

EMBRAPA AGROENERGY

Focusing on solutions:

Biomass for sustainable generation of bioenergy,
biomaterials and renewable chemicals.



Embrapa works on agroenergy since its foundation in the 70s, having concentrated efforts over the first three decades on the production of feedstock/biomass with potential for energy generation. During this period, Embrapa has developed and improved genetic materials and production systems to increase productivity of energy crops and establish production chains for new crops.

With the foundation of EmbrapaAgroenergy, Embrapa expanded its research and development efforts in bioenergy, particularly to the agro-industrial component of the chain, under the logic of biorefineries. The concept of a biorefinery is based on the full utilization of biomass and energy, to generate various products, also reducing waste and effluents.

Created on May 24, 2006, Embrapa Agroenergy is dedicated to "Research, Development and Innovation" activities related to the processing, conservation and utilization of biomass. Embrapa Agroenergy also coordinates many Embrapa activities with the goal of developing and producing high quality feedstocks for bioenergy, biomaterials and renewable chemicals in partnership with other Embrapa research centers and collaborators outside Embrapa.

In 2013, Embrapa Agroenergy's technical staff consisted of 92 employees, with two-thirds of this team directly dedicated to research, development and innovation activities (40 Ph.D. and 20 MSc.). The other team members make

contributions to all the processes that are needed for the achievement of goals related to the different stages of technology development.

To support its actions, Embrapa Agroenergy collaborates with other Embrapa research centers and partners in various sectors, both in Brazil and abroad. In cooperation with academia, Embrapa Agroenergy seeks to establish common areas of interest with Brazilian and foreign universities, so that Embrapa researchers are able to participate in graduate courses and advise master's and doctoral students, who's research activities are part of Embrapa's projects.

Embrapa Agroenergy works to help Brazil maintain, and even expand its leadership in the use of biomass for energy purposes and for green chemistry, and increase the participation of bioenergy in the renewable energy mix, in favor of economic, social and environmental sustainability.

Research and development facilities

To face the new challenges, Embrapa Agroenergy is located in a modern building, with an approximate area of 10,000 m², consisting of four laboratories and a pilot plant. Embrapa Agroenergy also has a supporting facility where the Active Germplasm Bank of Jatropha is planted, located at Embrapa Cerrados, just outside Brasília.



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Chemical Processes Laboratory (LPQ)

At LPQ research projects are conducted to add value to biomass, and agricultural and agro-industrial wastes, through compaction, esterification, transesterification, pyrolysis, gasification, and other physical-chemical processes.

In this laboratory, studies are conducted with oils, ethanol, wood waste and byproducts from various production chains of different feedstocks. Great importance has been given to green chemistry, with the generation of products with high-added value. Materials such as polymers, fibers and composites, as well as biofuels, food for human and animal use, biofertilizers and other chemicals used in agriculture, as well as energy cogeneration processes from biomass residues are also part of the research themes developed at LPQ.

Biochemical Processes Laboratory (LPB)

At LPB research focuses on using biological processes to produce biofuels from biomass as well as to produce value-added co-products, reducing waste.

LPB uses basic science knowledge to develop processes for biomass deconstruction and generation of energy and chemical products from co-products. The main focus in this lab is the prospection, selection, characterization and cultivation of microorganisms to obtain useful products for improving or developing first generation fuels (fermentation of sucrose and starch) and second generation (cellulosic ethanol). It is also part of the research strategy the development of enzyme cocktails for biomass deconstruction, and for the selection, characterization, immobilization, chemical modification and evaluation of enzymes for agro-energetic purposes.

Research on microalgae is also being implemented, aiming to produce biofuels. Genetics and genomic tools are being applied to cyanobacteria and microalgae for biofuel production and utilization of effluents.



Foto: Vivian Chies



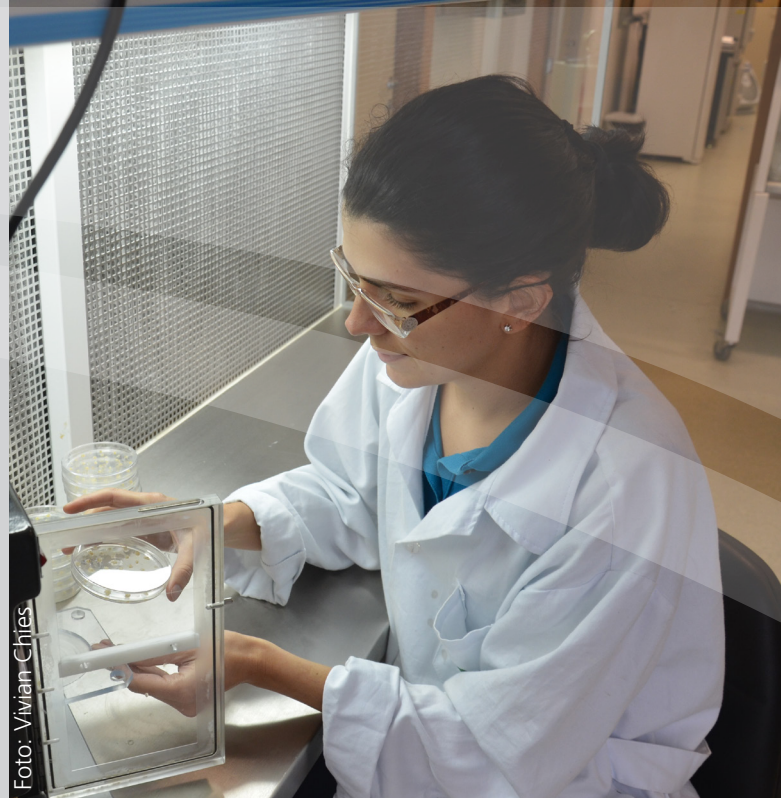
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Center for Chemical and Instrumental Analysis (CAQ)

CAQ is the facility responsible for the physical and chemical characterization of feedstocks, intermediate and final products, co-products and wastes.

This facility has state-of-the-art equipments to characterize the structure and chemical composition of biomass and its products and wastes. It is also possible to perform proteomics and metabolomics studies.

At CAQ, new analytical methods are developed to address specific issues of biomass, often decisive for the development of a process. Examples of equipments available in this laboratory are chromatographs coupled to different detectors, mass spectrometers, middle and near infrared region spectrophotometers, and microscopes. These instruments are also used to perform routine analyses to characterize biomass. This laboratory also performs tests on biofuels including the main quality biodiesel tests as defined by the National Agency of Petroleum, Natural Gas and Biofuels - ANP.



Genetics and Biotechnology Laboratory (LGB)

At LGB plants and microorganisms of interest to the agroenergetic sector are studied and characterized and, in some cases, modified to increase efficiency of biomass production and processing.

The team dedicated to microorganisms focuses on the use of Brazil's microbial biodiversity, from various biomes, using both genetics and genomics tools in different projects, as well as traditional breeding. The aim of this team is to generate inputs that can be used in the productions of biofuels, biomaterials, biopolymers, and "green" chemicals. Fungi and other microorganisms that produce plant cell wall degrading enzymes capable of releasing different types of sugars are studied for use in biorefineries. Microorganisms that are not easily culturable with traditional laboratory techniques are also studied using a metagenomics' approach.

The plant research group concentrates their efforts on studies that use genetics, cytogenetics, genomics, phenomics and genetic engineering to support the Embrapa's breeding program of species with potential for energy-related uses.



For example, studies of the diversity of plant populations of interest to agroenergy are being performed, as well as genomic selection assisted by molecular markers. Genetic transformation of plant species such as sugarcane is being used to speed up the development of new cultivars.

The LGB team has been also focusing on the discovery and validation of genes which can be used in genetic transformation of plants and microorganisms. To accomplish this, the lab has a Biosafety Quality Certificate (CQB), which is the legal authorization to work with genetically modified organisms (GMOs).

Pilot Plant

The pilot plant allows scaling up processes developed at the laboratory level, to an intermediate level, before transfer to industry. The idea is to have different types of reactors and equipments, to scale up processes such as fermentation, production of biofuels, and chemicals from a bench scale to a pilot plant scale. Once the economic viability of a given process is demonstrated at this intermediate level, it is ready to be transferred to industry so that it can be scaled up to a commercial level.

Technology transfer

Technology transfer at Embrapa Agroenergy starts with initiatives to understand the technological demands of society. Embrapa Agroenergy routinely performs the prospection of technologies and markets, as well as activities related to intellectual property, protection of knowledge, copyrights and to the establishment of collaboration and technology business contracts.

Scientific communication is also very important and aims to facilitate contacts with the targeted audiences and society in general. With this purpose, Embrapa Agroenergy hosts scientific technical institutional events, as well as special events for children and teenagers. Embrapa Agroenergy scientists present seminars at national and international conferences and are also committed to publishing scientific articles in specialized journals, as well as publications for non-scientists in magazines. Embrapa Agroenergy also produces audiovisual documents, such as videos and radio programs, and media to more specialized audiences: the monthly magazines "Agroenergetico" and "Agroenergia em Revista" as well as other publications such as books, documents and reports.



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Agroenergy

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