



TECHNOLOGICAL SOLUTIONS AND INNOVATION



Embrapa in the International Year of Family Farming



Brazilian Agricultural Research Corporation
Ministry of Agriculture, Livestock and Food Supply

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Embrapa in the International Year of Family Farming

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Introduction

The effective search for sustainability of agricultural production systems in their economic, social, and environmental dimensions is a permanent challenge to be equated in the formulation and implementation of public policies for the sector, at any time. Thus, it is a constant concern in the agenda and programming of public agricultural research institutions like Embrapa.

However, sustainable rural development will not be attained without paying special attention to integrated actions for productive inclusion and reduction of rural poverty.

This requires strong support to technological development that prioritize agriculture in all of its dimensions and plurality.

These are concerns that, in view of their relevance, are explained in the document *Visão 2014–2034: o futuro do desenvolvimento tecnológico da agricultura brasileira* [*Vision 2014-2034: the future of technological development of Brazilian agriculture*], with which Embrapa seeks to direct its programming in the next decades.

By doing so, Embrapa recognizes and reaffirms the absolute essentialness of the national policy for support and strengthening of family farming, in line with the effort of international bodies, which seek to reposition family farming in the center of agricultural, environmental and social policies, identifying gaps and opportunities to promote a more equal and balanced development. These are the reasons that led the Food and Agriculture Organization (FAO) of the United Nations to choose 2014 as the International Year of Family Farming.

Embrapa, in light of the importance of family farming to the development of Brazilian agriculture and in view of the recent creation of the National Agency for Technical Assistance and Rural Extension (Anater) develops and furthers specific strategies to meet this segment, aiming at strengthening the local/regional economies and promoting improvement in the quality of life, and food and nutritional security of the rural and urban populations.

It is in this context that the present document must be read and interpreted. It is an expressive demonstra-

tion of Embrapa's real involvement in the generation of knowledge and technologies "with" family farming, in the different Brazilian agroecosystems, as well as in technical exchange with African countries, through technicians and researchers assigned to the most diverse Research Centers and in partnership with relevant public and private institutions.

Maurício Antônio Lopes
President of Embrapa

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ARTICLE

Challenges and new horizons for the strengthening of family farming

Waldyr Stumpf Junior, Executive Director of Technology Transfer, Embrapa

The relevance of family farming in Brazilian development can be verified from several aspects.

Some important points to be considered refer to sustainable food production, observing the diversification of the production matrix in the different national biomes and ecosystems, ranging from its strategic role in the maintenance of biodiversity and in the search for new and different technological formats that are less dependent on external inputs, to its significant participation in the generation of income and employment for the rural workforce, which contributes, above all, to the promotion of food, nutritional, environmental and social security.

According to data from the Brazilian Institute of Geography and Statistics (IBGE), in 2006, in Brazil there were 5.2 million agricultural establishments, 4.4 million of which were classified as family farms¹ and accounted for 74.4% of the people occupied in Brazilian agriculture and livestock.

Since the creation of the *Programa Nacional de Fortalecimento da Agricultura Familiar* [National Program for the Strengthening of Family Farming] (Pronaf), in 1996, family farmers have received growing

attention, consolidated in public policies built with the participation and legitimate representation of social movements. One should note that, as of the beginning of the 21st century, notably as of 2003, a new set of actions and programs were added to Pronaf to strengthen this social segment.

The implementation of the *Planos Safra da Agricultura Familiar* [Family Farming Harvest Programs], as well as the initiatives of the National Food and Nutritional Security Policy and the work of the National Food and Nutritional Security Council (Consea) and of the National Council for Sustainable Rural Development (Condraf) have given greater consistency to the actions and programs aimed at family farming.

Besides the significant increase in financial resources destined to Pronaf, other important activities are also worthy of note: resumption of a technical assistance and rural extension policy for family farming, which has definitively influenced the initiative of creating the National Technical Assistance and Rural Extension Agency (Anater); implementation of the *Garantia Safra* [Harvest Guarantee], aiming at sustaining the income of family farmers in the Brazilian semi-arid region; implementation of the Family Farming Insurance, linked to Pronaf; implementation of the Food Purchase Program (PAA), which is a pioneering program for the procurement of foods originating from family farming, with a focus on promoting food and nutritional security; reinforcement of public research on family farming, with large investments in the Brazilian Agricultural Research Corporation (Embrapa) and in State Agricultural Research Organizations (Oepas) originating from the Growth Acceleration Program (PAC); creation of the National Policy on Agroecology and Organic Production (Pnapo); in addition to incentives for the process of agro-industrialization of family farming products, aiming at adding value, quality and better insertion in the markets.

¹ A family farmer is deemed to be one who simultaneously meets all of the criteria of Law no 11.326, dated 24 July 2006, which are: not owning an area greater than four fiscal modules in any capacity; predominantly using family labor in the economic activities within the establishment or enterprise, having family income predominantly originate from economic activities linked to the establishment or enterprise; directing the establishment or enterprise with their family. The following are also beneficiaries of this Law: foresters who simultaneously meet all of the above requirements, cultivate native or exotic forests, and promote the sustainable management of those environments; fish farmers who simultaneously meet all the above requirements and exploit water reservoirs which either take up a total surface of up to two hectares or up to 500 cubic meters of water when in cages; forest gatherers who simultaneously meet the above requirements and perform this activity manually in the rural area, excluding miners and diggers; fishermen who simultaneously meet the above requirements and perform manual fishing activities.



This rich Brazilian experience of creating and strengthening public policies for family farming has inspired other companies to learn from them and implement them. All of this learning can be furthered with the United Nations Food and Agriculture Organization (FAO)'s decision of choosing 2014 as the International Year of Family Farming (IYFF 2014). The aim is to reposition family farming in the center of agricultural, environmental and social policies in national agendas, identifying gaps and opportunities to promote change toward more equal and balanced development.

According to FAO, the importance of family farming is based on the following points: (a) it is intrinsically linked to food and nutritional security, (b) it preserves traditional foods, in addition to contributing toward a balanced diet and safeguarding agricultural biodiversity and the sustainable use of natural resources, (c) it represents an opportunity to boost local economies, especially when combined with specific policies intended to promote social protection and welfare in communities and sustainable rural development.

One of the most recent incentives to family farming in Brazil came with the sanction of the law that creates the National Technical Assistance and Rural Extension Agency (Anater), which will have the following competences:

I – Promote, encourage, coordinate and implement technical assistance and rural extension programs, aimed at technological innovation and appropriation of scientific knowledge of technical, economic, environmental and social nature.

II – Promote integration of the agricultural research system and of the technical assistance and rural extension system, promoting improvement and generation of new technologies and their adoption by producers.

III – Support the use of social technologies and traditional knowledge by rural producers.

IV – Certify and accredit public and private entities that provide technical assistance and rural extension services.

V – Promote continuous programs and actions to qualify technical assistance and rural extension professionals who contribute toward sustainable rural development.

VI – Hire technical assistance and rural extension services in accordance with regulation; VII - liaise with public bodies and private entities, including State Governments, state technical assistance and rural extension public bodies and municipal consortiums, to meet their objectives.

VIII – Collaborate with the units of the federation to create, implement and operate a mechanism with objectives that are similar to Anater's.

IX – Monitor and evaluate the results of technical assistance and rural extension service providers with which it maintains contracts or agreements.

X – Make the necessary efforts to universalize technical assistance and rural extension services for family farmers and medium-scale rural farmers.

XI – Promote priority liaisons with state rural extension bodies aiming at making the work in each Unit of the Federation feasible and increasing the coverage of service provisions to beneficiaries.

One should also note that items II and IV will be conducted in close collaboration with the Brazilian Agricultural Research Corporation (Embrapa).

In conclusion, in the course of its 40 years, Embrapa has contributed with know-how and technological solutions for family farmers. Presently, the Corporation's effort can be seen, for instance, in its contributions to the creation of public policies, like the National Agroecology and Organic Production Policy, Low Carbon Agriculture Program, Harvest Plans, Agro-climatic Zoning, Land Management Programs, and the Brazil Without Poverty Plan, in addition to longstanding institutional partnerships with government and nongovernment institutions and it has, in its own research, development and technology transfer programming, actions and projects to support development of family farming and of sustainability in rural areas.

The present reference book brings a small sample of the results from these projects. ♦

Embrapa's studies benefit family farming and Brazilian traditional populations

In an action involving Embrapa, *Rede Brasil Arroz* [Brazil Rice Network] and the Mato Grosso State Rural Research, Assistance and Extension Corporation [*Empresa Matogrossense de Pesquisa, Assistência e Extensão Rural*] (Empaer), counting on the support of the municipality of Nobres, MT, and Embrapa Rice and Beans, located in Santo Antônio de Goiás, GO, promoted the delivery of one ton of seeds of the BRS Sertaneja cultivar, developed by its researchers, to two Bacairi indigenous villages of that municipality.

In addition to the seeds, the members of the communities received crop-specific technical information for adequate sowing, aiming at better productivity.

A total of 22 hectares of rice were planted, 17.5 hectares of which with BRS Sertaneja and 4.5 hectares with BRS Bonanca, another cultivar by Embrapa used by these communities in the previous harvest. The harvest exceeded 42 tons, with average production of 1,934 kg/ha. In the area with the best result, owned by the farmer Jose Ricardo Soares, president of *Associação dos Produtores Indígenas da Aldeia Santana* [Santana Village Indigenous Farmer Association], the productivity reached 3,450 kg/ha. With the aim of ensuring next year's crop planting, families of the Communities stored 3.4 tons of seeds. According to the Chief of Santana village, Arnaldo da Silva, the communities now intend to receive bean seeds. Between 2006 and 2009, in the Quilombola do Cedro community, in Mineiros, GO,

Embrapa promoted the multiplication of traditional rice, beans and maize cultivars. The work, performed by the farmers themselves, contributed to food security for that population, and also recovered their agricultural culture, through the ratification of the creole cultivars and encouragement of their use in the community's diet. Embrapa's experts provided support with information on management techniques, protection against diseases, green manure, and crop rotation and diversification, guaranteeing the conservation and functional use of the local agricultural biodiversity.

The Technology Transfer (TT) analyst Carlos Magri Ferreira stresses the importance of farmers being open to the achievements obtained with the studies developed by the Corporation: "Embrapa's research has no defined addresses. Our cultivars have adaptability for every farmer, the proof is this adoption and approval by the indigenous community in Mato Grosso and the similar results obtained in the quilombola community of the municipality of Mineiros, in Goiás", says Magri.

According to the general head of Embrapa Rice and Beans, Pedro Machado, the adoption of good agronomical practices by traditional farming communities has greater efficacy when working in partnership with local public rural extension services, due to their knowledge of regional peculiarities. "Our conduct was to present our BRS cultivars with Empaer-MT to the indigenous farmers, always respecting cultures and customs, in the light

of the eventual choice for traditional cultivars, which are important for the biodiversity”, states Pedro Machado.

Embrapa Rice and Beans’ work in family farming and traditional populations has been governed by the partnership with such institutions. In Goiás, according to the TT analyst Glays Rodrigues Matos, once Emater and family farmer organizations identify the places where actions can be developed, the seeds are sent to the farmer for the implementation of Demonstrative Units (DUs); and the dissemination of the information provided takes place done through Field Days, bringing knowledge of the technologies applied and their results to other farmers.

“Such work strengthens social ties in the communities”, says Glays. “It is important to Embrapa as it increases our network of multipliers and crop production potential”, concludes.

AGROECOLOGICAL PRINCIPLES

In 2009, Embrapa Rice and Beans started the project Development of Technologies in Agroforestry Systems geared toward Agroenergy and Food Security, headed by the researcher Agostinho Didonet, which proposes agroforestry systems based on agroecological principles. The purpose of the Project was the production of foods and raw materials for Agroenergy and food security, as an alternative for the rehabilitation of degraded areas, using native species with potential for economic and sustainable exploitation; as well as the recomposition of riparian forests, springs and legal reserves. With the adoption of annual crops such as rice, beans, maize, cassava, pumpkin, melon and watermelon, among others, family farmers like Gilmar Pereira de Souza, from São Miguel do Passa Quatro, GO, saw new possibilities for increasing family income in the project. They started to adopt crops intended for the production of renewable agroenergy raw materials but that also allow food uses, like sesame and sunflower, and opting for the sustainable management of the forest component, which allows for the exploitation of fruit, firewood, timber, etc., preventing the use of native forests. In 2011, these actions started to count on the partnership of Emater-GO, which develops the *Fruteiras do Cerrado* [Cerrado Fruit Trees] project, through which it encourages land rehabilitation in this biome with fruit species of the Brazilian *Cerrado*. There

are already over 15 municipalities in Goiás whose communities have benefited from the Project.

Embrapa Cerrados (Planaltina-DF) and Embrapa Rice and Beans take part in an agroecology project in the Caxambu Community, in Pirenópolis, GO. About 20 families comprise one of the main irradiating centers of Agroecology in the country, including municipalities like Catalão, Silvânia, Faina, Uirapuru and Heitorai, in Goiás, and 20 others in the region of Montes Claros, north of Minas Gerais State, which produced 400 tons of grain and forage seeds last year. Embrapa provides rice and bean seeds to farmers, and their researchers conduct courses and lectures on the best management for the crops. The results, according to the producers themselves, are extremely satisfactory. “Today, we see that there is the possibility of making a living without using poison and adopting healthier cultivation practices”, says the farmer Gabriel Mesquita, *seu Bié*, as he is known in the Caxambu community. “Thank God we have help from Embrapa. We would like other farmers to join this project: one can make money!”, states Dona Maria Albertina, *Mr. Bié’s* wife. ♦





Basic sanitation:

a solution to improve quality of life in the fields



Biodigester septic tank and filter garden

The news that a simple and low-cost technology would be efficient in rural basic sanitation works reached the farmer Flavio Marchesin through the radio of the car he was driving through the roads of the São Paulo countryside. It was the information he was seeking to solve an old problem, contamination of the waters of the Feijão Brook, which borders the São João farm, belonging to the family, and responsible for part of the supply of the city of São Carlos, SP.

A short while after, the basic sanitation system for rural areas was installed in the farm under the guidance of the researchers and technicians from Embrapa Instrumentation, center responsible for development of the the technology known as Biodigester Septic Tank, which treats domestic sewage. Ten years later, the rural worker decided to increase the number of technologies intended for sanitation and also installed the Embrapa Chlorinator – for decontamination of the water that will be used in the rural residence – and the Filter Garden, for the so-called grey waters, which include sinks, showers and tanks. Flavio Marchesin is one of the more than six thousand users of the Biodigester Septic Tank spread throughout Brazil, in small, medium and large rural estates as well as in farm condominia. The technology treats domestic sewage, and generates organic manure of excellent quality with micro and macro-nutrients for plants, and organic matter for the soil. Correct use of organic manure improves the state of soil particle aggregation, reduces density, increases aeration and water retention capacity, and corrects soil acidity.

“I knew of the technology’s importance, but I was suspicious of the efficiency of the organic manure. Now I no longer have any doubts”, says the horticulturist, fish farmer and producer of native seedlings, who turned the farm into a model of environmental education, receiving over three thousand students annually, who in turn have the opportunity to see the basic sanitation demonstration unit firsthand.

CHANGE OF HABIT

Technology is contributing toward changing the quality of life of thousands of families that live in the fields, where about 23 million people do not have access to treated water and channelled sewers. The lack of basic sanitation has impact on the quality of life, health, education, work and environment. Studies show that lack of basic sanitation and access to good quality water are directly related to the number of hospital admissions due to diseases like diarrhea and hepatitis. According to the UN, 10% of diseases worldwide could be prevented if more investments were to be made in water, hygiene measures, and basic sanitation.

To boost food security and sustainability, the UN declared 2014 as the International Year of Family Farming, in an attempt to recover its double potential of

eradicating of poverty and conserving natural resources. However, both food security and sustainability encompass access to water of good quality and environmental preservation, which can be solved with efficient basic sanitation systems.

A study conducted by two researchers, the doctor in Applied Economics from Embrapa Instrumentation Cinthia Cabral da Costa, and the professor from the University of São Paulo Faculty of Economics, Administration and Accounting [*Faculdade de Economia, Administração e Contabilidade*] (USP – FEA) Joaquim José Martins Guilhoto, showed that for every R\$ 1.00 invested in the implementation of the Biodigester Septic Tank technology, R\$ 4.69 return to the society, mainly through the economy of resources to treat infections caused by diarrheic diseases.



The farmer and the researcher next to the Embrapa Chlorinator

The Biodigester Septic Tank was developed over a decade ago by the veterinary doctor Antonio Pereira de Novaes, deceased in 2011, and follows the principles of Asian biodigesters and of the fermentation chambers of ruminants like cattle. Similarly to the multi-cavity stomach of an animal, the technology also comprises various chambers, where domestic sewage (feces and urine) ferments in an anaerobic medium (in the absence of air), resulting in a treated, transparent and yellowish-brown liquid without unpleasant smells and with greater fertilizing potential.

The technology won the Banco do Brasil Foundation Award in 2003 and, since then, the institution has already supported the installation of over 3,200 Biodigester Septic Tanks throughout the country. The São Paulo State Full Technical Assistance Coordinatorship [Cati – *Coordenadoria de Assistência Técnica Integral*] has helped to disseminate the technology in over 200 municipalities since the end of the 1990s, benefiting over 1,500 rural producers.

This work was also recognized by the Mercocidades Award, delivered in Montevideo, Uruguay (2011). The researcher Wilson Tadeu Lopes da Silva, who continued the work of Antonio Novaes and also added the Filter Garden to the group of technologies intended for sanitation, believes that the model of the Biodigester Septic Tank proposed by Embrapa is ideal to replace the traditional cesspit, very common in the rural area, but responsible for contaminating the groundwater. “This biological system needs few external inputs to obtain suitable results, and its manufacture is simple and low-cost, with proven results in the biodigestion of human excreta, and with good efficiency in the reduction of pathogenic agents”, he states.

TECHNOLOGIES THAT COMPOSE THE RURAL BASIC SANITATION SYSTEM

BIODIGESTER TANK

A basic assembly of the technology, designed for a home with five dwellers, is mounted with three 1000-L water tanks (fibrocement, fiberglass, masonry, or other non-deforming material), pipes, connections, valves and meters. The toilet bowl's piping is deviated to the Biodigester Septic Tank, where the domestic sewage, with the aid of some fresh cattle manure, is treated and converted

into organic manure by the anaerobic biodigestion process.

The boxes should remain buried in the ground for the system to have thermal insulation and thus prevent great temperature variations. The number of boxes should increase in proportion to the number of people in the family. The cost of the material changes according to the region of Brazil and usually varies from R\$ 1,200.00 to R\$ 1,600.00.

EMBRAPA CHLORINATOR

Developed with creativity and economy by researchers of Embrapa Instrumentation and Embrapa Southeast Livestock, the equipment can be mounted by the user himself at a very low cost (about R\$ 50.00). It only takes the purchase of a meter, faucet, piping and granulated chlorine (calcium hypochlorite) with 65% of active chlorine. The Chlorinator is installed between the piping that collects water from a mine or well and the reservoir. The water will be disinfected 30 minutes after the chlorine has been added, free of germs and ready for consumption. The technology won the *Peão de Tecnologia* award from *Fundação Parqtec de São Carlos*, in 1998.

FILTER GARDEN

The technology complements the basic sanitation system in rural areas. The Filter Garden (technically known as artificial flooded area, or root zone or wetland treatment) is designed for treatment of grey water, i.e. water from sinks, shower and tanks that is not treated by the Biodigester Septic Tank.

It is similar to a small pond that is waterproofed with synthetic rubber geomembrane (EPDM) or equivalent material, protected by a bidim® geotextile blanket, covered with crushed rock and coarse sand. Aquatic macrophyte plants, like papyrus, calla lily, and swamp lily remove the nutrients and contaminants from the grey water to purify it. Maintenance of the Filter Garden is easy and efficiently reduces particulate material, turbidity, organic matter and acidity in the sewage. The cost of the material depends on each region where it is purchased, but it is around R\$ 2,000.00. ♦



Embrapa transfers technology for the Sustainable Agricultural and Livestock System

Technology for Sustainable Agricultural and Livestock System

A real green island, with giant and small palm trees divided by exuberant shrubs of the *Gliricidia* legume, surrounded by the brown of the soil covered only by dry vegetation, a reflection of the stress caused by more than two consecutive years of drought. This is the scenario that depicts the Sustainable Agricultural and Livestock System (SIAGROS), implanted in 2010 by Embrapa's Technology Transfer Team in the village of Sítio, located in the municipality of Tobias Barreto, Western Hinterland region of Sergipe state. The goal of this work is to develop and implant a new technology transfer approach for the adoption of sustainable technological solutions for family farming in the rural territories of Sergipe State.

This is the aim of the Sustainable Agricultural and Livestock System, also known as SIAGROS, which consists of a new methodological approach for Technology Transfer activities, guided by participative construction and economic, social, and environmental sustainability. This new approach is composed of a set of technologies and good practices for plant and animal production that are integrated so that one complements the other.

Thinking and acting sustainably, always preserving the environment, SIAGROS is also a way of reducing production costs, promoting greater income for the producer, conserving and recovering the soils, improving the quality of animals bred and leaving a production legacy

for future generations. The basic idea of the system is to plant various crops and breed different animals in an integrated fashion so that the residue from one activity is recycled and converted into inputs for the other, thus guaranteeing the nutrient cycling and sustainability in the production system.

“We, men of the fields, only have knowledge of the place we live in. We would not have chances were we to live in the city. This knowledge that Embrapa is giving us helps us improve the quality of life in our place of origin, which is the fields”, states Adenilton Santos, farmer from the municipality of Tobias Barreto and participant of the SIAGROS Project.

Today, SIAGROS is implanted in all territories of Sergipe State (Low São Francisco Basin, Middle South, Western Hinterland, High Hinterland and Southern Sergipe, as well as in the Alagoas back-country territory, totaling 22 different SIAGROS units, where each one meets local production demands, while also being used as a model for Embrapa Coastal Tableland’s TT actions in the scope of the Brazil Without Misery Plan [*Plano Brasil Sem Miséria* – PBSM], thus contemplating 18 municipalities with the implementation of technological showcases in the communities of smallholding family farmers with per capita family income of less than R\$ 70.00.

These showcases provide real environments favorable for various Technology Transfer actions like Field Days, Training Courses, Farmer Exchange and Technical Visits, which are constantly demanded by farmers and are conducted to better guide them with regard to good agricultural practices related mainly to planting, harvesting, selection and conservation of materials for



Soil Management Experiment in Acre

production of food for human consumption and production of forage for animal feed.

According to the producer Evangelista dos Anjos, aged 66 years, “working is good, but listening to those who know is even better. This is why it is worth dropping the hoe for an hour”.

The knowledge transmitted includes data on seed and cassava stem traits; plant spacing; furrow depths; best time for sowing, silage and haying materials for cattle feed; and sustainable cropping, with the use of mulch and reutilization of residue.

To reinforce the information, the producers also watch videos about the different crops implemented and on SIAGROS itself, elaborated for the *Dia de Campo* [Field Day] TV program.

Three years after the start of the SIAGROS implantation, some figures reflect the Project’s significance, as it is present in 22 different municipalities, meeting the needs of 330 families directly and over 1,100 indirectly. Approximately 70 workshops have been conducted, as well as 35 Field Days and 20 Training Courses, in addition to the distribution of hundreds of kilos of seeds for the sowing of gliricidia, maize, beans, sunflower, and pigeon peas, of thousands of rackets for the multiplication of forage palm, and of gliricidia seedlings for implantation of protein bank for animal feed.

SIAGROS’ experience has shown that “yes, it is possible” to produce with quality and in quantity, using small areas of land and reduced amount of inputs, allowing for cost reduction and production diversification, in addition to enabling a “technological appropriation” by farmers, making them able not only to use the technologies but to also become multipliers, capable of training new farmers. ♦



Sebastião, Embrapa Acre

Adoption of sustainable techniques contribute toward the recovery of agriculture in the Rio de Janeiro mountain region

The municipalities of Nova Friburgo, Petrópolis and Teresópolis are the cradle of Rio de Janeiro's agriculture and form the most important agricultural center of the state in the production of vegetables, flowers and poultry. The region is responsible for over 90% of the leafy vegetables sold in the unit of Ceasa-RJ, the central food market in the state's capital. In 2011, in the tragedy that killed over 900 people in the mountain region of Rio, many agricultural properties were destroyed. The fertile soil disappeared below so much mud and, in some cases, the uppermost layer was even removed, leaving many farmers without option for planting their crops.

Last year, the rains caused problems once again, and farmers lost over 200 tons of food due to the storms that affected the region in March 2013. However, this time, for a group of family farmers, the losses were smaller. They were the ones who, after the first tragedy, had started adopting some techniques that are more suitable for the region.

That was the case with farmers Lyndon Johnson Ferreira and Margarete Satsumi Tiba Ferreira. In their farm named Hikari, in Nova Friburgo, the couple produces oriental vegetables for specific cooking. In January 2011, their property remained isolated for almost 30 days. Landslides and floods destroyed the entire plantation. At the time, the calculated loss was of R\$ 100,000.00.

With financial aid from government programs and even international institutions like the World Bank, and with the support of research and rural extension companies located in Nova Friburgo, the couple resumed production. However, to recover productivity, they changed the way of dealing with the land. They started adopting more sustainable management techniques, like no-till farming, whose main characteristics include reduced tillage of the soil and formation of mulch covering on

the surface, which prevents the soil from sliding during the rains. "The options for farmers require change in behavior. We notice that this only happens when there are production losses like those being experienced by some farmers in Nova Friburgo, after the tragedy of 2011", emphasizes the Embrapa researcher Adriana Maria de Aquino.

Amidst constant climate threat, farmers are fighting to recompose their areas and Embrapa has been contributing with studies, courses, training and dissemination of more sustainable practices that are adapted to that reality. No-till farming, green manure, use of bokashi, tomatoc, and agroindustry of edible shoots are some of the techniques farmers are having contact with and adopting. The farmer Aroldo Botelho is part of a family that has made their living from agriculture for about 60 years in the community of Serra Velha, municipality of Nova Friburgo. However, inadequate management caused soil degradation and consequently a major loss in his cauliflower production, which was below the commercial standard.

Aroldo had never heard of vetch, black oat, millet, and sunn hemp until Embrapa's technicians brought seed samples and introduced him to green manure. Apprehensive, he tested the technique and this year obtained a production beyond his expectations.

The Embrapa researcher Renato Linhares de Assis states that there is no formula or crop that is more specific to the mountain regions, but that the farmer must be attentive to the manner of farming in these areas of high relief.

VETIVER GRASS

The mountain relief, production in areas with sharp declivity, and a soil with little depth demand that farmers adopt a different management approach. But in practice,

most prepare for cropping by plowing downhill, which causes soil loss in the production areas and drags material to back roads and to lower areas of the relief in the rainy season, causing silting of the riverbed and water sources, which hinders the transport of production and the movement of people.

The establishment of barriers with vetiver grass in the hills under threat of sliding is another technique that was presented in the region and that has been used successfully by some farmers for about a year and a half.

The grass forms a plant barrier to sustain the land and reestablish the natural vegetation, rendering the breaking of barriers and silting difficult.

IN SEARCH OF SOLUTIONS FOR THE MOUNTAIN FARMER

The Center for Research and Training for Farmers [*Núcleo de Pesquisa e Treinamento para Agricultores*] (NPTA) of the Rio de Janeiro Mountain Region was created five years ago as a result of the negotiation between the municipality of Nova Friburgo and Embrapa. The idea was to bring researchers from the Corporation's three Units in Rio de Janeiro (Agrobiology, Food Agroindustry and Soils) close to the agricultural reality of the region, which is recognizably the most dynamic agricultural area in the state, with predominance of family properties, with intense production of vegetables, flowers and fruits. ♦

Embrapa has equipment certified as Social Technologies

Six machines developed by Embrapa Rice and Beans received the certificate from Banco do Brasil Foundation (FBB) and were entered into the Foundation's Social Technology Databank (BTS). There are six equipment developed by the Unit's Mechanization Lab, namely three threshers and three blowers, intended for smallholders who produce rice, beans, maize and other grains.

The equipment benefits family farming, promoting comfort in the operation and an increase in smallholders' work capacity, favoring better performance in the activities and expansion of small cultivation areas. Manufactured with simple techniques, using resources found in small workshops, the equipment also allows harvesting works to be done in the appropriate time, with performance significantly higher than manual methods.

The technology was appropriated by farmers through several validations made in the fields, with purchase of equipment from the industry and with manufacture of the equipment by the farmers themselves.

This appropriation opened horizons of possibilities for the daily work in the fields with greater efficiency and

improvement in quality of life. Created and offered by FBB, the Award is an instrument to identify and certify items to comprise the Foundation's Social Technology Databank (BTS), which will now translate the specifications of the equipment into English, French and Spanish, expanding the equipment's frontiers and social reach possibilities.

Social Technology is the term applied to re-applicable techniques or methodologies that are developed in interaction with communities and that represent effective solutions for social transformation. ♦





Colored cotton

Margarida Maria Alves Settlement celebrates good harvest of colored organic cotton

Despite the drought in the last two years, the rural community of Margarida Maria Alves, in the municipality of Juarez Tavora, in the Paraíba state back country, celebrated the good harvest of colored organic cotton. In 2013, 15 hectares were cultivated, with an average of one thousand kilos per hectare. “Since we started planting cotton, this has been the best year. Had we not built this larger shed, there would be no place to keep the production”, says the farmer and one

of the community leaders, Margarida da Silva Alves, or *Dona Preta*, as she is known in the region.

The history of the community is directly linked to the cotton crops. Created by Incra in 1998, the Margarida Maria Alves settlement currently has 36 families, 12 of which cultivate colored cotton. One year after its creation, the community was chosen for the implementation of the Cotton and Citizenship pilot project, coordinated by National Social Mobilization Network (COEP), in

partnership with Embrapa Cotton. The project's proposal was to promote community development through the cultivation of organic cotton.

To add value to production, the following year, a cotton gin and a cotton fiber baling press especially developed by Embrapa for family farmers were implemented. "With this equipment, they process the cotton itself, separating the lint from the seed, and sell it directly to the textile industry, increasing their income up to four times compared with conventional sales of cotton bolls", explains the researcher from Embrapa Cotton Odilon Reny Ribeiro. "Their goal was to teach us to live in a community and to walk with our own legs", recalls *Dona Preta*.

Today, the farmers have even been able to approve projects to improve the settlement's infrastructure. "Through our organization, we approved the state government APL (Local Production Layout) project in the amount of R\$ 380,000.00 to build a larger shed to place the cotton gin and store the cotton. With the remaining resources, we will buy a utility vehicle for the community", she says.

But the main source of funds that sustains the settlement's farmers' association comes from the cotton collective area. "It is with this money that we maintain the community tractor and pay the tractor driver's daily wage", she reports.

According to her, the entire community is involved in this collective work. "The women, men and youngsters all work in the plantation, and in the harvest as well. Only the weeding and processing are left for the men. I say that the day this collective cotton crop stops, the association will end, because it has no other income", she states. "All we have achieved so far was because we live as an association", she concludes.

Besides the cotton, the settlement's farmers plant subsistence crops like beans, maize, fava beans, cassava and also raise sheep and cattle.

Even though it is a small area, the result attained represents a lot for each farmer who decided to bet on the planting of cotton, in spite of the drought. The farmer Aluisio Rodrigues dos Santos says that for him, colored cotton means an extra income at the end of the year. "We plant beans for consumption, part of the maize is sold and another part is for the animals, while the cotton is the hope for some money that the farmer will use to or-

ganize the next harvest and buy food between cropping seasons", he says. He already knows what to do with the profit obtained from the five hectares he and his three children planted: "I will buy some calves and invest in the property", he reveals.

The entire colored cotton production was sold to the local textile industry at R\$ 9.40 per kilo of lint.

The items made from the fiber will be exported to countries like Germany, France, United States, Japan, among others.

The story of the settlement has inspired many farmers from the region and even from other countries. They already receive delegations from Colombia, Paraguay, in addition to researchers from the African continent who are members of the Program of Support to the Development of the Cotton Industry in the Cotton-4 Countries (Benin, Burkina Faso, Chad and Mali). *Dona Preta* highlights that a crucial factor for the project's sustainability was learning to cope with the cotton boll weevil, cotton crops' main pest and responsible for the decadence of cotton in the Brazilian Northeast. "Embrapa brought many teachings about the weevil, how to live with it, fight it, and this was very important because from then on we started to receive the training, on how to plant, on how to know if it is already too infested, and we kept on learning and, today, we live with the weevil without using any pesticide", she states.

To make cotton production feasible in the community, the smallholders received training on new cropping technologies, which range from soil preparation and choice of suitable seeds to weevil control, and they also learned how to remove seeds, press and bale. It was thus possible to increase the quality of the fiber, productivity and crop yield. ♦



Colored cotton

Underground dam increases the chances of harvest in dryland farming

Underground dam in Rio de Janeiro

Rainwater is an essential resource for living in the Semiarid region. Technologies that capture and store rainwater do more than guarantee the supply of families during the dry season. Some of them have the capacity to maintain soil humidity for a longer time, which reduces the risks of losses during the maize and bean harvests in the properties.

According to surveys conducted in Embrapa Tropical Semiarid, the storage of a volume of 100 mm of rain in an area of 1 ha is enough to considerably reduce the effects of dry spells in dryland farming. In the Semiarid region, the interval of days between rainfalls is one of the main causes of harvest losses. “This situation especially affects small-scale farmers, who fail to reap the grains that feed the families during the year”, states the researcher José Barbosa dos Anjos. According to him, technologies like the Underground Dam and the Salvation Irrigation Dam are alternatives to minimize the effects of irregular rainfall. The Dam is a small land barrier formed by an intake area, a storage tank and a crop area. The installation site must remain in a plane above the crops to enable gravity-fed irrigation. The water accumulated will be used exclusively when the drought reaches a critical point, i.e., when the crops threaten to “die”. “When the situation

reaches this point, the farmer literally opens the faucets and allows the water to run through the furrows located beside the plantation rows. It is the humidity required to maintain plant growth”, teaches José Barbosa. With the Underground Dam, the farmer is also able to keep the soil wet for a longer period of time, but in a different way, with a wall built into the soil profile up to the hardest layer. This stops the water flow and favors its infiltration in the soil, which results in an artificial ebb. “Stored” inside the soil, the effect of evaporation is not so intense, and the land preserves the humidity for a longer time. “This is fundamental to increase the chances of harvesting traditional grain crops (maize and beans) and to have more food on the farmers’ tables”, states the researcher.

The storage structure of this type of dam is usually so efficient that the farmer is able to successfully plant fruit trees like mango and guava, among others, right in the heart of the Semiarid region and without conventional irrigation.

The ideal area to build this dam must have soils with 3- to 4-meters depth and slight declivity. Barbosa says that, even in years of low rainfall, like 2013, it is possible to obtain satisfactory results when the crops are planted in underground dams. And that is the case of Valdete



Underground dam in Rio de Janeiro

Tolentino, owner of Romão Farm, in the municipality of Petrolina (PE), who admires the crops planted in the middle of the dry *Caatinga* [region covered with brushwood].

PROVEN EXPERIENCE

A study sponsored by Embrapa Tropical Semiárido, Embrapa Soils' Special Research Unit, and Articulation in the Brazilian Semiárido (ASA), recorded data gathered during a period of thirteen years (1996/2009), in the Santo Antônio Farm, in the rural area of Petrolina (PE) and during a nine-year period (2003/2012) in Manicoba Farm, in Ouricuri. They show that, in such years, there were bean and maize harvests in the underground dam areas. The quantities produced of both species in the dam area were above the averages recorded for the region. "The experience with underground dams shows that it contributes toward food and nutritional security of the farmer families, as well as toward generating income from the sale of products in agroecological fairs", says the researcher from Embrapa Soils Maria Sonia Lopes

da Silva. "The dam also greatly reduces the demand for products from outside the property, like some foods, herbal medicines and small animals", she rounds up. Another important factor is to provide the families with better purchasing power and greater access to consumer goods.

The technology of the Underground Dam is part of the *Programa Uma Terra e Duas Águas* [One Land, Two Waters] (P1 +2) as an option for water collection for food production.

The P1+2 is part of the Training and Social Mobilization Program for Living in the Semiárido Region, which is one of the main actions developed by *Articulação no Semiárido Brasileiro* (ASA). It is being implanted in the entire Semiárido region, through ASA's organizations and with funding from the Ministry of Social Development and Fight Against Hunger (MDS), Codevasf, Banco do Brasil Foundation, Ministry of Agrarian Development (MDA), Petrobras and the Spanish Agency for International Development Cooperation. ♦

Simple techniques improve the production of goats in the Semiarid region



Goats

Small changes in practices in the raising of goats can have good results for farmers from the Brazilian Northeastern hinterland.

A study conducted by the Brazilian Agricultural Research Corporation (Embrapa), in Petrolina (PE) shows that adopting some simple techniques allow for better productive performances of the animals, which implies in greater profitability of the activity.

The experiments are being conducted by the researcher from Embrapa Tropical Semiarid Tadeu Vinhas

Voltoolini, and by the veterinary doctor Jair Campos Soares, Master's degree student in Animal Science at *Universidade Federal do Vale do São Francisco* (Univasf). The focus of the production system analyzed is the feeding and management of animals. Traditionally in the region, the raising of goats is practiced extensively, with feeding based solely on the native vegetation of the *Caatinga*.

According to the researchers, this food base is insufficient in terms of quantity and quality, and the weight

loss caused especially in the dry season compromises the reproductive performance of the females and weight of their offspring.

As for the breeding system proposed in the research, a combination of native vegetation and forage reserve is used. “When it is green, we raise the herd in the *Caatinga* – without exceeding the number of animals fed with this vegetation and, when it is dry, we use other strategies for feeding, like the oil palm tree, buffel grass, *pornunça* (a *Manihot* hybrid), maniçoba (*Manihot pseudoglaziovii*) and citron melon, most of which is preserved in the form of hay and silage”, explains Tadeu Voltolini.

With regard to management of the animals, one of the main techniques adopted is the mounting station, in which the males remain separate from the herd, and are placed with the females only in the period scheduled for reproduction. Thus, the birth, weaning and fattening of the animals can be planned, paying attention to each

one of these activities, which represents better management of animals in association with optimization of the property’s labor.

According to Jair Soares, in this production system, the mortality rate of the offspring was only 5%, a number considered low compared with the traditional system of extensive breeding, which reaches over 30%. In addition, the fertility of the females reached 75%, a value much higher than that usually found in the region. “With proper feeding and management, reproductive efficiency of the animals increases”, explains the veterinarian.

According to the researcher Tadeu Voltolini, these are results that will allow the property to have a better economic return. The research data was obtained in the year 2012, marked by the worst drought in the last decades in the Northeast. “This shows that, even in time of drought, simple techniques make a big difference in a production system”, he assesses. ♦



Actions

bet on family farmers' potentials

The production of animals in family farming units is a one of the marked characteristics of the chains of goat and sheep rearing in Brazil. In the country, 80% of the producers of goats and 70% of the producers of sheep are beneficiaries of the Family Farming Strengthening Program [*Programa de Fortalecimento da Agricultura Familiar*] (Pronaf). In this context, Embrapa has paid attention, through recent projects, to this public, contributing toward rural development with better use of the potentials of local production activities, greater empowerment of farmers and dissemination of technological innovations.

One example of the work with rural communities is the Sustentare project, from Embrapa Goats and Sheep (CE), which has adopted a work methodology with emphasis on the participation of dairy goat farmers in the planning of actions, in the appraisal of local potentials and crops, and in the insertion in different markets.

The project has already promoted interchanges among the three communities benefited for the exchange of experiences between producers and, in November 2013, it launched its first action for the social construction of markets: the fair organized by the Pé de Serra Cedro community, in Sobral (CE), for the sale of products and services by the community itself. In the event, there were sales of community-produced free-range eggs, goat meat, handicrafts, clothes, and snacks, besides the offer of services and cultural attractions.

The idea to promote the fair came from actions taken in the community by the Sustentare Project, which encourages the valorization of local competencies, promoting social construction of markets. According to the president of the Association of Residents of Pé de Serra Cedro, Francisco Chagas de Souza, the results were above expectations. "It was a very important activity because we see that it brings greater development to the

community. We intend to hold another fair next year”, he stated.

According to Francisco, the protagonist role given to the farmers has been an interesting differential of the Sustentare project. He also stressed that several other institutions have already conducted research in the communities, but that the farmers have had little feedback from these studies. “With the Sustentare, things are different, right from the first stages we already have a diagnosis of the community’s potentials, of our difficulties. The project is not imposed downwards; it is really an action ‘for’ and ‘with’ the farmers”, stated *Chiquinho*.

Sustentare was also implemented in the communities of Boqueirão and São Francisco. All were already part of the *Cabra Nossa* [Our Goat] project, created in 1993 with the aim of guaranteeing food security of rural communities in Sobral, having dairy goat farming as fundamental activity in this process. As food security was already contemplated by *Cabra Nossa*, Sustentare aims to go much further: favor the productive inclusion of family farmers through the generation, adaptation, and provision of knowledge; inclusion in different niches of local markets; strengthening of joint and associative initiatives, and local coexistence.

The emphasis on collective participation will also be adopted with communities from the Inhamuns-Crateus and Cariri Cearense territories, part of the Brazil without Misery Plan [*Plano Brasil sem Miséria*]. Embrapa will work with educational units to provide knowhow and technologies referring to the traditional activities of the communities included, like the rearing of goats and sheep, free-range chicken, vegetable crops, among others. It will also train technicians from partner entities and farmer leaders in technologies that apply to the reality of the productive vocations of the communities, and in work methodologies that favor farmer autonomy.

DAIRY FARMING

Another action in the scope of Brazil without Misery Plan is the production and provision of embryos originating from the crossing of specialized breeds (Alpine, Saanen and Toggenburg) with locally adapted dairy goat breeds (Anglo-Nubian, Caninde and *Moxoto*) to enhance dairy production in the farming communities. Embrapa has provided support in all animal husbandry techniques for embryo production, with the expectation

of generating 600 offspring in the herds of benefited communities.

LAMB ROUTE

The *Rota do Cordeiro* [Lamb Route] project, coordinated by the Ministry of National Integration, Embrapa, and partner institutions, is another initiative aimed at family farming.

Ceará will be the first state to perform the program’s actions, which will receive funds from the Ministry of National Integration for technological innovation in meat sheep farming, in regions where there is traditional sheep production but with low socioeconomic indices. In the city of Tauá, actions will be developed on genetic improvement, animal nutrition, and training of local producers, who will conduct animals from their herds to a sheep finishing center to be implemented in the local Technical Reference Unit.

The finishing center will have sanitary control that will allow the supply of sheep with better quality for slaughter and for the trade of meat and meat by-products, in addition to bringing benefits for the insertion of local producers in the market: negotiations for animal sales, which are often conducted in isolation, may be done in groups.

In each state, the program will install the technical units, which will have an intelligence center (for market diagnosis, sector monitoring, and trend analysis to aid decision-making), genetic improvement center (to breed improved multiplier herds), technological showcase (comprising technologies for living in the Semiarid region) and the finishing center (intended for standardization of production aiming at insertion in specific markets).

About 720 families should benefit from the Program, in addition to the continuous training of technicians and producers.

The Lamb Route program will also favor the dissemination of Embrapa’s technologies that target the meat sheep farming production chain. Among them is the Lamb Selection Kit, which includes tools to identify the animals and zootechnical and sanitary procedures to guarantee that meat sheep products from family farming regimes are standardized and have quality levels for insertion in new markets. ◆



**Irrigation project
transforms the reality
of family farmers in Bahia**

The participatory process is fundamental in actions with family farmers. Its efficiency is related to the researchers' stance, of being willing to listen and value farmers' tacit knowledge to build the most suitable technologies and development strategies. Based on this premise, the researcher from Embrapa Cassava and Tropical Fruits Eugenio Coelho heads the project's activities: "Transfer of irrigation technology for fruit crops at family farming levels in irrigated perimeters of settlements of the Brazilian Semiarid region", which has been changing the reality of family farmers located in riverside settlements of the Semiarid region of Bahia.

"What happens is that the producers are assigned there, obtain houses and, in most cases, have nothing to do during the rainy season. Then we can take this irrigation opportunity. With the system, they can plant and harvest. And our proposal is to set up an irrigation system in the cheapest way possible", says Eugenio.

From 2009 to 2013, demonstrative units have already been installed in the Alto Bonito settlement, in Cansanção; in the Ferradura, Nova Igarité, Nova Torrinha, Santo Expedito, and Ribeirão settlements, in the municipality of Barra; and in the Caxa settlement, located in the municipality of Marcionílio Souza.

The initial target is 12 to 15 beneficiary families, with exception of Cansanção, which covers 46 families.

Eugenio explains that the project selects the irrigation system it deems the most suitable to cheapen costs, and evaluates it with the producer. "We cannot force them to use what we want. We must balance what they think that can be used and what we consider to be most suitable. For example, in the Barra and Cansanção settlements, they did not accept conventional drippers. We had to use a *xique-xique* irrigation system adapted with connectors inserted in the hose holes, which are the emitters they liked the most", says Eugenio, who highlights the work of the analysts Tiberio Martins and Ildos Parizotto, who work face-to-face with the farmers.

Likewise, the project team does not impose the crop to be developed. In the Caxa settlement, for example, the farmers chose horticulture.

"This is why we make the participative diagnosis. Other settlements work with banana. Nova Igarité decided on papaya. Besides the irrigation system, we also supply the seedlings, the initial fertilization, and

the pump oil for them to start working", says the researcher. According to him, production has been good. Cansanção, for example, is already in the third year of banana production. Some sell it while others use it only for family subsistence. The project's intention is to enable farmers to sell their products, so as to make the system self-sustainable. The verification that this is possible was recent: the Ferradura settlement obtained funds and expanded the irrigation project that already benefits a reasonable number of families on its own.

STAGES

The work in each selected area is made up of several stages. The first is identification of the area, based on a demand from the associations of settlers themselves. Then the participative diagnosis is conducted, defining the crops that they will work with. Then, the area is marked, and the seeds and seedlings are brought for the start of sowing. Meanwhile, the project installs the irrigation system.

"During the crop cycle, we accompany the production, if the farmers are really doing it properly. They take an initial course on the use of water, conducted during the installation of the system, and leave with notions of water needs, water saving, irrigation management, etc.

One month later, we take a colleague from the Unit to give a course on their chosen crop. When the production period comes, we promote the *Field Day*", explains Eugenio, who stresses the importance of the partnership with the Bahia Agricultural Development Corporation [*Empresa Baiana de Desenvolvimento Agrícola*] (EBDA) in the entire process.

The *Field Day*, conducted in the demonstrative unit within the settlement, has the purpose of showing the region, which includes other producers and local public and private instances, the functionality of the system, and the design as a whole. The idea, according to the researcher, is to start seeking support in order to study alternatives to open the market for such production. Since 2009, four *Field Days* have been conducted as well as five courses on crops (banana and papaya).

RAPID PARTICIPATORY DIAGNOSIS

The analyst Ildos Parizotto explains that, among other approach tools, the Rapid Participatory Diagnosis (RPD) is conducted based on dialogue with the producers

– most are children of farmers who return to the fields after frustrated experiences in the urban centers, thus they do not have knowledge on how to deal with the land and irrigation. “We verify the group’s aspirations, limitations, and problems, and address other aspects to organize these farmers and seek solutions for issues of trade, processing, and even insertion in government programs, like the food purchase program (PAA) and municipal purchase program for school lunch (PNAE). Another tool used is the Participatory Strategic Planning (PSP), which aims at identifying, prioritizing, implementing, monitoring and evaluating the actions required to solve the limitations imposed on the group. We discuss social and environmental issues, like legal reserve, rational use of water, etc.”, states Ildos.

EXAMPLE OF NEW BEGINNING

In the Santo Expedito settlement, in the municipality of Barra, the water was there, less than 500 meters away, like an unreachable oasis. In fact, it was even possible to reach it, but only by crossing a dangerous highway. Adults and children risked their lives daily to get water from the river or to bathe in it. Sowing with that water was then unviable. Embrapa’s technicians arrived there on 16 November. Exactly one month later, the community already had water. “We saw in the diagnosis that their major problem was access to water. The project facilitated visits by technicians, and the setup of two water tanks and of the irrigation system”, says Ildos. They used piping that existed below the road to conduct the water.

All the benefited settlements have beautiful stories of new beginnings. The experience of Santo Expedito is highlighted here as one of the examples. The settlement, which occupies an area of roughly 17 thousand hectares, belongs to Velho Chico Identity Territory. The farmers organized themselves in the Association of Workers and Rural Workers of the Santo Expedito Settlement (Acotrase) – comprising 59 families. They have occupied the area, the former Queimada do Vale farm, for five years. The houses are a mixture of wood and mud structures. They have no electric power, access to water, lot distribution, road structure, or machines to help the work. According to the diagnosis, they have great organizing capacity and willingness to work as a community.

TESTIMONIES

Antonia Francisca Guedes, 63

“Today is a day of great joy for me. I see great prospects because, thank God, today the people are no longer suffering to fetch water in the river. Embrapa arrived here on 16 November and in 15 December water poured from that water tank there. It was quick to meet the needs of this suffering people. Now we intend to supply fruits and vegetables here for the region. The people from the project are guiding us and each word they say is precious to us. We are very united, joyful, and the collective work is fruitful. Our concern here is to also produce organic foods”.

Manoel Onofre, 63

“If you can obtain a small piece of land, you are able to survive. Water is life, and where we pour water and place that seed there is fruit, because it comes from the grace of God. In an irrigation project, there is no way you can lose because you plant knowing that you will reap.

Those who plant with irrigation do not lose. The divine light shone in our lives, and it was this wonderful water that we received. We have to thank God a lot and thank this body’s employees, who work with love in great projects to provide for the little people. From the day this water got here, things have changed. Never again did I see a woman or child crossing this road to bathe. We used to run a great risk”.

Ana Maria Barbosa, 42

“Many times we planted and lost everything due to lack of water. Before the water came, it was like this: take risks to see if one could obtain anything, no matter how small. Our struggle then was very hard because we would fetch water in the river. But now, thank God, we have water, and this made things much easier. We intend to plant our things in our backyard for our own consumption and also to sell. I think that from now on, everything will be better. We will grow, because we will be able to work and sell the things we plant.

I can see only the future from now on. May we be able to say tomorrow, when you get here, say ‘look at all that we have, thanks to God, first, and then thanks to Embrapa”.



Community Vegetable Patch

Irrigation Cidade de Deus

now uses irrigation system

Twenty-six families that produce foods in the Community Vegetable Patch in the *Cidade de Deus* [City of God] district, in Sete Lagoas, Minas Gerais State, now have irrigation for the more than 600 cultivated beds. The producers participate actively in the system's assembly, which involves buried pipes and 333 spray tubes to wet two beds each. To connect the water, plastic faucets were adapted, costing two BRL, while the meters normally used have average price of 17 BRL. The action is part of the partnership between farmers and the Development and Citizenship Project, coordinated by the agronomist from Embrapa Maize and Sorghum (Sete Lagoas, MG) Luciano Cordoval.

Cordoval explains the other initiatives conducted in the vegetable patch: “we installed a ‘lung’ lake to stabilize the irrigation and raise fish for the families. Forty trucks of manure were also donated, as well as kits with wheelbarrows, shovels, rakes, hoes, vegetable seeds and fingerlings”.

The producer Maria Nogueira was very happy to be able to count on the irrigation: “it is manna from heaven”,

she comments enthusiastically. To prepare all the drip lines and faucets, the workers worked together in a joint effort. “Our folks were committed to helping because it is a benefit for all”, says the president of the community vegetable patch's association, Adriana Fatima Lima.

The singing made the work lively. The producers cut the tubing, wound them, fastened the faucets, and did all this while singing. Geraldo dos Reis, aged 67 years, is satisfied with the activity: “we work while having fun”. Having worked with community vegetable patches for 27 years, he believes that the situation is improving by the day. “I had always struggled with watering pots and hoses. Now it will be great!”

The president of the association was very happy with the irrigation system and already knows what to do with the time that will be saved due to not having to water the plants. “We will be able to clean the beds more and work to improve the products. This system will help us a lot, since we have always had much difficulty with irrigation”, says Adriana. ♦



Barraginhas and ponds change the reality of the producers

In the countryside of Minas Gerais state, in communities where there was lack of water, producers breed fish today. With the construction of *barraginhas* [mini-dams], which are small basins to capture rainwater, the reality of several families has changed.

In the Fazendinhas Pai José community, in the municipality of Araçá, central region of Minas Gerais State, cisterns are the only source of water supply in many properties. For several years, the wells would dry up during dry spells. However, the construction of *barraginhas* changed the local scenario.

The farmer Dimas Marques Sobrinho says that he has always measured the level of his cistern. “Mine would be up to one meter of water. After the *barraginhas*, it started to be up to 11 meters. I can take about six thousand liters per day. And this was not just mine alone, everybody else’s has increased. Now there is water for the whole year”, he is pleased to say. The *barraginhas* retain the runoff and make the rainwater infiltrate the soil. They thus reload the water table, whose level increases. In addition to increasing the water availability in the



Marina Torres

Barraginhas

region, the technology preserves the terrain since, once it contains the runoff, it prevents erosion.

In the Periquito community, municipality of Cordisburgo (MG), 140 *barraginhas* were built, which greatly improved the preservation of roads and prevented floods, which were frequent in the rainy season.

The president of the Rural Association of Residents of Periquito, Joaquim Antonio Vieira, reports that “before, the runoff invaded homes. After the *barraginhas*, this problem is over. It greatly increased the water in the stream, and in the cisterns too”. Geraldo Saldanha, resident of the Fazendinhas Pai Jose community, noticed improvements in the agriculture. “The runoff would leave everything in ruins and the land would become dry. Then came the *barraginhas* and they changed the system. The plants stand out more, are more conserved and are producing more. The land looks better. I recommend making *barraginhas*. You should not refrain from using a piece of land for that just because the profit is from other things. There will be a reward. Nature will change completely”.

The agronomist from Embrapa Maize and Sorghum (Sete Lagoas, MG) Luciano Cordoval, coordinator of the *Barraginhas* Project, explains that the system helps to efficiently use the water from irregular and heavy rains. And, with the increase in availability of water in the properties, it makes it possible to build and supply small lined ponds, the so-called multiple-use ponds, which can be used as fish farms, reservoirs for irrigation, or water

supply. Complementary use of the two social technologies (*barraginhas* and multiple-use ponds) has made the dream of many producers of raising fish and being able to fish to come true.

Geraldo Saldanha says that he had always dreamed of having a small pond, but that he did not imagine that it would be possible. “I used to think: when will I ever see this in a place as high as this? And today there is a small pond that even overflows. We get our supply with water from the cistern, which gradually gets refilled and, if you do not turn off the pump, it overflows. It is a dream come true”.

According to the producer Geovano Vicente Morais, also resident of Fazendinhas Pai Jose, the pond is not only the realization of a dream, but also a therapy. “I used to want to buy a land by the riverside, but I had no conditions. Then this lake was a blessing for me, a great enthusiasm. It takes our mind off things. Sometimes, our minds are in a whirl and we come here with some feed to throw to the fish and forget everything”. Luciano Cordoval says that the experience of the integration between *barraginhas* and ponds supplied by cisterns can be replicated in any region with red and yellow latosol, which is porous and predominant in Central Brazil. The model can be adopted with little investment.

The miniponds, with 14 meters in diameter and 1.2 meter in depth, take four hours of wheel loader time and 30 meters of 8 meter-wide sailcloth . ◆



***Organic
sesame***

Viable option for family farmers from the Northeast

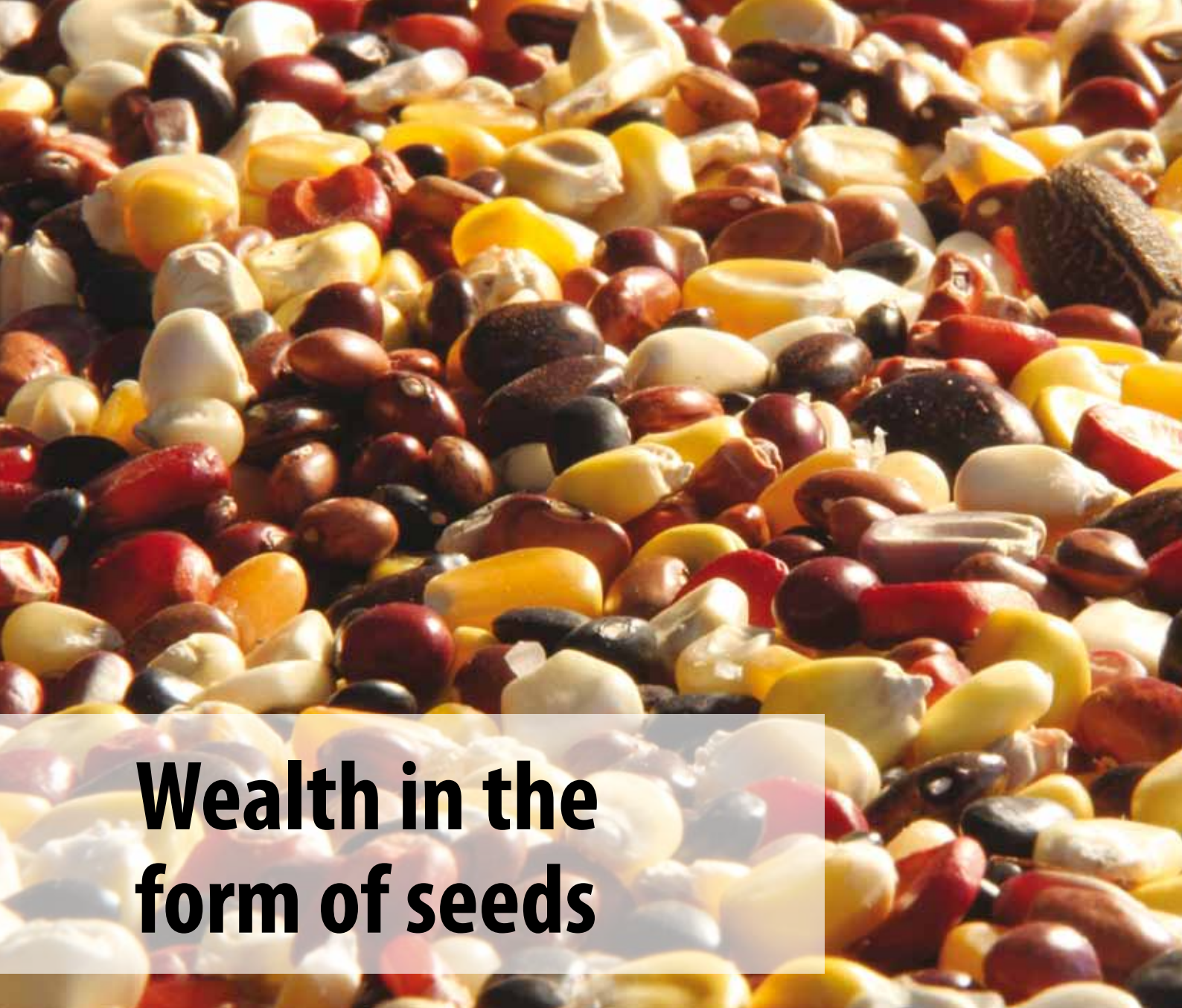
Whether for food, or phytotherapeutic, phytocosmetic use, or in chemical and pharmaceutical industries, sesame is a product widely known worldwide. It is currently being disseminated with importance in the rural areas of the Semiarid region. The crop has been adopted as a feasible alternative of occupation, employment and income for family farmers from the Northeast. This oleaginous plant is already known in the region and is traditionally used in the confection of homemade sweets. The crop, however, was practically restricted to the backyards, without use of its economic potential.

The plant has been one of Brazilian Agricultural Research Corporation (Embrapa)'s bets for the region due to a mix of several factors. The main one of them is this crop's great adaptation to weather and soil conditions, which are historically the biggest limiting factors of farming activity in the Semiarid region. In addition, it is also suitable for the local culture, facilitating acceptance by producers.

In farmer Antonio Gessildo de Oliveira's property, in the municipality of Lucrecia (RN), sesame did not even have space among the maize, beans, sorghum, and sunflower crops. With Embrapa's incentive, he started to plant organic sesame in 2011, at first in a small area of 50m². Enthusiastic with the good results from the first production, he increased the area to 1.5 hectare, from which he obtained more than one ton in only one harvest. He says that, in a short time, he has already been able to improve the income and quality of life of his family, and that sesame has become his priority crop. Another benefit that the farmer and his family are also experiencing is reduction in food insecurity, with the inclusion of a product of high nutritional value in their

diet. Gessildo is satisfied with the new food habits of the house: "We replaced soybean oil with sesame oil, which is organic and healthier, and we also use *tahini* (sesame paste) instead of butter to spread on the bread".

Processing – as a way of encouraging consumption and adding value to the product, Embrapa has offered courses for the processing of sesame, with food and agroindustrial processing. In all the localities benefited by Embrapa's projects, in the states of Piauí and Rio Grande do Norte, small agroindustries have been set up to extract the oil in the communities themselves. One of the communities, located in the Municipality of São Francisco de Assis do Piauí, PI, noticed the product's great potential and aims at bolder achievements: it already has organic certification for its seeds, now it is seeking the certification for organic sesame oil. In addition to oil extraction, the residue from pressing the sesame is also used to manufacture several by-products, like biscuits, sweets, coconut sweets, and cakes. "In the training we provide to the farmers, we seek to add value to local traditions, using and adapting the recipes they already use. As the community progresses, we also start working with more elaborate products", highlights Ayice Chaves Silva, agroindustrial technician from Embrapa Cotton (Campina Grande, PB). "The advantage is that the same sesame that the farmer plants and harvests to make his sweet is also consumed in Europe, US, Japan, China, Korea and in several places worldwide. Therefore, he can sell in the bodega or in the local fair as well as export", notes Silva. In addition, there is an international demand for functional foods, for products from organic agriculture, and with the social appeal of generating employment and income for family farmers. ♦



Wealth in the form of seeds

The work of recovering and selecting Creole seeds has been encouraged in partnership with family farmers from the southern region of Rio Grande do Sul. The families, which often have cultivated the same seed for generations, have a wealth in their hands that goes beyond economic issues. The creole seeds represent preservation of the agricultural biodiversity of the regions where they are cultivated and, also, the food security of many farmers in the southern half of the state.



Paulo Zanetta

Creole seeds

Adão, 65, and *Eva*, 68, named after Adam and Eve, live in paradise. More specifically, in the location called Chácara do Paraíso [Paradise Farm], in the countryside of the municipality of Canguçu, southern Rio Grande do Sul. But, unlike their biblical counterparts, they are not a couple; they are siblings. Yet, they live under the same roof and share everything, even the family. “Nothing is yours, nothing is mine, and everything is ours. Only the beds are separate”, kids *Dona Eva*. *Adão* is married to *Dona Lena*, 57, with whom he had two children. And *Eva*, married to *Gilberto*, 60, had only one. Together, they form the big Moraes family. Or Moraes, since a clerical error has made each sibling sign their name differently. Deep

down, the surname does not matter. The seven members of this peculiar family live in harmony, work happily in the practice of farming, and are also responsible for a very important activity in the preservation of agricultural biodiversity in the region: they are guardians of the creole seeds.

Due to cultivation in different weather conditions and also due to man’s selection in the search of a crop that would his needs, the seeds have been naturally adapted to the regions where they were cultivated.

They have therefore become more rustic, responding more suitably to soil conditions where they lay. They are usually preserved in the communities, being passed on from father to son and crossing several generations of farmers. Creole seeds are also important because they preserve a vast genetic variability, an aspect that contributes toward improving and developing new crops. In addition, they typically are organic seeds, that is, they are produced without the use of chemical inputs or genetically modified materials. Hence we can begin to understand the importance of the family’s work. And they have been making this recovery for some time now. Officially, Mr. *Adão* has been a guardian for ten years. But the farmer says that he was raised in farming and has always planted creole varieties, especially of maize, for consumption, flour making, or even for sale. Today, the family has two varieties of maize and five of beans in the property. A production that he is proud of exhibiting, stored inside PET bottles. According to *Adão*, the main difference between the hybrid variety (also present in the property) and the creole variety is the cost of planting, since the creole seeds can be multiplied countless times. “The man who supplied me with the seed told me that in his family, here in Canguçu, it has been produced for over a hundred years”, he informs. Part of the production of the *Morai(e)s* is for self-consumption. The rest is sold in the family storehouse, inaugurated in 1976. Due to the possibility of multiplication, the Creole seed is not one of the items most sold in the store because the farmer who already has the grain has seed guaranteed for the following year. But that which many not be good for sales is a positive point in the ambit of food security. “The creole seeds are important in a context of climate change, in which significant production losses are foreshadowed in given situations. Our work, however, is to preserve this material, contributing toward a greater production

diversification and thus more stable production”, argues the researcher from Embrapa Temperate Agriculture (Pelotas, RS) Irajá Antunes.

THE WORK OF RECOVERY

From the standpoint of research, the role is of recognition and preservation. The grains usually reach Embrapa through the farmers. From there, the varieties collected are integrated to a germplasm bank, where they will be analyzed, characterized, and later stored. In addition, the seeds available in Embrapa are also passed on to other family farmers. “We do not only keep the seeds, we mainly pass them on, with the hope that they can contribute toward a new source of income for the smallholder. It is, at the same time, to the extent to which they are planted that this material is preserved”, rounds up Irajá.

Through the project, The Creole Seeds as Technological and Cultural Instrument in Integrating the Family Farmer into the Socioeconomic Context, for which the researcher Irajá is responsible, Embrapa Temperate Agriculture articulates a state network of guardians made up of entities representing family, quilombola, and indigenous farmers, in addition to public institutions.

Each year, collections of Creole seeds of beans, maize and cucurbitaceous plants (like pumpkins) are

distributed to these farmers, so that they can identify the materials that most suit their production contexts. They thus indicate the seeds with greater potential for the selection of new varieties, in a continuous cycle.

In performing this work, more than a hundred farmers and technicians have been trained who, added to the support to various regional and municipal fairs of agricultural biodiversity, promote the attendance of about 20 thousand people.

EXCHANGE OF SEEDS

Mr. Adão, besides selling the seeds in the family storehouse, also sells them through the Union of Community Associations of the Canguçu Interior (Unaic), association that he also helped create. According to the farmer, Unaic was one of the main responsible for recovering creole seeds in the municipality.

Another space for interchange are the creole seed regional fairs, as is the case of the *Regional Meeting of Creole Seeds and Popular Technologies*, held every two years in Canguçu municipality.

Currently in its sixth edition, the meeting is an opportunity for the farmers to exchange their seeds and thus keep the cultural heritage of their forefathers alive, an important role in the practice of a more sustainable agriculture. ♦



Creole Seeds, Adão and Eva

Artisan Breadmaking: improvement in food quality and generation of income

Among the social problems of the Brazilian population are those of health, related to poor diet, combined with high contents of fat, sugar and sodium in processed foods. With the aim of reducing the problem, Embrapa Wheat, in 2003, started the social action: Improvement in Food Quality and Generation of Income with Wheat-Based Products. The project visits several municipalities and conducts courses on production of wheat-based foods.

According to one of the project's members responsible for the social actions in the area of Technology Transfer of Embrapa Wheat, Jorge Cerbaro, one of the action's goals is to use the foods produced in the properties as basis of the recipes. "We started to develop courses to use wheat from the properties and other products derived from Family Farming", points out Cerbaro. He also highlights that there is added value, with the generation of employment and income, and the development of the participating communities. Another result involves the participation of women in the family labor, with the training that turns the female farmer into a professional in the manufacture of wheat byproducts intended for local trade, creating expectations of a better future and improving self-esteem.

In the courses, there are theoretical and practical classes, ranging from basic notions of hygiene in food preparation, main ingredients, and alternatives for sale of the foods produced, to the creation of family-based agroindustry. Group dynamics are also conducted for interaction and strengthening of the participants' self-esteem.

During the more than ten years of project, over 1,500 people were trained, in 47 courses, throughout Brazil. The target audience included extension agents, students, teachers, representatives and those assisted by misery fighting entities, inmates, settlers of the agrarian reform and organized groups of family farming. The action is developed by a group of employees from Embrapa Wheat: Antonio Sergio Brizola de Oliveira, Eliana Maria Guarienti, Ellen Traudi Wayerbacher Rogoski, Helena Araujo de Andrade, Jorge Cerbaro and Paulo Ernani Peres Ferreira. According to the researcher from Embrapa Wheat Eliana Maria Guarienti, through the project one is able to reduce poverty and social inequality, collaborating toward a more sustainable world. "Making a balance of the actions performed in the course of a decade brings the satisfaction of a mission accomplished, generating economic development, social inclusion and environmental preservation", states Eliana.

One of the records that the training results in concrete actions is from *Cooperativa de Costureiras Unidas Venceremos* [seamstress cooperative], set up in the Sarandi district, in the environs of Porto Alegre (RS). Made up of 25 seamstresses, the group expanded its activities with the assembly of a bakery, whose project was presented by COEP-RS and included the participation of Embrapa Wheat, training the cooperative members in the production of various types of breads and turning the cooperative into a supplier of exclusive and differentiated products. Another record is in the Municipality of Passo Fundo (RS) in which a Community Kitchen, including a bakery, was installed in Igreja São Judas Tadeu Church, generating income for the families. ♦

Fruit Backyard for food security

A project developed by Embrapa Temperate Agriculture (Pelotas, RS) since 2004 has been helping family, indigenous, *quilombolas*, farmers in Agrarian Reform settlements, and students from rural and urban schools to produce fruits and vegetables in backyards all year round. A proposal that seeks to guarantee food security of countless families in situation of vulnerability and that, due to its ecological nature, contributes toward more sustainable production in the southern region of the country.



Backyard with fruit, and producer, wife, and son at the orchard's entrance

Mr. Antonio Eduino Silva, 58, is a *quilombola* (descendent of fugitive slave settlements called *quilombos*) in Santana do Livramento, southwest region of Rio Grande do Sul, and he was contemplated with an Organic Fruit Backyard in 2005. At the time, he received 80 plants of sixteen fruit species, which were added to the 40 existing in the property. With willingness and dedication, Mr. Eduino increased the planted area. Today, there are about 120 fruit trees, many of them native, and 200 trees, ranging from poplars to acacias, which serve as windbreaker for the orchard. An ambition that benefited more than ten *quilombola* communities near Ibicui da Armada locality. Because the production that feeds Mr. Eduino's family is also distributed to local school students and the elderly who, besides consuming them fresh, also use the fruits to make sweets. "Our work is directed toward the human being, toward a person who has suffered a lot. We experiment to see what yields more, what produces more, what adapts better. We will think about financial returns later", justifies the farmer. The social mentality of Mr. Eduino made the property of 7.5 hectares become a reference, not only on account of the success of the implantation of the Organic Fruit Backyards, but also due to the diversified cultivation structure. Besides the fruits, the *quilombola* has a vegetable patch, works with fish farming, produces seedlings, and is the guardian of creole seeds, also having two hectares of preserved native forest. As aspect that has called the attention of people from various parts of the country, including from the northeast, and from schools and universities, which visit the property to learn a little from Mr. Eduino's experience.

Seeing the beautiful and productive orchard also makes the eyes of the project coordinator, Fernando Costa Gomes, fill with pride. "The project is a technology transfer platform and should not stop at fruit crops. Mr. Eduino captured what we wanted to do with the backyards very well", he states. Here, social sustainability is combined with food and economic safety of the communities. The implantation of orchards works as a platform to aggregate other technologies, gradually shared by the farmers included in the program. "The backyards are small, but they use the technologies of large orchards", Fernando completes.

The secret of good development of the backyards in Mr. Eduino's property can be summarized in one word: dedication. He, his wife Maria de Lourdes, 56, and two sons, Lauro, 25, and Diego, 15, work continuously for evolution of the property. Based on the techniques learned from the initial orchard, the family gradually adapted the cultivations according to its necessities, evolving each year. In the project's proposal, the farmers are free to intervene in the orchards, increasing and adding species. One of the examples is blueberry, which did not adapt to Mr. Eduino's property. But the farmer was not discouraged and soon replaced it with the vine. It worked. "I fought with all my strength for the backyards to work, to serve as a model for the locality and to promote diversification", states the farmer.

Purchased in 2000, after many years of work, the property still did not attain full security. In these lands, he started from scratch, little by little, in a slow process. First came the structure for water intake. This was followed by the fruit trees. Finally, the Backyard project came to boost the production. "It was when we took off". The results obtained by the farmer reflect a long-term dedication and fill the family with pride. "We are amazed. More fellow farmers benefit from the fruits, which are healthy. And we do not even need to buy", he completes.

THE ORGANIC FRUIT BACKYARD PROJECT

The Organic Fruit Backyard Project: Contribution Toward Food Security in Rural, Indigenous and Urban Areas officially completes its 10th anniversary in 2014, period when more than 1.5 thousand backyards were implanted, divided in more than a hundred and fifty municipalities of the states of Rio Grande do Sul, Santa Catarina and Paraná and of Uruguay. In all, there were 47 thousand direct beneficiaries, which included family farmers (4,000), settlers (3,000), students (29,000), indigenous farmers (2,500) and quilombola farmers (700) and assistance institutions (8,000). In the year 2013 alone, 240 demonstrative units were implanted.

For composition of the backyards, 18 fruit species, 13 vegetables, beans, maize, pumpkin and watermelon are currently adopted, completing an offer of 35 foods to beneficiaries of the project. However, like Mr. Eduino, the farmers can also add other crops according to their needs. The availability of species is always the same. The crops vary according to the characteristics of each region.

The initiative to create the project started with Embrapa Temperate Agriculture, in partnership with institutions like *Companhia de Geração Térmica de Energia Elétrica* [Electric Power Thermal Generation Company] (Eletrobras CGTEE) and *Fundação de Apoio a Pesquisa Edmundo Gastal* [Edmundo Gastal Research Support Foundation] (Fapeg), in addition to support from the Municipal Offices of Emater and the Municipal Secretariats of Agriculture and Education. The joint efforts were recognized nationwide through four awards. Among them, that of the best Brazilian social project by *Financiadora de Estudos e Projetos* [Study and Project Financier] (FINEP), in 2009. The in-

novation is to add new technologies in the backyards as they are developed and validated, always adding social, environmental and economic sustainability. It is a way of taking what the research produces to the communities that most need them. Besides the initial public, the project also contemplated prisons and rehab centers, reinforcing its social role. “It helps agriculture that nobody sees that of subsistence. Because today, everybody sees only what gives profit”, concludes Mr. Eduino, satisfied with his backyard. A backyard that is not only his, but of the entire community.

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Fruit backyards, Antônio Eduino Silva

Traditional Vegetables aim at enriching the diet of rural populations

With the noble objective of enriching the backyards of rural communities, thus guaranteeing food security for these populations, the project Traditional Vegetables: an Alternative for Family Farming has been playing an important role of recovering and conserving vegetable species that were once much consumed decades ago and, due to a series of factors, ended up gradually disappearing from the Brazilian diet.

According to the researcher Nuno Madeira, globalization and the process of product standardization contributed toward changing Brazilian food standard of, suppressing cultural characteristics like the consumption of regional foods. “Since traditional vegetables have a seasonality effect and do not fit well in large-scale commercial production, it is difficult for producers to meet the criteria required by supermarket chains and their permanent deliveries”, he explains.

However, although far from the retail market, traditional vegetables like roselle, ora-pro-nobis or Barbados gooseberry, *mangarito* yams, arrowroot, and arrow leaf, among others, have not been totally forgotten. The Embrapa Vegetables project, in partnership with federal institutions, universities, and rural extension and technical assistance bodies, maintains a germplasm bank of traditional vegetables and helps the setup of multiplication banks in several Brazilian states. “Our idea is for these materials not only to be preserved, but to also be demanded by producers and consumers”, he points out.

According to the researcher, the aim is not to obtain the space of conventional vegetables like lettuce, potato and tomato, but rather to propose the commercial inclusion of traditional species in local and regional fairs, assuring an alternative source of income and improvement in the nutritional quality of rural communities. “In

several regions, traditional vegetables are part of the cultural identity of the people, like the roselle in Maranhão and the ora-pro-nobis in Minas Gerais”, he highlights. The relevance of such a project becomes even more evident when we know that some species are under threat of extinction, like the mangarito and the arrowroot. Due to lack of knowledge, some farmers regard them as weeds and end up weeding a food that could be synonymous with food security for their communities. See the use of some traditional vegetables in food as follows:

Arrowroot: Traditional use in the form of flour extracted from the roots (rhizomes). The dry flour is sieved and used to make cakes, biscuits and porridge. It also thickens sauces, creams and soups.

Wood sorrel: The chopped fresh leaves can be used in salads and juices, giving them an acidic taste. The braised leaves can also be used in soups and sauces.

Yam bean: Roots can eaten raw and cooked in soups; preparation of dough and breadmaking products.

Mangarito: After it is cooked, the pulp takes on a tender consistency. Used as potato and cassava, cooked, fried, pure, buns, soups and baked.

Ora-pro-nobis: The combination most used in traditional dishes of Minas Gerais is with chicken or with manioc flour. It can be used in soups, stuffing, scrambled eggs and omelets.

Arrowleaf plant: The leaves are used braised or cooked with chicken, minced meat or rice. Omelets and soufflés are also made.

Roselle: The leaves are used in raw or braised salads and in flowers in teas. The calices are used to make jams and juices. It is an ingredient for the traditional *arroz-de-cuxá*, a spiced rice from the state of Maranhão. ♦

Agroecological Transition praises farmers' knowledge

Project developed by various Embrapa research units takes advantage of a range of sustainable technologies and knowledge that are used by farmers are adapted to their reality, and strengthen the regional economy and promote improvement in quality of life and food security of the rural and urban population.

Agroecological transition - Lagoa do Rei, in the center of the Marinheiros Island



The Agroecological Transition project conducted by Embrapa, which involves 27 research units in the country and partner institutions, has been contributing to face a current agricultural challenge: a tested productive efficiency, with several social and environmental impacts, which requires qualified technological solutions. Agroecology would be the solution to face such challenge of preserving environmental sustainability, but there is insufficient availability of technologies to support concrete processes of agroecological transition. The challenge is to reach an even greater dimension, when one considers the premise that the technological build should respond to social demands and suit the reality of the farmers.

This challenge should be faced gradually, based on the participatory construction of agroecological knowledge, to respond to various specific issues, like: low availability of sustainable technological innovations, conceptual dissonance regarding Agroecology, insufficient methodological references to solve complex problems, demand for scientific exchange to enable an increase in the appropriation of knowledge available, and the need for public policies that focus on Agroecology.

The project was articulated in a national network, and has a Management Plan, concretized by the creation of a Management Board that united the Embrapa Units and partners, as a strategy to ensure strong integration among the component projects through a set of interdependent and complementary thematic lines.

The main impacts obtained were: advance of basic knowledge frontiers in strategic scientific areas, with direct consequences on productivity in production systems; improved quality of natural resources; reduction in farmers' economic dependence; strengthening of local and regional economies; improved quality of life and food security for farmers and consumers; and a contribution toward the construction of an integrating and transdisciplinarity paradigm that values dialogue between different kinds of knowledge, the sense of social responsibility, and public recognition.

According to the researcher Carlos Alberto Medeiros, from Embrapa Temperate Agriculture, in Pelotas, RS, the aim of working as a network on the project is that of uniting, coordinating, and sharing interests, knowledge, competencies, resources, and infrastructure among several institutions, research centers, and groups, in order to obtain and increase sufficient synergy and complementarity to trigger local and regional processes of agroecological transition.

The project was executed in the period of 2009 to 2012 and a proposal for continuity is going to be submitted.

WHO LIVES IN AGROECOLOGICAL TRANSITION

Some farmers live off organic production, or seek a new form of production that guarantees a differential to Agriculture and more: a new way of living and viewing life. Here is the case of the Bastos and the Muhlenberg family.

AGROECOLOGY AND DIRECT SALES ADD VALUE TO THE BASTOS FAMILY

In Rio Grande do Sul, we found the case of the Bastos family property, located in Ilha dos Marinheiros, and island and district of the municipality of Rio Grande, RS, where the production of vegetables is 100% organic. With good infrastructure for the production system, the farmer destined 1.5 hectare (out of a total of 7 hectares) to the cultivation of vegetables and flowers.

Diversification is a reality and in this unit at least 21 different species of vegetables are cultivated.

In addition, Bastos buys Isabel and Bordeaux grapes, from the region of Bento Gonçalves, RS, and produces wine and *jeropiga*. The beverages guarantee a significant supplementary income for the family, hence the elaboration of these products participated in the analysis, with 48.05% in the total gross income. The champion in representativeness among the vegetables is lettuce, which contributed with 40% of the net margin.

Bastos invested in improvements to the property's infrastructure and in diversification to improve the

production system and maintain soil fertility levels. He accepted the technicians suggestion and adopted the breeding of layer hens, like most producers in the network. Their aviculture has already promoted good results. It increased the income in the property, with egg sales and use of the poultry litter in vegetable production. The vegetable remains from the fair (a street market where they sell them directly to consumers) are used to feed the fowls, reducing consumption of feed and thus contributing toward reducing expenses.

To have another resource to produce inputs for vegetable crops, Bastos built a wormery production of humus and started to raise a confined bovine animal to produce organic manure.

Produced manually and with good quality, the wine and jeropiga reach the consumer in bottles labeled with the Vinho do Barão brand, and can be bought in fairs in the municipality of Rio Grande.

Another singularity in the Bastos smallholding is the vegetable production system. Their differential starts in the preparation of beds, done manually, incorporating the vegetation present, the water hyacinths of the ditches, and reed straw (material available from the edges of the lagoon).

The irrigation water comes from Lagoa do Rei, located in the center of Ilha dos Marinheiros. The water reaches the irrigation channels by infiltration. The beds are sprinkled in two ways: one through the traditional irrigation system (with pumping), and manually, using a pot that is perforated at the bottom and fastened to a rod. The water is collected from the ditches and poured on the

beds, raining on them. This system is used by the island's residents. Pests and diseases are controlled by applying protective syrups, biofertilizers, natural insecticides and traps.

THE EXAMPLE OF THE MUHLENBERG FAMILY

Roni Muhlenberg's family is located in Butia, a district of São Lourenço do Sul, RS. The conventional technology adopted mainly in the production of potatoes was based for many decades on the use of highly soluble mineral fertilizers and great amounts of pesticides. In the early 1990s, the heavy use of pesticides caused the producer to have serious health problems due to poisoning.

In 1993, the farmer, who up until then had produced without receiving any technical assistance, joined *Cooperativa Mista dos Pequenos Agricultores da Região Sul* [Mixed Cooperative of Smallholders from the South Region] (COOPAR), and started to receive technical information and obtain knowledge from the studies developed in Agroecology. As of then, he decided to try out this new way of producing, starting with the ecological cultivation of potato and beans in small areas. The result was that in the third harvest, the entire production was changed to the ecological system.

In the beginning, there was great resistance from the traditional traders who purchased the production, mainly with regard to the potato, alleging reduction in quality, and forced the farmer to seek alternative trade pathways. These barriers were broken and today only maize still receives cover fertilization with soluble fertilizers, in small quantities. There is great production diversification in



Agroecological transition – freerange egg production



Agroecological transition - production of wine and jeropiga

the property. Besides potato, they produce strawberry, peanut, *cará* yams, broccoli, carrots, mustard, spinach, kale, chives, green beans, colored beans, upland rice, maize, soybean, beans, cassava and sweet potato.

Since 1995, the Muhlenberg family has been part of a group of ecologist producers who sell their production in ecological fairs, in Pelotas, RS and in São Lourenço do Sul, RS. Part of the production is sold to *Cooperativa Sul Ecológica*.

To sustain this type of production system, the farmer uses conservationist and improved soil practices such as strip tillage, keeping the soil covered with grasses and leguminous plants. In the winter, he plants species like oat and vetch and, in the summer, azuki beans, jack beans and cowpeas. These covers are incorporated to the soil through plowing

POTATO PRODUCTION

In this unit, the research work sought essentially to value the set of technologies used for ecological potato production. The basis was what the farmer had previously been doing, valuing his knowhow and introducing

some procedures and technologies that could improve the production system. Thus, the farmer and technician joined their knowledge, with the presence of all the elements that interfere in the day-to-day of a family unit, and testing technologies suitable for the ecologically-based production system.

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Agroecological transition – organic compost production



Agroecological transition – bean crop

A man wearing a wide-brimmed hat and a brown shirt stands in a vast field of pineapple plants. He is holding several ripe pineapples in his arms. The field is filled with rows of pineapple plants, and the background shows rolling hills under a cloudy sky.

Pineapple cultivation changes the reality of municipality in Bahia

Antonio Evangelista, a producer partner, harvesting second-cycle pineapple

The municipality of Itaberaba, in the Semi-arid Region of the Piemonte do Paraguaçu territory, located in the entrance to Chapada Diamantina, is the biggest producer of pineapple in Bahia. The fruit has been exploited for 40 years in the region – which has ecological conditions that differ from most traditional farming regions, something which was consolidated less than 20 years ago. Today, without a shadow of doubt, pineapple is the main agricultural product of the municipality, occupying 2.5 thousand hectares of harvested area in 2012. The annual production reached 93,750 tons (according to data from IBGE/2012), generating about six thousand direct jobs during the harvest and 57 million BRL. The municipality's agriculture in 2012 (temporary and permanent cultivations) was based on only three crops (pineapple, cassava and mango), being that pineapple is responsible for 90.25% of the harvested area. The presence of Embrapa Cassava and Tropical Fruits was fundamental to the success of pineapple cultivation in Itaberaba, predominant in smallholdings with average areas of less than three hectares, where family labor is used and often without funding. It would not be an overstatement to say that there is a before and after the arrival of Embrapa. In 1995, after returning from his doctorate, the researcher Domingo Haroldo Reinhardt, current director-general, was responsible for setting up some demonstration courts, with support of the agricultural technician Jose Jorge, today retired. The team grew and included the researchers Getulio Cunha, Luiz Francisco Souza, Aristoteles Matos, Nilton F. Sanches, Jose Renato Cabral and Otavio Almeida, in addition to the assistants Antonio Pereira and Benedito Conceicao. “Frankly, I no longer recall what took me to Itaberaba. It must have been the invitation of a farmer or from EBDA [Bahia Agricultural Development Corporation]”, he remarks. At the time, there were about 20 hectares in the entire municipality and pineapple was planted in the shade of the cassava, with rudimentary management of the crop. “Extensive dairy farming, typical of the hinterland, with low productivity, was predominant, as well as cassava, which already received the attention of the research team from Embrapa”, he explains. During the first years, the production system came from the municipality of Coração de Maria, city where pineapple was in vertiginous decline on account of fusariosis – disease caused by the fungus *Fusarium subglutinans* f.

sp. ananas, which can generate losses of more than 80% of the production, and underwent some adaptations. “Contrary to the producers from Coração de Maria, they quickly adopted some fundamental technologies, like densification of the planting and ridging, and improved others, like fertilization, weed and pest control, flower induction, and ratoon management – rational exploitation of a second and third cycle, a practice characteristic in the region. Soon after, the cultivation started to grow, providing very significant economic return that remains stable over the years”, states Haroldo. The technical recommendations developed after years of studies in partnership with EBDA and farmers from the region were united in the first regional production system for pineapple elaborated in 2004, reviewed in 2011.

RECOGNITION

The importance of the cultivation for the municipality is so much that, in 2001, the Pineapple Management Group was created, made up of Embrapa Cassava and Tropical Fruits, Coopaita [Itaberaba Pineapple Producers Cooperative Union], EBDA, Adab [Bahia State Agency for Agricultural Defense], Sebrae [Brazilian Micro and Small Business Support Service], Banco do Nordeste, Banco do Brasil and, more recently, Sicoob [Brazilian Credit Unions System]. The group coordinates the technical assistance, research, development, commercialization and funding actions for sustainability of the pineapple crop in Itaberaba and region.

According to the farmer Antonio Santana, a partner of the Unit for 16 years and a member of Coopaita, having Embrapa nearby is very important. “I have always received directions from the researchers, which I have applied and obtained results. It is convenient, I cannot miss one *Field Day* of Embrapa”, he declares.

CHALLENGES

Currently, one of the Unit's biggest challenges is to try to protect the region's environment. The plane areas are ending and the cultivation is invading the hills and destroying the native vegetation. In addition, many farmers burn the remains in the site itself. “After the second or third cycle, despite the recommended practices, we notice a reduction in the fruit's quality.

In recent years, our concern has been to show the importance of using the cultivation remains, incorporating

it to the soil or maintaining it on the surface as covering, and not to burn it, as is most convenient to the farmer”, declares Haroldo.

Another challenge is improvement in the control of fusariosis, which continues to be the main threat. The resistant varieties developed by the Unit, like BRS Imperial and BRS Vitoria, released in the last decade, are more demanding of soil humidity than the traditional Perola crop, but the availability of water for irrigation is restricted to a small part of the municipality bathed by the Paraguacu river. According to the researcher Aristoteles Matos, who has headed the research activities there for about four years, there are indications that fusariosis emerged in the region after the crop migrated from Coração de Maria, probably due to the accidental

introduction of infected seedlings. “We are introducing management with eradication of diseased plants right after the third month and stricter chemical control during flowering to reduce losses”, he explains.

For this, he and his colleagues Nilton F. Sanches and Tullio de Padua are conducting monitoring – one of the techniques of Integrated Production (PI) – in the total areas of 12 properties, in the four main farming communities. These are areas with less than 1 hectare and up to 10 hectares. “We are using the IP techniques to gradually convince farmers that the quality of the fruits will improve, and will also promote the crop’s sustainability”, he points out. That nobody may doubt. It was slow and steady that Embrapa helped Itaberaba to become the biggest pineapple producer of Bahia and one of the biggest of Brazil. ♦



Domingo Haroldo Reinhardt

Overview of the semiarid region of Itaberaba, BA, with pineapple plantations

Partnership with focus on technology transfer

There is a growing concern in Embrapa with making the technologies actually fulfill their purposes: to reach the producer and the consumer. “In the case of Embrapa Cassava and Tropical Fruits, different mechanisms have been adopted to make the innovation cycle close with the actual transfer of knowledge generated for the customer.

Thus, the partnerships with various institutions have been fundamental for the success of this proposal”, states the director-general Domingo Haroldo Reinhardt. One example is the work performed together with Escola Rural Tina Carvalho (ERTC), institution linked to Fundação Jose Carvalho, in Entre Rios, in the north coast of Bahia. The latest action involves the project of ornamental pineapples, developed by the researcher Fernanda Vidigal and under phase of validation so that it can be released.

“The goal of the partnership is to try to place materials produced by the small-scale farmers linked to the foundation in the resorts of that region, in malls, etc. There are three links of the chain working in the logic of the project, such that the product, on being released, already has a channel to reach the customer”, explains the assistant head of Technology Transfer (TT), Alberto Vilarinhos.

Escola Rural Tina Carvalho has been a partner of the Unit since 2008. “At the time, the foundation’s project manager, who today is the president, Prof. Marilene, asked us to revamp the technical issue of the school. The goal was to seek a project that would serve as reference and represent a stronger identity of the school in the issue of agriculture and livestock. We conducted a diagnosis and noticed that 94% of the families of our students cultivated cassava. We then sought Embrapa to see how we could walk together in a project that would give the school greater visibility, in addition to offering greater economic sustainability to the parents of our students”,

says Rosely Machado, today director of the school, who has worked in the institution since the inauguration.

In 2012, ERTC completed 25 years. It is the only in the country that works with pedagogy of alternation with children (aged 6 to 13 years) – they spend 30 days at school and 60 at home. Today, there are 600 students (divided into three groups), which represents approximately 350 families, distributed through 15 municipalities of the coast.

BAHIA STATE NORTH AND HINTERLANDS

In fact, the contact with Embrapa started at around 2006, with training in the school’s Unit of technicians. From there the relationship was straitened with the researchers Mauto Diniz and Joselito Motta, specialists in cassava who, seeing the work of the school, saw the possibility of ERTC becoming a technological showcase of Embrapa. And this is what happened. The Unit frequently organizes visit by international, mainly African delegations, to get to know the project developed with the school.

ERTC thus started to receive materials from Embrapa, like cassava stems for propagation, which were transferred to the parents of the students. The next step was implantation of *Centro Tecnológico de Beneficamento da Mandioca* [Cassava Technological Processing Center], in 2007, a replica of the Unit’s Cassava Technological Center.

“There was here a characteristic of seeing cassava as a crop for flour only. We then turned our attention to the cassava starch. We then created an integrated system for the cassava crop that values the entire plant, the leaf in human and animal food, the stem for production of firewood, etc. We implanted here every model that we could bring from Embrapa as reference”, says Adenildo dos Santos, technician of the school for 21 years.

BESIDES CASSAVA, FRUITS

In 2010, the partnership was extended to fruit production. In October, the school received the first varieties of ornamental pineapple, developed by the researcher Fernanda Vidigal. The following year, in May, Embrapa delivered varieties of ornamental banana trees, fruit of the studies conducted by the researcher Janay dos Santos Serejo. “We are presently gathering data, field information on the plants; the measurements are being taken, like size, vigor of the fruits... In short, all this technical part. The varieties have not yet been passed on to the producers because they are still undergoing validation phase. And all is done in the internal area of the school”, informs Rosely.

Regarding the ornamental plants, the discussions with Embrapa now involve organization of this chain of production for the families to have the necessary structure to produce and deliver the product continuously.

“Our expectation with the ornamental plants is to guarantee greater economic sustainability of the families of our students. We will now move on to selection of the families that will benefit directly from the project.

At the same time, we are seeing the potential of the market because, since we are close to the tourist pole of Costa do Sauipe, we are mobilizing the managers of these hotels to also be partners of the project”, explains the director.

He highlights two important moments of this partnership with Embrapa: the *Field Days* conducted, one being about passion fruit (2010), with roughly 100 people, ranging from students, producers and technicians from the region, and another about cassava (2011), with a public of about 250 people. Both events counted on the partnership of the Bahia Agricultural Development Corporation [*Empresa Baiana de Desenvolvimento Agrícola*] (EBDA) and of the Entre Rio Municipal Agricultural Secretariat.

ERTC also implanted Educational Units in its area with the support of Embrapa. In 2010, that of cassava was installed, in 2011 that of passion fruit and in 2012 that of banana. Regarding her work in the school, Rosely says that it is very gratifying. “Each day that we go to the field and we see the fruit of what is being implanted, what the parents of the students say, what they have achieved with



the technology that is arriving there, how their lives have improved, we are happy and certain that we have a lot more to do”, she declares.

Adenildo praises importance of the protagonist role the students play in this process of local development. “We are in a very poor region, with great need for technologies. The parents, in general, preserve that traditional planting process, and the students are our references. They are the vehicles of change.

And, through the partnership with Embrapa, the school has promoted the scientific meeting with the rural community. A while ago, measuring in these communities the planting that was done, in the traditional model, they harvested nine tons of cassava per hectare, and with the planting system, respecting the entire process of nature and introducing alternative technologies, the average rose to 32 tons. We applied the comparative method. The father continues to plant and the student at his side. We later noticed the importance of comparing and showing the results”. An example of the success of this work is the experience of the farmer Josival de Jesus, from the Novo Paraíso settlement, in the municipality of Conde. He states that everything changed after the assistance received from the school and from Embrapa, started two years ago. “Formerly, even the time of planting was not suitable. Today, everything yields more: beans, potatoes, pumpkin... Planted at the right time, everything yields results. With help from the school, things improved 100%. The cassava we used to plant here would be lost. With nine, ten months, everything would be rotten. The biggest problem here was rotting of the root itself. With this new variety [Kiriris], we no longer have this problem”, reports Josival, who is aged 51 years and is the father of four children, all benefited by the project, except for the youngest Poliana, who anxiously awaits to complete 6 years of age to join the ERTC. He also praises the experience with the *manipueira* (liquid residue from cassava that can be used in fertilization and animal feed). “The experience was good. Last year, I planted okra, watermelon, maize...

A lot changed in my finances, I did not have any expense, as well as in quality because the watermelon, for instance, when I would take it to the streets, Holy Mary! Everybody would fight because of the sweet and the taste of the watermelon, which was different, even from those with chemical fertilizer.”

The technician Adenildo adds that Josival is a reference in the community. He seeks the genetic material and acts as multiplier of information, acting as bridge to the other families. “There was, for example, a great environmental impact on account of improper destination of the *manipueira*. The moment they received the information, they started to use the *manipueira* in fruit and cassava production, reducing the impact on the soil.”

The farmer Silvia Albuquerque, from Associação Renascer, in the settlement of Rio Preto, rural area of Entre Rios, is one of those benefited from the project. “From one hectare, we would harvest nine tons. With the new technologies, the production went up to 30, 32 tons, depending on the type, management, and nature itself, etc. But it doubled, at least. The producers have been noticing the interest in the cassava crop on account of the difficulties, but today they have a new view. The school and Embrapa have provided directions on production and also on environmental preservation. Today, we avoid degrading nature, using the *manipueira* for cassava itself and other crops as foliar fertilization. We also have directions on the type of cassava, the best for starch, for flour, etc.”, he explains. ♦





Garlic for family farmers

With the aim of offering the small garlic producer a productive and uniform material, Embrapa Vegetables is launching the BRS Hozan cultivar. The material was obtained through clonal selection, which is when a plant stands out from others and is thus multiplied to generate clones of the original plant. In this case, added to the selection, there was perfecting of the material, which underwent a process of virus cleaning to guarantee its physiological and sanitary quality and thus contribute toward establishment of a vigorous and uniform cultivation.

Regarded as semi-premium garlic, BRS Hozan has high quality of bulbs (heads) and, in the tropical conditions of the country, waives vernalization – treatment in which the garlic seed is stored for a period in cold chamber, with temperature of 3 °C to 5 °C. “Vernalization substitutes the absence of cold in the fields and reduces impacts of the hot climate in development of the culture. Since BRS Hozan garlic does not need this treatment, it is an option for the small-scale farmer due to the lower production cost, since there is no need to invest in cold chambers”, analyzes the researcher Francisco Vilela.

Another advantage of the BRS Hozan garlic is the bulb's appearance which, when compared to the materials of ordinary garlic, usually planted by the small-scale farmers, stand out for their homogeneity, while the cloves fit perfectly in the structure of the bulb. "The BRS Hozan garlic has an average of 15 cloves, large and of quality. Therefore, it is indicated to replace crops with excess number of cloves and low commercial acceptance", recommends Lenita Haber, Technology Transfer analyst.

When the bulbs are classified according to size, the BRS Hozan garlic also has an advantage over the ordinary materials because it has greater percentage of commercial bulbs. Tests conducted in Cristópolis, BA, for example, indicate 80.7% of commercial bulbs (classes 5, 6 and 7) against 2.2% of noncommercial bulbs and average weight of 31.4 grams. These characteristics allow BRS Hozan to be sold in pack, as well as the premium garlic, adding value to the product and thus guaranteeing an option of income for the small-scale farmer. Besides presenting, in field conditions, partial resistance to purple blotch and leek rust, with proper management, BRS Hozan's productivity can exceed 13 tons per hectare. From the point of view of the processing plant and the consumer, the new garlic also pleases due to its aroma and sharp smells, ease in peeling and high content of soluble solids, which give the material good aptitude for processing.

SEED PRODUCTION

The farmers from Cristópolis, municipality in the west of Bahia, had the opportunity of knowing the new variety of virus-free garlic. Regarded as semi-premium garlic, it is an option for family farmers of the tropical regions who are used to planting the common garlic varieties: Cateto Roxo or Amarante.

"The proposal was to offer the producer an alternative material for planting and to also encourage the adoption of healthy seeds to break the cycle of degeneration that destroys the crop", informs the researcher Francisco Vilela, who stresses the importance of using healthy seeds to start a new cultivation.

The farmer often sells the best garlic heads and reserves inferior heads for new planting, which compromises the quality. It is therefore imperative to consider using good seeds. A test on the relation between the size of the clove used as seed and the size of the bulb (head)

harvested, for instance, showed that the larger the clove, the larger the head and, consequently, the productivity and vigor of the plant. Thus, Embrapa's team proposed to the farmers that they separate the commercial cultivation from the production area of the virus free garlic seed.

POSITIVE EXPERIENCE

Over ten years ago, Embrapa developed the work of research and technology transfer of the virus free garlic (ALV) in the region of Cristópolis. In this interval, the area planted with garlic reduced from 200 to 70 hectares, while productivity rose from 3 to 16 tons per hectare. The farmer Jose Borges de Brito, also known as Mr. Valdez, was a pioneer on investing in this technology and, today, is a reference to colleagues.

From Mr. Valdez' example, the farmer Mario Luis Sales adopted the new technology and today plants 200 strings to harvest 3,200. "Before, I would plant 600 to produce 2,100 strings and with low quality", recalls the farmer who plans to increase the nursery for production of the virus free garlic seed. "Before, what was produced would not even pay the costs and, with Embrapa's arrival, there was a broad development. Garlic is one of the best crops of our municipality and, today, we pay the costs and money still remains", he celebrates. According to Humberto Carvalho, technician from Bahia Agricultural Development Corporation [*Empresa Baiana de Desenvolvimento Agrícola*] (EBDA), the work in partnership brought a very great progress for all the garlic-producing regions of Bahia. "Note that, with the importation of the Chinese garlic, farmers were discouraged, but now with a quality seed, they have increased the crop's profitability and been able to attain a better standard of living", he explains. The president of *Sindicato dos Trabalhadores Rurais de Cristópolis* [Cristópolis Union of Rural Workers], Ademildes Borges, shares the opinion. According to her, the project was fundamental to leverage the municipality's productivity and improve the crop's cost-benefit ratio.

The head of Research and Development from Embrapa Vegetables, Italo Guedes, stresses the symbolic importance of the work, geared toward family farmers.

"This case is a clear example of technology transfer since there was appropriation by the farmers. It serves to show that scientific research has a concrete effect on the lives of farmers in the country and abroad", he analyzes. ♦



**Project
foresees
virus free
sweet potato
branches**

A vegetable of great socioeconomic importance to Brazil, the sweet potato is usually cultivated by small-scale farmers from North to South of the country. Due to the rusticity, the crop has good performance in several climate and soil conditions, but its productivity is compromised by several factors, such as: low technology, little investment and, mainly, use of infected branches for the start of a new cultivation.

Therefore, the project “Agronomic performance of sweet potato crops of high phytosanitary quality of Embrapa in different edaphoclimatic conditions” aims at promoting the clonal cleaning of the sweet potato varieties launched by Embrapa and analyzing the yield of these materials in different regions of the country.

Summarizing, the researcher Fernanda Rausch, head of the project, explains that, since the phytosanitary quality of the plant is directly related to the quality of the propagation material (branches), “the purpose is to remove the phytopathogens from the sweet potato crops that have already been in the fields of a long time and, due to virus accumulation, present low productivity”.

The cultivars Purple Brazlandia, White Brazlandia, Pink Brazlandia, *Coquinho* and *Princesa*, launched by Embrapa Vegetables (Brasília, DF) in the 1980s, will be subjected to the clonal cleaning process so that later, together with the recommended cultivar Beauregard, and the cultivars BRS Amelia, BRS Cuia and BRS Rubissol, recently launched by Embrapa Temperate Agriculture (Pelotas, RS), they can be tested in nine different locations to verify agronomic performance.

The tests will be conducted in Pelotas, RS, Sorriso, MT, Brasília, DF, Patrocínio, MG, Palmas, TO, Teresina, PI, São Luis, MA, Aracaju, SE and Boa Vista, RR and the aim is to indicate the crops with greater productivity that

can guarantee greater profitability for the farmer from these regions. The researcher also informs that it intends to compare the tested crops with the local varieties normally used by the farmers.

Another activity foreseen in the project is the validation of a system for production of branches of high phytosanitary quality. “From the example of the virus free garlic, it is expected to create multiplication banks in protected cultivation, so as to have a continuous system of production of healthy sweet potato branches”, points out Fernanda.

Due to the plant propagation, the private initiative is not interested in investing in the crop, thus the importance of a project that aims at making producers self-sufficient.

“The project can offer significant contributions toward the sustainable development of sweet potato production in Brazil, in addition to increasing the productivity, profitability of the farmer, and social inclusion and food security in various Brazilian regions”, she plans.

Due to being a crop of plant propagation, the private initiative is not interested in investing in sweet potato, thus the importance of a project that aims at making farmers self-sufficient

Virus free garlic

The accumulation of virus causes great losses to garlic cultivation, such as reduction in productivity and low product quality. The technology of the virus free garlic (‘ALV’) allowed the farmer to maintain high quality multiplication banks in his property and thus guarantee healthy and productive cultivations.

How does the clonal cleaning process work?

When an infected sweet potato plant reaches the lab, it undergoes a process of clonal cleaning, that is, a tissue cultivation technique for elimination of virus and other phytopathogens. After this stage, the plant is multiplied in vitro before undergoing the virus indexation process, which will evidence if it is really healthy. In this phase, the plant is grafted in a host plant very susceptible to the virus that infects sweet potato and, later, undergoes serological tests. If both methods show negative results, it is a sign that the plant is virus free and ready for production of seedlings with guarantee of high phytosanitary quality.

Tomato crop's performance surprises farmers from Ceará



The BRS Nagai tomato is a hybrid for *in natura* consumption that has been standing out in places where it has already been tested, like Ibiapina, CE, Capão Bonito, SP, Pará de Minas, MG, Londrina, PR and Brasília, DF.

The farmer João Golberto Cesar, from Jurupiranga farm, planted about 180 stalks in the region of Serra da Ibiapaba, located in the municipality of Ibiapina/CE, and was surprised with the excellent productivity of the material. He says that the good result attracted the eyes of neighbors, who appeared to visit the plantation. “Many people appeared from the neighborhood interested in cultivating tomato. The fame also reached the nearby cities and several people came to visit the plantation and ask about the seeds”, informs the satisfied farmer.

Those who looked for Mr. João heard good recommendations regarding the new tomato hybrid. “The foliage helps prevent exposure of the fruits to the sun and, at the same time, is not so dense to the point of rendering spraying difficult.

The material has good adaptability to periods of drought and it is interesting to cite that it does not require much fertilizer”, he explains.

According to Carlos Jose da Silva, seller of the seeds in Ceará, BRS Nagai proved to be very competitive in relation to other crops. “Besides having good tolerance to diseases and viruses, it beats the competition in terms of productivity”, he assures. And the performance is so good that the producer João is quick to say that he will continue to plant tomato.

FLEX TOMATO

The researcher Leonardo Boiteux, one of those responsible for the development of BRS Nagai, humoredly, comments that, in terms of market segment, it can be regarded as a “flex” tomato.

This is because, although it is of the Santa Cruz type, it has characteristics of the Saladete segment, due to its more elongated shape.

Aiming at meeting a need identified in the producing regions, Boiteux informs that BRS Nagai incorporates two resistances to the Santa Cruz segment because it was developed to be highly tolerant to the tospovirus and to the begomovirus. “Another advantage of this hybrid is

that, because it is firmer, it has a longer post-harvest life. This characteristic favors sale by both producers and by wholesalers”, he highlights.

In terms of productivity, it is estimated that BRS Nagai yields 10 to 12 kilos per plant and produces, in average, 6 fruits per sheaf. In addition, the planting is recommended for any sowing season. in the open field as well as under protected cultivation.

As for the nutritional part, the researcher Italo Guedes alerts that there is need to be cautious with the adequate nutrition of calcium and boron for a good formation of the fruits. “Another point is that BRS Nagai requires less nitrogen since the excess causes great plant growth in detriment of fruit growth”, he explains.

SEEDS

Embrapa Vegetables developed this new hybrid in partnership with the company Agrocinco, which holds the sales rights according to the Innovation Law (Law No 10.973/04). According to Luis Carlos Galhardo, partner of the company, the partnership between public and private companies has a positive result, mainly in this case in which scientific research knowledge is combined with market knowledge.

Showing concern with the fact that Brazil has no tradition in the production of seeds, he praises the work of Embrapa in the generation of technologies. “In a scenario in which importation of seeds prevails, not always adaptable to Brazilian edaphoclimatic conditions, the generation itself of technology is essential to meet the peculiarities of our market and definitively reduce external dependence on seeds”, he points out. ♦

Tribute

The name of the tomato pays tribute (in memoriam) to Dr. Hiroshi Nagai, renowned genetic improver of vegetables from Instituto Agronomico de Campinas (IAC), who developed a large number of varieties, including the Santa Clara tomato crop (of the Santa Cruz segment).

The challenges of *women in agriculture*



The story below is a point outside the curve when talking about the conditions faced by women in the fields, since only 0.8% become employers. Therefore, it is very essential that it be told, to serve as incentive and inspiration. Born in Piauí, the sisters Marlene Veloso Teixeira Reis and Cleides Veloso Teixeira Reis have already worked as factory workers in the São Paulo capital, but it is as farmers of a rural center of Brazlândia, DF that they achieved their life dream. Although they were born in the fields, they had never dealt with the cultivation until they set up in the Federal District, as employees in the farmstead of a brother.

While they cooked for the workers, they started to plant medicinal herbs like basil, rosemary, thyme and parsley.

At this time, the will to manage a business that belonged to them alone prevailed and, together, they kept money to buy the four-hectare farmstead that, since 2001, has been dedicated to the planting of vegetables. The conventional planting gave way to, in the last four years, organic production that was sold successfully in fairs of Brasília.

From the onset, they have seen to all phases of the cultivation themselves: they plant, fertilize, irrigate, harvest and sell.

Today, however, they also employ two employees who help in the day-to-day of the production.

When asked about the possible difficulties they face due to being women, they readily answer that they are able to overcome anything. “There is no obstacle because all that we want, we are able to do”, stresses Cleides.

Even physical strength, indicated as an advantage for men, they insist on minimizing: “Both men and women, when they get old, become physically tired. But this is not a hindrance, mainly today, when you have technology in your favor to do the job”, explains Marlene.

With regard to obtaining credit, the sisters consider that the difficulty is the same for all who live in the rural area. “Obtaining credit is very difficult, especially when there is not land deed and one must depend on guarantors”, they confide. However, with much work and courage to face the daily challenges, they have managed to win.

Each sister has a daughter and they state that today they are racing against time to educate the girls and provide them with a good future. Cleides’ daughter, aged 19, is attending Pedagogy and takes English and Spanish classes. While the little Maria Clara, with imposing 6 years, faces timidity to answer, sure of herself, that she wishes to care for the crops and continue the work of her mother and aunt.

Among the plans for the future, the farmers say that they only see more work. Marlene plans to cultivate fruits. “We will grow old and the fruits will yield results whichever way. Little or much, an old woman will go and harvest”, she kids. With an emotional voice, Cleides confesses: “never stop because, like the story says, those who life off the field, if they stop, they die. And I want to die in the fields. I do not give that up for anything”.

STATISTICS

The month of March reserves a day exclusively to pay tribute to women. The 8th day reminds factory workers who, in the beginning of the 20th century, claimed better work conditions. On verifying the current situation of rural workers, one notices that the problem of gender discrimination has crossed decades and manifests itself regardless of the sector of the activity and historical and socioeconomic context.

Far from being an exclusive portrait of Brazilian reality, the woman of low income and education who

survives from work in the fields suffers the discrimination and difficulties imposed in relation to access to land, credits and agricultural inputs. The problem begins in the gender relations and pervades the heart of the production process.

According to *Anuário das Mulheres Brasileiras* [Brazilian Women Yearbook], published by Dieese (Inter-union Department of Statistics and Socioeconomic Studies), in 2011, out of the 27.1% of the permanent jobs in farming, only 5.1% were occupied by women. With regard to temporary jobs, men totaled 17% against 6.1% of women.

The only statistics in which the women lead is that referring to non-remunerated work. 30.7% of women toil without expectation of monetary gain, against 11.1% of men in the same situation. Also with regard to remuneration, the Yearbook also informs that more than 80% of women living in the rural area receive up to 1 (one) minimum wage per month.

However, the problem of gender discrimination is not restricted to Brazil and is also affects other maizeers of the globe. So much that it deserved highlight in the alignment of the Millennium Development Goals (MDG) in the year 2000. The third item indicates precisely the need to promote equality between the genders and autonomy of women.

In developing countries, for example, it is known that women answer for 43% of the workforce in agriculture, varying from 20% in Latin America to 50% in Sub-Saharan Africa. The 2010–2011 edition of the publication *The state of food and agriculture*, elaborated by the United Nations’ Food and Agriculture Organization (FAO) points out that were women to have the same production resources available to men, they could improve the productivity of their cultivations by 20 to 30%.

And this data becomes even more alarming when it is followed by other forecasts: were the conditions between men and women of the field equal, agricultural production of developing countries would have an increase of 2.5% to 4%, which could reduce from 12 to 17% the number of hungry people worldwide.

It thus becomes imperious to recognize the role of the woman in farm field, as a way of establishing public policies that value and encourage their work. ♦

Planning and technical assistance contribute toward development of family farmers in São Carlos

Family farmers still find difficulties to keep their properties viable.

The lack of access to infrastructure, credit and technical assistance is the main obstacle. However, the planning of the property, from choice of the product to be planted to its final destination, is the chance for these small-scale farmers to be successful in their activity.

This was the proposal of a project, coordinated by Embrapa Southeast Livestock, from São Carlos (SP), taken to the families of settlement, aiming at contributing toward sustainable development of the community through training of technicians of *Assistencia Técnica e Extensão Rural* [Technical Assistance and Rural Extension] (Ater) in participative strategic planning.

Fourteen families live in the Santa Helena settlement, in the rural area of São Carlos. The majority is still unable to obtain a living from the work alone in little more than 5 hectares, lot that each family received through the Agrarian Reform. Without planning, the farmers planted and harvested without much perspective.

In 2010, Embrapa Southeast Livestock, in partnership with public and technical assistance and rural extension

institutions, in addition to the Ministry of Agrarian Development (MDA/Incrá), developed a project for training of technicians in participative strategic planning to work in the settlement. “The lack of a consistent planning that allows local and regional development with sustainability is always a problem. In this case, the role of technical assistance and rural extension is fundamental, since there is need to disseminate knowledge and technology”, explains the project coordinator, Carlos Eduardo Santos, from Embrapa.

With acceptance of the proposal by the community, the main problems and the potentials for development of the settlement were identified in the planning. After this phase, for three years, the settlers put into practice, with technical support from the partner institutions, the main demands verified in the participative planning.

RESULT

During the period, Demonstrative Units (UDs) of various crops were set up like carioca beans, maize variety for production of seeds, animal feed with BRS Guandu Mandarin and the Tomatec cultivation system. According to Santos, the Demonstrative Units make the

producer see on the land itself the benefits of a planned plantation, discussing and using good management practices and technical directions adapted to the settlement's reality.

The farmers have taken part in several courses with themes they chose themselves. Training was conducted in soil correction, beans production technology, implantation of protein bank with BRS Guandu Mandarin, good maize production practices, preparation and use of hay in animal feed, implantation and management of pastures, Tomatec, harvesting and processing of maize seed and maize production cost. Some in partnership with other Units of Embrapa, like Maize and Sorghum, Cerrados and Soils.

The family farmer Sebastiao da Frota Duque, 71 years, based on technical knowhow obtained and on his daily observation of the plants, is able to obtain his family's sustenance from his property. "I have all that I want to eat here", he says proudly. *Seu Tiaozinho*, as he is known in the settlement, plants several types of fruits, legumes and vegetables. A part of the land is destined for planting of beans, cassava, potato, sugarcane for the animals and maize. From the products chosen, a great part is sold in the market of the producer from Agricultura Familiar Organica in São Carlos.

The maize planted this year, of the BRS variety from Embrapa, was with seed produced in the settlement itself, in a collective demonstration unit, through a project coordinated by Embrapa Maize and Sorghum. The aim, according to Santos, is for the settlements to be independent and produce their own seeds, reducing costs and bringing security for continuity of the production.

While Maria Aparecida Rosa, called *Dona Zita*, have high hopes for this tomato plantation. Her land served, in 2013, as Demonstrative Unit of Tomatec. 300 stalks were planted. Despite the work, "arduous" according to her, the result was worth it and served as experience for a future plantation.

Tomatec is a production system developed by Embrapa Soils (RJ) that guarantees tomatoes free of pesticide residues and less loss to the farmer.

With this technique, the number of sprayings is significantly reduced. The fruits are bagged with special paper, serving as obstacle to the pesticides, which remain only on the leaves of the tomato plant.

Dona Zita's expectation is a plantation with differentiated tomatoes, so she can guarantee a better price and greater yield at the end of production.

OBSTACLES

In spite of the positive results, majority of the families from Santa Helena settlement are still unable to obtain their sustenance exclusively from the property. Many must move to another city in search of employment to maintain the expenses. It is the case of Jose Maria de Souza Oliveira. The farmer works for at least three days during the week as caretaker of the farmsteads in the settlement's vicinities. But, according to him, he hopes to soon be able to work every day on his land.

One of the obstacles to the productive viability of all the lots is the distribution of water. Three families are able to obtain sufficient income. The three properties are the only ones that have water for the production activities, due to being close to a dam. The other lots depend on water from a collective well and rainwater intake, which is insufficient.

Despite the difficulties, the results obtained with the project are significant. Access to knowledge, technologies, information and technical assistance was enabled for the settlers, which in one way or another contributed and will contribute toward sustainable development of these small rural properties.

Other benefits

With support of *Centro Público de Economia Solidária de São Carlos* [São Carlos Solidary Economy Public Center], an Association of Producers was constituted in the settlement. The Center's work, together with actions of the project, promoted delivery of a tractor to the Association and reform of a collective shed.

A school was set up in the location for youngsters and adults. About 15 settlers attend the classes. *Seu Tiãozinho* and his wife are assiduous students.

A cooperative of technicians to provide assistance was also created. According to Santos, since the partnership with the companies hired by Inbra constantly suffered interruptions, the technicians mobilized themselves and formed the cooperative. Basic sanitation also appeared among the settlement's priorities. The problem was solved with the installation of a septic tank, with the support of Embrapa Instrumentation. ♦

Convention with the NGO Cultivar takes technology for Santa Inês sheep farming



NGO Cultivar

To receive donation of reproducers and matrices of sheep, feed them and manage them with technology, generating profits from the offspring and thus continuing the production cycle. This is the purpose of the NGO Cultivar, which transfers the animals with funds from Pronese [*Empresa de Desenvolvimento Sustentável do Estado de Sergipe*] (Sergipe State Sustainable Development Company) to 64 units for production of sheep of the Santa Ines breed in the settlements of Tabocas, Cachoeirinha, Gado Bravo Sul, Taborda and Massaranduba, municipality of Nossa Senhora das Dores, located in the region of the middle hinterland of Sergipe.

With the aim of collaborating with the project, Embrapa opened its doors to offer suitable technologies for good animal husbandry practices, which was conducted through Technical Cooperation Agreement between Embrapa and the NGO Cultivar. The first meeting was held in the Experimental Station located in the municipality of Frei Paulo, region of the central back country of Sergipe, where some suitable facilities and racial standards of animals adapted were presented to the family farmers involved, when the basic principles of management were discussed, as well as adoption of good practices, always stressing their importance to the growth of sheep farming.

The Technology Transfer Sector of Embrapa Coastal Tablelands (SIPT), through the elaboration of a Work Plan, proposed the conduction of continuous training of the farmers in good health management practices (main diseases, preventive methods and proper treatments), reproductive management (choice of matrices and reproducers, mating seasons and cares with pregnant females and newborns) and nutritional management (management of pastures, implantation of forage bank,

preservation methods and supply of traditional foods and alternatives).

For such, modalities were suggested of Practical/Theoretical Training Courses, Meetings for Interchange of Producers, *Field Days* and setting up of Demonstration Units. Knowing that the great majority of producers from this project lacked experience with the activity, the technical team of the Technology Transfer Sector sought to perform a differentiated work of qualification specific for the profile of these producers.

According to Dona Marilene, small-scale farmer from the Tabocas settlement, the training conducted by Embrapa in her region were even able to awaken her interest in the sheep farming. “Before I did not even like the idea, but with the learning of the techniques, today I already master and practice the mating season, cleaning of the water, application of vaccines, feeding, among others. And the knowhow on storage of food seen today will help us greatly for the summer that is near”, she reveals.

In addition to the distribution of animals and training actions, the project also includes construction of simple, functional and low-cost facilities, adapted for modern technological management, thus allowing the implementation of technologies that enable organization and production increase, such as use of the mating season, feeding of animals by category, hygiene/sanitary practices, among others.

Generally speaking, the project encourages the production of sheep of the Santa Ines breed with good genetic and productive characteristics, supports alternatives for living in the Semi-arid region, strengthens associativism and entrepreneurship, seeking to secure food security, increase family income and promote socioeconomic inclusion, increasing self-esteem with improvement in living conditions. ♦

Partnership will generate quality goats and sheep

Embrapa and the Sergipe Federation of Goat and Sheep Farmer Associations (FACCOS), in cooperation, will provide technical, strategic directions and train small-scale farmers in the Production and Management of Sheep and Goats.

The cooperation in the Sergipe Project for Social Development and Strengthening of the Production Base of Sheep and Goat Farming consists of training, evaluating and selecting technicians in agriculture and livestock who are candidates to become Agents of Sustainable Regional Development (ADRS), to guide small-scale producers from the Sergipe Backland and Hinterland regions in good sheep and goat management practices. With works geared toward Management of Offspring and Zootechnical Control, Planning and Reproductive Management, Food Planning and Nutritional Management and Health and Hygienic Sanitary Management.

To attend to the small and medium-scale farmer who already masters the basic principles of animal husbandry, the Quality Lamb and Goat Program (PCCQ/SE), which covers all regions of Sergipe State, has the goal of structuring and organizing the processes of Management, Technology and Market of Sheep Rearing in Sergipe.

During the first stage of the Program, 200 rearers from 49 municipalities took part in the activities di-

rected through technical consultancies in the properties, integration among rearers for genetic improvement of the herd, creation of business centers, characterization of the production units and legalization of the agroindustrial units.

“We always desire guaranteed sale of our products. We seek to structure the production chain and gradually enable the conditions to meet the demands of our segment”, says João Teles, president of FACCOS, partner institution of Sebrae in conduction of the program. According to Luiz Carlos, sheep farmer and businessman, besides organization of the production chain, PCCQ/SE seeks to demystify the prejudice in relation to products derived from sheep and goats, and for this a series of actions have been taken, including elaboration of leaflets with nutritional information on the products and a gastronomic festival with kitchen chefs from various restaurants of the state.

“Today, the rural farmer is noticing that there are survival conditions in the fields, without needing to abandon the properties to seek sustenance in the cities. What we need is to provide options for them to be able to sell their production, guaranteeing that the activity can become more and more sustainable”, explains Antonio Cardoso, member of SEBRAE and Manager of the Quality Lamb and Goat Program. Note that all actions by the ADRS and PCCQ/SE are directed and coordinated by a Management Committee, made up of representatives of the Federation of Goat and Sheep Farmer Associations (FACCOS), *Empresa Brasileira de Pesquisa Agropecuária* [Brazilian Agricultural Research Corporation] (EMBRAPA), *Universidade Federal de Sergipe* (UFS), *Empresa de Desenvolvimento Agropecuario de Sergipe* [Sergipe Agricultural Development Company] (EMDAGRO), *Instituto Federal de Sergipe* (IFS), *Faculdade Pio Decimo*, *Fundação Banco do Brasil* and the Sergipe Social Development and Inclusion Secretariat (SEIDES). ♦



Partnership will generate quality goats and sheep

Studies show feasibility of the *Passion Seeds* for family farmers

“**P**assion seeds” is how native or creole seeds of local varieties produced traditionally by family farmers, worked and kept since generations past, are known. They are usually stored in Community Seed Banks (BSC), inside well-sealed PET bottles or zinc cylinders to prevent humidity and preserve the quality of the product.

The community banks are used by these farmers as a way of socializing and increasing seeds, promoting food security and sovereignty for the people of the region. Due to not using pesticides, this practice also contributes toward sustainable development of the agroecosystems.

The BSCs are present significantly in the Region of Borborema, in Paraíba State, where farmers preserve it through its use, genetic rarities adapted to the north-eastern Semiarid region, which in science is called germplasm bank. Studies conducted by Embrapa Coastal Tablelands show the advantages in the use of creole seeds. Seven multiplication fields were implanted in six different municipalities, and comparative tests conducted between creole and commercial varieties.

The study showed, among other conclusions, that the Creole variety of the *jabatão*, for example, had yield equivalent to or greater than that of other commercial varieties, like AG-1051, widely known and used in the

fields, including with similar or higher yield of dry mass per hectare, important in the Semiarid region because it serves as forage for the cattle.

On account of the importance of the creoles, *Articulação do Semiarido Brasileiro* [Brazilian Semiarid Articulation] (ASA Brasil) includes the support and encouragement of the creation of seed banks in P1+2, One Earth and Two Waters Program, which assures water for agriculture through construction of cisterns and dams and food security, with permanent supply of creole seeds.

The studies were conducted in partnership with *Polo Sindical da Borborema* [Borborema Union Center], AS-PTA Family Agroecology and Agriculture, Coletivo Regional do Cariri, Curimataú and Serido Paraibano, Patac, Embrapa and Universidade Federal da Paraíba (UFPB), with support from CNPq [*Conselho Nacional de Desenvolvimento Científico e Tecnológico*] (National Scientific and Technological Development Board), in properties of farming families in the regions of Cariri and Borborema.

According to Amaury Santos, researcher from Embrapa Coastal Tablelands, the survey results show that the creole seeds generally have behavior similar or even superior to the commercial varieties tested, seeing the possibility of its use in public seed distribution policies in the Semiarid region.

These results were the theme of the *Seminar on Seed Research and Policy in the Semiarid Region*, which promoted an exchange of knowledge between farmers, teachers, technicians and students on the subject.

The seminar, which occurred from 30 to 31 May 2012, in Convento dos Maristas and in *Banco de Sementes Mãe* [Parent Seed Bank] in Lagoa Seca, Paraíba, contributed strongly toward the formulation of proposals of public seed policies geared toward family farming of the Semiarid region.

In the event, Embrapa Coastal Tablelands and *Articulação do Semiárido Paraibano* [Paraíba Semiarid Articulation, ASA – Paraíba] presented results of

the research with creole varieties that had the aim of conducting competition tests between these varieties and the commercial ones, mapping out and improving the quality of these varieties and training farmers in the mass selection of seeds and local varieties.

About 180 people took part in the seminar, ranging from farmers, researchers, technicians and students, as well as representatives of the State Secretariat for Agrarian and Livestock Development (Sedap), of the Ministry of Agrarian Development (MDA), Ministry of Social Development and Fight Against Hunger (MDS), Emater and *Companhia Nacional de Abastecimento* [National Company of Supply] (Conab). ♦



Biofortified seeds are already a reality in the fields

In the western hinterland of Sergipe, 116 families from rural settlements and pre-settlements are contributing with the research efforts to reduce malnutrition and increase food and nutritional security. The families of five communities planted in the 2011 and 2012 harvests the BRS Pontal and BRS Agreste ordinary beans and the BRS Xiquexique cowpeas, which have

greater indices of iron and zinc, and are more resistant to pests and diseases.

The pioneering project of Embrapa Coastal Tablelands has sought to introduce the use of biofortified bean seeds in small farming estates of the Sergipe interior. Besides fighting malnutrition and increasing food security, the work also analyzes the socioeconomic aspects in



Saulo Coelho

Biofort Beans

planting and harvest and in the food consumption habits of the families.

Biofortification consists of a process of crossing plants of the same species, generating more nutritive crops. The goal of biofortification is to guarantee greater food safety by increasing the contents of iron, zinc and vitamin A in products that are part of the population's diet.

With support of the BioFORT network, of the HarvestPlus and AgroSalud programs, and international research consortiums that benefit from resources of international development agencies, it was possible to also obtain data on the adoption of biofortified products, taking into account the socioeconomic conditions of the families, their sales and food preferences and detecting factors that can help in the selection and development of new crops.

TECHNOLOGY TRANSFER

In 2011, in the first phase of the work of technology transfer to Sergipe producers, the biofortified seeds were presented and provided in workshops conducted in the communities when the advantages of the seeds, the importance of iron and zinc to health and the project to be developed were discussed.

In the second phase, after the harvest, a survey with consumer, sales preferences and food habits was conducted with the producers. Already in the last phase, in August 2012, the planting of selected seeds was verified in the previous harvest, characterizing adoption of the biofortified seeds by the families.

PARTNERSHIP

The project of disseminating biofortified seeds is supported by various institutions. The obtainment of data from the rural families taking part in the project and evaluation of the nutritional impact on children in daycare centers of Aracaju had the participation of the team from the Nutrition Center of Universidade Federal de Sergipe (UFS).

Integration and articulation of the socioeconomic area of Embrapa Coastal Tablelands was promoted with several institutions like the International Center for Tropical Agriculture (CIAT, Colombia) and the International Food Policy Research Institute (IFPRI, United States), as well as in other Embrapa projects in Brazil, like TTBioFORT (for Technology Transfer) and

AIBioFORT (for studies on adoption and assessment of socioeconomic impacts).

And the work continues. In September 2012, Embrapa Coastal Tablelands approved an own project in Macro Program 6 (Support for Development of Family Farming and Sustainability in the Rural Area), in which the conclusion of market studies with orange sweet potato and cassava with greater quantities of carotenoids (provitamin A) is scheduled for 2015, as well as the creation of partnerships with farmers for planting of ordinary beans, cowpeas, sweet potato and cassava with higher nutritional contents, interlocution with public policies on food and nutritional security and offer of biofortified foods to daycare centers selected by the UFS in Aracaju/SE.

MORE NUTRITIVE LUNCH FOR STUDENTS

Produce more nutritive foods and reinforce the school lunch. This is the goal of the partnership formalized between Embrapa Maize and Sorghum (Sete Lagoas-MG) and the municipality of Capim Branco, municipality of the Metropolitan Region of Belo Horizonte.

The convention signed foresees that Embrapa will transfer seeds and branches of crops with higher contents of nutrients developed by the Biofortification project in Brazil (BioFORT). These materials are multiplied and are then planted by family farmers from Capim Branco. The foods produced will go to the tables of the canteens of schools of the Municipal Education Network.

The partnership is a pioneering initiative in the region and highlighted the importance of the municipality being engaged in providing more nutritive foods to its children.

About a thousand students should benefit from inclusion of the products in the school lunch.

The partnership foresees the installation of a production unit for multiplication of crops of the BioFORT project and provision of seeds and branches to the selected family farmers. Biofortified beans, cassava, maize, pumpkin and sweet potato should be produced.

The farmers, in turn, should undertake to return the production to the Municipality, which will buy the foods for use in the school lunch. ♦



Mini-libraries awaken the liking for reading and contribute toward rural development

Awaken. This is the word most cited by users benefited by Embrapa's Mini-libraries when asked about the main contribution of its collection for the schools. It is the awakening of children and youngsters from rural schools, agrotechnical schools or farming family schools (EFA), of students, teachers and producers of quilombola communities and fishing colonies, whether to the reading of books and primers, or to the access of videos and radio programs, which disseminate simple and low-cost farming practices.

In some communities and schools where the Mini-libraries operate, the pedagogic and agricultural practices of youngsters, teachers and parents of students, from access to the collection, prove that the interest and creativity of this public goes quite beyond that of reading, becoming an interchange of scientific knowledge and popular knowledge, fruit of the life and history of the communities, passed on from generation to generation.

The experience of *Casa Familiar Rural de Presidente Tancredo Neves*, 300 kilometers from Salvador, is a good illustration of what has been happening in the communities. With the collection's arrival, in August 2012, Embrapa's printed and electronic publications have become one of the main sources of student consultation. Ubiratan dos Santos, son of farmers from Zona da Mata da Bahia and student of Casa, says that the information

from Embrapa was fundamental. "Our material was outdated, but now we have where to find direction.

It is what we needed to develop our cultivation projects", he says. Ubiratan was in Brasilia in 2013 in the celebrations of Embrapa's 40th anniversary, and made the same report in defense of "agriculture as the best business, provided with technology" before the authorities present at the ceremony. According to the student, the Mini-libraries are more than books, CDs and DVDs. "They are the perspective that it is possible to do better".

The director of *Casa Familiar Rural*, Quinoei Araujo, confirms the experience. "The publications are used in the modules in the classroom, in the fields and in the properties, during development of the educational projects of the students", he explains.

PARTNERSHIPS

The partnership between the institution and Embrapa Cassava and Tropical Fruits (Cruz das Almas, BA), Unit nearest to the school, started in 2002 and, according to Quinoei, the productivity gains, per hectare, have been evidence since then in the areas for growing cassava and, more recently, banana and pineapple. "The material from the Mini-libraries is also very useful in the PAIS (Integrated and Sustainable Agroecological Production) project", points out the director.

In Salgueiro (PE), in the northeastern hinterland, when the collection of the Mini-libraries reached the schools of the Conceição das Crioulas quilombola community, at the end of 2010, the José Mendes Municipal School has already implemented *horta pavia* [vegetable patch] project, a technology that uses PET bottles to use the water that drips from passage pipes in the school for a small production of vegetables. João

Carlos de Souza Filho, rural development agent of the Conceição das Crioulas Quilombola Association, reported that the collection is very important because it has bridged the gap between the schools, the association, and farmer families.

“We have popular knowledge and our community needs to recover some agricultural practices that have been lost in time. The scientific knowledge present in



Mini-libraries

Embrapa's primers and books brought information that could be adapted to our reality and helped us produce with greater sustainability, without the use of pesticides and, mainly, without losing our traditions".

DISSEMINATING KNOWLEDGE

As part of the strategies of the Brazil Without Misery Plan, more than 500 mini-library kits have been delivered to various Citizenship Territories located in the northeastern and northern region of Minas Gerais, in partnership with Embrapa's research centers in the region, municipalities, state governments and rural extension.

Last year, the project contemplated public schools and offices of technical assistance and rural extension entities. In addition to delivering the collection, Embrapa also worked on the training of mediators – teachers, farmers, rural development agents and community leaders – who were responsible for encouraging and controlling use of the publications by the communities.

In all, in 2013, more than 130 people were trained from the Citizenship Territories of Serra Geral (MG), Piemonte Norte do Itapecuru (BA), Agreste Alagoano (AL) and of Alto Sertão Sergipano (SE). In 2012, start of the training, the Project empowered about 60 people.

The elementary school teacher, Nelci dos Santos, was one of those trained who worked, in 2013, as mediator of the mini-library collection in Escola Estadual Santos Dumont, in Francisco Sá, municipality located in the northern region of Minas Gerais. The school, with over 800 students distributed into groups from the 7th grade of elementary school to the 12th grade of high school, is located in the Citizenship Territory of Serra Geral, whose main activity is agriculture and where families' life off the production of maize, beans and mainly sorghum.

The kit arrived in the middle of June and since then Nelci has endeavored to encourage reading in his school community. She says that as soon as the school received the collection, held meetings with the parents of students to present the entire material. "The recipes, for instance, were a success with students from Educacao de Jovens e Adultos, who are in phase of learning to read and write", she details.

Other publications that have been calling the attention of the community are those of the children and youth collection, with the primers and environmental education. "Other publications that have been calling the attention

of the community are those from the children and youth collection, with primers and environmental education games. "It is possible to work this material, mainly in Geography, but also in History", he recommends.

Besides agricultural regions, fishing communities of the country were also included in the mini-library project, as instrument of professional qualification. The material is available to fishing cooperatives, colonies and associations benefited by the *Telecentros da Pesca* [Fishing Telecenter] project, of the Ministry of Fishing and Aquiculture. In these places, where there is computer equipment, internet access and professionalizing technical courses, transmitted via satellite, the kits can be used and from them new practices adopted that represent generation of income with food security.

NEW FRONTIERS

Currently, over 4 thousand mini-library kits, with 120 printed publication titles, audios and videos, are available in learning institutions and in technical assistance and rural extension offices of all regions of Brazil. The project, started in 2003, is already starting to cross the country's borders and has reached Mozambique, in the African continent.

The goal is to offer to family farmers – through young students in school age –, to extension agents and rural development agencies, information and technologies generated and/or adapted by Embrapa and partner institutions, which suit the needs of the field, in various regions of the country.

With focus on family farming, the contents of the publications include subjects like cultivation of grains, fruits and vegetables, dairy production, fight against pests and diseases in the cultivation, how to set up a small agroindustry, fruit processing, production of sweets, jams, liqueurs, production of flours and cheeses, among others. In addition to technical publications, the collection also includes children and youth collections, CDs and DVDs with radio and TV programs from Embrapa.

As a way of following up use of the material in the institutions and, above all, encouraging development of the farming families and their youngsters, the Mini-libraries promote writing contests and community projects. Since their creation, the Mini-libraries have awarded schools and students from several Brazilian states. ♦



Old photo compares the improvement in the fields after the management used

Family livestock farming in Rio Grande do Sul included in the agenda of public policies

Cooperation term signed between Embrapa, the State Rural Development, Cooperativism and Fishing Secretariat (SDR/RS) and Emater come to support the activity.

Family livestock farming is one of the various agricultural activities that make up family farming. From the point of view of the theoretical definition, family farming contemplates three large areas: the cultivations, livestock and fiber production (silviculture) and, predominantly, uses labor from the family. Family farming is closely linked with food security because it is one of the responsible for production of foods provided for consumption of the Brazilian population. In addition, this important agricultural segment preserves the traditional foods, contributing toward a balanced diet, for protection of the biodiversity and for sustainable use of natural resources. It is not by chance

that 2014 was declared by the Food and Agriculture Organization of the United Nations (FAO). The intention of this mark is to promote international discussion of the subject and the challenges faced by small-scale farmers, seeking efficient ways to support them.

ORIGIN OF THE TERM

The term “family livestock farmer” was coined after the creation of Pronaf (National Program for the Strengthening of Family Farming), in 1996. Despite beef cattle farming based on family labor always having existed, due to the fact that its origin is in the beginnings of the occupation of gaúcho agrarian space, this producer

was only recognized as a category in family farming after efforts by the Rural Extension, started in the end of the 1990s. “Our intension, especially here in Rio Grande do Sul, was precisely to distinguish, so we insisted that there was a type of rural producer who was not being considered and we thus started to work, in 1999, 2000, on the issue of the name of the family livestock farmers”, says Claudio Ribeiro, technician from Emater, region of Bage.

Since then, questions have started to be raised regarding the work with family livestock farmers, using the available technologies and manners of commercialization.

“Because there was the wish to reproduce in the small properties production technologies similar to those used in the large properties, due to lack of knowledge still.

All had good intentions, but their reality was not well known and from there works started to appear, both in research and in extension, and activities started to be tried out through some joint works, between Emater and Embrapa, for example”, reports Ribeiro.

In Rio Grande do Sul, in a universe of 450 thousand family farming establishments, this rural category represents about 60 thousand producers. Its main activity is the rearing of sheep and cattle for meat, through predominant use of family labor, in areas of less than 300 hectares. Its manner of production is characterized by the low level of mechanization and commercialization, this being one of the factors that allows great preservation of the biodiversity in places where this activity occurs, whose plant base is the native field.

Thus, family livestock farmers contribute strongly toward preserving the *Pampa* Biome. Studies by Emater estimate that 30% of beef cattle, that is, three million heads of cattle in Rio Grande do Sul, is under the cares of these producers. Working prioritarily with cattle, they represent 40% of the production of calves of the state.

On perceiving the importance of rural producers and including them in funding programs like Pronaf, one sought to shed light on this public, with the aim of increasing and improving its production while maintaining environmental preservation. Also in the 1990s, Embrapa South Livestock started an important work geared toward the gaúcho family livestock farmer, with the aim of offering an alternative income and promoting cultural recovery.

CREOLE SHEEP

In 1996, a significant work was performed to recover the creole sheep breed, which at the time was practically extinct in the fields of Rio Grande do Sul. “We sought out the three remaining breeders of creole sheep in Rio Grande do Sul and were able to obtain animals to set up a germplasm bank of the breed, in partnership with Embrapa Genetic Resources (which today is made up of approximately 200 animals). But why rear creole sheep, if it had no use? We therefore started to discuss and work together with the family livestock farmers the handicraft of wool and sheepskin through the traditional methods, as well as consumption of the meat”, says the retired researcher from Embrapa South Livestock, Clara Vaz, responsible for conduction of the activities. “Our goal was to bring an alternative source of income for these producers and recover the popular culture”, she says proudly. Clara says that this work also won greater highlight after it was broadcast on TV as one of the mini-documentaries *Gente que faz* [People who do]. These videos were broadcast by Rede Globo, with funding from the extinct Bamerindus bank and sought to disseminate the initiative of some people to improve living in the poorer communities.

PORTABLE SCALE

During a genetic improvement program directed toward small beef cattle farmers in Rio Grande do Sul, the researchers from the Research Center, Fernando Cardoso and Jose Carlos Ferrugem, diagnosed that the great majority of this public lacked scale to weigh animals, due to the high cost of this equipment. According to Cardoso, a portable system was adapted for weighing of cattle in the estates involved, conducted in partnership with Emater/RS, the Ministry of Agrarian Development, *Fundação de Amparo a Pesquisa do Estado do Rio Grande do Sul* [Foundation for Research Support of Rio Grande do Sul State] and the International Foundation for Science.

The “portable platform”, as it was called, is a system that enables controlling the weight of animals in properties that lack mechanical scale and that can be shared by a large group of producers, dividing the cost of the equipment, which makes it more accessible than traditional fixed mechanical scales. The portable platform can be transported in small-size vehicles and mounted in simple

animal husbandry facilities, typical of small properties. The product was developed together with Metalurgica Briao, from Cachoeira do Sul (RS), which manufactures and distributes the equipment under licensing of Embrapa. “Actions like this, of technology transfer to this producer profile, are essential for maintenance and strengthening of the small rural farmer”, stresses the assistant head of Technology Transfer of Embrapa South Livestock, Estefania Damboriarena. Knowledge and technical information therefore become the instruments that, combined with the public policies, will promote effective changes to boost the local economies.

COOPERATION TERM

It was with this aim that, in the end of 2013, a cooperation term was signed between Embrapa South Livestock, the Secretariat for Rural Development, Cooperativism and Fishing (SDR/RS) and Emater/RS-Ascar, which aims at taking in a more structured fashion the technical/scientific support to increase productivity and enable family livestock farming in the state. With the convention, it will be possible to implant and follow up new Participative Experimental Units (Uepas) throughout the gaúcho state, a pilot work that has been developed by Embrapa South Livestock and partners for the past six years in the region of Serra do Sudeste do RS, and for the past two years by Embrapa South Livestock in partnership with Emater/RS-Ascar, together with an organized group of beef cattle breeders in Santo Antônio das Missões. “This partnership of the government with research and rural extension comes to technologically update the farming estates, specifically those of family livestock farming, which are now included in the agenda of public policies”, guaranteed the State Secretariat for Rural Development, Fishing and Cooperativism, in signing the Term. Historically, this public was ousted from the public investments, but this also brought an advantage because, in average, they are the most preserved properties of the state. “The productivity of these properties are still wanting, but they have great potential for expansion, what is needed is for knowledge to reach the livestock farmer, without neglecting what they already know, therefore, build a new knowledge to forecast the future of these small properties”, points out the Secretariat.

According to Emater, today, there are already 110 properties spread throughout the state that work with

participative experimentation units. Majority of them are part of the RS Biodiversity Program, which is funded by the World Bank, with the aim of valuing the native field of the Southern Half. Among these properties, some receive resource from the state government to conduct experiments, which have the common goal of increasing production through differentiated management of the native field, with focus on preservation. “It is not about closing the area and saying that nobody will work anymore in order to preserve it. We want to increase production while preserving it, and in this wise Embrapa is being and will be fundamental in the follow-up of these units as well as in the proposal of training projects for technicians and producers we have tacked for conduction this year”, explains the extension agent from Emater of Bagé, Claudio Ribeiro.

THE BEGINNING

The work with the family livestock farmers in the region of Serra do Sudeste started a longer time ago, from the perception of researchers from Embrapa South Livestock on the potential of this region to revert its stigma of “economic arrears” with development of the livestock farming conducted there by improving its zootechnical indices combined with its differential condition in relation to environmental and socio-cultural preservation. Since then, several partners have been joining this idea, and several projects have been developed to improve the management of natural resources, management of the herds, and to promote associativism between producers and between communities.

While in Santo Antônio das Missões, the initial step of the entire process was taken by the producers themselves of that municipality. A few years ago, seven of them started to meet regularly in the properties to talk, exchange experiences and watch technical talks promoted by the Emater Regional Office in Santa Rosa (RS). With time, they formalized the group, founding the *Associação da Pecuária Familiar Missioneira*, which today has 32 members. “The group gradually stood out and we had follow-up by Emater, later by Fepagro (State Agricultural Research Foundation) because we sought to start improving the genetic quality of the animals, and the government itself had its participation at the time”, recalls Puranci Barcelos dos Santos. He was the first president of the Association, in 2012; he was also elected

mayor of Santo Antônio das Missões due to his work in the region.

Puranci evaluates the role of rural extension and research institutions as very important to strengthen the group. “Without these research experiments we conduct here, we would probably not have had the progress we have today. From the first moment that we approached Embrapa and Emater, we noticed that the group was strengthened, which awakened in us the will to make things happen. We talk with people from other regions and see that not much changes if the manner of action

and of making things happen does not change” he assesses.

Meanwhile, an agricultural and livestock commission was set up in the municipality of Santo Antônio das Missões to regularly discuss matters on behalf of the municipality’s development, among which, agriculture and livestock. The *Comissão Agropecuária de Santo Antônio das Missões* [Santo Antônio das Missões Farming & Livestock Commission] (Casam) is made up of a set of local representative institutions, like Emater/RS-Ascar, Union of Rural Workers, Rural

Pilot project

The work organized in the properties where the two pilot projects for participative experimental unit of the missionary region was set up visibly reaped fruits. The first Participative Experimental Units were set up in the properties of the Barcelos family and Nunes family. The main goal of this work in the Uepas was to transfer to Emater’s extension agents the technologies already existing on livestock and native field, transforming them into multipliers of conservationist practices, so that they can be taken to a greater number of producers. “The general principle of the work is that it is the fruit of the collective discussion of problems faced by family livestock farmers of the region, and that this discussion occurs with the highest possible number of producers and extension technicians”, explains the assistant head of Research and Development from Embrapa South Livestock Daniel Montardo, who followed up closely the development of activities in the region.

Several producers have already tried out alternatives of winter and summer forages cultivated, but the results obtained were not so good, and the costs of these pastures were significant for that producer profile. They were thus already convinced that a good alternative would be to enhance use of the native field, however, there were many problems. Among the main ones, what was most mentioned was the control of weeds in the natural fields. They saw this as the problem to be faced and sought control formulas through grazing and chemical control. After much discussion, reflection and more detailed observation of the areas, the group of technicians and producers itself reached the conclusion that that unfavorable situation, with the dominant presence of weeds, was not the problem itself, but rather the symptom of the real problem: incorrect management of the natural fields.

This finding, recognized by the group, was the starting point for the definition of participative experimentation strategies that would make up the first works performed in the ambit of this pilot project.

Actions were thus taken to promote greater control of the grazing process by the producers, like strategic deferments and subdivision of paddocks and, as the work progressed, a little more intense actions were tried, like fertilization, liming and oversowing with winter species. More recently, the group has worked in the attempt to reconvert cultivation areas in naturalized fields through planting and proper management of winter forage species intercropped with Bahia grass.

The results obtained to date are very good and with the real potential of expansion due to the continuous training process of all the players involved. Note that, from this pilot work in Santo Antônio das Missões, and with the resources enabled by the current convention, Emater Regional de Santa Rosa involved technicians from various municipalities of that region in a very qualified process of expanding the work.

Union, *Casa Familiar Rural Santo Antônio*; 40° Nate IRGA; Coopatrigo; *Escola Técnica Estadual Achilino de Santis*; Municipality of Santo Antônio das Missões; City Council Chamber, *Associação da Pecuária Familiar* [Association of Family Livestock Farming]; *Associação dos Produtores e Artesãos Missioneiros* [Association of Producers and Artisans of Santo Antônio das Missões]; Banrisul; Banco do Brasil; Sicredi and Radio 89.1 FM.

To “make things happen”, the group of producers noticed two points to be worked at first: the native field, in function of the degradation of natural pastures, a

common problem in the properties, and the genetic quality of the herds. “The best way we found to work these issues was through demonstrative units, seeking to discuss management of the field and herd. Embrapa had a motivating role of following up and guiding the experiments for generation of information, and starting from our local need, it pointed out paths that are enabling solutions”, says Paulo Matos, extension agent from the municipal office of Santo Antônio das Missões, who has followed up the process of organization of the family livestock farmers since 2009. ♦

Embrapa supports Epagri’s work in Serra Catarinense

With the aim of supporting the livestock farming development works in Serra Catarinense, Embrapa South Livestock, since the end of 2013, has sought to work more with *Empresa de Pesquisa Agropecuária e Extensão Rural de Santa Catarina* [Santa Catarina Agricultural Research and Rural Extension Company] (Epagri). For this, one of its researchers from the Production Systems area, Fabio Garagorry, is being assigned to that body, and he will be providing support in some ongoing projects in the region and research with pastures and animal production, creating a link between Embrapa and Epagri. The Good Agricultural Practices Program (GAP) and the Technological Reference Property Network (Reprotec) have received the researcher’s attention. The latter project was started by Epagri in 2011, in partnership with *Associação Rural de Lages* and funding from *Fundação de Amparo a Pesquisa e Inovação do Estado de Santa Catarina* [Santa Catarina State Research and Innovation Support Foundation] (Fapesc). The work seeks to implement actions in properties of the region that have livestock farming as their main activity, with the aim of increasing the zootechnical indices and profitability of the families, respecting the profile of each producer and characteristics of each property.

According to the researcher, Reprotec encompasses a systemic view of the property through technologies of processes like natural pastures, mating season, sanitary calendar, and technologies of inputs like implantation of perennial pastures, improvement of natural pastures, subdivision of wintering, aiming at increasing profitability of the livestock farmers who do not have the profile of seeking technology, and investing in beef cattle. The accounting follow-up of the six properties involved will measure the economic impact of the technical interventions. All the actions are developed in the properties to show the producers that it is possible to increase profitability from livestock in the real environment and not just in the research centers. The properties will also be disseminators of knowledge and of the experiments conducted by the project through meetings, field days and technical talks, being that in 2013 a total of 1,570 producers, technicians and students were trained with actions of the project. The second segment involves the creation of an organized group of already technified producers, the technicians from Epagri will make adjustments, and also apply a book of good practices for integrated production, associated with the organization of the producers.

These instruments gave the opportunity to create a market alliance with the brand *Campo das Tropas* [Field of the Troops], which has been slaughtering young cattle weekly. The animals have high carcass yield, and the quality meat is being sold directly to the consumer. This represented an increase in income of 12% in 2013 and of 20% in 2014, over the average market values for steers and heifers.

The experience of Alto Camaquã

Alto Camaqua is the upper third of the basin of the Camaqua river, located in the Serra do Sudeste do Rio Grande do Sul. It includes a total area of about 8,300 km² with a (mainly rural) population of approximately 40 thousand inhabitants. Marked by predominantly arboreal vegetation with field and forest mosaics, shallow soils and rugged relief, it was occupied by family livestock farming. The historical lack of application of conventional scientific knowledge to the regional socioeconomic and ecological characteristics, the contingent use of chemical inputs and consequent low mechanization left the region on the margin brink of agricultural modernization.

Thus, due to a set of historically shaped ecological, economic and socio-cultural attributes, Alto Camaqua was unable to incorporate the modern standards of production, being classified as a region of incomplete modernization. As a result, the local landscape, fauna, flora and culture have been preserved. The man who occupied the region, in a typical process of co-evolution between human culture and physical environment, forged environmentally dependent forms of production, integrating cattle, sheep and goat farming on the native forage base.

In this context, with a significant number of family farmers, the region was left on the brink of development, often resulting in abandonment of production activity and even of the land itself. The Alto Camaqua project was thus considered as a way of promoting a development different from the standards of agriculture and livestock practiced in the southern half of Rio Grande do Sul. This large region is known for a process of livestock production supported by vast rural areas, a system that hides family livestock farming that, even though practiced on the margin, has survived for more than two centuries.

According to the researcher from Embrapa South Livestock Marcos Borba, responsible for coordinating the activities in the Alto Camaqua project, Embrapa's intervention in the process aimed at showing that it is possible to develop an economic and viable activity from a land structure based on the family property. And more, a family activity based on natural resources, without the need for heavy investments, and that results in a final product strongly supported by nature and with a highly receptive commercial appeal in different markets. For this, a methodology was sought that takes off from the active participation of the players (the family farmers) in the construction of an economically and socially sustainable development model.

It is an endogenous development model, i.e., instead of the process being conducted "from the outside inwards", it was born "from the inside outwards". The project started in 2006, initially with the aim having an ecological form of production, due to being structured based on the native fields and other natural resources. In these over six years of works, the project has developed and its horizons have expanded, and today it is in the process of building a collective brand, Alto Camaqua, which will initially be stamped in some products of the region, like mutton, homemade cakes and sweets, wool and leather handicraft and tourism, among others.

The methodology proposed in the work takes off from the effective participation of the farmers themselves, showing that production based on natural resources can be highly efficient, besides generating differentiated products. The strategy of valuing the territory was born with the participation of all and with the understanding of the potentials of the proper management of natural resources to increase productivity, with quality and sustainability. In addition, the project extrapolates the production, also considering the historical, social, environmental, cultural and economic characteristics common to the region.

Interview with Edson Barcelos, farmer from Santo Antônio das Missões

How did you start the work here?

With the arrival of Paulo from Emater, we started to see that having that pasture was no longer possible. The areas were much degraded, with many areas without any pasture also. And the animals were hungry. At the time I had 82 steers and 130 ewes.

And how was the offer of food to the animals?

In the winter, there was pasture and the cattle would stave off their hunger, but in the end of winter, when this pasture was used up, the hunger would begin. The field was cleared and there was little grass really, of only native field. So we talked and Paulo talked of the possibility of Embrapa organizing this research to improve the native field, and it is where we started. This was in February 2012 and in April we closed the 1st area of 6 hectares, which was deferred until the 3rd of October.

What type of vegetation appeared in this deferment?

Forquilha grass came, which had practically finished, the *pega-pega*, which we could no longer see, jointtail grass, and now they are coming more and more. The technicians, who know it, get there and see what came and what we did not have.

Before this work started, did you already know these species?

No, I used to hear people say that there were many here, but I only knew the *tapete* grass and the forquilha grass, only now did I start to become acquainted with the various types of grasses. Up until the time, I was unable to record all the names, but the day that Pedro (Jose Pedro Trindade, researcher from Embrapa South Livestock) came here, he identified 13 species. What called my attention most was the tapete because it covered all those gaps in the earth that used to be there, of open soil.

After placing the animals in this deferred area, what was the next step?

We placed 15 beef cows (mixture of zebu with Charolais) first in four of the six hectares, leaving two hectares without use. I had many lean cows, with very low body score, with average of 331 kg. And in 80 days there, those that did not give birth left fat, some with gain of 1.5 kg per day.

With the result of the 6 hectares, we decided to do the same in 10 hectares. In this new area, we did things differently, we planted ryegrass, clover and oat in the native field, not just allowing it to defer. This was done in 2 May 2013. I picketed the entire 10 hectares and, in the winter, we made a rotation with 42 cows, after we placed 50 sheep with offspring and 40 more that were single.

What difference did you feel between the area with native field being deferred and the area in which you put ryegrass and oat?

In the re-growth, it comes faster with the fertilization, so the investment is worth it. For example, that which was deferred took 6 months to close all of it, and this one in September closed with two months less. You can see in the photo we took at the time, it was chaotic and today you can see what is there. Deferment alone is worth it because it really recovers, but if you want to be faster, use fertilization to recover faster. So you have sold fat cattle, tell me what you felt was different. The reproduction of the cows, because formerly there was 40% pregnancy and now it is at 78%. The sheep used to produce about 3 kg of wool, now they produce 5 kg.



Project trains farmers and seeks solutions for pest and disease of the cupuassu tree

The cupuassu (*Theobroma grandiflorum*) is a native fruit tree of the Amazon, famous for generating the cupuassu, which is loved for its taste in several states of Brazil, and even abroad. But in the North region of the country, the plantations of the fruit, cultivated mainly by family farmers, has suffered with the great incidence of pests and diseases, which is discouraging the fruit's cultivation. In the last three years, in the Amazon, the planted area dropped to 54%, from 11 thousand hectares to approximately five thousand hectares, according to data from the technical and rural extension body of the state, Idam [*Instituto de Desenvolvimento Agropecuário e Florestal Sustentável do Estado do Amazonas*] (Amazonas State Sustainable Farming and Forest Development Institute).

Despite the reduction in planting, in the Amazonas interior, farmers have resumed interest in cultivating the cupuassu tree. The valuation in the market and possibility of full use of the fruit in various segments of agroindustry have awakened this interest.

The family farmer Manoel dos Santos, for example, has cultivated the cupuassu tree for the past five years and intends to increase the production, located in Rio Preto da Eva, in the interior of the State. "I think at least of doubling the production", he guarantees. "I see that

cupuassu is not just any fruit. It is a fruit that gives great return if you know how to work with it. I have seen the price reach R\$ 12.00 per kilo. If we struggle and plant, we will have a very good revenue", he completed.

The trust is because the farmers are learning to deal with the two major problems of the crop: witches' broom disease, caused by the fungus *Moniliophthora perniciosa*, and the insect pest fruit borer (*Conotrachelus* sp). Through the Research and Technological Innovation Project for Development of Cupuassu Cultivation in Amazonas State, the producers receive training that address a general panorama of the crop, with main focus on themes like identification and control of pests and diseases.

According to the researcher from *Empresa Brasileira de Pesquisa Agropecuária* (Embrapa), Aparecida Claret, a lack of information was detected on good practices for cultivation of cupuassu in the state, which helped worsen the problems with the *cupuassu borer* and with witches' broom. "It is important for the producer to have knowledge of how the fruit borer cycle is and what he can do to reduce it. We see that where there is no control measure, this pest is increasing at an alarming rate. The first step is for the producer to know and recognize the importance of management. With regard to witches' broom, the same occurs, and the diseases becomes stronger and stronger



Cupuassu – farmer Manoel dos Santos observes examples of fruit borer

whenever the farmer leaves the broom, thinking it will no longer produce, not only in his area but also in that of his neighbors”, he highlighted.

The training, started still in 2013, teach some simple measures that can be done by the farmer himself. In the case of witches’ broom, for instance, one must conduct phytosanitary pruning, which consists of cutting the branches affected by the disease, preferably in the stage when they are still green. The pruning can also be done with dry brooms – when they take on a brown color. After removing the diseased material, it must be burned or covered, without access to light.

As for the fruit borer, one must daily collect the bored fruits and burn or bury them in pits with minimum depth of 70 cm, in a place outside the plantation. It is important not to leave abandoned fruits in the planting area and not move fruits from places where there is the borer to places that have not been infested by the pest.

According to the agriculture and forest technician from Idam in Rio Preto da Eva, Marivan Marinho, the contact of the farmers with these teachings will encourage resumption of the crop in Amazonas. “We believe that with this information, i.e., with the producers knowing how to control the disease and the pest, they will resume planting and this crop will grow once again in the municipality and state”, he said.

RESEARCH

At the same time that it offers training in good practices for the correct management of cupuassu, the project also works in research fronts to learn more about the pests and diseases, aiming at seeking practical solutions to the problems. With regard to witches’ broom, the study on its management stresses genetic, cultural, biological, and alternative control, so that, in the short, medium and long-run, technologies are produced to control the disease, through integrated management. As for the fruit borer, one seeks to increase knowledge of the bioecological aspects of the insect on which to base strategies and tactics for integrated management of the pest also.

The project, funded by Fapeam [*Fundação de Amparo a Pesquisa do Estado do Amazonas*] (Amazonas State Research Support Foundation), proposes integrated actions between research, extension and the farmers, in a participative research process, with activities for training several multipliers and exchanging information among the players involved in the cupuassu production chain. The work is being developed in network, in partnership with Units of Embrapa in Amazonas: Embrapa Western Amazon, Embrapa Rondônia (Porto Velho, RO), Embrapa Genetic Resources and Biotechnology (Brasília, DF), and with Universidade Federal do Amazonas (Ufam), *Comissão Executiva do Plano da Lavoura Cacaueira* [Cocoa Plantation Plan Executive Commission] (Ceplac) from Amazonas and Rondônia, and Idam.



CUPUASSU

Cupuassu has great acceptance in the market. With pleasant taste, the pulp is used for juices, sweets, creams, ice-creams, liqueurs and yogurts. The almonds, rich in fats and proteins, can be used to produce *cupu-late* (cupuassu chocolate) and has space in the cosmetic industry. The peel is also utility and can be used in handicraft or as manure. ♦



Brazil plum agroindustry: **greater income for the communities**

The technician Nilton de Brito Cavalcanti, from Embrapa Tropical Semiárida, has for over two decades conducted research with the *imbu*, as he prefers to call the native species from the *Caatinga*, a Brazilian hog plum most widely known in the country as *umbu* [Brazil plum]. During this time, he has gathered a great collection of information that details the plant growth and plant production, in addition to information gathered from studies on the production chain and agroindustrial potential.

Based on this experience, Nilton makes an interesting calculation and normally uses it in his lectures and courses made for farmers, technical assistance and rural extension professionals and agriculture secretaries.

According to him, an adult Brazil plum plant can produce about 300 kg of fruits/year. If, as is the case with the extractive industry, they are sold fresh, at the amount of R\$ 0.25/kg, they generate an income of

R\$ 75.00/plant/year. However, upon converting Brazil plum into jam, it is possible to process a quantity equivalent to 720 125-g jars, which, when sold at R\$ 2.50 each, provides an income of R\$ 1,800.00.

If the option is to produce sweets, it is possible to obtain 210 kg of pulp, or 630 jars of 250 g of sweet, which sold at R\$ 2.50/jar generate R\$ 1,575.00. But this same amount of pulp results in 2,100 packs of 100 g each, which can be sold at R\$ 1.05 and return R\$ 2,205.00. These are decisions that producers, in associations, can take to obtain greater profits.

Nilton obtained this data after a study of the production chain of the Brazil plum plant. He followed the valuation that the fruit receives from the time it is harvested and sold on the roadsides up to the various trade circuits (middlemen, supermarkets, and street vendors) and the forms of processing undergone in snack bars, delicatessens, restaurants, and hotels.

He thus defends that the umbu agroindustry is one of the main initiatives for coping with Semi-arid conditions. The possibility of setting up small processing structures in communities, within the scope of municipal, state, or federal public policies, can guarantee an important source of income and employment for farmers and their families all year round.

According to him, a successful example is the 20-year experience of ProCUC, in the Bahia municipalities of Uauá, Curaçá and Canudos. The organization of farmers in the communities, their quality and managerial competency have turned their sweets, jams, and pulps into products exported to several markets in Brazil and in the European Union.

According to Nilton, the fruits can be converted into pulp and stored for more than a year. Thus, the farmers have raw material to run the small plant after the harvest period, which occurs in the rainy season. The thus “have a source of income even in the dry season”, he states.

The sanitary quality of the products can be obtained with simple and cheap resources. In the case of fruits, one must use chlorine concentrations that vary from 10 ppm to 70 ppm, with immersion time between

15 and 30 minutes. “Fruits gathered, instead of collected from the ground, where there are few incrustations on their surfaces, should receive low concentrations with a reduced time. For fruits collected from the ground, higher concentrations of chlorine should be used for a longer time”, he explains.

Another important factor in the processing of sweet with pulp stored at room temperature is the control of pH, which must always be between 2.5 and 3.5, such values prevent the growth of pathogenic microorganisms, such as the bacteria that causes botulism.

According to Nilton, encouraging the Brazil plum agroindustry has important consequences for the conservation of the *Caatinga* Biome, which has been affected by indiscriminate deforestation and reduced incidence of new plants in the native vegetation. “Perceiving the benefits of preserving the umbu for the communities can encourage initiatives like preparation of (grafted and non-grafted) seedlings with the aim of reforesting this environment”, states Nilton de Brito. ♦



Fernanda Birolo

Alberto's umbu tree



Marcelino Ribeiro

Umbu fruit

Family farming motivated by cultivation of *Cachinho* rice

Family farmers from the southern half of Rio Grande do Sul are organizing themselves to encourage rice cultivation in the municipality of Sentinela do Sul. Through an association, they aim to standardize the chain – in order to obtain the Certificate of Origin for the *cachinho* rice produced locally, and thus add value to the production. An agroindustry to process the product is one of the dreams. And, with the support of various institutions, they are increasingly closer to making some goals a reality.

The municipality of Sentinela do Sul, located near the metropolitan region of Porto Alegre, has the vocation to plant rice. Culture, also in the social sense. Records show that the *Cachinho* grain – of the curled, japonico or cateto type – has been cultivated in the locality for at least one hundred years, marking its presence in several generations. With this history in the curriculum, in 2009, the municipality won the title of Land of *Cachinho* Rice and soon of the Gaucho Capital of *Cachinho* Rice. The seed had been planted for the organization of family farmers of the region who, motivated by the initiative, created the *Associação dos Produtores de Arroz Cachinho de Sentinela do Sul* [Association of Sentinela do Sul *Cachinho* Rice Producers] (APACSS).

With 25 members, the Association was the first step in seeking the Certificate of Origin for the Rice – document that certifies the origin of the product in function of the region produced. The creation of a databank with the crop's history in the municipality and the second stage in direction toward this achievement. “We are forming the foundation”, explains the president and one of the creators of APACSS, Jonas Carvalho. The document also standardizes the production systems.

All these efforts gave rise, in 2011, to the project “Organization of the *Cachinho* Rice Production System in the Middle South of Rio Grande do Sul” which, with support from Embrapa Temperate Agriculture (Pelotas, RS), Embrapa Food Agroindustry (Rio de Janeiro, RJ), Emater/RS, Municipality and APACSS itself, also seeks to standardize the product aiming at adding value. The incentive of rural tourism, gastronomy and handicraft – based on the rice straw – is included to indicate other sources of income from cultivation of the grain. In addition, the project also aims at encouraging agroecological transition of the production systems, trying to reduce the use of chemical inputs. “Organization of the production chain of *cachinho* rice in the region, from the plantation to sale, will allow the producers to guarantee the business' sustainability, promote food security and also increase the quality of life of their families”, reports the project coordinator and researcher from Embrapa Temperate Agriculture Paulo Fagundes.

NEEDS

To encourage production of the *Cachinho* rice, the association conducted a diagnosis of the needs of the producers. The recovery was urgent because the crop was almost extinct in the region. (1) To prevent the use

of low-quality seeds, the Association sought Embrapa. They intend to recover creole varieties and to also purify and multiple standardized seeds. (2) In the ambit of commercialization, up until then devaluated, they aim at market differentiation actions – like the certificate. (3) The lack of places for drying and stocking will be solved in partnership with Emater, in the construction of dryer silos. (4) Finally, the dream of agroindustry intends to meet the demands for processing of the grain.

Based on the number of producers of thin long (“needle”) rice, the Association hopes to expand the production of *Cachinho* rice in the municipality in the next harvests. “They are also potential producers”, points out Jonas. The little interest for *Cachinho* production is mainly due to the difficulty in processing.

The bag of *Cachinho* is worth more, compared with the bag of needle rice, for instance, which is – widely produced in the locality. But only if dehusked. According to producers, without processing, the price of the bag reaches similar levels and, despite the demand, it is not worth it. “Last year everybody produced, but they encountered difficulties in the outflow”, completes the president.

Another solution in the ambit of processing and commercialization, in the middle term, is the creation of partnerships. At least until the Association has conditions to set up its own agroindustry. According to Jonas, there are many possibilities to be explored in such grain crops to promote local development since, in addition to its economic impact, the project also has social characteristics because it increases farmers’ quality of life and purchasing power. And its sustainable profile is a poster child for the municipality and the production beyond the region. “We already had a vocation, we only enhanced it”, he rounds up.

EXPERIENCES

The farmer Dione Vencato, 42, has produced rice for over 20 years, but he only started to produce the *Cachinho* seven years ago. “I started to plant when I started to harvest for the others. What a beauty, I was charmed. And it is good to eat too”, he states. But all this satisfaction was still not sufficient for the farmer to fully invest in the *Cachinho*.

The 12 crop hectares are geared exclusively for the Pampa cultivar, of the needle-like type. In the last harvest, the farmer planted *Cachinho* just to produce seeds.

He reduced it on account of the demand for dehusked rice. Even then, Mr. Dione wants to invest more in the *Cachinho* next year. But to enter head on, only with guarantee of processing. “It is not worth it if it is to sell with the husk”, he concludes.

Luis Paulo Machado, 53, is experiencing a similar situation. Out of the 16 hectares planted, only one is dedicated to the *Cachinho* rice. The reasons for reduction in the area are similar to those of Mr. Dione. But Mr. Luis still has an advantage: he made a partnership for the processing of his production and, with packaging and packaging machine granted by the Association, he packages the grain directly in the property.

Even then, he does not risk increasing the area on account of the partner’s dependence. “Soon I may no longer want to (process) anymore for me, then what?” he asks.

But, despite the bottlenecks, the expectation of the farmers is high because the demand for this type of rice is great. And, as we have seen, the prices are worth it. In the last harvest, for instance, Mr. Luis sold the bag of 60 kg of needle rice at R\$ 37.70 while the bag of *Cachinho* rice, already processed, was sold for R\$ 60.00. According to Fagundes, in some cases, the seed of this type of rice reaches close to a hundred BRL. The recent work of the articulated farmers and of the Association has already shown results through development of the chain. An agroindustry is the cherry that is missing on the cake for farmers to be able to celebrate. They already have the market and interest in the *Cachinho*. And with the arduous work of perfecting the production, they will soon not lack anything. ♦



Dione Vencato's cachinho rice production

Gliricidia: an alternative to feed herds in the Semiarid region

One of the crucial points for production of animals in the Semiarid region is the preparation of a strategic reserve of forages, to be supplied to the herd in the period when there are fewer offers of foods. *Gliricidia* is one of the good alternatives and is being presented by the technicians from Brazilian Agriculture Research Corporation (Embrapa) to cattle rearers of the Bahia hinterland.

The initiative is part of the *Lago de Sobradinho* project, a partnership between Embrapa Tropical Semiarid and *Companhia Hidro Eletrica do São Francisco* (Chesf), together with the municipal governments of

the municipalities of Casa Nova, Sento Sé, Pilão Arcado, Remanso and Sobradinho (BA). The project aims at improving the quality of life of the population that lives in the environs of the Sobradinho Dam, and one of the strategies is to increase dairy production in the region.

Gliricidia has proven to be a promising option for feeding the dairy cattle, with advantages for the diet of the animals as well as for the region's conditions. "It is resistant to the dry season, produces a good quantity of green mass and has high protein content", points out the agricultural technician, Alberto Amorim, from Embrapa Tropical Semiarid.



The leguminous plant's cultivation is easy and quick. According to Amorim, the farmer must plant in the beginning of the rainy season. If he has a way of wetting the plants, in four months he can already make the first cut. In upland areas, one must wait a little more for it to better develop its roots. And he complements: "From there onward, he can cut whenever he has material to be stored. The more he cuts, the more it yields".

To show how easy it is to cultivate and the good production results, Technological Learning Fields (CATs) were set up in the properties of ten farmers, two in each municipality. In these areas, the leguminous plant is planted and catered for by the farmer himself, with follow-up by the technicians, and the experience can be observed by other interested parties on field days conducted by the project.

It was so in the property of Luiz Ferreira dos Santos Filho, in the Tataui Irrigation Project I, in Sobradinho (BA). Gliricidia was planted in a fenced area of half hectare and in four months it was ready for cutting. The material was collected and, with participation of residents from the vicinities, prepared for storage in a silo. "The storage of forage is very important to farmers, and we see very little of this in the properties. If you wish to rear animals, you must first plant to have source of protein and energy", explains the agricultural technician Geraldo Farias, from Embrapa Tropical Semiárid.

Having learned the lesson, Luiz has already made plans for the future: "Once the area is full of gliricidia, to be able to have enough feed, I will sell these cattle that does not produce much and buy about ten dairy cows", he states.

Another farmer who had a CAT set up in the area was João Batista de Oliveira Neto, from the Novo São



Gonçalo farm, in Sobradinho (BA). In the beginning of the project, he received a gliricidia silage drum and with the experience it was already possible to see the results. "When the silage was being given, the dry season came and the cattle held the foundation, neither reducing nor increasing. When it ended, it lost weight and the milk also reduced", he says.

According to Alberto Amorim, 8 kg of the gliricidia silage has the same amount of protein and double of dry matter of 1 kg soy bean, and is sold for less than half the price. The production of foods in the site itself, using family labor and reducing dependence on external inputs, is another advantage pointed out by the technician. According to him, "it is essential that you have a good quality and low cost food". ♦



Prosa Rural: the help that comes from the radio

“Even when we have direction from a technician, it is always good to learn a little more”, says one listener. “They explain things very well.

There are researchers giving interviews, not only the speakers speak... There is always a researcher there, instructing, saying everything step by step”, another remarks. These are some of the things said by listeners who took part in discussion groups of *Prosa Rural* – Embrapa’s radio program, in the Northeast of the country, conducted as part of an opinion poll.

They are people like Lenilva de Arruda Ximenes, aged 61 years, farmer from Olinda (PE) who, having lost her first husband and divorced the second, guaranteed through farming the sustenance of her seven children. She says that she sometimes spends the day with the radio on. She listens to *Prosa Rural* in the early morning. When she hears a piece of information she does not understand, she solves her doubts with her daughter. Dona Lenilva’s example shows how much the educational function of the radio is important for those who live and work in the fields. In the day-to-day of these people, the

information from radio programs is combined with their own knowledge and directions of family members, technicians and rural extension agents, helping them find solutions to problems or plotting our more profitable and advantageous alternatives to their activities.

Radio host from Brejinho (PE), municipality 500 kilometers from Recife, located in the border of Pernambuco with Paraíba, in Alto Sertão do Pajeú, José Anchieta Souza knows well what this means. “Our region is lacking information, this is why I use *Prosa Rural* to take to farmers’ information on technologies that can contribute toward improving farming and the quality of life of the population”, the professional informed during his participation in *Prosa em Sintonia* – first meeting of partner radio stations of *Prosa Rural*, promoted by Embrapa in 2012 in Recife (PE).

According to Souza, due to demands of the community, the program, which up until then had been broadcast once a week, started to be broadcast every day, with the re-presentation of contents of highlight always on Saturdays in the morning.

On this same occasion, Erivam Rubem, radio host from Itapetim, region also located in Alto Sertão do Pajeu, gave a similar testimony. “With the help of *Prosa Rural*, which broadcast a program on apiculture, farmers from Itapetim organized themselves and set up an Association. We have the support of Embrapa Tropical Semiarid to guide them and, today, honey production is on the rise in the municipality”.

The event *Prosa em Sintonia* united, in Recife (PE), 50 radio professionals, and 50 others in its second edition, held in Salvador (BA). The main goal of the event was to train radio hosts from the Northeastern region in order to convince them to become partners in the dissemination of information generated by Embrapa and partner institutions and thus enhance their actions in support of the Brazil Without Misery Plan.

URBAN PUBLIC

According to the audience survey, which collected opinions of the listeners, *Prosa Rural* also reaches the urban public. Housewives and retired workers form a good part of the target audience of the radio stations consulted.

Some of these people become interested in small cultivations, even if farming is not their main activity.

It is the case of the administrator Francisco de Oliveira Sodre, resident of Cruz das Almas (BA). Francisco likes to deal with the earth as a distraction, and is interested mainly in the cassava crop. “When this is the subject of the program, it already calls my attention. And when there is testimony from a farmer, it is an encouragement for us to listen more”, he says. According to Francisco, when the program gives voice to the rural farmer, it encourages valuation of the work in the fields, at the same time promoting the dissemination of street fairs. “On participating in the program, the farmer becomes more famous. People from the city end up knowing that there are many things they can buy at the fair, directly from the farmer, instead of buying in the fair”, he points out.

The *Prosa Rural* also has its social contribution, dissemination of Embrapa’s actions in the Brazil Without Misery Plan, developed since 2012 in 14 Citizenship Territories in the Brazilian Semiarid region, as well as current information on subjects of highlight in agriculture, like control mechanisms for the *Helicoverpa armigera* pest, which fiercely attacked several crops in the last two

harvests, like cotton, soybean, maize, beans, tomato and many others. *Prosa Rural* produced a special program on Integrated Pest Management (MIP), highlighting technology as the best alternative to control the caterpillar, distributed freely to all partner stations and made available on the internet: <http://www.embrapa.br/alerta-helicoverpa>.

Prosa Rural is currently distributed to over 1,300 partner stations throughout the country. One of the first collaborators of the program is Radio Cultura FM de Araci, Bahia municipality 230 km from the capital, Salvador. For more than 11 years on the air, Radio Cultura FM de Araci broadcasts *Prosa Rural* from Monday to Friday, from 6:15 am to 6:30 am. “I conducted a survey, talked with friends and decided this was the best time for the program”, states José Socorro, director of the radio. “And do you know why? Because it is when the people are in their work. The people wake up early to milk their cows. I have a friend who does this: he wakes up early, takes his small radio, hangs it on the fencepost and listens to *Prosa Rural* while milking the cows”.

A BIT OF HISTORY

Prosa Rural is produced by Embrapa Technological Information, in partnership with the Research Units of the Company and the State Agricultural Research Organizations (Oepas). The program also counts on the partnership of the Ministry for Social Development and Fight Against Hunger (MDS), through the Brazil Without Misery Plan.

Created from a field survey conducted in 2003, in the states of the Northeast, *Prosa Rural* started to be broadcast in 2004 in this region, with the initial partnership of 50 radio stations. Each year, its coverage has been increasing: in 2005, it started to be broadcast in the Northern region also, in 2006, in the Midwestern region, in 2007, in the Southeast, and in 2008, in the South. Today, four program schedules are produced per year (one of them is intended for two regions, the Midwest and Southeast).

From the onset, *Prosa Rural* has been distributed without cost to the radios, which undertake to broadcast it, also free of charge, always on the same day and at the same time. Many of *Prosa Rural*’s partner stations comprise local radios of small range, but with strong social action. ◆



Ideal piglet **earns R\$ 21 million per year**

Control of the productivity indices and application of operational standards guaranteed an increase in the income of family pig farmers in the west of Santa Catarina, region where pig farming

is concentrated in the country. The Ideal Piglet Project, fruit of a partnership between *Cooperativa Central Aurora* (which includes 12 cooperatives in Rio Grande do Sul and Santa and has 60 thousand associates) and

Embrapa Swine and Poultry, has promoted an annual increase in income of R\$ 21.5 million, divided among the more than 1 thousand piglet producers linked to Aurora.

The main result attained by the Ideal Piglet Program, which started in 2011, was increase in the average productivity of piglets by 18.2% within Aurora. In 2010, the cooperative's producers presented average of 19.52 slaughtered piglets/sow/year. At the end of 2013, the average was already close to 24 slaughtered piglets/sow/year, indicated by Embrapa Swine and Poultry as the goal for the activity to represent a satisfactory profitability. The most important is that the gain with improvement in the productivity of piglets goes entirely to the producer's pocket.

In practice, the Ideal Piglet implanted in the properties, from the work of Aurora's technicians, a logic based on better organization of production complemented by follow-up of productivity through observation of performance indicators. For each one of these indicators, an ideal was established based on the knowledge of technicians from Embrapa and Aurora, and a goal adapted to the reality of each producer.

Whenever the goal is not attained, the technician and producer return to the operating standards related to that indicator to correct eventual failures. The operating standards were described from the Good Pig Farming Practices of Embrapa and were converted into manuals for the producers and technicians. "It is simple, does not necessarily require financial investment, but it works", guarantees the agronomist Sandro Tremea, from Aurora, who coordinates the Ideal Piglet in the central cooperative.

In June 2013, the Ideal Piglet Project entered its second phase, with a refresher course for Aurora's professionals who provide technical assistance to the producers.

Besides the updated version of the operating standard manual, the technicians receive a special message. "One must reinforce even more among producers the need to generate data on their activity. Without observing the production, gathering data and using this data to make corrections, it is difficult to obtain results. I am satisfied because I see this awareness increasing", says the researcher from Embrapa Swine and Poultry Nelson Mores.

According to Sandro Tremea and Jean Vilas Boas, coordinators of the Ideal Piglet program from Aurora and

Embrapa, the program has reached a point of maturity. "It is part of a continuous improvement process that is working", evaluated Sandro Tremea. According to the manager of Pig Farming from Aurora, Valdir Schumacher, the Ideal Piglet answers the growing competitiveness of pig farming. "We are surely contributing so that many small-scale producers can continue breeding pigs", he stated.

From resistance to security – the producers who put into practice the controls, goals, follow up the productivity indices and operating standards suggested by the Ideal Piglet do not hide the fact that they received the project with mistrust. The beginning was one of resistance, as can be seen in the first assessments by the technicians from Aurora. But the better economic results showed, with time, that the change was worth it. "From the Ideal Piglet, we conducted a better management of the grange and obtained more profit, which gives us more safety to continue the activity", assured the pig farmer Jairo Miotto, from Severiano de Almeida (RS).

Erasmus Bavaresco, from Seara (SC), does not hide that the "beginning was a little boring". Implementing Piglet's directions required many changes. "But it was worth it because I can now foresee a problem with a lot and better administer this situation. Therefore it is more secure because sometimes you would expect something and when the time came for the pig to give birth it was much different from what you had planned". Every day, Erasmo fills a spreadsheet with information on the production, like dates of the parturitions, number of piglets born, dead and weaned.

On the wall of this office in the grange is a board with the productivity indicators of the last two years. Diogo Baccin, piglet farmer in Quilombo (SC), was able to make the productivity average in the grange to go from 18 to 28 piglets per female per year, an increase of 55%. "Formerly, the grange's structure was made of wood, the control was done manually, in notebooks. The computerization of administration, with recommendations of the Ideal Piglet Project, greatly changed the grange's results", said Diogo. The farmer is sure that he would have been out of the activity had he not changed. "When we got organized, I also noticed that we could still go farther than we had ever gone", he assured.

Assistance uniformity – the 125 technicians from Aurora who work with the piglet farmers of the 12

associate cooperatives consider that the Ideal Piglet brought mainly uniformity to the rural assistance. And with it came the certainty of the efficacy of the recommendations that are passed on to the pig farmers. “If the producer follows the operating procedures, recommendations of the technical assistance, we have no doubt that the pig farmer will be successful in his activity because he will no longer have an artisan production”, stated Elia Campos, of the cooperative Cotrel, from Erechim (RS).

According to Maicon Techio, of Coperdia, from Concordia (SC), the planning of production, follow-up of the productivity indices and application of operating standards made those important details to gain more attention. “A part that we look at more carefully now is that of parturition and the first three days of life of the piglet.

We demand that the farmer really apply the operating standards of this period, which are decisive for the final results”, explained Maicon. Aldo Brena, who works in Cooperalfa, from Chapeco (SC), recognizes that the producers with low income and outdated grange showed greater resistance to the project. Since they needed to make some reforms in the grange, they had doubts regarding the return they would get.

But uncertainty gave way to trust as soon as the former practices were replaced by the new, more professional ones. “Today, they have greater control, more quality of information and of piglets. The farmer, on seeing the figures and cash at hand, accepts the changes and becomes easier to work with”.



Ideal piglet - Erasmo and Maicon check the goals board



Ideal piglet - Erasmo and Maicon check the project's spreadsheets



Ideal Piglet

Alternatives for maintaining soil quality in Acre

The use of no-till farming and fertilizer is a reality for the majority of Brazilian farmers, but not for those from Mancio Lima (AC), the westernmost municipality of Brazil. Located in the region of low Jurua, where there is predominance of sandy soils and with low fertility, its main crop is cassava, used for production of flour. The same occurs in the neighboring cities, Rodrigues Alves and Cruzeiro do Sul, the second biggest of the state.

In this context, Embrapa installed in 2006 an experiment in the area of the farmer Sebastião Oliveira, with the aim of evaluating alternatives to the felling and burning system for recovery and maintenance of soil quality and thus diversify family farming production.

In addition, the experiment seeks to reconcile food production with reduction of environmental impacts. The use of fire, a technique widely adopted by farmers of the region, has been forbidden in Acre since 2010.

The experiment shows the efficacy in the use of alternatives like no-till farming, use of limestone, covering plants, which aim at eliminating the use of fire to clear the areas, and phosphated manures. The result of the work has been positive. “The experiment’s soil analyses, conducted from 2006 to 2012, and the productivities of cassava and maize, evidence the efficacy of the alternative to maintain quality of the soil and its productive attributes. With use of the technologies recommended, compared with that of the conventional system of the region, the rural farmer is able to obtain up to double the productivity of cassava”, states the researcher from Embrapa Acre, Falberni Costa.

“There was an area that I had already abandoned because I used to collect 120 bags of flour and the last time we planted I collected only 30 bags. So I put limestone, planted velvet bean and did no-till farming. I was able to obtain up to one kilo of flour per cassava plant”, confirms the farmer Sebastião Oliveira, who has 55 hectares in the Pentecostes extension.

The experiment area is currently cultivated with maize with different treatments. The maize has a great demand in the region, being raw material of feed for fish and birds, production chains encouraged by public

policies of the state government. “The people here did not believe that this land could become fertile and still yield maize, which is highly valued. The other farmers, mainly those of the Association, are already starting to adopt these techniques”, states Oliveira.

Maize production in Acre is still small compared with that of other states of the northern region, this is why the grain is valued in the market. Acre produced 111 thousand tons in the 2012/2013 harvest, while the neighboring state, Rondônia, produced 501.6 thousand tons, according to data from *Companhia Nacional de Abastecimento* (Conab). In Jurua, the purchase of agricultural inputs still has a high cost due to the distance from the production sites of limestone and fertilizers.

The government of Acre, through the Agroforestry and Family Production Extension Secretariat, adopted the Pro-Limestone Program since 2010, which foresees the distribution of limestone to family farmers. Sebastião was one of the beneficiaries and corrected the soil of the rest of his property.

According to Oliveira, before the experiment, he did not know what limestone was, much less fertilizer. “If only I had the knowledge I have today, this land here would still be half forest and I would not have had to open more areas. This area will not stop producing and I will no longer burn. Before we used to think that the cleaner the soil the better, now the more straw the better. This is the kind of knowledge I obtained with this partnership with Embrapa and that made all the difference”, he states.

CONSERVATIONIST FARMING

The alternatives used in Jurua (no-till farming, with minimum soil tillage, permanent covering of the soil with leguminous plants and grasses, and crop rotation) follow the recommendation of conservationist farming.

In this area, velvet bean has already been used, a leguminous plant indicated for recovery of degraded soils, ideal for green manuring and with good nitrogen-fixing rate, an important element for soil quality. The rural farmer also planted cassava and is now conducting the planting of maize.

Primers

**guide small-scale dairy
farmers in the use of
accessible technologies**



Embrapa Dairy Cattle (Juiz de Fora, MG) has been producing primers for distribution to small-scale dairy farmers, through Emater-MG, cooperatives and in events for family farmers. The material provides clear, objective, richly-illustrated and plain-language information on how to proceed at the various stages of dairy production, using technologies validated by Embrapa that are accessible to smallholders. In 2013, four primers were produced addressing the following subjects: Assembly of the Embrapa Manual Milking Kit to Produce Quality Milk, Use of the Embrapa Manual Milking Kit to Produce Quality Milk, How to Obtain Quality Milk Using a Mechanical Milking Machine and Breeding Heifers.

The publications are fruit of the project Development of a Process for the Elaboration of Printed and Electronic Contents Adapted for Dairy Farmers' Various Levels of Literacy and Culture, led by the analyst Vanessa Magalhães. According to Vanessa, one of the goals of the project is to make technical information, in accessible language, with step-by-step illustrations of the procedures available to farmers with low literacy levels. By 2015, the term of the project, the production of new primers with various important themes related to dairy farming is scheduled, an action that is supported by Embrapa Technological Information (Brasília-DF).

The base of the material is also used for the production of educational videos, which are uploaded to Embrapa Dairy Cattle's website, Youtube and in the *Rede de Pesquisa e Inovação em Leite* [Dairy Research and Innovation Network] (Repilite), a thematic social network intended for the debate and dissemination of contents relevant to the dairy sector, coordinated by Embrapa Dairy Cattle. "The videos are produced in the same manner, with very accessible language and step-by-step images of each procedure with all the details", explained Vanessa.

The analyst points out that, in order to validate the methodology, several stages were required before the production of the printed and electronic material. Initially, the profiles of the producers and their interests were identified. The identification part included dairy farmers from cities like Valença, Muriaé, Lima Duarte, Ponte Nova, and Barbacena, in the state of Minas Gerais. Then, questionnaires were elaborated and applied based on the statistics of the most searched topics in the Citizen's

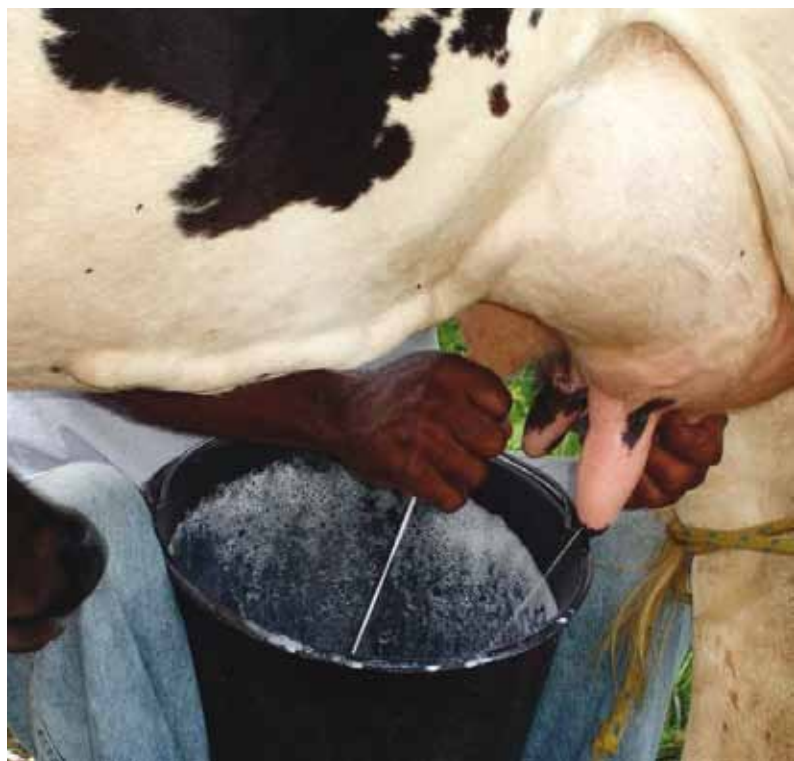
Call Center (SAC) from Embrapa Dairy Cattle's website and in surveys conducted in *Field Days* and technology transfer events conducted by the Embrapa Unit.

The questionnaires were applied to identify, for instance, which mobile phones the farmers had, their level of education, among other points.

"With this, it was possible to know a little about the farmer to elaborate specific material", she pointed out. Vanessa also informed that, to obtain a significant sample of the target audience, an analysis was conducted with data from the Brazilian Institute of Geography and Statistics (IBGE) with the number of farmers from each region to be visited to know how many farmers would be interviewed.

Finally, to validate the contents, the level of perception and capacity to assimilate information had to be verified. For this, tests were conducted with dairy farmers and their children. A total of 101 dairy farmers and 19 of their children from different regions of Minas Gerais State and from the states of Rondônia and Rio de Janeiro took part in this stage. "We conducted an intelligibility test to know if both the primer and video produced were efficient in terms of transmission, reception and understanding of the information», declared the analyst.

Involving farmers' children in this study had a dual purpose: to bring the youngsters closer to the reality of production, considering the process of succession in the property, and to also have them as facilitator agents for access to the information technologies, stated Vanessa. ♦



AFS: **alternative means of income for the smallholder**



A return to the origins with the use of smallholder-friendly technology: this is how we can summarize the results of the project Technology Transfer in Agroforestry System for Family Farming in two Identity Territories in Bahia State, led by Embrapa Cassava and Tropical Fruits in partnership with Bahia Agricultural Development Corporation [*Empresa Baiana de Desenvolvimento Agrícola*] (EBDA) and *Universidade Federal do Recôncavo da Bahia* (UFRB).

Funded by the Bahia State Research Support Foundation [*Fundação de Amparo a Pesquisa do Estado da Bahia*] (Fapesb), the project disseminated the technique called agroforestry, agroforestry system or AFS in the Recôncavo and Paramirim territories, in the Semiarid region. Combining wood tree species (fruit and/or wood) with crops, AFS allows for harvests right from the first year of implantation, so that the producer obtains yields from annual crops, vegetables and short-cycle fruit trees while awaiting exploitation (maturation) of the forest species and fruit trees with longer cycles. From the same family as the cedar and mahogany, the Neem (*Azadiracta indica*) was chosen as main arboreal species in the 20 demonstrative units of the two territories. The other crops were chosen participatively by the farmers, and according to their needs and to each region's possibilities.

According to the researcher Antonio Souza do Nascimento, who led the project, AFS is interesting for family farming because it has economic and environmental advantages. "Besides producing foods, the farmer can rehabilitate areas that were degraded through the intensive use of conventional farming", he states.

It is what the farmer Ercon Joaquim da Silva, his wife and children did in the community of Lagoa da Palha, in Paramirim. "My patch did not have a speck on the ground. But today, after the people from Embrapa and EBDA came here and explained to me, I know what I was doing wrong. Today, I am making the covers at the foot of each plant to preserve the wetness. Before, I would wet them every three days and it would be dry. Today, I wet them every seven days and they keep green and wet", he states. "Before, I would go to the fair to buy groceries. Today I go there to sell. I hardly buy anything". His

plantation is well diversified: vegetables, beans, yams, passion fruit, watermelon, beetroot, cashew, *umbu*, mango, banana, orange, pinecone and *acerola* cherries.

Pedro Coni, organic farmer in Conceição do Almeida, in Recôncavo, is another adept of AFS. "Here I plant fruit, ornamental, exotic, and wood trees to have sustainability in the long term; and alternative crops like arrowroot and pepper", he states. In this region, traditional family farming faces serious problems of low soil fertility and pests and great difficulty in purchasing inputs and even finding wood for firewood, due to the deforestation. With regard to the wood species, AFS is like a long-term savings account", explains Jorge Silveira, an agronomist from EBDA responsible for following up on the partner farmers from the Recôncavo Territory.

The project's farmers received guidance on food production, environmental conservation in adverse conditions, planting of fruit seedlings (hole-digging, fertilization, planting, construction of berms, mulch and wetting) and the importance of crop/livestock integration for family small holdings.

AFS also has an important social function: that of making man settle in the fields mainly due to the increase in the demand for labor, and prevents seasonality.

"As it unites agricultural and forest crops, AFS is planned to allow for harvests right from the first year of implantation, so that the farmer obtains yields from annual crops, vegetables and short-cycle fruit trees while awaiting for the maturation of the forest and fruit species with longer cycles", he explains.

"Another advantage is the use of sustainable resources combined with less dependence on external inputs, resulting in greater food security and savings, both for farmers and consumers", states Ildos Parizotto, an analyst from Embrapa who also participates in the project.

In Guanambi, the farmer Ivanaldo de Oliveira Fernandes uses neem intercropped with grass in three properties. In the pasture, he raises Nelore cattle. "With the neem, I can make seedlings from the fruits, powder from the leaves, stalks from the stems, and charcoal with the small branches", he explains. ♦



Embrapa's *Sisteminha* becomes alternative to fight hunger and misery

An integrated food production technology that is quite simple and easy to adopt has been calling the attention of countless family farmers in the Brazilian Northeast. Developed in 2011 by the researcher Luiz Guilherme and perfected by Embrapa Mid-North (Teresina, PI), the *Sisteminha Embrapa* [Embrapa's Little System], as it became popularly known, consists of a production rotation that involves integrated production of fruits, vegetables, poultry, small animals, and fish, with recirculation of nutrients

through aquiculture. In 2013, the work was ranked among the top three in the Banco do Brasil Foundation Social Technology Awards, in the category for Research Institutes and Universities, and in 2014 it was awarded in the Social Innovation category of the 2014 Innovagro, by the Agrifood Sector Innovation Management Network, which is headquartered in Mexico.

The system consists of a fish tank, chicken coop, earthworm farm, hydroponics and a shelter for composting, in addition to a peripheral vegetable patch. The fish

tank has capacity for 5 thousand liters and operates with a water recirculation system, with production capacity of 25 kilos of tilapia in three cycles per year. The fish can weigh between 150 and 200 grams at the end of each cycle. The entire system reutilizes water from the fish tank, which reduces production costs and increases food supply.

According to the researcher Luiz Guilherme, the technology is based on four principles: miniaturization, replicability, staggering of production and food and nutritional security. Fish farming, with the use of simplified water recirculation, allows for great water savings and is practiced by those who will benefit directly from the final product, for their own consumption. This type of fish farming is the driver that integrates the modules for production of layer hens, broiler chicken, quail, caviar, composting, and earthworm breeding.

The staggering of plant production is done weekly and includes maize, peppers, okra, green beans, hydroponic forage, cassava, fortified sweet potatoes, pumpkins, tomatoes and other vegetables, in addition to fruit species like papaya, watermelon and Gaúcho Caipira melon. This food diversity is produced continuously during the entire year and guarantees the system's sustainability.

The beneficiary families are encouraged to use their creativity to solve the basic problems in the implantation, and develop small projects with resources existing in their surroundings. Everything can be recycled: cardboard, plastic, PET bottles and wood.

Guilherme explains that the farmer and his family see the advantage of producing this way and thus rationalize the use of small spaces, building creative solutions to use the resources existing in their surroundings as they



Suspended bed for planting chives

define facilities and use of inputs. “Despite the apparent complexity involving the integration of the activities, the principles of the *Sisteminha* are easily absorbed by the families, and the staggered and modular implantation allows for the establishment of arrangements that respect family traditions and capacity to absorb new technologies”, he states. Traditional knowledge is also applied to solve the farmer's food needs.

The maintenance of a small system of alternative food production also allows for the continuity of agriculture all year round, reducing dependence on a brief season of rains or on irrigation. This increases food production, especially for the communities with greater difficulty of access to major centers. ♦



Weekly staggering of vegetable production.



The tank allows the production of up to 25 kg of tilapia per year

A photograph showing two women in a rural setting, likely a market or farm. They are carrying large, heavy, woven baskets filled with produce on their heads. The woman in the foreground is wearing an orange t-shirt and a patterned skirt, and she is smiling. The woman in the background is wearing a white t-shirt and a patterned skirt. The background shows green foliage and a clear sky.

Brazil's cooperation in Africa focuses mainly on family farming

In the context of international technical cooperation in agriculture, Embrapa is the Brazilian institution in charge of performing research, training and institutional strengthening activities, coordinated by the Brazilian Cooperation Agency (ABC), linked to the Brazilian Ministry of External Relations (MRE).

Brazilian technical cooperation characteristics include non-conditionality and meeting partner countries'

demands. This approach entails not imposing priorities, but rather seeking to cooperate and help in areas in which each country needs the most help.

Africa has been one of the foremost partners of Brazil on account of the challenges faced by its agriculture. African countries in general, especially in the Sub-Saharan desert, have recorded lower agricultural growth than population growth. The continent therefore depends

Cotton 4 marks Brazilian action in the Sahel region



Agricultores en los alrededores de Maputo, Mozambique

strongly on food imports, with great impact on the trade balance and worsening the population's food and nutritional security.

In the various technical cooperation projects implemented by Embrapa in Africa, the work with family farmers is essential. About 80% of agricultural production in the continent depends on family farming, and 95% of the properties have less than five hectares.

Started in 2009, the Cotton 4 Project is included in the political agenda of the South-South International Cooperation. It is a Brazilian action in conjunction with four countries in West Africa (Benin, Burkina Faso, Chad and Mali) to increase the quality of life of their populations through cotton production. In 2014, the second phase will begin, with the inclusion of a fifth country. The project will now be called Cotton 4 + Togo.

The initiative is an example of the exercise of horizontality, a principle of the South-South Cooperation. Economic and social inequalities are reduced by strengthening the research institutions of these countries and through the transfer of Brazilian tropical farming technology.

This exchange of experiences is a way of increasing cotton productivity and contributing toward food and nutritional security. Benin, Burkina Faso, Chad and Mali are countries in which the great majority of the rural population is made up of smallholders, and 10 million inhabitants depend directly or indirectly on the cotton production system.

The Cotton 4 Project is a realization of the Ministry of External Relations (MRE) Brazilian Cooperation Agency (ABC), and implemented by Embrapa.

Its focus is the training of human resources, aided by the adaptation of Brazilian technologies, based on the three pillars of the project.

The first of them is the improvement of the genetic base of the cotton plants existing in the C4 countries. Brazil sent ten cotton varieties developed by Embrapa, nine of which with white fiber and a red-colored one. The second pillar is development of integrated pest management to reduce the use of pesticides, with improvement in the quality of life for farmers' families and less harm to the environment. The third is introduction of the no-till farming system. This has to do not only with cotton but also with food security and climate change, whose effects on the African continent speed up the process of desertification in the Sahel region.

One can say that, with improvements in the production system, the cotton plants will produce more and

will generate more income, and families will be able to eat better. The results show that it is possible to increase cotton production to up to 3 tons per hectare and foods like maize, millet, sorghum and cowpeas to levels close to 1.5 ton per hectare.

The entire system has been based on the integration between agriculture, livestock and forestry. Family farming will survive and allow these farmers' children to study, improving their quality of life, through maximization of their production system. The combination of cotton and food plants with species like *Gliricidia sepium*

and *Calotropis procera* for wood production and animal feed is extremely important to the region.

Mozambique wants to guarantee food security

As a response to the search for partnerships, Brazil has collaborated through the implantation of technical cooperation projects geared toward the development of

Knowledge Exchange

According to the researcher José Geraldo Di Stefano, coordinator of the first phase (Cotton 4), the project team sees man integrated with technology. An understanding of the role of the local extended family and social reproduction are fundamental to this process of technological adaptation. The conducting wire of this work were the capacity-building and integration meetings, called "Knowledge Exchange", a union between knowing and doing in the five countries. "A real exercise in knowledge through joint elaboration, and not the transfer of an authoritarian model defined by the Brazilian part", states Di Stefano.

The Knowledge Exchange supports and strengthens the three pillars, allowing for greater interaction among the participants and the consolidation of the project goals. The meetings started in Brazil in 2010 and were taken to the C4 countries in 2012. Each meeting culminates in a field day, uniting the researchers, technicians responsible for the technology transfer and farmers, creating a moment of knowing and doing in the learning units set up in the stations within the research centers in all the participating countries.

According to Di Stefano, there is the need to speed up the understanding of the technologies presented. For that purpose, these obey a pedagogic structure that allows dialogue with the people who do not have the capacity to read the information provided in the post-

ers that were installed. "Establishing easy decoding of information, and dialogue between users and technologies presented contribute toward speeding up reflection without the presence of interlocutors. Learning passes through example, suggesting change from the repetitive model to the reflective one".

The experience of replicating the learning units in properties of information interlocutors can speed up the technology transfer process in countries of the Cotton 4 Project. In the first experience with a farmer in Mali, approximately 400 farmers visited the learning unit spontaneously set up. During the development period of the first phase of the project, 1,514 researchers, technology transfer agents and farmers participated. ♦



the agriculture and livestock sector in Mozambique. This initiative is part of the strengthening of Brazil's relations in the South-South axis, with highlight on Mozambique, whose projects have had emphasis on agriculture, especially on food security and increase in farmers' income, through technological innovation.

The Embrapa-ABC-Mozambique Program encompasses several initiatives to strengthen the agricultural sector of the country, covering the adaptation of Brazilian varieties (upland or dryland-rice, cotton, beans, cowpeas, maize, soybeans and wheat) and production technologies to local conditions, the development of the *Instituto de Investigação Agrária de Mocambique* [Mozambique Agrarian Research Institute] (IIAM), and the training of researchers and technicians.

Several international institutions and donors are collaborating with various projects in Mozambique. Currently three projects in execution are supported by the United States Agency for International Development (Usaid) and the Japanese International Cooperation Agency (Jica) and are focused on institutional strengthening in the main areas of agricultural production, and in the empowerment of IIAM for development of agriculture and livestock in that country.

Mozambique's agriculture is the main source of income and employment for a great part of the population. The government policies for the sector stress the need for sustainable increase of agricultural and livestock production, generating income and self-sufficiency in foods, especially in relation to basic food crops.

Despite this situation, the Mozambican agricultural and livestock sector has great economic and social importance as provider of foods, source of employment and income, and as pillar of the national territory's occupation. Besides maize and cassava, the products of greater importance for the country's basic food basket are: rice, potato, wheat, and oilseeds like peanut, sunflower, and sorghum. However, one of the great obstacles to growth in the sector is the low level of agricultural income, compared with that of other countries.

Despite low productivities, agricultural production is not stagnant: in the 2006–2008 period, maize production increased from 1.4 million to 1.85 million tons, and cassava production from 6.65 million to 9.6 million tons, a growth mainly due to expansion of the cultivation areas in the period (20.1% for maize and 1.11% for cassava).



Despite the huge potential, the country has significant deficits in several products that make up its basic food basket, particularly rice, potato, and beans. However, Mozambique's climate characteristics, combined with the adoption of improved seeds and production systems and forms of management that suit the country's conditions, enable the cultivation of various species, as is the case of soybean and wheat production.

To maximize potentialities, assure sustainable increase in agricultural and livestock production, and be able to attain self-sufficiency, the Mozambican government launched the Strategic Plan for Development of the Agrarian Sector (PEDSA) in 2011. As a goal, it seeks to establish the conditions required for agriculture to grow by 7% per annum, in average. The strategy creates space for the private sector to have an active role in the modernization of agricultural production chains, notably in production, modern inputs, provision of services, post-harvest, processing, packaging and commercialization.

Another relevant item of the PEDSA is the understanding of the importance of seeking partnerships, specifically in technological innovation (research, development and transfer). Without doubt, the vision of

a modern and dynamic agriculture must be based on a capacity to provide knowledge and technologies that suit the environment as well as the economic and social situation of the country. This goal requires the effective implantation of an agronomic innovation system, made up of a technical and operational structure able to support the agricultural and livestock sector in all stages, notably in cases of increase in the internal offer of technologies and of seeds of varieties adapted to the country's weather and soil conditions.

Embrapa's action is structured in three special points

The Embrapa-Mozambique Program is currently made up of three large projects (Platform, ProSavannah and Food Security), based on the tripartite technical cooperation. The projects comprise specific technical team, activity planning, and budget.

The technical teams are trilateral, always involving experts from Embrapa, from IIAM and from the third partner country (Jica-Japan or Usaid-US). The activities planned are the fruit of intensive discussion and consensus between Embrapa and its partners and are implemented through technical missions and joint works.

The Platform Project is a trilateral technical cooperation between Brazil, United States and Mozambique, whose goal is to train for technological innovation and development of agriculture. Its specific goal is to strengthen the Mozambican Agricultural Innovation System, through training for planning, execution, and technical, economic and social assessment of the activities and results of technological innovation.

The project includes strengthening of strategic areas, like the study of soils and the modernization of the seed sector, in addition to communication for technology transfer and strategic planning. Although it is recent, this project has already shown results, like the collection, organization and systematization of information on Mozambique and its agriculture.

While the Food and Nutritional Security Project is a trilateral technical cooperation between Brazil, United States and Mozambique to strengthen the vegetable production s by family and/or subsistence farmers and direct the products, either for consumption *in natura* or processed ones, mainly to the market of Maputo. In the end, the diversification and increase in agricultural

Characteristics of Mozambican agriculture



- Represents 24% of the gross domestic product, with average growth rate of 7.9%, and uses about two-thirds of the national labor.
- In 2003, 65% of the national population was rural, and mostly dedicated to subsistence farming.
- Agricultural production depends mainly on the family sector: about 97% of the 5 million hectares currently cultivated.
- Low agricultural production and productivity levels.
- Low use of agricultural inputs (improved seeds, fertilizers, irrigation, mechanized farming and animal traction, etc.).
- The trade network of agricultural inputs and products is incipient, partly on account of the limited network of basic infrastructure (access ways and transportation, storage, electricity, imports, etc.).
- As it is conducted fundamentally in a dry-land regime, the level of irrigation use is low (< 3%).

Potentials

- Potential for irrigation (about 3 million irrigable hectares – currently less than 3% in use).
- Vast pasture areas (more than 12 million hectares, with only 1.2 million cattle and 4.3 million goats).
- Climate and soil diversity, with potential for introduction of more productive varieties.
- Agroecological potential that allows intensification and diversification of agricultural and livestock production.
- Availability of workforce.
- Arable land (36 million against 5 million hectares in use) and forests (54.8 million hectares).

production through improvement of cultivation techniques will result in greater food supply and thus will also improve families' income and diet.

ABC and USAID are the financing agencies, and the project is executed by Embrapa, University of Florida, Michigan State University and the Mozambique Ministry of Agriculture through the IIAM.

The initiative is based on three axes directed toward vegetable production in Maputo: socioeconomic assessment, production systems, and postharvest and processing.

Already in its third year, the project collects significant results, like the training of human resources through courses conducted in Brazil, US, and in Mozambique, in addition to direct capacity-building in the “learning by doing” format during the field activities, with the introduction of dozens of production technologies, preliminary socioeconomic assessment of the production chains, and postharvest and processing studies.

More than 70 varieties of different species of vegetables have already been tested, some with proven adaptability. In addition to the tests with Brazilian and American varieties, the project conducts studies to support vegetable production, postharvest and processing systems, to learn the particularities of vegetable production and consumption in Mozambique, in addition to assess the technologies, products and processes to be transferred to IIAM technicians. Several irrigation technologies have been tested, including surface irrigation system (through furrows), conventional spray, micro-sprinkler and dripping lines, having demonstrated the potential, characteristics, advantages and disadvantages of each. Several events and publications have already been done in the first years of the project. The demand of

regional farmers for adoption of the technologies tested in the Umbeluzi Experimental Station, where the project activities are performed, has been great.

The next step, already in progress, is focused on the planning and technology transfer/validation of demonstrative units in rural properties in the vegetable production areas of Maputo, including training of undergraduate students and rural extension service technicians, both from IIAM and from the Board of Agriculture. One can highlight that this project has presented productive harmony among partners, serving as an example for other trilateral initiatives in South-South Cooperation.

The ProSavannah Project is a trilateral cooperation between Brazil, Japan and Mozambique. It is a regional development program for the agricultural and rural sector to adapt to the Brazil's successful experience in the *Cerrado* in the Mozambican Savannahs in the Nacala Corridor. This program is rooted in three projects:

- ProSavannah-PI: research project under the charge of Embrapa, IIAM, and the Japanese research consortium Jircas-NTCI. Its goal is to improve IIAM's research and technology transfer capacity for the development of agriculture in the Nacala Corridor. Its purpose is the construction of a technological base that is able to develop and transfer suitable agricultural technologies and provide sustainability for the increase in regional agricultural production and productivity, based on Embrapa's experience in the development of technologies for tropical agriculture. Seven crops were prioritized: upland (or dryland) rice, cotton, beans, cowpeas, maize, soybean and wheat.

The field surveys started in the 2012–2013 agricultural year, with the implementation of 17 experiments in Nampula (750 experimental plots) and 19 in Lichinga



(850 experimental plots), including studies on liming, fertilization, varieties, and planting seasons for the seven crops prioritized. The results were deemed very good and promising. To present the trilateral results, there was a seminar in which 17 posters were authored by Embrapa. Also, ten undergraduate interns elaborated their monographs on the project, under the supervision of researchers from IIAM and Embrapa. During the cropping season, the project received visits from rural extension technicians, farmers, international research institutions,

partners, businessmen and Brazilian farmers interested in the country's agriculture.

The experiments of the 2013–2014 agricultural year were implemented in December–January 2014 through missions composed of technicians from Embrapa's decentralized units. In Nampula, the number of experiments grew to 23, while in Lichinga it increased to 26, totaling about 2 thousand experimental plots in areas of 7 and 9 hectares, respectively. The new tests include studies on the evaluation of pest and disease occurrence

in experimental plots of 2.500 m² for the seven crops, in addition to studies for assessment of the inoculation of soybean and cowpea seeds.

- ProSavannah-PD: focuses on the structuring and implementation of a regional development program, whose first product is the launch of the Nacala Fund in 2012. With public and private contributions, this pro-

gram meets the financial support needs for the development of the Nacala Corridor. It started in 2011.

- ProSavannah-PEM: to strengthen the capacity for technology transfer and support the Mozambique technological innovation process, through structuring and strengthening of public and private extension in the Nacala Corridor. It started in 2013. ♦





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