

AgriS&T

Technological Information for Development

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The Challenge of Preserving and Developing the Amazon

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MINISTRY OF AGRICULTURE,
LIVESTOCK AND FOOD SUPPLY

Embrapa
Brazilian Agricultural Research Corporation

DEAR READER,

The Amazon continues to be one of the greatest challenges of Brazilian Researchers. Getting to know the biodiversity that exists in the five million square kilometers of forest, most of it still intact, it is not a task for few people and least of all an easy work. As it is carefully pointed out by the Executive Director of Embrapa, José Roberto Rodrigues Peres, in an article at the end of this issue, we have managed to identify eleven thousand plant species up to now, of which only eighty have become semi-domesticated genetic resources; and only five are being used for social and economic benefit. The cover story on this edition shows how our national agricultural and livestock research bodies are facing these difficulties and finding technologies that can contribute to the sustainable development of the Amazon.

In an exclusive interview for AgriS&T, the Minister of Agriculture, Livestock and Food Supply, Marcus Vinicius Pratini de Moraes, points out the greatest achievements of our National Agriculture and Livestock researchers in the last few years, and shows the importance of transgenic research, and how we are preparing to face international commercial barriers.

In the following pages you will also find some new products recently produced by Brazilian researchers such as exotic grains that were adapted to Brazil and begin to make their way into the savanna; new and innovative scientific experiments in the use of solid waste, swine dejects and sewage sludge in agriculture; new flowers that promise to swing the market, such as the colored sunflower; national varieties of aromatic rice, which will soon be competing with imported varieties; and how genes from spiders and scorpions are being transferred to baculovirus, enabling the creation of a bioinsecticide to fight the worst pest of Brazilian corn.

These are small daily achievements that show the ability of Brazilian research to generate increasingly strategic results for the development of national agricultural and livestock production.



INTERVIEW

Minister of Agriculture, Livestock and Food Supply Marcus Vinicius Pratini de Moraes talks about the most important achievements of agricultural and livestock research in Brazil and how the country can face trade barriers.
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Marcus Vinicius Pratini de Moraes

"Either we negotiate agriculture, or we negotiate nothing."

AgriS&T – In your opinion, what were the greatest achievements of agricultural and livestock research that influenced the development of Brazil in the last few years?

Pratini – The transformation of the Brazilian savanna into a new agricultural frontier was perhaps the most classic example. Technologies developed by Embrapa, universities, state research agencies and private groups have made the region responsible for 40% of the Brazilian grain production, doubled the production of vegetables and milk, tripled the availability of bovine and swine meat and multiplied the production of poultry by ten. Soybean has adapted to Brazilian conditions and today we are the second largest world producer. Research is also making us increasingly productive. To have an idea, the total cultivated area in Brazil has been stable since 1989 but the production has grown 44%. Do you know what that means? That we have an excellent increase in production without occupying new areas, thus preserving our forests, savannas and other ecosystems.

AgriS&T – How can research continue to help making our agriculture and livestock more competitive?

Pratini – In the first place, by seeking technologies to reduce our production costs, creating practices that demand less resources from the producer. And then, by developing better quality products. A recent example is the Alvorada carrot, which contains a higher degree of carotene than other varieties available in the market. And last, by creating a technology that guarantees environmental sustainability of the business. Today the environmental issue

is connected to competitiveness, especially if we aim at the external market.

AgriS&T – Where is agribusiness research more advanced?

Pratini – Brazil is today recognized in the entire world as a leader in the area of genetics for tropical and subtropical agriculture. It was the area of plant genetics that took, for example, soybeans from Rio Grande do Sul to Piauí, and cotton from the Northeastern to the savanna. I believe that research focused on the use of natural resources is also another great achievement.

AgriS&T – In which areas does Brazil need to invest more?

Pratini – There is no doubt that it is in the knowledge of our biodiversity. We know how to use our natural resources to our advantage, but we do not fully know the biodiversity that exists in our ecosystems, especially in the Amazon, the Semi-Arid and the savanna. Another field that is little exploited by Brazilian research is gene prospection. We are beginning to take the first steps but we have already obtained excellent results, such as the sequencing by Fapesp of the bacteria that causes the yellowing disease (CVC). We also need to file more patents for our achievements. Brazil occupies 35th place in the ranking of competitiveness for intellectual property. We are behind countries like Malaysia, Thailand, Chile and Luxembourg.

AgriS&T – The issue of liberating transgenics in Brazil is today being decided by various bodies from different Ministries. In your opinion is excessive discussion causing damage to research and national agribusiness?



"We know how to use our natural resources to our advantage, but we do not fully know the biodiversity that exists in our ecosystems..."

Pratini – My fear is that Brazil will not follow the technological advances that could benefit agriculture. Various other countries have been using transgenics for

a long time, cutting down production costs, which makes their agriculture more competitive. But the Ministry of Agriculture will follow what is determined by the CTNbio (National Technical Commission for Bio-security), which is the body responsible for coordinating this issue. Our worry is to produce according to market demands. If there are buyers for transgenics and present research indicates that there are no risks for the environment or the health of consumers, why not do it? And if, on the other hand, we find markets that refuse transgenics, we will sell non-transgenic products. Because of its diversity and size, Brazil can opt for both markets.

AgriS&T – In the long run, what kind of alternatives do we have to face the commercial barriers imposed by First World countries?

Pratini – Our strategy is to participate in all the negotiations relevant to international commerce. My opinion is: either we negotiate agriculture or we negotiate nothing. One of the main barriers we have had to face is protectionism. Since today we have an increasingly bold and modern agriculture, we are making our competitors uneasy. Brazil must be prepared for a new type of international protectionism, which is sanitary protectionism. We are the main victims of protection regimes adopted by developed nations. To reduce these restrictions, the government has been maintaining negotiations in international fora. We have already made some progress, such as the inclusion of agriculture in the World Trade Organization (WTO) discussions. We would like to see changes in the barriers imposed by the U.S.A. on Brazilian soybeans and cotton and by the European Union on sugar. Besides this, Brazil should adopt a more aggressive position in the commercial negotiations with other countries. We need to sign agreements for the items produced in Brazil, which generate jobs and income,

and to condition any lifts on agricultural products.

AgriS&T – How much can the traceability of our herds and fruit production help Brazil secure a bigger place in world markets?

Pratini – Establishing traceability is fundamental not only for increasing our competitiveness in the external market, but especially to assure the offer of better quality products with guaranteed sanitary conditions to the Brazilian

"Our productivity has grown over 70% in the last ten years while the planted area was maintained practically stable, going from 37.8 to 39.7 million hectares. No other country has had such a remarkable agricultural performance."

consumer. But, apart from the creation of an infrastructure that will allow a better management of rural properties, we need to invest in marketing. Brazil still needs to be more efficient in promoting its trademark. This necessity has already been detected by various segments of the agribusiness. We have international marketing programs for beef, poultry, fruit, coffee and "cachaça" (sugar cane liquor). In other words we are beginning to create an export culture.

AgriS&T – On which products do you place more hope to win the international markets in the next few years?

Pratini – The Brazilian agribusiness is highly competitive. Some sectors however have stood out more than others. The meat productive chain is an example. Last year the external sales of the sector

increased one billion dollars, in comparison to 2000. Beef exports reached one billion, poultry, 1.2 billion and swine, 350 million dollars. This year the estimate indicates that beef exports will reach 1.2 billion, poultry 1.45 billion and swine nearly 500 million dollars. We have registered an excellent performance in soybean and sugar exports, as well as good performances in the fruit, coffee, cachaça and fish sectors. In 2001 exports of Brazilian agribusiness totaled nearly 24 billion dollars with a superavit of 19 billion.

AgriS&T – What are the main contributions of the present government to Brazilian agriculture?

Pratini – There are numerous and all are equally important. The greatest worry of the government has been to guarantee jobs and income in the field. That is why I highlight the consolidation and renegotiation of agricultural debts and the reintroduction of pluriannual credit lines with fixed interest rates. This scenario brought greater confidence to the producers and the last four grains harvest were record breaking. The last harvest went over the hundred million ton mark. Our productivity grew around 70% between 1990/1991 and 2001/2002, while the cultivated area remained almost stable, going from 37.8 million hectares to 39.7 million hectares. No other country in the world had such an agricultural performance. I can also emphasize the work accomplished in the area of animal and plant sanitary conditions, fundamental to guarantee food safety and quality. In order to renovate the technology available in the field, we have created the fleet modernizing program for harvest machines, tractors and agricultural tools. These are actions that have contributed to make Brazilian agriculture stronger in the last few years, capable of competing with any great agricultural power in the world as long as there are equal trading conditions. ■

The Amazon

The challenge to preserve and develop

The Amazon is one of the best known regions of the world and one that most raises curiosity in the population of scientists. The very belief that changes in its ecosystem can alter the climate of the entire world is sufficient to mobilize Brazilian, American and European researchers. But there is a lot more to be discovered in the biggest forest of the planet. There are five million square kilometers, more than half in Brazilian territory and unequalled exuberance and richness. The Brazilian Amazon is 88% intact forest. According to a World Bank report, 83% of Brazilian Legal Amazon (which is equivalent to 46 times the area of Portugal) has a natural vocation to remain as forest. In the 21st century the objective is to act in the best way possible, on this patrimony rich in biodiversity, which shelters 20 million people. How do we reconcile development, conservation and quality of life? This task is challenging various Brazilian institutions working in cooperation even with researchers from other countries.

Researches already have the tools and techniques necessary to compile socioeconomic information and identifying the potential fauna and flora in the main micro regions of the Amazon. This data composes a process of dynamic understanding, which is important to negotiate the planning and management of public policies. It is the first step to consolidate a culture of preservation and development.

Embrapa maintains close to 300 researchers in the region involved with the leadership of 50 great projects in which scientists from other regions and institutions also participate. The result of this effort translates into the accumulation of knowledge about soil, vegetation, climate and water resources, which has contributed to development based on the safe use of natural resources. Agriecological zoning is one of these processes. By using it before any investments are made, it is possible to determine the type of soil and its deficiencies as well as flora, fauna and water potentials and predict impacts on zones nearby national parks and Indian reserves. The cost of this technology is very reduced in relation to the benefits obtained: it is estimated that each kilometer studied costs two reais. Embrapa has already carried out 21 agriecological zonings in Pará, five in the Amazon and five in Acre.

Research efforts, for example, gave origin to the gathering of the greatest collection of humid tropical plant species in the world. Embrapa research improved genetically and made feasible the production of native plants. Scientists studied the productive chain of the principal forest essences and placed instructions about sustained management at the disposal of the region's inhabitants. They developed techniques to manage degraded areas, to prepare and clone seedlings, pest control, industrial processing and trading, benefiting primarily producers who work

under the family agriculture regime. The research also contributed to the growth of the agriindustry sector, making available specific production systems adequate to the characteristics of each region.

All that is aimed at the region is to rational use of existing natural resources, especially biodiversity and the recovery of areas that are already altered, incorporating them into the development process and avoiding pressure to use the native forest.

But even so, research in the Amazon is at the discovery stage, generating basic knowledge. At least that is what various specialists who direct or who carry out scientific research think. The diversity is so great that to research and development purposes, the Amazon is being divided into "23 Amazons", facilitating the classification of information about climate, vegetation, botany, birds, fish, soil, fungii, bacteria, virus (from animal and plant species), indigenous peoples, the environment and biodiversity in general.

It is about a collection that will be multiplied soon, in the opinion of Adilson Serrão, of Embrapa Eastern Amazon (Belém – Pará). "In the past two decades and in the next, more information will be produced about the Amazon than in all of its history", he assures.

Although Peter Toledo, director of the Emílio Goeldi Museum of Pará – also believes in significant advances in the generation of knowledge, he emphasizes that there is still a great need for researchers in the region to discover its functioning. But the work accomplished to date allows the task to be done more easily. Maps, for example, have already defined the climate regimes and the tendencies for the environment to change giving credibility to the preservation and development policies.

Project brings together 500 researchers from 40 countries

Studying the impact caused – and that which can still be caused – by land use changes in the Amazon is the primary concern of the Large Scale Experiment on the Amazon Biosphere-Atmosphere (LBA), a big project bringing together 500 researchers from 40 different countries involved in approximately 100 projects. The LBA is trying to understand how the Amazon interacts with the atmosphere, how the region is absorbing or liberating carbon or what is the regeneration capability of devastated areas, assuming

that changes in its environmental system can affect the climate in the region, in the continent and in the whole world.

As knowledge is generated, it is concluded that what is known is still very little and a lot of what was held as truth still needs scientific proof. The Amazonian rain is an example that illustrates what researchers have recently discovered in the region. It was always believed that rain clouds in the Amazon were of the continental type just as in other tropical regions of the world. In little

more than three years of research, it has been concluded that such clouds have a type A maritime behaviour. The basic difference is that maritime clouds have a greater quantity of water and the raindrops are also bigger. They also produce rain more easily or in less time, and larger volumes of it in general. Continental clouds produce more lightning and ice. This information has caused the revision of climate and weather forecast models in the Amazon.

Forest management is a reality

Research in the Amazon seeks to change the present scenario by conserving natural resources and increasing the profitability of forest businesses. One of the challenges is to allow the move from an extractivist system of exploitation to a regime of sustainable management with forest conservation. Technologies have demonstrated that management and environmental conservation are compatible, thanks to the research that has been developed by Embrapa and its partners for 25 years.

For example, low impact forest management is aimed as much at lumber companies as it is at communities of family agricultural workers living in the forest. Technology has come out of scientific experiments and is being increasingly used by lumber companies which have changed their techniques to exploit the forest. A few decades ago, this form of exploiting forest resources was nothing but utopia, but today it is a reality and a prerequisite to compete in the International Market. Brazil already has the largest certified area of Amazonian forest.

This management system aimed at the small agricultural worker is developed in an area of 4 hectares of legal reserve, resulting in an increase of 50% in their annual income. The forest becomes a type of riskless investment to which the agricultural worker can turn to every year without the risk of depleting it.



The basis of the whole work is in the integration between forest and industry, training in services and evaluation of social, economical and environmental impacts, which is the foundation for companies to display the coveted "green seal" with the FSC – Forest Services Council logo. Other successful sustainable forest management technologies are the management of non-wood products, multiple uses management and rural settlement management, among others.

Açaí breaks barriers

Açaí is a native palm tree of the Amazonian rain forest that yields a tasty dark purple fruit and is attracting the tastes of consumers from Brazil and other countries. The positive reception is considerably increasing its production and showing how to generate income with the region's products. The State of Pará alone trades 200 thousand litres of concentrated juice daily and exports approximately three thousand tonnes of fruit pulp to various Brazilian states and countries such as Japan, United States, Italy and Argentina.

A technique developed by Embrapa, coupled with the adequate management of native açaí plantations is allowing an increase in productivity from 4.2 tonnes of fruit per hectare to 8.4 tonnes of fruit per hectare per harvest. Recently the açaí research has been amplified to become national, focusing on increasing the quality and food security of açaí products available in the market today, being the fruit pulp, palm heart and nectar.

Reca: cooperation to produce and preserve

In the 1990s, a group of migrants who were settled in Rondonia found themselves facing accumulated losses in their rice and corn plantations in the middle of the forest. Low productivity and the impossibility of returning to the South and Southeast of the country created a situation of anguish and frustration. This was when the Project of Ecological Associated and Compact Reforestation – Reca – was created, which today congregates 400 families. With the help of national and international NGOs, technicians, researchers and the Church, Reca invested in the consortium of native plants, like cupuacu, pupunha, Brazilnut, forest essences, grasses and other forager plants. The result is a type of wood that imitates the forest itself protecting the soil from inclement weather and erosion.

Agricultural industrialization was the next step, bringing business opportunities from other regions. Today producers export cupuacu pulp and pupunha palmheart to various states, guaranteeing income and plans for new investments. The challenge of research continues when the history of the Amazon is looked at again, marked by the exportation of raw materials. Today science seek alternatives to aggregate value to regional products, allowing the population to leave extractivism behind and move into ample participation in the various facets of the agribusiness production chain.

Settlers are given alternatives to burning

The use of fire in agriculture, even being practiced for centuries by Amazonian agricultural workers, is condemned by virtue of aspects that vary from environmental damage to agricultural production itself, which tends to decrease. Indiscriminate burning damages the soil, destroys biodiversity, aggravates the greenhouse effect and generates irreversible economic and social losses.

By means of satellite images, specialists have concluded that only in the period between 1999 and 2000 the Amazon rainforest lost an area as big as 20 thousand square kilometers. A good part of these fires was caused by small producers who use forest fires for lack of other techniques to work their property and also due to the difficult access to credit lines to obtain other technologies.

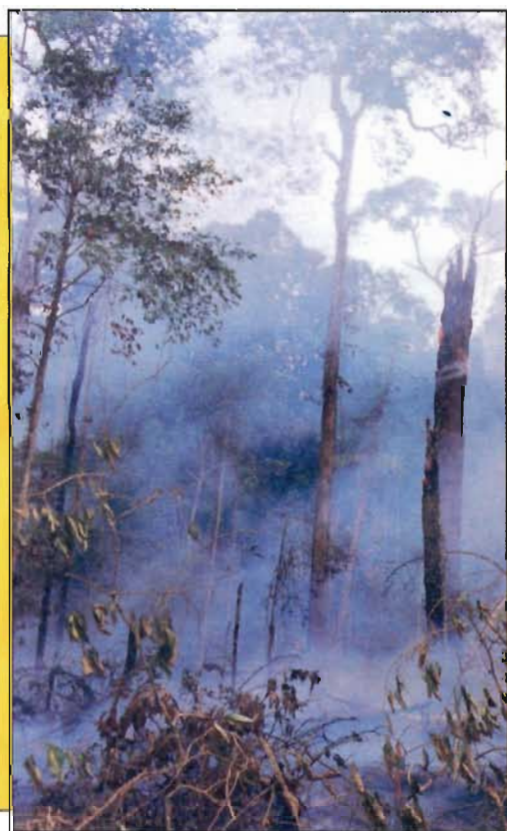
It was with this problem in mind that a group of organizations decided to amplify the diffusion of alternative techniques to the use of fire. For two years, institutions such as Friends of the Earth, Embrapa, Senar, State Secretariat of Production,

Capeb, Caex, Federal University of Acre, Amorex, Municipal Governments of the Estate of Acre, Ibama, Imac, Program of Alternatives to Slash and Burn Agriculture (ASB-ICRAF) and finally the Protection Program have been providing training to small producers, extension workers and multipliers to reduce the annual volume of forest burning. The participants learn to deal with electric fences, grazing management, animal health, use of manure and urine as fertilizer and artificial insemination.

Groups of producers have sealed an agreement: in exchange for technical support and inputs they have pledged to adopt technologies and abolish forest fires. The objective is to have areas of reference where it can be demonstrated that it is possible to increase productivity and income in the field without further slashing and burning techniques. The communities



receive technical assistance, seeds and seedlings adapted to each region, equipment for installing the electric fences and semen. The agreement is cancelled and the community loses its benefits if a member of the group uses fire. But this has not occurred. Up till now more than 800 people have had access to training even a group of rural producers and students from Bolivia.



Adequate management avoids fire

Another successful project to avoid the use of fire in the forest is the Tipitamba, a partnership between Embrapa and the German Government. The main idea is to stimulate management of the capoeira (uncultivated secondary vegetation), substituting the preparation of the area via slash and burn (the most usual practice in Amazonian family agriculture) by that of cutting and triturating the capoeira. This system provides greater flexibility to the planting period, besides improving physical, chemical and biological conditions of the soil.

The capoeira is triturated by the Tritucap, a prototype grinder coupled with a 100 hp tractor developed and patented by Embrapa and the Institute of Agricultural Engineering of Göttingen – Germany.

Apart from preparing the area without burning it, the project aimed at improving the capoeira by means of planting fast growing leguminous trees at the end of the last crop cycle in order to accelerate the accumulation of carbon and nutrients by accessing water and nutrients present in deeper layers of the soil.

The association between these two technologies is economically advantageous and reduces the impact on the forest. For example, it is possible to plant twice in a sequence, thus intensifying the sustainable use of the land, and spending less time preparing the soil. Without burning there is no loss of nutrients. There is retention of organic matter, improvement of the soil's physical structure and absence of toxic emissions into the atmosphere. ■

Biofactory will produce curauá clones



September will see the opening of the first biofactory to produce cloned seedlings of curauá (*Ananas erectopolius*), a plant of the Bromeliaceae family that has a natural fiber of great resistance, which is presently used in motor vehicles, and products of the textile, shoe and cellulose industries. The project will cost around R\$500 thousand reais and will be funded by the Financial Aid for Researches and Projects – Finep and partnerships with the Federal University of Pará and with Poema, the Environment and Poverty Program.

“Embrapa has been researching the micropropagation of curauá since the last decade and has been greatly responsible for the advancement of seedling cloning research in the region”, explains researcher Osmar Lameira of Embrapa Eastern Amazon (Belém – PA). Based on this technology it is possible to produce healthy clone seedlings free from pests and diseases at reduced costs, with higher fiber productivity in large quantities and in a shorter period of time. The plants have no thorns (which reduces harvesting accidents) and can be cultivated closer together increasing productivity.

The biofactory will receive the first genetic material from Embrapa for cloning and will be able to generate three million seedlings per year in a 450 hectare area. The production has already been guaranteed: around 250 small producers from northeast Pará, a priority area because of lack of economic alternatives. The expected result is the production of approximately 100 tons of fiber per month.

Sinval Paiva, a technician with Emater – PA and Poema said that there is a guaranteed demand for 370 tons of curauá fibre per month by the textile, automotive and shoe industries. “The sector’s current problem is the lack of good quality seedlings for the producers”, he explains.



Units will be installed to demonstrate the planting of curauá cloned seedlings in three municipalities of the State. Embrapa has already sent 40 thousand seedlings to the municipalities of Tomé-Açu, Castanhal e Ponta de Pedras (at the Island of Marajó). ■

Basil (*Ocimum gratissimum*) can save the rosewood tree

Research carried out by agronomist Nilson Maia, of The Campinas Institute of Agronomy (IAC), showed that basil, a plant widely used in cooking worldwide, also produces linalol, an oil used in perfumes, cosmetics, medicines, and fine lubricants. The discovery brings new perspectives to environmental preservation, since linalol was being extracted from rosewood, a native tree of the Amazonian rainforest, in danger of extinction due to predatory and clandestine exploitation since the 17th century.

The work creates new income alternatives for Brazilian producers, because it offers them higher productivity even in

relatively small areas. The agricultural worker who dedicates himself to the production of basil and has his own oil distillery can obtain close to 2,000 dollars per hectare. Another advantage is that the plant needs only four months from the production from seedling to harvest, while the cultivation of rosewood takes approximately 3 decades.

New investments will allow the research to obtain an increase in the quality and quantity of oil produced from basil. This improvement can be obtained by changing plant nutrition, genetics and also extraction methods. ■

Ceará free from South American fruit fly



Concerned with the opening of new trade frontiers to export watermelons, a fruit with great potential in the international market, Brazil is investing in the expansion of the South American Fruit Fly Free Area (*Anastrepha grandis*). This insect is inhibiting efforts to increase exportation. The fruit-growing centre of Assu/Mossoró in the state of Rio Grande do Norte is free from the fly and Ceará is close to being declared a free area. Two years of monitoring studies coordinated by Embrapa have shown that an area measuring 4,063 km² spread over six municipalities of that state is a free area.

The results of this research, which involved over 20 partners, both public and private, are allowing the Ministry of Agriculture, Livestock and Food Supply to give continuity to the process of adapting products of Ceará to further international demands. One of the conditions is already being complied with: from now on, watermelon producers of Ceará, represented by the Vale do Jaguaribe Union of Agribusiness (Univale), take upon themselves the responsibility of permanently monitor the area. An official control will also be implemented, by means of regulatory instructions, governor's decree and raising phytosanitary barriers. The Department of Plant Protection and Inspection of the Ministry will systematically audit this work.

During 2001, Brazil exported 99.3 tons of watermelons, of which 28.6 tons were grown in Ceará. Ceará watermelons are mainly traded with European and Mercosul countries.

Forage variety of sugarcane more efficient

The Campinas Institute of Agronomy (IAC) has developed a forage variety of sugarcane containing more sugar and less fibre. It affords a higher weight gain on cattle, creating more favorable conditions for animal feeding. IAC86-2480 is more efficient than standard RB72454, the most grown variety in Brazil and the world.

Not only have the animals gained 18% in weight, the use of the new variety allowed animal feeding to be better operated, decreasing labor costs. Harvest efficiency has increased by 30% with the reduction of part of the manual labour. Mechanized harvesting has also had a gain, since the plant's uniform shape has allowed the machine to yield better.

The work has been developed by researcher Marcos Guimarães Landell in partnership with Embrapa. Although Brazil has the most efficient sugarcane production in the world, sugarcane grown for fodder does not yield the ideal productivity. According to IAC, over a million animal breeders use sugarcane as alternative fodder for their animals.

Pineapple with no fusariosis

Embrapa will introduce by 2003 two hybrids of pineapple resistant to fusariosis, a disease caused by the fungus *Fusarium subglutinans* that has become most important, since it causes high fruit losses. Both hybrids are a result of a genetic improvement program being conducted at Embrapa Cassava and Fruits (located at Cruz das Almas, Bahia) and are undergoing field tests in the states of Tocantins, Paraíba, Minas Gerais and Bahia. Other four hybrids, also resistant to fusariosis, are expected to be introduced between 2004 and 2005.

New onion variety can be stored for six months

Onion producers now have a variety that can be stored for six months without losing quality. Developed by Embrapa, variety BRS Cascata has dark-brown colour and high scale (skin) retention.

According to researcher Daniela Leite of Embrapa Temperate Agriculture (located at Pelotas, Rio Grande do Sul), with the possibility of increased storing time, the producer can obtain better prices between harvests, which is from July, when the Argentinean onion enters the market. The variety is adequate for production in Rio Grande do Sul, but researchers will soon begin testing in other states. ■



Embrapa innovates in S&T management

When it was founded in 1973, Embrapa had the objective of modernising Brazilian agriculture. It was all about raising crops, animal and forest production. The bulk of the attention was on increasing productivity. Time passed by and various strategic planning exercises made Embrapa amplify its mission. Today, its research activities go beyond rural property gates, are aimed at the whole scale of agribusiness and reflect, more than ever, its concern for the environment, with food quality and the society's welfare.

By the same measure its mission and business focus were changing, Embrapa was attempting to bring its management model to maturity in order to make it more proactive, evolving to the present model, which according to Director-President Alberto Portugal, allows the Corporation to completely fulfil the expectations of society, to observe fundamental principles such as client satisfaction, efficient structure and results assessment, and to run the company according to a new management focus, where planning and target negotiation are valued practices.

Strategic planning has been elected since the beginning of 1990's as the tool to support the organisation of internal transformations needed to adjust the Corporation to the challenges imposed by the scarcity of resources and new demands from Brazilian society. But from the second half of the 1990's, a new impetus was given to change operational routines and over 30 strategic management projects were implemented, among them systems that assess employees and all Corporation Units, plus a public selection process for heads of Decentralised Units (see report on the next page).

The principles guiding these projects included the management strategy proposed by the Executive Board for management period 1995-1998. This strategy highlighted the Global Management Policy, based on three operational policies. Research and Development Policy, designed to guarantee the quality of Embrapa technologies; Technology

Transfer Business Policy, designed to guarantee to the society adequate access to these technologies, especially for clients and users; and Corporate Communication Policy, designed to guarantee all segments of society access to information about Corporation activities and to establish mechanisms to monitor the organisation's image. The philosophy underlying these operational policies also integrates the concepts expressed in the III Embrapa Five-Year Plan for the period 1999 to 2003.

By the end of the last decade, Embrapa adopted a tool to allow the Board of Trustees, the Executive Directorate and the managerial body to monitor the Corporation's steps towards fulfilling its mission and the values, objectives and policies contained in its Five Year Plan: the Balanced Scorecard, a method created by Americans Robert Kaplan, Professor of Harvard Business School, and David Norton, Strategic Management Consultant, in which the institutional strategy is translated into processes and then extended to all levels of the organisation, involving all employees in its execution. Embrapa was one of the pioneering Brazilian companies to adopt this method, which is the basis for its Strategic Management Model (SMM).

Now, with the perfection of the Corporation's management practices, the Embrapa Management System (EMS) is being introduced. In it, the different management levels – strategic, tactical and operational – are integrated, the various instruments and Collegiate Units are aggregated, and the SMM and the Research and Development programme, previously represented by the Embrapa Planning System are more in line with each other.

Agenda – In the strategic level of the Embrapa Management System the Five Year Plan is interpreted within the framework of the Institutional Agenda, which together with the SMM, details the strategies contained in the Corporation's higher document, sets guidelines and instructions, and points to ways in which they can be attained.

On the tactical level, the programming – the Corporation's portfolio – is organised and conceived into five macro-programs: three for Research and Development (R&D) projects, one for Technology Transfer and Corporate Communication projects and another that contemplates initiatives translated into managerial improvement projects and processes of high institutional impact. Such projects and processes, are organised in the macro-programs and aimed at the technological development of agribusiness, at sector competitiveness and sustainability and at the great national challenges, and are materialised in the operational level by the Research Units.





Initiatives are rewarded

Embrapa's preoccupation with excellence in management has resulted in innovative proposals in public administration. Two examples are the Results Assessment and Reward System and the public selection process for heads of Decentralised Units of the Corporation, winners of the "1st National Competition of Innovative Management Experiences in Federal Public Administration", held in 1996 by the National School of Public Administration (Enap), of the then Ministry of Administration and State Reform.

The Assessment and Reward System gathers results obtained by the Units and the employees and recognises their performance. It distinguishes the rewards given for results obtained using previously negotiated targets, organised in an Annual Working Plan (AWP) and in the Performance Planning, Follow-up and Assessment System (PPFAS). The objective is to develop and introduce integrated assessment and rewarding systems to subsidise the Senior Management in managing and recognising the work of those Units that contributed the most to the fulfilment of Corporation objectives and mission, and to stimulate employees.

Choosing Unit heads via public selection follows previously defined objective criteria. The candidates present and submit a working plan for the Unit in conformity with the Corporation's guidelines for R&D, Corporate Communication and Technology Transfer and Institutional Development, and are submitted to oral examination by an examining board formed by professionals even from outside the Corporation.

Any person who fulfils the minimum requirements as to formal education and professional experience may apply. Director-President Alberto Portugal explains that further than the emphasis placed on technical and managerial competence, the involvement of society with the work proposal of Corporation Units is encouraged.

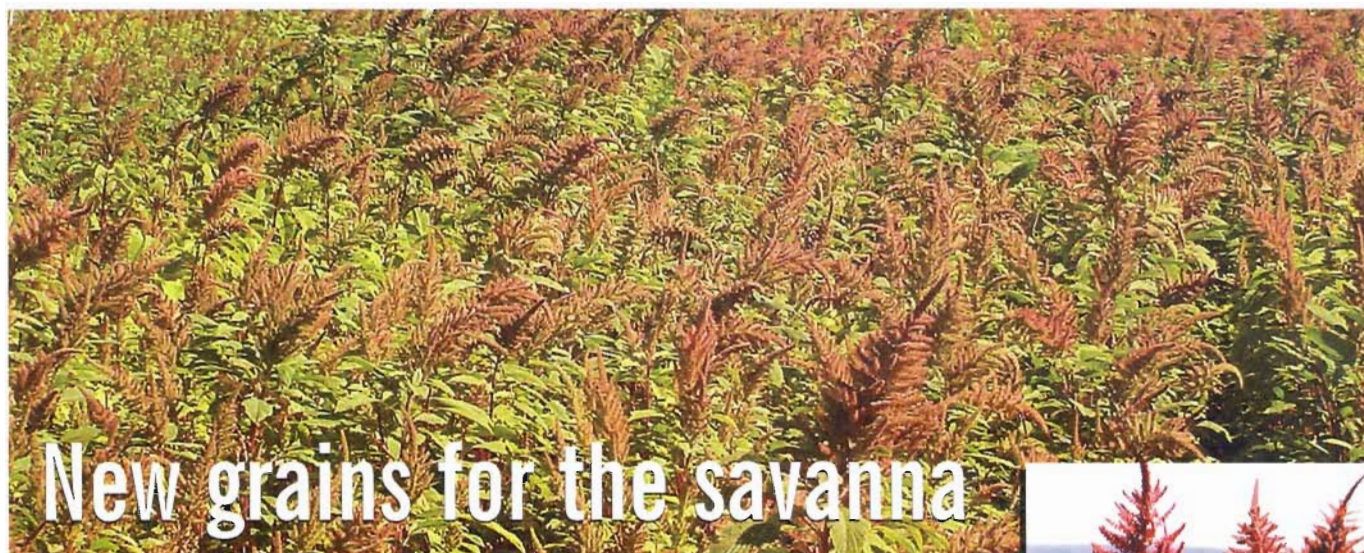
The EMS strengthens Collegiate Units in the various decision levels and stimulates partnerships, multidisciplinary activities and the formation of research networks. "The system integrates abilities from within and outside the Corporation as it guarantees the participation of internal actors and partners, and makes feasible the sharing of resources, intellectual capacity and infrastructure to approach issues that are strategic for the society", adds Alberto Portugal. Further from technical merit, which was already the object of rigorous assessment, a project must have strategic merit in order to be part of a macro-program.

"Embrapa proposes to continually perfect its management model because it has clear targets. It wants to be a synonym of quality in research and development, to be more and more market-oriented and to manage its business within standards of excellence. And to be recognised for that", concludes Alberto Portugal.

Research projects are reassessed

The document, which presented the Directory's strategy for the period 1995-1998, had already made explicit our intention to ensure that the quality of our technologies should be adequate to the demands of intermediate and final consumers. The reassessment of research projects was at its start. Those who totally fulfilled the demands of the productive sector continued, those who did not were reformed or cancelled. The focus was on concentrating efforts in strategic areas close to state-of-the-art scientific advancement, crystallizing technologies in products and processes that could reach everybody. The concern with family agriculture and the environment was given more attention, although it has always been present in the Corporation's projects.

Market, agribusiness development, excellence in consumer relations and the welfare of the society are also part of this new focus. Corporation Units, when planning their activities, had to use reliable methods to identify demands. In order to be more efficient at this identification process, the Corporation once again innovated and created the Advisory Boards, made up by representatives of the agribusiness and the society in general. Further to the Advisory Boards, Embrapa reformed its bylaws in 1997 and created the Board of Trustees with the duty of supporting its interaction with the society in its institutional role. ■



New grains for the savanna

Not long ago, soybean and cotton reigned alone in the savanna fields, followed closely by rice and corn. In the past years, the region has begun producing other types of grains such as sunflower, barley and wheat. Nowadays, for instance, almost 80% of the sunflower grown in Brazil are in the Center-Western region.

However, a new generation of grains is about to invade the Brazilian savanna. Embrapa has succeeded in adapting two products in the region: amaranth and quinoa, of which varieties are being distributed to producers for seed multiplication. Soon, they will be able to occupy a niche in the market, which was poorly exploited until recently.



Brazil is given its first amaranth variety

The carriers of coeliac disease (allergy to gluten) will be able to enrich their diet with the new grain variety launched by Embrapa. Today, Brazil has close to 300 thousand coeliac patients. The diet of those who are allergic to gluten is restricted as they cannot consume wheat, oats, barley, malt, rye or their by-products. According to Maria Elisete de Freitas Quero, of the Association of Brazilian Coeliac Sufferers (Acelbra), the offer of alternative products with no gluten is small and the price is very high.

BRS Alegria is the first amaranth variety recommended for grain cultivation in Brazil. It is high on proteins, free from gluten and can be consumed as morning cereal or used to make dough, bread, biscuits and cakes.

Researcher Carlos Spehar, of Embrapa Cerrados, explain that there is a low cost involved in implementing amaranth farming, as only 6 to 10 kg of seeds per hectare are necessary in direct planting. The period between emerging and maturity is 90 days, ideal for the economic production in between main cropping seasons. It can also be used as animal nutrition – it is more advantageous than corn or soybean to feed birds and swine due to its natural balance of essential amino acids.



Quinoa: from the Andes to the Central Plains

Embrapa has launched the first quinoa variety recommended for cultivation in Brazil – BRS Piabiru. Originated in the Andes, it belongs to the spinach family and can be defined as “a type of spinach that produces grains”.

The variety is tolerant to draughts, is high on protein (it can substitute milk casein and red meat protein), has no gluten and does not have saponin, a bitter substance that limited the direct use of quinoa. The grains can be food substitute for morning cereal, in salads, as flour and can be used by the food industry to make bread, crackers and pasta. It can be used as animal feed, processed by the feed industry or the whole plant in the agriculture-farming integrated system. Quinoa is also useful as straw in the direct planting system.

With all these qualities, the demand for quinoa around the world has grown, as it is used by naturalists and persons allergic to gluten. The research that obtained cultivar BRS Piabiru was developed with the participation of the University of Brasília, the Federal University of Goiás, the Superior College of Agrarian Sciences of Rio Verde and the Association of Direct Planting in the Cerrado. ■

The arrival of aromatic rice

Embrapa and IAC develop popcorn aromatic cultivars

Although it can be found on the shelves of Brazilian supermarkets, aromatic rice is still imported and expensive – it can cost five times as much as traditional rice. Embrapa and the Campinas Institute of Agronomy (IAC) have begun developing Brazilian varieties of aromatic rice with the same features and a lower price. The objective is to cater for this market niche often formed by specialised restaurants.

IAC began working in 1992. Researchers believe that within three years new varieties will be traded, with jasmine and popcorn fragrance. The most advanced research involves cultivar IAC 500 whose main feature is its buttery flavour, often compared to that of microwave popcorn. The institute is also developing rice cultivars adapted to Brazilian conditions, such as black rice and wild rice.

Embrapa also expects that within three years another popcorn-aromatic variety will be available to Brazilian agricultural producers. At present it is still designated as CNA 8934 and is undergoing final assessment in the North and Center-Western regions. The Corporation will begin the multiplication process of basic seeds in the next harvest.

CNA 8934 does not require special attention to be farmed: the same techniques recommended for the production of rice in high land can be applied to this cultivar. Productivity is similar to other rice cultivars and it has the advantage of being more resistant to brusone, a fungus disease that can cause losses of up to 100% in production. It has special attributes that are appreciated by Brazilian consumers: it comes processed and packed and has translucent, fine long "agulhinha" grains, which become soft and loose after being cooked.

Researchers from both institutions expect the varieties to rapidly occupy market niches all over the country. "The agricultural producer will have an alternative to aggregate value to rice with a quality differential and so obtain a better price for it", explains researcher Emílio da Maia de Castro, of Embrapa Rice and Beans (Santo Antônio de Goiás – GO). ■



New corn varieties in the market

Embrapa is launching five new varieties that promise to stir the seed market – three corn and two sorghum varieties. The main news is BRS 1010, a simple corn hybrid with orange-reddish grains, high productivity and sanitation, and a production record in national tests performed during the last three years. Other launchings are corn BRS 3003 and BRS 1001, combining two important features for successful plantations: high productivity and productive stability (capacity of adapting to changes in the environment). The grains are of the semi-hard orange type (the market's favourite). The three cultivars will be fit for planting in the Southeast and Centre-Western regions, in northern Paraná, southeast Bahia and south of the states of Maranhão and Piauí.

Embrapa is also launching two sorghum hybrids for the next harvest, one graniferous and one forager. BRS 307 is more resistant to common sorghum foliar diseases than its main competitors. BRS 610 is a simple forager sorghum hybrid, high bearing for ensilage and a high producer of dry matter. ■

Satellites to map coffee areas

Brazil is making a census of its coffee producing areas based on remote orbital sensing using medium and high-resolution satellite images. The work was begun in May by the National Company of Supply (Conab) in partnership with Embrapa and consultants of the Brazilian Consortium of Coffee Research and Development (CBP&D/Café). The coordination is under the responsibility of the Research Directive Committee of the Deliberative Council on Coffee Policy (CDPC).

The work will afford a complete view of the surface planted with coffee, analysis and mapping of its spatial distribution. The objective is to obtain updated data about size, social, economical and agricultural features of the national coffee production areas to subsidise the adoption of policies for the sector, estimates and harvest forecasts. The database can be used to transfer crop management technology, to survey and monitor coffee producing areas and for planning and managing the sector. ■

Research guides the use of urban solid waste in agriculture

Using organic matter from urban solid waste in agriculture can be an excellent alternative to decrease environmental pollution. But one issue prevents this practice from being fully used in Brazil: the lack of studies regarding the quality of our urban solid waste compost (USWC) for trading purposes and standards to guide its agricultural use.

In an attempt to solve this problem, Embrapa, the Campinas Institute of Agronomy (IAC), the "Luiz de Queiroz" Superior School of Agriculture (Esalq/USP), the Piracicaba School of Engineering (EEP) and the University of Taubaté (Unitau) have developed a research to create a formal system to make the use of USWC feasible in agricultural soils. The work was based on 32 essays conducted by researches on vegetables (lettuce, carrot, chicory, beetroot and radish), rice, black beans, sugarcane, triticale, corn, manioc and white oat.

The agricultural use of USWC produces better results when associated with mineral composts, acting as the primordial source of nitrogen, phosphorus and potassium, and having reflexes on the agricultural production of the most nutrient-demanding crops.

Embrapa is already offering publications containing tables to calculate the dosage of solid waste compost with the necessary chemical fertiliser complement for different crops, based on the soil fertility analysis and on total levels of nitrogen, phosphorus and potassium present in the compost.

However, researchers warn that its use must be disciplined and a few restrictions must be observed by the agricultural producer, such as the quantity of inert matter present in the compost (needle tips, shaving blades, nails, glass, etc), levels of heavy metals (which must be below the established limits) and the presence of pathogens, organisms that can cause diseases in humans. The initiative is being financed by the State of São Paulo Research Foundation (Fapesp), Ministry of Science and Technology and private companies.

Sewage sludge also makes excellent compost

The Brazilian research initiative is assessing the use of biosolids (by-products of treated sewage residues) in agriculture. Researchers from Embrapa Environment (Jaguariúna – SP) are studying mainly the environmental impact of this product. Although the agronomic value of sewage sludge is unquestioned, its agricultural use must be done carefully so as not to cause harm to the environment, crops or who is applying it.

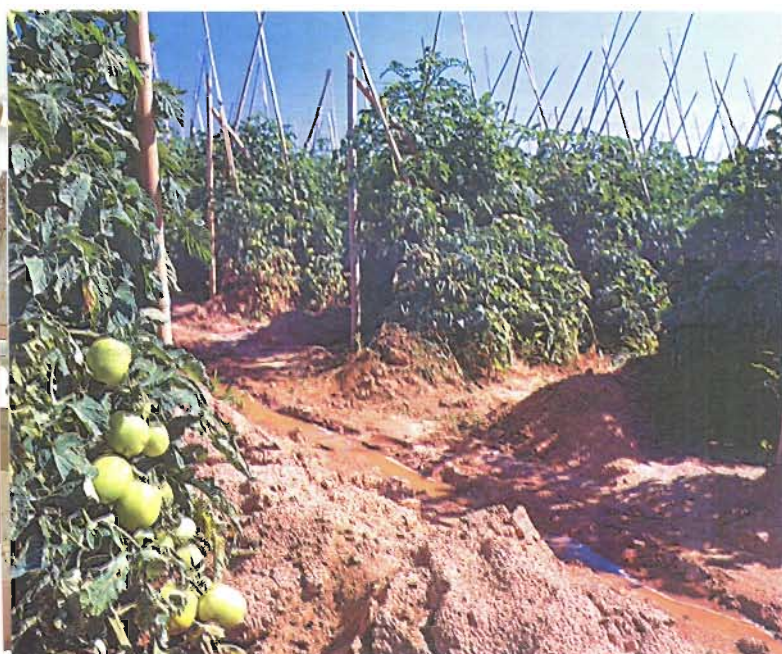
Experiments are being held with domestic sludge and urban-industrial sludge, both used in corn production. Results show that biosolids have all the nutrients required by plants and have high levels of organic matter, which improves soil conditions. So, its agricultural use depends only on the effective elimination of pathogens, which is the study being presently developed. With the results obtained, the project will subsidise the preparation of specific standards adapted to Brazilian conditions. ■

Swine dejects are source of income in Santa Catarina

Embrapa is leading the greatest effort ever made by the federal government to transform swine dejects, which endanger the environment, into income for the producer. The National Environmental Program (PNMA-II) will invest some R\$ 10 million within the next three years in two river basins located at Concórdia and Braço do Norte, municipalities of the state of Santa Catarina that concentrate swine production.

The idea is to create a model of successful intervention, which will then be taken to other regions with environmental problems caused by the inadequate management of swine, dejects. A good part of the resources will be spent on rural properties and there will be no need to pay it back by the agricultural producers who were benefited. All technological intervention will be discussed with producers associations.

Expected results of PNMA-II are a reduction in the volume of liquid dejects in the selected river basins, an increase in the capacity of treatments to eliminate pollutants, the aggregation of value to dejects and the introduction of treatment systems in the properties. To make these objectives feasible, two small organic waste plants will be set up. ■



Colored sunflower arrives at the market

Two varieties of colored sunflower developed by Embrapa are going to arrive at markets in early September. Seventy kilos of BRS Saudade seeds (yellow with a dark center) and of BRS Oasis (mixed) will be made available by public auction to professionals licenced to cultivate these flowers, corresponding to 1.5 million sunflowers.

Traditional genetic improvement allowed the development of nine different shades of sunflowers. After introducing the first two varieties, Embrapa wants to put in the market the seeds of another seven shades of sunflower: wine-red, light pink, dark pink, lemon with light middle, lemon with dark middle, light reddish-brown and dark

reddish-brown.

The flowers can be produced in small areas, to cater for regional markets. In one hectare, it is possible to produce up to 100 thousand sunflower plants. "We work with an estimated production of 40 thousands plants per hectare", calculates researcher Vânia Beatriz Castignoli, of Embrapa Soybean (Londrina – PR). "If farmers sell each flower for R\$ 0.45, and have a production cost of 50% then they will have a net profit of R\$ 8,000 per hectare", explains researcher Marcelo Oliveira. Nowadays, the prices practiced in ordinary sunflower (yellow with dark middle) markets range from R\$ 0,70 to R\$ 1,00 per flower.



Ceará invests in tropical flowers

The cultivation of tropical flowers is exciting the people from Ceará, who have their eyes on outside markets. The following step will be done in the second semester of the year 2002, with the beginning of the project Agroflowers Center of Technological Innovation, with funding from Financial Aid for Researches and Projects (FINEP). R\$ 1,18 million will be invested in research projects, development actions, in training of technicians and producers and the installation of observation, climate monitoring and electronic communication units.

Embrapa Tropical Agri-Industry (Fortaleza – CE) will be responsible for studying the selection of varieties, species of flowers and ornamental plants. Researchers will also perform the propagation in vitro of tropical species, apart from developing cultivation, management and conservation techniques for the post-harvest. The partnership is with Ceará Secretariat of Irrigation Agriculture (Seagri) and Institute Center of Technological Education (Cetec). ■



Paraíba invests in “red gold”

Urucum is again attracting the attention of national producers. With the crisis in the synthetic dye market (almost all pointed out as causing cancer), the production of natural dye (especially those derived from urucum, which is rich in bixin) is now stimulated in many places worldwide. And Paraíba who answered for almost half of the national production during the 1980s, is now one step ahead and is investing in the revitalization of the “red gold” culture, as it is called in the region.

Over 400 thousand seedlings were produced by the Paraíba State Agricultural And Livestock Research Corporation (Emepa) in 2002, increasing the planted area by 98% and reaching 800 hectares in 32 municipalities. Final production has gone to 1.2 thousand tons per year. The Seedlings are from varieties Embrapa-2, Bico de Pato and Peruana Paulista, adapted by the research to conditions in the region. They are mainly being used as substitutes for old, improductive urucum plantations. ■



Young bullocks from Pantanal come to steak houses

Brazilian consumers have a new option of fine meat on supermarket shelves and at steak houses tables. It's a young beef, very soft and delicious, cheaper and produced from young bullocks (young animals) raised in a sustainable way in the Brazilian Pantanal.

The product is available to consumers through the brand Montana Premium Beef, quality certification seal and costing only 10% more than the beef sold in supermarkets. Participants in the project are Montana Grill (group with steak houses in Campinas, Goiânia, São Paulo and Rio de Janeiro) and Associated Steak Houses of the state of São Paulo (Achuesp), which has about 100 associates. Together, they consume about 1,2 thousand tons of beef per month – a slaughter of approximately 12 thousands a month.

“Embrapa had an important role in

this process, as articulating the alliance between cattle breeders of Mato Grosso do Sul and the business of São Paulo”, explains researcher Ezequiel Valle, of Embrapa Beef Cattle – (Campo Grande – MS). Embrapa offers technical support to the project, guiding the selection of the best racial groups and checking the particularities of the young bullocks. He emphasizes that it is fundamental that animals are young, with no deficiencies, raised in comfortable and stress-free environments, always observing the handling prior to the slaughter.

The alliance is the first of its kind in Brazil involving the producers, slaughterhouses and consumers. Negotiations are being held to launch this project in Minas Gerais, through a partnership with The Young Bullocks Cattle Center of Producers of Uberlândia. ■

Consumers approve ham and sausage of sheep

Brazilians are going to discover another novelty on supermarket shelves by the end of the year: ham and sausage of sheep. The products, which are in the last stage of development, were thoroughly evaluated in a sensorial research held during this year's first semester in Brasília – DF. The technology has been developed in partnership of several institutions, like The Indústria e Comércio de Aditivos Ltda. de São Paulo (Adicon) and the Federal Universities of Santa Maria, Rio Grande and Rio Grande do Sul.

According to researcher Eliane Monteiro of South Embrapa Cattle & Sheep (Bagé – RS), the sheep ham and sausage will improve the formulation of canned food, agregating value to the flesh of young ovines and creating adequate products for national industrial equipment, with more accessible prices to consumers. After adjusting technological procedures, research will focus on product stability (physical, chemical, organoleptical and microbiological) and the cost to offer to the consumers market. ■

Colonial Chicken changes market

The Embrapa 041 Colonial Chicken, developed by Embrapa, is changing the poultry market in western Santa Catarina. Produced by small agricultural workers and sold under the label of "green chicken", the 041 became a new income alternative in the countryside and a consume habit all over the region. In the beginning of 2001 the city hall of Peritiba, a municipal district of five thousand inhabitants, whose economic basis is agriculture, decided to create a program to give opportunities to producers who were not integrated with the big agro industries. The way out was to invest in the Colonial Chicken.

"Today we have 32 families breeding from 550 to 1100 chicken, our goal is to involve 80 families up to the end of the year" states Omir Remussi, City Hall technician who is responsible for the project. Each producer is getting a profit of R\$ 1.25 per traded chicken and the income total, a minimum wage a month. "It's the kind of money that helps producers a lot since chicken breeding demands little labor and doesn't interfere in other activities which the agricultural workers deal with in his property" explains Remussi.

The green chicken is being so well accepted that by the end of the year an exclusive slaughter house should be ready for the project, and therefore the weekly slaughter will jump from 900 to 5000 be ready birds. The novelty is helping small producers from another 8 Brazilian states. Embrapa's investment in the development of the agri-ecological poultry breeding was R\$ 3.2 millions. With the sales of 41 chicken matrixes, in 2002, Embrapa Swine & Poultry (Concórdia - SC) expects to get R\$ 470.000. ■



Epamig proposes the integration of milk and beef cattle



Researchers from Agricultural and Livestock Research Corporation of Minas Gerais (Epamig) are developing a program to help the cattle breeders from Minas Gerais, particularly those with less investment capacity, to raise their income with an economic alternative of sustainable exploration. It is called Organization and Management of Bovine Breeding, and their work defends the use of half blood animals (F1), which produce cheaper milk.

The research developed by Alberto Marcatti Netto, José Reinaldo Mendes Ruas and José Joaquim Ferreira provides for the production of beef bull-calvers by cross-breeding F1 with Zebu bull. The integration between milk and beef cattle will allow an increase in milk production and in the offer of high quality animals for slaughter. First results were obtained in Epamig experimental farms and in various regions of the state, but the private initiative is already adopting the model. One example is Cassiolândia ranch of the Andrade Gutierrez group. ■

Rainwater for ranch usage

The State Secretariat of Agriculture of Santa Catarina and Embrapa Swine & Poultry (Concórdia - SC) have struck a partnership to take advantage of rainwater and prevent the future droughts from affecting the agricultural production in the region. The idea is to implement a system of low cost wells, which can be attached to the aviary and big pigsties already existing in the region.

Researchers guarantee that rainwater is the big solution for the increasing demand of water in the countryside. According to a simulation, if the rainwater from May 1995 were collected, a month with the lowest amount of rain in the last 10 years (only 23mm) in western Santa Catarina, it would be possible to collect 31 cubic meters of water from a poultry aviary, which is enough to supply water for 8 days to three-week-old chicken. The system will have conditions to supply water for installations cleaning and the animals as long as the necessary orientations are followed. ■

Bioinsecticide fights corn pest

An insecticide that is efficient, safe for the environment and for man. Those are only some of the advantages of the bioinsecticide that is being developed by Institute of Biological Sciences of the Federal University of Minas Gerais (UFMG) in partnership with Embrapa Corn & Sorghum (Sete Lagoas – MG), to fight the caterpillar *Spodoptera frugiperda* which attacks corn plantations. The pest, which is responsible for losses of 30% of the production, is fought today by the usage of chemical insecticides, which in spite of being efficient and low cost, they cause serious environmental damages, attacking other animals indiscriminately including the pest's natural predators, the baculoviruses.

The bioinsecticide acts by controlling the caterpillar using the baculovirus' itself. Since they act slowly, researchers looked for ways of potentialising its action. 'We chose a faster and more efficient strategy: the genetic modification of baculoviruses by introducing in its genome genes related to the production of toxins', tells professor Evanguedes Kalapothakis, who coordinates the research together with professor Marcus Vinícius Gomez and researcher Ivan Cruz, of Embrapa.

The genes are originally from spiders and scorpions which were selected by isolation and characterization of toxins produced by these animals. 'We chose the genes of toxins that attack the caterpillar nervous system but do not act on mammals or birds' explain Kalapothakis. The genetic modifications tested on the baculoviruses increased their lethal capacity, decreasing the lifetime of the caterpillar by 20%. 'The results are significant but our goal is to reduce the caterpillar's lifetime by 50%', reveals the professor.

The research is funded by the Ministry of Science and Technology. As well as carrying out the research in its own laboratories, Embrapa also provides caterpillars for experiments and offers baculoviruses patented by them, which are specific for use against the corn pest. Researchers are looking for business partners because the bioinsecticide has great market potential. ■

TB-Net starts testing vaccines against cattle tuberculosis

One of the greatest problems of cattle breeders is about to have a definitive solution: Brazil will start testing within the next months a genic preventive vaccine against bovine tuberculosis. Today, sick animals must be slaughtered by recommendation of the Ministry of Agriculture, Livestock and Food Supply.

Researches is being coordinated by TB-NET of The Ministry of Science and Technology, formed by 47 national institutions and 170 scientists. The objective is to develop a vaccine to control tuberculosis in humans, but clinical tests will first be made on bovines. Animal testing will be done until September by a team formed by researchers from the University of São Paulo (USP), The Federal University of Minas Gerais (UFMG) and a company called RD Biotec. The vaccine is expected to be commercialized by the end of 2003. ■

Vaccine against tick reaches its final phase

Embrapa research to produce a vaccine against cattle tick (*Boophilus microplus*) has reached its final phase. Efficiency analyses made by researcher Renato Andreotti, of Embrapa Beef Cattle (Campo Grande – MS) show that the protection afforded by the vaccine is around 72.8%. Existing vaccines against tick point to a protection margin of around 51% in Brazilian cattle and need at least three doses. There are vaccines in the international market, which are based on the gene of protein Bm86, which acts in the tick's digestive tube, but it causes lesions that jeopardize the development of the acarus in its parasitic stage.

The Brazilian vaccine acts on the tick's larvae on the moment they fix themselves to the cattle, before beginning its parasite stage, not damaging the cattle. The tick has attack mechanisms that facilitate their permanence on the cattle's body, avoiding the inflammatory response at the place bitten and inhibiting the sensation of pain in the animal. The vaccine acts exactly upon a protein responsible for this process, making the cattle defend itself more quickly against the tick in its larvae phase (when it is still fragile). The inflammatory response in the bitten place prevents the tick from feeding and therefore the larvae dies within 24 to 48 hours. ■



Chicken and bull genomes begin to be sequenced



Embrapa is participating in two strategic researches for the future of national cattle breeding: the sequencing of chicken and bull genomes. In partnership with the Luiz de Queirós Superior School of Agriculture (Esalq/USP), of Piracicaba, researcher Mônica Ledur works to map the segments of the chicken genome that contain genes which could be influencing certain characteristics of economic interest, such as a bigger chest, reduction in the fat in the carcass, resistance to certain types of disease and to reduce production costs.

The first results will be seen in approximately two years, but the incorporation by Brazilian aviculture will take longer because it depends on the

validation of results obtained in commercial populations. "There's no doubt that possession of this information will be decisive in the international chicken market", foresees the researcher. Similar experiments are being held only in Northern Hemisphere countries, which have environmental conditions different from Brazil.

BOVINES – the cattle genotype is being studied by means of genetic markers, making it possible to identify characteristics of resistance to parasites that infest the cattle and cause diseases, the capacity of producing more milk and meat, the better adaptability of the animals to the tropical conditions and the resistance to mastitis, which affects the cow's udder.

"We want to define which genes are responsible for these and other characteristics of economic interest to cattle breeding", says researcher Mário Luiz Martinez, from Embrapa Dairy Cattle (Juiz de Fora – MG). To continue with the work, the enterprise inaugurated a molecular genetics laboratory and launched The National Bovine Genome Network, gathering efforts from various institutions all over the country, which hold their researches in this field. ■

New technique avoids the dissemination of mad cow disease

Embrapa developed a new method to systematically identify animal origin proteins and peptides present in the rations. The great advantage of this technique is that it allows the direct investigation of the high sensibility animal protein presence, avoiding more precisely the dissemination of diseases such as 'mad cow' (bovine spongiform encephalopathy).

Embrapa is already working with the new method, making isolated analyses, signing contracts for periodic analyses to follow up the production and fiscalizing actions. Main users of this service are the ration industries, exporting and importing companies, Ministries and State Secretariat of Agriculture. The patent request for the methodology was filled at the National Institute of Intellectual Property (INPI). ■

Research can lead to the creation of anti-hypertensive made with goat milk protein

A research by Embrapa Goats (Sobral – CE) may lead to the creation of the first medicine to fight hypertension made from proteins found in the goat's milk. Preliminary results of a study by researcher Antônio Sílvia do Egito reveal great possibilities of breakdown of milk proteins by enzymes that have anti-hypertensive properties.

Producing the path to the possibility of this medicine began 10 years ago with the work purify protein as1, found in cow's milk, which has that presents tranquilizing effects and is already being commercialized in Europe under the name of Positea. At that time, Antônio

Egito was a member of professor Jean-Luc Gaillard's team, of University Henri Poincaré, in Nancy, France.

Using the model that breaks up mare milk proteins, which showed the presence of anti-hypertensive properties in tests made in vitro, and comparing this result with the same protein in goat's milk, the researcher believes it to be possible to obtain fragments with the same property. The novelty will allow the adoption of new lines of research not only in the French University where Antônio Sílvia do Egito developed his doctorate thesis but also at Embrapa Goats. ■



Agribusiness as a factor of sustainable development in the Amazon

The Brazilian policy for the sustained development of the Amazon Region has been developed to deal with issues of national integration, promotion of social and economic growth, with rational use of the natural resources, never losing sight of environmental preservation. This policy has generated a great deal of discussions within our society, specially by non-government organizations (NGOs) identified with environmental conservation and the struggle to restrict the use of forests and other forms of native vegetation. At the same time, the representatives of the Brazilian agribusiness understand that the public control and management of natural ecosystems must be made flexible, provided that we develop environmental characterization and safe methods for use of the resource, in order to promote social welfare and to enhance the competitiveness of the Brazilian agricultural sector.

During the last 29 years, the National Agricultural Research System has been generating and validating technologies so as to offer great changes in the processes of forest and agricultural production, as well as in the planning, use and management of natural resources in the region.

In spite of these significant advances on the knowledge of the Amazon ecosystem, in practical terms we are still very far from reaching what is known as sustainable development. There are several challenges and they will only be overcome after better agricultural models have been defined, offering a more balanced integration among man, environment and technology. Since it is not possible to measure the extent of these challenges, we have selected three themes that, in our view deserve more immediate attention: biodiversity, deforestation and burning practices and agricultural production.

We call attention to the potential usage of biodiversity in the Amazon. In spite of the biodiversity characterization efforts developed by public and private research institutions, from the 11,000 species of identified plants, only 1,200 are being used as biological resources, most of them by local and Indian communities in extractive activities. From these, only 80 species

became semi-domesticated, and the number of species that have germplasm banks does not reach 10 – of which only 5 are being used with economically and socially relevant results.

When it comes to the diversity of microorganisms in the Amazon, the challenge is even greater, since this is a virtually unknown world. For this reason, we are certainly missing the opportunity to use these resources to enhance the competitive capacity of our industry in the areas of health, bioremediation, biomaterials, food, etc. It is therefore necessary to invest more resources in scientific and technological efforts directed at the transformation of these valuable genetic resources into economic resources.

Deforestation and burning – Today the area in the Amazon region that suffers with burning surpasses 55 million hectares. It causes great concern that, despite all government efforts to halt this process of destruction, there is still deforestation and fire which covers from secondary vegetation up to dense forest, covering approximately 1.5 million hectares a year. It has been calculated that around 600 thousand families of smallholders live in the region. According to Dr. Alfredo Homma, a scientist of Embrapa Eastern Amazon, located in the state of Pará, these family farmers deforest and burn down around 2 hectares a year to grow crops and cultivate the same area only for 2 years. This means an inertial deforestation of 1.2 million ha/year.

Considering estimates that deforestation of one hectare produces 100 tons of CO₂ and that the cost of eliminating 1 ton of CO₂ from the atmosphere is around US\$12, we can deduce that each hectare that is burned down in the Amazon forest costs US\$ 1.3 thousand. This loss can be avoided by the utilization, in deforested areas, of simple technologies that allow the farmer to remain in the same area for longer periods of time.

The goal of the Kyoto protocol is to reduce around 6 billion tons of carbon a year. The developed countries that signed the protocol could help Brazil to preserve and restore our forest by buying CO₂ retention

quotas, which would be desirable for the whole world community.

Production – Agricultural activity in the Amazon is a reality. Today there is a herd of over 35 million beef cattle and a significant production of palm oil, black pepper, cupuaçu, açaí, Brazil nut, native wood, exotic fruits, grains etc. If in one hand agricultural activity and production increased, in the other hand little use of technology and subsistence farming with intense deforestation and burning are still significant problems.

In recent years a series of factors stimulated the interest of the private sector to expand the production of grains in the region. This interest raised expectations and the opportunity for materialization of new agricultural activities, with wide possibilities of job generation and raising wages. However, much of these possibilities are surrounded by ecological preoccupations.

In this context, a position must be made clear: Embrapa will not stimulate the growth of grain production in the Amazon, but will look for improvements in crop production, responding to the demands of the public and private sectors. There are more than 55 million hectares of areas in the Amazon region which have suffered the influence of man and, if agriculture is intensified by 40% we could produce more than 60 million tons of grains a year, without the need for new deforestation.

Finally, if agribusiness in the Amazon is to fulfill its role in the improvement of urban and rural life conditions with environmental preservation it will be necessary a substantial increase in S&T investments, as well as the development of public policies which make possible the use of already existing technological alternatives, promoting cautionary measures directed to environmental protection and conservation.

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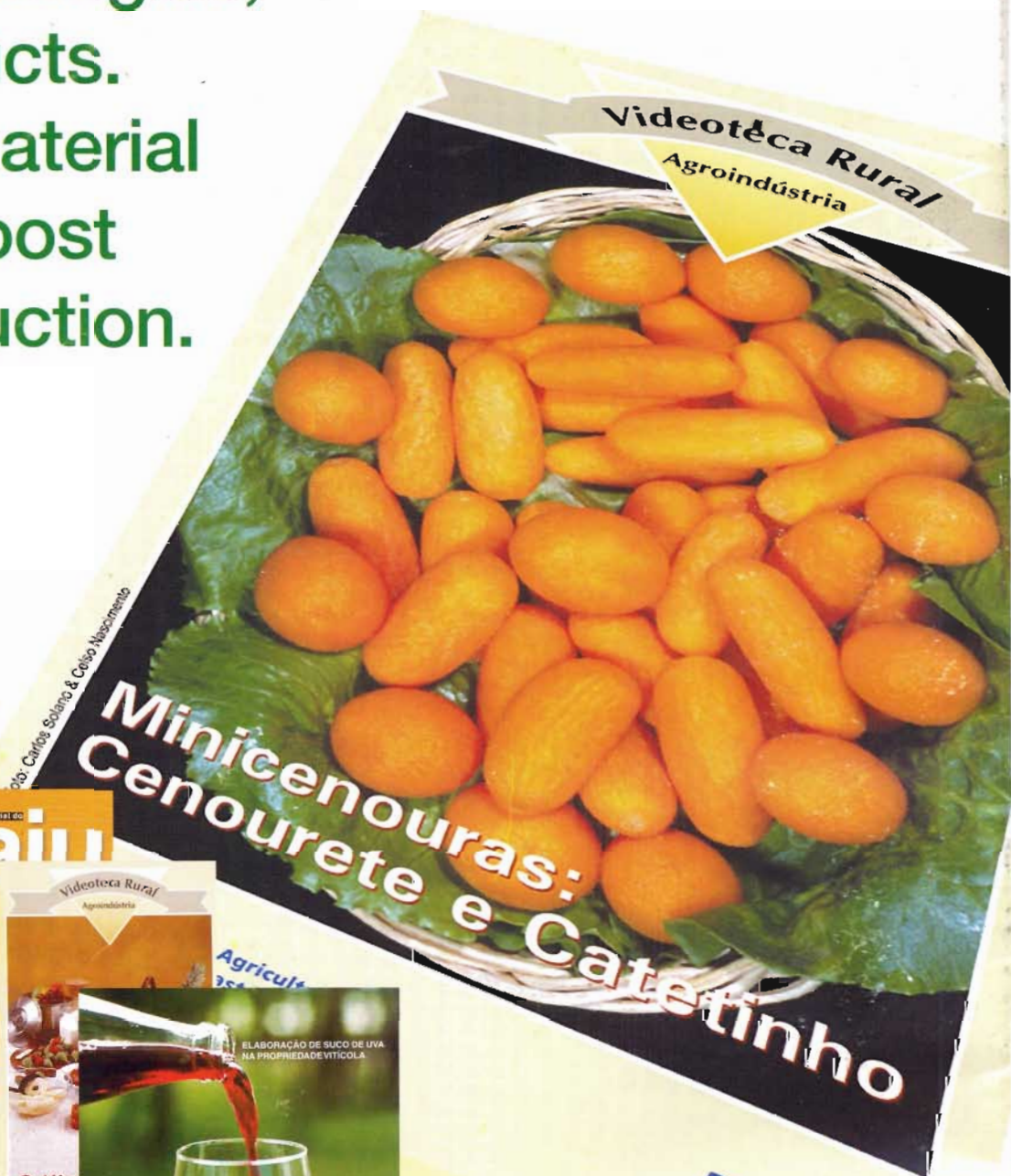
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