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## **Redesigning public agricultural research and development in Brazil**

Alcido Elenor Wander

Brazilian Agricultural Research Corporation (EMBRAPA), National Goats Research Center (Embrapa Goats), Caixa Postal D-10, 62011-970 Sobral-CE, Brazil, email: [awander@cnpq.embrapa.br](mailto:awander@cnpq.embrapa.br)

### **Abstract**

Agricultural research and development (R&D) has played an important and increasing role in the course of agricultural development all over the world. In Brazil public agricultural R&D was started with the creation of Embrapa at beginning of the 1970s. Since that, Embrapa's contribution to agricultural R&D for tropical regions became well known worldwide. However, in the last decade, Embrapa's R&D focused mainly on agribusiness, neglecting the fact that other groups of rural society, like family farmers and peasants, who are responsible for a significant part of food production, would have different demands than those of large-scale commercial production units. The governmental change which took place in January 2003 represents a reorientation of the whole economy: from a neoclassical model to a social market economy. After decades of R&D on the development of the "Green Revolution-Model" now Embrapa is challenged to open the focus of its work to give answers for demands coming from all groups of the Brazilian society involved in agricultural production, like tenants, peasants, family farmers and large scale commercial farms as well as to provide solutions to increase the workability of whole production chains of agricultural products. Therefore Embrapa's R&D agenda is being redesigned to match better the upcoming challenges, and will concentrate on ten priorities: 1) to prioritize technology transfer to family farms; 2) to consider more environmental questions in research; 3) to support the social programs of the government; 4) to assimilate the concept of multi-functionality of rural areas; 5) to contribute to improve the Brazilian agribusiness; 6) to improve capillarity and social control of R&D activities; 7) to build up institutional arrangements to support spatial development; 8) to develop and to validate practices of organic farming and agro ecology; 9) to generate information and scientific results on impacts of genetic modified organisms on environment and human health; and 10) to consolidate the actuation of Embrapa as an 'arm' of the Ministry of Agriculture, Livestock and Food Supply together with the Ministries of Agrarian Development, Science and Technology, Environment, and specially, with the Extraordinary Ministry of Food Security and the Fight Against Hunger.

### **Introduction**

The Brazilian agriculture was and still is strategic for Brazilian socioeconomic development. Brazilian agriculture supplies staple foods like grains, fruits and meat with security and safety for wellbeing of the society. Many of the fibers used for textile industry and renewable energy are produced by the agricultural sector. Besides these production aspects this sector is responsible for renewing the water sources and preserving other natural resources.

Like in other countries, the relative importance of Brazilian agriculture in domestic income generation decreased through economic development in last decades, representing about 10% at

the end of last decade. But agriculture has raised its importance with the impacts caused through backwards and forward linkages. With the generation of about 30% of Brazilian GDP and 37% of all jobs the agribusiness represents the main sector of the economy. The trade balance of 2002 was kept positive only because of the exports from this sector.

The Brazilian agriculture has been the main instrument to effectively conquest the national territory. Some decades ago agriculture advanced through western region of the states of Santa Catarina and Paraná, conquest Mato Grosso do Sul State and more recently, occupies large areas of the “cerrado” in the states of Mato Grosso, Tocantins, Maranhão, Piauí and Bahia. Together with the introduction of agriculture, supplying facilities (industry of agricultural machinery, equipment, fertilizer etc.) and processing units are being installed. The meat complex complements the whole process, particularly the pork and poultry production. Thus the occupation process is being consolidated and the benefits of economic growth are homogeneously distributed.

Agricultural research institutions have given an important contribution to the agricultural expansion process and the increases in productivity of crops and animal production observed during the last decades in Brazil.

### **The national agricultural research and development system**

The National Agricultural Research System consists of universities, research institutes and state research corporations. They are distributed over the whole territory and operate interlinked according to the necessities of each institution’s work.

The Brazilian Agricultural Research Corporation (EMBRAPA) coordinates the National Agricultural Research System (NARS) with cooperated institutions carrying out research in geographical areas or in defined fields of scientific knowledge.

EMBRAPA’s mission is to provide feasible solutions for the sustainable development of the Brazilian agribusiness by generating, adapting and transferring knowledge and technology that benefits the Brazilian Society.

From the very beginning, on April 26, 1973, EMBRAPA has generated and recommended more than nine thousand technologies for Brazilian agriculture, reduced production costs and helped Brazil to increase the offer of food while, at the same time, conserving natural resources and the environment and diminishing external dependence on technologies, basic products and genetic materials.

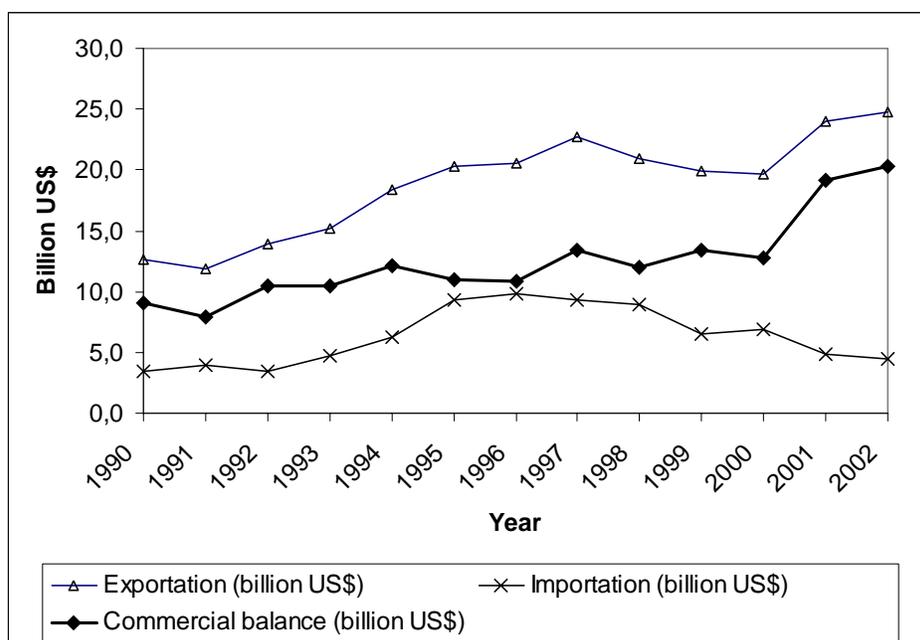
Networking through 40 research units distributed throughout the country with the headquarters located in Brasília, EMBRAPA is present in almost all the states of the Union, each with its own ecological conditions. EMBRAPA’s purpose is to develop technology that helps increase agricultural yields, at lower costs and without damage to the environment. There are 8,530 employees in EMBRAPA, of which 2,045 are research scientists working on different areas, products and ecosystems, connecting agriculture, livestock farming, agro industry and environment. At present, the company's staff includes 2,045 researchers, 49% of whom hold doctoral degrees and 47%, Master's degrees.

EMBRAPA has ongoing technical and scientific co-operation programs with more than 150 institutions from 56 countries in order to perfect knowledge of technical and scientific activities or to share knowledge and technology with other countries.

EMBRAPA’s research has enabled Brazil to significantly increase grain production. Since 1973, when EMBRAPA was created, soybean production has increased by 360%; maize, by 128%; wheat, by 49%; and rice and beans, by 27%. Research has also enabled farmers to produce soybean in the “Cerrado”, to eliminate numerous pests and to grow fruit in the semi-arid region. It has also developed alternative logging techniques that prevent the destruction of forests.

## The performance of Brazilian agribusiness

Since 1990 the Brazilian agribusiness has been characterized by a continuous increasing trend. Figure 1 shows the trend of exportation, importation and commercial balance of Brazilian agribusiness 1990-2002.



Source: CNA & CEPEA (2003).

**Figure 1. Exportation, importation and commercial balance of Brazilian agribusiness, 2002**

From economically active population, 27% worked in agriculture considering backward and forward linkages (IBGE, 2003).

From a GDP of 373 billion US\$ about one third were generated by agribusiness. Agriculture alone was responsible for 9.5% of GDP in 2002 (Table 1).

**Table 1. Brazilian GDP: general, agribusiness and agriculture, 2002.**

Item	Amount (1,000,000 US\$)	Participation in GDP
Brazilian GDP (2002)	US\$ 373,042	100.0%
GDP of Brazilian agribusiness	US\$ 119,780	32.1%
GDP of Brazilian agriculture	US\$ 35,512	9.5%

Source: CNA & CEPEA (2003); IBGE (2003).

Brazil exported 60 billion US\$ in 2002. About 41% (24.8 billion US\$) were agribusiness products. The main agribusiness products exported are presented in Table 2. With nearly one fourth of agribusiness exportations the soybean complex represents the main product group of Brazilian exportation portfolio.

These figures show how important the achievements in Brazilian agribusiness have been for the whole economy. Looking to these figures it could be asked: what is wrong if agribusiness grows more and more?

**Table 2. Main agribusiness products of Brazilian exportation portfolio, 2002**

<b>Product</b>	<b>US\$ 1,000,000</b>	<b>% participation in total</b>
Soybean complex	5,963.53	24.01
Meat	3,062.31	12.33
Sugar and alcohol	2,262.79	9.11
Leather and shoes	2,341.38	9.43
Paper and cellulose	2,055.56	8.28
Timber and its products	1,765.36	7.11
Coffee	1,362.02	5.48
Tobacco	1,008.17	4.06
Juices and Fruits	1,409.93	5.68
Others	3,607.85	14.52
<b>TOTAL</b>	<b>24,838.90</b>	<b>100.00</b>

Source: Brazilian Ministry of Agriculture, Livestock and Food Supply.

### **The “neglected beneficiaries”**

During its history the Brazilian public agricultural research system (ARS) has focused on development of technologies aiming agribusiness development. However, during last decade the rural society, defined as all society members involved in rural economy, became more and more diversified. Where earlier only large farms of different sizes existed, now many family farmers and land reform settlement farmers live and produce an important part of food consumed by urban population.

For many years the public agricultural research system had neglected the fact that these beneficiaries would have different demands than the of large-scale commercial production units. Small scale producers are generally poor in capital and land. Most of the technologies developed, however, demanded at least high amounts of capital (fertilizer, pesticides, irrigation, etc.) to be effective in productivity increasing.

### **Time of focus re-orientation**

Since less than ten years ago research scientists started to establish on-farm observation and demonstration trials. This was an important step moving from research station to farm level. The technology prototypes developed on station started to be tested by farmers before they became considered as “recommended”.

The governmental change which took place January 2003 in Brazil represents a reorientation of the whole economy: from a neoclassical model to a social market economy. After decades of R&D focused on the Green Revolution Model now the research system, and particularly EMBRAPA, is challenged to open the focus of its work to give answers for demands coming from all groups of the Brazilian society involved in agricultural production, like tenants, peasants, family farmers and large scale commercial farms as well as to provide solutions to increase the efficiency of whole chains of agricultural products. Therefore EMBRAPA's R&D agenda is being redesigned to match better the upcoming challenges. EMBRAPA's is now being re-oriented in a way that the focus becomes broader. Beside of the focus on agribusiness and strategic areas of biotechnology, now family farming becomes one of three main target areas. Basically EMBRAPA will concentrate its efforts on the following ten tasks:

- 1) Prioritize technology transfer to family farms: As family farms did not have sufficient access to technologies in the past, from now on more efforts will be done by EMBRAPA in order to prioritize technology transfer to those beneficiaries in order to enable them to be integrated into the production chains and therewith into the markets.

- 2) Consider more environmental questions in research: Since the creation of EMBRAPA based on the Green Revolution development model more and more importance is being given to environmental aspects mainly because of the unwished impacts caused by technologies developed through the time. The consideration ex-ante of potential environmental impacts shall contribute to develop technologies that assure more sustainability to agricultural activities.
- 3) Support the social programs of the government: As governmental change which took place in January 2003 is focusing more on programs aiming at more equity and access to resources in order to satisfy all basic needs of Brazilian population, EMBRAPA as a public institution is also been challenged to give its contribution to these programs in achieving their goals.
- 4) Assimilate the concept of multi-functionality of rural areas: For several years the development agents including agricultural research system considered as “rural” only those activities directly connected to agricultural production. Since more and more non-agricultural activities are being carried out in rural areas in order to improve livelihoods of rural population all public institutions are asked to give answers for rural issues, and not only agricultural issues like before.
- 5) Contribute to improve the Brazilian agribusiness: As agribusiness is responsible for about one third of Brazilian GDP and 40 percent of jobs, EMBRAPA is one public institution that has an important contribution to give in order to improve efficiency and international competitiveness of Brazilian agribusiness.
- 6) Improve capillarity and social control of R&D activities: In a time of scarce resources being used for agricultural research those activities which will have more positive impacts on different levels of society need to be prioritized. Beside of that the tax payer is asking for more transparency in public resources use to reduce unnecessary costs for the whole public sector and to assure that the society’s needs are being prioritized instead of the researchers personal interests.
- 7) Build up institutional arrangements to support spatial development: After several years of working in an isolated way, institutions are more and more being required to interact more with potential public and non-governmental organizations to take advantage of potential synergy effects and to avoid shadowing of working. The integration of different institutions’ work can provide more holistic approaches that will favor sustainable and equitable development in geographic areas with close social and economic relationship.
- 8) Develop and to validate practices of organic farming and agro ecology: As the environmental impacts of pesticides use were catastrophic in many regions and the demand for food been produced under healthy and sustainable conditions increase, organic farming is becoming more important in all regions. Not only the better marketability of produced food, but the sustainable use of natural resources that ensure that future generations will have access to a resource base that may permit their livelihood are motivating more and more farmers to change their production patterns.
- 9) Generate information and scientific results on impacts of genetic modified organisms on environment and human health: Until now very little is known about the impacts of genetic modified organisms on environment and human health. Scientific research that can predict such impacts is needed and EMBRAPA is going to concentrate efforts to find answers for theses uncertainties.
- 10) Consolidate the actuation of EMBRAPA as an 'arm' of the Ministry of Agriculture, Livestock and Food Supply together with other Ministries: Although EMBRAPA is an institution of the Ministry of Agriculture, Livestock and Food Supply, its work refers to some other Ministries, like Agrarian Development, Science and Technology, Environment, and specially, with the Extraordinary Ministry of Food Security and Safety. Therefore EMBRAPA is challenged to give answers to and to interact with other Ministries and their institutions to consolidate the planned governmental for the different regions.

These ten areas are now being considered as priorities within EMBRAPA.

## **Conclusions**

Agribusiness plays a central role in Brazilian economy. Agricultural research contributed to this achievement. However, not only large-scale commercial farms are involved in agricultural activities.

The re-orientation which is taken place in Brazilian agricultural research and development system brings new opportunities to strengthen agricultural and rural development.

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