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Casas J. (ed.).

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Montpellier : CIHEAM

Options Méditerranéennes : Série Etudes; n. 1988-VI

1988

pages 23-29

Article available on line / Article disponible en ligne à l'adresse :

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To cite this article / Pour citer cet article

Moreno J. **Agricultural research in Spain**. In : Casas J. (ed.). *Agricultural research in countries of the Mediterranean region*. Montpellier : CIHEAM, 1988. p. 23-29 (Options Méditerranéennes : Série Etudes; n. 1988-VI)



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Agricultural research in Spain

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In Spain, agricultural policy can be defined at three levels: The European Economic Community (EEC), Spain itself as a member state, and its regional (autonomous) governments. Agricultural research is mainly applied and its objectives are to find suitable answers for specific problems arising from the production factors affecting the quality and quantity of the products, the technical and economic conditions of marketing and industrial processing of agricultural products, and the inadequate use of all kinds of natural resources. This implies that the specific objectives may be different according to the area where the research is carried out. It is, therefore, important to have an efficient coordination system in agricultural research to reach a balance between the different specific objectives established at different planning levels, in such a way that agricultural products, farms and industries may be competitive in the international markets, while also responding to the demands and necessities of domestic markets.

I - Institutions

Agricultural research is decentralized in Spain, specially concerning the organization of personnel and the use of resources at regional research stations. However, there is good coordination for those projects included in the National Plan of Agricultural Research regardless of where they are being carried out.

Five different groups of institutions are responsible for research:

1. National Institute for Agricultural Research - *Instituto Nacional de Investigaciones Agrarias (INIA)* - that belongs to the Department of Agriculture, Fisheries and Food;
2. Agricultural Research Services - *Servicios de Investigaciones Agrarias (SIA)* - that depend on the regional (autonomous) governments;
3. university departments, that are responsible to the Ministry of Education and Science;
4. Higher Council for Scientific Research - *Consejo Superior de Investigaciones Cientificas (CSIC)* - which is part of the Ministry of Education and Science; and
5. private enterprises.

The first two institutions - INIA and SIA - belong to organizations responsible for the planning and development of agricultural policy at the national and regional level. Their research is essentially applied and is aimed to solve practical agricultural problems (see **Annex 1** for more details).

The university and CSIC belong to a ministry responsible for planning and development of policies for teaching, training and research. Their field of activity is very broad and includes a wide scope from strictly basic to applied research.

Private industries are involved in research activities whose results can be applied in the very short term. They try to recover as soon as possible the funds invested in research. Some of the research projects in this sector are also financed with public money.

II - Research administration

1. INIA reports to a Directorate General of the Ministry of Agriculture, Fisheries and Food which also oversees the Extension Service. This ensures good coordination between research and technology transfer to farmers. The Directorate General includes:

- a general secretariat and technical departments for Coordination and Programs, Scientific Relations, and Services.

They assist the Directorate General and carry out most of the administration work of INIA research. They are also responsible for the national coordination of research programs and international relations for INIA and the SIAs.

2. The SIAs depend on their own Department of Agriculture of the corresponding Autonomous Government. In general, they collaborate closely with the Extension Service operating at the regional level. They are responsible for the management and control of their research centers.

3. University departments benefit in general from a relative autonomy concerning the planning of their own research and administrative affairs. They can include professors from different faculties in the same university.

4. CSIC is a large organization which covers many areas of scientific research, including agriculture. The administrative structure is centralized with national officials for the different programs.

III - Research centres and units

Agricultural research is carried out in the following units:

1. Eleven research departments from INIA, based in Madrid:

- Quantitative Genetics and Animal Breeding,
- Plant Physiology,
- Biochemistry and Microbiology,
- Animal Reproduction,
- Crop Protection,
- Genetic Resources Bank,
- Animal Pathology,
- Animal Virology,
- Forest Research,
- Wood Processing, and
- Cellulose and Related Industries.

All activities carried out by these Departments are of a disciplinary nature and are of paramount interest for the whole country.

2. Seventeen Research Services operate in the Autonomous Communities. Their main activities are:

Galicia

Studies on livestock production systems in humid areas that can improve the use of grassland.

Research on forestry, concerning leafy species, fast growing species, nurseries, fire control, etc.

Asturias

Research on apple tree varieties, pastures, livestock production and mycorrhizae.

Cantabria

Quality of milk.

Pais Vasco

Research on potato crops, livestock pastures, animal pathology and forestry.

Cataluna

This service works mainly on market gardening and fruit production, ornamental plants and

greenhouse production. It is currently developing research work on animal products.

Castilla-Leon

In Burgos, the Centre is developing research activities on the analysis and preservation of natural environments. In Valladolid, the main research projects are on cereals, legumes and, in general, major crops. In Salamanca the aims of the research are the improvement of pastures and forages.

Aragon

In this Centre research activities focus on pitted fruit crops and horticulture as well as studies on soil salinity. Also emphasized are research activities on the intensification of animal production based on forage crops and optimum utilization of valley and mountain resources.

Valencia

In the Moncada Centre, the main research work deals with citrus fruits but also includes studies on horticulture. In the Sueca Center, rice is the main research subject.

Murcia

The most important effort here is on horticultural crops and lemons. For animal production, research includes optimum utilization of pastures and forage bushes in marginal lands.

Madrid

The *El Encin* Centre develops research on viticulture and enology, small grains and legumes, forest industries, sheep production and the preservation of wild fauna species.

La Rioja

The main work of the Rioja Centre deals with horticulture and viticulture.

Castilla-La Mancha

Studies on viticulture, sheep and goat production and the genetics of the Iberian pig breeds.

Extremadura

Subjects concerning livestock use of pastures have priority. They include research on pasture improvement and its optimum utilization by livestock in an intensive system.

Research projects on horticulture, legumes and cereals are also significant.

Andalucia

The most important Centre is *Alameda del Obispo* in Cordoba, where cereal, legume, oil plants (mainly olive and sunflower) and horticulture projects are developed, as well as animal production and utilization of by-products as animal food. In Seville, the research includes cotton, viticulture and enology.

Canarias

The projects carried out involve tropical and subtropical fruits and the technical and scientific aspects of greenhouse production of both horticulture and ornamental plants.

Other centers in Cantabria, Asturias, Baleares and Castilla-La Mancha take part in national projects, to the extent that their equipment allows.

3. The following university institutions also participate in the national agronomic research program:

a) Four Senior Technical Agricultural Schools in: Madrid, Cordoba, Valencia, Lérida.

b) Several university schools of agricultural technical engineering.

c) Several departments in the Faculties of Biological Sciences and Pharmacy, specially: Soils, Genetics, Biochemistry, Microbiology, Botany and Plant Physiology.

d) The eight veterinary faculties in: Madrid, Cordoba, Zaragoza, Barcelona, Leon, Murcia, Lugo, Caceres.

Research in these departments is carried out by part-time professors who also devote part of their time to teaching. Doctorate theses are prepared by students.

4. Several departments, institutes and Centres from CSIC, specially those related with: pedology, edaphology, soil fertility, plant genetics, plant cultivation (cereals, fruits trees and horticulture), plant propagation, microbiology (nitrogen fixation, etc.), plant protection, water management and biochemistry.

5. Industries involved with the production of seeds and fruit trees, pesticides, veterinary products. Research activity in industry is not large, being estimated at less than 10% of public research.

IV - Coordination

Agricultural research has different levels of coordination in Spain.

1. On April 14, 1986 a new law on the Promotion and General Coordination of Scientific and Technical Research was published in the Spanish *Official Journal*. It created an Interministerial Committee for Science and Technology to coordinate activities between the different ministries. A National Research Program of Research on plant and animal production is being developed. It should define the coordination system between the different institutions that carry out agricultural research in Spain. It is expected that a public organization will be in charge of general coordination. The program will also define eight to ten research areas. Each of these areas should have a National Coordination Center to improve the efficiency of the research teams and the use of facilities (laboratories, equipment, experimental farms, libraries, documentation, computers, etc.).

2. A National Plan of Agricultural Research (1984-1987), is now being carried out. The plan was developed by INIA and the Autonomous Communities and covers the research activities of INIA and the SIA's. The main features of the plan are:

- the definition of general research objectives;
- general coordination of research projects financed by the plan;
- international scientific relations;
- the implementation of research projects; and

- the dissemination and transfer of results at the national and international level.

Research proposals are developed by researchers and submitted to a National Committee formed with representatives of INIA and the SIAs that evaluates all proposals and finances the selected projects.

3. There is also an Advisory Committee for Scientific and Technological Research - *Comision Asesora de Investigacion Cientifica y Técnica* (CAICYT)- that finances agricultural research projects of all institutions, INIA, SIA, CSIC, universities, and private enterprises.

Proposals are evaluated by independent referees on the basis of their quality and national interest.

V - National agricultural research plan

The main objectives of the National Agricultural Research Plan are:

A. Improvement of the agricultural trading balance.

- Genetic improvement of animal and plant species and the development of appropriate production technologies,
- Studies of techniques to increase and improve agricultural and livestock products destined for export,
- Preservation and increase of genetic resources.

B. Development of integrated production systems.

- Improvement of intensive production systems.
- Implementation and correct utilization of forests.
- Studies of techniques of resource use.

C. Adaptation of agricultural enterprises to reduce investment costs and ensure optimum use of inputs such as: irrigation water, energy, seed and plant nurseries, fertilizers, soil amendments and substrates, phytosanitary

products and herbicides, mechanization, and animal feeds.

D. Improvement of transformation and marketing procedures.

- Improvement of the quality and consistency of agricultural and livestock products.

- Study of marketing systems.

E. Conservation and use of natural resources:

- Studies on the optimum use of natural resources, forest ecosystems, recreational sites, etc.

- Conservation of the rural environment.

- Erosion and desertification programs.

The Agricultural Research Program includes the following areas and programs :

1. Crops: legumes, horticultural crops, small grains, and major crops.

2. Fruit trees: citrus fruits, other fruits, olives and viticulture.

3. Animal production: cattle, sheep, pig and goat raising, pastures and forages, and others.

4. Forestry: forestry production, and industries, conservation of the natural environment.

5. Natural Resources.

6. Rural Economics and Sociology.

The financial resources of the Plan are allocated as follows: 46% for crop production, 37% for animal production and 17% for forestry.

VI - Human resources

Scientists

The distribution of researchers in the different institutions is as follows:

- INIA has 175 scientists working full time.

- The 17 SIAs have about 450 scientists working full time.

It is difficult to estimate the number of professors that actually work on agricultural research in university departments. However, considering that on average they might devote 40% of their time to research, a rough estimate adjusted to full time would be about 350 scientists.

The CSIC works on agricultural research and other related areas and consists of about 225 scientists at full time.

The number of students preparing theses on agricultural topics in research centres or universities is estimated at 150.

The salaries of researchers at INIA, the SIAs and CSIC are similar to those of Associate Professors at universities, a little lower than that of the Full Professors or administration officers with the same level of education. Social status is very much related to salary.

There is not a satisfactory degree of promotion within a research career. Only two or three ranks based on competitive *curricula* (publications, patents, leadership for research teams, personal attitude) exist at the present time.

About 200 researchers from INIA and the SIAs were trained abroad (USA, UK, France, New Zealand, Australia, Ireland) for more than one year between 1973 and 1981. A large percentage (about 30%) of researchers from CSIC and the universities were abroad for short stays (less than three months) or longer stays (one year).

An ambitious national program is being prepared for training students abroad (about 200 per year) and in Spain (about 200 per year) over the next four years.

2. Others staff members

The number of technical engineers and technicians is not large representing about 30% of the total number of researchers.

Administrators constitute between 15% to 18% of the number of researchers. The office work is done by secretaries, librarians and administrative assistants. Their estimated number is 900.

The total number of these workers (about 2,000) is sufficient at INIA, the SIAs and CSIC.

VII - Material resources

1. Experimental fields

Most of the centres from INIA, the SIAs and CSIC have enough experimental fields. Eleven large research centres from the SIAs have several experimental farms in different places of the region. The total surface of these farms can reach 1,000 ha for some of the centres. On these farms, several Centres organize a field day every year to demonstrate to farmers the most significant results of their research.

2. Equipment and services.

Those centers working on animal production have good installations and enough livestock to carry out their research. Laboratories, buildings, green houses, growing chambers, stoves and freezing chambers are generally well equipped.

Seminars are frequently organized for farmers, extension agents, researchers and scientists. Most development activities are independent from research. For example, there is no seed production on research centres. However, some high technology, such as the antigen reactives to test for African Pork Disease, are prepared for the whole country in INIA laboratories.

The library and documentation system is not sufficiently developed. Researchers would like to have more scientific journals available in their libraries.

3. Financial resources (estimates for 1985)

a) Total national expenditures on research development were about 156 billion pesetas (\$1.17 billion) or 0.58% of the GNP. Public expenditures were 92 billion pesetas (0.33% of the GNP) but public scientific institutions accounted for 124 billion pesetas (0.46% of the GNP).

b) National expenditures on agronomic research are estimated at 11.8 billion pesetas (\$88 million) or 0.88% of the agricultural GDP. The breakdown of these expenses by institutions is as follows:

- INIA and the SIAs (national programs): 5.6 billion pesetas (\$42 million)

- CSIC: 2.8 billion pesetas (\$21 million)

- universities: 1.5 billion pesetas (\$11 million)

- private sector: 1 billion pesetas (\$7.5 million)

CAICYT: 0.55 billion pesetas (\$3.75 million)

- SIA regional projects: 0.2 billion pesetas (\$1.5 million)

- Spain/USA committee: 0.14 pesetas (\$1.05 million)

These expenses can be organized as follows:

- research projects: 2.24

- investments: 0.90

- operations: 0.80

- personnel: 7.50

- training grants: 0.25

- miscellaneous: 0.10

Spain hopes to get about 300 million pesetas (\$2.25 million) per year from the EEC for agricultural research projects.

VIII - International relations

Over the last few years, there has been a considerable increase in international cooperation because it is thought that research problems in agriculture can only be solved through a coordinated world-wide effort.

Emphasis must be placed on bilateral, multilateral, and regional relations established by agreements between institutions or governments.

a) Multilateral: FAO, ICAMAS, CGIAR (Consultative Group on International Agricultural Research), EEC, NATO, OAS (Organization of American States), OECD, etc.

b) Bilateral: United States of America, Federal Republic of Germany, France, United Kingdom, Argentina, Mexico, Italy, Austria and Romania.

c) Regional projects: A research network on olive growing for the Mediterranean area financed by UNDP, EEC, IOC (International Olive-growing Committee) and Mediterranean countries. It is coordinated by the Cordoue Research Centre. To these agreements can be added relations established between INIA and similar institutes from different countries, specially Latin American, Arab, and European countries.