Brazil

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2.2. BRAZIL

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Background to Brazil's Biotechnology Policy

Brazilian biotechnology began in the middle of the last century when pioneer work was carried out in São Paulo on various specialized fields of microbiology, notably bacteriology, mycology, protozoology, phytopathology and virology. As a result of the work of these pioneer groups the first institutes devoted to research on bacteriology, vaccines, and clinical, pharmacological and immunological analyses sprang up in São Paulo.

Brazil benefited greatly from the results of these early initiatives which paved the way for successful public health campaigns against epidemics of yellow fever, trypanosomiasis, leishmaniasis, bubonic plague and typhus. Important institutes such as Oswaldo Cruz, Adolfo Lutz, Butantã and Pasteur were also set up, and these are now fully competent to maintain national progress in the field of biotechnologies applied to health.

In agriculture the technical progress made in the early days of biotechnology studies applied to seed production made Brazil the second country in the world, after the United States, to obtain uniform and high-yield hybrid maize from fines developed from local genetic stock.

As a result of this process of development and consolidation of various branches of traditional biotechnology, in particular those related to agriculture, the first private enterprises in the seed production markets such as Agroceres sprang up in the forties followed, in the sixties, by Brasilsul Agropecuária.

As regards the development of genetics, the basis of modern biotechnology, Brazil's historical development has its roots in the work of Cruz Martins, in 1924, together with the Instituto Agronômico de Campinas. The development of Brazilian genetics is also connected with international names such as Dr Dreyfus, Dr Krüg, Dr Brieger and Dr Dobzhansky who were the pillars of Brazilian genetics and left behind many disciples who became top-level researchers.

Again in the field of health, Brazil is carrying out initiatives in diagnosis methods and biopharmaceuticals of high molecular weight; it is self-sufficient in insulin and is carrying out research into the production of interferon and also has the technology to produce blood derivatives, including human albumin and anti-haemophilic factors.

Arable and Stockfarming

This represents a great development potential for the country since we now have a number of excellent research institutes and universities covering various areas such as genetic engineering, cell and tissue culture (USP, IAC, UNICAMP, EMBRAPA, IAA, UFRJ, UFVIÇOSA, ESAL, IAPAR), and biological fixing of nitrogen and mycorrhiza (inoculants) (UAPNPBSOLO/ EMBRAPA, UFRGS, CENA, IPT, IAC, UFV and others).

The most impressive example of nitrogen fixing is the result obtained by the constant research carried out over the past twenty years with soya cultivars which, today, can extract 80% more than their nitrogen needs by biological fixing.

Noteworthy Brazilian technological developments in the field of plant health, owing to their importance and possible uses, are techniques for disease detection, pest control, resistance to herbicides and resistance to diseases and weeds, from endogenous technological development. As regards pest control in particular, it should be stressed that Brazil is one of the first countries in the world to undertake a large-scale project to spray nearly 600.000 hectares with baculloviruses.

Mention should also be made of the experience of Cenargen whose work has proved to be of growing importance for the systematic identification and establishment of active germplasm banks.

Bioconversion and Energy

The example of Proalcool, among others, is a clear demonstration of Brazilian potential for making use of its bioclimatic conditions, coupled with its technological development, to resolve, using native resources, the serious question of alternatives to oil. In this area, the Department of Industrial Technology of the Ministry for Industry and Trade is investing mainly in the field of alcohol fermentation, aimed at the production of fuel

alcohol and the genetic improvement of yeasts (direct fermentation of starch to alcohol; this work is being carried out by the Institute of Chemistry of the USP).

This being the case, the Department of Biotechnology of the Ministry of Science and Technology sees itself as an agent of integration and co-operation and acts as national co-ordinator of the Government's biotechnology activities. In this context it should be private enterprise which acts, with public-sector support.

The policy proposed by the Department of Biotechnology, leading up to 1990, assigns the following roles:

a) Public sector

a.1. guidance, co-ordination and stimulation of biotechnology activities;

a.2. supervision of national work in the sector, so as to take account of the priority economic- and social-development programmes in a long-term strategy;

a.3. participation in production sectors, on a complementary basis, in the national interest and/or in cases where private enterprise is unable or unmotivated to act;

a.4. provision of guarantees for national production;

a.5. establishment of appropriate conditions for full scientific and technological skills to be developed in the sector by the strengthening of research centres and training of teams with guaranteed resources for these activities;

a.6. stimulation and guarantees for the development of national technology and the economic, financial and commercial strengthening of Brazilian enterprise, to ensure that it can compete on an open market.

b) Private sector

b.1 exploitation of the results obtained from technological research in biotechnology, bringing products within reach of society;

b.2 suggestions to the Government, on an interactive basis, of the areas most needing investment for national production;

b.3 Raison with areas in which knowledge is generated, with a view to providing conditions for the satisfactory assimilation and dissemination of knowledge.

In order to give substance to this proposal for the integration of scientific and technological development work, by complementing and incorporating the other fields addressed by the Ministry of Science and Technology (CNPq and FINEP), the Department of Biotechnology will have to allocate some US$60 million for the period 1987-89 over and above the biotechnology budgets of the other areas of the Federal and State authorities (source: SBIO plan of objectives). Approval was recently given for the allocation of resources for the award between now and 1989 of 4 650 grants in the country and 2 700 abroad, with the aim of stepping up training of researchers and technicians in biotechnology, at home and abroad.

One of the principal means of distributing the above-mentioned resources will undoubtedly be the implementation of the Biotechnology Integration System.

The Biotechnology Integration System (BIS) is a national technical and scientific cooperation network which brings together, under a number of subject headings, the centres of scientific and technological production, devoted to the same line of research or the subsequent development of a product or provision of services using biotechnology.

The system will examine, on the one hand, the critical areas of science and technology to be introduced in the country, with a view to reducing the present difference in level between the national and international contexts and, on the other hand, will have to bring existing know-how in science and technology within the reach of the national production sector, for the development of goods and products.

In this system, input data will be taken to be the information and requests resulting from scientific and technological production, at national and international levels, the production sector, the administrative authorities and related institutions and, in particular, the directives issued by the national government, as embodied in the state biotechnology programmes, which are being implemented in various parts of the country, such as Rio de Janeiro, São Paulo, Minas Gerais, Rio Grande do Sul, Parana and Bahia.

The input data also include those opportunities offered by international co-operation programmes, with special emphasis on horizontal co-operation, the main example of which, to date, is the Brazil-Argentina co-operation programme.

At the operational level, the BIS will make use of BICs (biotechnology integration centres).

BICs will be structures for co-ordinating centres of acknowledged research capability, organized at state or regional level, intended to support biotechnology application projects integrated with the production sector.

The BICs will take part in the Biotechnology Integration System within the context of activities and lines of research of national interest, managing their activities entirely independently of the sys-tem as regards local and regional integration initiatives.

The administration of the system will be the responsibility of the Department of Biotechnology, and general coordination will involve full representation of institutional bodies and the operational sectors.

The system will have a matrix configuration and will offer as output data the products established in its planned objectives, with feedback based on a system of continuous assessment, to be implemented by general co-ordination.

Therefore it is expected that, coupled with the other initiatives taken at federal and state level, the biotechnology integration system will be a key means of bringing about the quantitative leap that Brazilian biotechnology needs.