



Action Plan 2010-2013

**Agricultural Sciences
Area**

EXECUTIVE SUMMARY

N.B.: If you require any further information about the specific content of any particular Area 4 Centre or Institute's Strategic Plan, please ask for it by sending an e-mail to: pe2010-13@csic.es. Thank you

CONTENTS

1	General Information	4
2	Critical Analysis of the Area	8
3	Objectives 2010-2013	10
4	Research Strategy and Proposed Actions	12

4 Agricultural Sciences Area

1. GENERAL INFORMATION

Description of the area

The CSIC's Agricultural Sciences Area covers a broad range of research with a clear social impact, covering lines of research that address the study of the soil, plants and stock farming resources. Its main aim is to obtain healthy foods for consumers or products of plant and animal origin that are suitable for industrial processing, and all at minimum cost to the environment.

Various different thematic spheres can be distinguished within the Agricultural Sciences Area: plant research for agricultural and forestry interest (nutrition, photosynthesis, enhancements, fruit cultivation and forestry) and the environment (soil, water, beneficial plant-micro-organism interactions, environmental stress and crop protection), and the study of farm animal resources (nutrition, production and animal health). This research is clearly multidisciplinary and closely related to work in other areas of the CSIC, such as Food Science and Technology, Natural Resources and Biology and Biomedicine.

The research conducted in the CSIC's Agricultural Sciences Area in recent years has made it possible to compete from a position of strength with research at other institutions in Spain and abroad. This strength is undoubtedly the result of the efforts by the area's researchers and the demanding and up-to-date guidelines they receive from the Area and the institution as a whole. Moreover, the Area has built up considerable specialisation in many of its disciplines, and taking on board latest-generation analytical tools.

Finally, it should be added that many of our disciplines and research lines have a clear alignment with the strategic axes defined by the CSIC, the priorities of the Spanish National Plan, and those of the European Union's Seventh Framework Programme.

Mission and Vision

MISSION

To contribute, through scientific excellence backed by high quality research, to generating knowledge of soils, plants and livestock, so as to enable the agricultural industry to advance and innovate, not only in terms of production methods and materials, but also as regards sustainability and respect for the environment, given that agriculture shapes a large share of the landscape, particularly in rural areas.

Vision

To establish the Area as a "QUALITY AREA" within the CSIC, so that it continues to lead agricultural research at the national level in many of its thematic fields, grouping together its research lines, and becoming an international benchmark in some of them.

Incentives will be given to those thematic areas which maintain clear social support, both for their environmental implications (elimination of wastes generated by society, decontamination of soils, clean agriculture, etc.) and their intrinsic interest (developing agriculture that produces healthy foodstuffs, improving stock-rearing systems) or those that are linked to the strategic axes most intimately linked to the area (climate change, energy or water).

Institutes and Centres that comprise the Area

The Area comprises a total of 17 institutes, of which 10 have all their research lines in the Agricultural Science Area (EEAD, EEZ, IAS, ICA, IDAB, IGM, IHSAM, IIAG, IRNASA and MBG) while the others share some lines with other areas: CIB and IBMCP with Biology and Biomedicine; IRNAS with Natural Resources; CEBAS and ICVV with Food Science and Technology; IPNA with Chemical Technology and Science. Of these 17 institutes, 12 are CSIC-only institutes and the remaining 5 are run jointly with universities (IBMCP, IdAB, ICVV, IGM and IHSM), and in two cases (IdAB and ICVV) the corresponding regional government is also involved. Table I below summarises the research lines at each institute.

Table I. Institutes and Research Lines in Agricultural Sciences

INSTITUTE	%
CEBAS ¹	80
Improvement of fruit species	
Plant nutrition	
Conservation of water and soil and handling of wastes in semi-arid regions	
Biology of stress in crop plants	
Sustainable water management in mediterranean agricultural systems	
CIB ¹	10
Environmental biology: Plant-environment interaction	
EEAD	100
Development of systems for an agriculture in line with good environmental practices	
Obtaining and developing plant matter adapted to semi-arid temperate zones	

Executive Summary

Basic and applied aspects of plant nutrition	
EEZ	100
Biology and biotechnology of the plant-microorganism interaction	
Bioremediation and biological protection of agricultural systems	
Mediterranean pasture and woodland-pasture systems	
Signalling, stress and development in plants	
IAS	100
Genetic improvement of plants	
Protecting sustainable agricultural systems against soil pathogens and weeds	
Sustainable use of water and soil in Mediterranean agricultural systems	
IBMCP¹	30
Biotechnology and improvement of crop plants	
Virology	
Molecular development mechanisms in plants	
ICA	100
Agroecology	
Soils, wastes and contamination in agro-ecosystems	
Sustainable crop protection	
ICVV¹	50
Sustainable viticulture	
IDAB	100
Biotechnology in animal and plant health	
Plant biotechnology	
IFNA²	100
Nutrient metabolism and energy: aspects of production and health benefits	
IGM	100
Main infectious diseases and herbivore parasitosis	
Nutritional factors affecting production, welfare and final product characteristics of herbivores of interest for stock farming	
Stock rearing in mountain regions: land use and animal yield	
IHSM	100
Plant disease biology and control	
Improving fruit quality and nutritional safety	
Physiology of the development and selection of germplasm in subtropical fruit trees	
Plant-pathogen interaction	
IIAG	100
Forestry biotechnology	
Sustainable management, conservation and recuperation of soils in temperate and wet zones	
IPNA¹	10
Plant nutrition and chemical defence activators in plants against biotic and abiotic stresses	
IRNAS¹	90
Biogeochemistry, forestry systems and global change	
Dynamics of agrochemicals and pollutants in the soil-water plant system	

Executive Summary

Plant biotechnology	
Water efficiency in agriculture based on crop eco-physiology and soil management	
IRNASA	100
Abiotic stress	
Soil and water contamination	
Animal parasitosis and parasite zoonosis	
Sustainable development of agroforestry systems	
MBG	100
Plant genetics and improvements	
Viticulture: Biodiversity, genetics and biochemistry	

Thematic areas

The various research lines that are run at the institutes belonging to the Agricultural Sciences Area are grouped together into 12 thematic research areas, permitting an integrated overview of the Area, and a greater interaction between institutes and researchers, as well as the design of consensus-based objectives for each thematic area.

Water in agriculture

- a) Soil conservation, Quality and Organic Matter
- b) Contamination of Soils and Soil Recuperation
- c) Beneficial Plant-Microorganism Interactions
- d) Plant Nutrition
- e) Photosynthesis
- f) Forestry and Fruit Growing
- g) Genetic Enhancement
- h) Environmental Stress
- i) Phytopathology: Viruses, Fungi and Nematodes
- j) Agricultural Entomology and Weed Science
- k) Stock farming: Nutrition-Production and Animal Health

These thematic areas have been configured based on the work groups established in the preceding 2005-2009 Strategic Plan and will be redirected as appropriate to ensure they are consistent with the research lines established in the new 2010-2013 Strategic Plan, so that they clearly reflect the research being carried out in the Agricultural Sciences Area. This task will involve meetings with

Executive Summary

researchers in various fields, which will be organised by the Agricultural Sciences Commission. This is due to be completed before the start of the new Strategic Plan. It should be borne in mind that the possible changes established in the future will be linked to the strategic axes the CSIC implements in its new Action Plan.

2.CRITICAL ANALYSIS OF THE AREA

SWOT ANALYSIS

Weaknesses

- Shortage of support personnel, in laboratories, field trials and management.
- Some of the Institutes are old and do not have services appropriate for a modern research centre.
- A certain tendency towards the fragmentation of research groups persists, with the consequent duplications and overlapping in certain lines of work.
- There sometimes a scant connection between the Area's environment and social reality.
- Limited internationalisation of some of the research currently underway in the area.
- The lack of a career in technology, equivalent to that of a scientist or researcher, with productivity linked to objectives.

Threats

- Greater competition for resources due to the increasing competitiveness of the universities which perform research activities in our thematic areas and have greater administrative flexibility.
- The lack of administrative support is noted primarily in the lack of presence in complex calls for proposals, such as those in the Consolider, Cenit and EU FP7 programmes.
- If there is no appropriate scientific policy there is a possibility of uneven growth between the Area's Institutes and between some of the research lines within a given Institute.

- Strict regulations on animal experimentation, which can be an obstacle to research in stock farming.

Strengths

- The positive connotations of agriculture in the economy today.
- High quality research that is well positioned internationally (third place worldwide).
- Strategic territorial distribution of institutes, identified with various productive systems.
- Availability of good scientific equipment in laboratories, field facilities and collections.
- The recently constituted technology transfer network for the Area, with two territorial nodes (Murcia and Granada)

Opportunities

- The change in the CAP will open up new challenges for the sustainable production of raw materials under restrictive conditions.
- The Area is able to address the problems of regions with limited resources and offer solutions, with clear potential for developing countries.
- The possibility of forming multi-disciplinary research groups combining the Area's different thematic areas so as to enable them to be more competitive.
- Ease of information transfer and transmission of findings of our work to national decision-making bodies or those in the autonomous regions.
- The appearance of European regulations governing environmental issues concerning agriculture (clean agriculture, elimination of waste, use of fertilisers, CO2 emissions, etc.) will offer an opportunity to provide appropriate advice.
- The adoption of the set of analytical tools referred to as "-omics" by many Agricultural Science disciplines.
- New alternatives for research into non-food energy crops from Agricultural Sciences, factory plants or spaces devoted to recreational use.
- New tools developed by the CSIC at the dissemination and transfer level.

3. OBJECTIVES 2010-13

GENERAL OBJECTIVES

The main objective of the Agricultural Sciences Area is to achieve scientific excellence in the research it performs, creating incentives for all its institutes to contribute to this goal through high quality scientific publications, and to produce developments that are useful to the productive sector in the form of patents or technology-based companies. Agricultural research and technological development is necessary to provide this added value compared to more traditional types of agriculture. A renewed commitment has been made to research contributing to sustainable agriculture, through a reduction in the excessive use of agrochemicals and improvements to animal production systems as regards nutrition, welfare and animal health, interaction with the environment and quality of the products obtained. This should make it possible to develop technology-based companies and for the sector's structures to be based on the knowledge economy, as the definitive step towards the modernisation of farming activities.

INTEGRATION OF THE AGRICULTURAL SCIENCES AREAS WITH THE "STRATEGIC AXES" DEFINED FOR 2010-2013

Within its Plan of Action the CSIC has established 5 major Strategic Axes (Energy, Global Change, Water Resources, Advanced Instrumentation and Engineering, Aging and Quality of Life), on which it aims to pivot a large share of its research. From the research carried out in the Agricultural Sciences Area as a whole, and always in a transversal way reaching out towards other CSIC Areas with which it could undoubtedly interact, we would highlight the way in which many of our disciplines and future research lines are aligned with these Strategic Axes:

ENERGY

- Sustainable Energy Production: Factory plants (energy crops or crops with functional components), and procedures and tools for their sustainable cultivation take on considerable importance in this context. Researchers involved in plant biotechnology, enhancement, nutrition, photosynthesis, stress and even those whose lines are working to improve soil fertility, have a clear relevance to this strategic axis.
- Reducing local CO₂ emissions. Agriculture is a sink for atmospheric CO₂, and all research aiming to maintain stable and healthy vegetation

is making a potential contribution to alleviating the greenhouse effect. Studies of the carbon cycle and strategies aimed at using the soils as a carbon sink are also integrated with this axis.

GLOBAL CHANGE

This term covers a broad range of issues and incorporates research into changes of soil use, through to the problems of climate change linked to the preceding axis. The work of the Agricultural Sciences Area is concerned with two aspects of global change:

- Protection and conservation of the Soil-Water-Plant ecosystem. Research into soil quality and the processes affecting it (contamination, remediation) are closely linked to this axis. Studies into the protection of species of agricultural interest which may be affected by climate change are also included within this thematic axis.
- Sustainable Food Production. Almost all the Agricultural Science Area's research groups, from those studying fundamental issues (molecular mechanisms and processes) through to those dealing in applications (agronomics and stock production) could be included in this section. Generating new knowledge should enable the sustainable production of foods and other raw materials in a situation characterised by limited resources and adverse conditions.

WATER RESOURCES.

Research groups conducting research into the efficient use of water for agriculture, and the potential for using treated waste water for agriculture, will be fundamental in this strategic axis.

- Production under deficient irrigation conditions through the development of the basic tools (from the plant to the irrigation calculation and control system), permitting drought resistant cultivars to be obtained or high precision irrigation control systems to be developed, or systems using low quality water.
- Prevention and development of systems to minimise contamination or raise the quality of waste water so as to enable its use in agriculture.

4. RESEARCH STRATEGY AND ENVISAGED ACTIONS

The Area Commission has proposed a series of **ACTIONS** which will be run during the forthcoming 2010-2013 Strategic Plan, and which will enable the proposed objectives to be achieved. In outline, these are as follows:

1. **PROSPECTIVE** studies involving scientific searches at national and international level enabling an analysis of current and future research in the field of agricultural science and to detect and adopt, if considered necessary, new lines or aspects for which we are prepared and which are of interest for the future;
2. Give decisive support (by forming scientific networks or other actions of interest), to those research lines in which we are **LEADERS** vis-à-vis competing organisations (universities or other PROs). Recruiting prestigious researchers into our Area should not be ruled out as a means of putting these actions into practice;
3. Consolidating the **Agricultural Area's technology transfer network**, monitoring it through the Area Commission and generating a database on those groups able to create new plant varieties or results suitable for patenting;
4. Implementing an appropriate **DISSEMINATION POLICY** in order to generate products (promotional leaflets and videos), and lecture series on topics of interest, etc. to make the results of our research better known at first hand;
5. Creating incentives, by associating resources, for those groups able to take part in programmes with European funding, so as to promote the Area's **INTERNATIONALISATION**.
6. Establishing **SYNERGIES** between research lines within the Area and between Areas, with a view to bolstering their scientific potential.

Executive Summary

CU