
Embrapa Technological Information: A Bridge Between Research and Society

Patrícia Rocha Bello Bertin, Fernando César Lima Leite, and Fernando do Amaral Pereira

ABSTRACT: This paper presents the efforts undertaken by the Brazilian Agricultural Research Corporation regarding Science and Technology information management, through one of its Decentralized Units, Embrapa Technological Information. The major aim of this Unit is to promote and improve the processes of scientific communication—information that feeds and that results from research activities—and of science and technology dissemination—information that results from research activities and that is directed to the general public.

RESUME: Cet article présente les efforts entrepris par la Corporation de recherche agricole brésilienne pour la gestion de l'information technologique et scientifique, à travers l'une de ses unités décentralisées, appelée Informations technologiques Embrapa (SCT). L'objectif majeur de l'SCT est de promouvoir et d'améliorer les processus de la communication scientifique

Introduction

In today's globalized world, the minimization of time and space barriers favors the integration of diverse societies, cultures and economies. This has intensified the global exchange cycle, in which importance is assigned not only to increased financial capital flows, but also to another asset, both intangible and hard to quantify, albeit eminently productive, i.e. intellectual capital. Intellectual capital is the sum total of the knowledge of all workers in a given entity, agency, company, or institution, together with the efficacy of its management systems and a good relationship with the target population of the products or services of the organization.

The Brazilian Agricultural Research Corporation (Embrapa) has a long tradition of working to generate information and knowledge. The activities of one of its Decentralized Service Units, Embrapa Technological Information, or Scientific and Technological Information Service (SCT), and the organizational structures that preceded it, are based on the premise that when information management processes are properly conducted, the relationship between the institution and its target populations will be efficient and effective, whether for scientific communication or scientific dissemination. Thus, SCT's strategic guidelines generate lines of action that are first translated into projects and then into information services and products. These strategic guidelines are designed to support research, development and innovation (RD&I) activities and address social development demands.

The purpose of this article is to show how Embrapa

(l'information qui nourrit et qui résulte des activités de recherche), et de la diffusion technologique et scientifique (l'information qui résulte des activités de recherche et qui est dirigée vers le grand public).

RESUMEN: Este artículo presenta los esfuerzos que ha hecho la Empresa Brasileña de Investigación Agropecuaria en el campo del manejo de la información, a través de una de sus unidades descentralizadas conocida como Información Tecnológica de Embrapa (SCT). El propósito principal de SCT está en la promoción y el mejoramiento de un doble proceso: el de comunicación científica—es decir, la información que llega a la investigación científica y la que ésta produce—y el de diseminación de la ciencia y la tecnología—o sea, la información que resulta de las actividades de investigación y que está dirigida al público en general.

has used SCT to manage, organize and disseminate information.

An Introduction to Embrapa

Embrapa was formed some 35 years ago to “provide feasible solutions for the sustainable development of Brazilian agribusiness through knowledge and technology generation and transfer.” It has built a national and international reputation as a leading tropical agriculture RD&I company. As such, it has been courted by diverse countries and multilateral organizations wanting to capitalize on its success.

Embrapa is currently comprised of 54 units: 38 devoted to research, 3 to services, and 13 to administration. It is present in almost all the States of the Federation and the most diverse Brazilian biomes. Embrapa has also intensified its international activities through the creation of the Embrapa Virtual Laboratories Abroad-Labex in the United States (http://www.embrapa.gov.br/a_embrapa/labex/labex-usa), France (<http://www.agropolis.fr/international/labex.html>), and The Netherlands, as well as Embrapa Business Offices Abroad in Ghana and Venezuela.

To help build Brazil's leadership in tropical agriculture, Embrapa has invested primarily in training. The company has 8,278 employees, of whom 2,113 are researchers, with 25 or 1.2% holding Bachelor's degrees, 525 or 24.8% holding Master's degrees, and 1,563 or 74% holding PhD degrees. Embrapa also coordinates the National Agricultural Research Systems (SNPA, in Portuguese), which consists of public federal and state insti-

tutions, universities, private companies, and foundations. The SNPA carries out research in agriculture and related areas in the different regions of the country in a coordinated fashion.

With SNPA-generated technologies, Brazil has become the leader in tropical agriculture and has solved century-old problems associated with the production, domestic supply, and insertion into international markets of foodstuff and fibers, as well as renewable energy. An 87% increase in land productivity from 1970 to 2006, achieved through the technological development of Brazilian agriculture, prevented the conversion of forested lands into farmed land. To attain the current level of agricultural production with the technology available decades ago would have required triple the grain farmed land, i.e., clearing 90 million hectares of forest. Such major preservation of natural resources is an invaluable contribution of Brazilian agricultural research to the reduction of the global warming phenomenon (Embrapa, 2008b).

Recent research on the impact of the technologies that Embrapa develops and transfers to Brazilian society demonstrated social profits equivalent to R\$ 15.47 million (Embrapa, 2008b). In a major effort to restore Embrapa's budgets in 2007, the federal government granted the company the largest nominal Net Operational Revenue in history: 1.157 billion reais, of which each real returned R\$ 13.36 to the Brazilian society.

Even so, even more funding is needed to enable Embrapa's capacity for solving technological problems to keep up with society's demands. To that end, the Program for the Strengthening and Growth of Embrapa and Brazilian Agricultural Research will promote annual budget increases so that by 2010 the budget should be R\$ 1.685 billion. That level of funding will enable Embrapa to modernize its infrastructure and laboratories and set up new research units in agricultural expansion areas, as well as train and increase its staff (Embrapa, 2008a).

Information Management in Embrapa's Strategic Planning

Research institutions must have information services that enable them to recognize quickly the demand for innovations and research results. The *1st Embrapa Master Plan (I PDE, in Portuguese)*, the document that guided the company's activities during the 1988–1992 period, already emphasized the importance of information as the “primordial basis for the full development of research” (Embrapa, 1988). Since the research sector is the most interested in improving the global technical and scientific information network, the knowledge it produces is certified, disseminated and used as an input in the development of new knowledge via the subjacent scientific communication system. The science and technology information systems (S&T) of an institution must be well structured and integrated into the global

scientific communication system. However, society will only benefit from that structure if institutional policies ensure that the information used and generated by research contributes to social development.

With this in mind, Embrapa began managing the information inherited from the National Agricultural Research Department, which was closed in 1973, by producing collective catalogues and a crude bibliographic commutation system. Among the macro-policies established in *I PDE: 1988–1992* related to research support, priority was assigned to increased resources for the information and documentation areas with a view to:

- promoting activities in the area of technical and scientific information in order to support researchers with current and retrospective information and documents that could influence significantly the researchers' level of application and contribute to increasing their performance as generators of scientific knowledge and technological innovations;
- networking with national and international, technical and scientific information, maintaining permanent control over the literature in agriculture and similar fields of knowledge and promoting the acquisition of those of interest to Embrapa; and
- coordinating the documentation and information activities of Embrapa's decentralized units and other entities that make up the SCPA (Cooperative Agricultural Research System) (Embrapa, 1988).

The master plan that guided Embrapa's activities from 1994 to 1998, *II PDE*, underscored the importance of information and knowledge, a fact readily observed in the company's mission for that four-year period: “to generate, promote and transfer knowledge and technology for the sustainable development of the agricultural, agro-industrial and forestry sectors of the economy to benefit Brazilian society” (Embrapa, 1994).

In order to fulfill that mission, among other things, the *II PDE* established it as Embrapa's responsibility:

- to ensure that the knowledge and technologies generated through research reach the target populations directly or through appropriate dissemination and transfer channels;
- to encourage other organizations to generate knowledge relevant to their mission; and
- to organize existing knowledge to make it more useful within the scope of the mission (Embrapa, 1994).

During that period, Embrapa began a priority information exchange and production program to support the research and development (R&D) actions whose purpose was to promote:

- (...) organizing and making available agricultural, agro-industrial, forestry, and other similar information to society, in general, and to the scientific community, in particular, with a view to improving the efficiency and effectiveness of the generation and transfer

TABLE 1 – Scientific production at Embrapa from 2000 to 2006

Type of publication	2000	2001	2002	2003	2004	2005	2006	Total
Article in proceedings / technical note	1,203	1,553	2,089	2,399	2,818	3,231	3,107	16,400
Article in an indexed journal	1,228	1,135	1,211	1,228	1,420	1,464	1,489	9,175
Chapter of a technical-scientific book	859	657	739	986	738	903	937	5,837
PhD and master thesis supervision	187	204	244	267	248	265	263	1,678
Summary in proceedings	3,252	3,069	3,730	3,576	3,779	3,843	4,093	25,342
Total	6,729	6,618	8,013	8,456	9,003	9,706	9,889	58,432

processes of knowledge, technologies, products, and services...

The *III PDE* was developed and made public as the guiding framework for the strategic realignment of Embrapa's actions during the 1999–2003 period. The document propounded overcoming the new challenges arising from the “great transformations” in the world scenario, namely, the globalization phenomenon accompanied by the opening of markets; the importance of the environment; the reform of the State; consumer power; and the technological revolution (Embrapa, 1998). The focus of Embrapa's activities during that period was agribusiness and associated opportunities for the economic development of the country. In fact, the emphasis assigned to issues related to information management in the previous master plan was substantially reduced in the *III PDE*. On the other hand, this master plan promoted the perspective of diffusing technologies and knowledge through the use of new channels and enhancement of business communications. Much was said about the need to transfer technologies and the qualification of information to achieve greater conformity with the modern vision of agribusiness.

The *IV PDE* (2004–2007) showed important progress in supporting the public policies that assigned priority to democratizing access to production factors (credit, technical assistance, inputs, and land), diminishing social and regional inequalities, and increasing social well-being, especially through the strengthening of family agriculture (Embrapa, 2004).

Like the previous master plan, the *IV PDE* did not include among the strategic guidelines and objectives any specific mention to information management. Nevertheless, a series of innovating actions were implemented during the *IV PDE* regarding the dissemination of information and knowledge that focused on increasing the production capacity of family farmers, especially related to the current public policies.

The current Embrapa master plan period—*V PDE* (2008–2011)—innovates in matters pertaining to organizational strategies for the middle term (2008–2011) and long term (2008–2023), in anticipation of the company's 50th anniversary (Embrapa, 2008b). Among the institutional challenges set forth in the master plan, the issue of

information is considered of major importance, as well as a priority, particularly in strategic guidelines 4 (“Strengthening the management and protection of knowledge.”) and 8 (“Strengthening institutional and market-oriented communication in order to act in a strategic manner vis-à-vis the challenges of the information society.”) and respective secondary strategies.

Research Outputs of Embrapa

Agricultural research outcomes have become a fundamental element in science and technology planning in developing countries. That is especially true in Brazil, because the country's scientific production in the field of agriculture has been widely recognized throughout the world. During the 2003–2007 period, 4,139 Brazilian articles related to the agriculture field were indexed by ISI; this represents 4% of the world's total production (Produção, 2008). Embrapa, in turn, contributes significantly to Brazil's scientific production, as is shown in Table 1.

The input and first manifestations of RD&I outcomes are scientific publications and patents. In order for RD&I to be conducted efficiently and effectively, scientific communication processes must foster the information flows that feed this process (input). Furthermore, the results of the research activities must be organized and disseminated so as to maximize their impact within science itself. This will in turn support the generation of new knowledge through the management and communication of scientific information—and within society as a whole by means of the scientific dissemination processes. Since its formation, Embrapa has sought to guide RD&I according to such parameters through the activities of Embrapa Technological Information.

Embrapa Technological Information

Embrapa has always considered having well structured Service Units indispensable to support its central role in the SNPA. The implementation of a documentation and information center was deemed essential from the very beginning, along with a technology transfer and knowledge dissemination unit that would maintain close relations with the Brazilian technical assistance and rural extension services (Embrapa, 2006).

The first three organizational structures with specific roles relating to the various spheres of information, technology and communications were created in 1974: the Data Processing Department, Technology Dissemination Department, and Information and Documentation Department (DID). The latter arose from concern about facilitating the access of researchers to research outcomes from around the world and permitting public access to Embrapa research outcomes. DID's first responsibility was to establish a network of specialized libraries in all of the company's units, as well as documentation systems capable of seeking the information required from any country in the world (Embrapa, 2002).

The departments of Technology Dissemination and Information and Documentation coexisted within Embrapa until the 1980's, when the Technology Dissemination Department assumed responsibility for information and documentation and the latter department was closed. The growing demand for publishing dissemination material, periodicals and books led the company to invest heavily in modern publishing equipment.

The Information Production Service (SPI) was created in 1991 in order to guarantee an adequate structure that would organize the information available within the company, qualifying it in terms of form, contents and support to meet the demands of the various clientele.

Over time the SPI has undergone changes in its organizational structure, experimented with three operational models and, at the same time, modernized its production and product distribution structure. Its name was changed in 1999 to Technology Transfer Communication Service, and it came to house printing equipment and a series of services compatible with publishing, together with videotape and CD-ROM collections.

To ensure the transfer of information and technical, scientific and socio-economic data, given the demands of the market and the Information Society, the unit underwent some administrative and managerial transfor-

mations in mid 2001. It implemented electronic media projects to make information available in a digital environment and online. At that time, its name was changed again, to Scientific and Technological Information Service (SCT), or Embrapa Technological Information.

Beginning in 2003, the unit joined in the effort to democratize access to information and, thus, contribute to the success of the public policies focusing on social inclusion. New information projects met the demands of those who generate information and those who consume it, with publications edited in the language, style, media, and format adequate to previously determined functions and clientele—particularly to those excluded from having access to scientific and technological information.

Organizational Structure – Embrapa Technological Information is a decentralized services unit of Embrapa, with the mission of “Proposing, coordinating and executing solutions for the scientific management and dissemination of information generated by Embrapa to the benefit of the Brazilian society” (as in *III PDU SCT—2008–2011*). The organizational structure of SCT is shown in Figure 1.

At present, SCT's 111 employees (high-school, Bachelor's and graduate levels-specialization, Master's degree and PhDs) make up the multidisciplinary team required for the planning and execution of the information-related work. Librarians, journalists, archivists, administrators, economists, systems analysts, pedagogues, graphic designers, language specialists, biologists, and agronomical engineers, as well as trainees in the various areas, make up the staff. Thus, the unit is equipped to plan, develop and implement information products and services for either dissemination or scientific communication.

A comparison of SCT's average annual budget of approximately R\$ 3,094,972.34 (see Table 2) with Embrapa's net operational revenue in 2007 of R\$ 1.157 billion

FIGURE 1 – Embrapa Technological Information Organizational Structure

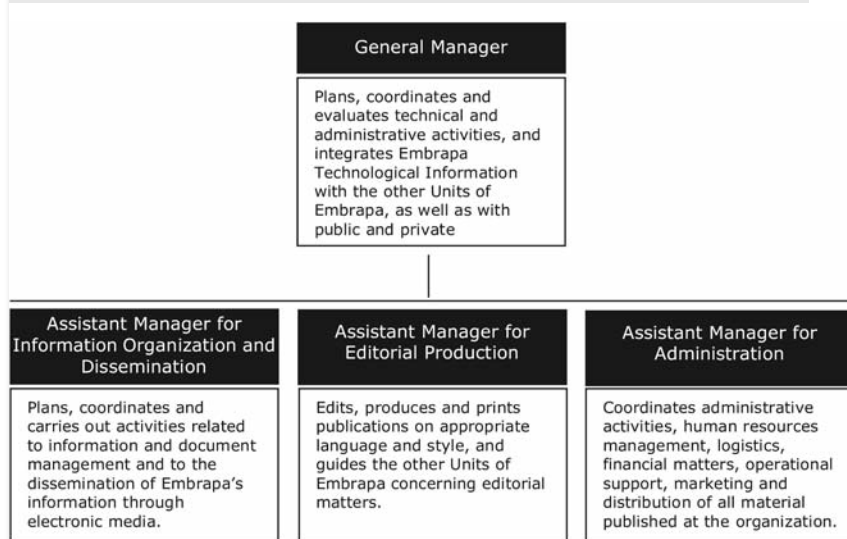


TABLE 2 – Annual budget of Embrapa Technological Information (1995–2008)

Year	Budget (R\$)
1995	3,800,284.22
1996	2,431,607.93
1997	1,853,858.05
1998	1,616,895.33
1999	2,024,668.22
2000	1,778,940.34
2001	2,199,115.82
2002	2,184,396.09
2003	2,621,386.95
2004	3,411,657.29
2005	4,269,862.62
2006	4,394,969.87
2007	4,946,342.99
2008	5,795,627.00
Mean	3,094,972.34

shows that the unit's structure is low cost, considering that Embrapa has 54 decentralized (research and services units) and centralized (administrative) units.

Information in Agriculture: From Scientific Communication to the Dissemination of Science

Developing countries like Brazil face structural problems such as poverty, which affects a high proportion of the population; income concentration; hunger; high illiteracy rates; foreign indebtedness; and poor health standards. A common characteristic of these problems is that S&T can contribute towards their minimization. Thus, promoting access to the information resulting from scientific research is potentially useful for creating the robust social, economic and technical infrastructure required for the development process (Chan and Costa, 2005). The accumulation of knowledge through scientific and technological progress and the facilitation of access to information are essential driving forces in the development of nations.

The information communication flow in the production of knowledge requires:

- scientific communication (researchers ↔ researchers and to the scientific community as a whole), and
- mediation of the scientific information for professionals (non-researchers), technicians and society at large, which favors social development.

Since Embrapa is a research institution, its researchers—and Embrapa itself—are inserted into a greater global scientific system, whose production, management and scientific communication processes are di-

rectly related to and influenced by a complex arrangement of institutions, development agencies, companies, and scientific publishers, among others. This means that the communication of scientific information in an institution such as Embrapa meets not only its own demands using its own mechanisms but also, and mainly, the imperatives imposed by the context of world science.

SCT Products and Services: From Research to Society

Within the scope of its mission, SCT proposes, coordinates and executes a series of activities that result in information products and services for research and society at large. The unit's patrons are individuals or public and private entities that benefit from its services and/or the information transmitted by its information products. Nevertheless, SCT gives priority to the demands of those social groups excluded from access to scientific and technological information, or even those having difficulty maintaining such access. SCT's activities are conducted taking into account the following contextual trends:

- Accelerated evolution of scientific knowledge, with growing interdisciplinary articulation, and more intensive application of technology in all categories of agribusiness and the sustainable development of rural areas.
- Growing concern of the population and governmental policies as regards the environmental, economic and social sustainability of commercial agriculture's production, as well as the quality and contribution of foodstuff to nutrition, health and quality of life.
- Attention to information and knowledge management as an instrument that enables access to information, as well as the sharing of information, in a competitive globalized world.
- Growing concern and competition in the information publishing market with respect to issues such as information security and intellectual, author, and property rights.
- Rapid increase in the number of people interested in electronic products and services.

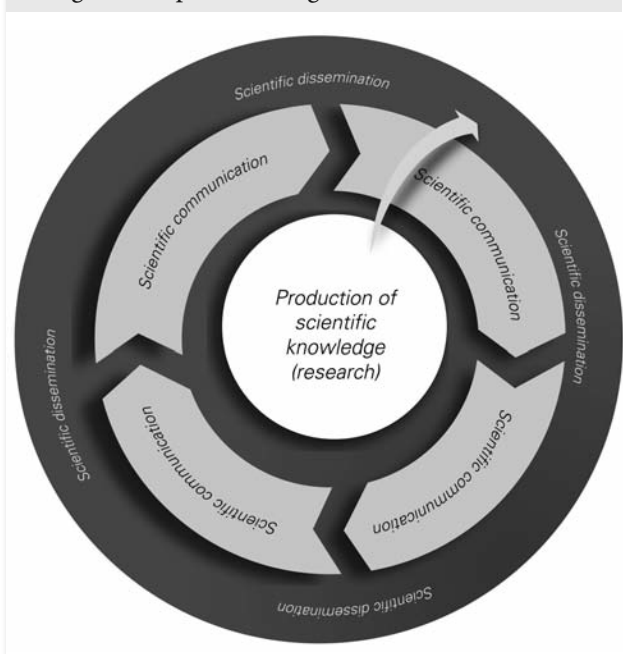
Since the R&D outcomes in agriculture and related areas are the main focus of Embrapa's activities, SCT structures its products and services as a function of such outcomes. Thus, it is concerned not only with scientific information management aiming at improving internal and external scientific communication, but also with the management of information with a view to improving the communication processes between Embrapa and society (dissemination), as shown in Figure 2.

The main information products and services generated by SCT are described below, categorized by print media, electronic media and information management.

PRINT MEDIA

In the last few years, SCT has produced and made available to internal and external clientele approximately

FIGURE 2 – Scientific communication and dissemination through Embrapa Technological Information



three million printed copies of books, magazines, manuals, periodicals, information leaflets, forms, posters, direct mailing material, letters, and folders.

Printed Publications & Journals –

- ***Pesquisa Agropecuária Brasileira*** – *Pesquisa Agropecuária Brasileira* (Brazilian Journal of Agricultural Research / <http://seer.sct.embrapa.br/index.php/pab/index>) is an open access journal, published monthly in print and online, that disseminates original technical-scientific papers resulting from research connected to agriculture, e.g. plant physiology, plant health, crop science, genetics, soils, food technology, and animal science. It is indexed by ISI (Web of Science and Current Contents: Agriculture, Biology & Environmental Science), Scopus, CAB Abstracts, AGRIS and SciELO. The technical-scientific articles, as well as the scientific notes and new cultivars, are published in Portuguese, Spanish and English. Reviews are published by invitation from the Editor.

- ***Cadernos de Ciência e Tecnologia***

- *Cadernos de Ciência e Tecnologia* (<http://webnotes.sct.embrapa.br/cct/CCT.nsf/Principal>) is published quarterly in print and electronic media. It is indexed in CAB Abstracts, AGRIS, AGRICOLA, Agrobases, and the Pesquisa Agropecuária Brasileira Database. It was created in 1984 to foster reflection, debate and a critical view of science, technology and agricultural development, with an emphasis on the social, cultural and political aspects of agricultural problems. The journal accepts original papers from researchers, scholars and analysts from the various areas and institutions that work with agriculture.

Mini Libraries – The Mini Libraries project (<http://hotsites.sct.embrapa.br/minibibliotecas>) includes the production and distribution of information products in different media to public schools in rural areas. The material contains technological information generated by Embrapa and instruction on the production of quality foodstuff, taking into account the realities of rural communities in the various Brazilian regions. Each mini library includes 108 print publications, 40 Rural Talk radio programs and 37 *Field Day on TV* program videos produced by SCT. The subjects covered by the various collections emphasize environmental preservation and education, citizenship values, cooperative enterprises, vegetable gardens and orchards, raising small and large animals, producing quality foodstuff, soil and water

FIGURE 3 – Brazilian municipalities that benefited from the Mini Libraries project



management, and how to begin a small food agro-industry, among others. By the end of 2008, as a result of partnerships established by SCT with the Ministry of Social Development and Combat Against Hunger, National Institute for Colonization and Land Reform, and Banco do Brasil Foundation, the Mini Libraries project installed mini libraries in 1,279 municipalities, meeting the needs of an estimated population of 100,000 students and surrounding communities, with almost 198,245 publications. Figure 3 shows the Brazilian municipalities that benefited from the Mini Libraries project.

ELECTRONIC MEDIA

Radio Program: Rural Talk – In 2003, Embrapa began using the radio to disseminate technologies and information useful in the daily lives of rural families in the Northeast Region's semi-arid zone, as one of the actions associated with the Zero Hunger (*Fome Zero*, in Portuguese) Program of the Federal Government. The following year, the Rural Talk radio program (*Prosa Rural*, in Portuguese / <http://hotsites.sct.embrapa.br/prosarural>) was initially broadcast by 50 radio stations. Rural Talk is a 15-minute program whose content is produced by Embrapa's research units in the Northeast Region. By the end of 2004, Rural Talk had been broadcast by 423 stations and covered the entire semi-arid region. More

than 1,000 radio stations currently take Rural Talk to thousands of Brazilian rural families who learn about low-cost, easy-to-adopt technologies and products developed by Embrapa for young people and family farmers in the Brazilian Semi-Arid and the Vale do Jequitinhonha (State of Minas Gerais), as well as the Northern, Central-West, Southeast, and Southern Regions of the country.

Rural Talk is distributed free of charge to radio stations throughout Brazil with the support of the Ministry of Social Development and Combat Against Hunger, the Brazilian Association of Community Radios, the Brazilian Communications Company, the Ministry of Communications, and the Brazilian Association of Radio and Television Stations. Figure 4 shows the Brazilian municipalities that have radio stations working in partnership with Rural Talk.

TV Program: *Field Day on TV* – Field Day on TV (Dia de Campo na TV, in Portuguese / <http://hotsites.sct.embrapa.br/diacampo/>) is a weekly television program created in 1998 to disseminate information and technologies resulting from research executed at Embrapa and state research organizations. These non-technical programs are designed for the most varied publics, including farmers, technicians, students, homemakers, and businessmen. The program is aired over public and private TV stations. Starting with just four programs in 1998, over 350 Field Day on TV programs have been aired to date.

Embrapa Portal – The purpose of the Embrapa Portal (<http://www.embrapa.br>) is to improve and broaden the communication and technology transfer capability of the company vis-à-vis the various sectors of society via the Internet. It uses a content management tool to speed up the maintenance and production of information by Embrapa's units and to help improve the electronic information publication process on the Web. Access to the Embrapa Portal enables clients, users and/or beneficiaries to obtain information generated by Embrapa through a single entryway.

SCT was charged with defining the visual identity of Embrapa on the Web and the architecture of the information to be made available via the Portal. Currently, SCT is responsible for coordination of the process of publishing content via the Embrapa Portal, in partnership with the Social Communications Office.

Embrapa Information Agency – The Embrapa Information Agency (<http://www.agencia.cnptia.embrapa.br/>) is a web system that makes it

possible to organize, treat, store, publicize, and access technological information and knowledge generated at Embrapa and other research institutions. The information is organized hierarchically in a tree structure called the Tree of Knowledge. The Embrapa Information Agency contains all of the Trees of Knowledge developed by Embrapa's decentralized units pertaining to agribusiness products and themes. The first three levels of the hierarchy contain generic knowledge, while the deeper levels present more specific knowledge. Each item in the Tree of Knowledge is called a node, which is defined at each successive subdivision (sub-node) of the contents. The Tree of Knowledge contains validated information about all stages of the production chain, e.g. plant cultivation and raising animals, and the most diverse themes. In addition to this information, the Embrapa Information Agency provides users with complete access to various information resources, including articles, books, image and sound records, spreadsheets, etc. Information can be accessed by navigating a hyperbolic tree (graphical form of the Tree of Knowledge—see Figure 5), navigation over hypertext, or the use of a search service:

- Navigation of the hyperbolic tree makes it possible to visualize the ramifications and sub-nodes of each basic node.
- Navigation over hypertext shows nodal and sub-nodal

FIGURE 4 – Brazilian municipalities that have radio stations working in partnership with Rural Talk (*Prosa Rural*)



contents and enables access to the document file.

- The search service makes it possible to identify the route followed to reach the information within the hyperbolic tree when the user types in the subject desired in the search box.
- The advanced search option permits quality and precision retrieval of the information requested.

INFORMATION MANAGEMENT

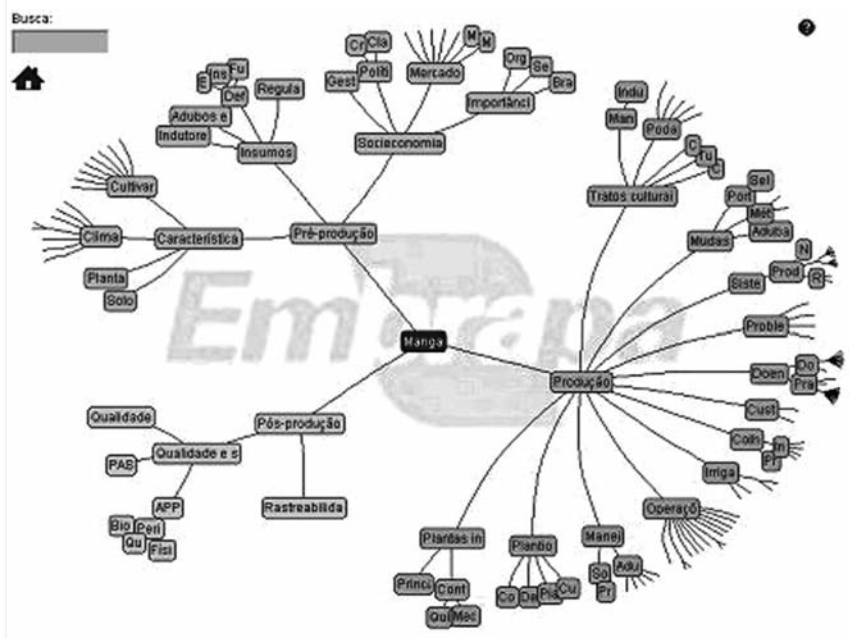
Open Access to Embrapa's Scientific Information

– Embrapa is designing a project whose purpose is to propose and implement a methodological model for the management of technical-scientific information. The model is based on the premises/mechanisms of Open Access to feed the research and development activities and broadly disseminate the information produced. The application of an open access model to scientific information at Embrapa and its effective use by part of the community would make it possible to:

- assemble and preserve the scientific intellectual production of the institution in digital form using specific techniques;
- provide unified access to the entire scientific production of Embrapa in electronic format and full text, and to external open access scientific information sources relevant to the research carried out in the institution;
- enhance the profile of the scientific production, the researchers and the institution itself by maximizing access to their intellectual production and, consequently, helping increase the impact of the outcomes of the research executed at Embrapa, i.e. an increased rate of citation of scientific articles written by Embrapa's researchers, and thus support the internationalization of the institution;
- provide tangible indicators for the evaluation of Embrapa's scientific production and demonstrate the public value and scientific, social and economic relevance of its activities; and
- provide scientific information services to external users, with special focus on universities, researchers, and research institutes in developing countries.

Embrapa's Memory – The purpose of the Embrapa's Memory project (<http://hotsites.sct.embrapa.br/pme>) is to retrieve, preserve, manage, and share Embrapa's technological and institutional knowledge and to record the history of the company and its units. The project will help strengthen the credibility and image of Embrapa within Brazilian society, especially among people in Brazilian agribusiness.

FIGURE 5 – Hyperbolic navigation in the Tree of Knowledge on Mangoes, from the Embrapa Information Agency



Embrapa's Library System – The SCT coordinates Embrapa's Library System, which is composed of 39 libraries and whose mission is to plan, coordinate, standardize, execute, and advise on the organization of information and technical, scientific and administrative documentation of the company, as regards acquisitions, technical processing and availability of information to the company, the scientific community, and society at large.

Management of Documentary and Archival Information

– The Central Archives serves Embrapa's 13 Central Units on issues relating to the management of documents and archives, such as evaluation, control, classification, term of preservation, and elimination. SCT coordinates the management of archives and documents in the company's Decentralized Units.

Final Considerations

Embrapa Technological Information has transformed the knowledge generated by Embrapa's research into information available to academic and technical-scientific publics and has achieved internal and external public recognition since its creation.

As important as the mediation of scientific information for specialized publics is, SCT also focuses on organizing and disseminating information to excluded populations, as a way of supporting universal access to knowledge. The plurality of the Brazilian society and the country's rural areas and the diverse socio-economic and political arrangements, demand creativity and determination from a government-owned company such as Embrapa to ensure that the various forms of communication

within society reach all of the people. By doing so, the organization aligns with public policies aimed at the development of huge sectors of our population. There remains in Brazilian society a vicious circle of technological exclusion that marginalizes millions of Brazilians with regard to the benefits that science has brought to society, thereby strengthening the social exclusion processes. By making information available in the language(s), style, media, and format appropriate for the various segments of our population, SCT assigns priority to that part of the population excluded from access to knowledge and takes aim on the alleviation of technological and social exclusion.

Bibliographic References

Chan, L., and S. Costa. 2005. Participation in the global knowledge commons: challenges and opportunities for research dissemination in developing countries. *New Library World* 106(3/4): 141–163.

Embrapa. 1988. *I Plano Diretor da Embrapa: 1988–1992*. Brasília, DF: Secretaria de Planejamento, 1988.

Embrapa. 1994. *II Plano Diretor da Embrapa: 1994–1998*. Brasília, DF: Serviço de Produção da Informação.

Embrapa. 1998. *Plano Diretor da Embrapa: Realinhamento Estratégico (1999–2003)*. Brasília, DF: Embrapa-SPI.

Embrapa. 2002. *Pesquisa agropecuária e qualidade de vida: a história da Embrapa*. Brasília, DF: Embrapa Informação Tecnológica.

Embrapa. 2004. *IV Plano Diretor da Embrapa: 2004–2007*. Brasília, DF: Secretaria de Administração e Estratégia.

Embrapa. 2006. *Sugestões para formulação de um Sistema Nacional de Pesquisa Agropecuária*. Brasília, DF: Embrapa Informação Tecnológica.

Embrapa. 2008a. *Balanço Social da Pesquisa Agropecuária Brasileira*. Brasília, DF: Secretaria de Gestão e Estratégia.

Embrapa. 2008b. *V Plano Diretor da Embrapa: 2008–2011–2023*. Brasília, DF: Secretaria de Gestão e Estratégia.

Produção científica cresce no País. 2008. Brasília: Secretaria de Comunicação Social da Presidência da República. http://www.cereja.org.br/arquivos_upload/producao_cientifica_cresce.pdf

PATRÍCIA ROCHA BELLO BERTIN is Assistant Manager for Information Organization and Dissemination at Embrapa Technological Information, Brasília, DF, Brazil.

FERNANDO CÉSAR LIMA LEITE is Analyst of Embrapa Technological Information and a PhD Candidate in Information Science at the Department of Information Science – University of Brasília.

FERNANDO DO AMARAL PEREIRA is General Manager of Embrapa Technological Information and a MSc Candidate in Science and Technology Policies and Management at the Center for Sustainable Development – University of Brasília.

Contact Information

Patrícia Rocha Bello Bertin
 Assistant Manager for Information Organization and
 Dissemination
 Embrapa Technological Information
 Parque Estação Biológica - PqEB, W3 Norte (final)
 CEP 70770-901 Brasília, DF
 BRAZIL
 E-mail: patricia@sct.embrapa.br
 Web: <http://www.embrapa.br/>