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TRANSGENIC CROPS IN LATIN AMERICA: FIRST SOCIOECONOMIC AND ENVIRONMENTAL RESULTS

by

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Summary:
2000/2001 will be the period when transgenic crops like RR soybean will be planted over the whole lands in Argentina. As the first developing country that adopt the technology is very important to identify the variables that had done that it has been so quickly adopted by farmers. In this presentation, we will comment about the socioeconomic conditions that have done that farmers adopt the technology, the effects of global trade and economy subsidies of developed countries and the impacts on ours different scale models. Farmers in Argentina obtain an important discount by producing transgenic crops, especially because low costs of seeds and herbicides. Instead it, a different scale is necessary for production and the new technological approach is generating lowers and winners. We will present too the first socioeconomic and environmental results of the application of the new technology and the expansion of it on marginal areas of the country and the trends for adoption of transgenic crops in Latin America.

Keywords:

RR Soybean – Bt corn - No-Tillage – Organic agriculture - Glyphosate - Argentina

TRANSGENIC CROPS IN LATIN AMERICA: FIRST SOCIOECONOMIC AND ENVIRONMENTAL RESULTS

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Introduction

Argentina is the only one country of South America that allowed the commercial releasing of transgenic crops. Indeed, it is the second world - following USA - in transgenic crops implanted and first, in technology adoption. Transgenic crops planted are soybean and maize with traits as tolerance to glyphosate or *Lepidoptera*. The rate of adoption of the new herbicide resistant crop has levels higher than USA, and is part of an important complex of agriculture intensification and concentration of the economic model.

Argentina is at the global top ranking in relation with the adoption of the transgenic soybean technology. Even though this year, planted surface with this crop rise 100 % (around 9.500.000 has), for international trade, the whole argentine soybean that will be in the commercialization (25.000.000 metric tons) is transgenic.

For the commercial point of view, the new situation must be analyzed taking in account two markets. Those of the companies and farmers, and by the other hand, the customers. For farmers, RR soybean – under the current intensification of agriculture as unique mode of production - came to solve one of the main problems for the farm management: weed control, obtaining a virtual simplification, cost reduction in the herbicide price and simply application that became irresistible the technical package offered. For private sector of pesticides and seed production, it's opened the possibility to concentrate and rearrange the business of production and commercialization of insecticides and weed killers to the new biotechnological alternative. To this point, two components of the market were satisfied, with results more that promises but, neither the farmers, nor policy makers, officers companies involved, taking into account the primordial link of this chain: the customer. For these ones, the new RR soybean and foods didn't imply any improvement for the diet, nor high levels of quality or new organoleptic factors, that convert these as necessary. These considerations, added to other ones, such as the different impacts over the socioeconomic agriculture structure allowing the concentration in more large firms, the missing of small and mid growers and a changing from a low input technology to a high

intensive input technology with effects on the environment, society and the quality of ours well known natural foods.

A global market

In a global context, the affairs of agricultural biotechnology represent a colorful blend between old and new modes of international affairs. On the one hand, governments and their emissaries still dominate most international forums, standing for the sovereign right of their countries to use and regulate natural resources. On the other hand, non-state actors have directly or indirectly taken prominent positions at the negotiating tables.

The consolidations of the agrobiotechnology industry over the last years has led to the formation of a few powerful multinational enterprises with global outreach, and the increasingly concentration of a multinational private industry with more power than the own countries, specially in the cases of developing countries, such as Argentina. On the other side and at the same time, a small groups of issue-oriented NGOs such those that protect the developing country farmers right, genetic resources and customer rights.

Another critical transnational network that influences the international biotech agenda, is made up by the large number of scientists engaged in the many areas of pure and applied biological research, whose dependence of multinational funds are crucial.

The different groups of stakeholders tend to come together in a number of international forums, which include United Nations agencies, international conventions and regional economic organizations. Other political forums such as the G-8 are starting to pronounce on biotechnology and trade. While many of these entities are limited in their substantive and regulatory mandates, they do, however, represent important platform for the debate, negotiation and orientation and needs of future markets.

While economic interests are often invoked to explain contrasts in innovation policies and trade decisions, they fail to account for more significant variation in how societies address new technologies. For example, implementation of the precautionary principle in Europe appears at first glance to stifle industrial growth, indicating that economic factors alone do not explain public policy.

Biotechnology global market is changing. The market was constructed for supply but for the end of second century, demand pressure and customer's rights have transformed the rules. Europe Union and Japan address to a wide regulatory frame that has include now, customers rights and willing, labeling, long term environment studies, developing countries farmer's rights, limits for property rights and any other questions that have to be review. United States, it is too changing the position about releasing of engineered crops and

reviewing its regulatory system in behalf of the public interest, customers rights and new researching to bring more transparency and security to a reluctant customer, internal and external.

The situation of Argentina

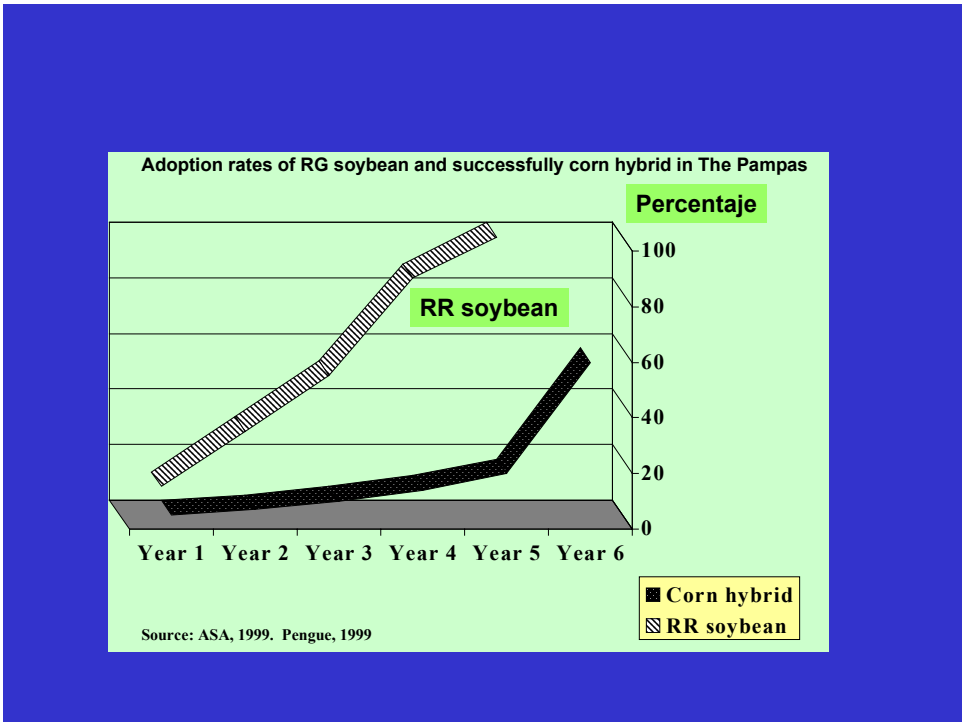
Facing this international scenery, Argentina, one of the main global producer of transgenic soybeans, found itself under a commercial storm without umbrella, while others producers and exporters of this kind of crops – USA, Brazil – have already located themselves, one of them beginning to distinguish the production and diminishing the adoption of RR crops and the other, because – without interrupting Biotechnology researching – has not allowed commercial releasing of transgenic crops.

Just like that, Argentina will must to analyze how and where to follow this new way of technology adoption, and which strategies are more convenience to the country, not only with the current situation but in the mid and long term. How strength its natural advantages, facing a general fall down of comparative advantages by the adoption of globally widespread technology – which will allow that countries that now are ours purchasers, will become first in producers, and in the mid future, ours competitors?, How ordered the agriculture production and diversificate it in the profit of farmers, specially those small and mid producers, each day more in debts?, Which are the mechanisms, instruments and policies that will allow to diversify the agriculture production and favor, a real agroecological sustainable environment?, How to build real competitive advantages that will allow to develop and to take advantage of the several commercial specific spaces of the world market?, How assure and guaranty the “natural market” that till this time Argentina has been for the European market?, How to rotate the production improving the incomes?, How to continue using a tool as glyphosate without accelerate the appearance of potential resistances?, And, finally, how to avoid that our country falls down in the “monoproduction” of transgenic crops, with all the commercial risks that we know of monocultures and the disadvantages that no differentiated products causes to the farmers? And finally, how to maintain ours agriculture and the people and environment involved, in a global market where the countries that subsidize theirs productive system gives continuous support for the goods they produce, creating artificial markets and prices that impacts directly over the farmers and societies in developing countries.

Since 1997, the private companies combined in many cases with the support and expectations of government sector has established that this kind of biotechnology could offer to the country a real competitive advantage.

These advantages added to the comparative advantages of the country could become of Argentina one of the more efficient country for producing and trading agricultural commodities.

In this way, since 1996/1997 season, there was a strong campaign for the commercialization of transgenic crops (RR soybean, e.g.) that grew from 20 % to 80 % of surface implanted in 1998/1999. In five years, there was rapid adoptions of the new technology by growers that will represent during the 2000/2001 season the whole production of argentine soybean as transgenic (Picture Nº 1). Argentina did not generate the new technology, which has been imported by international company's branch from USA.



Picture Nº 1

But this rapid commercialization of biotechnology in agriculture, has not been a smooth one. In Europe, Japan and Brazil consumers, environmentalists, policy makers, scientists, the popular press and other social groups have forced governments to review their regulatory systems. Many of their concerns are at odds with the international trading and intellectual rules that are being promoted through institutions such as the WTO and the WIPO.

The general principles of the global trading system as set out under WTO have covered the aspects of commercialization and property rights of biotechnology but have not

considered very exhaustibly the long term implications of this matter. There are, however, other issues such as the potential flow of genes from GM crops to their wild relatives. The management of pest resistance, the effects over biodiversity, the impacts of bioprospecting for developing countries, the sustainable conditions of natural resources and the consequences of such application of biotechnology over health population, that falls under the jurisdiction of other treaties and national regimes.

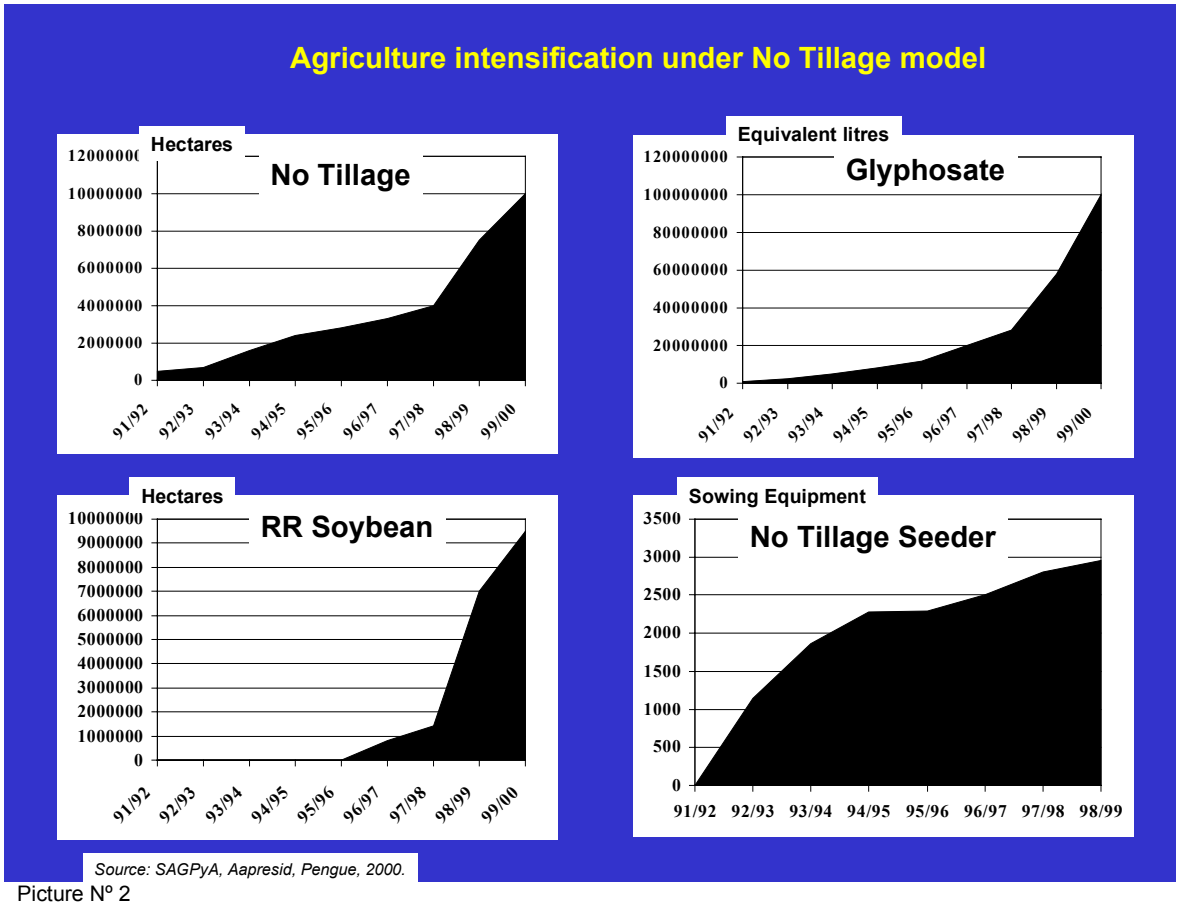
It is this potential regulation and orientation of biotechnology by the regimes that create the potential for conflict between trade and environment. Differences in perceptions about the character of GM crops, the very few information about this matter from the private sector, and weak implications of governmental agencies in the country, create the current conditions in which the agricultural biotechnology is walking on.

Others countries are watching and monitoring the new demands of the markets (Glickman, 1999). “Science follows the market” (Sachs, 1999). In other side, Brazil, the second world soybean supply country does not produce transgenic crops, and it is gaining a special market position in the commercialization of conventional crops in the world. But, though to this global situation, Argentina, not only it is not reviewing its regulatory and commercial situation about the commercial releasing of transgenic crops (e.g. RR soybean, Bt corn, RR corn, LLsoybean, RRBtcorn, RRbtsoybean) besides it is expanding the commercialization and offering of engineered crops to the argentine farmers.

Few years ago, traditionally cultivation of grains was altered with fallow seasons to grow cattle pasture. This rotation system allowed maintaining the agronomic and environment system from a long-term point of view. But, in the 1980s, world market prices for grains and oilseeds increased, while at the same time productivity of raising cattle declined. Agriculture continue become more lucrative, since the production of soybean in rotation with wheat or sunflower, that allows for three harvests in two year. Furthermore, the open economy to the global model, the end of hyperinflation due to the fixation of the argentine peso against the US dollar and abolition of export levies on agricultural products triggered an investment in new technologies. This new framework favored the import of machinery and agricultural inputs as pesticides, fertilizers and royalties on seeds at low prices and their use in oilseed production for export markets (Picture Nº 2).

The intensification of the production system was followed by a decline in soil fertility and increase of soil erosion. Consequently, fertilizer consumption stepped up from 0,3 million tons in 1990 to 2,5 million tons in 1999. Another step was the continuos increasing of No Tillage system that is being supported by the herbicides consume and special machinery for sowing. The model is directly associate with the high consume of herbicides – such as glyphosate – which application is being reinforce under a change of the herbicide patron,

with the releasing of transgenic soybean, that are tolerant to this herbicide (package glyphosate + Roundup Ready soybean).



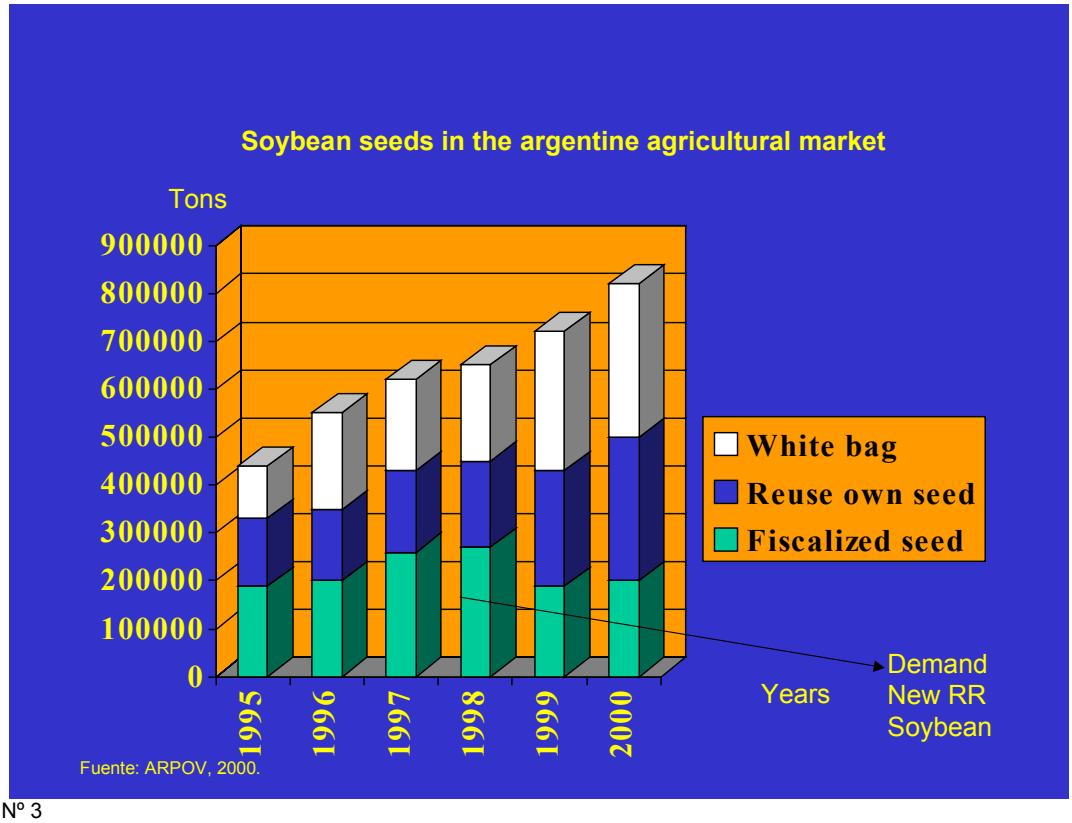
Picture Nº 2

The main factors that produce the rapid adoption of modified genetic crops has relation with:

a) Lower herbicide prices. In Argentina, from a price of $ 28/litre goes down now to $ 3/l, much less expensive that in the own USA. Four companies (Monsanto, Atanor, Nidera and Dow) concentrate more than 80 % of glyphosate market in Argentina, which is mainly imported from USA, EU and China.
b) Fewer expenses on labor, fuel and machinery. Direct sowing and more effective herbicide application allow for crop cultivation with less labor and fewer machinery cycles.

c) Complete knowledge of the technological package associate to No Tillage + Soybean.

d) Seed prices and self-reproduction. In Argentina, farmers don't pay technological fee for seeds and they reproduce the new seeds in theirs fields. This action attempts against the companies and this year the "white bag" (seed with no certificate and fiscalization) is around 300.000 tons (Picture Nº 3).



Picture Nº 3

Risks and profits of OGM in developing countries.

Biotechnology is emerging at a period of worsening inequalities between the developing countries and the industrialized world. The income gap between the fifth of the world's people living in the richest countries and the fifth in the poorest was 74 to 1 in 1997, up from 60 to 1 in 1990 and 30 to 1 in 1960 (UNDP, 1999). And of the US$ 460 billion spent in R&D worldwide, only one tenth was spent in developing world where 80 % of the world's population resides (UNESCO, 1999). These figures imply that much of developing countries are unlikely to benefit from biotechnology.

As many of developing countries are interested in the role of biotechnology in improving nutrition and reducing hanger, the majority of current agricultural biotechnology efforts are driven by the markets in the developed world: thus much of the research focus is on crops that are staple varieties for animal foods, attributes that minimize labor and comfort for farmers (unique herbicides, insecticides) or improve the quality of foods. Many of the crop

varieties, traits and environmental or health conditions that could be important for large parts of the developing world are still largely ignored.

A redirection of current agricultural biotechnology efforts would require new incentives for the private sector to support research efforts responsive to developing country needs, as well as increases in public sector support and independent sector for agriculture research in our countries.

But with current investment in science and technology so in Brazil (0,85 % of GDP) or Argentina (0,3 %), developing countries are very far from the media of the Europe Union (1,85), Japan (2,78) or the USA (2,55).

The only producer of OGM in the developing countries is Argentina, but real investment for research of the local or regional problems in the country are around 0 %. The country imports the technology and all the local seeds companies pay royalties for it. The situation seems to be that the country have to produce crops that are resistant to herbicides, which are commercialized by multinational companies and insecticides plant that protect it of insects, but with a great cost for the agricultural environment in the mid time (Picture Nº 4)

Picture Nº 4. Permission releasing by trait and crop in Argentina. Some selected traits.

Trait	Soybean	Maize	Cotton	Rapeseed	Total	Total %
Glyphosate tolerance	14	7	5		26	23,5
Gluphosinate tolerance	6	30	1	7	44	39,6
Bt resistance	1	17	11	1	30	27,0
Bromoxynil tolerance			2		2	1,8
Bt and gluphosinate tolerance		9			9	8,1

Source: CONABIA 1997 – Pengue 1998

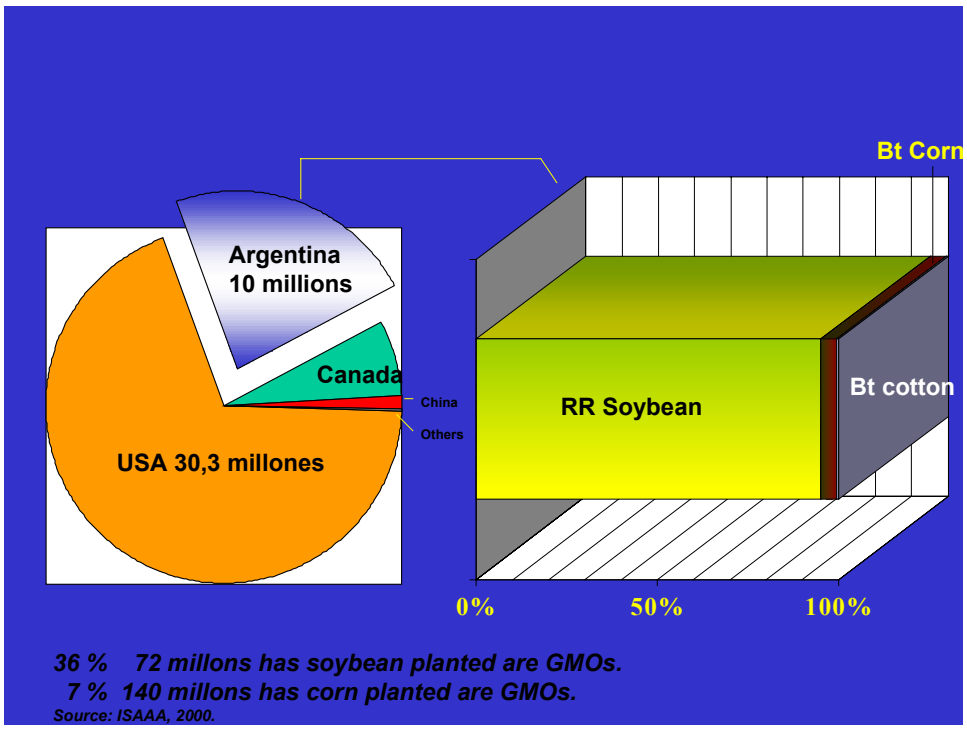
Meanwhile, surface planted with OGM crops grows continuously, so for herbicide resistant soybean and cotton, IMI Corn, as the new Bt maize (Picture Nº 5).

The intensification of agriculture implies for South American countries like Argentina and Brazil (the two main crop growers) two different ways of production:

1) Intensive production, under high input technology on common agricultural lands.
2) Extensive production, on new lands, gaining and advancing on marginal areas agricultural border) under high input technology for high yielding crops as soybean.

Three decades before, soybean was a botanical curiosity. Nowadays, is the engine of MERCOSUR. It is the third exportation good (after coffee and sugar) ant the first of

Argentina. But, both countries have followed different goals and different views of markets. While Argentine followed the United States and continue with the intensification of OGM production, Brazil has not accepted the production of engineered crops, and production conventional crops, which allowed the country to obtain beneficial gains for the commercialization of this crops (Picture 6).



Picture Nº 5

Picture Nº 6. Growing of surface implanted with soybean in Argentina and Brazil

Country decade	**1970**	**1980**	**1990**	**2000**
Argentina Hectares	50.000	2.000.000	5.000.000	8.000.000
Brazil Hectares	1.000.000	6.000.000	12.000.000	13.000.000

The current situation seems to be a bifurcation of the world market. By one side, those countries that accept engineered crops and those that not accept engineered crops or insist that those crops and foods have to be labeled.

Soybean and maize are the main crops for Argentina, which with the United States and Brazil represents the global exporters of these goods. So, know the future situation of markets and the road that will follow the competitors of argentine are relevant for the agricultural growers, the economy and the society.

Current situation and trends for agriculture production in Argentina.

Argentina is a "natural" country, free till the first years of this decade of high inputs of chemicals as fertilizers, insecticides or herbicides for its crops (Picture 7). This is a "market value". But, in hands of globalization, the country is changing its system of production, following an intensification of agriculture, with high consumes of imported chemicals, new varieties of crops and a class of agriculture biotechnology that implies more consume of herbicides, with active principles imported too.

Picture 7. Some agriculture indicators in selection agriculture economies.

	Argentina	*USA*	*France*
Insecticides (gr./ha)	*250*	*1000*	*3000*
Fertilizer (kg. /ha)	*25*	*100*	*300*
Herbicides (gr./ha)	*250*	*900*	*2000*
Changes in farm landing (%)	*18*	*5*	*- 2,5*
Native mammals under danger extinction (%)	*10*	*11*	*50*
Native birds under danger extinction (%)	*2*	*8*	*40*
Native reptiles under danger extinction (%)	*0*	*6*	*38*

Sources: INTA (1995), INRA(1995), USDA (1996), Pengue (1996)

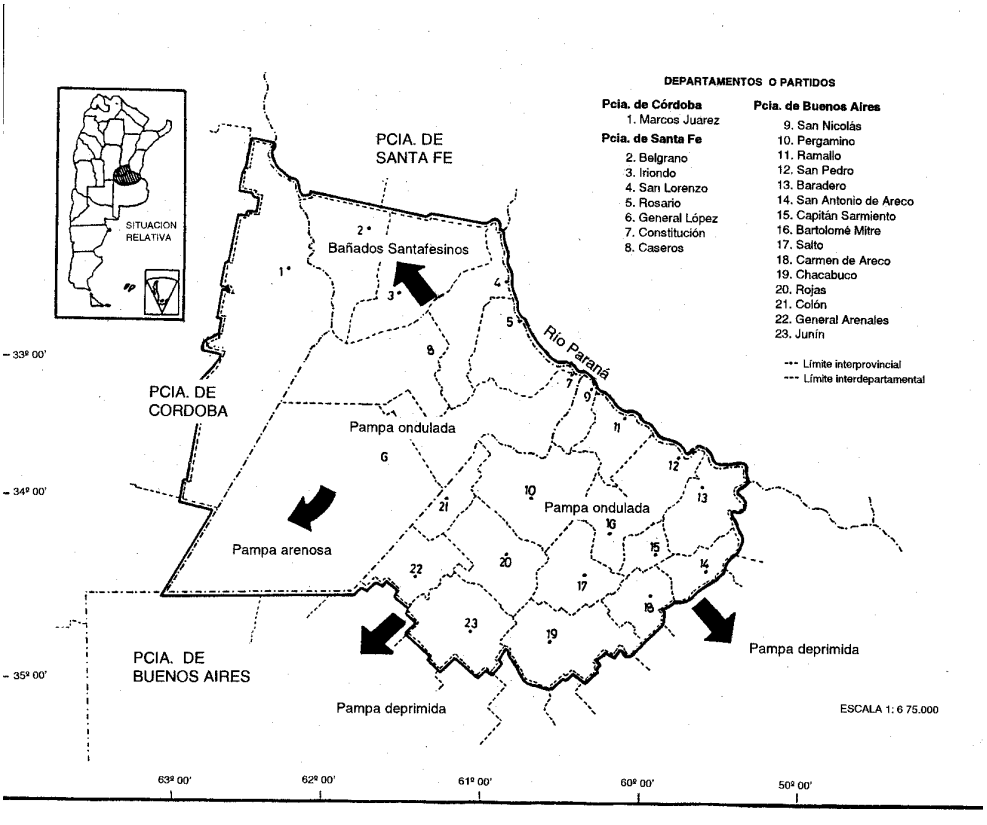
Historically, Argentina has been characterized for its natural conditions, that have done, that indeed following the steps and intensification of the "green revolution", the country has not serious problems with its natural resources. Only in case of soil, the erosion has been important as a consequence of wrong management and the incorporation of the package for soybean, without the right evaluation of the environmental context. But nowadays, adding to the problems with soil resource, the entire ecosystem will be involved. The "new biorevolution" will allow increasing the agricultural cycles, diminishing the length of fallow

fields and restoration, increasing the impacts and pressure over natural resources, the social system and the economy.

As the debate over the effectiveness of the green revolution crops continues, biotechnology and genetic engineering are now being touted for their agricultural potential in developing countries. And once again, the conventional wisdom among officials in international agencies and companies is that what is good for USA farmers and industrialized nations will be even better for the farmers of developing countries. Indeed, some third world scientists and governments see biotechnology as a way out of the fertilizer and pesticide dependencies that came with the high yielding crops. But this is a very wrong way.

It is true that, by hands of agriculture intensification the country has increased its crops yields, especially in its more important agricultural area, The Pampas (Picture Nº 8) that have allowed the exportation of goods under a commercial point of view in the short time. The acceleration and globalization of agricultural markets have done that meanwhile we exports commodities which values goes down year by year, ours imports of pesticides, fertilizers and seeds rise an important part of our balance gains. Very shortly, because of the millions of dollars flowing out of our countries to pay for agricultural supplies, questions began to be raised about whether this new agricultural revolution might be helping the developed world companies as American companies, more than it was helping a developing country as Argentina.

Picture Nº 8. The main agricultural productive area of Argentina. The Pampas



But agriculture intensification has produced environmental, economical and social consequences that have not been evaluated conspicuity in the country. Probably, the new biorrevolution could exacerbate the weak conditions of the system; Intensification of agriculture, globalization, large farm concentration, low levels of credit for small farmers, dependence of imported supplies, dependence of technology, apropiation of large farms by outside owners, concentration in a very few agricultural firms, the seeds and chemicals that we need to produce

This simplification of agriculture will produce effects that will affect the commercial position of Argentina in the meantime: degradation of soils and biodiversity, rural migration, concentration in large farms only producing commodities in a single way of high yielding crops in place of more natural foods that are the willing of the global market, increasing of chemicals over the environment, effects on human health and loss of competitivity in comparison with ours competitors.

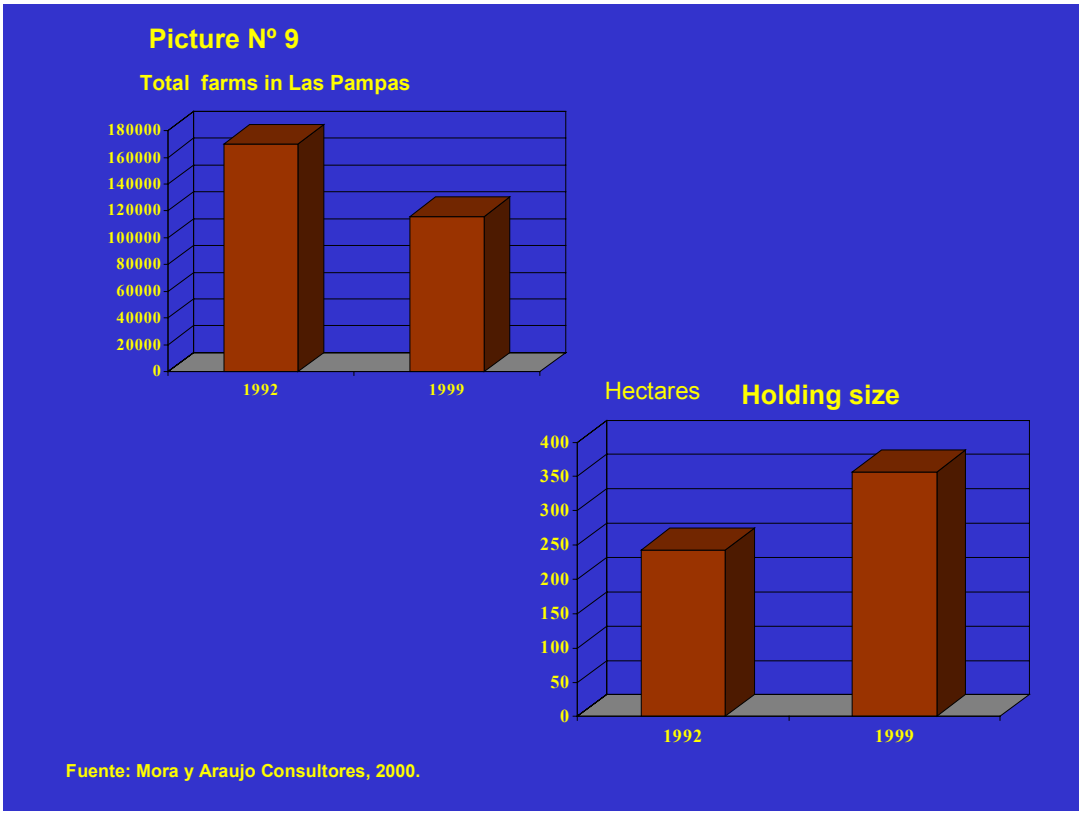
Obviously, the social and economic consequences of the technology package have not waited. Since 1991 and the start of the period of dollar convertibility, changes in mode of production have led to a number of consequences for the agricultural sector:

a) Dependence on imports. Grains and soybean have become the main goods for foreign markets, boosting the dependence on import of the inputs, for this export-oriented mode of agriculture production. Local production of pesticides rise 16,6 %, while 43,6 % are imported and the other 39,8 % are produced in Argentina with imported drugs.
b) Declining profit margins. Most vital for the individual farmer, profit margins have been under pressure. Commodity prices for soybean have suffered a decline of 28 % between 1993 and 1999, whereas during the same period the prices for gasoline, one of the principal ingredients for production have risen by 26 %.
c) Concentration of holdings. New technological package offered in a context of profit margins falling down by half between 1992 and 1999, it makes very difficult to survive for many farmers indebted with bank loans of high interest rates to pay back for these investments in machinery, chemical inputs and seeds. This situation favorites the concentration of holdings and may farmers (especially small and mid growers which were the train of the argentine economy) disappeared. Between 1992 and 1999, the number of farms in Las Pampas declined from 170.000 to 116.000, while the average size of a producer's farm increased from 243 to 357 hectares (Picture Nº 9).

d) Dumping prices. Argentina as many developing countries subsidize neither its farmers nor the goods they produce, but are being affected by those governments that subsidize the production of commodities in developed countries.

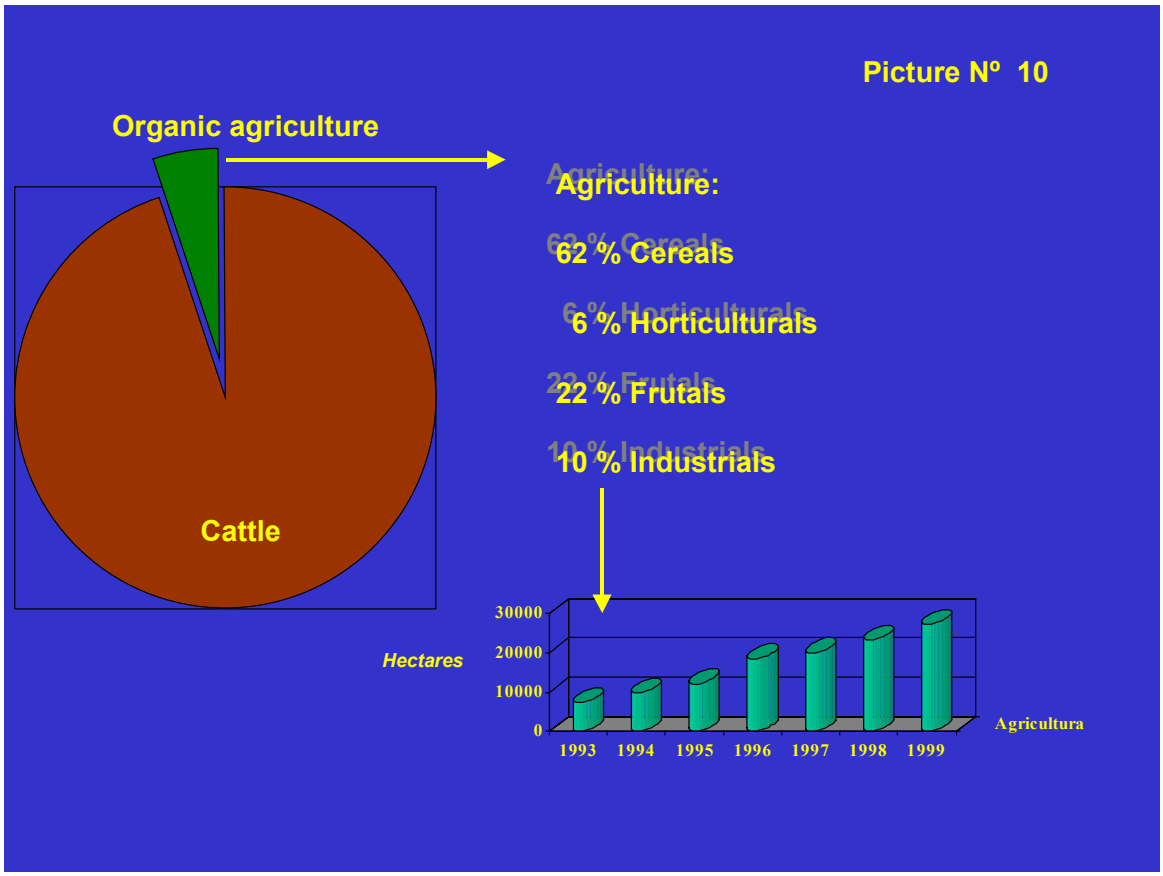
Commoditization or diversification in agriculture

The type of biotechnology under the intensification model that is now being offered to the argentine farmer and the present export-oriented commodity production system is most likely to drive more smaller farmers out of business that are not able to sustain the competition. Probably, big farmers could survive under this technical package if they can maintain the useful of glyphosate as a cheap and effective herbicide, the reuse of seed and



financial support. These frameworks will favorite much more the concentration of agricultural business, under an open market policy that favor a little part of the farmers' distribution gains. But for smaller and mid farms a diversification beyond global commodity market, be they conventional, organic, low input farming, other crops or rotation with cattle under and extensive and natural lands make return the model to a real rotation system – recognizes by its environment restoration and labor intensive – opening a beneficial

window to obtain important profits for mid farmers. However, this would requires a drastic turn in argentine agricultural policy, namely to play a more active role, financing or getting funds to install new projects, new rules for protecting the environment and social system extracting mine agriculture, looking for high incomes markets that know the high quality of natural and regional goods of developing countries. This must include and take into account subsidize small-scale farmers, not to produce the same commodities like large farms, forcing them to buy through the bank loans inputs, seeds or machinery, but to produce alternative and high quality goods, that are the real and need future of the high incomes economies – so impact with negative ways of intensificate mode of production – and which Argentina could have a lot to offer by its comparative advantages and cheaper way of production (Picture Nº 10), avoiding the negative impacts for developing countries of this first wave of biotechnology that force to be implemented.



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