

Embrapa

A successful case of institutional innovation

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Embrapa is a case of successful institutional innovation that has as main characteristics: a public corporation model of organization; scale of operation at national level; spatial decentralization; specialized research units; enhanced training and remuneration of human resources and a vision of an agriculture based on science and technology. Moreover, from the beginning the organization has always been result oriented. Based on the perception of one who has participated in its life from the beginning, first as one of the formulators of the Embrapa project, then as a leader for twelve years – both as director and president, and finally as a researcher, I will try to describe the main factors that paved Embrapa's road to success.

The support of the federal government

This support has been critical to the survival of Embrapa. In the early years, it took the form of the federal government having understood the importance of technology for the development of agriculture. Once the results proved Embrapa could be profitable as an option for the government, the battle for budget support remained, but it takes place in an environment where the corporation is one of the priorities of government, both in the sphere of executive and the National Congress.

In the first twelve years of its existence, Embrapa was a promise: of bold and mod-

ern design, but still a promise. During those twelve years, huge investments were made in the training of human resources and infrastructure – about six billion dollars in 2008 value. The federal government paid for this investment based on the promise that Embrapa could be for the modernization Brazilian agriculture. Without the support from the federal government, Embrapa would not have been possible.

But Embrapa's management has always been aware of the risk that the lack of achievements represented. For this, it led the research centers in a portfolio of research with short-term goals and to the conclusion of research already in progress. Moreover, it also gave special attention to the dissemination of existing results. And the media had a key role in creating the image Embrapa has. It is clear that the media not only operates on top of achievements, but also upon a consistent promise, provided it is not for long. In the early years of life of the corporation, the media bore the promise consistently, even in light of few existing results. This support was crucial to create a favorable image in society and in government. So, it has to be registered how important the development of competence to relate with the press, was for the success of the Embrapa. This relationship helped the government to justify the investment, over a period of lean achievements.

Figure 1 shows the support given by the government in terms of total spending of Embrapa (government support was 90–95% of

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the budget during this period). It grew rapidly in the period 1974–1982, reached a ceiling in 1982, and experienced a fall in the period 1983 to 1984. It subsequently grew, with smooth swings, from 1985 to 1996, which was the peak year during the period from 1974 to 2008. A fall was observed in the period 1997–2002, but this was greatly influenced by the macroeconomic adjustments of the Real Plan. In 2003, spending resumed a growing trend.

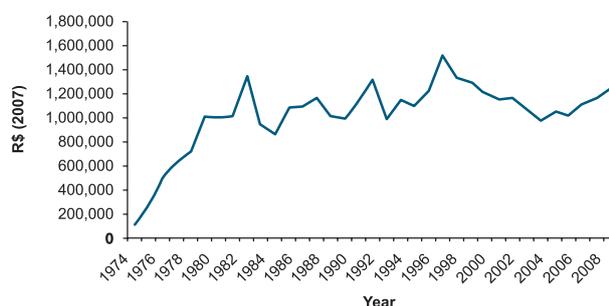


Figure 1. Government expenditures with Embrapa in reais for 2007 (values adjusted by the IGP-DI; PLOA + PAC in current values).

Source: Embrapa/DAF.

In a period of many macroeconomic imbalances and non-orthodox policies to deal with then, it is surprising that Embrapa’s budget support did not falter, which only shows the decisive support the federal government gave to it. At the stage where Embrapa was only a promise, the expenditures of Embrapa evolved linearly until 1982. This was essential to consolidate its image. From 1982 onwards, the corporation was no longer a promise, and its success will explain the government’s continued investments.

The impact of the theory of induced innovation

The theory of induced innovation emphasizes the interaction of farmers with the re-

searchers; this interaction indicates the priorities for research, within public research institutions. For private research institutions the market acts directly, otherwise, the technology developed would not find buyers.

In the public research, the market influence is indirect. It creates, among farmers, demand for certain type of technology, say the technology that saves land, and farmers, responding to that demand, signalize their needs to researchers, who respond with research that generates technologies that increase the productivity of land. Labor is now the expensive component, as compared to land, so farmers are pressuring the researchers for technology that replace men by machines, and scientists respond in line with the demands outlined by decision-makers, directly or in specialized publications or the media.

At the macro level, it is important to understand if the macro economic conditions require an institution of research. At the beginning of the 1970s, conditions were ripe for Embrapa: there was a food supply crisis, mainly caused by a rapid displacement of the population from rural to urban areas. This also caused high prices for basic foodstuffs, queues in supermarkets, social unrest. Any increase in production would also find a readily available opportunity to increase exports, which would help to keep the high rates of growth the economy, was experiencing at the time. Alongside this, the conviction existed that increasing the area used for cultivation and pastures would not be enough to keep pace with the rates of economic growth at the time and potential demand. Still, the stock of knowledge was largely insufficient. So, on the macro economic level, there was enough pressure and understanding to reform public research in agriculture: a typical case of induction of institutional reform, as provided by Hayami-Ruttan (1971). Thus, Embrapa was created, when conditions were very favorable for its success.

To facilitate the interaction with farmers and society, the model chosen was decentral-

ized in the territorial dimension and organized by priorities in the following order: level of product, resources and themes.

At national level, the model requires strong interaction with decision-makers, at the level of Presidency of the Republic, Congress and Ministries. Embrapa gave priority to have staff capable of interacting with the political powers and other agencies as equals, in terms of competence. Embrapa gave priority to transparency, to assessing the social and economic impact of its investments, and moreover has always given priority to dealing with the media. Even more, Embrapa is prepared to capture, interpret and internalize the signals coming from a society as complex as ours, and also to the international market, since the needs of interaction crosses national borders.

Option by the public corporation model

The option taken in 1972, to organize Embrapa as a public corporation, was a bold decision of the government to release Embrapa from the bureaucratic rules used in the public administration. This gave it the flexibility to administer resources and personnel, to plan, to assess performance, to implement the budget, to disseminate results and to be transparent.

The model allowed Embrapa to develop its own personality, which has characterized it in the national and international scenario as an unique example in the field of public research. This personality obviously is derived from the results collected, which facilitated Embrapa's relationship with the government and helped it to gain the sympathy of society. The symbol of that personality is crystallized in the brand-name Embrapa, which today opens the door to the relationships with institutions from government, private sector and a large number of countries.

Choosing CLT² gave much more flexibility in the administration of personnel, construction of several careers, especially that of researcher, and in designing and implementing a personnel evaluation policy. As a public corporation, the relationship with the outside world and with the particular initiative is much easier.

Scale and decentralization

Many wished that Embrapa would be small and only coordinated a research program run by the existing institutes and universities. This option was rejected because it was soon realized that, in a country of continental dimensions, the success of Embrapa depend on its size and an accumulated critical mass of researchers, diverse for talent, and branched throughout the national territory. It was understood that Embrapa needed to have the scale as large as Brazil and that it needed to have its own research network, so it could be direct responsible for the results, allowing it to be well known and evaluated on its own merits. This model would also allow for it to seek cooperation with universities, research institutes, private sector and overseas in a position of equals. Being large, diverse and decentralized, Embrapa would have conditions to represent the federal government in an area as important as agriculture and receive priority, both in the allocation of resources and with regard to institutional development.

It was very important for Embrapa to have a presence throughout the national territory. This presence helped to attract sympathy of the state governments and the National Congress. Embrapa has a marked the presence in the Federal District. Here are located Embrapa's Headquarters, Embrapa Cerrados, Embrapa Vegetables, Embrapa Genetic Resources and Biotechnology, Embrapa Agroenergy, and Embrapa Technology Transfer with its Business and Dissemination of Technology Offices. The units in the Federal District are an important window of

² CLT – Hiring of personnel using laws governing the private sector instead of civil service laws.

Embrapa. Being in the proximity of power, they have had important role in helping establish and solidify the image of the corporation near the central power and the international market.

A concentrate organization model for the research units

Embrapa research units are distributed throughout the national territory and are specialized in products, resources and themes. For example, farmers know that the unit responsible for maize research is Embrapa Maize & Sorghum, located in Sete Lagoas, Minas Gerais. Maize producers know where to go with demands for information and results, which will give them ownership in the center, providing help with the political leadership and the economic area of government. Similarly, researchers have the exact notion of their responsibilities, and no ambiguities regarding goals and actions needed. Even more, there are strong ties of solidarity and spirit of corps, as if all employees are committed to having a winning team. Thus, Embrapa's model has aimed to facilitate and encourage the interaction researcher-farmer and researcher-society. It had an important role in preventing the dispersal of efforts, which is one of his pillars, and is an objective way of identifying priorities for research.

Human resources

The human resources policy is one of the main reasons for Embrapa success. The policy aims to develop the human capital of the corporation and it is from this capital that Embrapa derives its success. To stimulate creativity and by creating an environment that encourages coexistence is another specific role of this policy. The policy is based on the following specific points:

- 1) The establishment of a career that stimulates the desire to study and progress.

It has three levels (called positions), where the level I is for someone who holds only a bachelor degree, level II for those with master's and, finally, level III is for those who hold doctorate degree. Each level has several sublevels.

- 2) A level of salary that allows the researcher to have a dignified living with his family based on the salary Embrapa pays him.
- 3) A retirement plan, with voluntary membership, paid by Embrapa and the employee, to support old age. The plan aims to supplement the retirement of the public social security.
- 4) A health plan paid by Embrapa and the employers, with two purposes: support the researchers and his families for expenses in health care, and preserve the health of researchers, which is the most important capital of the corporation³.
- 5) A series of activities to stimulate the researcher to accumulate knowledge and experience, allowing him or her to be productive and to love the Embrapa. There is a complex system of promotion on merit, based on individual, group and the research unity. The aphorism, ingrained in Embrapa, says that every year it has to deliver technologies to justify to society the investments made and produce better-trained researchers. Thus, there are two products that Embrapa has to deliver – researchers always more competent and technologies.
- 6) A training program at post-graduate and post-doctor levels, that meets both the interests of the corporation and researchers, and which seeks to train them at the same levels of the best centers of advanced countries.

³ The health plan is for all employers, and its reason for being applies to all.

- 7) The corporation recognizes that the technology generated incorporates the effort of all its employees. Thus, the training program is available for everyone, but post-graduate training focuses on researchers, but it is not exclusive of them.
- 8) Each research unit has a critical mass of researchers. It is organized around a specific target audience, a clear main problem to solve and the team's responsibility towards society. Each unit is in itself an instrument of concentrated effort in research and provides a work environment that encourages human development, creativity and sense of usefulness to society.
- 9) Embrapa seeks to stimulate the researcher to be an entrepreneur in his field, to seek resources, to interact with the outside world and ensure the dissemination of technology. Commands another aphorism: research results in the drawer of the researcher, means that; it did not result in anything or the researcher is not good enough, or both.
- 10) Embrapa's communication program aims to provide accountability for work, actions to disseminate research results, giving the corporation visibility and transparency and valuing its employers. This communication program is organized around many ceremonies, some connected with the anniversary of the corporation and the research units, carried out in other seminars, symposiums in Brazil and abroad, and they all provide opportunities for learning and enhancing the employers. Thus, the communication program is also considered part of the human resource development policy, but with independent living.
- 11) Although the corporation is always looking for opportunities to improve its

human capital, one has to plan for the future and the principle of orderly replacement has to prevail. In Embrapa's case the goal is to maintain an average age of 45 years old for the PhDs, imagining the following guideline: on the average a researcher should be finish his Ph.D. work around 30 years old, which would leave him with a horizon of around 30 years of productive work. Half of this is 15. So, 15 years should be added to 30, comprising 45 years. Thus, on average, a young doctor has 15 years of work alongside senior researchers. A complementary strategy is for the creation of conditions that would allow for competent and outstanding retiring researchers to continue doing some kind of work with Embrapa. There is much to be done in this regard.

- 12) In the beginning, an enormous effort was made to integrate the researchers to the spirit of Embrapa, in training courses, meetings and direct communication from the direction of the corporation. As the corporation was young, a world of opportunity was opened to those who joined the effort. The leadership did not have time to stratify on a separate level. For this and by having the support of society, there were no major difficulties to develop the spirit Embrapa. Today, the fame of Embrapa helps to develop the spirit Embrapa, but we should not overlook this point.

In research, it is natural over time that seniority develops, that is how leadership solidifies, founded on knowledge and recognition. If these leaders do not have the ability to integrate with new researchers as part of their work, they will be disappointed to learn that they have no help to develop their careers. This disappointment can be transformed into rancor, leading quickly to an anti Embrapa attitude. This kind of problem cannot be solved by employing more

democratic procedures. What should be done is to find mechanisms for promotion for those who can work in teams and spread their knowledge. Procedures have no place in making a competent researcher share more than what he has already reported in text or oral communication. However, a competent researcher has much more to offer.

Independence from politics

Independence from politics does not mean isolating itself from politicians. It means to have a close relationship with them, but having the nation interests first. This independence has been built over the life of Embrapa. There were crisis, few but they happened, caused by interference from those who wanted to force the corporation to violate its principles. But they were overcome with skill. There was a leader who went against the principles of the model, but he was soon replaced.

Embrapa has found a form of coexistence with power, which has guaranteed independent and competent leaders. Hiring by open public selection and the process of selecting the leaders of the research units are instruments that have promoted coexistence with the politicians.

Politicians represent Brazilian society. For this, it is important that they take part of Embrapa's life, as it pertains to directions, priorities for research and institutional development. We must learn to work with them, understand their role and help them understand our role. In an organized way, it is necessary for Embrapa to have a presence in the National Congress, taking part of the work of committees, when convened, and lobby for the allocation of resources for science and technology.

International opening

Embrapa was open to the outside very early in its life, when the external exposure of the Brazilian economy was still very small. This

openness was very important for the following reasons:

- a) Helped to create the image of the corporation abroad, thus facilitating the relationship with the donors, countries, universities and organizations of research. The good image abroad has had strong repercussions in the federal government bringing dividends in terms of support and budget.
- b) It gave an international dimension to Embrapa, in terms of horizon, quality of research, and as an instrument of foreign policy of the country.
- c) Created new parameters for measuring performance of scientists, in terms of self-evaluation.
- d) Helped in the understanding that in a globalized world science is also globalized and it is very important to improve the relationship mechanisms with the outside world, in terms of countries, universities, funding bodies, organizations and research up to the scientist-scientist level.

Embrapa, throughout its life, keeps a strong post-graduation program, sending researchers to several countries, the vast majority to the United States and Europe, and to a lesser extent to United Kingdom, Canada, Spain, Holland, Germany and Australia. The good performance of students helped to form important relationship bridges with the academic world abroad.

Projects financed by the World Bank, Inter-American Development Bank and Japanese government have been very important to equip Embrapa and to finance the post-graduation program. Furthermore, because they have been well implemented, helped to solidify the image of Embrapa, as a serious and responsible corporation.

Embrapa has agreements with several countries and research organizations. In the United States, with several major universities

and the USDA; in France, with the INRA, CIRAD and IRD, and in Japan, with JICA and JIRCAS. At project level, there are numerous agreements involving several countries. Recently, Embrapa has extended its actions to Africa and Venezuela.

The ties of Embrapa with the CGIAR extends to its origin, and the relationship with the International Centers has brought many good results for both sides, and this relationship especially at the beginning of Embrapa, was very important to set directions for research and for training scientists. In Embrapa's mature phase, the relationship is still very important for Brazil and for joint work in Africa, Latin America and Asia.

Aiming to establish the presence of Embrapa abroad, Embrapa has created the Virtual Labs Abroad (Labex). Initially, in the United States, through an agreement with ARS USDA. This agreement has allowed Embrapa to have senior scientists working together with American scientists, and also seeks to establish permanent links between scientists of both countries. There is a detailed plan setting out goals and topics of work. Similarly, American scientists may work in Brazil: it is a two-way bridge.

Given the success of Labex in the United States, Labex Europe was created based in Montpellier (France), with further presence in Holland and England, more recently, by separate agreements with these countries. It is under study the creation of Labex Asia, thus covering the presence of Embrapa scientists at the three major regions of knowledge generation in the world: North America, Western Europe and Asia.

The success of Brazilian tropical agriculture motivates poor countries to seek information and support for technology transfer from Embrapa. Besides the traditional instruments of support, the direction of the Corporation has decided to have researchers in less developed countries, creating Embrapa Africa, in Accra (Ghana) and Embrapa Venezuela, in Caracas. It is also planned to create a structure in Cen-

tral America, at the request of the governments of that region, to work with countries of Latin America and the Caribbean. The goal is to transfer knowledge and technology in tropical agriculture and to look for opportunities in licensing Embrapa's technology.

Both the Labex model – sharing research with developed countries – or the structures of transfer of technology in developing countries, are flexible models that can be expanded with new scientists or by transfers of scientists among countries, according to the interests of Embrapa. The goal is both benefiting agriculture and helping to combat hunger in developing countries⁴.

Decisive results

Achievements are what have consolidated Embrapa with the government and public opinion. But there was a result that has been decisive in shaping the brand Embrapa. It happened: the redemption of the cerrado (Brazilian savannah) for modern agriculture. The contribution of Embrapa has been fundamental and was perceived by society that its participation was crucial for the success of agriculture in the cerrado, in terms of new varieties, cultural practices, zoning, tillage, biological fixation of nitrogen, development of livestock for both meat and milk, vegetables, fruit, irrigation and knowledge of the cerrado natural resources basis.

With the inauguration of Brasília in 1961, the federal government undertook the construction of a road and rail network, linking the capital to key cities in the South, Southeast, Northeast and North regions. It also built airports and the communication infrastructure.

The federal government created a program of credit on large scale, which financed the recovery of land and introduction of modern agriculture. As the region was almost a demographic vacuum, the program stimulated migration of farmers from southern Brazil for the

⁴This section had the cooperation of Elisio Contini, Head of ACI and a researcher with Embrapa.

cerrado. Afterwards farmers from the Southeast also came. Much more advanced in modern agriculture than the native population, migrants sold their small properties, bought much larger areas and opened the land, creating the agriculture that now characterizes the region. Few natives became modern farmers. It is important to note that since the migrants had experience in managing agriculture, they immediately sought to apply the technologies developed by the research institutions. Therefore, the cerrado is a typical case of replacement of the local culture by another, more agriculturally advanced.

Embrapa has major research centers in the Central-West region, where the capital Brasília is located. These centers sought and still seek to resolve problems of the cerrados. Embrapa Cerrado (specific to the cerrado), Embrapa Vegetables (crops), Embrapa Genetic Resources & Biotechnology and the headquarters of Embrapa are located in the Federal District, Brasília. Outside of Brasília, but in the Central-West, are Embrapa Western Agriculture in Dourados; Embrapa Rice & Beans, in Goiânia; and Embrapa Beef Cattle, in Campo Grande. Embrapa Maize & Sorghum in Sete Lagoas is located in the Southeast Region, but its ecosystem is also in cerrado. Thus, organically Embrapa gave high priority to the cerrado. Furthermore other centers located in the southeast and south have dedicated part of their research agenda to the Cerrado. Those centers are: Embrapa Soybean, in Londrina; Embrapa Wheat, in Passo Fundo; and Embrapa Dairy Cattle.

The federal government established universities and post-graduate courses in all states of Cerrado region – Distrito Federal, Goiás, Tocantins, Mato Grosso and Mato Grosso do Sul and stimulated the universities from other regions to invest in research to solve problems of the cerrado. These universities with Embrapa created a network capable of carrying out research with depth and quality.

It was very important the cooperation of the United States, Japan, France, the World Bank and Inter-American Development Bank,

but also of the system CGIAR International Centers. The development of the cerrado exemplifies a success story of international cooperation: the governments and research institutions such as universities and international centers.

In the 1970s, prices of grain and meat were very high, and those high prices in conjunction with ample and subsidized credit, contributed to modern agriculture, which has a large capacity to respond to incentives, that quickly overcame the traditional extensive model of exploitation. There was, in the period 1970–2008 alternation of high and low prices. In those periods of high prices, modern agriculture has gained ground. In bad times, it held position, but never went back. But it is noted that high prices led to modern agriculture, because the technology base had been established.

Exposure to the media

The Embrapa has always been focused on results, and results that are easily understood by society. However, the question is: what makes a result to be easily understood by society? This is a complex issue that has much to do with daily needs such as cheaper food, but also has much to do with symbols, such as those related to national pride: being the largest exporter, have high rates of productivity growth and have a powerful agribusiness. Thus, between the success of the scientist who created a given technology, and the propagation of this success by the media, a large time-frame exists, in which the scientific event is transformed to be understood by the public as a success, at the appropriate dimension; be it international, national, regional or local levels. Even more, to make it a symbol of national pride, where appropriate.

Two groups of organizations are involved: Embrapa, with its specialized staff, and the media. The specialized staff is required to link the media to the results achieved, or to facilitate and stimulate the connection when it is already in progress. Thus, the relationship of Embrapa-media is a very specialized task and requires special talents.

The second group of organization is the media that has great interest in disseminating news and in reviewing the accuracy and originality of them, but has difficulties with the technical jargon and the way scientists communicate.

Placed in another way, the media is a complex set of private organizations, multiple objectives, which may be interested in disseminating the news that Embrapa creates, because their customers so demand. Scientists of Embrapa also want to reach society with its results. It is the responsibility of Embrapa communication professionals to establish the means and processes by which the connection between the media and Embrapa takes place with the minimum of noise as possible.

From the beginning, Embrapa sought to develop a group of competent professionals, as well trained in their areas of expertise as their scientists. This group supported and gave it prestige. This has helped to create strong ties between the corporation and the media: results were well publicized, both in Brazil and abroad. And more than one can imagine, Embrapa has become a symbol of national success. And it gave Embrapa an international dimension.

How to measure the impact of communication?

If all the knowledge inputs were incorporated in the growth of them, their growth would equal the growth of the product, and the difference between the two rates of growth – growth rate of input and product – would be zero. Note that one pays for the knowledge incorporated in the input, when one makes a purchase. If the rate of output growth is greater than that of input means that the society is benefited without having to pay for the cost of generating the new inputs. Where is the gain? Of the knowledge that are not incorporated in the inputs.

Example – A new cultivar of soybeans is created, the new cultivar incorporates new

knowledge, and the market will charge the price to sell the seed. Furthermore, it is found that there is a better spacing to make the planting. In case the new spacing is not incorporated in the seed, it also applies to other cultivars. And the market will not charge the price of the new spacing. What is the gain? In this case is simple. Let us say that productivity grew by 5% because of the new spacing. The gain, free of payment, is 5%. Who has this gain? Society has. How was this possible, since there is no free lunch? It is the work of the media, which does not charge directly for the work of diffusion and, therefore, this benefit can be attributed to all of the area of communication of Embrapa with the media. What size since is the benefit? During 2000–2007, 87% of the total productivity gains in agriculture were attributed to excess growth of inputs, by which society has not paid (GASQUES et al, 2008). Therefore, the dissemination of the results was of vital importance in boosting the productivity of agriculture, and this is genuine work of the media and from the Communication Office of Embrapa, in what concerns it.

References

- ALVES, E. Inovações na agricultura. In: BUAINAIN, A. M. (Coord.). **Agricultura familiar e inovação tecnológica no Brasil**: características, desafios e obstáculo. Campinas: Editora da Unicamp, 2007.
- ALVES, E.; SILVA, R.; FONSECA FILHO, J. P. Formação de recursos humanos e novos tempos. **Revista de Política Agrícola**, Brasília, DF, v. 14, p. 63-72, out./dez. 2005.
- EMBRAPA. Departamento de Gestão de Pessoas. **Plano de Carreira da Embrapa**. Brasília, DF, 2006. Disponível em: <https://intranet.embrapa.br/administracao_geral/pessoal/politica_de_pessoal/plano-de-carreiras-da-embrapa/pce-2006>. Acesso em: 5 maio 2010.
- GASQUES, J. G.; BASTOS, E. T.; BACCHI, M. **Produtividade e crescimento da agricultura brasileira**. Brasília, DF: Mapa, 2008.
- HAYAMI, Y.; RUTTAN, V. W. **Agricultural development: an international perspective**. Baltimore: John Hopkins, 1971.