(i) Past and present of soybean's international market

The international market of soybean has presented very particular characteristics in the production as well as in the commercialization of the product. In the technological aspect, it is the transgenic crop most extended in the world, 60% of the total land cultivated with GMOs is soybean. None of the others oil-crops has the economic relevance of soybean in the international market, soybean grains account with 86 % of the total market shared by the seven oil-crops seeds marketed, which determines soybeans as the most important oil-crop in the world.

Supply performance

The supply of soybean in the international market has grown very significantly. If we consider 1992 as reference year and comparing the volume cropped in this year and in the year 2004, it is observed that the production has been increased in more than twice; from 104.093 thousands of tons in 1993 to 224.140 thousands of tons in 2004.

Another remarkable aspect of the production of soybean is the concentration of the production in some few countries, this concentration has also increased in the mentioned period. Of 88% cultivated by five countries: US, Brazil, China, Argentina and Paraguay in the year 1990 this concentration has grown to 94% in the year 2004.

Table 8: World production of soybean

Period	In thousand of tons
1990	104,093
1991	107,298
1992	117,379
1993	117,771
1994	137,697
1995	124,912
1996	132,217
1997	158,066
1998	159,819
1999	159,912
2000	174,942
2001	184,066
2002	197,270
2003	189,810
2004	224,140

Source: Own elaboration in base of information from ERS/USDA.

The global offer of soybean is going through structural changes whose final result will be the emergence of new commercial leaders in the world market. United States, which held the historically leadership in soybean production, has been recently displaced by the MERCOSUR (and more specifically by Brazil and Argentina) in soybean production. In 2002, for the first time in history, Brazil and Argentina have overcome the United States in soybean production. Figure 11 indicates the evolution of soybean production among United States, Brazil, Argentina and Paraguay

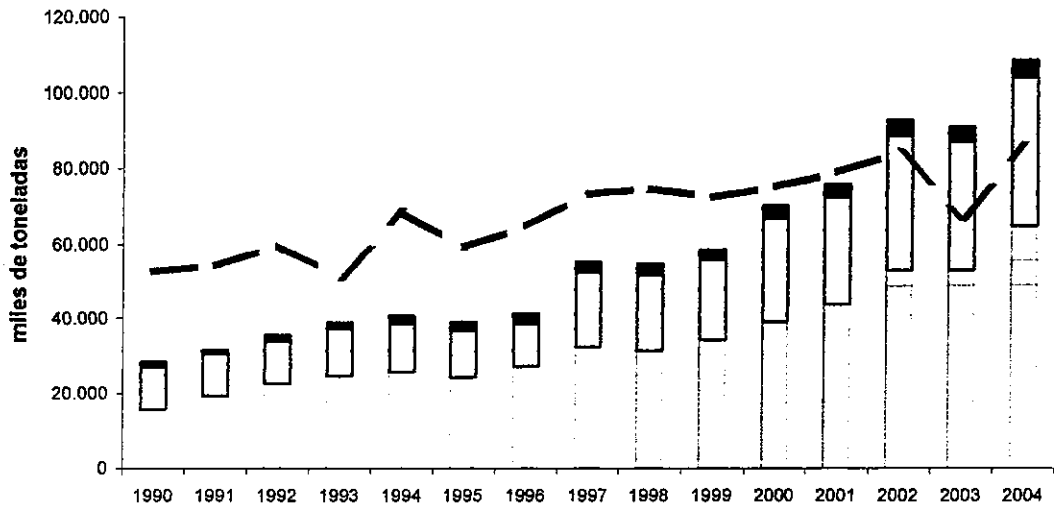

Figure 11: Evolution of soybean production: USA, Brazil, Argentina and Paraguay

The increment in the production of soybean in the MERCOSUR countries tends to consolidate and to transform this region into the main producer of soybean in the world. As a matter of fact, the region has overcome all other soybean regions in the world in soybean production since 2.002 .

According to studies carried out by the Ministry of Agriculture of United States, this structural change that is in a consolidation process, exercises a descending pressure on the prices paid for soybean to US producers. An increase of 1% in the production of soybean in South America reduces the price of the soybean in the United States in 0,26 % (Plate & Chamber, 2004). The Table 20 of the annex 2 illustrates the evolution of soybean cropping area for the main producing countries.

Evolution of the production among the main world soybean sellers.

A better appreciation in the evolution of soybean supply from exporting countries can be observed in the Table 9, where the historical series of soybean production from the main producing countries are indicated in comparison with

the whole world production. Considering 1990 as a base year, it is observed that the world production grew in 221% between this year and 2004.

In absolute terms, United States continues being the main producer of soybean in the world, although its market quota has come decreasing gradually from 50 % in 1990 to 37 % in 2004. On the other hand, Brazil has almost fourfold its soybean production from 15.750.000 tons in 1990 to 64.500.000 tons in 2004 and, in relative terms, its market quota has been increased from 15% in 1990 to 28% in 2004. Another country that has significantly increased its soybean production in the above mentioned period is Argentina, whose production volume grew from 11.500.000 tons to 39.000.000 tons. This represents an 339 % increment.

In relative terms, Paraguay had a very similar increment to that of Argentina, growing from a production of 1.300.000 tons to 4.500.000 tons. This volume represents an increment of 346% during the period between 1990 and 2004. Of the six main soybean production countries in the world, India maintained its production relatively constant between the years 1998 and 2004. In the meantime, the increment in relative terms of China production was just 63,6 %, considering the 1990 volume in comparison with the 2004 production.

Table 9: Soybean production in the main producer countries at world level (Thousand of ton)

Year	U.S.A.	China	Brazil	Argentina	India	Paraguay	World
1990	52.416	11.000	15.750	11.500	n.d	1.300	104.093
1991	54.065	9.710	19.300	11.150	n.d.	1.300	107.298
1992	59.612	10.300	22.500	11.350	n.d.	1.750	117.379
1993	50.885	15.310	24.700	12.400	n.d.	1.800	117.771
1994	68.444	16.000	25.900	12.500	n.d.	2.200	137.697
1995	59.174	13.500	24.150	12.430	n.d.	2.400	124.912
1996	64.780	13.220	27.300	11.200	n.d.	2.771	132.217
1997	73.176	14.728	32.500	19.500	n.d.	2.988	158.066
1998	74.598	15.152	31.300	20.000	6.000	3.050	159.819
1999	72.224	14.290	34.200	21.200	5.200	2.900	159.912
2000	75.055	15.400	39.000	27.500	5.250	3.500	174.942
2001	78.669	15.450	43.500	28.750	5.400	3.300	184.066
2002	83.776	16.510	52.500	35.500	4.000	4.530	197.270
2003	66.778	15.400	52.600	34.000	6.800	4.000	189.810
2004	85.484	18.000	64.500	39.000	6.500	4.500	224.140

Source: Own elaboration based on ERS/USDA information. n.d.: no data

Evolution of soybean stock.

The only available information about the historical series of soybean stock is from United States, Brazil and Argentina. According to this information, the stock of soybean has shown a different behavior in the main producing countries of the world. Considering the years 1998-1999 as a base year, we can appreciate that the stock of soybean in the United States has dropped gradually

from an initial volume of 9.484.000 tons to 3.059.000 tons in the period 2003/2004. However, in the following period soybean stocks has shown an increment of 3.87 times to reach 11.483.000 tons. In Brazil and Argentina, on the other hand, the soybean stock has grown continually from the year 1998/99 to 2004/05 with the exception of the period 2000/01. Considering the stock value at the beginning of the time series, at the end of the considered period we can observe that the growth of the stock in Brazil was of 18 times and in the Argentina it was of 39 times.

In the whole world, the stock of soybean has maintained a more constant rate of growth in comparison with the countries previously mentioned, increasing from 27.290.000 tons in the period 1998/99 to 60.810.000 tons in the period 2004/05. This figures represents a growth of 2.23 times. The Table 21 of the Annex 2 indicates the evolution of the stock in main producing countries.

Oil crops trade in the world market

The world trade of oil-crops is clearly leaded by soybean. During the last five years, the market quota in soybean supply has been increased from 80% to 86% and current forecasts of world production estimate that this share will be maintained or increased in next years. The colza supply is placed in the second position in oil-crops international markets with and stabilized shared of 8 % since the period 2001/02 until the present.

Table 10: World trade of the main oil crop seeds (Millions of metric tons)

Oil-crop	2000/1		2001/2		2002/3		2003/4*		2004/5 **	
Soybean	53.79	80%	53.62	85%	55.59	83%	55.59	83%	62.41	86%
Cotton seed	1.29	2%	0.98	2%	0.93	1%	0.85	1%	1.00	1%
Peanuts	1.79	3%	1.93	3%	1.74	3%	1.74	3%	1.86	3%
Sunflower seed	2.59	4%	1.29	2%	2.75	4%	2.75	4%	1.84	3%
CANOLA	7.18	11%	4.93	8%	5.48	8%	5.48	8%	5.48	8%
COPRA	0.14	0%	0.14	0%	0.12	0%	0.12	0%	0.12	0%
Palm almond	0.05	0%	0.08	0%	0.06	0%	0.06	0%	0.07	0%
Total	66.83	100%	62.97	100%	66.67	100%	66.59	100%	72.78	100%

Source: Based on data from ERS/USDA. March of 2005
* Preliminary
**Estimated

According to the Table 10, the world trade of oil-crops has presented a differentiated behavior in what concerns to the rate of annual growth. Considering the seven oil-crops detailed in this table, soybean is the only one that presents an annual growth of 3.79%, with volumes of relevant commercialization. Although the product with the highest annual growth during the period between 2000/1-2004/5 was the palm nut, nevertheless, the share trade for this oil-crop in the world market is inferior to 1%. Another crop that had a positive growth was the peanut. However, the rate of annual growth did not even reach 1%. Other oil-crops: Sunflower seed, Colza and Cotton presented during the analyzed period a negative rate of growth, what means a decrease in the traded volume.

Evolution and trends of international prices

Soybean international prices show a cyclical behavior through time and, at the same time, a very volatile and seasonal behavior. The farm gate prices in US during the agricultural season 1999/2000 fell at their lower level during the last 27 years (US $4.10 to US $4.90 per bushel). On the contrary, in May of 2004 soybean's price has overcome the barrier of US$ 10 per bushel. However, in December of the same year price was about US$ 5 per bushel. The behavior of these prices indicates the high uncertainty of soybean market; this fact demands a great managerial capacity for professionals in charge of trading institutions that are specialized in this particular oil-crop.

The issues mentioned in the previous paragraph refer to the nominal prices; in other words, those prices that have the inflation incorporated in their values. However, the behavior of real (or deflated) prices indicate a sharply fall of soybean value during the last 50 years of the 20th century. In what concern to soybean real price behavior during the last fifty years, a study carried out by the World Bank is very illustrative. According to this research, soybean has lost in real terms among US$ 600 and US$ 700 per ton in the second half of the 20th century.

Prices projections -carried out by the Department of Agriculture of the United States as well as by the Secretary of the Organization for Economic Cooperation and Development- suggest that prices will keep on in similar values to the current ones in next 10 years. It is important to highlight that this is a phenomenon that not only affects to soybean but also to all commodities. The Figure 12 illustrates the behavior of the real soybean prices during the last 50 years of the 20th century, and a forecast until year 2010.

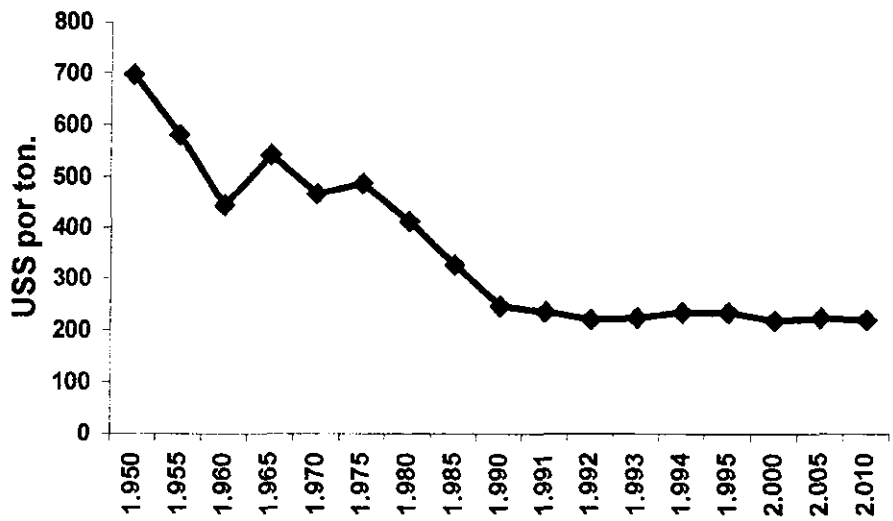

Figure 12: Evolution and projection of soybean international price (deflated).

The impact of the fall of real terms soybean prices on farmers could foster the process of consolidation of the productive base. This process is mainly due to the fact that earnings are achieved through scale economies, where as higher is the cropping area lower would be the costs and, consequently, higher the revenues.

Trends among the main soybean exporting countries.

The world exports of soybean are concentrated on four countries: United States, Brazil, Argentina and Paraguay. Around 90% of the total volume exported during the period 2004/05 was concentrated in the first three countries previously mentioned.

At country level, United States is the leader in soybean exports, although its share in the world market presents a notorious decrease in soybean exports, particularly comparing to the MERCOSUR exports. The evolution of soybean exports for main countries can be appreciated in the Table 22 of the Annex 2.

If we consider the year 1995/96 as a base for our analyses, we find that United States exported during this period 23.165.000 tons, which means 3,35 times more soybean than Brazil, Argentina and Paraguay together. However, these countries have increased more than proportionally the exported volume of soybean and in the period 2002/03 exported a joint volume of 30.044.000 of tons in contrast to the 28.423.000 of tons exported by the United States. Since this period, the countries of the MERCOSUR block have maintained their leadership in soybean exports and, according to projections carried out for international institutions, the leadership in soybean exports of this economic block will be stressed in the future.

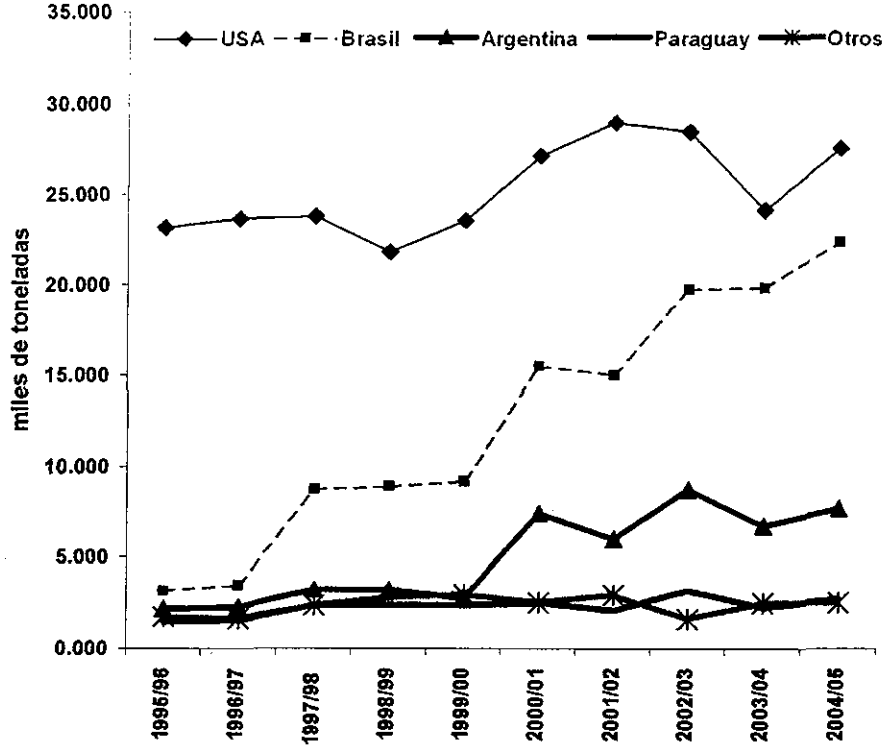

Figure 13: Evolution of soybean exports

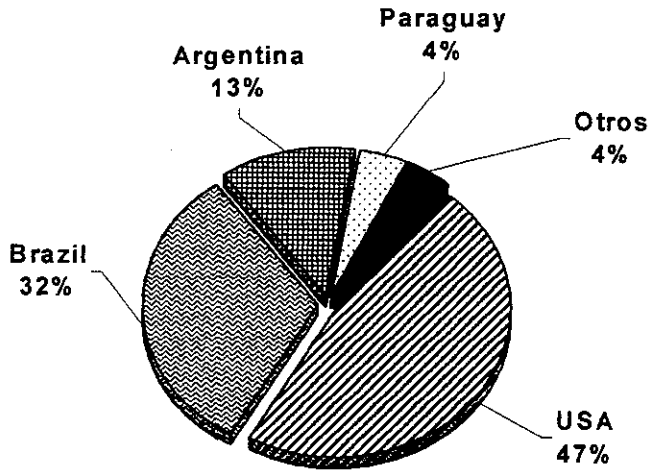

Figure 14: Paraguay's market share of World soybean exports. Average for the period 2000/01 to 2004/05

Main world importers of soybean

The international trade of soybean has also presented some changes among the main importing countries. Asia has become the main importer of soybean of the world. The imports of China during the year 2003 have reached the record volume of 20.7 million tons, which transform this country into the main soybean importer of the world. The European Union has been displaced to the second bigger soybean importer of the world.

The imports of soybean at global level, likely the exports, are strongly concentrated in some few countries. As the Figure 15 indicates, almost two thirds of the average imports during the last five years (2000/01-2004/05) have had two single destinations, the European Union (31%) and China (29%). The following countries in order of relevance for the imported volume are Japan (9%), Mexico (7%), Taiwan (4%), Korea (3%) and Indonesia (2%). Altogether, these countries imported 85% of the total volume traded during the last five years. The Table 23 of the Annex 2 shows the imports of soybean in the main producing countries.

The remaining 15% of the imports is distributed among the other countries importers of the world. As it will be described later on, the imports of soybean (likely the exports) are in a stage of structural changes; where Asia trends to be consolidated as the biggest importer in the world of soybean grains, particularly China.

China's soybean imports

The importance of this country in soybean's international market deserves a detailed analysis. In the following section, we will explore the recent behavior of the soybean economy in China.

The growing of soybean oil and flour consumption, particularly in the urban areas, plays a significant role in the demand of soybean grains. It demands that it surpasses consistently to the internal offer of the country. The US Department of Agriculture estimates that, during the period between the years 2003 and 2004, the consumption of soybean in China was superior to 34.4 million tons; this quantity is fourfold the volume of soybean consumed during the year 1980. Due to this quick increment in the consumption, China currently imports 50% of the volume demanded in its internal market, becoming in this way in the destination of almost a third of the world soybean exports during the year 2003. China not only imports soybean grains. In spite of having implemented a strong policy of soybean oil production in the last 20 years, its commercial scale in this product has not lessened until the present its permanent deficit. Studies carried out by the USDA suggest that during next 10 years the imports of soybean from China would be twofold with regard to the current imports.

The socioeconomic causes that sustain the increment of soybean imports by China are the enlargement of the individual purchase capacity of the population, the population's growth and the changes in the way of life of the population that it is currently going through a process of rapid urbanization.

The expectations about soybean imports from China suggest that this country will follow the current tendency in the next years. These expectations are sustained in the fact that China still has a per capita consumption lower than other Asian countries with a similar food consumption patterns. So much in Korea as Taiwan where the purchase capacity is higher than China, the individual consumption of soybean oil is markedly higher than in China. Indeed, the individual consumption of oil in China reaches only 30% of the oil consumption in Taiwan.

The individual consumption of oil in China in the year 2003 were of 5,7 Kg. This volume is very similar to that of Japan (5,53 kg.), although, very below the levels consumed in Taiwan (19,05Kg.) and in South Korea (8,01kg.).

Besides, the oil consumption produces a derived demand of soybean grains to be used in the form of soybean flour for animal feeding, which pressure in the demand of grains. In fact, the consumption of soybean flour for animal food production was increased from 1,03 million tons to 19,6 million annual tons in the period between the years 1993 and 2003. This increment represents an annual rate of growth of 25%.

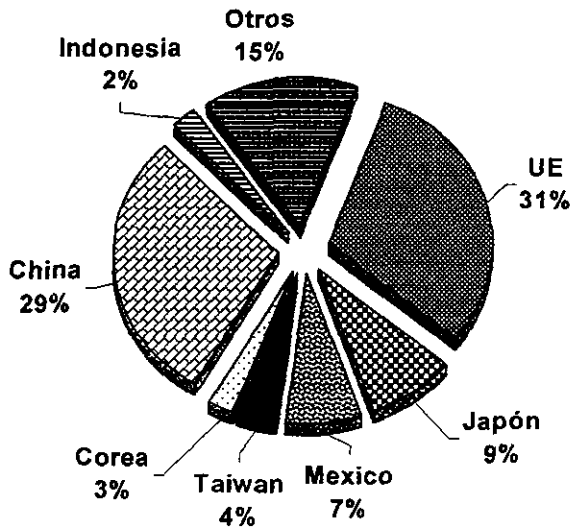

Figure 15: Soybean Imports: Main importing countries in the world Average for the years 2000/01 to 2004/05.

(ii) Outlooks of soybean international trade during the period 2004/5 to 2014/15

In the previous chapter it was portrayed the soybean behavior in the last decade and the beginning of the present decade. The rivalry in soybean international market stressed a strong pressure over competitors, to such a point that, as much the productive structure as the commercial one is going through a process of deep changes. Next, it will be described the projected future behavior, so much of the

exports as of the imports of soybean. The projections were carried out by the Ministry of Agriculture of the United States.

Exports

The projections for the period between 2004/05 and 2014/15 suggest that Brazil will become the leader of the world production of soybean. Indeed, the results of studies carried out by the USDA[13] indicate that Brazil would displace the United States in the leadership of soybean exports in the season 2008/2009 and it would become the biggest exporter in the world of this oil-crop. However, the third bigger exporter of soybean in the world, Argentina, would maintain its exports constantly during the same period.

We can infer from this report that as much United States as the Argentina have arrived to their production frontier, consequently the increment of its supply would be base mainly in the increase of productivity per hectare and not for the expansion of the agricultural frontier as it has happened in the last decades of the 20th century. Contrary to these countries, the Brazilian agricultural frontier still has a lot to expand its area and, consequently, its production. The area of the Brazilian "Cerrado" represents 250 million hectares, 50 millions of which are being used at the moment and other 90 million hectares can be incorporate to the agriculture. The Table 24 of the Annex 2 indicates the expected volumes of soybean import for the period 2003/04 to 2014/2015.

[13] Agricultural Baseline Projections. February 2005.

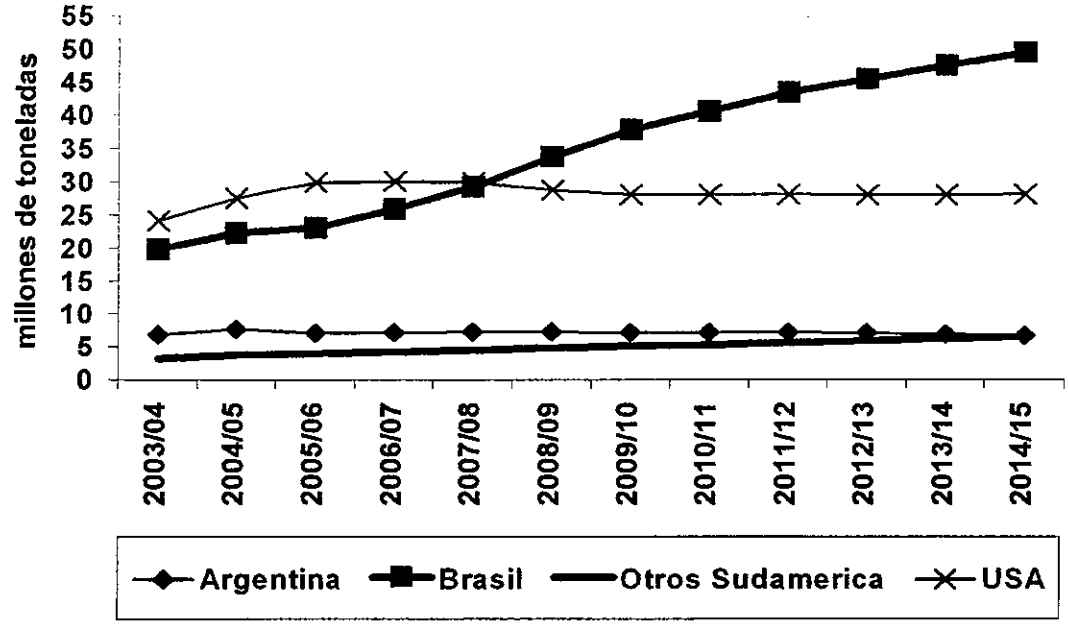

Figure 16: Projections of world soybean exports

Imports

The report previously mentioned suggests that Asia will continue being the biggest importer of soybean grains in the world. These projections indicates that not only China will maintain its leadership like biggest soybean importer during next 10 years (2004/05–2014/15), but it will also maintain the biggest rate of annual growth in the world imports. The Table 25 of the Annex 2 indicates the prospective volumes of imports for the period previously mentioned.

It is expected that China would share 48% of the total soybean imports during the years 2014 and 2015. The Figure 17 indicates the rate of annual growth for Chinese imports, which would be of 9%. A further analysis points out that of a total of 16,9 million tons of soybean imported during the period 2003/04, China would increase its imports to 44,2 million tons during the period 2014/15.

The second bigger importer of the world, the European Union would stay in this position. However, the import volume would diminish from 15,3 million tons in the years 2003/4 to 13,7 million tons in 2014/15. This drop in the quantity traded in indicates a decrease in the imports equivalent to 1% annual during the analyzed period.

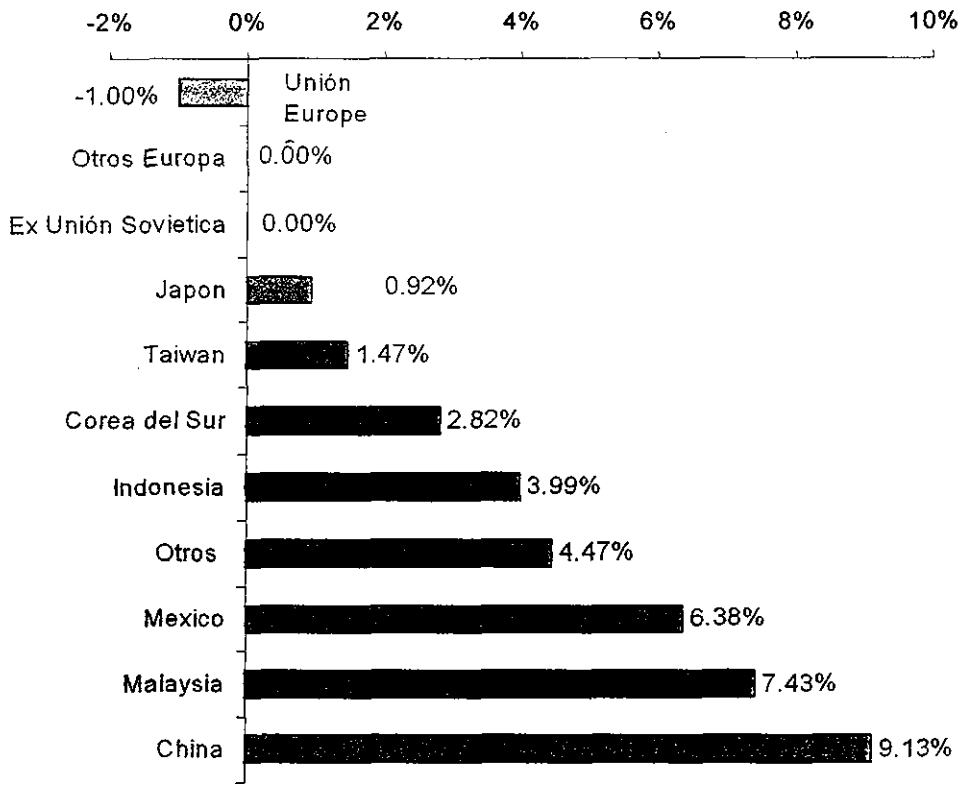

Figure 17: Projected annual growth of soybean imports. Period 2003-04 to 2014-15

Considering the volume of soybean imports, Mexico would be the third main demander of this oil-crop by the end of the analyzed period. This country would increase its imports to 7,5 million tons in the year 2014/2015. To reach this volume, Mexican soybean imports would need to growth at an annual rate of 6,38%.

Malaysia is another country that would show an increment in its imports. This increment would be equivalent to more than 100% of the current imports. That is to say, of the 0,5 million tons traded in at the moment, Malaysia would increase its imports to 1,1 million tons. In relative terms, this growth would represent a yearly increment of 7,43 %.

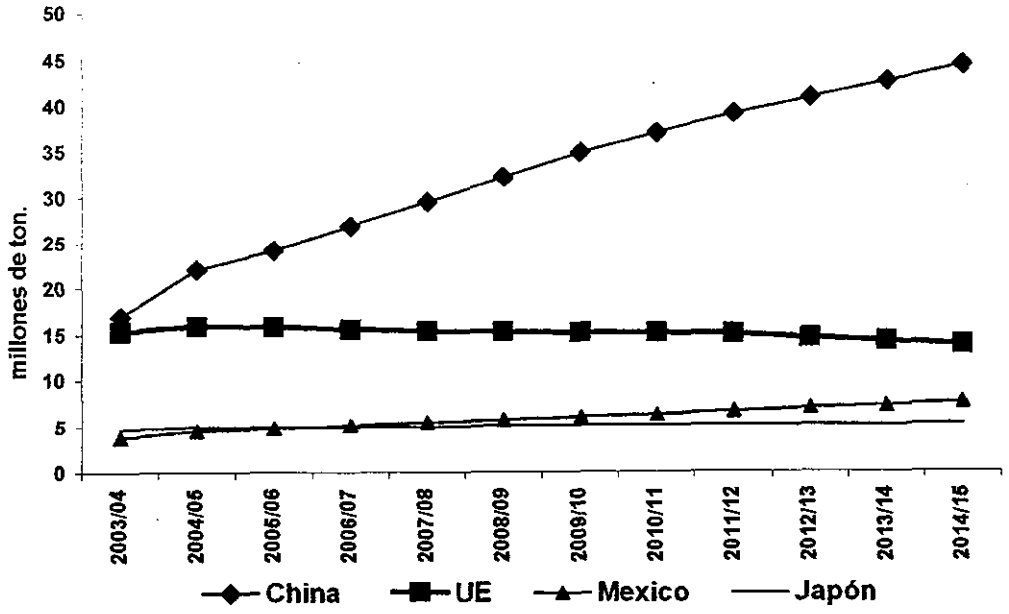

Figure 18: Projections of soybean world imports. Main importers

(iii) Trends in consumers preferences with regard to GMOs and implications for the different types of soybean

The mass introduction of genetically modified soybean varieties, since the middle 90s, forces us to review the trends of different consumers types with regard to this phenomenon. The implications of the consumers' opinion about transgenic products are fundamental for foods exporting countries.

A study elaborated by the firm "Innovest Strategic Advisors Valued" warns that the foods elaborated with GMOs have caused an unprecedented rejection from the consumers' side[14]. Moreover, there is a perception that the rejection toward GMOs has been accentuated with the years. For instance, Wansink and Junyong (2.001)[15] have remarked that in 1994 the public opinion toward the biotechnology was neutral if not moderately positive. The authors notice that the perception about GMOs has varied from the sprout of the "Mad Cow Disease" in Europe.

In coincidence with that expressed in last paragraph, a research elaborated by the department of Agriculture of the Government of Australia has noticed that many consumers are concern about GMO food due to the lack of information about the security of this kind of food. For example, after the problems of the sprout of the "Mad Cow Disease" and "Foot and Mouth Disease"

[14] Innovest Strategic Value Advisors (2.003). Monsanto and Genetic Engineering: Risk for Investors. Accessed from: http://www.innovestgroup.com/pdf/Monsanto_Analysis4-03.pdf

[15] Wansink B. y Junyong K. (2.001). The Marketing Battle Over Genetically Modified Foods: Consumer Acceptance of Biotechnology. University of Illinois. Accessed from: http://www.foodpsychology.com/content/gmo.pdf

in the United Kingdom, the consumers of this country demand simple food that has not been modified or altered for human[16].

We need to highlight that consumers have a differentiated reaction with regard to GMOs depending on whether these are used directly for human consumption or for the animal feeding. The rejection to GMOs for human consumption seems to be significantly higher than in the use of these products for livestock feeding.

As example of the consequences of the rejection to GMOs for human consumption, Innovest Strategic Advisors Valued (op. cit.) remarks the following facts:

- The Monsanto company has withdraw –from the North American market - genetically modified potato varieties due to a series of rejections shown by companies like McDonald's, Burger King, McCain's and Pringles.
- Varieties of rice genetically modified have been retreated from the market for the Company Aventis (largely) due to the warnings -of Mills and added value producers - that they would reject these varieties.
- North American Sugar Industries has rejected GM beet varieties due that the Japanese market -that imports 80% of the North American beet pulp- noticed that they would not buy it.

The examples of rejection of GMOs for the food industry are numerous. Many companies have stated policies with regard to these products like the case of the baby foods companies, Gerber and Heinz, which have announced that they will not use genetically modified products as ingredients.

As it has been previously mentioned, GMOs products targeted to animal feeding likely to generate a lower rejection on the consumers' side. This fact is particularly important for the Paraguayan economy since most of the production (and sub-products) of soybean is assigned for livestock feeding.

On the other hand, the smallest rejection toward GMOs committed to animal consumption could be explained in the reasons that take consumers to have an adverse opinion toward genetically modified foods. These reasons can be ordered in three big groups: i) of foods security, ii) of environmental security and iii) ethical questions. The different backgrounds of GMOs rejection that have been mentioned until here found motivation in food security reasons.

The uncertainties about the security of the foods to be ingested can also generate adverse opinions toward the products used for animal feeding. In this way, those derived from GM soybean can be discriminated against by consumers that prefer to ingest foods derived from cattle that had not fed with this type of grains. In this respect, the groups Heinz and Grampian Country

[16] DAGWA (2002). International Market Trends for Genetically Modified Crops. Department of Agriculture Government of Western Australia. Accessed from: http://www.agric.wa.gov.au/pls/portal30/docs/FOLDER/IKMP/FOOD/GMOMARKETTRENDS.PDF

Food have opted to market foods derived from non-GM fed cattle (Innovest Strategic Advisors Valued).

The ethical and environmental security questions can also generate an adverse opinion from consumers about GMOs. These questions are also relevant for the production of grains for animal feeding or agricultural derived products like cooking oil, where the protein of the RR soybeans' gene cannot be detected. Due to the more quantity of evidences of environmental risks caused by the introduction of GMOs, the following paragraphs will concentrate on this dimension[17].

The questions about environmental insecurity have refer to the following points: possibility of contamination with pollen of transgenic varieties to neighboring crops that use conventional varieties, potential contamination of related native species with transgenic crops, potential induction to the development of resistant plagues and weeds to some insecticides and herbicides.

In what refers to the genetic contamination of neighboring crops and native species, Smith (2004) [18] presents the following backgrounds summary.

- An analysis of about 20.000 papaya plants in Hawai concluded that near half of them were genetically modified. 80% of the samples has been taken from organic farms and supposed that were not GMOs.
- Similarly, a variety of genetically modified corn with potential allergic effect not approved for human consumption has been found in taco corn tortillas and other products based on this cereal in the United States. Although the cropping area with this variety represented less than 1% of the total corn surface in the mentioned country, the gene has been found in 22% of the samples examined by the agriculture department.
- Pollination studies in CANOLA have determined that, in the United Kingdom, bees can carry the pollen of this oleaginous for a radius of up to 16 miles. This discovery is significant since in this cultivation, most of the pollination is carried out through bees.
- The pollination of species of the same family with pollen of genetically modified CANOLA can be contributing to the generation of herbicides' super resistant weeds.
- The light pollen of a transgenic grass variety developed for golf fields has contaminated by crossed pollination to other similar varieties. As the transgenic variety it was resistant to total herbicides, their control has become extremely difficult. Although the developers of the GM grass variety estimated a dispersion of the pollen of only 1000 feet, studies on the topic found dispersion in a radius of up to 13 miles. This event has worried

[17] The ethical questions basically refers that human beings should not mix living forms in such a fundamental level as the genetic composition.

[18] Smith, J (2.004). The Myth and Necessity of Genetically Modified Free Zones. Institute for Responsible Technology. Assessed from: http://www.gefreemaine.org/jeffreysmith.pdf

environmentalists for its potential polluting effect in native wild grass and others cultivated ones.

The author also analyzes the derived risks of contamination of the production of GM Soybean. He/she argues that in the case of being able to stop the migration of pollen or seeds, accidental mixtures can happen in harvest equipments, during the storage or transport, or through human errors. The Soybean, for example, does not reproduce through crossed pollination, even yet, at least half of the sacks of supposedly conventional Soybean seeds acquired by a Scientific Union were polluted with GMOs.

Finally, some authors suggest that varieties of transgenic crops resistant to Gliphosato (Round up ready) and with Basillus Turigensis (BT) have facilitated the development of weeds and insects resistant to these products.

The criticisms exposed in this section only represent a faction in the world debate generated around GMOs. However, these criticisms emanated from some sectors of the public opinion can have a fundamental role in the design of public policies related to transgenic crops. An example of these policies is the demands for labeling and traceability that have been designed around the "right to know" of the consumers. The following section of the document analyzes the policies related to GMOs in some of the main destination markets of soybean.

Policies related to the GMOs

From the beginning, in the main GMO producing countries producing; in United States and in Argentina, the transgenic crops were considered as a variety and special requirements did not exist for its production and trading. Currently, the production is fastened to a change in the manipulation; particularly when the product seeks to be sold to markets that demand the statement that soybean is GMO or non-GMO. The detail degree in the label information will depend on the market to which was destined the product. In the MERCOSUR, as much in Brazil as in Paraguay GM soybean has been forbidden until last year. However, these two countries have released the cultivation of transgenic soybeans and, at this time, the production of these varieties depends on the willingness of farmers to incorporate or not transgenic seeds to its production system.

For the purpose of this study, we have made a revision in GMOs concerns for those markets with higher international relevance in the supply and demand of soybean.

GMOs in China

China introduced normative on GMO products in the year 2001, soon after having became a member of the World Trade Organization (WTO). According to the normative, which are relevant to GMO products, the GMO soybean bags require an individual certificate from a Chinese recognized institution. This could lasted up to 270 days, reason for which soybean imports were interrupted from China during the

months of April and June of 2002. Due to this problem, China released an authorization for temporary import that allowed the free flow of imported soybean.

GM soybean imports were fastened to temporary authorization specially issued from the Chinese Ministry of Agriculture until March of 2004. Since this period, the Ministry of Agriculture granted a permanent authorization to import Round Up Ready soybean patented by Monsanto. Nevertheless, import authorizations are required by the services of customs control. The certificate of import of RR soybean is plausible of amendment every five years. The certificate of approval of RR soybean imports does not approve the cultivation of this variety in the country. Also, according to qualified informants from Chinese government, it is possible to release new regulations that ban in the future the import of transgenic crops.

GMOs in the European Union

Contrary to the other industrialized countries and great food producers, the European Union is cautiously considering the diffusion of genetically modified organisms inside its territory, particularly OGM vegetables. Until the year 2003, 14 GMO crops had been approved for trading in the European Union. The approved crop varieties are: corn (4), CANOLA (4), carnation (3), chicory (1), soybean (1) and tobacco (1). From October of 1998 until the year 2003 (March), the European Union does not grant any authorization to another variety of GMO, additionally from those previously mentioned[19]. Among the GMO crops approved for consumption by the EU is the GM soybean Round Up Ready. However, this variety is not allowed for farming except for research purposes.

Preliminary information on the situation of GMOs in UE indicates that the quantity of field trials has decreased significantly in the last years. Indeed, in the period between the years 1998 and 2002, the number of field trials decreased in 87 %. The reasons of this reduction in the number of field trials are supported in the decision by the Environment Council of Ministers[20] in the year 1999, which ban the release of any new GMO variety in the UE territory. Field trials reduction may be also due to the unanimous rejection of European population concerned with GMO crops.

The perception that EU citizens have about OGM food is divergent. As much civil society as politicians' questions toward GMO vegetables are a daily matter. The use of GMOs in agriculture still is a matter of strong debates, particularly because there are not obvious benefits for consumers; on the contrary, there is a strong perception of environmental risks. On the other hand, OGM's uses for health purposes are well seen and there are some research progresses in this field.

[19] After the year 2003 until the present, not any document has been identified granting an authorization for the cultivation, trading or processing GMOs in the UE. The absence of authorization documents does not mean that in, the fact, this issues has not happened.

[20] In June of 1999, the Ministers of environment from Denmark, Italy, France, and Greece began a moratorium to delay the approvals of new GMOs. In the year 2001, the ministers of environment from Germany and Belgium were added to them. This moratorium would be rule until the approval and implementation of the new regulatory framework for GMO in the UE, where besides the security, norms should also incorporated labeling and traceability for this vegetables.

According to a surveys carried out by "Eurobarometer" about the public opinion with regard to GMOs, the Europeans have a divergent attitude toward biotechnology. In general, the perception toward GMOs has improved, although, the population's perception toward the benefits that biotechnology would grant in food production is not still superior to the risks that this could mean to the atmosphere.

Consumers' attitude toward GMOs and the pressure from environmentalists groups destroying field trials has discouraged research and development activities. A survey -carried out to private companies and research institutes about GMO developments in Europe- revealed that 39% of the respondents has canceled its programs of GMO research and development projects in the last four years. The reasons, that motivated this attitude, were an unclear legal framework and the very high uncertainty in markets with regard to GMO foods. From consumers' perception, it exists a widespread attitude of rejection toward GMO products, especially those for food.

The regulation 1829/2003, which rules GMOs in the UE, requires that all the transgenic products should carry a label to inform consumers about their attributes. All foods, including oil from transgenic soybean, should be labeled to inform consumers whether they were produced with GMOs or not. The label should indicates: "This product contains GMO" or "it was produced with an GMO", and identify the name of the GMO.

GMOs in Japan

In Japan GMOs are regulated by the Ministry of Agriculture, Forestry and Fishery (MAFF). In April of 2001, this institution established the scheme of labeling GMOs. According to the Japan norms, all the GMO containing products that can be detected in the final food require a label to provide this information to consumers. The labeled is mandatory for those products that contain a GMO products concentration higher than 5%. On the other hand, those products with a NO-OGM label should have a certification stating that its components were managed under a Preserved Identity (PI) system in each stage of the production and distribution net.

The Table 11 illustrates the situation of labeling schemes for GMOs in selected countries. As we can observe, from those countries with high relevance in soybean consumption, most of them require an obligatory label. Two exceptions are the United States and Canada; in the case of the latter, GMO label is not compulsory although this country have no great relevance in the production or consumption of soybean.

Table 11: Labeling policies for GMOs in selected countries

	Labeling for GMO	% GMO maximum in non GMO
European Union	compulsory	0.9% - 0.5%
Switzerland	compulsory	1%
South Africa	compulsory	Not available
Ethiopia	compulsory	Not available
China	compulsory	1 %
Hong Kong	compulsory	5 %
Japan	compulsory	5 %

Philippines	compulsory	5 %
Brazil	compulsory	1 %
Australia	compulsory	1 %
New Zealand	compulsory	1 %
Canada	Not compulsory / voluntary	
United States	Not compulsory / voluntary	
Taiwan	compulsory	5 %
Thailand	compulsory	5 %
Russia	compulsory	5 %
Korea	compulsory	3 %

Source: Second Conference on Biotechnology for Asian Development. April. 2004. New Delhi. India.

(iv) Demand of organic soybean and soybean with preserved identity

Demand for organic products

The premium that products with organic labels can obtain changes according to the product type and to the markets. Although the products with higher prices are the organic ones, whose premium with regard to conventional products could be over 100% depending on the market and product. However, the biggest benefit in these labels probably consists on the opportunity that farmers have to access to more stable and growing markets.

Among the different market segments that exist in the world, the market for organic products is currently growing. The world retail trading of organic products is estimated in US $25.000 millions. The market of organic products is the only segment in the food market with an annual rate of growing of two digits. Depending on the product and of the country whose market is analyzed, the rate of annual growth for organic products sales were between 10 and 40 percent at the end of the 90s and the beginnings of the current decade. While the products from conventional agriculture, like cereals and oilseeds; have an annual rate of growth of 1.6 percent.

In spite of the high rate of growth in sales, the consumption of the organic products with regard to the conventional foods is yet very low. The market share of organic foods -with regard to the total food consumption- is lower than 3 percent depending on the product and the country. United States accounts with the highest share in organic food consumption. Nearly 46 percent of the value of organic foods consumed in the world is traded in the United States. The EU and Japan account with 40 and 14 percent of the world market [21]. Table 12 illustrates the expected value of organic products sales in selected countries. As we can observe, the market share of organic products is lower than 3 percent of total sales of foods.

The price premium for organic products is very attractive, taking values between 15 and more than 100 percent. In Table 13 we can see the rate of increase

[21] Values from 2001

in the price that is paid for corn, soy and the organic wheat in the United States markets.

Table 12: Value and market shares for organic products

	Sales Values Total in US$ Millions	Expected market share with regard of total food sales (in %)
Great Britain	986	1.25 - 1.5
Germany	2.128	1
Italy	978	1
France	846	No disponible
Nederland	210	1.2
Belgium	138	1
Austria	195	1.8
Switzerland	457	2
Denmark	372	2.5 - 3
Sweden	175	0.9
USA	8.000	1.5
Japan	350	-

Source: Organic Agriculture: Sustainability and Market Policies. OECD, 2003

Table 13: Premium for organic products in the USA (in %)

	1995	1996	1997	1998	1999	2000	2001
Corn	35	43	73	88	98	89	59
Soybean	114	85	141	202	217	175	177
Wheat	54	59	73	80	87	103	94

Source: Bertramsen and Dobbs. 2002. In Recent Growth Patterns in US Organic Markets. ERS-USDA. Pp. 13

As indicated in the last table, the premium for organic soybean in the United States has been higher than for wheat and corn during the years between 1995 and 2001.

According to Illinois Specialty Farm Products, the demand rate of growth for organic soybean during the year 2003 was slightly lower than previous years; although this price was slightly higher than the prices for conventional soybean. In the United States, the price for organic soybean in the year 2003 was between US $404 and US $661[22] per ton; this value was lower than the US $808 per ton paid for the same product in the year 1998. In spite of this price difference, the cropped area with organic soybean in the United States did not overcome 0,1% of the total cropped area for soybean in the year 2003.

[22] Price estimated with a baseline between US$ 11 a US$ 18 per bushel, from the Illinois Speciality Farm Products.

Soybean with Identity Preserved

The introduction of transgenic soybean into the market has created a differentiated demand for this oilseed from consumers. One of the core demand from soy consumers is the right to know; through which, they request food sellers the labelling of the grain to categorize it as GM or not GM. As we have mentioned previously, the tolerance threshold of GM mix in conventional soybean differs from 0,9 % in the EU to 5 % in Japan. In spite that the pressure for the banning of GM food is higher in Europe, there is also a pressure in the United States from environmentalists' organizations. An example of this pressure is the victory of these organizations in making two baby food industries –Herber and Heinz- state that they will not use GM raw material in their foods.

Because of all this pressure toward avoid GM food consumption, the demand for non GM food becomes an important market niche. The American Soybean Association (ASA) estimates the demand for Identity Preserved Soybean (IP) for the "tofu" market in the year 2.000 was equivalent to 500 to 700 thousands tons in Japan, which represents between 15 % and 20 % of US soybean exports to this country. Some specialists in soybean marketing estimated that, during the 2.005, the volume of soybean produced under the Identity Preserved regime in the United States would be 25 %.

Estimations about the European Union demand for Identity Preserved soybean suggest that nearly 200 thousand tons of this product were demanded during the year 2.000.

Paraguay and the new market niches.

There is only one institution known in Paraguay, which is currently producing Identity Preserved soybean. The Cooperative "Iguazú", placed in the city with the same name in the Department of "Alto Paraná".

The purchasing of the IP soybean is guaranteed to farmers through a contract. The price stated in the contract has a "premium" which usually is 17 % above the reference price From the Chicago Board of Trade; even though, the farm gate price is frequently higher than the previously stated[23]. The price of this type of soybean has been quoted among US $350 and US $400 during the year 2003 in the destinations market (Japan). The marketed volume is around 800 tons per year. The conditions for IP soybean production are significantly harder than those required in the production of conventional or transgenic soybean. Farmers who are cultivating IP soybean cannot cultivate other kind of soybean near their crops.

The variety Aurora is the one used by farmers from the Cooperative "Yguazú" for IP soybean production. The MAG's Regional Centre for Agricultural Research -in the city of "Capitán Miranda"- developed this variety through genetically improvement. The characteristic of this variety is a higher content of protein than other varieties in the market. A regular variety contain between 38 and 39 % of protein, while the

[23] Personal communication, Mr. Orquiola from Cooperative "Yguazú".

variety "Aurora" contain between 41 and 42 % of protein, main feature of differentiation for the grain. Furthermore, the size of the grain is slightly larger than other varieties. The average diameter of Aurora grains is 6,5 millimetres. The bags of seeds that not fulfil this requirement cannot be traded in this market.

Organic Soybean Farmers' Association of "Natalio" (Itapúa).

The Organic Soybean Farmers' Association from Itapúa was created fifteen years ago as an initiative encouraged by the Cooperative "Colonias Unidas". Ten farmers, who cultivate near 1.000 hectares of soybean, integrate this association; the average yield of the crop is 2.000 kilograms per hectare.

More than five years ago, farmers could created an association where its members assigned plots of their cropping areas exclusively for the production of organic crops. The production of organic soybean is exported to Europe, mainly through a merchant who has contacts with buyers in the European Union. The premium that farmers get for the production is 30 % above the market price for conventional soybean. The total volume of organic soybean exported each agricultural season is 2.000 tons. A company from the destination market carries out the crop certification. The inspection for the certification is carried out in the farm. However, products certification and the qualification for soybean exports depend on a person unattached to production.

(v) Conclusions

World soybean production has grown above 200 % in the last 25 years. International prices for this oilseed has decrease in real terms from US $ 600 to US $ 400 per ton in the last 50 years of the 20th century. Some outlooks expect prices will remain at the current levels for the next years.

Soybean is the main oilseed allocated in the production of oil for human consumption and animal feed. Soybean shares 86 % of the total volume of oilseed traded in the world. Well bellow in world market importance, CANOLA shares 8 %. Other oilseeds with relatively importance are peanuts and sunflower.

Soybean world market is strongly concentrated in a few countries: United States, Brazil and Argentine shares 82 % of the international market. Paraguay is the fourth soybean exporter with 4 % of the world market share. In the same way of soybean exports, imports of this oilseed are highly concentrated in a few countries: China and the European Union import almost two thirds of the global soybean traded in the world market.

The leadership in soybean production and exports is currently under a changing process. This is one of the solely events economically relevant where the South displace the North. The MERCOSUR is becoming -in this way- in the main soybean producer and exporter in the world. Since 2.002, this economic block have produced more soybean tan the United States.

We can observe deep international changes, as at production as at consumption levels, in soybean markets. At production level, Brazil will become in the major soybean producer and exporter of the world from the 2008/09 campaign. On the other hand, China has already became in the main soybean importer in the world; this process is likely to be consolidated. Some outlooks estimate that, at the end of the 2014/2015 campaign, China would import 48 % of the soybean traded in the international market. On the contrary, the EU –which has been the main importer in the world- would decrease the volume of its imports for the same period.

Considering the future relevance of China in the trading of soybean, on one side, and the importance of this product in the Paraguayan international trade, for the other side; it would be important that the parts engaged in this business consider the revision with the Paraguayan Government of the current situation in the trading relations with China, and assess the benefits and disadvantages of implementing a commercial approach between both countries.

Each and every one of the main soybean producers in the world has incorporated GM varieties in its production system, particularly herbicides resistant soybean. Some outlooks estimate that soybean represents 60 % of the world transgenic cropping areas.

Contrary to the production, the consumption side has shown some rejection to transgenic soybean, particularly in the European Union where there is a general consensus about caution in the consumption of GM food. Soybean with identity preserved and organic soybean are very small markets and the economic advantages are still to be defined, mainly because price differences (particularly for IP soybean) are not attractive enough.

CHAPTER III: Cross sectional component of the study

SOCIOECONOMIC AND ENVIRONMENTAL IMPACT OF THE SOYBEAN PRODUCTION

(i) Methodology and Instruments

The study corresponds to a non experimental design of investigation, considering that in this case the variation causes have already happened, where the present component represents a cross-sectional design, with descriptive statistics, of correlation and interpretative.

The investigation hypotheses corresponding to the economic, social and environmental dimensions are summarized in the Annex, including their conceptual and operational definitions as web as their indicators.

Among the primary data gathering instruments used we can mention:

c) **Surveys:** at farm level, for the collection of quantitative and qualitative information,
d) **Interviews to qualified informants:** representatives of diverse community groups involved, such as directives of production cooperatives, district authorities, Secretaries of Agriculture from Departmental Governments, specialized technicians, and other organizations, in order to gather qualitative information of knowledges, experiences, perceptions and opinions.

a) Farm surveys:

The research design, according to the Terms of Reference (TOR) of the Contract of Consultancy, contemplates the comparison of the commercial soybean agriculture with the peasant agriculture and cattle raising farming. Also, we exam eventual influences of the different size strata of farms within the soybean productive system of (small-scale: up to 20 hectares, medium-scale: of more than 20 and up to 200 hectares, and large-scale: farms with more to 200 hectares). The study design also required the discrimination between conventional and genetically modified varieties (transgenic), in order to compare their production technologies and associated costs.

The research questions were structured in the survey questionnaire in order to characterize the social, economic and environmental operational variables. The required information was a combination of quantitative and qualitative data organized in open and closed questions.

The survey provides primary information about the household (income, material wealth, employment, demographic data), the characterization of the

productive system and its costs and the management of the natural resources of the farm (soil, vegetation, air, water, toxic waste).

The study carried out with the farm survey is of descriptive type and cross-sectional correlation in its majority, with the exception of some questions where retrospective longitudinal information on the last three years was required, to allow the extraction of some trends at micro level.

The study area corresponded to the four more important departments in soybean production: Alto Paraná, Itapúa, Canindeyú and Caaguazú (traditional Area). (88% of the total soybean production according to the Sampling Survey 2002, MAG-DCEA).

The population to be sampled and interviewed is constituted by 42 districts corresponding to the four departments, where the observation units consisted on farms stratified by production size of differentiated soybean (with soybean) and peasant farms (without soybean). The sampling unit raises data of the household and the farms where they are settled.

The total size of the sample was of 100 farms, previously defined, considering budgetary restrictions. This limitation confers to the sampling a character of Case Study, when allowing extracting statistics valid for the sample, but should not be considered expansive to the universe like inferential statistics.

The sampling design selected was stratified clusters (conglomerates), in order to improve the precision and to optimize costs. In this design, the population is divided internally in homogeneous strata (heterogeneous to each other), which are totally sampled. Agrological and socioeconomic variables were used as an approach of internal homogeneity of each stratum,:

4- **Caaguazú:** fragile soils (derived of gritty), area of current expansion of the soybean frontier, this department accounts with all the types of producers, so much commercial as peasant agriculture.
5- **North Alto Paraná and Canindeyú:** intermediate soils, areas of expansion of the soybean frontier over cattle farming systems, in their most important sectors. Scarce relative population of the family agriculture.
6- **South Alto Paraná and Itapúa**: fertile soils, low humidity deficit, traditional soybean production area, with a majority of medium and small-scale soybean producers, high development of cooperatives.

In each stratum (area) they were selected the clusters randomly (conglomerates) represented by the districts, which constitute the primary sampling units (psu), being selected 10 of the 42 districts, in proportional form to the number of districts enclosed in each area (stratum), according to the following square:

Table 14: Sample of the soybean production districts, method proportional to the size of stratified clusters

		Strata Clusters (psu)			
Regions	Districts	Accumulative	Range	Selection	N° of farms
A) Caaguazú	9	9	1-9	2,8,3,7	40
B) APN+Can.	9	18	10-18	10,12	20
C) APS+Itap.	24	42	19-42	19,21,41,35	40
Total	42			N:	100

Source: Own elaboration

The selected districts were:

1- Caaguazú: R.A.Oviedo, J.E.Estigarribia, Repatriación and F.S.López

2- Alto Paraná Norte y Canindeyú: Saltos del Guairá and F. Caballero Alvarez

3- Alto Paraná Sur e Itapúa: Yguazú, Santa Rosa, Pirapó and Hohenau.

The clusters (districts) are considered internally heterogeneous, since they contain all the types of farmers in the area. For this reason, in coherence with the sampling modern, districts are considered homogeneous to each other.

Finally, stratified farms were selected in each district, considering the inclusion of non-soybean peasant farms, present in some areas of Caaguazú (area of soybean production expansion) according to the information of the Sampling Survey 2002 (MAG-DCEA), (Table 15).

The farms represent the simple sampling units (ssu) being selected randomly by stratum and type of farm, according to the abovementioned research design.

Table 15: Number of surveyed farms according to Department, type of farm and variety of cultivated soybean

Type of exploitation	Type of soybean	DEPARTMENT				
		Caaguazú	Itapúa	Alto Paraná	Canendiyú	Total
Small-scale (up to 20 has)	Conventional soybean			1	9	10
	RR Soybean	10	10	9	1	30
	Both	1				1
	Total					41
Medium-scale (from 21 and up to 200 has)	Conventional soybean	1		1	5	7
	RR Soybean	10	7	7	3	27
	Both	2	1	1		4
	Total					38
Large-scale (201 has and more)	Conventional soybean			1	1	2
	RR Soybean		2	1		3
	Both	1			1	2
	Total					7
Small-scale non-soybean Producer		15				15
Total	Conventional soybean	1		3	15	19

RR Soybean	20	19	17	4	60
Both	4	1	1	1	7
Small-scale non-soybean Producer	15				15
General Total					101

Source: Own elaboration. Fix effect. no randomly. proportional to the distribution of the survey 2002 (DCEA-MAG).

b) Interviews to qualified informants:

The interviews to qualified informants constitute an appropriate instrument for the analysis of the distributional impact over the wealth of different groups involved in the change caused by the advance of the commercial soybean agriculture (in general) and transgenic varieties (in particular) (Sanginga et to the, 1999)[24]. Interviews are considered as an effective instrument to appraise the impact at community and institutional level. They are supplementary to the farm surveys that assess the impacts on the producers and their households.

With such aim, we would disaggregate the general impacts in their economic, social and environmental dimensions; and we will analyze these impacts over the main involved groups at local level: large, medium and small-scale soybean's growers, small-scale family-based agriculture, rural (journeymen) and urban family waged laborers, cattle raisers of the district, traders fro the town and other localities, local services providers (truck drivers, mechanics, tractor drivers, etc).

The qualified informants communities are: directives of local production cooperatives, Municipal Representatives, Secretaries of Agriculture from the Departmental Governments, technicians from public or private (Universities) institutions (MAG).

As data gathering instrument, we have designed a basic form questionnaire including so much closed as open questions, organized around the research hypotheses in their dimensions of social, economic and environmental impact at community and institutional level. Besides the codification of closed questions we recorded and transcribed the information, perceptions and opinions of interviewees about specific features at local level.

The evaluation of declarations from qualified informants was carried out through methods of non-parametric analysis. The first comparison factor corresponded to regions: soybean production traditional areas (Alto Paraná, Itapúa, Canindeyú and Caaguazú) in contrast to a no-traditional region where is currently registering an opening of the commercial agricultural frontier (Misiones, Guairá, Caazapá, San Pedro, Concepción, Amambay and part of Canindeyú). Another comparison factor is constituted by the categories of qualified informants (directives of cooperatives, representatives of Municipalities and Departmental Governments as well as technicians of public and private

[24] *Sanginga, P.C., et all, (1999). Social Impact of Soybean in Nigeria's Southern Guinea Savanna. International Institute of Tropical Agriculture (IITA). Ibadan, Nigeria,*

institutions). The numeric codification of the questionnaire's answers was analyzed by means of the chi-square test (X2) for independent samples. In the table 3, we present the probability associated to the calculated value of X2, this values are interpreted in function at the significance levels at 0,05 and 0,01 of tabulated probability.

Table 16: Significance of differences among declarations of qualified informants. (Chi Square Test)

Socials Variables	Regions: Traditional / No-traditional	Types of informants
A1	0.5324	0.7183
A2	0.1425	0.7366
A3	0.5839	0.2758
A4	0.0039**	
A5	0.9414	0.2499
A6	0.1399	0.3360
A7	o.0771	0.7597
A8	0.0388*	0.4621
A9	0.0306	0.2297
A10	0.4607	0.0574*
A11	0.0605	0.7668
A12a	0.8118	0.0728
B	0.7266	0.0669
A13a	0.8555	0.7741
B	0.1999	0.3543
A14	0.1341	0.3213
A15	0.1341	0.1856
A16	0.7202	0.2727
A17	0.0604*	0.7042
B18	0.2343	0.5458
B19	0.9059	0.0188
B20	0.4339	0.9978
B21		
B22	0.1836	0.1696
B23	0.5561	0.0491
B24	0.3253	0.2914
B25		
C26	0.7273	0.4576
C27	-	
C28	0.3032	0.5786
C29	0.0373*	0.4301
C30		
C31	0.2389	0.5744
C32	0.0778	0.2879
C33	0.7720	0.1482
C34	0.0071**	0.0214*

Source: Own elaboration.

(ii) Results and discussion

The main results and their discussion obtained with the application of farm surveys are presented next; the data were raised from the soybean traditional region (Alto Paraná, Itapúa, Caaguazú and High Canindeyú), and qualified informants' declarations interviewees in the traditional and not traditional soybean regions (Concepción, Amambay, San Pedro, Canindeyú: low area, Guairá, Caazapá and Misiones).

A) Social Impacts

Demographic characterization of the farm surveys.

A total of 101 farms were surveyed in four departments were soybean is traditionally cultivated. From that total, 15 farms are "non-soybean" small producers. A total a 413 residents older than 10 years old were registered in the surveyed farms. Men headed ninety-nine families and women headed only two farms. The total of sons and daughters older than 10 years old (traditional family labor force) were 198, reported in 74 families from the 101 farms (73,3 %).

When we analyzed the relation between type of producers and family size, we found an average of 2,17 descendants in the families of non-soybean small producers, compared with 3,12 descendants in families of small-scale soybean producers. In the layers of medium-size and great-scale producers, the averages of descendants older than 10 years old were 2,54 and 2,83 respectively. We can appreciate no significant differences among producers type and, surprisingly, small-scale non-soybean producers accounted with the minimum value, in contrast with the maximum of small-scale soybean producers. These results contrast with the perception that peasant families (non-soybean small-scale producers) are the most numerous in rural areas.

We also found 22 relatives in 22 % of the families and only 3 non-relative family members. The number of marriages reached 89, equivalent to 88 % of the total families.

A1: Effects of the moving forward of the soybean system over the displacement of peasant agriculture.

One of the assumed social effects of the expansion of commercial agriculture is the constraint for small-scale agriculturalists in the access of their main productive mean: land. With the purpose of exploring this situation, we have investigated the perceptions of available key informants about the relative evolution in the number of farms in the soybean production system and small-scale agriculture production system.

A socially important outcome of land concentration in medium-size and large farms is the migration; as much from those people who has sold their land as local waged labor, and different groups which emigrate to cities and rural areas.

A1.1. Rural displacement as an outcome of the moving forward of commercial soybean production.

We survey the perceptions of key informants –at community and institutional level- relative to the current performance of land market as a result of an eventuality modification in the proportion of commercial and peasant farms. The survey was conducted in the soybean traditional region (Alto Paraná, Itapúa, Caaguazú y High Canindeyú), as well as in new regions where the soybean boundary is going forward.

An important share of the interviewees has agreed in their perception abut a fall in the number of peasant farms in the soybean traditional areas where the survey were conducted. In contrast, the majority of the interviewees have argued that the number of farms –specialized in soybean commercial production- remains relatively stable (some have argued that the number of these farms has decreased).

The Major of a northern district in "Alto Paraná" clearly illustrates the expansion trend of commercial agriculture over peasant agriculture. This informant argue that, when fulfilling their municipal tax duties (real state taxes), some commercial soybean producers (Brazilians) declare 15 to 20 land property tittles of small plots bought from small-scale producers (Paraguayans or Brazilians).

(A1) The interviewees who have answered the questions have agreed –not among regions but among type of informants- in their perception about the evolution in the number of commercial farms in their regions. In the traditional regions, the opinions were even, among those who have asserted that the number of commercial farms has not changed and those who have asserted that this number has been increased. In the regions where soybean is increasingly growing, the number of commercial farms obviously has been increased (Table 1, Annex 4).

(A2) About the number of small (peasant) farms, we have found a disparity of opinions, but it was not significant, between interviewees from traditional and non-traditional regions (Table 2, Annex 4). In the traditional soybean regions, the most who have answered (75 %) have asserted a "decrease" in the number of small (peasant) farms: In the "new regions", in the other hand, the opinions where divided among those who have observe a decrease in the number of these farms and those who have observe no changes.

From the answers of the interviewees, we can infer that the new structure in number of small and commercial farms is explained by the expansion of soybean cropping area. Commercial farmers, instead of increase its number; have increased the seeded surface, which could have implied the acquirement of small farms from small-scale farmers (peasants).

(A3) The most frequently mentioned reasons for the change in land tenure structure are land sales and the search of larger scale of production.

Other reasons minority mentioned are "switch of production" and renting to larger-scale producers. Curiously, none interviewee - in the "new regions"- has mentioned migration and demographic growth as a cause of change in the number of farms (Table 3, Annex 4).

(A5) To the question about the main reasons for the sales of farms from small-scale farmers, there were no great differences among regions or type of interviewees. In both regions, the most interviewees (60 %) have mentioned "attractive prices" paid for the land and, in lesser frequency, problems about "scale of production", "not enough training" and lack of perspective. In the same way, we found a high degree of consensus among type of interviewees, who has also mentioned "good prices" as a main reason (Table 5, Annex 4).

In summary, we can say that the main reason for land sales has been the reactivation of the land market. The expansion of the cultivated area has been encouraged by sound international prices for soybean; this fact has increased the demand for land in traditional and not traditional regions for grain production. In the districts of the departments of Itapúa and Alto Paraná, lands for agricultural use quoted among US $3.000 and US $3.500 per hectare.

For instance, farm sales from small-scale agricultural producers have been highly frequent in the department of "Caaguazú" due to the attractive price of the land. In the district of "Campo 9", an agricultural plot of land could be acquired in average prices among US $ 2.000 and US $ 2.500 per hectare.

Land prices has been stimulated, not only for the international prices of the grain, but because the lack of alternatives to invest the profits from soybean producers. This situation has contributed to distort the land market, pushing the prices of this production factor above its return capacity. The president of a cooperative from South Alto Paraná argues that farmers buy lands, not only for expanding their productive activity, but also for insure their profits in an environment of "lack of alternatives for investments", even so this mean paying prices well above the productive potential of this production factor. This phenomenon has contributed to the acquisition of some agricultural plots for more than US $5.000 per hectare in some of the most traditional districts for soybean production.

(A4) To the question if the local peasants sell their lands to larger-scale soybean producers, we have found mismatches between regions, but not among type of interviewees (Table 4 Annex 4). In fact, interviewees from traditional soybean regions have perceived a greater frequency in this phenomenon, while in the "new regions", most of the key informants asserted this practice was not frequent.

Exploring about the intensity of the frequency of land transaction from peasant producers to soybean producers, we found divergences among type of informants. Cooperative members and technicians consider these transactions "not very frequent", while district officials consider as "not frequent", in contrast with departmental agricultural secretaries, only type of informants who see this phenomenon as "quite frequent".

During the last agricultural seasons, land sales of small agricultural plots seems to have decrease in the districts where soybean production is traditional. This fact is mainly because most of small-scale producers have already sold their lands. However, the expansion of commercial farming and soybean production over peasant farming still is a current event in some districts of "Alto Paraná", like "Itakyry" and "Minga Pora".

In a second stage of interviews, we have visited the departments where soybean production has not been traditional, but where soybean production has shown a sharply growth during the last years. Information obtained in these departments do not show an important displacement of peasant agriculture (at least until nowadays) as a consequence of the expansion of soybean commercial farming.

From what has been previously mentioned, we can assume that the main cause of "uprooting" of peasant production has been the activation of the land market, which has been, in turn, stimulated for the international price of the grain. Soybean is yet considered in the international market as an homogeneous product and, therefore, lack of differentiated prices. Thus, it seems hard to find, "*a priori*", a causal relation between differentiated soybean production, international (and local) price of the product and the land market.

At "micro" level, in the **farm surveys** we have also made inquiries about the land market based on the own experience of the 101 head of families surveyed. The results obtained in the survey are following exposed.

In what regard to land acquirement from the farmers surveyed, only 4 from 101 cases have mentioned they purchased land new lands. The size of the plots varied between 15 and 400 hectares, while the land value (per hectare) varied from Gs 1.550.000 per hectare in the larger plot, to Gs. 14.939.759 per hectare in a medium-size plot, as a maximum value. In US dollars, the mentioned sums are equal to US $ 250 and US $ 2410 per hectare respectively (Table 17).

Table 17: Land acquisition in the population surveyed

Type of Farm	Size in Ha	Value Gs/Ha	Value U$S/ Ha.
Small	15	7.500.000	1.208.7
Medium	45	8.680.000	1.400.0
Medium	83	14.939.759	2.409.6
Large	400	1.550.000	250.0
1 U$S = 6200 Gs.			

Source: Own elaboration.

In the Table 18, we can appreciate the few transactions of buying / selling lands stated in the 101 samples. Those cases who have stated the acquisition of new land have purchased from soybean production 2 plots smaller than 50 hectares. Another case acquired a plot with between 50 and 100 hectares from a stockbreeder, and another bought a plot larger than 100 hectares from another

stockbreeder. On the other hand, two interviewees stated they have sold their land to soybean producers: the first one sold a plot between 50 and 100 hectares and the other one a plot smaller than 50 hectares.

Table 18: Number of producers who made transactions in the land markets according to the type of farmer (N = 100)

Land surface (in has.)	Bought from			Sold to		
	Soybean grower	Traditional agricultura producer	Stockbreeder	Soybean grower	Traditional agricultural producer	Stockbreeder
1-50	2	0	0	1	0	0
51-100	0	0	1	1	0	0
101-más	0	0	1	0	0	0
Total of producers	**2**	**0**	**2**	**2**	**0**	**0**

Source: Own elaboration

In Table 19, we can identify the productive activity of the buyer or seller of land. We can observe that the buyers were exclusively Round Up Ready Soybean producers. On the other hand, the sellers who have been surveyed were: a Round Up Ready Soybean producer (medium scale with a plot between 50 and 100 hectares of soybean), and another who cultivated both kind of soybean (conventional and transgenic).

Table 19: Number of producers who made transactions in the land markets according to differentiated kind of soybean. (N = 100)

Bought or sold surface (in has.)	Activity of the buyer / seller of land according to the survey (N = 100)							
	Comprador				Vendedor			
	Conventional Soy	RR Soy	Both	Small non-soybean producer	Conventional Soy	RR Soy	Both	Small non-soybean producer
1-50	0	2	0	0	0	0	1	0
51-100	0	1	0	0	0	1	0	0
101-más	0	1	0	0	0	0	0	0
Total of producers	**0**	**4**	**0**	**0**	**0**	**1**	**1**	**0**

Source: Own elaboration.

The results likely to confirm, at farm survey level, that soybean producers, and specifically transgenic soybean producers, the land buyers who concentrate land even at cost of other smaller-scale soybean producers.

Evolution of soybean farms according to strata, period 1992 – 2002 (DCEA – MAG)

At macro level, the structure of soybean production stated in the Agricultural Census from 1991 has been comparated with the results of the

Agricultural Survey by Sample from 2.002 (Table 20), which has shown the following evidences.

The number of soybean producers' farms increased between 1991 and 2002 to 27.806 properties. However, in the soybean traditional area, the total number practically remain unchanged, reaching 24.494 in 2002, while in the new soybean areas the number was increased in 51,4% but to much smaller scale, reaching 3.240 farms in 2002.

At level of the whole Oriental Region, the number of medium and large-scale producers increased from 4.871 farms (1991) to 8.671 (2002), representing a relative growth of 78%, while the small and low-medium-scale producers (lesser than 50 has) it diminished from 21.846 farms (1991) to 19.165 (2002), equivalent to –12,3%.

Analyzing the cultivated area, we found that the above-mentioned events has leaded to a rise in the overall soybean cropping area from traditional regions from 509.856 has (1991) to 1.139.687 has. (2002). These figures represent a raise of 124%. On the other hand, the soybean cropping areas in the new zones increased from 42.169 has (1991) to 143.136 has. (2002), representing an increment of 239%.

The soybean surface of smaller-scale soybean producers (less than 50 has) in 1991 was 137.657 has, decreasing to 133.582 has en 2002, a small change. On the other hand, the prevalent difference in soybean cropping area from medium and large-scale producers varied from 414.798 has (1991) to 1.149.273 has (2002), representing a difference in the decade of 734.475 has, what means an increase of 177%.

From the mentioned data, we can infer that, inside the soybean producers' universe from both sources (the census and the survey), although 2.681 small-scale soybean producers have lost their farms during the decade, the accelerated growth of soybean production would be mainly due for the assimilation of new medium and large-scale farms either in the way of acquisition or the leasing of large extensions.

Table 20: Evolution of the number of soybean farms and soybean cropping area

	2002		1991		Variation (%)	
	Number	Surface	Number	Surface	Number	Surface
Oriental Region	27.806	1.282.85	26.717	552.455	4,1	132,2
Size of the farm						
Less than 5 has	1.460	1.745	1.673	2.232	-12,7	-21,8
From 5 to less than 10 has	4.050	10.009	4.712	11.529	-14,0	-13,2
From 10 to less than 20 has	7.550	36.255	8.239	37.401	-8,4	-3,1
From 20 to less than 50 has	6.105	85.573	7.222	86.495	-15,5	-1,1
From 50 to less than 100 has	3.834	193.405	2.424	79.954	58,2	141,9
From 100 to less than 200 has	2.811	270.014	1.329	86.709	111,5	211,4
From 200 to less than 500 has	1.268	261.408	767	103.819	65,3	151,8

From 500 to less than 1.000 has	410	147.965	213	50.588	92,5	192,5
From 1.000 to less than 5.000 has	273	195.605	112	50.694	143,8	285,9
From 5.000 to less than 10.000 has	30	54.652	21	19.396	42,9	181,8
From 10.000 and more has	15	26.224	5	23.638	200,0	10,9
Oriental Region	27.806	1.282.855	26.717	552.455	4,1	132,2
01. Concepción	61	1.425	30	187	103,3	662,0
02. San Pedro	269	32.323	563	17.367	-52,2	86,1
03. Cordillera	-	-	3	12	-	-
04. Guairá	150	2.990	104	237	44,2	1161,6
05. Caaguazú	1.422	81.412	1.070	21.799	32,9	273,5
06. Caazapá	2.570	67.740	1.161	8.931	121,4	658,5
07. Itapúa	12.698	367.846	15.132	210.523	-16,1	74,7
08. Misiones	4	120	26	159	-84,6	-24,5
09. Paraguarí	71	27	30	414	136,7	-93,5
10. Alto Paraná	7.852	486.475	5.967	228.504	-	112,9
11. Central	-	-	4	3	-	-
12. Ñeembucú	1	5	4	2	-75,0	150,0
13. Amambay	186	38.538	256	15.288	-27,3	152,1
14. Canindeyú	2.522	203.954	2.367	49.030	6,5	316,0
Surface: has						

Source: Agricultural Census 1991 and Sample Survey 2002. (DCEA-MAG).

A1.2. Migrations within soybean regions

In the attempt to elucidate the assumption that the advance of commercial farming displaces peasant agriculture we gather data from the General Direction of Statistics, Surveys and Census (census of population from the years 1992 and 2002). The results were compared with the analysis of the data collected from the farm survey and the interviews with key informants. Next we present a brief analysis of the rate of growth of the rural and urban population's over the last ten years in the departments where soybean crops are traditional (Canindeyú, Caazapá, High Paraná, Itapúa and Caaguazú).

At first sight it could be affirmed that the rural population's decrease is in direct relationship with the expansion of soybean production. Supported in the figures, we can say that these reflect (in a general way) an important decrease in the rural population within the districts identified specifically as soybean growers. We observe that 33% of these districts shows a progressive decrease in its rural population, reaching negative growth rates of up to 12%. (Table 1 Annex 5).

In the decade 1992-2002 a gradual increase is observed from the urban population at national level. The urban population's supremacy is registered for the first time in the census of 1992. In coincidence with this trend, the urban population is in increase in the five departments analyzed. The average rate of growth in 75% of the districts is 4,3%, where 33% of these shows a rate of growth of more than 5%.

At institutional and community level, we survey among **key informants** about rural population dynamics in relation with the advance and prevalence of commercial farming. The questions -referred to the evolution of the migration- had the aim to rescue the vision of local informants about population's displacements in the region, as much as a consequence of expulsion as much as a consequence of attraction. The starting point has been the assumption that the peasant population would have emigrated from rural areas toward urban areas of the department. Equally, we attempt to verify the current state of the Brazilian immigration in the region.

The frequent purchase of lots from small-scale producers, associated to the lack of working opportunities, would be the main causes in the rural population's decrease in most of the districts we have visited in the Departments of Itapúa, Alto Paraná and Caaguazú. In the department of Canendiyú, because these phenomenons are not of so much importance, the demographic displacements seem to be not so important.

(A14) When asking on the local migratory dynamic, there were differences among areas. In the new soybean production areas, most of the informants (54%) have declared, "there was not a lot of emigration". In the traditional region only 18% declared that the emigration process "was not important". Most of the interviewees from both regions agreed in their perception that the emigration was not an eminently rural phenomenon, but rather it affected as much to the countryside as to the city. However, more than 20% of the interviewees in soybean traditional regions perceived a higher emigration from the countryside.

(A6) On the query about the geographical destination of rural emigrants, the answer from the interviewees has been quite varied. 40% of the interviewees manifested that producers used their money from the sale of their farms to emigrate to near urban centers, buying houses. A smaller share answered that many emigrants buy farms in other towns (Table 6, Annex 4).

Some representatives from municipal governments observe a growth of the poverty belts which surround their cities, estimating that the displaced rural population tend to be relocated in the nearest urban centers. These "new urban dwellers" have found few insertion opportunities in the urban labor markets, and many made their livelihood with seasonal jobs in the agricultural sector before technological innovation left little margin for the use of manpower.

Other producers choose to set up small business in neighboring cities with the money they have gotten from the sale of their farms. Some interviewees asserted that this kind of enterprises tends to fail and, in the short time, the recently immigrated would be trapped in the urban marginality.

(A7) Another assumption considered during the study is that the displaced producers would settle in new settlements. When inquired about whether exist or not of new settlements in the region, there was great disparity in the answers between regions, but not between type opf informants: the majority (55 %) in the traditional region has answered there are no new settlements in

the region, in the new soybean regions most of the interviewees (75 %) identified new settlements. The representatives of municipal governments and from the agriculture secretaries, as well as technicians, responded they had new settlements, and only cooperative members did not find new settlements in their regions (Table 7, Annex 4).

Some producers who have sold their farms in the departments of Itapúa and Alto Paraná could access to larger parcels in other regions of these or other departments of the country. For example, a technical adviser of an ONG from Itapúa has stated the rural population's important increment -through land occupation- in the districts of the Paraná riverside and of the Natural Reserve of San Rafael's hill.

(A15) With regard to new immigrant's dynamics and their identification according to their original region, there are not disagreements between areas and type of informants. Most interviewees asserted that they would not have significant new immigrations. (Table 17, Annex 4)

At **farm survey** level, when we quantified the number of family members from the sample who necessitated to move to other regions looking for complementary jobs (to the farm); we found the results stated in the next table.

Table 21: Place of work outside the farm in the last year

Job Location	Frequency	Percentage
Did not work off farm	302	73.1
Within the community	69	16.7
Other communities of the district	10	2.4
In town	24	5.8
In other cities of the country	3	.7
Abroad	5	1.2
Total	**413**	**100.0**

Source: Own elaboration.

Most of the individuals of the sample (73%) only worked in the farm. The majority of the remaining individuals (17%) worked outside of the farm but within their community. 6% of the sample worked in the nearest city, 2% in other communities, 0.7% in other cities, and only 1.2% worked abroad. In summary, emigration for job reasons affected to lesser than 4 % of the sample.

In the soybean commercial farm system of production, a fourth part of the rural population of the "farmers" interviewed is free to carry out off-farm works. However, very few are forced to emigrate to work, working the majority in their own environment, rural or urban.

In the Table 21, the geographical destination of the labor from farm population is classified according family links with the head of the family; with the intention to be able to identify the family members that opted for off-farm employments.

Table 22: Off-farm job location where he/she worked during the last agricultural year and family links with the head of the household

	Links with the head of the household						TOTAL
	Head of the family (male)	Head of the family (female)	Spouse	Children	Other relative	Non relative	
Did not do off farm jobs	71	1	74	137	19		302
Within the community	23	1	9	31	2	3	69
Other communities of the district	3			7			10
In town	2		6	15	1		24
In other cities of the country				3			3
Abroad				5			5
Total	**99**	**2**	**89**	**198**	**22**	**3**	**413**

Source: Own elaboration.

We can appreciate that the children, in great majority, are who opt for off-farm employments, although very few of them emigrate outside the district in traditional soybean production regions.

A 2: Effects of the increment of soybean crops on the employment

An assumption of high social relevance is that the soybean commercial farms system of production and other grains do not generate employments, when substituting the labor factor (the manpower), for capital (the machinery and the technology in general). In the investigation carried out with the surveys and the interviews, we queried about the growing and decreasing employment types, the number of days worked in farm or off-farm, the number of relatives who work in the farms or outside, so much in agricultural tasks as not agricultural labors, and the evolution of the hired labor. We also studied, by means of secondary data, the evolution of the employed population of the soybean production regions, as much in agricultural activities as in other non-agricultural activities.

(A10) In what regard to the evolution of the employment in the rural areas, the perception of the local community informants varied among informants' types and among production regions (Table 10, Annex 4). Most of the cooperative members, 71%, estimate that (at present time) there is "more rural unemployment" and only 14% said that the employment level was "the same" as one decade ago or that now they were "more employment." At municipal representatives' level in the soybean production regions, most (55%) interviewees believe that there is "more rural unemployment" and just 22% estimates that "employment increased". In contrast, in the new soybean production regions informants said there are "more employment" or –at least- "the same employment as before."

(A12b) In relation with the new opportunities for rural employment, we neither have found great difference among areas, but we have among informants' types (Table 13, Annex 4). The most important type of employment was the "agricultural production" so much in the soybean production traditional area (71%) like in the new soybean production areas (64%). Among informants'

types, the cooperative members of each area indicated "agricultural production" and "agricultural daily laborer / tractor-driver" and just (14%) of the interviewees from the soybean production traditional area have mentioned "dairy".

The municipal officials, on the other hand, prioritized "agricultural production" (75%) and also "agricultural daily laborer / tractor-driver". Only the officials from agriculture offices of regional governments gave a minimum importance to the "dairy", they also prioritized "agricultural production" most frequently (71%) as the main source of employment.

The uprooting of rural producers would have had an important regional impact in the aggregated levels of rural employment. Most of the interviewees has agreed in pointing out to the agricultural activity and, specifically, to the agricultural production self-employment as the main source of rural employment at the present time. Therefore, we could infer that an increment in the uprooting of rural farmers could make worse the unemployment problems in these regions.

The family-labor-base agricultural producers are adjusted to the category of independent workers, dedicating most from their time to activities in their own property. Also, peasant farms are characterized by the employment of several members of the family for their productive activities. Therefore, the decrease in the number of peasant farms has supposed the loss of a great quantity of job positions in the form of sel-employment.

(A11) When inquiring informants about their perception of the evolution in the level of urban employment, in contrast to the rural one, there was opinion differences among areas (Table 11, Annex 4). In the soybean production areas, most interviewees said employment levels "did not change" (50%), while 29% said that "this have increased" and 21% that "it diminished." In the new soybean production areas, on the other hand, the opinions are extremely different since 55% says that "employment increased", 36% that "it diminished" and only 9% that the level of urban employment remains constant. In this way, it seems clear that the expansion of soybean areas has also negatively shocked on the opportunities for urban employment.

(A12a) When discussing with local informants about which are the emerging sources of urban employment at the present time, there were not differences among areas, but there was variability among informants' types. (Table 12, Annex 4). In both areas, most interviewees mentioned that "commercial activity and services", with "industries" in second place.

In soybean production traditional areas, informants mentioned "cooperatives" and "sawmills" as other alternatives. Cooperative members put at the same level "commercial and service activities" and "the cooperatives", while in contrast, the municipalities and the Agriculture Secretaries prioritized the "commercial and service activities" in the first place, and "industries" in second place.

In contrast with the job loss in the traditional rural sector, many "urban" activities -linked to the provision of services and products for agribusiness- have

increased the demand for human labor. Most of the districts visited had grain-bins that offered seasonal jobs for workers. Likewise, agrochemicals, fertilizers and services sales related to the mechanization have increased the demand of labor. However, some informants have also pointed out that many of the new labor opportunities required a profile of worker more qualified than the displaced rural dweller.

(A13a) On the other hand, among the formerly important urban occupations but currently in decadence, the answers of the interviewed informants were similar among areas and among informants' types (Table 14, Annex 4). For a wide majority, it was indicated sawmills and timber industries as those more affected in traditional areas and in the new regions for soybean production. "Stores" were indicated in second place. The same distribution of answers was registered among all the types of informants, with remarkable unanimity,

(A13b) The rural jobs in decline also registered high agreement degree among all the interviewees (Table 15, Annex 4). Hoeing and deforestation stands out as the main declining jobs in the soybean traditional area and "timber extraction" in second place. In the new areas, where soybean production recently advanced, it was mentioned as a main rural declining job "timber extraction" and "agricultural production" while the employment demand for "hoeing and deforestation" registers no changes.

On the other hand, among the types of informants, cooperative members pointed out the decadence of the employment in "hoeing and deforestation" while municipal officials and Departmental Agriculture Secretaries prioritized "timber extraction" as the main cause of job losing.

During the years of enabling of agricultural parcels at cost of natural forests, the demand for manpower was very important for wood-removal works, and for the cultivation of crops that constituted head of rotation (for example the mint). Several interviewees have mentioned that the first great loss of job positions has been consequence of the end of the process of "agricultural frontier advance at the cost of natural forests".

As the agricultural frontier advanced, another job source formerly important that has been lost is the extraction of wood, log and even charcoal manufacturing. This fact also had impact in urban employment, with the closing of several sawmills that operated in almost all the districts that have been visited. Many interviewees have agreed in identifying these occupations like "lost employments" as a consequence of the advance of the soybean frontier.

Another important point in the dynamics of the rural employment of these regions has been consequence of the mass adoption of the no-till-farming technology. According to the manager of a Production Cooperative from South Itapúa, this technology generates a significant saving in the use of agricultural machineries for land preparation, that which returns in a decrease in the demand of semi-qualified manpower dedicated to activities linked with the handling and maintenance of tractors.

The no-till-farming technology also meant a reduction in the demand of agricultural journeymen. In the words of another cooperative manager of the same department: the hoeing tasks in soy crops became more difficult since the introduction of no-till-farming technology. Because the mulching hindered the use of the "hoe", many producers opted to find alternative technology for weed's control in the post emergency state of the crops.

Finally, in the weighting on the quantity of lost employment in the rural sector, with relationship to the generated one in the urban economy, we can appreciate a difference of opinions according to the informant's orientation. The interviewees belonging to the productive-managerial sector trend to minimize the negative effects of the soybean in the rural manpower and overvalue the generation of urban employment. The representatives of local governments trend to weigh more the lost of rural employment that the generation of urban jobs. For example, the Major of a district from Itapúa considers that the generated urban employment is very small with relationship to the quantity of rural employment lost.

At micro level, we have asked in the **farm surveys** about workers' recruiting; 43% of the interviewed families informed to have hired some (Table 23). Disaggregating according to producer type is appreciated that the families of non-soybean small-scale producers declared not to have hired people (not even for seasonal tasks).

Table 23: Workers' recruiting in farms of soybean producers and small-scale non-soybean farmers

	Frequency	Percentage
Yes	44	43,6
Not	57	56,4
Total	**101**	**100.0**

Source: Own elaboration.

In the case of soybean farmers from all farm size layers, the small and medium strata hired most of the journeymen in 27% and 70% of the respective cases. Every big farm also hired personal; when larger the size of the farm, bigger the proportion of properties which hired personal (Table 24).

Table 24: Workers' recruiting according to type of farm and kind of soybean

			Hired Labor		
			Yes	Not	Total
Type of Farm	Non-soybean producer	Small-scale non-soybean producer		15	15
		Total		**15**	**15**
	Small-scale (lesser than 20 ha of soy)	Conventional soy		10	10
		RR soy	10	20	30
		Both	1		1
		Total	**11**	**30**	**41**

	Conventional soy	3	4	7
Medium-scale (21 to 200 Ha of soy)	RR soy	19	8	27
	Both	4		4
	Total	**26**	**12**	**38**
	Conventional soy	2		2
Large (201 and more ha of soy)	RR soy	3		3
	Both	2		2
	Total	**7**		**7**

Source: Own elaboration.

When we disaggregate according to the type of cultivated soybean, none of the small soybean farms declared to have hired labor for conventional soy, while 33% of farms with soybean RR have hired workers. In the medium strata, 42% of the farms with conventional soybean hired personal; while for RR soy, 70% of the farms have answer affirmatively to the question about labor hiring. In large-scale farms, the agricultural workers were hired for all the farms and for all types of soybean production.

In what concern to the recruiting of permanent workers, the great majority, 91 of 101 cases in the years 2004/5 and 93 of 101 cases in the years 2003/4, declared they do not account with this kind of employees. Only 7 soy-farms had 1 permanent employee, 1 property reported 2 employees and 2 properties 3 permanent workers (Table 25).

Table 25: Quantity of men hired in permanent form for the harvests 2003/04 and 2004/05

	2004/5		2003/4	
Number of employees	Frequency	Percentage	Frequency	Percentage
0	91	90,1	93	92,1
1	7	6,9	5	5.0
2	1	1.0	1	1.0
3	2	2.0	2	2.0
Total	**101**	**100.0**	**101**	**100.0**

Source: Own elaboration.

Table 26: Quantity of men hired with seasonal contracts for the harvests 2003/04 and 2004/05

	2004/5		2003/4	
Number of employees	Frequency	Percentage	Frequency	Percentage
0	61	60,4	74	73,3
1	24	23,8	12	11,9
2	11	10,9	10	9,9
3	3	3.0	3	3.0
4	1	1.0	1	1.0
6	1	1.0	1	1.0
Total	**101**	**100.0**	**101**	**100.0**

Source: Own elaboration.

In contrast to the permanent laborers, the number of temporarily hired laborer increased, varying in the number of people employed under this kind of contractual relationships (Table 26). In the last harvest (2004/5), the number of farms that reported none employees diminished to 61, from a total of 74 during the previous year. The number of farms that hired at least 1 personnel has been duplicated, growing from 12 in the agricultural year 2003/4 to 24 in 2004/5. Variation was not observed between both harvests in the number of farms that hired more than 1 seasonal laborer.

We can infer, therefore, that there was an improvement in the demand of seasonal laborers. However, this improvement would be explained in greater degree by a bigger quantity of farms that require few laborers than for an intensive demand of labor from large-scale agricultural farms (which are those that possibly would hire more than a worker).

In what concern to labor activities of the surveyed families, of the total of 413 members (101 farms), near 72% worked in the farm or at home and 16 was committed exclusively to study. We can appreciate that just a tenth of the surveyed population is employed off-farm, and most of these are engaged in urban activities (Table 27).

Table 27: Household members occupation during the last year

Type of Ocupation	Frequency	Percentage
Unemployed	7	1,7
Employed in the family's farm	207	50,1
Seasonal Agricultural Laborer	1	0,2
Permanent Agricultural Laborer	7	1,7
Non Agricultural Laborer	35	8,5
Work at home	89	21,5
Student	67	16,2
Total	**413**	**100.0**

Source: Own Elaboration.

When studying the intensity of agricultural work within the farm, 73% of the sample asserted to work over two weeks per month in their farms, 11% worked lesser than two weeks per month, and just 0,2% no more than one week per month (Table 28). In summary, 84% of the sample population (at least) dedicates over 1 week a month in the works of the farm, being very important the fraction of the interviewees that dedicates in the farm most from their time to the tasks of production.

Table 28: Intensity of household members in agricultural activities within the farm

Seasonal Intensity	Within the farm		Off-farm	
	Frequency	Percentage	Frequency	Percentage
None	66	16.0	376	91.0
Up to 1 one week per month	1	0,2	16	3,9

Up to 2 one weeks per month	45	10,9	14	3,4
More than 2 two weeks per month	301	72,9	7	1,7
Total	**413**	**100.0**	**413**	**100.0**

Source: Own elaboration.

In contrast, the intensity of agricultural off-farm work was reported by a smaller quantity of people, since of the 413 people -enclosed in the 101 farms surveyed - 91% declared do not do this sort of jobs. Among the few people that did work, 3,9% declared to work outside of the farm up to 1 week a month, 3,4% up to half a month and 1,7% more than two weeks monthly. Considering that these results do not match with the numbers of the table 19, we can infer that many of the people that were reported as "off-farm" employees do not have full employments and they also dedicate part of their time to the production in the own farm. Moreover, less than 2% of the sample dedicates most of their time in obtaining off-farm revenues.

If we only consider the share that reported to work in their own farm (207 cases), around 15% of them recognized to be occasionally employed in extrafarm works (Table 29). Therefore, we can assume that the self-employment combination with occasional extra-farm employment is relatively frequent in the sample.

Table 29: Intensity of agricultural (off-farm) activity of household members that reported to work mainly in their own farms

Intensity of agricultural work	Frequency	Percentage
None	177	85,5
Up to 1 one week per month	16	7,7
Up to 2 one weeks per month	12	5,8
More than 2 two weeks per month	2	1.0
Total	**207**	**100.0**

Source: Own elaboration.

When we disaggregate the information according to the kind of exploitation with respect to the employment of dependants from the head of the family (excluding family's head), we observe contrasting information (Table 30).

Table 30: Occupation of family heads' dependants during the last agricultural year, according to producer type

Type of farm		Occupation during the last agricultural year						
		Worked in the family's farm	Agricultural journeymen	Permanent agricultural laborer	Non-agricultural laborer	Work at home	Student	Total
Small-scale non-soybean producer	Son / daughter	16				2	7	25
	Other relative	1				2	5	8
	Spouse	3			1	6		10
	Total	**20**			**1**	**10**	**12**	**43**
Small (up to 20 ha of soy)	Son / daughter	39	1	3	17	10	27	98
	Other relative	1				1		4

	Spouse	11			2	26		39
	Total	**51**	**1**	**3**	**19**	**37**	**27**	**141**
Medium (from 21 to 200 ha of soy)	Son / daughter	19			6	8	26	60
	Other relative	3						4
	Not relative			3				3
	Spouse	7			1	26		34
	Total	**29**		**3**	**7**	**34**	**26**	**101**
Large (201 ha of soy and more)	Son / daughter	7			4	2	2	15
	Other relative	4				1		6
	Spouse	1				5		6
	Total	**12**			**4**	**8**	**2**	**27**

Source: Own elaboration. Note: It does not include family's' head.

In the case of the families of small-scale non-soybean producers, of 43 dependant relatives 20 declared to work exclusively in the family's farm and 10 at home. Only 1 spouse was waged employee in a non-agricultural job and 12 declared to be exclusively students. In summary, family members practically did not do off-farm work. This represents a contradiction to the perception that the families of small-scale rural producers are traditionally strong manpower suppliers.

In the group of small-scale soybean producers, in contrast, they registered all the combinations since of the 141 family dependants, 51 worked in the family's farm and 37 at home. Although 27 were students and 3 did not work, some family members carried out off-farms works, standing out the category of non-agricultural waged jobs (19). We can appreciate in this stratum, that a highly mechanized soybean crop allows the release of family labor from their farms to access to other external labor opportunities or use their time in another type of tasks. On the other hand, this evidence could only be casual and it can be due to the biggest labor demand in the regions where these producers are located.

In the category of medium-scale producers, nobody (of the dependants from the 101 farms surveyed) declared to be seasonal waged laborers in non-agricultural jobs. Most of the children of the families in this stratum are committed to collaborate in the farm (29%) to study (26%) or collaborated in domestic duties (34%). A minor proportion of the sample (in this stratum) has become independent through getting permanent non-agricultural employments. In the category of large-scale producers, of 27 dependants, only 4 declared to be non- agricultural employees, indicating the almost null necessity to do off-farm work in this (economically) sounder stratum.

When we analyze the work intensity in the family's farm, we observe that the dependants from small-scale non-soybean producers are those who more work within the farm: 77% on full time, followed (in smaller scale) by medium-scale producers' dependants 70%, small soybean producers (66%), and large-scale soybean producers (59%). Also, very few dependants of small-scale non-soybean producers did not work in the family's farm (6,9%), compared with small-scale soybean producers (26%), medium-scale soybean producers (15%) and 33% of large-scale soybean producers (Table 31). This information supports what it was before mentioned with regard to the little time availability to do offfarm work for the dependants of small-scale non-soybean producers.

Table 31: Work intensity within the farm according to the kind of producer and family's relationships

TIPO DE EXPLOTACIÓN	Relation with the family	Occupation during the last agricultural year: None	Up to 1 one week per month	Up to 2 one weeks per month	More than 2 two weeks per month	Total
Small-scale non-soybean producer	Son / daughter	1		3	21	25
	Other relative			2	6	8
	Spouse	2	1	1	6	10
	Total	**3**	**1**	**6**	**33**	**43**
Small (up to 20 ha of soy)	Son / daughter	30		9	59	98
	Other relative	2			4	4
	Spouse	7		2	30	39
	Total	**37**		**11**	**93**	**141**
Medium (from 21 to 200 ha of soy)	Son / daughter	11		11	38	60
	Other relative				4	4
	Not relative	3				3
	Spouse	1		5	28	34
	Total	**15**		**16**	**70**	**101**
Large (201 ha of soy and more)	Son / daughter	6		1	8	15
	Other relative	2		1	3	6
	Spouse	1			5	6
	Total	**9**		**2**	**16**	**27**
Total	Son / daughter	48		24	126	198
	Other relative	2		3	17	22
	Not relative	3				3
	Spouse	11	1	8	69	89
	Total	**64**	**1**	**35**	**212**	**312**

Source: Own elaboration.

A3: Effects of the advance of transgenic soybean on the employment's level.

One general assumption is that the additional effect generated by the introduction of transgenic soybean is the worsening of unemployment, when substituting the all manpower (hoe-men) for the use of herbicides, specifically the Gliphosato, of total action, to which the RR soybean is resistant. In order to deepen what was abovementioned, we appealed to the statements of key informants locally interviewed, which gave the following results:

A3.1 Local Background.

(C31) The answers of the informants interviewed, so much in the traditional areas as not-traditional ones, indicate a significant penetration of transgenic soybean in their districts. In the soybean production traditional area, 88% of the interviewees asserted that there were a lot of RR soybean crops; while in the *"new areas"*, 78% of the interviewees agreed in asserting the existence of this variety. The difference between the answers of the informants from one or another region, was in the RR soybean dispersion. In general, as the interviews were carried out toward the northern region, the importance of the transgenic crops diminished (Table 52, Annex 4).

(C32) In what concern to the main reasons that explain the adoption of the RR soybean by producers from each community, we found opinion differences among areas, but not among informants' types (Table 53, Annex 4). In the soybean production traditional areas, two reasons were evenly mentioned: 43% for "lower costs of production" and 38% because this varieties "facilitate the works of weed control" and, as a consequence, the obtaining of clean grains. A smaller fraction of the interviewees (19%) mentioned other reasons. In contrast, in the new areas where soybean production system is currently penetrating, three fourth of the informants prioritized the "easiness" of weed control, and the remaining "lower costs of production".

When comparing the answers of the key informants, most of the cooperative members prioritized the "easiness of weed control" over the decrease of the "cost of production". Municipal Representatives, on the other hand, mentioned more frequently the "the lower cost of production" instead of the *"easiness of the agricultural tasks"*.

(C34) There were significant differences, among the answers of the informants interviewed, in relation to the local public opinion about the production of transgenic soybean, as much among areas as among informants' types (Table 55, Annex 4). In the traditional soybean production areas, most interviewees asserted that the public opinion at local level was "positive" (52% of the cases), compared with attitudes of "fear" (28% of the answers). The lack of information on the issue and the negative opinion with regard to transgenic crops only represents a marginal share of the answers (8% each one). In contrast, in the new soybean production areas, only 9% of the informants responded as "positive" the local public opinion, against 55% that responded "the public opinion lack of information" about this issue. The answers, which suggest that the "local opinion is of fear about these varieties" or that "has a negative opinion", represents 36% of the answers (evenly distributed).

In what concern to the analysis of the answers according to the informant's type, the cooperative members asserted that the local public opinion was "positive" in most of the cases. Curiously, none Municipal Representative mentioned that the public opinion would be "negative", being distributed the other qualifications in similar proportions. None of the Agriculture Secretaries qualified the public opinion as "positive", indicating that it would be rather a "fear", "lack of information" and 25% answered the public opinion "is negative."

None technician considered that public opinion would be "negative", distributing the answers among the other categories evenly.

A3.2.: Transgenic soybean and employment levels.

(C33) The answers (of the informants interviewed) about the main effects on the employment, which could be attributed to the diffusion of transgenic soybean in the community, were in general unanimous. There were no differences among areas neither among informants' types in relation to this perception (Table 54, Annex 4). Most of the informants responded that it caused "unemployment" of the rural labor force.

We can infer from the answers, that the soybean expansion has happened in a context characterized by the loss of job positions in the rural areas. This process has been progressive, but sharpener in the past than in recent years. Although most of the interviewees sustains that the introduction of transgenic soybean has been harmful for the rural employment (mainly journeymen for hoeing), we can assume that the additional damage generated by the GMOs in the labor force demand is marginal in comparison to the effects caused by the "closure of the agricultural frontier" and with the technological change impelled by the no-till-farming.

On the other hand, the production of GM soybean has opened possibilities for small-scale producers (Paraguayan peasants) to be readdressed toward the cultivation of this crop. According to a small cooperative leader of Paraguayan peasants in the department of Itapúa, the easiness in the handling of transgenic varieties facilitates the small-scale cropping, offering to the small-scale producers the possibility to incorporate this cash-crop. The General Manager of one cooperative in North Alto Paraná has agreed with this opinion; he asserted that transgenic soybean is "the right crop for poor farmers".

Some interviewees have suggested that it might exist a relationship between the displacement of the rural poor producers and the technological change linked to the production transgenic soybean. This technological change could contribute to the peasant's uprooting in two ways: i) the opening of new farming parcels would have been facilitated by the possibility of using "Gliphosato" in post-emergency, and ii) the deepening in the use of agricultural defensives had been a coercive factor for rural producers placed in neighboring areas to transgenic soybean farms.

In the farm survey, with the aim to quantify the influence of the soybean type cropped on the recruitment of rural labor force, we include a question that addressed this issue. When we searched a relation between the quantity of hired rural labor force and the soybean cropping surface, there was substantial and highly significant correlation, showing a lineal growing tendency. In the Figure 11, we can appreciate that the number hired employees concentrates on the strata of larger conventional soybean producers, while in the case of transgenic soybean, most of the hired employees (between one and two laborers) concentrates in the strata of farms with lesser than 200 hectares cultivated with soybean (medium and small-scale).

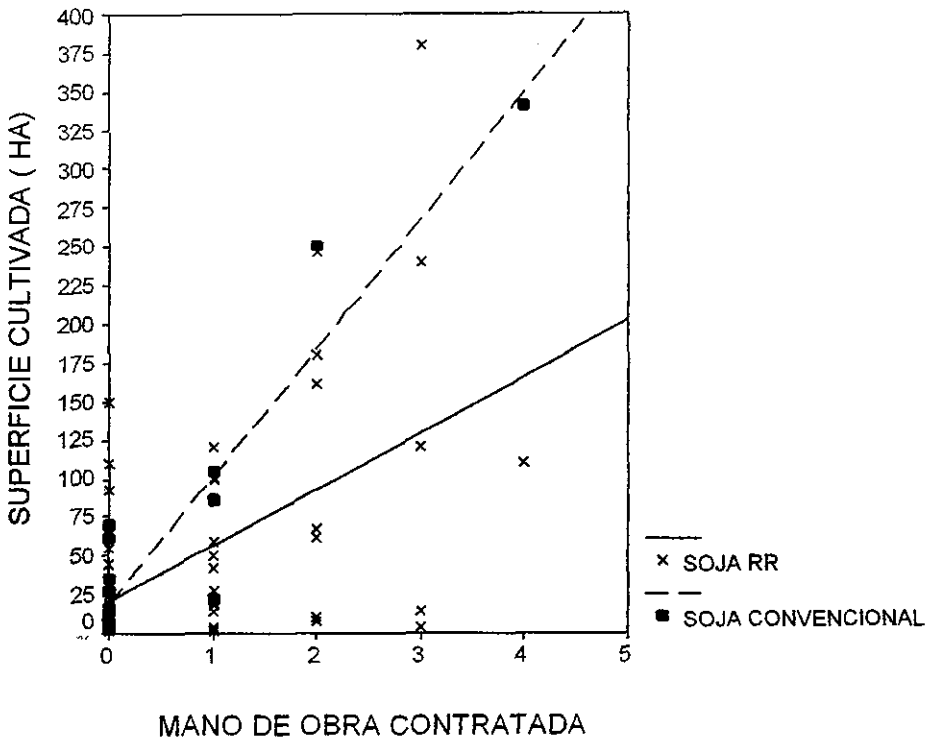

Figure 19: Differentiated soybean: hired labor force levels according to the cropping area

Table 32: Correlations between the quantity of hired labor force and the soybean cropping area

		Quantity of hired labor force
Soybean Cropping Area (ha) (Harvest 2004/05)	Pearson Correlation Coefficient	0.618**
	Probability (2 tails)	0.000
	N	79

Source: Own elaboration. Note: **Sadistically significant at 1% (Test of 2 tails).

Also, when analyzing the relation between the number of hired labor and the volume of production of farms with different sizes, the correlation is moderate and highly significant (Figure 19). When disaggregating by type of soybean cropped in the farm, it seems clear the lineal growing trend in the number of hired laborers as the produced volume of conventional soybean increases. In contrast, as the scale of RR soybean production increases, the recruited labor diminishes. The recruitment disappears above the 400 tons.

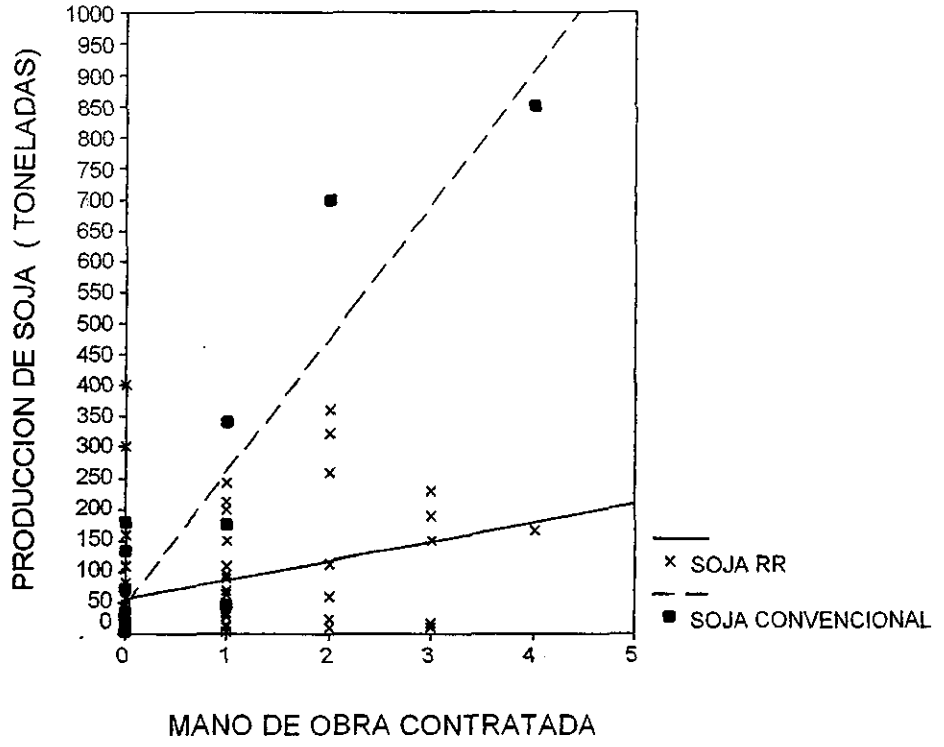

Figure 20: Differentiated Soybean: Hired labor levels according to the produced volume.

Table 33: Correlations between the quantity of hired rural labor and soybean production

		Quantity of hired labor force
Soybean Production (in Tons) Harvest 2004/05	Pearson Correlation Coefficient	0.476**
	Probability (2 tails)	0.000
	N	79

Source: Own elaboration.
Note: **Sadistically significant at 1% (Test of 2 tails).

A4: Soybean Production's influences in the identity structures of the communities.

The mass entrance of foreign immigrants from diverse origins, especially Brazilian nationals who constitute the wide majority of the commercial farmer type in the soybean production traditional area, has not been exempt of problems of adaptation and assimilation to the social environment. Rather it has been characterized by an asymmetric relationship with the national population, and in a special but not the only way, with the rural waged laborers.

A sort of social segregation is attributed among different ethnic groups as possible effects of economic, cultural and language differences, which occasionally has ended in conflict situations and insecurity. Also, it is important to know the degree of membership to different types of organizations at local level (social capital). In this section we analyzed the frequency of possible discriminations and conflicts among different origin groups that also would affect the participation in productive associations and other kind of organizations.

A4.1. Discrimination and conflicts

At the micro level, the information is primary and focused in the data collection from farm surveys and from interviews to key informants. In the farm surveys, when identifying the nationality of origin of the seasonal laborers, 64% of the farmers that hired workers answered that the employees were Paraguayan, while almost 30% of the interviewees said they were Brazilian. Only 7% of the interviewees asserted they have hired workers from other nationalities (Table 34).

Table 34: Nationality of the labor force

Nationality	Frequency	Percentage
Not applicable	57	56,4
Paraguayan	29	28,7
Brazilian	13	12,9
Other	3	2.0
Total	**101**	**100**

Source: Own elaboration.

Although the proportion of hired Paraguayans labor force is the most important, this indicator is relative when considering the share of the overall population by origin in the production area. The share of Paraguayan workers in the region is very higher than the 64 % hired by soybean farms, and the proportion of foreigners is quite inferior to 36% employees hired by commercial farms. These indicators may suggest positive discrimination, from producers, toward foreign workers.

The discrimination signs are also perceived when analyzing the answers of the head of families interviewed. When consulting them about off-farm local working opportunities with agricultural producers from other nations, 80% of the

interviewees do not consider this as feasible (Table 35). It is important to point out that this question has been formulated as much to Paraguayans as to foreigners; therefore, the latter ones might also observe difficulties of being employees for local producers.

Table 35: Feasibilities of off-farm working in farms managed for producers with another nationality

	Frequency	Percentage
Yes	21	20,8
Not	80	79,2
Total	**101**	**100**

Source: Own elaboration.

The perception of labor opportunity has been analyzed later according to the nationality of the head of family interviewed. Eighty-five percent of the Paraguayans consider not very feasible the employment opportunities with foreigners in comparison to 66% of the Brazilians that have the same opinion. It is necessary to highlight that none of the interviewees with "other nationalities" see working opportunities in foreigners' farms.

Table 36: Perception about off-farm working opportunities with foreigners according to the nationality of the interviewee

		Nationality of the Producer			
		Paraguayan	Brazilian	Other	Total
Is there any (off-farm) working opportunity with no-national producers	Yes	7	14		21
	Not	47	28	5	80
Total		**54**	**42**	**5**	**101**

Source: Own elaboration.

(A8) At community and institutional level, when asking to the interviewees about the frequency in the area of illegal private property occupations, the answers were significant according to areas but not according to informants' types. Indeed, in the soybean production traditional areas, the answer was affirmative for most of the informants where they reported a more frequent number of occupations to soybean farms than to cattle farms. On the other hand, in the new soybean production areas, interviewees reported that private property invasions affected mainly to cattle farms (Table 8, Annex 4).

(A9) Assuming that land occupations are as much the origin as the derivation of social conflicts, we interrogated local informants about the eventual causes of confrontations among different groups of producers (Table 9, Annex 4).

There was disparity in the opinions between soybean areas but not among informants' types. In this way, in the soybean production traditional areas the main cause of conflict that has been reported referred to "environmental

contamination" (53% of the answers), followed by "invasions" (24%), "political interest" (12%) and a single case for "deforestation".

(A16) In what concern to the evolution of insecurity, there were not important differences between areas neither among informants' type (Table 18, Annex 4). A third of the interviewees in the soybean production traditional regions answered that insecurity is higher than before, in contrast with other 25% that affirm the levels of insecurity stay stable. In the new areas for soy production, the perception about insecurity seems to be lower; however, a fifth of the interviewees asserted that security conditions had worsened.

Most cooperative members interviewed during the study said that the security situation is stable and only 18% answered that there would be "more" insecurity. The other types of informants agreed in asserting that insecurity is higher that before. In the "new areas", among the few interviewees that answered this question, seems to prevail opinions about "the same level" or even "more" insecurity that before in their districts.

It is necessary to highlight that the insecurity perceived by the interviewees is not related to the problems of previously mentioned social conflicts. We could suppose that the problems of insecurity are related with the higher population's poverty as a consequence of demographic displacement for the advance of the soybean boundary. However, very few interviewees perceived the problem of the insecurity as a consequence of this phenomenon, and they talked mainly about common crimes.

B) Economic Impacts

B1 Effect of the advance of the system sojero mechanized on the stockbreeding and the family agriculture.

It is assumed that the revealed competitiveness of the soybean production system, once exhausted the advance of the agricultural frontier at the expense of native forests, at present would be displacing the semi-intensive bovine cattle raising, as well as family agriculture. With the object of analyzing this vision, indicators of economic performance for each productive system were studied. Likewise, information concerning the evolution of the land leasing was relieved to identify the types of producers, both the leasing takers as well as the givers.

B1.1. Comparison of economic Indicators

When studying the farm surveys, the relieved descriptive statistics are presented relative to the economic performance comparison among the conventional soybean, the genetically modified (RR), and that of the cash crop (cotton) produced by the non soybean producer small farmers (Table 37).

Table 37: Cotton descriptive statistics

DESCRIPTIVE STATISTICS	Profitability US$/Ha)	Total Cost (US$/Ha)	Cultivated Area (Ha) 2004/05	Production Kg/Ha)
Mean	-2	147	0,69	659
Confidence Interval				
Upper Límite (95%)	30	173	0,85	765
Lower Límite (95%)	-33	122	0,53	553
Median	-6	143	0,50	700
Standard Desviación	57	47	0,29	192
Mínimo value	-111	70	0,10	400
Maximum value	104	224	1,00	1000
Variation spread	215	154	0,90	600
Asimetry	-0,34	0,10	-0,28	0,06
Curtosis	0,43	-0,81	-0,92	-1,04

Source: Own elaboration.

For the cotton crop, it was registered an average total cost of 147 U$S/ha., being the median of 143 US$/ha. The cost per hectare varied from a minimum of 70 to a maximum of 224 US$/ha. The average cultivated surface in the 2004/5 campaign of the sampled farms was of 0,69 ha. of cotton, corresponding the median to 0,50 ha. The farmer that cultivated the less sowed 0,1 ha. While the larger plot barely totaled 1 ha. planted with the textile.

The yield performance obtained in this year was hardly impacted by a severe drought reflected on an average of 659 kg/ha. of hand picked raw cottonseed, with a median of 700 kg./ha. The lower yield was of 400 kg./ha. and the maximum barely reached 1.000 Kg./ha. It fits to remark that the national average of cottonseed yield performance at present fluctuates around the 1.000 Kg/Ha., in normal years.

All this resulted in a negative profit value of -2 US$/ha. (net loss), with a median of –6 US$/ha. The worst economic performance threw a loss of –111 US$/ha. while the maximum benefit totaled 104 US$/ha. It should be emphasized that the cotton growers small farms (non soybean growers controls) under study were sampled mainly in the Caaguazú department.

Table 38: Descriptive Statistics of Soybean

DESCRIPTIVE STATISTICS	Profitability (US$/Ha)	Total Cost (US$/Ha)	Cultivated Area (Ha) 2004/05	Soybean Production (ton./Ha) 2004/05	Hired Labor per farm 2004/05
	Conventional Soybean				
Mean	127	287	57,99	2,41	0,47
Confidence interval					
Upper limit (95%)	176	308	14,69	2,73	-0,02
Lower Límite (95%)	79	266	101,28	2,38	0,97
Median	96	274	17,50	2,50	0
Standard Deviation	101	44	89,82	0,68	1,02
Minimum Value	-48	206	3,00	1,30	0
Maximum Value	325	384	340,00	4,00	4
Variation spread	373	178	337,00	2,70	4
Asimetry	0,12	0,64	2,44	0,30	2,71
Curtosis	-0,75	0,28	5,66	0,20	7,96
	Soybean RR				
	Profitability (US$/Ha)	Total Cost (US$/Ha)	Cultivated Area (Ha) 2004/05	Soybean Production (ton./Ha) 2004/05	Hired Labor per farm 2004/05
Mean	79	252	52,63	1,85	0,87
Confidence interval					
Upper limit (95%)	110	270	34,08	2,02	0,60
Lower Límite (95%)	47	250	71,17	1,69	1,13
Median	55	246	20,50	1,80	1
Standard Deviation	122	68	71,79	0,65	1,033
Minimum Value	-129	115	1,00	0,60	0
Maximum Value	504	445	380,00	3,20	4
Variation spread	633	330	379,00	2,60	4
Asimetry	0,82	0,50	2,46	0,23	1,14
Curtosis	1,27	0,40	7,31	-0,57	0,59

Source: Own elaboration.

There was not large difference in the total cost of production between the conventional soybean and the genetically modified crop (287 and 252 US$/ha. respectively). (Table 38)

Neither was found a great difference in the average soybean cultivated surface per farm between the conventional soybean and the genetically modified

plots (57,99 and 52,63 ha., respectively). However, differences in soybean production were registered, both in the labor hired, and in the profit value.

The average yield performance of soybean varied among soybean types, between 2,41 ton/ha. for conventional soybean compared with 1,85 ton/ha. in the genetically modified plots. The difference in performance could be explained mainly by the rainfall shortage during the cropping period. These data confirm the information of some interviewed farmers who stated that the soybean RR varieties introduced to Paraguay show scarce drought resistance.

Likewise, the average number of 0,47 laborers hired corresponding to the conventional soybean growers was duplicated to 0,87 for the soybean RR producers. This result contradicts the generalized perception that the GMO's varieties replace the utilization of laborers, generating more unemployment.

The economic final result consisted of a marked difference among 127 US$/ha. as average profit value for conventional soybean in contrast to 79 US$/ha. obtained with the genetically modified soybean. Again it stands out the producers perception with respect to the greater vulnerability to drought of the genetically modified varieties from the temperate zone when they are produced in the subtropics, as it happened in the 2004/5 campaign.

Besides the previous descriptive statistics, the correlational distributions obtained in the farm survey are presented, examining the relationship between the total soybean production cost at the farm level, with the harvested production and soybean cultivated land surface, respectively (Figures 21 and 22). A high correlation is observed, with values of 0.902 and 0.950; respectively (high and significant at 1%), being higher in the case of the cultivated surface, showing a linear trend. When comparing them to each other it is observed that, contrary to the cultivated surface, in the case of the correlation among the total cost (in US $) of the entire crop and the total soybean production (in tons.) this growing tendency is lineal until a level of production of approximately 400 tons, spreading to diminish starting from that level. These data suggest, that in the studied year (2004/5) there are not improvements in response to large production scale.

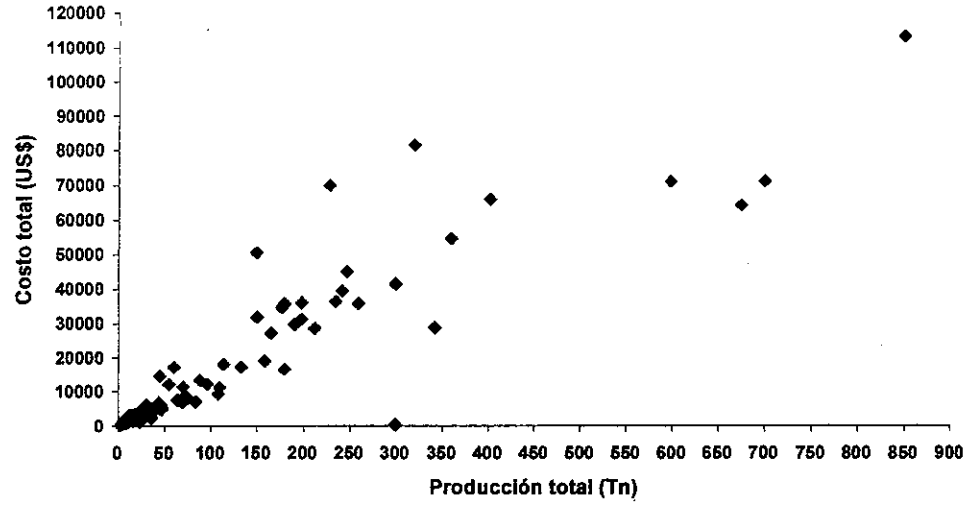

Figure 21: Soybean Total Cost and Total Production relationship

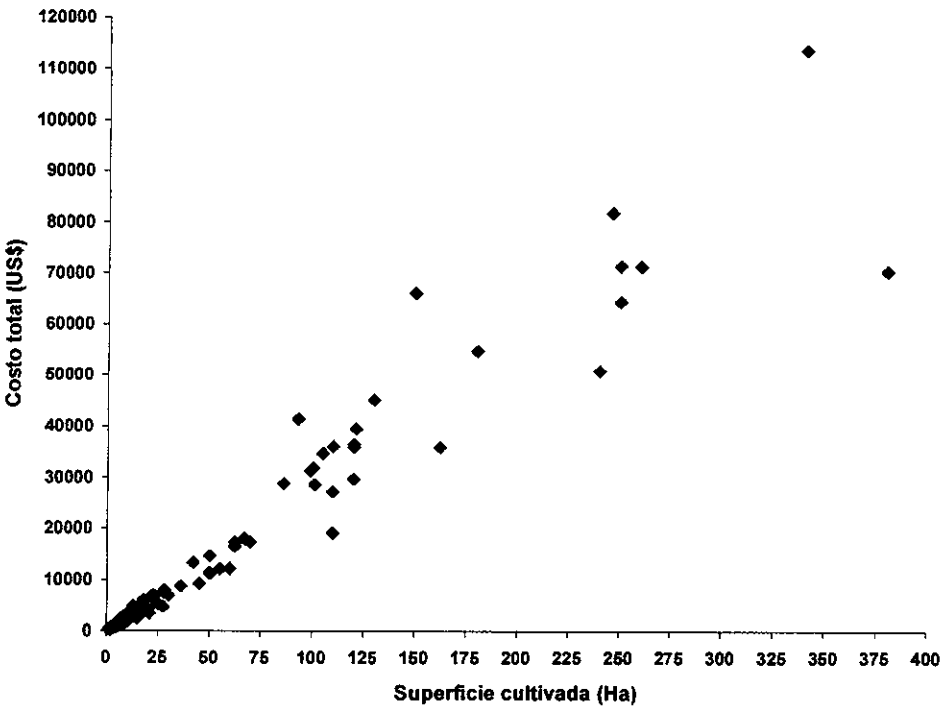

Figure 22: Soybean Total Cost and Total Cultivated Area relationship

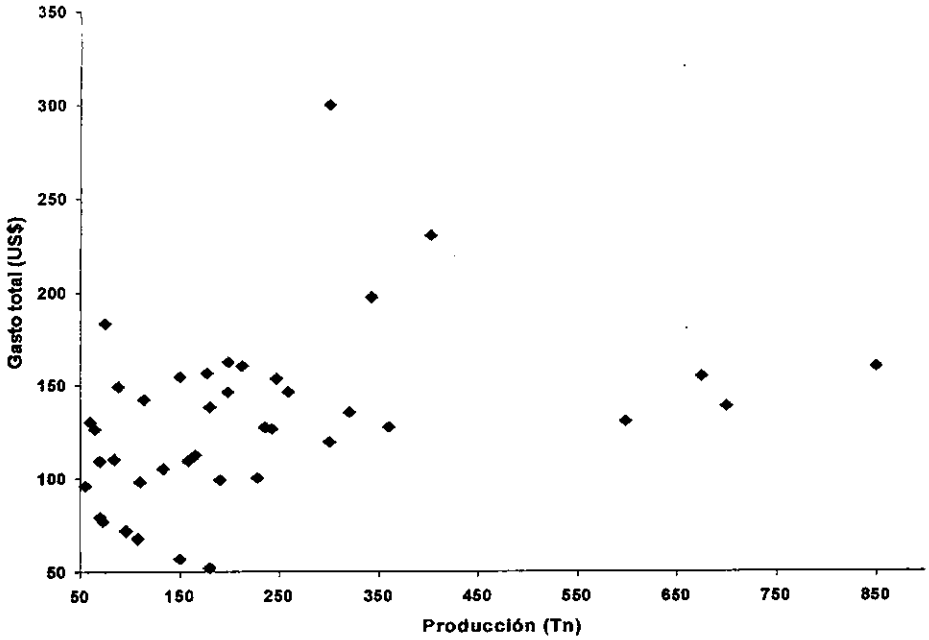

Figure 23: Relationship among Soybean Total Production y expenditures in imported inputs

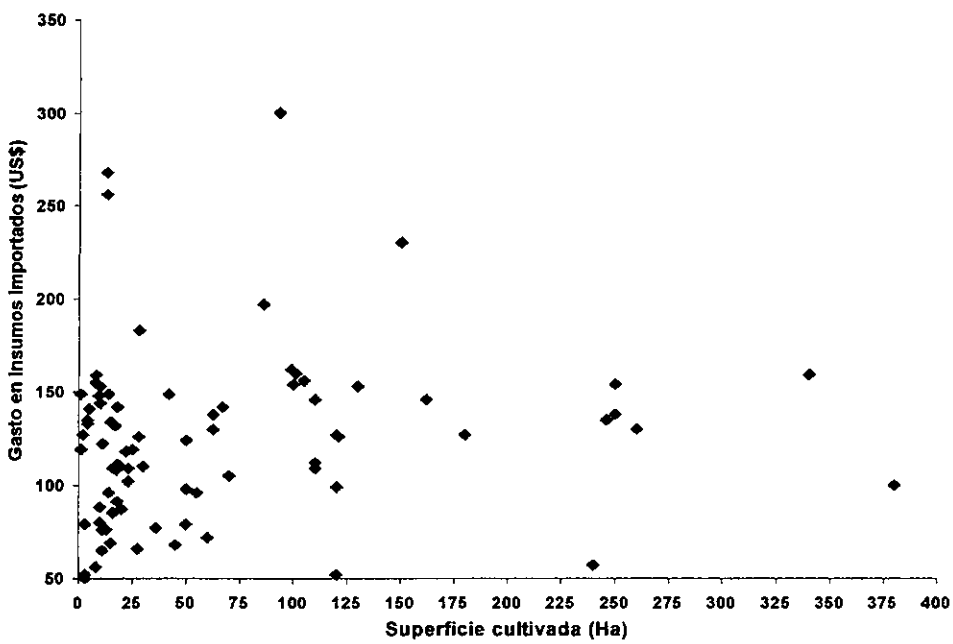

Figure 24: Relationship among Soybean Cultivated Area and Expenditures in Imported Inputs

When observing the distribution corresponding to the expenditures invested in supplies per hectare according to the sizes of soybean cultivated surface and the production volume, the same positively increasing relationship is observed among both variables in the medium and small strata, tending later to remain constant in the large farms, starting from around 150 soybean cultivated hectares (Figures 23 and 24).

When the relationship among the total profit value (in US$) is analyzed with both the total soybean production at the farm level (ton), and the total surface cultivated with soybean (ha.), a higher correlation is observed with the first but not with the second mentioned variables. (Figures 25 and 26) [25].

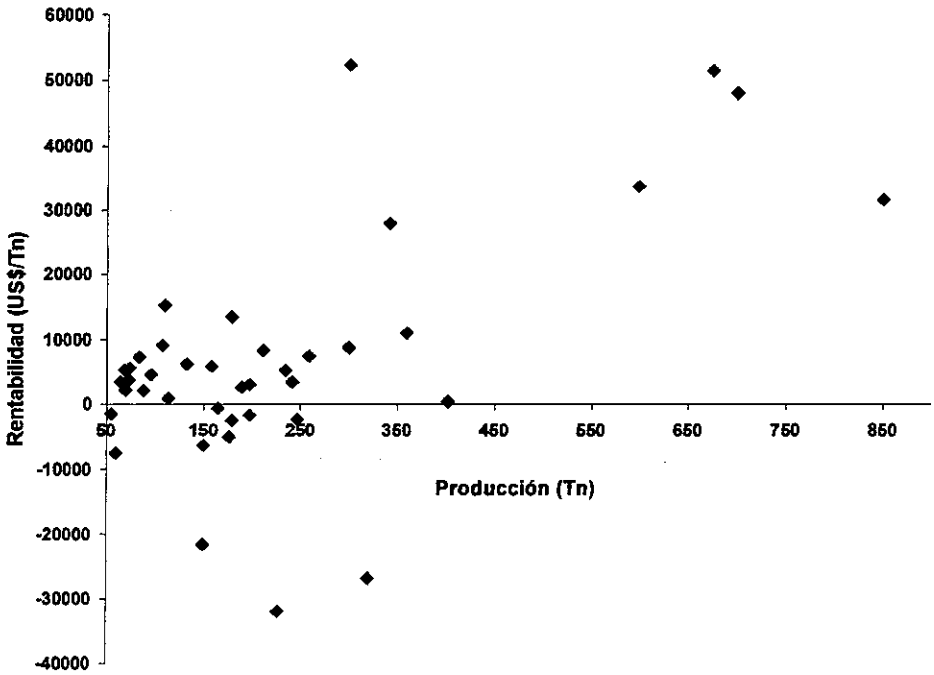

Figure 25: Relationship among total soybean production and profitability.

[25] The correlation among soybean production and profitability is 0.606; statistically significative at 1%, while the coeficient among Soybean cultivated area and profitability was 0.147, not being statistically significant.

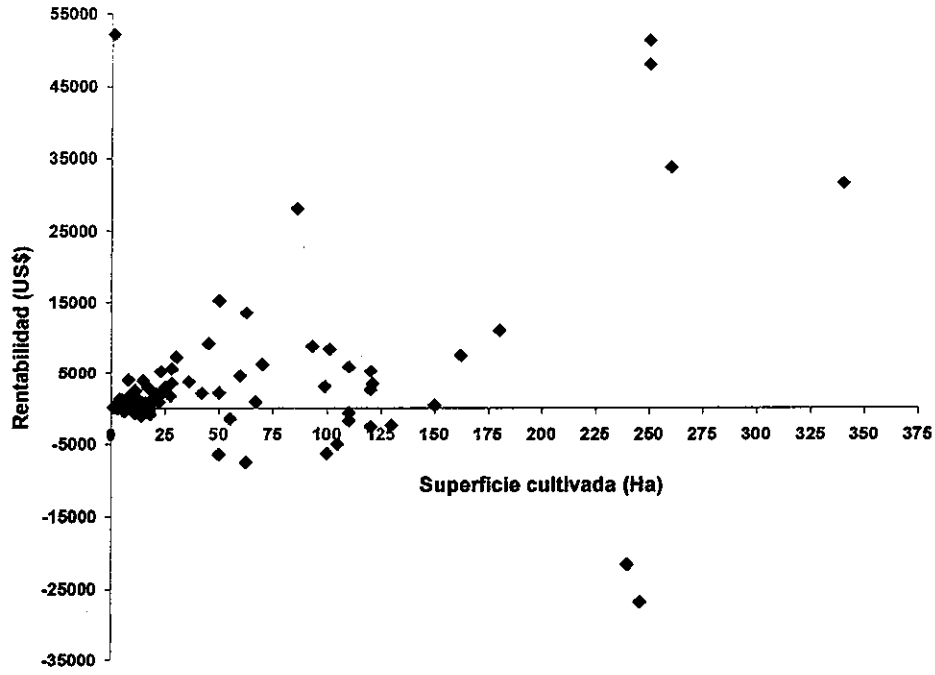

Figure 26: Relationship among profitability and soybean cultivated area.

When the performance of the main cash crop from **non soybean grower small farmers (cotton)** is compared to that from the small soybean producer, a different behavior is observed in the year under study, In Figure 27, the distribution of the cotton yield is presented (in Kg. /ha.) obtained with increasing production costs (in Gs. /ha.). Although the correlation obtained in the year under study (very dry) was expected to be low, the data suggested a great dispersion in the obtained results. In most of the cases it was registered between 700.000 and 1.300.000 Gs. /ha. However, the yields per hectare in their majority concentrated between 600 and 1000 Kg. /ha. of seedcotton. Also, it should be paid attention that with a sub-investment between 400.000 and 600.000 Gs. /ha resulted in yields of hardly 400 Kg. /ha. of seedcotton. The wide yield dispersion obtained for the same production cost level only can be explained by other causes.