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CROPS SOCIETY**

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AGRONOMIC RESEARCH CENTER FOR FRENCH ANTILLES AND GUIANA
I.N.R.A.-A.G.

G. Anais

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INTRODUCTION

Founded in 1949, the INRA Agronomic Research Center for the French Antilles and Guiana (INRA-AG) is one of the Regional Research Centers of the French National Institute for Agronomical Research (INRA).

It has the distinction of being the only INRA Center situated in the tropics covering the totality of the Institute scientific disciplines: Physical Environment and Agronomy, Plant Production, Animal Production, Agro-Industries, Agricultural and Rural Development, and Social Sciences.

Covering the French Overseas Departments of the American area (Guadeloupe, Martinique and French Guiana), the Main Station is situated in Guadeloupe with several sub-stations situated in French Guiana and some personnel located in Martinique.

Although primarily intended to serve the French West Indies, INRA has, because of its situation in the humid lowland tropics, a natural vocation to cooperate with ACP countries in research, training, scientific information and extension.

ORGANIZATION OF THE INRA-AG CENTER

The basic units are Research Stations attached to a Research Department of INRA. At the Regional level, the Center is headed by a President assisted by a Scientific Council and a Management Council. Research programmes are determined by INRA and regional priorities. They are coordinated and initiated by the President and supported by administrative services and a Regional unit of Documentation.

RESEARCH STATIONS AND SECTORIAL PROGRAMMES

Physical Environment and Agronomy
Agronomy and Soil Science Station

- 1) Studies of tropical soil fertility, including moisture and air functioning of the heavy clay soils of Grande-Terre, cartography of large scale humidity variability, water balance and soil management.
- 2) Studies of the Guiana soils, including the cartography and fertility parameters of livestock farms.
- 3) The agronomy of vegetable and root crops, including research on sources of renewable organic matter for increasing soil fertility.

Bioclimatology Station

1) Knowledge of tropical environment

Characterization of climatic contrasts between Grande-Terre (dry) and Basse-Terre (humid). Study of global radiation and evapotranspiration.

2) Study of plant reactions under tropical climate.

Photosynthetic efficiency and modification by genotypes or cultural practices. Relations between water uptake and plant production. Most studies are on sugarcane, vegetables and grass-legume associations.

3) Adaptation of animals to the hot humid tropics. Studies are made on local breeds and temperate zone animals and on crosses between them. These results may be used in breeding adapted animals.

Plant Production

Genetics and Plant Breeding Station

Research is conducted in four laboratories: Tropical Forages, Vegetables, Root Crops and Seed Production.

Main objectives are to obtain varieties adapted to the hot humid tropics and resistant to various diseases and pests encountered in the Caribbean namely *Pseudomonas* and root knot nematodes. Research is underway with:

- 1) Tropical Forages: Determination of ecological adaptation in pangola, Transvala, Guinea Grass, *Cenchrus*, *Brachiaria*, cowpea, sorghum and maize.
- 2) Vegetables: Breeding of eggplant, tomato, pepper, onion, beans, muskmelon. Varietal tests of other species.
- 3) Root Crops: In vitro propagation of yam, fractioning or cutting of yam. Introduction of varieties resistant to anthracnosis. Breeding Cush-Cush yam hybrids.
- 4) Seed Production: soya, sunflower, maize, eggplant, beans.

Plant Pathology and Weed Science Station

- 1) General phytosanitary watch in collaboration with the Regional Group of Scientific Phytosanitary Interest (GRISP). Concerns all pests and diseases.
- 2) Soil parasites: Control of damping-off parasites in particular by the use of organic matter. Evaluation of infectious potential of *Pythium* and *Rhizoctonia solani*. Extensive study of *Sclerotium rolfsii* and search for antagonists *Gliocladium*, *Aspergillus*,

Penicillium and mostly **Trichoderma**. Ecology of **Pseudomonas solanacearum** - Anthurium Bacteriosis.

- 3) Epidemiology of airborne parasites. **Erwinia** of the papaw, **Helminthosporium** on maize.
- 4) Phytoecology and Weed Science

Phytoecology of the Guadeloupean savannas. Phytoecology of the weed population to integrated weed control.

G.R.I.S.P. (Regional Scientific Group of Phytosanitary Interest)

The group is at the crossroads between research and extension. It is an association between INRA and the Plant Protection Service of the Ministry of Agriculture. It purports to:

- Centralize phytosanitary diagnosis requests
- Counsel farmers on plant protection methods
- Train extension officers in plant protection
- Work on current diagnosis methods
- Collect and analyze information that permits progress in the knowledge of phytosanitary problems concerning Caribbean agriculture.

Zoology and Biological Control Station

Deals with invertebrate pests through three laboratories:

- 1) Attines (leaf-cutting ants) Laboratory

Strategies in Control of **Acromyrmex octospinosus**

- a) Study of new control technics (Bait matrix and attractants), protection of baits against humidity and U.V. radiation, retardant effect by digestible microencapsulation of the bait, pathogens of **Acromyrmex**, antagonists of the fungus.
- b) Control by perchlordecone
- c) Analysis of foraging behaviour
- d) Work division

Physiology of Communication - Social Cohesion

- Biology of larval tissues, study of central and peripheric nervous system, pheromones, biochemical taxonomy of **Acromyrmex octospinosus** and their symbiots.
- Ecophysiology of the Ant-Fungus symbiosis. Nutritional and antibiotic activity of the fungus.

- Plant parasite relations: List of defoliated plants, inappetance of *D. cayenensis* yam, plant toxicity vs. the symbiot.

- 2) Noctuid moth laboratory: Studies on 20 threatening species on the 130 identified, permitted to determine fluctuations in the populations.

Agricultural warning can be settled up by using sexual pheromones. Study of intercaribbean migration is also a priority. Integrated control is elaborated in collaboration with the Plant Protection Service. Studies are made on faunistics, dynamics of attacks of *Spodoptera frugiperda* and *Heliothis zea* on maize, larval evolution and mortality factors of adults.

Control management: incidence of chemicals, host plant, adults displacement. Rearing of Noctuidae and their parasites.

- 3) Nematology laboratory: role of plant nematodes in tropical soils weariness syndrom. Study of nematode populations in different crops.

Plant Physiology and Biochemistry Laboratory

Fundamental and applied research are conducted to increase knowledge of tropical plants in their environment focusing on flowering and tuberization, crop diversification and nutritive deficiencies encountered in the Caribbean.

- 1) Physiology of growth, flowering and tuberization

Study of responses to climatic factors of *Christophene Sechium edule*, and yam bean *Pachyrhizus erosus*. Effect of sowing dates, phytohormones in different natural photoperiods.

Flowering physiology studied through biochemical markers: phenolamides, and polyamines.

- 2) Biochemistry of soluble carbohydrates:

Glucidic composition and evolution of enzymatic activities during fruit and tuber swelling. Evolution of involved enzymes will help in understanding the partition of photosynthetic assimilates between source and sink.

Relations between glucidic metabolism and nitrogen fixation in *Pachyrhizus erosus*: glucidic composition of the nodules and enzymatic activities involved in their synthesis and utilization.

Nitrogen fixation and assimilation.

Forestry Research Station

Forest bioclimatology and silviculture of the natural forest. The

objectives are to highlight the ecophysiological basis of silviculture in natural forest favouring growth and regeneration of interesting species.

Animal Production

Zootechny Research Station

This station is interdisciplinary and covers several animal research departments. It aims to master the constraints of animal production under the tropics. Research is done on:

- 1) Weaning: Incidence of different weaning procedures on feeding habits, growth and reproduction of local goats.
- 2) Reproduction: Comparison of different reproduction patterns taking in account female and male fertility, and pasture management. Simple technics for inducing ovulation are studied: "Ram effect" with the goats, "Shang effect" with the bovines.
- 3) Animal nutrition: Optimal exploitation of the pastures during the favourable season for intensive managing of sheep, goat and cattle is a high priority research program. The second one is the study of the basic ration during the dry season.
- 4) Genetic improvement: In view to improve productivity in the traditional rearing context, genetic improvement of "creole pigs" is done with selection and diffusion of Large White sires. Resistance of local goats to diseases transmitted by ticks.
- 5) Animal and Climate Relations: Incidence of climate on adaptation of crosses between Creole and Limousin or Brahman breeds of cattle, comparison between Creole and Large White pigs. Physiological behaviour and economic results in relation to climate.

Hydrobiology Laboratory

Aquaculture of native species seems to offer the best potential as compared to introduced species such as Tilapia, Clarias, Carpes, Ictolarius, etc. Studies are made in Guadeloupe and mostly in French Guiana in three main directions:

- 1) Inventory of continental fishes. More than 300 new species were added to PUYO's Survey (1949). A book is in press.
- 2) Economic studies showed that about 100 species are interesting: 60 for aquariology and 40 for human consumption.
- 3) Biology of the main species in their natural environment is investigated.

Agro-Industries

Plant Products Technology Station

The objective is to introduce technological processes in agroindustry. Rum technology and valorization of by-products and wastes. More recently research on local fruits, vegetables and root crops was initiated.

- 1) Microbiology: Inventory of microorganisms involved. Study of their physiological characteristics to appreciate their behaviour in the fermentation process.
- 2) Biochemistry: Metabolism of superior alcohols, ethylic esters, fatty acids, aldehydes. All these compounds are involved in the aroma with positive or negative effects.
- 3) Analysis Laboratory: supports the work on biochemistry of aromas.
- 4) Experimental Platform: to evaluate transfer from laboratory to industry. These experiments can be done also in the industry.
- 5) Rum Technology: optimization of the fermentation according to raw materials (Cane juice, concentrate, molasses), the process, the equipment and the type of products.
- 6) Valorization of wastes: treatment of residuary products by mechanization is doubly interesting for depollution and energy production. Complementary processes are studied in particular use of water hyacinth.

Extension

Farming Systems and Extension

Located in French Guiana, researches in this unit concern management of livestock farms established after deforestation.

Problems encountered are forage quality, animal adaptation, determination of technical and socio-economic references for these types of farms.

Social Sciences

Rural Economy and Sociology Station

Considering the situation in the Caribbean characterized by severe lack of balance (unemployment, emigration, inequality of income, excessive growth of services, etc.) and a crisis in production particularly in agriculture, two main directions of research were taken:

- 1) Crisis in the plantation economy and growth of peasantry in the Caribbean (since 1830).

- 2) Models and strategies of economic growth in the Caribbean (since 1940).

The research concerns the entire Caribbean but considers the particularities of the French Antilles due to the links with France. Also are considered possibilities of integration of the French Departments in the Caribbean.

INTERDISCIPLINARY RESEARCHES

(Several projects are financed by the EEC).

Tropical Forages and Livestock Rearing

- Study and valorization of traditional stock rearing on natural pastures.
- Mixed forage cropping of grass and legumes (financed by EEC).

The program has two main research stages and some connected studies:

- The first one is preliminary. Local legumes will be selected from a phytocological study of natural pastures. Introduced and local legumes will be evaluated in a collection for their ecological adaptation, seed production and germination on ferrallitic and calcareous soils. Experimental mown plots will permit morphological, chemical and animal evaluation of the associations management.
- During the second stage, a natural pasture undersown with legumes and grazed by milking cows will give basis for grazing adaptation, drought resistance and animal live gain weight. Dry matter production, soil and water balances, shade or radiation effects, and forages feeding value will be studied on this pasture and also on cut micro-trials.

Connected studies could concern penetration of sunlight into mixed stand forages, impact of water stress, and photosynthetic yield.

Vegetables

- Integrated pest management in vegetable cropping systems. This program deals with resistance to soilborne diseases caused by *Pseudomonas solanacearum* and *Meloidogyne*, soil fatigue and use of organic matter.

Food legumes research financed by EEC deals with beans and cowpeas for human and animal use.

Irrigation

An extensive development project is undertaken in Grande-Terre, Guadeloupe. Research is sustained by the Guadeloupe Regional Council. The crop involved is sugarcane.

Root Crops

This project financed by EEC deals with selection, ecological adaptation and seed production of tuber crops for the Caribbean.

The project aims to a development of a genetic pool among aroids, yams and sweet potato, three basic foods for a number of Caribbean communities, from the varietal research built up to the release of seed material. Selection criteria involve productivity, quality, pests and diseases resistance, post-harvest conservation, soil tolerance, fast field covering or/and intercropping ability, mechanical cultivation and agroindustrial aptitudes.

Wide introductions, clonal and sexual selection, "in vitro" culture technics and mutagenesis by gamma irradiation will be used. A Caribbean varietal experimental network will insure ecological adaptation.

Selection criteria evaluation will be done through multidisciplinary approaches.

A special cooperation will be developed with CARDI in Dominica, Barbados and Jamaica. The project will give support to and receive emphasis from the VIIth Symposium of the International Society for Tropical Root Crops to be held in Guadeloupe in 1985. A newsletter will be edited during project duration.

Other Interdisciplinary Research

More recently studies were initiated on resistance to noctuids, moths on maize, biological control of pests of sugarcane and forage crops.

RESEARCH TRAINING AND INFORMATION RESOURCES

Research Training

Due to the diversity of its programs and the qualification of its research teams, the INRA Antilles-Guyane Center has received trainees of different tropical and temperate countries every year, including France, Africa, the Caribbean and the Pacific. Training is offered from the secondary to the post doctoral levels. We also receive highly qualified research scientists on sabbatical leave. Many of INRA research teams are also teaching at the University, and at the Agricultural Lycee (Secondary school).

Information Resources

INRA as an institution, and as the Regional Center for the French Antilles and Guiana, believes that information and more particularly technical and scientific information, are basic aspects and resources for research.

The documentation activities of our Center have two components: the Regional Unit of Documentation (in French: Unité Régionale de Documentation-

U.R.D.) and the specialized libraries of the research stations (for instance Plant Improvement, Zootechny.

Besides its activities of information processing and management, the URD coordinates the documentation activities of the whole Center, and is the contact point for external users.

Documentary cooperation is an important aspect of the URD objectives. It has settled exchange relation with many agronomic research libraries and documentation centers of the Caribbean, Latin America, with other institutes of the tropical zones or with the institutes in tropical areas.

The former publication "Nouvelles Agronomiques des Antilles et de la Guyane" has been replaced by a new one "Bulletin Agronomique Antilles-Guyane".

The reference Bulletin (formerly manually made), prepared as a selection from the computerized file now in use, is mailed to many institutions with which we have scientific and documentary relations. Institutions may ask for our publications referenced in this Bulletin.

The URD is a member of AGRINTER, the Interamerican Information System for Agricultural Sciences. It is also a member of the AGRINTER Services Network and accept AGRINTER coupons for payment of services. It is the AGRINTER input Center for French Antilles and Guiana. The input for AGRIS is made through the French and European AGRIS input Centers.

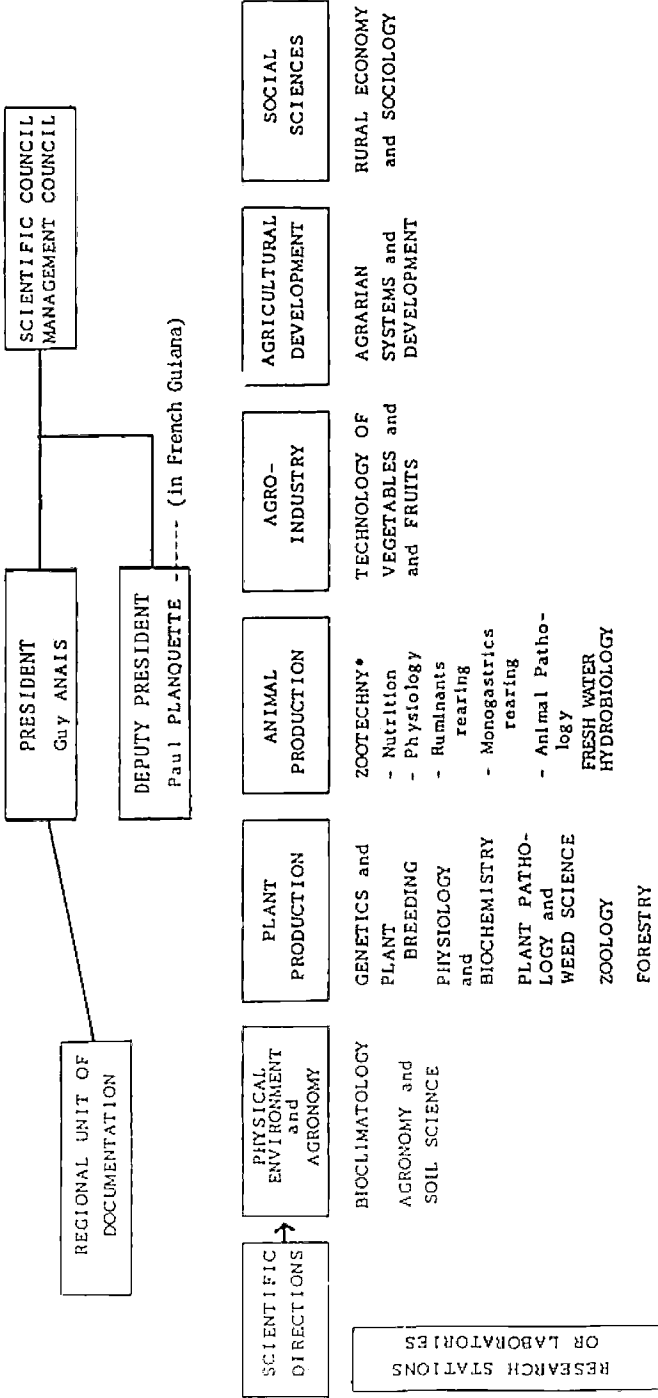
Our Documentation Unit is equipped for on-line retrieval from world and french databases, and is able to satisfy requests from the neighbouring countries. It can also help to have access to the french agricultural documentation services at cost price.

During the Seminar on Tuber Crop Research held in July 1985 in Guadeloupe, INRA's URD adopted the objective of an information network to give information on publications and current research on tuber crops through the Research Institutions.

The INRA Regional Center and its URD wish to participate in any kind or regional agricultural information system, and could help neighbouring countries and institutions which plan to train documentation personnel or to organize their agricultural documentation resources.

I. N. R. A. ANTILLES-GUYANE - ORGANIZATION OF RESEARCH

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* Pluridisciplinary Research Station (5 Departments)

Lucie Pellissier, a CNRS research scientist at the Joint Research Unit for Reproductive and Behavioural Physiology (PRC) at the INRA Val de Loire Centre, has been awarded a 2019 Starting Grant from the European Research Council (ERC). She will receive 1.5 million euros in funding to pursue her research on social behaviour. The genome of the pea assembled for the first time. An international team* led by researchers from INRA and CEA succeeded in assembling the first sequence of the pea genome. This study, published on September 2, 2019 in Nature Genetics, will, in addition to increasing knowledge of this genome compared to that of other legumes, help to improve traits of interest for peas, such as disease resistance, regularity of yield and nutritional value. Read what follows.