumption and Exports

Source: AGE/Mapa and SGE/Embrapa

Figure 13 - Soybean Oil Production, Consumption and Exports
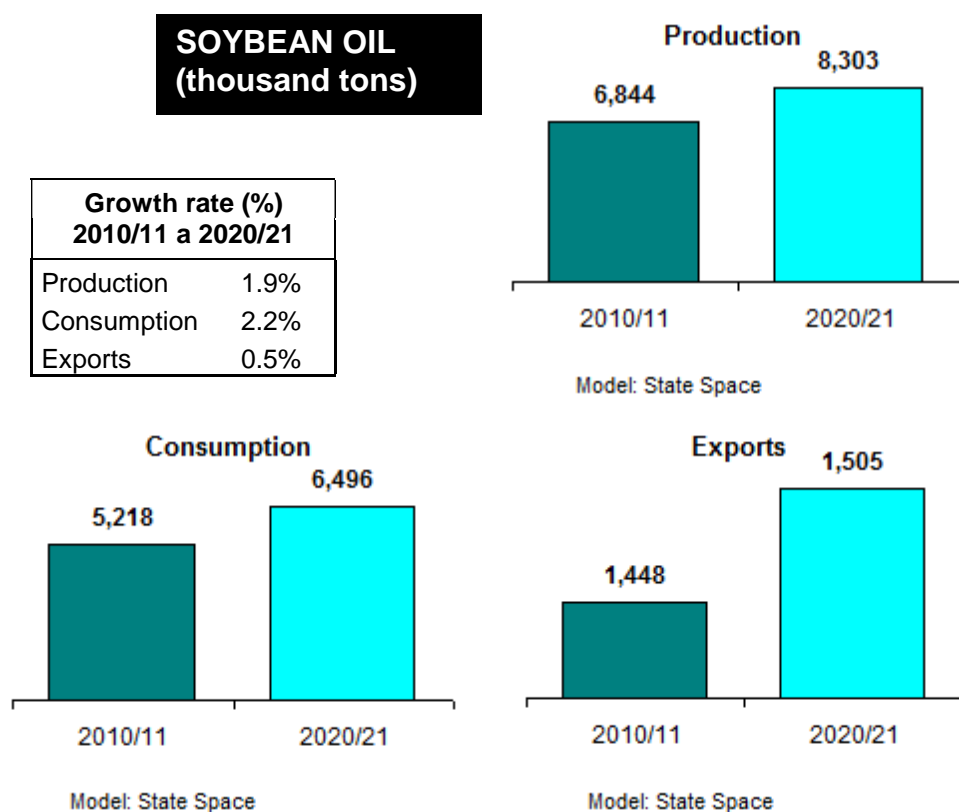
Source: AGE/Mapa and SGE/Embrapa

The relation between soybean oil consumption and production projeected for the next years is around 78.0%. Most of the oil is for human consumption and the other part has been destined to the biodiesel production. Around 22.0% of the production must be destined to exports. For soybean meal, between 47.0 and 49.0% must be destined to the internal consumption, and around 50.0% to exports.

4.7. Coffee

Coffee projections shows that production must increase at an annual average rate of 4.0% in the period 2019/2020. Estimates from DCAF – Department of Coffee from MAPA indicates that this growth can reach a annual rate up to 9.0% until 2013/2014. The consumption is estimated to grow around 4.5% percent a year in the next 10 years. The Brazilian Association of the Coffee Industry – ABIC (2011) estimated that the consumption grew 4.0% in 2001, and has been growing systematically since 2003. The coffee exports are projected for 2019/2020 at 42.1 million sacks. To obtain this estimation, the annual rate must expand at 2.5%.

Year	Production (million sacks)	Consumption (million sacks)	Exports (million sacks)
2010/11	54	19.5	33.7
2011/12	50	20.4	34.5
2012/13	58.9	21.3	35.4
2013/14	54.5	22.3	36.3
2014/15	64.2	23.3	37.2
2015/16	59.4	24.3	38.1
2016/17	69.9	25.4	39.1
2017/18	64.8	26.5	40.1
2018/19	76.2	27.7	41.1
2019/20	70.6	29	42.1

Source: DCAF - Department of Coffee from the Ministry of Agriculture, Livestock
and Food Supply

4.8.   Milk

Milk was considered as one of the products which presents high possibilities of growth. The production must grow at an annual rate of 1.9%. This corresponds to a production of 38.2 billion liters of raw milk at the end of the projections period. The consumption must grow at a rate practically equal to the production. The production growth rate is superior to the rate observed for the growth of the Brazilian population.

According to technicians from Embrapa Milk Cattle, for the production, the initial number (2010/11) seems a good number, but the final number was considered low. It is believed that something around 40,000 to 42,000 would be a better number, which is equivalent to an average growth around 2.5% per year (in the last 10 years we grew 4.3% per year). The primary sector will go through important transformations in the next years due to the process of reorganization and consolidation of the transformation segment. But the estimations obtained in this report shows that the milk production will be able to reach at the end of the projections period to 42.8 billion liters in its superior limit.

Table 10 - Milk Production, Consumption and Exports

MILK (million liters)

Year	Production			Consumption			Exports		
	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L
2010/11	31,569.6	30,691.2	32,447.9	31,801.9	30,034.8	33,569.1	209.3	-	625.0
2011/12	32,309.6	30,736.1	33,883.0	32,498.3	30,043.6	34,953.0	218.7	-	774.2
2012/13	32,989.1	30,873.5	35,104.7	33,148.7	30,106.2	36,191.1	229.5	-	899.2
2013/14	33,645.6	31,078.0	36,213.2	33,792.0	30,253.6	37,330.4	240.2	-	1,006.9
2014/15	34,295.6	31,338.7	37,252.5	34,431.7	30,455.8	38,407.7	250.9	-	1,103.7
2015/16	34,943.5	31,641.2	38,245.7	35,070.6	30,700.1	39,441.0	261.6	-	1,192.5
2016/17	35,590.6	31,975.3	39,206.0	35,709.1	30,976.7	40,441.5	272.2	-	1,275.3
2017/18	36,237.6	32,334.1	40,141.1	36,347.6	31,278.9	41,416.2	282.9	-	1,353.3
2018/19	36,884.5	32,712.6	41,056.3	36,986.0	31,602.1	42,369.9	293.6	-	1,427.2
2019/20	37,531.4	33,107.4	41,955.3	37,624.4	31,942.6	43,306.1	304.3	-	1,497.8
2020/21	38,178.2	33,515.8	42,840.7	38,262.8	32,298.1	44,227.5	315.0	-	1,565.5

Source: Elaborated by AGE/Mapa and SGE/Embrapa with data from IBGE/Municipal Livestock Research; MDIC/Aliceweb; Embrapa Milk Cattle.

* Models used: For the production and consumption State-Space model. for exports Arma model

Figure 15 - Milk Production, Consumption and Exports
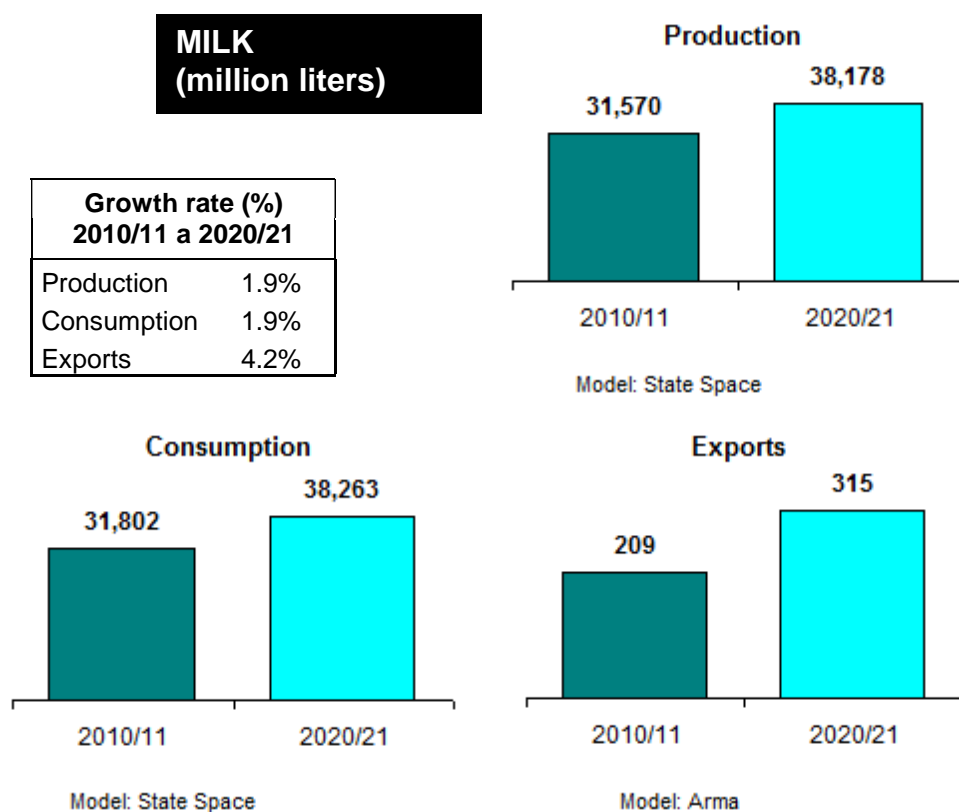
Source: AGE/Mapa and SGE/Embrapa

The available data on exports do not allow the projections to be made safely. Because like other series data, the period is not long enough to have some insurance (the series of information on exports begins in 1996),

4.9.   Sugar

The estimates obtained by AGE and SGE for sugar Brazilian production indicates an annual average growth rate of 2.2% in the period 2010/2011 to 2020/2021. This rate must lead to a production of 42.3 million tons being possible, however, in its superior limit to reach 52.2 million. This production corresponds to an increase of 8.3 million tons in relation to the observed in 2010/2011. In the superior limit of the projection this difference might reach 18.1 million tons of increase in relation to 2010/2011;

The projected rates for exports and internal consumption for the next 11 years are, respectively, of 3,8% per year and of 1,8% per year, For the exports, the projection for 2020/2021 is of a volume of 41,4 million tons,

Table 11 - Sugar Production. Consumption and Exports

	SUGAR (thousand tons)								
Year	**Production**			**Consumption**			**Exports**		
	Projection	**Inf, L**	**Sup, L**	**Projection**	**Inf, L**	**Sup, L**	**Projection**	**Inf, L**	**Sup, L**
2010/11	34,079.81	32,062.9	36,096.7	12,064.9	10,547.8	13,581.9	28,398.3	24,138.4	32,658.3
2011/12	35,907.19	33,048.6	38,765.8	12,299.7	10,413.7	14,185.7	29,997.2	24,946.2	35,048.1
2012/13	35,820.12	32,439.7	39,200.5	12,542.4	10,293.9	14,790.8	31,160.3	25,140.5	37,180.1
2013/14	36,813.05	32,726.9	40,899.2	12,783.0	10,235.7	15,330.3	32,481.6	25,723.6	39,239.6
2014/15	38,375.00	33,423.4	43,326.6	13,024.2	10,206.6	15,841.7	33,745.4	26,291.4	41,199.5
2015/16	38,726.16	32,788.0	44,664.4	13,265.2	10,201.8	16,328.5	35,030.1	26,950.1	43,110.2
2016/17	39,627.40	32,998.0	46,256.8	13,506.2	10,215.2	16,797.3	36,307.3	27,642.8	44,971.7
2017/18	40,227.79	32,828.8	47,626.7	13,747.3	10,243.4	17,251.2	37,587.2	28,376.5	46,797.8
2018/19	41,194.21	32,883.7	49,504.7	13,988.4	10,283.8	17,692.9	38,866.0	29,139.4	48,592.7
2019/20	41,999.60	32,893.3	51,105.9	14,229.4	10,334.5	18,124.3	40,145.3	29,928.9	50,361.7
2020/21	42,333.14	32,447.6	52,218.7	14,470.5	10,394.1	18,546.8	41,424.4	30,740.5	52,108.3

Source: Elaborated by AGE/Mapa and SGE/Embrapa with data from DCAA/SPAE/Mapa; SRI/Mapa; USDA.

* Models used: For the production State-Space model and for the Exports and consumption Arma model

Figure 16 - Sugar Production, Consumption and Exports
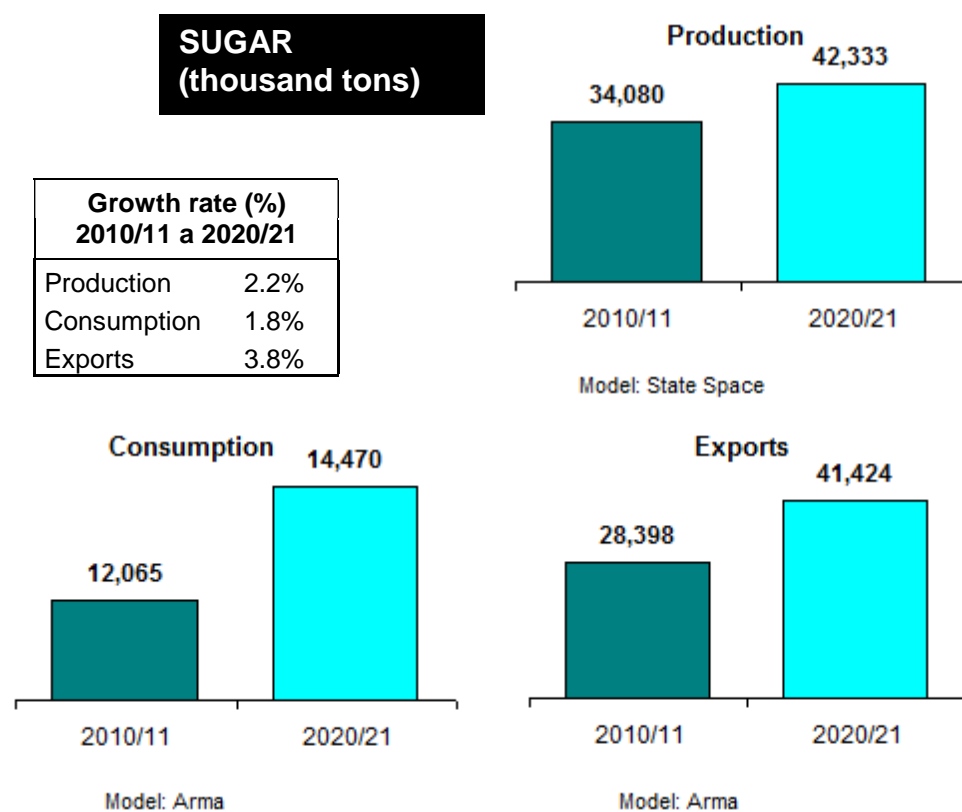
Source: AGE/Mapa and SGE/Embrapa

Figure 17 – Sugar Production
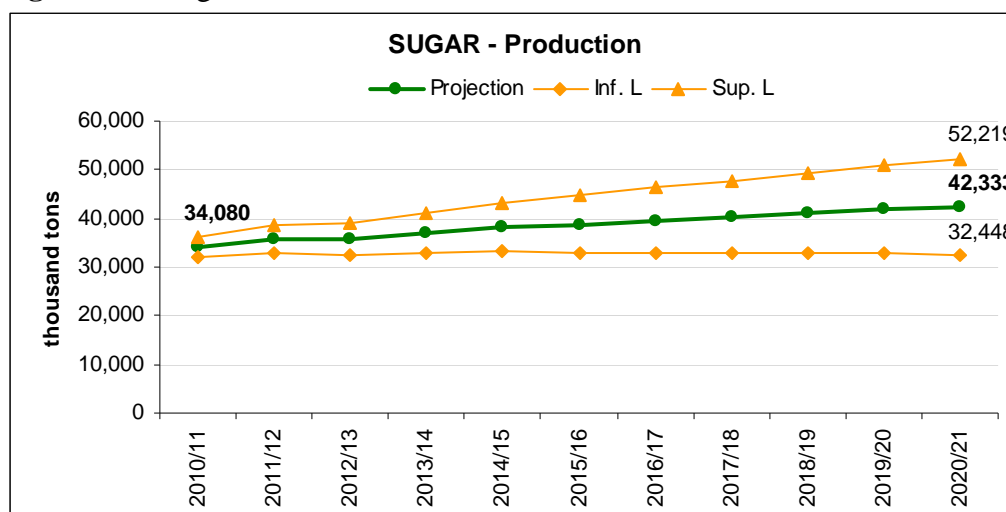
Source: Elaborated by AGE/Mapa and SGE/Embrapa

Figure 18 – Sugar Consumption
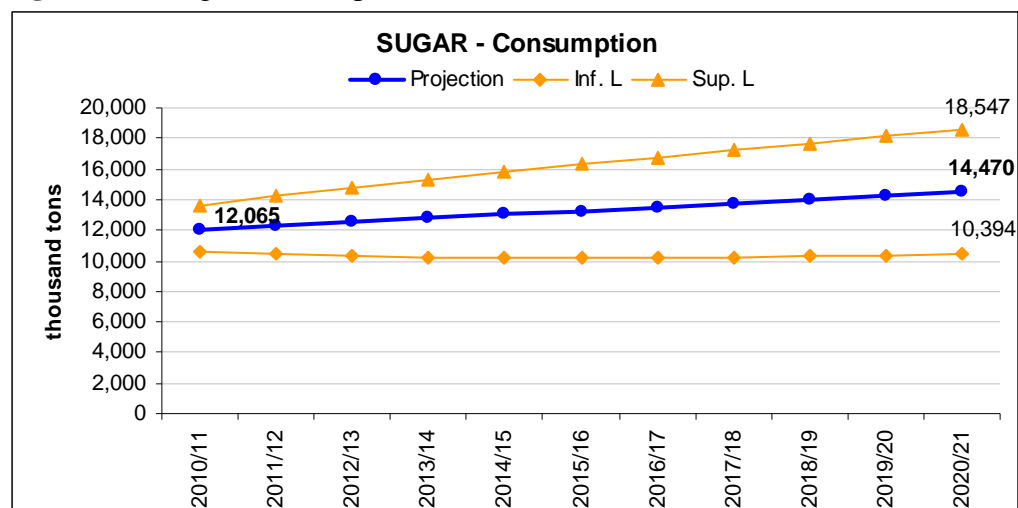
Source: Elaborated by AGE/Mapa and SGE/Embrapa

Figure 19 – Sugar Export
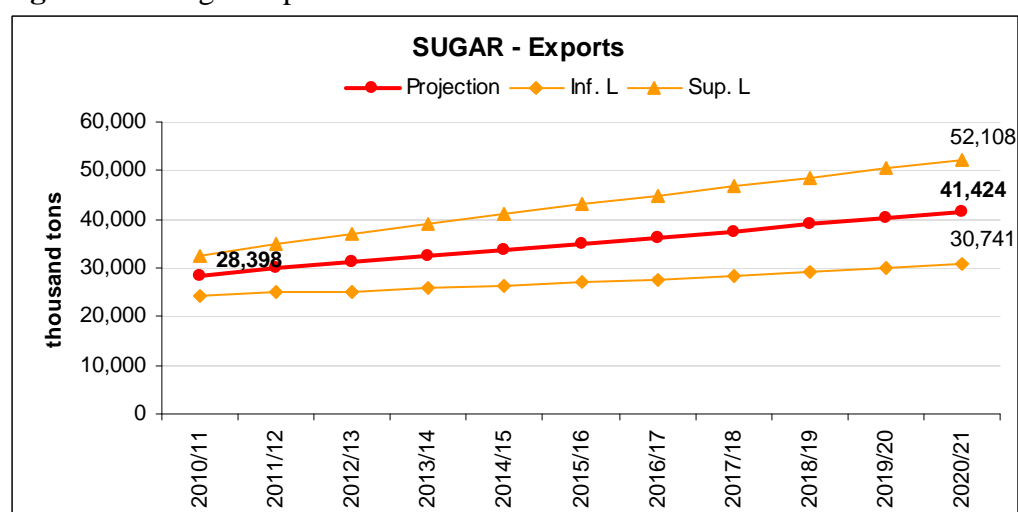
Source: Elaborated by AGE/Mapa and SGE/Embrapa

4.10.   Orange and Orange Juice

The orange production must goes from 19.4 million tons in the harvest 2010/2011 to 23.5 million tons in 2020/2021. This variation corresponds to an annual growth rate of 1.9%.

The harvested area of orange must expand in the next years, from the current 856 thousand to 962 thousand hectares in 2020/2021. The projected rate for the area is 1.2% per year for the next 11 years.

Brazil must exports 2.68 million tons of orange juice at the end of the projections period. But this number might reach, in its superior limit, 3.3 million tons of juice. Commercial restrictions in the format of barriers to the trade are the main limiting factor for the expansion of the orange juice.

Table 13- Orange and Orange Juice Production and Exports

ORANGE (thousand tons)						
Year	Production (Orange)			Exports (Juice)		
	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L
2010/11	19,362.6	17,923.4	20,801.8	2,102.1	1,866.4	2,337.7
2011/12	19,858.9	17,884.9	21,832.9	2,135.0	1,863.0	2,406.9
2012/13	20,216.9	17,857.6	22,576.1	2,206.6	1,881.5	2,531.7
2013/14	20,656.8	17,964.0	23,349.5	2,261.9	1,899.4	2,624.3
2014/15	21,048.2	18,065.4	24,031.1	2,324.1	1,924.7	2,723.5
2015/16	21,468.4	18,219.3	24,717.4	2,383.3	1,951.4	2,815.3
2016/17	21,871.5	18,378.1	25,365.0	2,443.9	1,981.1	2,906.6
2017/18	22,284.7	18,562.2	26,007.3	2,503.8	2,012.4	2,995.2
2018/19	22,692.0	18,754.1	26,629.9	2,564.0	2,045.5	3,082.6
2019/20	23,102.8	18,960.5	27,245.1	2,624.1	2,079.8	3,168.4
2020/21	23,511.5	19,174.5	27,848.5	2,684.3	2,115.4	3,253.2

Source: Elaborated by AGE/Mapa and SGE/Embrapa with data from CONAB, IBGE and Agrostat.
* Models used: For the production State-Space model and for Exports Arma model

Figure 24 - Orange Production and Orange Juice Exports
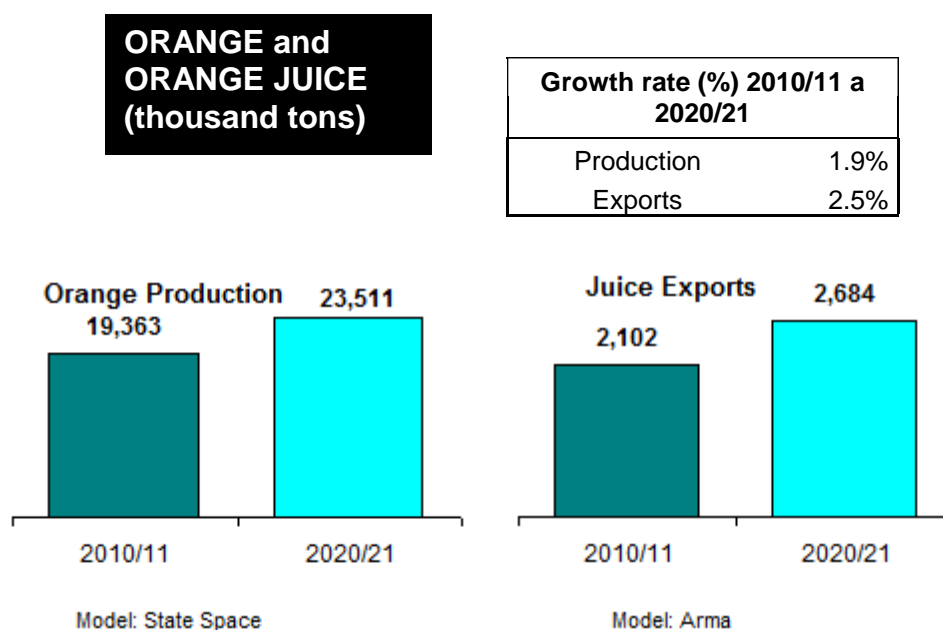
Source: AGE/Mapa and SGE/Embrapa

4.11.   Meat

Before presenting the meat projections, we try to illustrate the current distribution in Brazil of the bovine population. It refers to the number of slaughtered animals. In 2010 22.0 million animals were slaughtered, being that Mato Grosso, Mato Grosso do Sul, São Paulo, Goiás and Minas Gerais lead the slaughters, with 55.4% of the slaughters in the country.

Slaughtered Bovines	Year* 2010	%
	Heads	
Number of animals	22,055.51	100.00
RO	1,406.36	6.38
PA	1,597.87	7.24
TO	728.60	3.30
MG	1,851.79	8.40
SP	2,690.87	12.20
RS	1,351.53	6.13
MS	2,521.81	11.43
MT	3,138.63	14.23
GO	2,028.91	9.20
Others	4,739.15	21.49

* January to September 2010
Source: IBGE, 2011 www.sidra.ibge.gov.br
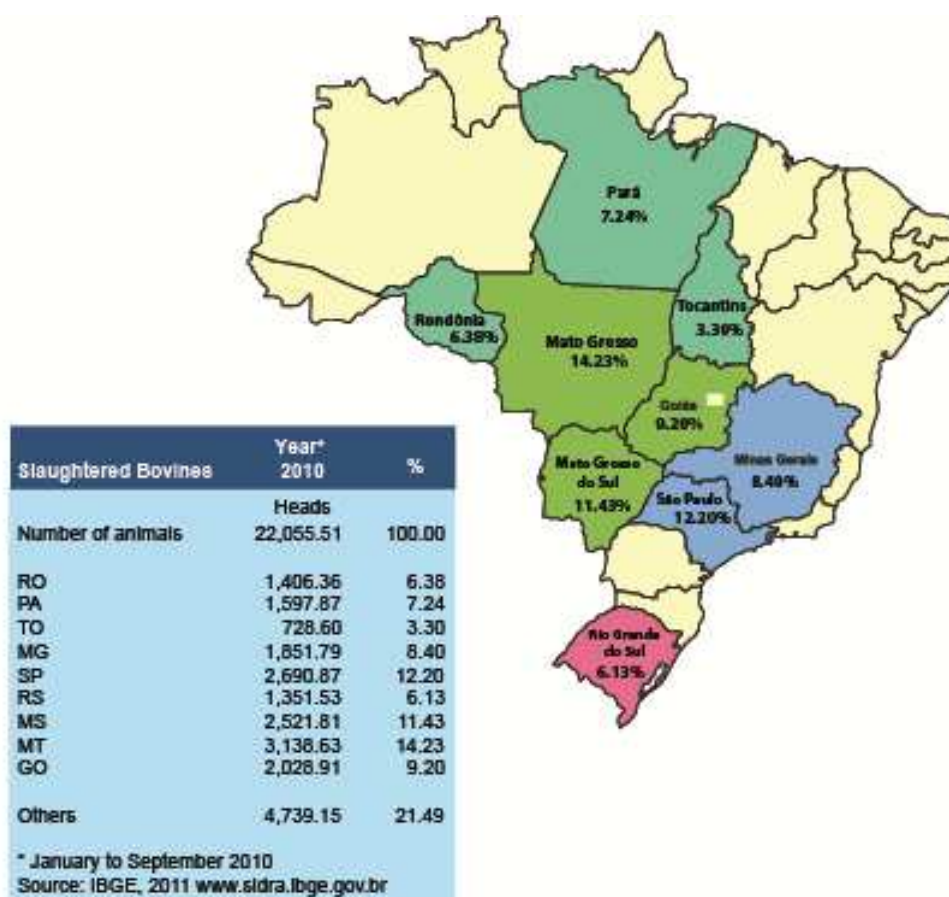
The meat projections shows that this sector must present intense growth in the next years. Among meat, the ones which project higher production growth rates in the period 2010/2011 to 2020/2021 are chicken meat, which must grow annually at 2.6%, and beef, whose projected growth for this period is of 2.2% per year. The pork production has a projected growth of 1.9% per year, which also represents a relatively high value, for being able to fulfill the domestic consumption and the exports.

Table 14 - Meat Production

PRODUCTION MEATS (thousand tons)

Year	BEEF			PORK			CHICKEN		
	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L
2010/11	9,158.4	8,203.1	10,113.7	3,377.8	2,993.3	3,762.3	12,107.7	11,428.0	12,787.4
2011/12	9,379.8	7,960.5	10,799.2	3,442.7	2,926.5	3,959.0	13,141.4	12,333.7	13,949.1
2012/13	9,599.3	7,828.4	11,370.2	3,515.6	2,898.5	4,132.7	12,882.0	11,621.3	14,142.7
2013/14	9,818.6	7,754.7	11,882.5	3,587.4	2,882.0	4,292.9	13,882.6	12,457.0	15,308.3
2014/15	10,037.9	7,717.7	12,358.1	3,659.2	2,875.6	4,442.7	13,612.5	11,787.5	15,437.5
2015/16	10,257.1	7,706.2	12,808.0	3,731.0	2,876.4	4,585.5	14,606.4	12,613.6	16,599.2
2016/17	10,476.4	7,714.0	13,238.8	3,802.8	2,882.7	4,722.9	14,330.1	11,983.4	16,676.9
2017/18	10,695.7	7,736.8	13,654.5	3,874.6	2,893.3	4,855.9	15,318.7	12,813.3	17,824.0
2018/19	10,914.9	7,771.9	14,057.9	3,946.4	2,907.5	4,985.3	15,038.1	12,217.3	17,858.8
2019/20	11,134.2	7,817.3	14,451.1	4,018.2	2,924.8	5,111.6	16,023.4	13,056.1	18,990.7
2020/21	11,353.4	7,871.2	14,835.7	4,090.0	2,271.3	4,370.1	15,740.3	12,489.3	18,991.4

Source: Elaborated by AGE/Mapa and SGE/Embrapa with data from CONAB.
* Models used: For the beef Arma model and for pork and chicken meat State-Space model

Figure 25 - Meat Production
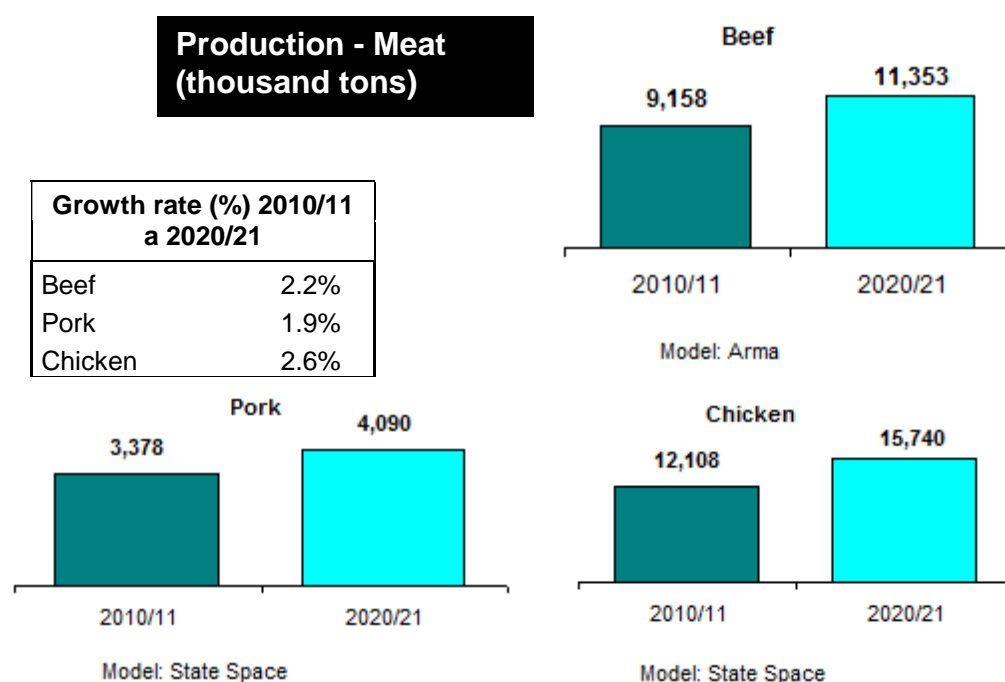
Source: AGE/Mapa and SGE/Embrapa

The consumption projections shows increasing preference of the Brazilian consumers for the chicken meat. The projected growth is of 2.5% per year in the period 2010/2011 to 2020/2021. This means an internal consumption of 10.6 million tons in 11 years from now, and of 9.4 million tons for beef. Beef takes over the second place in the consumption increase with a projected annual rate of 2.3%, between 2010/111 to 2020/2021. The projection of the pork consumption is in inferior level of growth, of 1.8% per year for the next years.

Table 15 - Meat Consumption

CONSUMPTION MEATS (thousand tons)

Year	BEEF			PORK			CHICKEN		
	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L
2010/11	7,283.8	6,592.7	7,974.9	2,785.6	2,411.3	3,160.0	8,240.4	7,736.9	8,743.8
2011/12	7,539.2	6,561.9	8,516.6	2,834.3	2,350.4	3,318.2	9,021.9	8,457.9	9,586.0
2012/13	8,180.5	7,101.4	9,259.6	2,889.6	2,315.6	3,463.7	8,729.5	7,921.2	9,537.8
2013/14	8,455.3	7,283.2	9,627.4	2,943.4	2,290.4	3,596.3	9,485.5	8,621.1	10,349.8
2014/15	8,383.8	7,094.7	9,672.8	2,997.3	2,274.3	3,720.2	9,191.9	8,132.8	10,251.1
2015/16	8,566.1	7,252.1	9,880.1	3,051.2	2,264.3	3,838.0	9,948.8	8,836.7	11,060.9
2016/17	8,792.8	7,459.2	10,126.4	3,105.1	2,259.2	3,951.0	9,654.2	8,372.8	10,935.7
2017/18	8,776.4	7,378.6	10,174.2	3,159.0	2,257.9	4,060.1	10,409.3	9,078.0	11,740.6
2018/19	8,894.3	7,432.6	10,356.1	3,212.9	2,259.8	4,166.0	10,113.2	8,631.0	11,595.3
2019/20	9,235.6	7,736.9	10,734.3	3,266.8	2,264.4	4,269.2	10,867.0	9,338.4	12,395.5
2020/21	9,428.0	7,865.3	10,990.8	3,320.7	2,944.6	5,235.4	10,569.9	8,905.0	12,234.8

Source: Elaborated by AGE/Mapa and SGE/Embrapa with data from CONAB.
* Models used: For beef Arma model and for pork and chicken meat State-Space model

Figure 26 - Meat Consumption

CONSUMPTION - MEAT (thousand tons)	
Growth rate (%) 2010/11 a 2020/21	
Beef	2.3%
Pork	1.8%
Chicken	2.5%
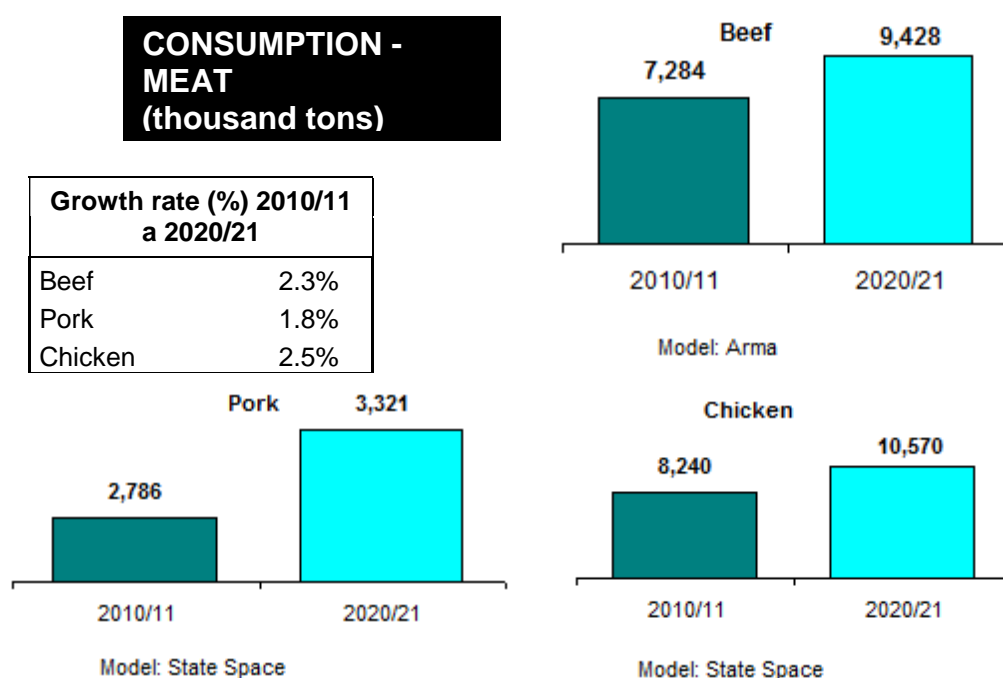
Source: AGE/Mapa and SGE/Embrapa

In relation to the exports, projections indicates high growth rate for the three types of meat analyzed. The estimations project a favorable scenario for the Brazilian exports. Chicken meat and pork lead the annual growth rates of the exports for the next years – the forecasted annual rate for chicken meat is of 2.9%, and for pork of 2.8%; the beef exports must be around an annual average of 2.6%.

Table 16 - Meat Exports

EXPORTS MEATS (thousand tons)

Year	BEEF			PORK			CHICKEN		
	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L
2010/11	1,796.6	1,486.7	2,106.5	580.2	468.1	692.4	3,868.3	3,482.3	4,254.3
2011/12	1,848.3	1,319.5	2,377.2	597.9	445.2	750.6	4,120.4	3,635.9	4,604.8
2012/13	1,900.9	1,190.7	2,611.1	616.0	431.1	800.9	4,153.6	3,387.0	4,920.1
2013/14	1,953.8	1,090.1	2,817.5	634.2	421.9	846.4	4,398.1	3,510.3	5,286.0
2014/15	2,006.8	1,009.7	3,003.9	652.3	415.8	888.8	4,421.6	3,285.8	5,557.5
2015/16	2,059.8	944.1	3,175.6	670.4	412.0	928.8	4,658.7	3,403.2	5,914.3
2016/17	2,112.9	889.5	3,336.3	688.5	409.9	967.2	4,677.0	3,202.2	6,151.9
2017/18	2,166.0	843.6	3,488.4	706.7	409.1	1,004.2	4,910.5	3,324.1	6,496.9
2018/19	2,219.0	804.5	3,633.6	724.8	409.5	1,040.0	4,926.2	3,144.6	6,707.8
2019/20	2,272.1	771.1	3,773.2	742.9	410.9	1,074.9	5,157.6	3,273.6	7,041.6
2020/21	2,325.2	742.3	3,908.1	761.0	413.0	1,109.0	5,171.8	3,112.3	7,231.2

Source: Elaborated by AGE/Mapa and SGE/Embrapa with Data from CONAB.

* Models used: For beef and pork Arma model and for chicken meat State-Space model

**Figure 27** - Meat Exports
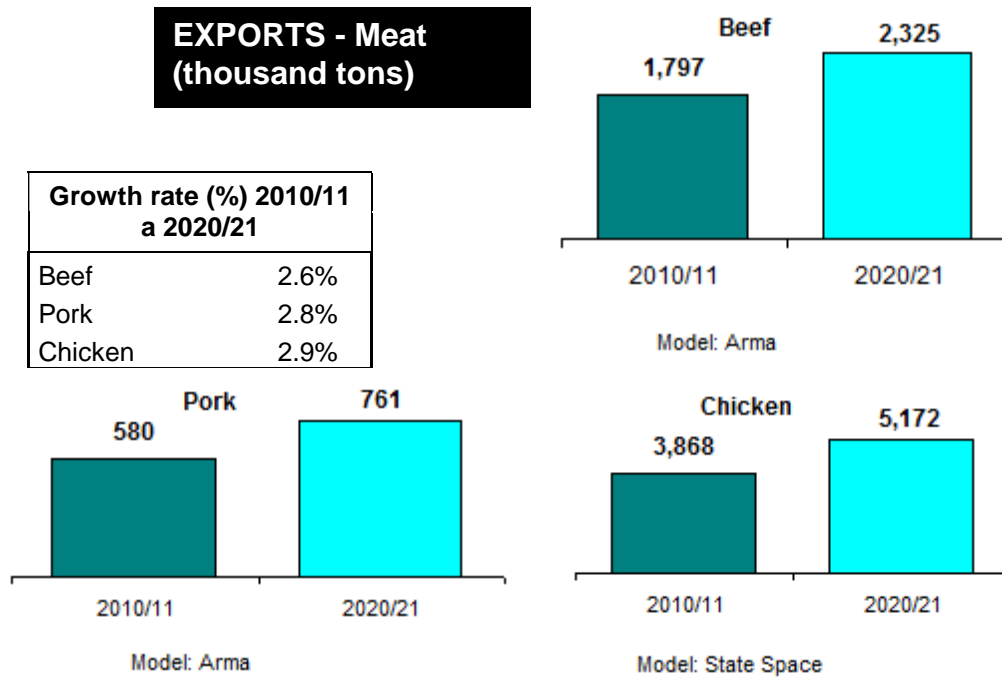
Source: AGE/Mapa and SGE/Embrapa

Figure 28 – Meat exports
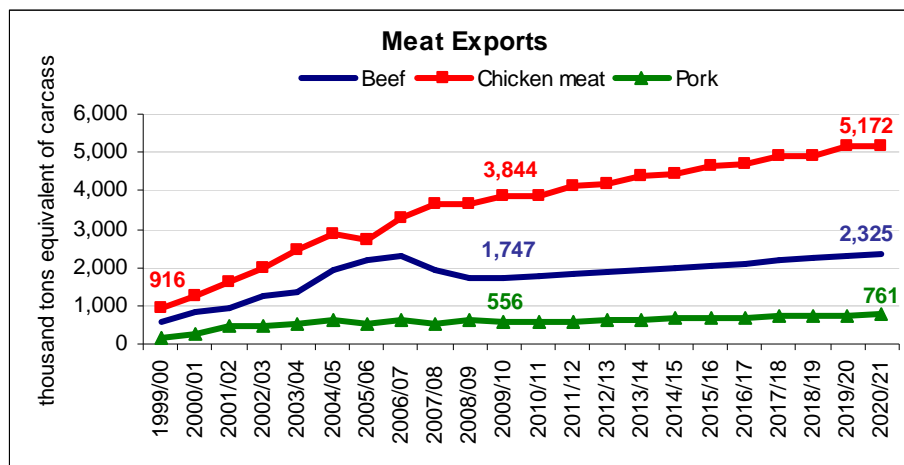
Source: AGE/Mapa and SGE/Embrapa

4.12. Cellulose and Paper

The forestry sector represents the fourth position in the rank for the value of the exports for the national agribusiness. Paper, cellulose and wood and its derivatives composes this segment of the agribusiness.

Although it is known that wood is one of the important components in the forestry sector, it was not possible to incorporate this activity at the moment. The results of the production, consumption and exports projections for cellulose and paper will be presented. These two components represent, in 2010, 73.0% of the exports value of the group denominated Forest Products by the SECEX/MIDIC classification.

Table 17 - Cellulose Production, Consumption and Exports

CELLULOSE (thousand tons)

Year	Production			Consumption			Exports		
	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L
2010/11	14,509.5	14,050.6	14,968.4	6,148.5	5,736.8	6,560.2	8,909.2	8,275.1	9,543.4
2011/12	15,057.9	14,221.8	15,893.9	6,170.1	5,728.5	6,611.7	9,188.4	8,248.4	10,128.3
2012/13	15,547.5	14,358.6	16,736.5	6,390.2	5,944.9	6,835.4	9,630.1	8,351.2	10,909.1
2013/14	16,050.3	14,543.6	17,557.1	6,523.1	6,072.5	6,973.6	9,971.4	8,398.9	11,543.9
2014/15	16,536.5	14,743.0	18,330.0	6,632.2	6,181.6	7,082.9	10,355.5	8,509.1	12,201.9
2015/16	17,025.7	14,972.6	19,078.7	6,775.9	6,324.9	7,226.8	10,712.2	8,619.1	12,805.2
2016/17	17,510.1	15,220.0	19,800.1	6,913.0	6,462.0	7,364.0	11,080.0	8,759.4	13,400.6
2017/18	17,995.1	15,487.0	20,503.3	7,042.7	6,591.7	7,493.7	11,440.3	8,910.1	13,970.5
2018/19	18,478.8	15,768.2	21,189.5	7,177.1	6,726.1	7,628.2	11,803.6	9,077.9	14,529.3
2019/20	18,962.6	16,062.6	21,862.7	7,311.9	6,860.9	7,762.9	12,164.8	9,256.0	15,073.5
2020/21	19,446.0	16,367.7	22,524.3	7,445.2	6,994.1	7,896.2	12,526.7	9,445.1	15,608.2

Source: Elaborated by AGE/Mapa and SGE/Embrapa with data from Bracelpa

* Models used: For the production and exports State-Space model and for the consumption Arma model

Figure 29- Cellulose Production, Consumption and Exports
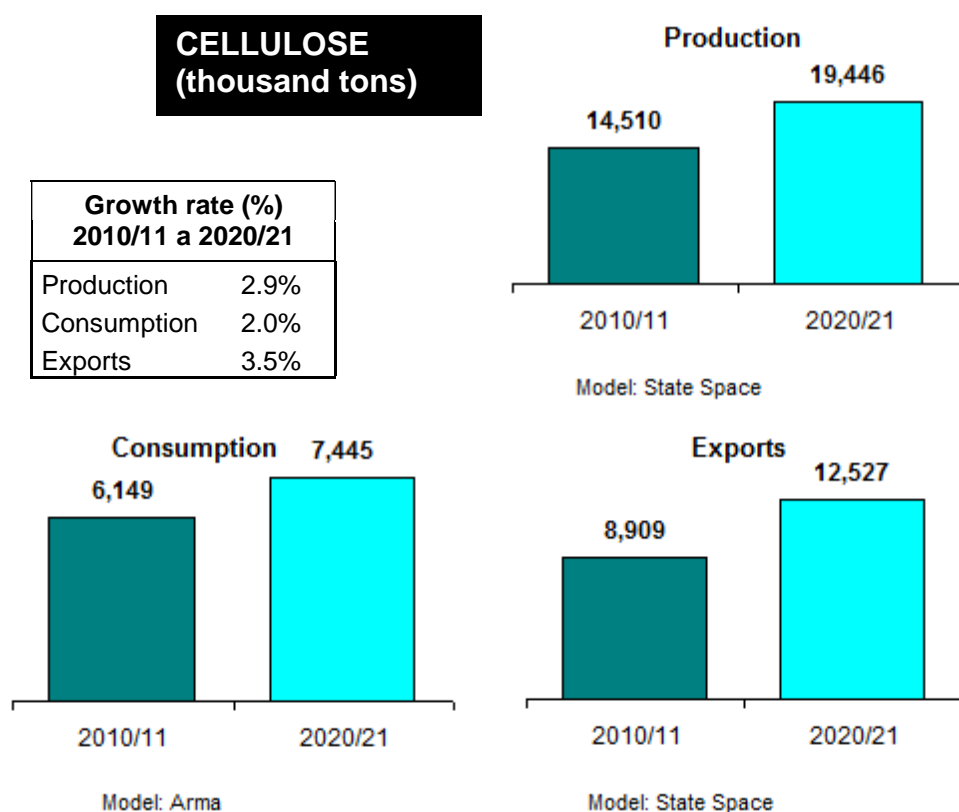
Source: AGE/Mapa and SGE/Embrapa

Table 18- Paper Production, Consumption and Exports

Year	Production			Consumption			Exports		
	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L	Projection	Inf. L	Sup. L
2010/11	10,093.0	9,857.4	10,328.6	9,358.0	8,743.6	9,972.4	2,125.7	1,856.0	2,395.3
2011/12	10,259.1	10,009.3	10,508.9	9,634.8	8,857.6	10,412.0	2,181.3	1,799.8	2,562.8
2012/13	10,535.6	10,279.2	10,792.0	9,883.9	8,955.9	10,811.9	2,237.0	1,769.7	2,704.2
2013/14	10,824.7	10,525.3	11,124.0	10,139.3	9,085.1	11,193.4	2,292.6	1,753.0	2,832.2
2014/15	11,047.5	10,730.3	11,364.8	10,393.2	9,225.7	11,560.7	2,348.3	1,745.0	2,951.6
2015/16	11,306.7	10,977.9	11,635.5	10,647.5	9,376.9	11,918.0	2,403.9	1,743.0	3,064.8
2016/17	11,577.1	11,225.6	11,928.7	10,901.7	9,535.7	12,267.6	2,459.6	1,745.7	3,173.5
2017/18	11,821.2	11,453.0	12,189.4	11,155.9	9,700.8	12,610.9	2,515.2	1,752.0	3,278.4
2018/19	12,076.4	11,695.0	12,457.8	11,410.1	9,871.0	12,949.1	2,570.9	1,761.4	3,380.4
2019/20	12,338.3	11,940.3	12,736.2	11,664.3	10,045.6	13,282.9	2,626.5	1,773.3	3,479.8
2020/21	12,590.0	12,177.2	13,002.8	11,918.5	10,224.0	13,613.0	2,682.2	1,787.3	3,577.1

Source: Elaborated by AGE/Mapa and SGE/Embrapa with data from Bracelpa

* Models used: For the production, exports and consumption Arma model

Figure 30- Paper Production, Consumption and Exports

PAPER (thousand tons)	

Growth rate (%) 2010/11 a 2020/21	
Production	2.3%
Consumption	2.4%
Exports	2.4%
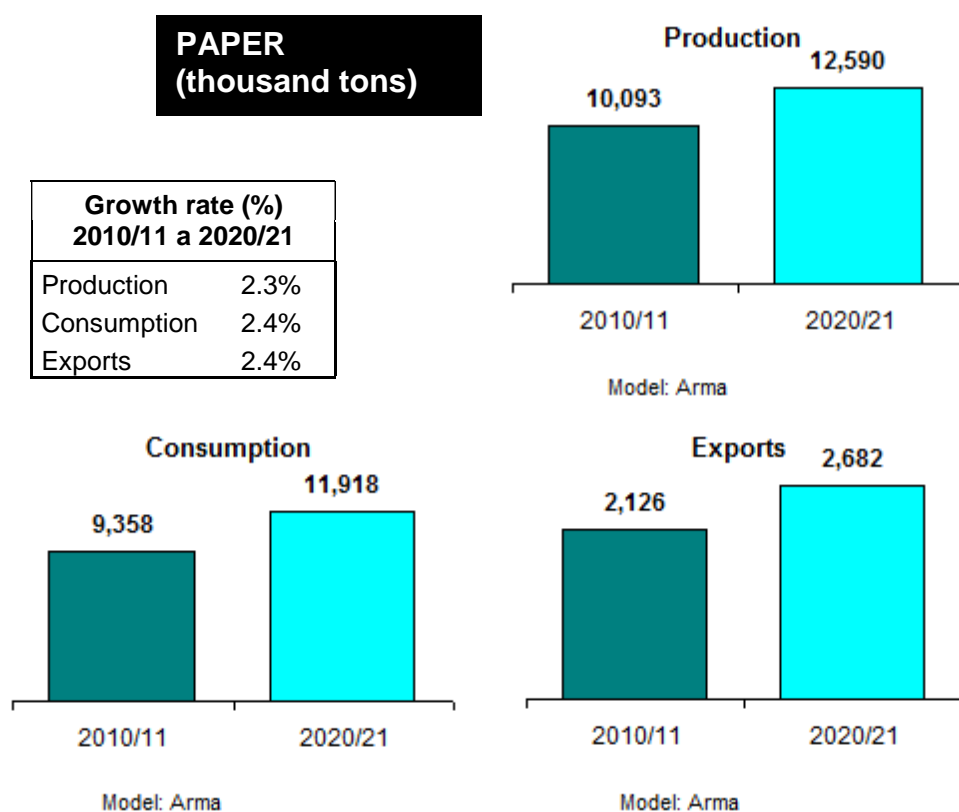
Source: AGE/Mapa and SGE/Embrapa

In relation to paper, to attend the internal consumption growth of 2.4% per year in the next 11 years, and of 2.3% of the exports, it will be necessary to expand the production rates higher than the projected which is of 2.3% per year until 2020/2021. For cellulose, it is possible that the production will bee situated close to the superior limit of the projection which is of 22.5 million tons in 2020/2021.

The projected cellulose production for the next years must be greater to fulfill the internal consumption growth and the international market. According to STCP Engineering technicians, the estimations of the production for 2020 are situated between 21 and 25 million tons of cellulose (Information from 2010). These estimations are greater than the superior limit of the production obtained in this study, of 22.5 million tons in 2020/2021. Among the three analyzed variables, production, consumption and exports the most dynamic are the exports, whose projected growth rates is of 3.5% per year between 2010/2011 and 2020/2021.

According to experts from the forestry sector who by our request analyzed these results, the paper projections are relatively well adjusted. In relation to cellulose, the results are also in accordance to what the sector is projecting, including forecasting the entry of new units in the next years. The estimation from these experts for cellulose in the next years is of 20 million tons produced. This number is a little above what this report presents, and little below the superior limit projected.

4.13. Tobacco

The inclusion of the projections for some variables referent to tobacco is justified by the importance of the product in the Brazilian trade balance and in the composition of income in the producing regions. Projections of production and harvested area were carried out in this version.

The projected production for 2020/2021 is around 1.0 million tons, greater in 100 thousand tons in relation to the forecast of 2010/2011. The projected area is almost 500 thousand hectares, obtained through an annual growth of 1% in the next years.

Table 19- Tobacco production

TOBACCO (thousand tons)

Year	Production		
	Projection	Inf. L	Sup. L
2010/11	857.4	735.0	979.8
2011/12	836.8	669.7	1,003.9
2012/13	861.1	638.8	1,083.3
2013/14	863.4	606.8	1,120.0
2014/15	882.1	598.1	1,166.1
2015/16	895.8	590.9	1,200.8
2016/17	912.5	587.3	1,237.7
2017/18	926.2	581.0	1,271.5
2018/19	940.0	574.6	1,305.4
2019/20	953.3	568.8	1,337.9
2020/21	967.3	564.7	1,369.8

Source: Elaborated by AGE/Mapa and SGE/Embrapa with data from LSPA/IBGE.
* Models used: For the Production State-Space model

Figure 31 - Tobacco Production
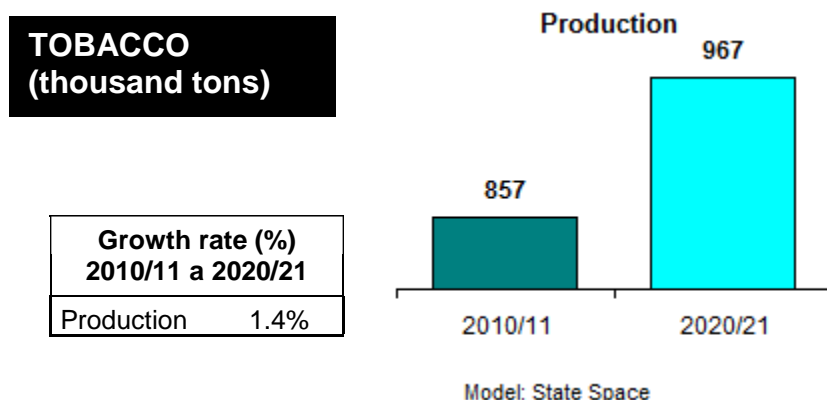
Source: AGE/Mapa and SGE/Embrapa

5. RESULTS OF THE REGIONAL PROJECTIONS

The regional projections were carried out with the purpose of identifying possible trends of selected products in the main producing regions, and also show the forecasts in a little more disaggregated way. The analyzed products were the same from last year. They are: Rice in Rio Grande do Sul; Corn in Mato Grosso, Paraná, Minas Gerais; Soybean in Mato Grosso, Rio Grande do Sul and Paraná; Wheat, in Paraná and Rio Grande do Sul; and Sugar Cane in São Paulo, Paraná, Mato Grosso, Minas Gerais and Goiás. It is included, this year, the projections of production and area for the set of the states of Maranhão, Tocantins, Piauí and Bahia, here called MATOPIBA.

The regional projections were made only for production and planted area because there is no detailed information as in the national projections.

Table 20 - Regional Projections - 2010/2011 to 2020/2021
Selected States

	Production (thousand t)			Planted Area (thousand ha)		
Rice						
	2010/2011	**2020/2021**	**Var. %**	**2010/2011**	**2020/2021**	**Var. %**
RS	8,066	9,967	23.6	1,143	1,321	23.6
Sugar Cane						
	2010/2011	**2020/2021**	**Var. %**	**2010/2011**	**2020/2021**	**Var. %**
GO	52,086	74,010	42.1	624	885	41.8
MG	64,307	82,667	28.6	783	975	24.5
MT	16,551	21,579	30.4	236	299	26.7
PR	55,628	71,935	29.3	659	839	27.3
SP	441,881	574,429	30.0	5172	6,682	29.2
Corn						
	2010/2011	**2020/2021**	**Var. %**	**2010/2011**	**2020/2021**	**Var. %**
MG	6,339	7,388	16.5	1,163	985	-15.3
MT	9,012	11,613	28.9	1,978	2,522	27.5
PR	12,705	14,098	11.0	2,180	2,130	-2.3
Soybean						
	2010/2011	**2020/2021**	**Var. %**	**2010/2011**	**2020/2021**	**Var. %**
MT	20,218	25,753	27.4	6,641	8,405	26.6
PR	14,324	17,008	18.7	4,675	5,390	15.3
RS	8,199	9,098	11.0	3,936	4,073	3.5
Wheat						
	2010/2011	**2020/2021**	**Var. %**	**2010/2011**	**2020/2021**	**Var. %**
PR	3,246	3,816	17.6	1,259	1,191	-5.4
RS	1,978	2,386	20.6	846	598	-29.3
Grains						
	2010/2011	**2020/2021**	**Var. %**	**2010/2011**	**2020/2021**	**Var. %**
MATOPIBA *	13,341	16,660	24.9	6,438	7,501	16.5

* It comprises the states of Maranhão, Tocantins, Piauí and Bahia
Source: AGE/Mapa and SGE/Embrapa

The regional projections shows that Rio Grande do Sul must continue leading the rice expansion in Brazil in the next years. The production of the state which represents in 2010/2011, 64.5% of the national production of rice, must increase the production in the next years in 23.6% and the area in 15.6%. This represents until 2020/2021 average annual increases of 2.1% of the production and of 1.42% of the rice area in the state.

The sugar cane production must expand at high rates in all considered states. In São Paulo the production must increase in 132.5 million tons. To reach this growth, the area in the state must increases in 29.2% at the end of the period of the projections. By the forecasts, the Goiás state is the one which must present in the next years a greater production increase (42.1%) and of the sugar cane area (41.8%).

Mato Grosso must lead in the next years the production and area growth of the corn and soybean area. The production as well as the area have forecast of growth in this state. The corn must suffer in the next years a reduction of area in Minas Gerais and Paraná. This product must to transfer area especially for soybean and possibly for sugar cane. The soybean must increase the production without reducing the area in none of the analyzed states. Also in relation to this product, it is surprising the lead forecasted for Mato Grosso.

The MATOPIBA region might reach a grain production of 16.7 million tons in 2020/2021, and a planted area of 7.5 million hectares, but it might reach 10.0 million hectares in its superior limit.

Finally, the wheat must present in the next years increase in the production between 17.6% and 20.6%, in Paraná and Rio Grande do Sul, respectively. But they must have in the next years a reduction of the wheat area. Other states, especially from the Mid-West, might have more highlight in the next years in relation to this product.

6. SUMMARY OF THE MAIN RESULTS

The most dynamic products in the Brazilian agribusiness should be cotton, soybean, beef, chicken meat, milk, sugar, paper and cellulose. These products are the ones which indicates a greater growth potential of production and exports in the next years.

Table 21 - Production Results - Brazil
Production Projections 2010/11 to 2020/21

Product	Unit	2010/2011	2020/2021	Variation%
Rice	Million t	12.50	13.74	9.88
Beans	Million t	3.51	3.82	8.85
Corn	Million t	52.85	65.54	24
Soybean Grain	Million t	68.72	86.53	25.91
Soybean Meal	Million t	26.71	32.35	21.12
Soybean Oil	Million t	6.84	8.30	21.31
Wheat	Million t	5.30	6.15	16.06
Chicken Meat	Million t	12.11	15.74	30
Beef	Million t	9.16	11.35	23.97
Pork	Million t	3.38	4.09	21.08
Coffee	Million sacks	54.0	70.6*	30.74
Milk	Billion liters	31.57	38.18	20.93
Cassava	Million t	26.43	26.09	-1.32
Potato	Million t	3.58	4.19	17.07
Cotton	Million t	1.58	2.34	47.84
Sugar Cane	Million t	750.11	934.59	24.59
Tobacco	Million t	0.86	0.97	12.82
Sugar	Million t	34.08	42.33	24.22
Orange	Million t	19.36	23.51	21.43
Paper	Million t	10.09	12.59	24.74
Cellulose	Million t	14.51	19.45	34.02

Source: AGE/Mapa and SGE/Embrapa
Note: Sugar Cane - refers to the cane destined to the production of sugar, ethanol, and other purposes such as forages and cachaças.
* refers to 2019/20

Many products must presents expressive production increases in the next years. But the lead in this sense must be of cotton, 47.84%, soybean grain, 25.91%, Chicken meat,

30.0%, sugar cane, 24.59%, paper, 24.74% and cellulose, 34.0%. These are those which must have the greatest production expansion between 2010/2011 and 2020/2021.

The production of grains (soybean, corn, wheat, rice and beans) must goes from 142.9 million tons in 2010/2011 to 175.8 million tons in 2020/2021. This indicates an increase of 33.0 million tons to the current production in Brazil, and, in relative values, 23.0%. The production (beef, pork and poultry) must increase in 6.5 million tons. This represents an increase of 26.5% in relation to the meat production of 2010/2011.

Table 22- Main Trends of the Production

Grains	Unit	2010/2011	2020/2021	Increase %
Rice	Million t	12.5	13.7	9.9
Beans	Million t	3.5	3.8	8.9
Corn	Million t	52.9	65.5	24
Soybean Grain	Million t	68.7	86.5	25.9
Wheat	Million t	5.3	6.2	16.1
Total	*Million t*	*142.9*	*175.8*	*23*
Another 33.0 million tons of grains				

Meats	Unit	2010/2011	2020/2021	Increase %
Chicken	Million t	12.1	15.7	30
Beef	Million t	9.2	11.4	24
Pork	Million t	3.4	4.1	21.1
Total	*Million t*	*24.6*	*31.2*	*26.5*
Another 6.5 million tons of meats				

Source: AGE/Mapa and SGE/Embrapa

The growth of the agricultural production in Brazil must continue occurring on basis in the productivity. There will be strong growth of the total factor productivity, according to what recent researchs have shown. The results reveals greater increase of agriculture and livestock production than the area increases. The projections indicate that between 2011 and 2021 the production of grains (rice, beans, soybean, corn and wheat) must increase in 23.0%, while the area must expand in 9.5%. This projection shows a typical example of growth based on the productivity.

The estimations made until 2020/2021 are that the total planted area with crops must goes from 62 million hectares in 2011 to 68 million in 2021, an increase of 6.0 million hectares. This area expansion is concentrated in soybean, 5.3 million hectares, and in sugar cane, 2.0 million. The area expansion of soybean and sugar cane must occur due to the incorporation of new areas and also by the substitution of others crops which must give area. Corn must have an area expansion of around 500 thousand hectares and the other analyzed crops are kept practically with no change or they lose area, such as coffee, rice, orange, and others. As corn is an activity with high productivity potential, the projected production increase is mainly due to gains in productivity.

Besides Brazil presents, in the next years, strong increase of the exports, the internal market will continue to be an important growth factor. In 2020/2021, 64.7% of the soybean production must be destined to the internal market, and in corn, 85.4% of the production must be consumed internally. There will be, this way, a double pressure on the national production increase, due to the growth of the internal market and of the exports.

There will also be strong pressure from the internal meat market. From the forecasted increase for the production of chicken meat, 67.0% of the production of 2020/2021 will be destined to the internal market; of the beef produced, 83.0% must goes to the internal market and in pork, 81.0% will be destined to the internal market. This way, although Brazil is, in general, a great exporter for several of these products, the internal consumption is predominantly the destination of the production.

Table 23 - Brazil: Exports Projections 2010/11 to 2020/21

Product	Unit	2010/11	2020/2021	Variation (%)
Cotton	Million t	0.5	0.8	68.4
Corn	Million t	9.1	14.3	56.46
Soybean Grain	Million t	29.3	40.7	39.06
Soybean Meal	Million t	13.9	15.4	10.84
Soybean Oil	Million t	1.4	1.5	3.95
Orange Juice	Million t	2.1	2.7	27.7
Chicken Meat	Million t	3.9	5.2	33.7
Beef	Million t	1.8	2.3	29.42
Pork	Million t	0.6	0.8	31.16
Coffee	Million sacks	33.7	42.09*	24.89
Sugar	Million t	28.4	41.4	45.87
Milk	Billion liters	0.2	0.3	50.49
Paper	Million t	2.1	2.7	26.18
Cellulose	Million t	8.9	12.5	40.60

Source: AGE/Mapa and SGE/Embrapa
* it refers to 2019/20

Table 24 - Brazil in the World Food Trade
Participations in % (*)

	2010/2011	2014/2015	2020/2021
Sugar	54.8	54.8	54.8
Green coffee/grain	36.1	36.1	36.1
Soybean/grain	30.8	31.8	33.2
Soybean meal	23.3	23.0	21.9
Soybean oil	15.2	14.9	14.1
Corn	9.6	10.6	12.0
Beef	28.0	29.7	30.1
Pork	10.1	10.7	11.6
Chicken meat	44.0	46.5	49.0

Source: USDA, 2011, AGE/Mapa and SGE/Embrapa

The nine complexes shown on the table represent the main foodstuffs consumed in the world and considered essential by almost the totality of the world population.

The Brazilian participation in the soybean world trade, beef and chicken meat must continue expressive and with a tendency to increase. As noted, the Brazilian soybean must have in 2020/2021 a participation in the world exports of 33.2%, beef, 30.1%, and chicken meat, 49.0%. As observed from the presented data, Brazil shows by the participations in the world market of sugar and coffee its lead in the productivity of these products.

Finally, the regional projections are indicating that the greatest increase of production, 42.1%, and of area, 41.8% of the sugar cane, must occur in the State of Goiás, although it is still a state with a small production. But, São Paulo as the greatest national producer also projects high expansions of production and of area for this product. Mato Grosso must keep leading the soybean production in the country responding to almost 30.0% of the production. The region denominated as MATOPIBA, for being situated in the Brazilian states of Maranhão, Tocantins, Piauí and Bahia, must presents high increase for the production of grains as well as its area must present also an expressive increase. The expansion of this new region is attributed to the land prices, which although they have increased sharply in the previous years, they are still inferior to states such as Mato Grosso which is still a frontier expansion region.

7. UNCERTAINTIES

World Recession

Increase of the degree of protectionism in the importing countries

Severe climate changes

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ATTACHMENT 1 – Methodological Note

1. Introduction

The study of the national agribusiness projections consists on the analysis of historical series with the use of statistical techniques for analysis of time series classified as Exponential Smoothing, Box and Jenkins (ARIMA) and State-Space. Below, there is a brief description of the models, methods and some concepts which were used in this study. As general reference it is suggested Morettin and Toloi, 2004). Other specific references are given throughout the text.

1.1 Stationary Process: A process is stationary (weakly) when its mean and its variance are constant through the time and when the value of the co-variance between two periods of time depends only on the difference between the two periods of time, and not on the time itself where the covariance is calculated. We have:

Mean: $E(Z_t) = \mu$;

Variance: $VAR\ (Z_t) = E(Z_t - \mu)^2 = \sigma^2$

Covariance: $\psi_\kappa = E[(Z_t - \mu)(Z_{t+\kappa} - \mu)\ ]$

Where $\psi_\kappa,$ is the covariance between the values of Z_t and $Z_{t+\kappa}$ that is, between two values of the time series separated by κ periods.

1.2 Purely Random Process or White Noise: A process (e_t) is purely random when its mean is zero, its variance is σ^2 and the variables e_t are not correlated.

1.3 Integrated Process: If a time series (non-stationary) has to be differenced *d* times to become stationary, it is said that this series is integrated of order *d*. An integrated time series Z_t of order *d* is denoted as: $Z_t \sim I(d)$.

2. Exponential Smoothing Models

The Double Exponential Smoothing or Linear Smoothing is adequate to time series Z_t which evolve showing linear trend for which the linear and angular coefficients can also vary in time. It is possible to demonstrate that optimal representations of the exponential smoothing models are obtained from the ARIMA models and of State-Space models described below. In the double exponential smoothing approach (the only one we are dealing here) the linear coefficient μ_t (level) of the series in period t and its growth rate β_t in the same period are given by the smoothing equations (see Bowerman, O' Connel and Koehler, 2005)

$$\mu_t = \alpha Z_t + (1-\alpha)(\mu_t + \beta_{t-1})$$
$$\beta_t = \gamma(\mu_t - \mu_{t-1}) + (1-\gamma)\beta_{t-1}$$

where α and γ are constants in the interval (0,1) and t=1,2,...,N. The predictor of the series in period $N+\tau$ based on period N is given by $\hat{Z}_{N+\tau} = \mu_N + \tau\beta_N$.

The exponential smoothing, simple, double (discussed here) or even triple can be obtained from PROC FORECAST (SAS, 2010), but the standard errors of the predictors may also be computed from state-space methods.

3. ARIMA Models

The Autoregressive Integrated Moving Average (ARIMA) model fits data generated by a univariate time series, transformed to stationarity through calculations of differences, using a class of models known as autoregressive processes, moving average processes or mixed autoregressive-moving average processes

Autoregressive Process (AR)

Let Z_t be a stationary time series. If we model Z_t as

$$(Z_t - \mu) = \alpha_1(Z_{t-1} - \mu) + e_t,$$

where μ is the mean of Z_t and e_t is a white noise, we say that Z_t follows an autoregressive process of first order, or AR(1). In this case, the value of Z_t in period t depends on its value in the previous period and on a random term; the values of Z_t are expressed as deviations of its mean value. So, this model says that the forecasted value of Z_t in period t is simply a proportion ($= \alpha_1$) of its value in the period (t-1) plus a random shock in period t. Stationarity is achieved imposing $|\alpha_1| < 1$.

In general, it is possible to have:

$$(Z_t - \mu) = \alpha_1(Z_{t-1} - \mu) + \alpha_2(Z_{t-2} - \mu) + ... + \alpha_p(Z_{t-p} - \mu) + e_t$$

In this case Z_t follows an autoregressive process of order p, or AR(p) if the coefficients α_i satisfy appropriate conditions.

3.1. Moving Average Process (MA)

Let Z_t be a stationary time series. If we model Z_t as

$$Z_t = \mu + e_t - \beta e_{t-1}$$

Where μ and β are constants with $|\beta| < 1$, and the error term e_t is a white noise, it is said that the time series defines the MA(1) - moving average process of order 1.

In general, if the time series satisfies

$$Z_t = \mu + e_t - \beta_1 e_{t-1} - \beta_2 e_{t-2} - \cdots - \beta_q e_{t-q}$$

where the coefficients β_i satisfy additional conditions of invertibility, it is said that Z_t follows a moving average process of order q, or MA(q). In summary a moving average process is a linear combination of terms of a white noise process.

3.2. Autoregressive Moving Average Process (ARMA)

If a stationary time series (Z_t) has characteristics of AR with errors following a process MA, it will be an ARMA process. The series Z_t will follow an ARMA process (1,1), for example, if it can be represented by

$$Z_t = \mu + \alpha Z_{t-1} + e_t - \beta e_{t-1}$$

In general, for an ARMA process (p,q) there will be p autoregressive terms and q moving average terms.

3.3. Autoregressive Integrated Moving Average Process (ARIMA)

If a time series is not stationary, but when differenced d times it becomes stationary, and it is an AR with errors MA, we say that the time series is an ARIMA (p, d, q), that is, an integrated autoregressive-moving averages time series, where p denotes the number of autoregressive terms, d is the number of times that we must difference the series to make it stationary, and q, is the number of moving average terms. It is important to emphasize ARMA models can be fit only to stationary and invertible time series. These properties are achieved through differencing. This approach was proposed by Box and Jenkins (1976). The fit and computation of forecasts of a given time series with the use of Box and Jenkins techniques were performed here using PROC ARIMA (SAS, 2010).

3.4. Deterministic Trends with ARMA Errors

In one instance (consumption of cellulose) a satisfactory model was not possible with the use of integrated models. In this case it was used the regression model Zt=F(t)+Ut where Ut is an ARMA error and F(t) a linear function in time. The PROC ARIMA (SAS, 2010) produces statistics for these models using generalized least squares.

4. State-Space Models

The state-space model is a statistical model for a multivariate time series. It represents the multivariate time series through auxiliary variables, some of which are not observable directly. These auxiliary variables are denominated state-space variables. The state-space vector summarizes all the information of values from the present and from the past on the relevant time series for the prediction of future values for the series. The observed time series are expressed as linear combination of the state variables. The state-space model is called a Markovian representation or canonical representation of a multivariate time series.

Let Z_t be a q dimensional time series. Its representation in state-space, relate the observations vector Z_t to the state vector X_t, of dimension k, through the linear system

$$Z_t = A_t X_t + d_t + S_t \varepsilon_t \text{ (observation equation)},$$

$$X_t = G_t X_{t-1} + c_t + R_t \eta_t \text{ (state or system equation)}$$

where $t=1,..., N$; A_t is the matrix of the system of order (q x k); ε_t is the noise vector of the observation of order (q x 1), not correlated in time, with mean vector zero and matrix of variance W_t of order (q x q),; G_t is the transition matrix of order (k x k); η_t is a noise vector not correlated in time, of order (k x 1), with mean vector zero and matrix of variance Q_t of order (k x k); d_t has order (q x 1); c_t has order (k x 1); R_t has order (k x k).

In the state-space models it is supposed additionally that the initial state X_0 has mean μ_0 and matrix of variance Σ_0; the noise vectors ε_t and η_t are not correlated with each other and not correlated with the initial state, that is,

$$E(\varepsilon_t \eta_s') = 0, \text{ every } t, s= 1,...,N; \text{ and}$$

$$E(\varepsilon_t X_0') = 0 \text{ and } E(\eta_t X_0') = 0, t= 1,...,N;$$

It is said that the state-space model is Gaussian when the noise vectors are normally distributed. The matrixes A_t and G_t are non-stochastic; in this way if there is any variation in time it will be pre-determined.

In this work it was used a particular form of the general representation described above, which is the stationary representation described in SOUZA, et al, 2006 and Brocklebank and Dickey, 2004.

It is important to notice here that every ARMA process has a state-space representation.

The parameters of the state-space representation are estimated by maximum likelihood supposing that the residual shocks vector are normally (multivariate) distributed.

The fit and forecasts of time series performed via state-space models were performed using PROC STATESPACE (SAS, 2010).

5. AIC and SBC Information Criterion

The information criteria are very useful to assist in choosing the best model among those which are potentially adequate. These criteria consider not only the quality of the fit but also penalize the inclusion of extra parameters. Therefore, a model with more parameters can have a better fit, however not necessarily it will be preferable in terms of the information criterion. It is considered the best model by the information criteria the one which presents the lowest values of AIC or SBC.

The information criterions known as Akaike Information Criterion (AIC) and the Schwartz Bayesian Criterion (SBC) can be described as follows:

$$AIC = T \ln (\text{estimator of maximum verisimilitude}) + 2n,$$

$$SBC = T \ln (\text{estimator of maximum verisimilitude}) + n \ln(T)$$

Where, T is the number of observations used in the computations and n the number of parameters estimated.

It is interesting to highlight that these information criteria analyzed individually do not have any meaning considering only one model. Comparison of alternative models (or competing) is to be done in the same sampling period, in other words, with the same quantity of information. In this work the use of the information criteria was used in the choice of the order of some ARMA models and restricted to the Akaike criterion in the context of the use of the state-space modeling.

ATTACHMENT 2 – Tables of Results

Brazil - National
Production Projection
Brazil 2010/11 to 2020/21

Product	Unit	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	Growth Rate
Cotton	Million t	1.6	1.7	1.8	1.8	1.9	2.0	2.1	2.2	2.3	2.3	2.4	4.3
Rice	Million t	12.5	12.6	12.7	12.8	12.9	13.1	13.2	13.3	13.5	13.6	13.7	1.0
Beans	Million t	3.5	3.6	3.5	3.6	3.6	3.6	3.7	3.7	3.8	3.8	3.8	0.9
Corn	Million t	52.9	56.2	56.4	57.8	58.8	60.0	61.1	62.2	63.3	64.4	65.5	2.0
Soybean Grain	Million t	68.7	71.1	72.8	74.5	76.2	78.0	79.7	81.4	83.1	84.8	86.5	2.3
Soybean Meal	Million t	26.7	27.5	27.9	28.5	29.1	29.6	30.2	30.7	31.3	31.8	32.4	1.9
Soybean Oil	Million t	6.8	7.0	7.2	7.3	7.4	7.6	7.7	7.9	8.0	8.2	8.3	1.9
Wheat	Million t	5.3	5.3	5.4	5.5	5.6	5.7	5.8	5.9	6.0	6.1	6.2	1.6
Chicken Meat	Million t	12.1	13.1	12.9	13.9	13.6	14.6	14.3	15.3	15.0	16.0	15.7	2.6
Beef	Million t	9.2	9.4	9.6	9.8	10.0	10.3	10.5	10.7	10.9	11.1	11.4	2.2
Pork	Million t	3.4	3.4	3.5	3.6	3.7	3.7	3.8	3.9	3.9	4.0	4.1	1.9
Coffee	Million sacks	54.0	50.0	58.9	54.5	64.2	59.4	69.9	64.8	76.2	70.6	-	4.0
Sugar	Million t	34.1	35.9	35.8	36.8	38.4	38.7	39.6	40.2	41.2	42.0	42.3	2.2
Cassava	Million t	26.4	26.3	26.2	26.2	26.2	26.2	26.2	26.1	26.1	26.1	26.1	-0.1
Potato	Million t	3.6	3.6	3.7	3.8	3.8	3.9	3.9	4.0	4.1	4.1	4.2	1.6
Orange	Million t	19.4	19.9	20.2	20.7	21.0	21.5	21.9	22.3	22.7	23.1	23.5	1.9
Milk	Billion liters	31.6	32.3	33.0	33.6	34.3	34.9	35.6	36.2	36.9	37.5	38.2	1.9
Tobacco	Million t	0.9	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.4
Sugarcane	Million t	750.1	769.3	788.0	806.4	824.7	843.1	861.4	879.7	898.0	916.3	934.6	2.2
Paper	Million t	10.1	10.3	10.5	10.8	11.0	11.3	11.6	11.8	12.1	12.3	12.6	2.3
Cellulose	Million t	14.5	15.1	15.5	16.1	16.5	17.0	17.5	18.0	18.5	19.0	19.4	2.9

Source: AGE/Mapa and SGE/Embrapa

Note : Sugarcane - refers to the cane destined to the production of sugar, ethanol and other purposes as forages, cachaças, etc.

Planted Area Projections
Brazil 2010/11 to 2020/21

Product	Unit	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	Growth Rate
Cotton	Million ha	0.91	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.89	0.89	0.89	-0.17
Rice	Million ha	2.56	2.48	2.38	2.28	2.23	2.12	1.99	1.89	1.78	1.69	1.61	-4.64
Beans	Million ha	3.74	3.72	3.63	3.63	3.62	3.57	3.54	3.52	3.49	3.46	3.43	-0.83
Corn	Million ha	12.91	13.14	13.06	13.15	13.16	13.21	13.24	13.27	13.31	13.35	13.38	0.30
Soybean Grain	Million ha	24.74	25.40	25.98	26.50	27.01	27.51	28.01	28.52	29.02	29.52	30.02	1.91
Wheat	Million ha	2.32	2.34	2.31	2.31	2.29	2.28	2.27	2.26	2.24	2.23	2.22	-0.49
Coffee	Million ha	2.01	1.97	1.90	1.85	1.79	1.74	1.68	1.62	1.56	1.51	1.45	-3.26
Cassava (*)	Million ha	1.82	1.81	1.80	1.79	1.78	1.77	1.76	1.76	1.75	1.74	1.73	-0.49
Potato (*)	Million ha	0.14	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.12	-0.95
Orange (*)	Million ha	0.86	0.87	0.88	0.89	0.90	0.91	0.92	0.93	0.94	0.95	0.96	1.18
Tobacco (*)	Million ha	0.46	0.46	0.46	0.46	0.47	0.47	0.48	0.48	0.49	0.49	0.50	0.96
Sugarcane (*)	Million ha	9.42	9.64	9.85	10.06	10.27	10.48	10.69	10.90	11.10	11.31	11.52	2.02

Source: AGE/Mapa and SGE/Embrapa

* Harvested area

Note : Sugarcane - refers to the cane destined to the production of sugar, ethanol and other purposes such as forages, cachaças, etc.

Consumption Projections
Brazil 2010/11 to 2020/21

Product	Unit	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	Growth Rate
Cotton	Million t	0.99	1.00	1.01	1.02	1.03	1.04	1.05	1.06	1.07	1.08	1.09	0.95
Rice	Million t	12.63	12.79	12.92	13.07	13.20	13.33	13.47	13.61	13.74	13.88	14.01	1.03
Beans	Million t	3.53	3.55	3.60	3.64	3.68	3.72	3.76	3.80	3.84	3.89	3.93	1.10
Corn	Million t	46.39	47.86	48.30	49.62	50.26	51.46	52.20	53.30	54.10	55.15	56.00	1.86
Soybean Grain	Million t	37.62	38.61	39.35	40.14	40.92	41.70	42.49	43.27	44.05	44.83	45.61	1.92
Soybean Meal	Million t	12.55	12.86	13.21	13.55	13.90	14.25	14.61	14.96	15.31	15.66	16.01	2.48
Soybean Oil	Million t	5.22	5.38	5.51	5.64	5.76	5.88	6.01	6.13	6.25	6.37	6.50	2.17
Wheat	Million t	10.35	10.49	10.63	10.76	10.90	11.03	11.17	11.31	11.44	11.58	11.71	1.24
Chicken Meat	Million t	8.24	9.02	8.73	9.49	9.19	9.95	9.65	10.41	10.11	10.87	10.57	2.45
Beef	Million t	7.28	7.54	8.18	8.46	8.38	8.57	8.79	8.78	8.89	9.24	9.43	2.28
Pork	Million t	2.79	2.83	2.89	2.94	3.00	3.05	3.11	3.16	3.21	3.27	3.32	1.78
Coffee	Million sacks	19.50	20.38	21.29	22.25	23.25	24.30	25.39	26.54	27.73	28.98		4.50
Sugar	Million t	12.06	12.30	12.54	12.78	13.02	13.27	13.51	13.75	13.99	14.23	14.47	1.84
Milk	Million liters	31.80	32.50	33.15	33.79	34.43	35.07	35.71	36.35	36.99	37.62	38.26	1.85
Paper	Million t	9.36	9.63	9.88	10.14	10.39	10.65	10.90	11.16	11.41	11.66	11.92	2.43
Cellulose	Million t	6.15	6.17	6.39	6.52	6.63	6.78	6.91	7.04	7.18	7.31	7.45	2.00

Source: AGE/Mapa and SGE/Embrapa

Exports Projections
Brazil 2010/11 to 2020/21

Product	Unit	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	Growth Rate
Cotton	Million t	0.52	0.55	0.59	0.62	0.65	0.69	0.72	0.75	0.79	0.82	0.86	5.05
Corn	Million t	9.14	9.19	11.16	11.11	10.92	12.16	12.67	12.66	13.42	14.09	14.30	4.57
Soybean Grain	Million t	29.30	30.90	32.99	33.57	34.26	35.71	36.97	37.67	38.60	39.77	40.74	3.17
Soybean Meal	Million t	13.87	13.89	14.13	14.26	14.44	14.59	14.75	14.90	15.06	15.21	15.37	1.08
Soybean Oil	Million t	1.45	1.42	1.43	1.43	1.45	1.45	1.46	1.47	1.48	1.49	1.50	0.54
Orange juice	Million t	2.10	2.13	2.21	2.26	2.32	2.38	2.44	2.50	2.56	2.62	2.68	2.53
Chicken Meat	Million t	3.87	4.12	4.15	4.40	4.42	4.66	4.68	4.91	4.93	5.16	5.17	2.89
Beef	Million t	1.80	1.85	1.90	1.95	2.01	2.06	2.11	2.17	2.22	2.27	2.33	2.61
Pork	Million t	0.58	0.60	0.62	0.63	0.65	0.67	0.69	0.71	0.72	0.74	0.76	2.75
Coffee	Million sacks	33.70	34.54	35.41	36.29	37.20	38.13	39.08	40.06	41.06	42.09		2.50
Sugar	Million t	28.40	30.00	31.16	32.48	33.75	35.03	36.31	37.59	38.87	40.15	41.42	3.78
Milk	Billion liters	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.30	0.31	4.19
Paper	Million t	2.13	2.18	2.24	2.29	2.35	2.40	2.46	2.52	2.57	2.63	2.68	2.35
Cellulose	Million t	8.91	9.19	9.63	9.97	10.36	10.71	11.08	11.44	11.80	12.16	12.53	3.50

Source: AGE/Mapa and SGE/Embrapa

Imports Projections
Brazil 2010/11 to 2020/21

Product	Unit	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	Growth Rate
Wheat	Million t	6.04	6.12	6.19	6.25	6.31	6.38	6.44	6.50	6.56	6.62	6.69	1.01
Milk	Billion liters	0.80	0.85	0.88	0.89	0.89	0.90	0.90	0.90	0.90	0.90	0.90	0.79
Rice	Million t	0.21	0.35	0.44	0.52	0.58	0.64	0.69	0.74	0.79	0.83	0.98	13.25
Beans	Million t	0.19	0.16	0.17	0.19	0.18	0.18	0.20	0.20	0.20	0.21	0.21	2.03

Source: AGE/Mapa and
SGE/Embrapa

<u>**Regional Projections**</u>

Production Projection 2010/11 to 2020/21

	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	Growth rate %
Rice - Thousand Tons												
RS	8,066.3	8,399.6	8,507.0	8,720.6	8,884.3	9,071.5	9,247.6	9,428.9	9,607.8	9,787.8	9,967.3	2.05
Sugarcane - Thousand Tons												
GO	52,086.0	55,521.8	58,530.6	61,124.9	63,425.7	65,500.1	67,404.4	69,179.7	70,857.6	72,461.8	74,010.3	3.42
MG	64,306.6	66,732.3	68,876.9	70,830.4	72,661.0	74,411.6	76,110.3	77,775.3	79,418.5	81,047.4	82,667.2	2.48
MT	16,550.7	17,093.4	18,233.7	18,879.9	18,922.7	19,084.3	19,496.5	20,371.3	21,034.4	21,391.5	21,578.9	2.61
PR	55,627.8	57,473.0	59,419.6	61,104.3	62,656.2	64,189.6	65,733.4	67,283.3	68,834.2	70,384.6	71,934.6	2.56
SP	441,881.1	461,264.5	474,279.6	489,653.1	501,991.6	515,340.8	527,235.8	539,556.4	551,176.9	562,972.1	574,428.7	2.58
Corn - Thousand Tons												
MG	6,339.5	6,449.3	6,552.2	6,657.1	6,761.5	6,866.0	6,970.4	7,074.9	7,179.4	7,283.9	7,388.3	1.54
MT	9,012.2	9,217.0	9,620.1	9,862.1	10,048.6	10,343.5	10,620.2	10,842.8	11,097.1	11,367.2	11,612.7	2.56
PR	12,704.7	12,104.7	12,732.4	12,679.9	13,004.3	13,119.8	13,351.1	13,518.2	13,720.9	13,903.9	14,097.8	1.33
Soybean Grain - Thousand Tons												
MT	20,217.7	20,720.0	21,257.0	21,832.2	22,394.9	22,951.7	23,512.0	24,072.9	24,633.0	25,193.1	25,753.4	2.46
PR	14,324.4	14,537.2	14,831.3	15,096.7	15,372.0	15,643.8	15,916.9	16,189.5	16,462.2	16,734.9	17,007.7	1.75
RS	8,198.5	7,951.2	9,058.7	9,513.2	8,875.5	8,400.9	8,965.8	9,680.4	9,525.6	8,984.6	9,097.6	1.10
Wheat - Thousand Tons												
PR	3,246.3	3,291.1	3,337.2	3,390.9	3,448.3	3,507.8	3,568.5	3,629.9	3,691.7	3,753.8	3,815.9	1.66
RS	1,977.5	2,045.0	2,073.5	2,106.4	2,156.5	2,188.8	2,227.5	2,270.3	2,306.0	2,345.7	2,385.7	1.82

Source: AGE/EMBRAPA/MAPA - 2011

Planted Area Projections 2010/11 to 2020/21

	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	Growth Rate %
Rice - Thousand Hectares												
RS	1,142.6	1,170.7	1,182.7	1,202.2	1,218.2	1,235.9	1,252.8	1,270.1	1,287.1	1,304.3	1,321.4	1.42
Sugarcane - Thousand Hectares												
GO	624.1	665.8	701.4	732.4	759.7	784.4	807.0	828.1	848.0	867.0	885.4	3.40
MG	783.2	809.1	831.7	852.2	871.3	889.5	907.1	924.4	941.4	958.2	974.9	2.16
MT	236.5	240.9	247.9	254.2	260.7	267.2	273.6	280.1	286.5	293.0	299.4	2.43
PR	658.8	675.4	695.6	714.7	732.7	750.3	767.9	785.6	803.3	820.9	838.6	2.44
SP	5,172.3	5,407.3	5,545.3	5,726.5	5,861.7	6,016.0	6,148.4	6,289.1	6,419.5	6,553.4	6,682.3	2.51
Corn - Thousand Hectares												
MG	1,162.7	1,145.4	1,127.4	1,109.6	1,091.7	1,073.9	1,056.0	1,038.2	1,020.3	1,002.5	984.6	-1.65
MT	1,978.0	2,067.2	2,132.9	2,158.6	2,213.8	2,277.5	2,320.7	2,367.5	2,423.8	2,474.1	2,521.5	2.34
PR	2,180.2	2,128.8	2,154.5	2,137.5	2,144.1	2,137.7	2,138.5	2,135.2	2,134.2	2,132.0	2,130.4	-0.13
Soybean Grain - Thousand Hectares												
MT	6,640.8	6,811.7	6,973.0	7,155.3	7,336.4	7,513.4	7,691.4	7,869.9	8,048.3	8,226.5	8,404.8	2.39
PR	4,675.3	4,751.7	4,821.3	4,892.9	4,963.7	5,034.7	5,105.7	5,176.7	5,247.6	5,318.6	5,389.6	1.43
RS	3,936.4	3,887.2	3,973.8	4,076.2	4,053.6	3,984.0	4,009.9	4,105.2	4,136.7	4,088.2	4,072.9	0.45
Wheat - Thousand Hectares												
PR	1,258.7	1,219.8	1,208.4	1,200.7	1,196.5	1,194.0	1,192.6	1,191.8	1,191.3	1,191.1	1,190.9	-0.39
RS	846.0	805.6	756.8	768.5	730.9	704.0	694.6	663.7	642.4	624.3	598.1	-3.21

Source: AGE/Mapa and SGE/Embrapa

MATOPIBA Region

MATOPIBA (*)

Production Projections 2010/11 to 2020/21 (thousand tons)

	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	Growth Rate %
Grains	13,341.0	13,757.0	14,048.0	14,384.0	14,706.0	15,033.0	15,358.0	15,683.0	16,009.0	16,334.0	16,660.0	2.21

Planted Area Projections 2010/11 to 2020/21 (thousand hectares)

	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	Growth Rate %
Grains	6,438.0	6,567.0	6,666.0	6,772.0	6,876.0	6,980.0	7,084.0	7,188.0	7,292.0	7,396.0	7,501.0	1.52

Source: AGE/Mapa and SGE/Embrapa