

ICT-AGRI Country Report

**Reports on the organisation of research programmes and
research institutes in 15 European countries**

**ICT-AGRI: COORDINATION OF EUROPEAN RESEARCH WITHIN ICT AND
ROBOTICS IN AGRICULTURE AND RELATED ENVIRONMENTAL ISSUES**

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Colophon

This publication presents reports on the funding structure, research programmes and research institutes in 15 countries involved in the ERA-NET ICT-AGRI (Coordination of European Research within ICT and Robotics in Agriculture and related Environmental Issues).

Authors and editors of the particular country reports are representatives of the organisations involved in the ICT-AGRI network. The contents are mainly focused on the research funding programmes, managed and/or driven by the ICT-AGRI partners. The ICT-AGRI partners created the reports to the best of their knowledge, but cannot claim completeness.

The information contained herein has been obtained from sources believed by the authors to be reliable, but they cannot make a claim of full accuracy or completeness. This information is supplied without obligation, and on the understanding that any person who acts upon it or otherwise changes his/her position in reliance thereon does so entirely at his/her own risk. Therefore, the editors and authors are not subject to any obligation and make no guarantees whatsoever regarding any of the statements etc. within this document; they accept neither responsibility or liability for any possible mistakes contained therein.

Despite this publication's evolution into a comprehensive project output, it is not a deliverable as such. The editors gratefully acknowledge the financial support from the Commission of the European Communities, under the ERA-NET scheme of the seventh Framework Programme, grant agreement n° 235460 in the making of the report. The text in this publication does not necessarily reflect the Commission's views and in no way anticipates the Commission's future policy in this area. This text is the sole responsibility of the authors.

For further information about ICT-AGRI see www.ict-agri.eu.

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Foreword

European collaboration on automatisisation and ICT in agriculture: growing benefits

Agriculture in Europe and Flanders now faces major challenges. Farmers are expected to produce larger amounts of food, meet high standards regarding quality and animal welfare, and at the same time reduce agriculture's ecological footprint.

Fortunately, this can all be achieved with a number of new applications culled from information and communication technology. But development of these applications is fragmented in the various European countries.

Flanders, represented by the Institute for Agricultural and Fisheries Research (ILVO), plays a leading role in the European network for better co-ordination of these ICT-developments: the ICT-AGRI ERA-Net (Coordination of European Research within ICT and Robotics in Agriculture and related Environmental Issues).

ILVO recently published an inventory of all relevant research groups and enterprises with expertise on automatisisation and ICT in agriculture. Together with this important first step, a website was launched that will facilitate day-to-day communication and knowledge exchange between those involved.

Eventually, this project - in collaboration with agriculture, industry, research and government - shall result in a strategic research agenda.

As the Flemish Minister responsible for agriculture I wholeheartedly support this initiative. The ICT-AGRI ERA-Net, including the Flemish branch at ILVO, are now issuing a call for new members. We hereby express our wish to involve all Flemish researchers, entrepreneurs, farmers and other interested parties in this project. Their participation will make the Flemish part of this European network into a powerful instrument for innovation and evolution.

Such expertise will help Flemish farmers to grow a future they can bank on.

Kris Peeters

**Flemish Minister-President and Flemish Minister for Economy, Foreign Policy,
Agriculture, Sea Fisheries and Rural Policy**

Preface

In May 2009, our European team embarked on a four-year quest to bridge the existing gaps between agriculture and information and communication technologies (ICT). To complete this challenging task, 15 partner countries formed a consortium to carry out the “**Coordination of European Research within ICT and Robotics in Agriculture and Related Environmental Issues**” project, or ICT-AGRI for short. By valorising the massive potential of ICT for the farming sector, ICT-AGRI will help to create the best possible opportunities for a modern European agriculture while protecting the environment and promoting innovation and competitiveness.

This country report, a first inventory of all the relevant research programmes in Europe within the scope of ICT-AGRI, will function as stepping stone. First, it guided us towards the development of the Meta Knowledge Base, a tool for gathering knowledge and mapping research, expertise and facilities. But this document will also lead to future cooperation between disciplines and research areas that do not usually join forces.

In the very beginning of this transnational collaboration, we were challenged as work package leader to keep a good overview and visualise our final goal. But very soon, thanks to the excellent coordination of our captain Niels and his crew, we developed a clear view, a well-considered approach and kept track of our goals. The Danish coordinators and their German deputies facilitated the cooperation with other work packages and project partners, and balanced the necessary freedom of the partners with the decision-making required for progress.

One of our first tasks was to write this country report, which has also formed the foundation of our Meta Knowledge Base.

We started off with a very classical questionnaire, but after intensive brainstorming and an international workshop, we choose a two-step approach that combines this country report with our Meta Knowledge Base.

We want to thank all the national editors for gathering information at the national level. We also have very much appreciated the fruitful discussions with our partners: Elke, Renate, Stefan, Victor, Marcus, Martin, Dominique, Meltem, and many others. We really enjoyed our conversations during meetings, brainstorming sessions and dinners. We hope to have many more in the future.

We are grateful to Niels for his steady leadership and for the good discussions, even when they were happening late at night with an *Absacker* (German for “nightcap”). We also greatly valued Iver’s contribution. His refreshing views led to original solutions and gave us all the courage to try things another way.

Carina, we know it is a huge task to manage all the questions, deadlines, meetings, newsletters and documents. Without your support this project would not be where it is now. Thank you very much. It has been a pleasure to work with the ICT-AGRI team and we strongly hope it will continue its journey long after the ERA-project itself has ended.

Finally, we sincerely thank the people too numerous to mention who contributed or will contribute to our work package. We sincerely look forward to continuing work on this project.

Jürgen, Stephanie and Donald

General introduction

“Coordination of European Research within ICT and Robotics in Agriculture and related Environmental Issues”, ICT-AGRI, is a trans-national network, that aims to foster pan-European collaborations in research and technological development activities related to ICT/Robotics in the area of agriculture and environmental protection. The ICT-AGRI network has five main goals:

1. A comprehensive, publicly accessible **mapping and analysis of existing research and future needs**
2. A widely accepted **Strategic Research Agenda**
3. Two or three successful **calls for transnational projects**
4. **Viable networks** for funders as well as researchers and developers
5. **Supplementary support actions** for coordinated research and development

Knowledge about existing research, national R&D programmes, infrastructures and resources available for ICT and Robotics is a prerequisite towards developing joint research activities.

Therefore, as the first part of the mapping process of ICT-AGRI, this document is the collection of 15 national country reports. Countries that have provided data are: Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Latvia, the Netherlands, Spain, Switzerland, Turkey and United Kingdom.

All country reports have a standard structure. A small introduction explains national funding structures, national motivation and incentives towards European coordination. An overview follows that describes the national funding bodies and their national research programmes within research disciplines covering ICT and Robotics in the agricultural sector. The last chapter provides a list of existing national research institutes within the ICT-AGRI area, including information about research expertises, infrastructures and priorities.

This report will serve as a reference book for researchers, policymakers and other stakeholders. It is our hope that this will become a useful tool to get an overview of the research programmes currently running and a deeper insight into the research founding bodies and structures of the partner countries. It shall also help the reader to find suitable partners for research coordination and cooperation. Based on the descriptions of institutes, expertises, infrastructures and priorities, project consortia can be formed to participate in future calls or non-competitive collaborative actions (e.g. PhD's and post-doctoral research, exchange of hardware resources or researchers, etc...).

The individual country reports within this document were finalised in January 2010. This publication reflects the status quo at that point in time.

In order to identify research gaps and opportunities and develop a common strategic research agenda, information on research projects in the field of ICT-AGRI is currently in the process of being collected.

To meet this goal an internet-based tool has been developed: the so-called “**Meta Knowledge Base**”, located at http://ict-agri.eu/Meta_Knowledge_Base-121.aspx. The Meta Knowledge Base is a tool for gathering knowledge and mapping research, expertise and facilities. All who register their profile in the Meta Knowledge Base can make contact with fellow colleagues throughout Europe, to contribute to the Strategic Research Agenda and to participate in the future ICT-AGRI calls.

We thus encourage our readers to share this report with their colleagues and we invite each of them to enter his/her profile, research or policy area and expertise in the Meta Knowledge Base.

ICT-AGRI is funded by the European Commission's ERA-NET scheme under the 7th Framework Programme for Research.

Further information is available from the ICT-AGRI website: www.ict-agri.eu.

ICT-AGRI Country Report



ICT-AGRI Country Report BELGIUM

Technology and Food Science Unit, Agricultural Engineering research area, Institute for Agricultural and Fisheries Research (ILVO), Burg. Van Gansberghelaan 115, 9280 Merelbeke, Belgium

Authors: Jürgen Vangeyte and Stephanie Van Weyenberg

1. Introduction

Decentralised funding structure:

Within the highly decentralised Belgian research system, the main responsibility for research policy and funding lies with the regions and the communities.

Several governments carry out these tasks with complete autonomy as follows:

- the regions (Flanders, Wallonia, Brussels-Capital: responsible for economic development purposes (technological development and applied research)
- the communities (French-, Flemish- and German-speaking): responsible for education and fundamental research
- the federal state: responsible for research areas requiring homogenous execution at the national level and research in execution of international agreements

Note:

- In Flanders only one authority is responsible for funding research since the region of Flanders and the Flemish community's governments have merged into one.
- Due to its small size, the German-speaking community does not have a research policy.
- Some research institutions have their own research programmes, which they can attributed autonomously (for example, ILVO's PhD grants; University BOF).

National research programmes:

Topics:

Most of the national research programs are competitive funds, meaning that researchers/institutes can apply for all programmes, not only those restricted to ICT and robotics in agriculture. Consequently, all national research programmes may cover all proposed ICT-AGRI research topics and no indication of relevant ICT-AGRI research topics per research programme is given.

Agriculture research (IWT) and doctoral grants (ILVO) are exceptions in the way that these programmes are only open for agriculture-related projects (but not restricted to ICT and robotics).

Towards European Research Area:

National research institutes are encouraged to take part in European research programmes. Participation of SMEs in these international programmes is especially promoted. Besides specific international research programmes, the cooperation with international partners is

encouraged by opening all national (federal) research programmes for participation of research teams of other member states (the rate of funding is sometimes limited to 50%, for example). In addition, a new measure of withholding taxes for private researchers active in cooperative research projects with public research institutions has been granted in the case of partnership with international research institutes.

Some support measures have also been taken at the regional level. For example, within the Strategic Basic Research programme, foreign partners are rewarded up to 20% of the budget; the fund for financing of non-oriented research in universities (BOF) can be used for participation in international research projects.

2. Mapping of national funding bodies

2.1 Department of Economics, Science and Innovation (EWI)

Contact: Vlaamse Overheid, +32 2 553 59 80, info@ewi.vlaanderen.be

2.2 Flemish Ministry of Agriculture

Contact: Landbouw en Visserij, +32 2 552 77 69, communicatie@lv.vlaanderen.be

2.3 Institute for the Promotion of Innovation by Science and Technology in Flanders

Contact: Veerle Lories , +32 2 209 09 00, info@iwt.be

2.4 Institute of Agricultural and Fisheries Research (ILVO)

Contact: Maurice Moens, +32 9 272 25 03, maurice.moens@ilvo.vlaanderen.be

2.5 Scientific Research Foundation - Flanders (FWO)

Contact: Elisabeth Monard , +32 2 550 15 15, post@fwo.be

3. Mapping of national research programmes

3.1 Industrial research and development projects (Onderzoeks- en ontwikkelingsprojecten)

- Owned by:
Department of Economics, Science and Innovation (EWI)
Vlaamse Overheid, +32 2 553 59 80, info@ewi.vlaanderen.be
- Managed by:
Institute for the Promotion of Innovation by Science and Technology in Flanders
Christine De Vos, +32 2 209 09 14, iwt-bedrijfsprojecten@iwt.be
- Website:
www.iwt.be

Brief characterisation:

- Region: Belgium (Flanders)
- Geographic scope: Regional
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Potential

3.2 SME-specific programme (KMO-haalbaarheidsstudie)

- Owned by:
Department of Economics, Science and Innovation (EWI)
Vlaamse Overheid, +32 2 553 59 80, info@ewi.vlaanderen.be
- Managed by:
Institute for the Promotion of Innovation by Science and Technology in Flanders
Luc De Buyser, +32 2 209 09 40, kmo.programma@iwt.be
- Website:
www.iwt.be

Brief characterisation:

- Region: Belgium (Flanders)
- Geographic scope: Regional
- Participation of research institutes: Permitted
- Participation of industry: Required

- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Potential

3.3 SME-specific programme (KMO-innovatieproject)

- Owned by:
Department of Economics, Science and Innovation (EWI)
Vlaamse Overheid, +32 2 553 59 80, info@ewi.vlaanderen.be
- Managed by:
Institute for the Promotion of Innovation by Science and Technology in Flanders
Luc De Buyser, +32 2 209 09 40, kmo.programma@iwt.be
- Website:
www.iwt.be

Brief characterisation:

- Region: Belgium (Flanders)
- Geographic scope: Regional
- Participation of research institutes: Permitted
- Participation of industry: Required
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Potential

3.4 Post-doctoral research fellowship (Onderzoeksmandaten)

- Owned by:
Department of Economics, Science and Innovation (EWI)
Vlaamse Overheid, +32 2 553 59 80, info@ewi.vlaanderen.be
- Managed by:
Institute for the Promotion of Innovation by Science and Technology in Flanders
Veerle Cauwenberg, +32 2 209 29 12, ozm@iwt.be
- Website:
www.iwt.be

Brief characterisation:

- Region: Belgium (Flanders)
- Geographic scope: Regional
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Permitted

- Contribution to ICT-AGRI calls: Potential

3.5 Strategic basis research (Strategische basisonderzoek)

- Owned by:
Department of Economics, Science and Innovation (EWI)
Vlaamse Overheid, +32 2 553 59 80, info@ewi.vlaanderen.be
- Managed by:
Institute for the Promotion of Innovation by Science and Technology in Flanders
Paul Schreurs, +32 2 209 09 45, sbo@iwt.be
- Website:
www.iwt.be

Brief characterisation:

- Region: Belgium (Flanders)
- Geographic scope: Regional
- Participation of research institutes: Required
- Participation of industry: Permitted
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Potential

3.6 Agriculture research (Landbouwonderzoek)

- Owned by:
Department of Economics, Science and Innovation (EWI)
Vlaamse Overheid, +32 2 553 59 80, info@ewi.vlaanderen.be
- Managed by:
Institute for the Promotion of Innovation by Science and Technology in Flanders (IWT)

Ferdi Soors - Fredy Van Wassenhove , +32 2 209 09 16,
landbouwonderzoek@iwt.be
- Website:
www.iwt.be

Brief characterisation:

- Region: Belgium (Flanders)
- Geographic scope: Regional
- Participation of research institutes: Required

- Participation of industry: Required
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Potential

3.7 Strategic research grant (Strategisch onderzoeksbeurs)

- Owned by:
Department of Economics, Science and Innovation (EWI)
Vlaamse Overheid, +32 2 553 59 80, info@ewi.vlaanderen.be
- Managed by:
Institute for the Promotion of Innovation by Science and Technology in Flanders
Michèle Oleo, +32 2 209 09 00, sb-support@iwt.be
- Website:
www.iwt.be

Brief characterisation:

- Region: Belgium (Flanders)
- Geographic scope: Regional
- Participation of research institutes: Required
- Participation of industry: Permitted
- Participation from foreign countries: Unknown
- Contribution to ICT-AGRI calls: Potential

3.8 Pre- and post doctoral grants (Predoctorale mandaten en postdoctorale mandaten)

- Owned by:
Department of Economics, Science and Innovation (EWI)
Vlaamse Overheid, +32 2 553 59 80, info@ewi.vlaanderen.be
- Managed by:
Scientific Research Foundation - Flanders (FWO)
Elisabeth Monard , +32 2 550 15 15, post@fwo.be
- Website:
www.fwo.be

Brief characterisation:

- Region: Belgium (Flanders)

- Geographic scope: Regional
- Participation of research institutes: Unknown
- Participation of industry: Unknown
- Participation from foreign countries: Unknown
- Contribution to ICT-AGRI calls: Potential

Comments:

The FWO is the official government body responsible for the allocation of funds for fundamental research.

The FWO key activities are:

- Support for individual researchers
- Support for research teams
- Promoting national and international scientific mobility
- Participation in European research organizations

3.9 The fund for financing of non-oriented research in universities (Bijzonder onderzoeksfonds)

- Owned by:
Department of Economics, Science and Innovation (EWI)
Vlaamse Overheid, +32 2 553 59 80, info@ewi.vlaanderen.be
- Managed by:
All national universities
One contact person for each university
- Website:
Information available on the university websites

Brief characterisation:

- Region: Belgium (Flanders)
- Geographic scope: Regional
- Participation of research institutes: Required
- Participation of industry: Permitted
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Potential

Comments:

The programme aims to promote fundamental research at universities in the shape of either projects or mandates. The BOF demands no control over the allocation of the grant once it is awarded to the university. Therefore the BOF also fits into the desire of the Innovation Pact to have less administrative friction between application and supply of funds.

3.10 ILVO PhD grants (ILVO-Doctoraatsbeurs)

- Owned by:
Flemish Ministry of Agriculture,
Landbouw en Visserij, +32 2 552 77 69, communicatie@lv.vlaanderen.be
- Managed by:
Institute of Agricultural and Fisheries Research
Maurice Moens, +32 9 272 25 03, maurice.moens@ilvo.vlaanderen.be
- Website:
www.ilvo.vlaanderen.be

Brief characterisation:

- Region: Belgium (Flanders)
- Geographic scope: Regional
- Participation of research institutes: Required
- Participation of industry: Permitted
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Confirmed

4. Mapping of national research institutes

4.1 Applied research centers

Contact:

Els Lapage, +32 2 552 79 07, els.lapage@lv.vlaanderen.be

Research expertise

Topic specific research centers are founded by the Flemish government, with two specific goals:

- offer combined infrastructure to test and evaluate the application of new types, breeds and techniques. Consequently, these research institutes are the final step in the research process.
- form knowledge platforms by integration of all actors working in one area to ensure better cooperation and integration between the several research groups all over Flanders.

List of all official applied research centers in Flanders:

Name	Address	E-mail	Website
Landbouwcentrum aardappelen (LVA) vzw	Karreweg 6, 9770 Kruishoutem +32 9 381 86 86	pca@proefcentrumkruishoutem.be	www.pcainfo.be
Interprovinciaal Proefcentrum voor de Biologische Teelt (PCBT)	Ieperseweg 87, 8800 Roeselare +32 51 27 32 00	Povlt-pcbt@west-vlaanderen.be	www.povlt.be
Landbouwcentrum Bieten-Cichorei (LCBC) vzw	Molenstraat 45, 3300 Tienen +32 16 78 19 40	irbab@irbab.be	www.irbab-kbivb.be
Landbouwcentrum voor Granen, Eiwitrijke Gewassen, Oliehoudende Zaden en Kleine Industriegewassen	Ieperseweg 87, 8800 Roeselare +32 51 27 32 00	povlt@west-vlaanderen.be	www.lcg.be
Landbouwcentrum voor Voedergewassen	Hooibeeksedijk 1, 2440 Geel +32 14 85 27 07	info@hooibeek.provant.be	http://www.provant.be/be_stuur/departementen/wel_zijn_economie_en_/hooibeekhoeve/
Nationale Proeftuin voor Witloof vzw	Blauwe Stap 25, 3020 Herent +32 16 29 01 74	whubrech@vl-brabant.be	www.proeftuinherent.be

Proefcentrum Fruitteelt	Fruittuinweg 1, 3800 Sint-Truiden +32 11 69 70 87	pcf@pcfruit.be	www.pcfruit.be/content/pcfruit/site
Proefbedrijf der Noorderkempen vzw	Voort 71, 2328 Meerle +32 3 315 70 52	info@proefcentrum.be	www.proefcentrum.be
Proefcentrum voor de Champignonenteelt	Ieperseweg 87, 8800 Roeselare +32 51 27 32 00	povlt@west-vlaanderen.be	www.povlt.be
Proefcentrum voor Sierteelt	Schaessestraat 18, 9070 Destelbergen +32 9 353 94 94	info@pcsierteelt.be	www.pcsierteelt.be
Proefstation voor de Groenteteelt vzw	Duffelsesteenweg 101, 2860 Sint-Katelijne-Waver +32 15 30 00 60	info@proefstation.be	www.proefstation.be
Provinciaal Proefcentrum voor de Groenteteelt Oost-Vlaanderen (PCG)	Karreweg 6, 9770 Kruishoutem +32 9 381 86 86	info@proefcentrumkruishoutem.be	www.proefcentrum-kruishoutem.be
Vlaams Centrum voor Bewaring van Tuinbouwproducten (VCBT) vzw	Willem de Croylaan 42, 3001 Heverlee +32 16 32 27 32	ann.schenk@biw.kuleuven.be	www.vcbt.be
West-Vlaamse Proeftuin voor Industriële Groenten vzw	Ieperseweg 87, 8800 Roeselare +32 51 27 32 00	povlt@west-vlaanderen.be	www.povlt.be
Praktijkcentrum Rundvee	Koning Albert II-laan 35, bus 40, 1030 Brussel +32 2 552 79 16	Stijn.windey@lv.vlaanderen.be	http://lv.vlaanderen.be/nl/apps/docs/default.asp?fid=231
Praktijkcentrum Varkens	Koning Albert II-laan 35, bus 40, 1030 Brussel +32 2 552 79 16	Stijn.windey@lv.vlaanderen.be	http://lv.vlaanderen.be/nl/apps/docs/default.asp?fid=231
Praktijkcentrum Pluimvee	Koning Albert II-laan 35, bus 40, 1030 Brussel +32 2 552 79 16	Stijn.windey@lv.vlaanderen.be	http://lv.vlaanderen.be/nl/apps/docs/default.asp?fid=231
Praktijkcentrum Kleine Herkauwers	Koning Albert II-laan 35, bus 40, 1030 Brussel +32 2 552 79 16	Stijn.windey@lv.vlaanderen.be	http://lv.vlaanderen.be/nl/apps/docs/default.asp?fid=231

Praktijkcentrum Bijen	Koning Albert II-laan 35, bus 40, 1030 Brussel +32 2 552 79 16	Stijn.windey@lv.vlaanderen.be	http://lv.vlaanderen.be/nl/apps/docs/default.asp?fid=231
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4.2 Biomaterial science - Devision Mechatronics, Biostatistics and sensors - Katholieke Universiteit Leuven

Contact:

Engelbert Tijskens, +32 16 32 85 95, engelbert.Tijskens@biw.kuleuven.be

Research expertise

The overall aim of this research group is to understand the physical properties of agricultural products (vegetable or animal) and the way these properties change during the entire food production chain. The group has specific expertise on optical, transport, mechanical and thermal properties of biological materials and is investigating tomographical methods to quantitatively describe their microstructure. An important aspect is to construct and validate mathematical models, based on physical and biological basic mechanisms, of the mechanical behaviour of biological materials. A multiscale approach is used, and mechanical properties of biomaterials are characterised at all appropriate length scales (from nano- to macro scale). The coupling of mechanical properties with transport properties and biological processes is a major challenge.

4.3 Biostatistics - Devision Mechatronics, Biostatistics and Sensors - Katholieke Universiteit Leuven

Contact

Bart De Ketelaere, +32 16 32 85 93, Bart.DeKetelaere@biw.kuleuven.be

Research expertise

The increasing complexity of signals measured by sensors, the increasing acquisition frequency and the inherent biological variability of products and processes causes an increasing complexity of the resulting data structures. This research group develops novel advanced techniques for statistical data analysis which account for the particular properties of such datasets and their high dimensionality, such as multivariate statistics for signal analysis (chemometrics) and the analysis of repeated measures or a combination of both. Special emphasis is paid towards a correct description of biological variability. On a larger scale, the integration of different sensors, data acquisition and analysis (multivariate statistical process control) leads to a general concept of chain management and control (traceability, integral chain management) for the optimisation of the logistic chain between producer and consumer.

4.4 Biosystems Dynamics - Division Mechatronics, Biostatistics and Sensors (MeBioS)- Katholieke Universiteit Leuven

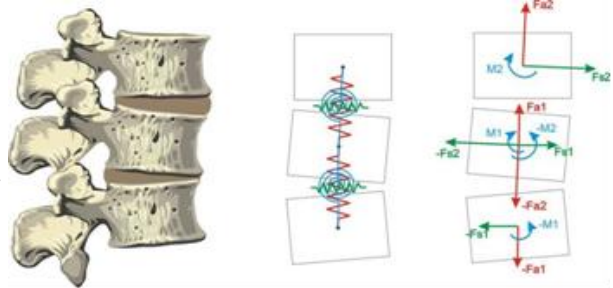
Contact

Herman Ramon, +32 16 32 14 46, Herman.Ramon@biw.kuleuven.be

Research expertise

System dynamics involves a structural way of thinking which unifies different principles and laws from several disciplines. It helps to understand the structure in systems and puts the relation between cause and consequence, mostly supported by a mathematical model. An application of system dynamics is bio-mechatronics, in which biological, mechanical, electrical, pneumatic and hydraulic systems are integrated. In the division, bio-system dynamics is mainly applied to model, analyse and control machines and bio-technical installations. The biological product determines the boundary conditions, e.g. forces which may not be exceeded in order to avoid crop damage, maximal machine motions. Actually, a higher degree of integration of the biological factor is pursued, by incorporating the dynamics of biological processes and transport phenomena in the mathematical model. Research activities are located in the area of system identification, parameter estimation, dynamics and control of non-linear and distributed bio-technical systems.

In the application area “Precision mechanisms, we are involved in the analysis, synthesis and control of the dynamical behaviour of precision mechanisms in biological and biotechnical processes from macro- to micro scale, and the interaction between those mechanisms and their (technical) environment.



This includes:

Development of controllers, precision mechanisms and sensors for precision farming in the primary production, post-harvest technology and food process engineering

Study of the interaction process between machine and living organism

- study of the dynamical behaviour of cellular systems and tissues
- study of the dynamic behaviour of biological products and functional systems in living organisms (human, animal, plant)
- study of the dynamic interaction between those biological products and systems and their technical environment (machines and fine-mechanical parts)

Optimisation of this interaction process in a bio-mechatronic design.

The methodologies we use are applied dynamics (flexible multibody dynamics, granular mechanics, computational dynamics, structural dynamics) and mathematical systems theory (robust linear and nonlinear control system design, optimisation, multiscale techniques).

Our expertise is currently focused on mechatronic engineering of precision mechanisms on machinery for the primary production, post-harvest technology and food process engineering, improvement of human vibration comfort, dynamic modelling of plant and animal soft tissue in a multiscale approach.



Research facilities

Test hall equipped with Stewart-platform (admissible load 1000kg, frequency range 0Hz – 30Hz, maximal displacement 20cm) and four-poster (admissible load 30000kg, frequency range 0Hz – 30Hz, maximal displacement 20cm)

Data acquisition equipment, software

Sensors: tri-axial servo accelerometer, force sensors, tactile films, optical instrumentation (NIR spectrophotometers, high speed camera, infrared camera, laser vibrometer, acoustic sensors, ...)

Research priorities

See research expertise

4.5 Computational Biology - Division Mechatronics, Biostatistics and Sensors - Katholieke Universiteit Leuven

Contact

Nico Scheerlinck, +32 16 32 70 61, Nico.Scheerlinck@cs.kuleuven.be

Research expertise

Today, biosystems are studied in many fields of science and engineering. The major challenge is to understand the fundamental principles that allow complex systems, such as fruits, to operate at scales from molecules within a single cell to the function of an organism. Computational biology claims to give mechanistic interlevel explanations through advanced numerical models, whereas physiology, molecular biology and biochemistry are used to give intralevel explanations.

In our research we consider a biological system as a multi-dimensional landscape where interacting, dynamic processes operate across a range of spatial and temporal scales, from discrete events at the molecular level taking nanoseconds, to a complex network of

physiological processes operating over minutes to years, or even decades.

The goal is to describe fruit growth, respiration, senescence and quality changes at different spatio-temporal scales. Through metabolic profiling and proteomics empirical information is stored and propagated using mathematical models at system-level.

A central issue in our work is the concept of biological variation and how it propagates in time and space.

4.6 Data Quality Management - Measure, Model & Manage Bioresponses (M3-BIORES) - Katholieke Universiteit Leuven

Contact

Eddie Schrevens, +32 16 32 24 20, eddie.schrevens@biw.kuleuven.be

Research expertise

- Mixture systems optimisation
The research group is well-known for its expertise in optimization of nutrient solution composition for hydroponic plant nutritional research and commercial cropping.
- Quality
Important quality determinants for foods products have a visual nature. The research group uses quantitative imaging techniques to measure visual product quality. Product quality parameters, such as colour, size and shape, are extracted from digital images. This results in an objective, quantitative description of visual product quality.
- Information processing
Our group defines 'Information Processing' as the integration of Statistics, Computational Methods and Simulation and System Dynamic methodologies in the context of data-acquisition, management and analysis.
- Modelling production processes and –systems
Starting with models for physiological processes, e.g. photosynthesis, transpiration, ... the interest of the group moved on to simulation of whole plant-climate interactions and recently to production systems modeling.

4.7 Department of Biosystems Engineering - Ghent University

Contact

Jan Pieters, +32 9 264 61 88, jan.pieters@ugent.be

Research expertise

Research within the department always deals with engineering and biosystems. These biosystems can be related to (livestock) animals, plants (incl. biomass), micro-organisms, or man. Engineering aspects include construction, physics, mechanisation and automation. Materials, energy and ergonomical aspects are considered key aspects in our research. Applications in *agriculture* include amongst others: climate control in animal houses and

greenhouses, mechanisation, technical aspects of precision agriculture (e.g. development of on-line measuring systems).

Recently, an important part of the research work is related to design, development, and optimisation of machines used in the *food processing industry*. Actual topics in this domain are improved control of fluidised bed coating of food ingredients via simulations and experimental research, building of thermodynamic models used for pasteurisation of food products (e.g. intact eggs), optimisation of machines for processing meat products, etc.

Applications in the field of *environmental engineering* mainly deal with biomass (incl. organic waste) treatment mostly in relation to *renewable energy*. Current research themes are innovative biomass treatment technologies (such as plasma technology, gasification in supercritical water, pyrolysis, etc.) and optimisation of proven technologies. Another aspect in the field of environmental engineering is the *ventilation* of buildings. Studying air distribution in buildings (inlet devices, ventilation patterns, heat exchange, spreading of pollutants in rooms) contributes to the rational use of energy on the one hand and to the well-being and health of the occupants, on the other hand.

In each of the above mentioned application fields, simulations are often based on Computational Fluid Dynamics (CFD - the numerical simulation of momentum, heat and mass transfer in fluids), which is considered a powerful tool to speed up experimental research and development. Moreover, in the experimental laboratory, lab-scale and pilot-scale experimental set-ups are built for research purposes.

Research facilities

Simulation software: COMSOL, Fluent, TRNSYS

Laboratory for thermo-chemical biomass conversion equipped with a.o. apparatus for pyrolysis, gasification, carbonization and torrefaction.

Research priorities

- Modelling and control of greenhouse microclimate
- Modelling heat and mass transfer in fluidised bed processes
- Computational Fluid Dynamics (CFD) modeling in biosystems applications
- Thermal/Mechanical treatment of organic wastes
- Catalytic fast pyrolysis
- Biochar production
- Torrefaction as a biomass pre-treatment

4.8 Geomatics Engineering Research Group- Division of Monitoring, Modelling and Management of BioResponses – Biosystems Department – Faculty of Bioscience Engineering - Katholieke Universiteit Leuven

Contact

Pol Coppin, +32 16 32 16 22, Pol.Coppin@biw.kuleuven.be

Research expertise

The Geomatics Engineering Research Group focuses on designing earth-observation-technology-based approaches to terrestrial system monitoring and modeling. At present, emphasis lays on the monitoring of the dynamics of vegetative production systems using in-situ, airborne and space-borne sensor data as primary diagnostics. The integrative approach is implemented within different vegetative system management frameworks and at different spatial and temporal scales, e.g., from annual grasslands to perennial orchards, from intensively managed plantations to natural forest ecosystems.

The primary objective of our research group is to develop new methods to extract spatio-temporal information from remotely sensed data on plant production systems so that all processes involved may be better understood and so that management may be optimized towards the relevant management goals within a context of sustainability and durability.

The innovation we strive for has a direct bearing on the quantitative modeling of (i) the interaction between electromagnetic energy and living vegetative systems and (ii) the water-, carbon-, and nitrogen cycles in agricultural, horticultural and forest systems. We tackle this implementing quantitative and statistical/probability-based analysis techniques within a framework that integrates diagnostics obtained from earth observation, virtual 3D modeling (computer graphics), plant-process-modeling, geographical information systems technology (GIS) and data mining procedures.

Our group has a proven track record in spectral data acquisition and analysis, including among others spectral index development, radiative transfer modeling, and time series analysis. In addition, we have acquired a solid reputation in the capture, processing and analysis of structural canopy data, including ground LiDAR operation, laser data visualization, and virtual canopy modeling.

Today, key application areas for our research are:

- *Precision farming*: integration of in situ and hyperspectral remote sensing data for plant production system monitoring, modeling and management.
- *3D Characterisation of canopies*: derivation of structural and other inventory-related parameters in perennial woody vegetation systems (forests, orchards, etc.).
- *Epidemiological monitoring of vegetative habitats in relation to risks to human health*: development of remote-sensing-based techniques to predict the risk for infectious disease outbreak.
- *Sustainable land and ecosystem management*: Spatio-temporal monitoring of vegetation dynamics using satellite time series analysis.

In addition, we provide training in earth observation technology (photogrammetry, aerial photointerpretation, geodesy, mapping, digital image analysis, ground-based data acquisition procedures for spectral, laser and other sensors), in the remote sensing of vegetative systems (interaction of solar energy with vegetative components, response measurement technology, vegetation modeling), and in natural resource inventory (land survey, dendrometry, forest inventory). Most educational activities form part of the bachelor degree in biooscience engineering and of the master degrees in bioscience engineering and in earth observation.

Research facilities

- 1 ASD full-range field spectroradiometer
- 2 SpectraVista full-range field spectroradiometers
- Custom-built fully automated spectrogoniometer
- High resolution ground-based LiDAR (Faro Photon 80) for 3D laser scanning
- LiCor LAI 2000 instrumentation
- Sun photometer

Research priorities

- Hyperspectral, hypertemporal and hyperangular remote sensing of plant production systems
- Quantification of canopy structure using hemispherical imagery & LiDAR systems
- Diagnostic monitoring and modeling of the productivity (inclusive of all impacting factors) in perennial woody plant production systems, mostly in the framework of precision agricultural and horticultural practices
- Terrestrial system carbon sequestration monitoring and modeling
- Coupling remote sensing technology to epidemiological research

4.9 Institute of Agricultural and Fisheries Research (ILVO)

Contact

Lieve Herman, +32 9 272 30 10, lieve.herman@ilvo.vlaanderen.be

Research Expertise

General:

The research focuses on innovative animal and environment-friendly agricultural systems with a high added value for the sector and the society. The core activities of this research are the development and the assessment of novel and existing techniques and their integration into innovative production systems in the framework of a sustainable agriculture and horticulture.

Besides traditional engineering competences (theory of strength of materials, mechanics and electromechanics, pneumatics, hydraulics, measuring and regulation techniques, sensor

techniques, etc.) the research also involves modern mathematical and IT-based techniques such as image processing, data-based modelling, mechanistic modelling (e.g. CFD), CAD design, etc. The section Agricultural Engineering is also equipped with a workshop where new designs of experimental setups and agricultural equipment can be constructed.

Competences:

1. Spray measuring

ILVO's Spray Tech Lab is one of the only BELAC-accredited spray technology laboratories in the world specialised in the characterisation of sprayers and spray nozzles. Apart from the accredited measuring methods, the laboratory possesses a range of measuring and test devices to study and develop various spray application techniques. Recent examples include a PDPA laser-based measuring set-up for the characterisation of spray droplets, a measuring set-up for the evaluation of the spray application of biological plant protection products and a fully automated spray unit. Moreover, the Spray Tech Lab has experience with different types of field experiments like spray drift measurements, deposition tests in different crops, operator exposure measurements, etc.

2. Image and sensor techniques

The section Agricultural Engineering applies image acquisition and image processing to objectively monitor animals, to perform complex biometrical measurements on agricultural materials. The section specializes in downscaling expensive existing techniques like high-speed imaging to low cost solutions effective and affordable for farming practice and SME's. The same approach is used for other sensor techniques where the focus lies on pressure measurements. Relevant examples are pressure assessment in silos, a tool for cattle gate analyzing to predict lameness, an instrumented lab set-up for mechanical testing of claw-floor interactions and a model to predict mechanical damage in potato harvesting and a prototype to measure 3D form of teats of dairy cattle. Recently a study into the use of RFID techniques has started to further extend the existing expertise.

3. Indoor air quality and emission measurements

This topic regards the automated measurement of gasses (NH_3 , CO_2 , CH_4 , N_2O) and particulate matter in agricultural buildings. The monitoring of the indoor climate is used to assess the impact on the farmer's health and on animal production. Emission measurements are performed to assess emission factors in relation to environmental issues. These measurements are also used to evaluate climate control techniques (e.g. fogging, precipitation) and emission reduction techniques (e.g. air scrubbers).

4. Dedicated CFD techniques

The quantity and quality of air flows in and around agricultural buildings is of major importance to both the indoor air quality and the impact on the environment (emissions). Dedicated CFD techniques are used to better understand these mechanisms and to optimize our measurement strategies. These CFD techniques also provide an objective assessment tool to evaluate specific building and ventilation types.

5. Energy measurements

Current research focuses on the energy consumption of the ventilation process in the intensive livestock farming. Long-term and short-term energy measurements are performed and related to ventilation systems, climate computer settings, maintenance, and so forth. Calculation models are developed for the energy consumption of ventilation processes or diesel engines. With respect to renewable, different valorisation trajectories are explored for either new generation plants for biomass or rest fractions of agricultural material.

6. Prototypes development

In close cooperation with SME's the section agricultural engineering designs small prototypes for applications in special niche segments of agricultural production such as biological flower, chicory, and pumpkin production

Research facilities

1. Spray Tech Lab

2. Mobile Unit for Emission Measurements

This unit is used for indoor air quality and emission measurements in real live buildings. The unit is equipped with fully automated measurement systems for gasses (NH₃, CO₂, CH₄, N₂O) and particulate matter.

3. Emission Lab (EMIL)

A real scale manure pit is equipped with sensors and a conditioned wind tunnel system to perform emission experiments with both calibrated solutions or gasses and manure. EMIL allows in depth research of emission mechanisms in the pit headspace zone for naturally ventilated buildings.

4. Cameras for high-speed , high resolution, thermal and multispectral images

5. Gate and stance analysis system on the experimental farm of the ILVO animal science unit

6. An instrumented lab set-up for mechanical testing of friction, form stability, wear and claw-floor interactions

Appropriate flooring is required to prevent claw problems or even lameness in livestock farming. Friction tests are carried out with an instrumented lab set-up to judge various floors. Floor and rubber mat wearing tests are additionally performed.

7. 3D-measuring device for teat-dimensions and characteristics (discoloration, teat end collosity) for the selection of optimal liners

8. Measurement panel to determine the loads exerted on vertical walls (f.e. by forage and vehicles on the bunker silo walls)

9. Set-up for measuring fertilizer spread patterns

10. Mechanical workshop

Research Priorities

1. Spray Application Technology

- Spray drift and drift reducing techniques
- Greenhouse spray applications
- Operator exposure
- Spray nozzle characterisation
- Crop deposition and penetration
- Optimisation of the spray application of biological plant protection products

2. Precision Lifestock farming

- Milking techniques
- Gait and stance analyses of farm animals and automatic lameness detection
- Continuous and automatic monitoring of individual behaviour, location and characteristics of livestock (body condition score, cleanliness, ...)
- The relation between udderhealth, teatdimensions, milkquality and environment
- Optimisation of interaction between livestock and their environment
- Integration of new techniques in experimental and field conditions
- Measurements of hygiene and other characteritsics of stable surfaces and bedding material

3. Environmental Technology

- Indoor concentrations and emissions of gasses and particulate matter (PM) in mechanically ventilated buildings
- Air flows and emissions from natural ventilated buildings
- Emission reduction strategies and techniques
- Modelling emissions for inventory purposes
- Energy efficiency of ventilation systems and greenhouses

4. Precision farming

- Design of small harvesting machinery
- Fertiliser spread pattern analysis

4.10 M3-BIORES: Measure, Model & Manage Bioresponses - Division of Monitoring, Modelling and Management of BioResponses – Biosystems Department – Katholieke Universiteit Leuven

Contact

Daniel Berckmans, +32 16 32 14 36, daniel.berckmans@biw.kuleuven.be

Research expertise

Measure, Model & Manage Bioresponses (M3-BIORES), the former Laboratory for Agricultural Buildings Research belongs to the Katholieke Universiteit Leuven (° 1425). With a staff of about 20 enthusiastic people it is one of the biggest scientific groups worldwide working in the field of integration of biological responses in the monitoring and control of living organisms (humans, animals, plants).

The main focus of research is to integrate the dynamic responses of living organisms in the monitoring and control of biological processes. Our objective is to measure continuously in an on-line way the responses of living organisms to their varying individual micro-environment. Next we want to predict the dynamic time-varying responses of living organisms in order to monitor and control their well being, their health and performances. At the same time the micro-environment around the living organisms is controlled. We do this for humans (athletes, drivers in a car, workers in a factory, etc.), animals (pigs, chicken, cows, horses, etc.) and plants.

Research facilities

- Measurements of ammonia concentrations of agricultural constructions
- Image analysis
- Respiration chamber to measure heat production
- New lab test room
- Equipment for the dynamic modelling of the growth rate of broilers
- Test installation on dynamic heat and moisture production
- Scale test room to study 3D air flow patterns
- Environmental and Bioprocess Control by On-Line Adaptive Modelling of the Plant
- Responses on variations of the microclimate
- Driving Simulator
- Fan test rig
- Image analysis of animals
- Test room to quantify air flow
- Comfort of cyclists
- Response measurements on pigs

4.11 MeBioS Biosensor group - Devision Mechatronics, Biostatistics and Sensors - Katholieke Universiteit Leuven

Contact

Jeroen Lammertyn, +32 16 32 14 59, jeroen.lammertyn@biw.kuleuven.be

Research expertise

The fundamental research activities are framed in the supradisciplinary field of bionanotechnology and focus on development of novel bio-molecular detection concepts for integration in miniaturised analysis systems. The applications span a broad range of sectors

including food quality and safety, medical, veterinary and environmental diagnostics.

The Biosensors group is associated to the K.U.Leuven Nanocenter and Leuven Materials Research Center.

Research facilities

Equipment used at MeBioS Biosensor group:

- Capillary electrophoresis
- Automated Liquid Handling System
- Inverted Fluorescence Microscope
- Multiscan Spectrophotometer for Microtiterplates
- FTIR

Research priorities

Because the MeBios biosensor group closely follows the emerging field of biosensing, we're active in different subdomains. What follows is an overview of our main research topics:

- Aptamers
- Enzymatic assays
- Nanoparticles
- Biomimetics
- Micro- and nanofluidics
- Fiber optic SPR biosensors

4.12 Soil erosion and soil conservation - Department of Biosystems Engineering - Ghent University

Contact

Donald Gabriels, +32 9 264 60 50, Donald.Gabriels@UGent.be

Research expertise

Within the research group soil erosion and soil conservation research is conducted on the various aspects of erosion by wind and water. Particular attention is given to mapping of potential and actual water and wind erosion risk zones in various agroclimatological regions, the study of various erosion factors through laboratory experiments (wind tunnel and rainfall simulator) or on experimental plots under natural or simulated rain, the evaluation of tillage and structural practices to reduce water and wind erosion and its downstream/leeward effects, the combined effect of wind and rain on degradation of soils, and the assessment of emission and immission of fugitive dust and dust fall out mainly originating from diffuse sources.

Research facilities

Research facilities (instruments):

- a lab rainfall simulator
- a field rainfall simulator
- a wind tunnel with build-in rainfall simulator, peripheral equipment

4.13 Soil fertility and nutrient management - Department of Soil Management - Ghent University

Contact

Stefaan De Neve, +32 9 264 60 61, Stefaan.deneve@ugent.be

Research expertise

Within the research group soil fertility and nutrient management research is conducted on the dynamics of nutrients in the soil. Particular attention is given to modelling of soil processes as carbon and nitrogen transformation, the environmental hazard of fertilisation and the associated fertilisation research, the dynamics and sequestration of organic material in soils, the assessment of nutrient losses, the elaboration of nutrient balances, and the nutrient and organic matter dynamics in alternative farming systems such as organic farming, conservation agriculture and precision agriculture.

Research facilities

Continuous flow auto-analyser (Chemlab System 4, Skalar, The Netherlands)
The continuous flow auto-analyser is used to determine the NH_4^+ and NO_3^- concentration in KCl or water extracts. The ammonium determination is based on the modified Berthelot reaction. Ammonia is chlorinated to monochloramine which reacts with salicylate to 5-aminosalicylate. After oxidation and oxidative coupling a green coloured complex is formed. The absorption of the formed complex is measured at 660 nm. The automated procedure for the determination of nitrate + nitrite is based on the enzymatic reduction method. The nitrate in the sample is reduced to nitrite by nitrate reductase from intact E. Coli cells. The nitrite (organically present plus the reduced nitrate) is determined by diazotising with sulphanilamide and coupling with a-naphthyl ethylenediamine dihydrochloride to form a highly coloured azo dye which is measured at 540 nm.

4.14 Soil physics - Department of Soil Management - Ghent University

Contact

Wim Cornelis, +32 9 264 60 40, wim.cornelis@ugent.be

Research expertise

Within the research group soil physics the research is oriented towards the physical processes that occur in the unsaturated (vadose) zone of the soil and their interaction with the atmosphere and the groundwater table. Particular attention is given to measuring and estimating soil-hydraulic properties (including pedotransfer functions), modelling of water and

solute transport (salt, contaminants, ...) in flat and hilly areas, the study of the soil-water balance of various crops in different agroclimatological regions, the efficient use of water under various irrigation techniques, the optimisation of water harvesting techniques, the structural behaviour of soils (sodicity, swelling and shrinkage, ...), the effect of various tillage practices on the hydrophysical properties of soils, the characterisation of organic and non-organic substrates and hydrogels for horticultural applications, and the evaluation of various indicators associated with desertification.

Research facilities

Instrumentation for hydrophysical soil characterisation in the lab and in the field:

- Texture analysis (sieving-pipette method) (Eijkelkamp Agrisearch Equipment)
- COLE-index - Linear extensibility
- Particle density: pycnometer method
- Bulk density
- Core method (Eijkelkamp Agrisearch Equipment)
- Excavation
- Clod method
- Gamma ray spectrometer (CPN)
- Soil-water content
- Gravimetry with oven-drying
- Neutron probe (Nucletronics)
- TDR (Campbell Scientific)
- TRIME TDR (Imko)
- Pressure potential: tensiometers with various manometers/gauges
- Mercury manometer (SDEC France)
- Dial of Bourdon gauge (Soilmoisture Equipment)
- Needle pressure transducer (Soil Measurement Systems - SDEC France)
- Soil-Water Retention Curve
- Tension Tables (Eijkelkamp Agrisearch Equipment)
- Pressure Chambers (Soilmoisture Equipment)
- Determination of parameters of various analytical expressions can be conducted on demand. The test can be performed on contaminated soil.
- Saturated hydraulic conductivity
- Constant head permeameter (Eijkelkamp Agrisearch Equipment)
- Double-ring infiltrometer (Eijkelkamp Agrisearch Equipment)
- Well or Guelph permeameter (Soilmoisture Equipment)
- Pressure infiltrometer (Soilmoisture Equipment)
- Tension infiltrometer (Soilmoisture Equipment)
- Unsaturated hydraulic conductivity
- Wind method (SDEC France + Campbell Scientific))

- Internal drainage + inverse method using Hydrus software
- Soil shrinkage characteristic
- Balloon method
- Clod method
- Specific surface area: Area meter (Ströhlein)
- Penetration resistance
- Lab penetrometer (J.J. Lloyd Instruments)
- Penetrologger (Eijkelkamp Agrisearch Equipment)

4.15 VITO: Vision on Technology

Contact

Jan Bronders, jan.bronders@vito.be

Piet Seuntjens, piet.seuntjens@vito.be

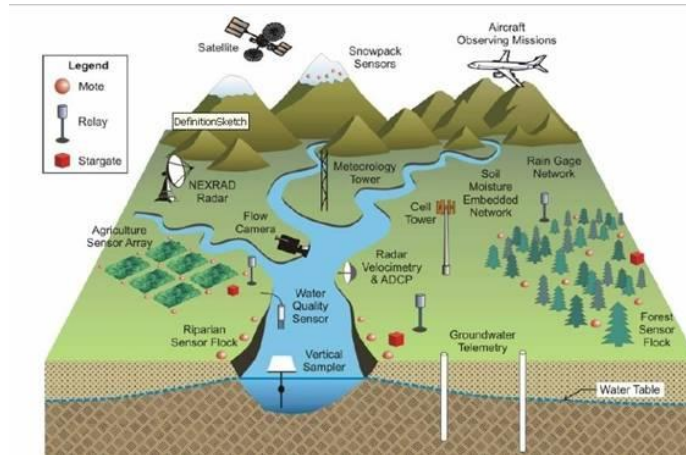
Research expertise

Sensor technology for agricultural management

VITO develops sensor technology for various applications of environmental monitoring. These sensors, mounted on a (possibly mobile) instrument platform, may all be part of a larger (GIS) data network or may in certain applications be related to remote sensing images. Specifically for agricultural applications VITO develops integrated sensor technology that measures changes in water quality, soil moisture, water potential, surface and subsurface drainage and infiltration fluxes.

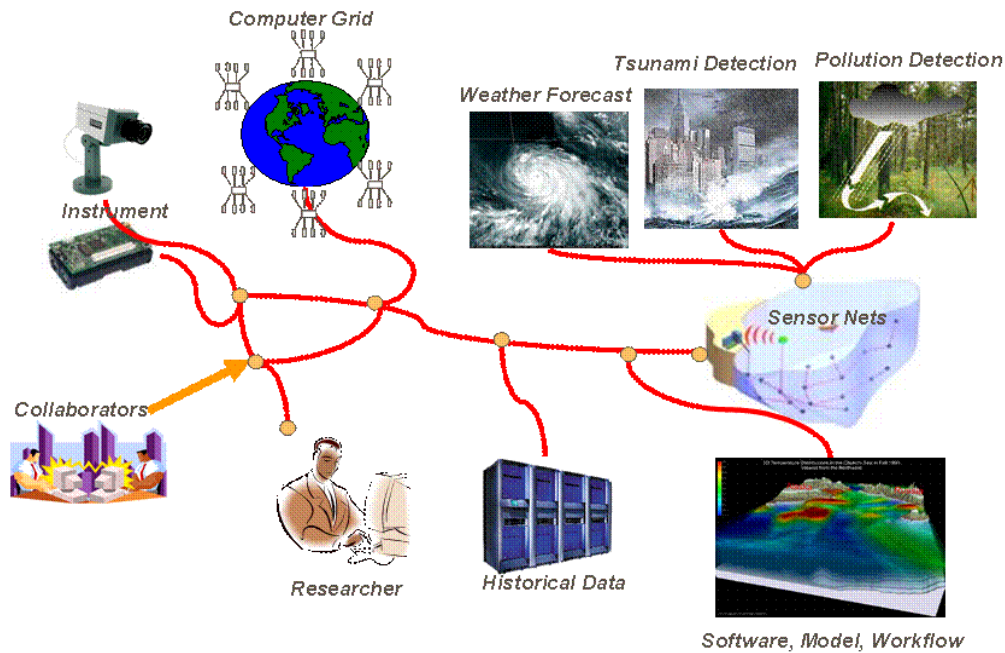
Specific software for reading and models for processing large data sets into useful information can be provided above. Our web application generates (near) real-time time series the hydrological soil parameters for an agricultural area.

The sensors, software, models are offered separately or integrated as a (web) service in applications of water and soil monitoring, quality control, irrigation, notifications (alerts) and evaluating the impact of treatment technologies and climate change on the soil and water system.



Research facilities

- Sensors:
 - Nitrate, ammonium, chlorides, pH, conductivity, DOC,...
 - Soil moisture, tensiometers, flux meters, erosion en surface runoff (collaboration with Department of Soil Management Ghent University)
- Sensor web applications
- Dataloggers, wireless communication with autonomous power supply
- Geospatial databases: postgis and geo server
 - <http://rma.vgt.vito.be/verkenner/verkenning.jsf>
- Geodata center together with Remote Sensing Unit
 - <http://www.vito.be/VITO/EN/HomepageAdmin/Home/WetenschappelijkOnderzoek/Aardobservatie/>
- Modelling: hard en software
 - Soil - groundwater and surface watermodelling
 - Agricultural management: nutrients, agricultural chemicals



Research priorities

- Climate change and agriculture
- Sensors for water
- Hydrology and climate change

<http://www.vito.be/VITO/EN/HomepageAdmin/Home/WetenschappelijkOnderzoek/RuimtelijkeMilieuaspecten/>

4.16 Soil spatial inventory techniques - Department of Soil Management - Ghent University

Contact

Marc Van Meirvenne, +32 9 264 60 56, Marc.VanMeirvenne@UGent.be

Research expertise

The 'Research Group Soil Spatial Inventory Techniques' focuses on the soil-related applications of Geographical Information Science. The need for these applications arises from the fact that soil is a medium which is very difficult to observe directly. Without entering into it we can 'see' only its surface, and even this is only possible when there is no vegetative cover. So, since soil represents a volume that is continuously varying in 3D, its multivariate nature is extremely difficult to inventory. Specialized and advanced techniques are needed to perform this task in a reliable way so that management decisions can be supported. Fulfilling this objective is the mission of our research group.

Research facilities

- GIS infrastructure
- Geostatistical software

- Proximal soil sensing equipment based on electromagnetic induction. Available soil sensors: EM38, EM38DD, EM38MK2, DUALEM 21S
- Soil science laboratory

Research priorities

Improving soil inventory techniques using :

- secondary information sources like soil sensors, yield data, elevation data,...
- geostatistical interpolation methods (incl. multiple-point geostatistics)

Application domains:

- soil pollution mapping
- precision agriculture
- archaeological prospection
- metal detection in soil

4.17 Transport phenomena - Division Mechatronics, Biostatistics and Sensors - Katholieke Universiteit Leuven

Contact

Pieter Verboven, +32 16 32 14 53 , Pieter.Verboven@biw.kuleuven.be

Research expertise

Agro-food production requires physical processing in all steps of the production chain, from spray applications on the field to heating in the household oven. To achieve optimal product quality while minimizing losses, energy consumption and environmental impact, these processes –by existing as well as emerging and novel methods- must be understood, optimized and controlled. Agro-food processes involve transport phenomena such as flows of gasses, liquids, droplets or particles, as well as heat and mass transfer between the biological product and its processing environment. Furthermore, biological and biochemical processes in the product are strongly coupled to the physical process.

The research group develops model-based design tools to investigate, design and optimize agrofood processes by means of a wide range of physical modelling techniques using Finite Element Analysis and Computational Fluid Dynamics. Fundamental research areas are multiphase fluid-particle/droplet flows in complex structures such as plants and bulks, porous media mass transfer, convection-diffusion-reaction modeling, micro- and nanofluidics and multiphysics. Emphasis is put on modelling of processes at different spatial scales (multiscale modelling), taking into account nano- and microstructural properties of products in process design. Microstructure imaging methods and microscale models are thereto developed. Applications cover the entire agrofood chain, including the design and optimization of agricultural machinery, storage facilities, processing appliances and diagnostic devices. The group also has expertise in the required measurement techniques for fluid flow, heat and mass transfer in processing equipment and products. Technology transfer of fundamental and applied research occurs through the platform CADcracker

(www.cadcracker.be), by means of bilateral research and technology development with industrial partners.

Research facilities

- FEA software
- CFD software
- High performance computing cluster
- CA containers and ULO rooms
- Thermometry and velocimetry equipment
- Diffusion cells for mass transfer analysis
- Water activity meter
- 2 microCG

Research priorities

- Micro- en nanofluidics
- Microstructure imaging methods
- Multiscale modeling of heat, gas and water exchange in agrofood products
- Fluid flow, heat and mass transfer in systems for agrofood production, storage and processing
- Spray technology
- Refrigeration technology
- Thermal processing technology

4.18 Other Universities working in the field of ICT and Robotica (less agriculture related)

1. University of Antwerp - Department of Bioengineering

- Applied Biological Sciences
www.ua.ac.be/main.aspx?c=*TBW&n=15247
Contact: Luc D'Haese, + 32 3 265 32 85, luc.dhaese@ua.ac.be
- Sustainable energy and air purification
www.ua.ac.be/main.aspx?c=*TBW&n=79979
Contact: silvia lenaerts, +32 3 265 36 84, silvia.lenaerts@ua.ac.be

2. Vrije Universiteit Brussel - Faculty of Science - Computational Modeling Group

<http://como.vub.ac.be>
Contact: Ann Nowé, + 32 2 629 38 61, ann.nowe@vub.ac.be

Research expertise:

The Computational Modeling (COMO) Lab has 10+ years of experience in the fields of machine learning, data mining, optimization and control. Its core skills are the design and implementation of learning algorithms for distributed and complex dynamic systems. The group is involved in a wide range of applied projects, including process optimization in the industry, logistics, bioinformatics, robotics and networking systems.

The group recently started expanding its research in the domains of distributed wireless sensing systems, and actively collaborates in this domain with several other research units at the VUB and ULB universities. In particular, the group is involved in urban acoustic monitoring with ETRO (informatics and electronics - VUB), in greenhouse monitoring with PLAN (Research Group on Plant Genetics – VUB) and in cattle monitoring with USE (Unit of Social Ecology – ULB).

Research facilities:

One hundred state-of-the art environmental wireless sensor nodes (Zigbee Tmote Sky climatic sensor platforms), 3 Khepera mobile robots.

Research priorities

- Machine learning
- Data mining
- Wireless sensor networks
- Robot planning and control
- Graph optimization

3. Vrije Universiteit Brussel - Faculty of Engineering Science

- Department of Electronics and Informatics

<http://www.etro.vub.ac.be/>

Contact: Johan Stiens, +32 2 6292397, jstiens@etro.vub.ac.be

Research expertise:

- Contact-free non-destructive measurements of material properties including: dielectric response, density, humidity concentrations,...by means of millimeter waves and THz waves, i.e. electromagnetic waves in the frequency range 30 to 3000 GHz. We have been characterizing fluids, solids, vapours, mixtures, evaporation processes, melting, baking, freezing processes, monitoring humidity levels, ...Due to the high frequency range, the image or sensor resolution of these sensors is much smaller than for microwaves. Resolution is inversely related to the frequency, hence for 100 GHz signals, image resolution of 1.5 mm can be reached, for 1000 GHz, 0.15 mm. The depth resolution can be more advanced. Today we reached already micrometer scale resolution in the depth at 100 GHz.

- Already 1 research project running in the food sector
- One strategic project as recently been submitted (with the ETRO as coordinator) in Flanders whereby the food sector is involved; at this very moment the project is under review

Research facilities

- Quasi-optical free-space network analyzer operating today in the 40-660 GHz range, will be upgraded in the future to 2000 GHz = 2 THz
- Also reflection-transmission sensors operating in the 75-110 GHz range now available

Research priorities

- Research work is ongoing related to the determination of dielectric material properties of all kind of materials, objects in the frequency range 75 – 260 GHz
- Development work is now ongoing to make tiny integrated electronic circuit sensors operating in the 60 to 180 GHz range
- Material characterisation above 260 GHz will start soon

Department of Mechanical Engineering - Robotics and MultiBody Mechanics

http://mech.vub.ac.be/multibody_mechanics.htm

Contact: Dirk Lefeber, + 32 2 629 28 64, dlefeber@vub.ac.be

Research expertise:

The R&MM research group is particularly interested in the design of lightweight actuators and actuators with adaptable compliance. They developed the Pleated Pneumatic Artificial Muscle and adaptable compliant actuator called MACCEPA. These types of actuators are especially suitable for applications involving energy efficient locomotion and safety in physical human-robot interactions. The group has integrated its actuators in different robots to test their applicability amongst which the bipedal walking robots (Lucy and Veronica) and has started projects for rehabilitation (FP7 VIATORS-project, the exoskeleton Altacro, ankle-foot prosthesis IPPAM and AMPfoot and an elbow orthosis). Safety is studied using the robot manipulator Softarm. One of the latest projects, focusing on the study of cognitive human-robot interaction, is the robot platform Probo which can express different emotions. The group also develops a robot manipulator that will be used in the new generation reactor vessels cooled by liquid Pb-Bi.

Research facilities

- Different in house build robot platforms: Biped Lucy and Veronica, exoskeleton ALTACRO, ankle-foot prosthesis IPPAM and AMPfoot, robot manipulator Softarm, HRI robot platform Probo,...

- Machine shop with CNC milling machine, 3D ABS printer,...
- Measurement equipment like oscilloscopes,...

Research priorities

- Variable impedance actuators for energy efficiency and safety
- Rehabilitation robotics
- Physical and cognitive human-robot interaction
- Legged locomotion
- Humanoids

4. Universiteit Hasselt - Faculty of Sciences - Databases and Theoretical Computer Science

Contact: Marc Gyssens, +32 11 26 82 48, marc.gyssens@uhasselt.be

5. Campus Kortrijk of K. University of Leuven

▪ Distributed decision support

www.kuleuven-kortrijk.be/nl/Onderzoek/Wetenschappen/Informatica

Contact: Patrick De Causmaecker, +32 56 28 28 73,
Patrick.DeCausmaecker@kuleuven-kortrijk.be

ICT-AGRI Country Report



ICT-AGRI Country Report DENMARK

*Ministry of Food, Agriculture and Fisheries Research Division, Danish Food Industry Agency,
Nyropsgade 30, 1780 Copenhagen, Denmark*

Authors: Carina Madsen and Iver Thysen

1. Introduction

Research in Denmark is primarily funded by the Ministry of Science, Technology and Innovation. Research programmes and calls are managed by research councils and foundations with varying degree of autonomy. Research programmes are usually targeted towards important issues in society and business, and calls are usually aiming quite broad in terms of scientific disciplines. Over the last decade, the Danish government has stimulated innovation and collaboration between industry and public research through specific research programmes.

The sector ministries provide some funding of research specifically for their resort. The Ministry of Food, Agriculture and Fisheries has its own research programme with annual calls, and it has also an innovation programme targeted for agro-business. The Ministry of Food, Agriculture and Fisheries is administrating various levies on agricultural products; the income from these levies is returned to agriculture, partly to agricultural research, development and innovation.

Research in ICT and robotics in agriculture and environment is as a rule funded from programmes with much broader call topics. Funding is achieved by the expected contribution of ICT and robotics to the society goals or business goals of the research programme or by the scientific value of the proposed methods within ICT and robotics. The only research programme specifically for ICT and robotics in agriculture is a research call from Ministry of Food, Agriculture and Fisheries from 2006.

2. Mapping of national funding bodies

2.1 The Ministry of Science, Technology and Innovation

The Ministry of Science, Technology and Innovation is the primary research funding authority in Denmark. The Danish Agency for Science, Technology and Innovation serves and oversees a wide range of independent councils, commissions and committees which support and advise on research and innovation. For full information see the agency's homepage at <http://en.fi.dk/>.

2.2 The Ministry of Food, Agriculture and Fisheries

The Ministry of Food, Agriculture and Fisheries is funding research specifically for food, agriculture and fisheries. The ministry is administrating various levies on agricultural products; the income from these levies is returned to agriculture, partly to agricultural research, development and innovation. See the ministry's homepage at <http://www.fvm.dk/>.

2.3 The Ministry of the Environment

The Ministry of the Environment is funding research specifically for reducing the negative effects of pesticides based on levies on pesticide products. ICT and robotics are in some cases included in projects being funded.

3. Mapping of national research programmes

This section includes research programmes having funded projects within the ICT-AGRI research area during the last five years.

3.1 Innovation Consortia (Innovationskonsortier)

- Owned by:
The Danish Council for Technology and Innovation, Ministry of Science,
Technology and Innovation, Mette Lerdorf, 3392 9913, mele@fi.dk
- Managed by:
The Danish Council for Technology and Innovation, Ministry of Science,
Technology and Innovation, Mette Lerdorf, 3392 9913, mele@fi.dk
- Website:
www.fi.dk/raad-og-udvalg/raadet-for-teknologi-og-innovation

Relevant ICT-AGRI topics:

- ICT applications
- Automation of machinery / equipment
- Standardisation of data dictionaries and communication

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Permitted
- Participation of industry: Required
- Participation from foreign countries: Unknown
- Contribution to ICT-AGRI calls: Potential

Comments:

The programme is specifically aiming at stimulating innovation and collaboration between public research and industry.

3.2 Technological Networks (Højteknologiske netværk)

- Owned by:
The Danish Council for Technology and Innovation, Ministry of Science,
Technology and Innovation, Mette Lerdorf, 3392 9913, mele@fi.dk
- Managed by:
The Danish Council for Technology and Innovation, Ministry of Science,
Technology and Innovation, Mette Lerdorf, 3392 9913, mele@fi.dk

- Website:

www.fi.dk/raad-og-udvalg/raadet-for-teknologi-og-innovation

Relevant ICT-AGRI topics:

- ICT applications
- Automation of machinery / equipment

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Unknown
- Contribution to ICT-AGRI calls: No

Comments:

The programme is specifically aiming at stimulating innovation and collaboration between public research and industry.

3.3 Advanced Technology Projects (Højteknologiske projekter)

- Owned by:

Danish National Advanced Technology Foundation, Ministry of Science,
Technology and Innovation, Thomas Bjerre, 3363 7285,
tb@hoejteknologifonden.dk

- Managed by:

Danish National Advanced Technology Foundation, Ministry of Science,
Technology and Innovation, Thomas Bjerre, 3363 7285,
tb@hoejteknologifonden.dk

- Website:

www.hoejteknologifonden.dk

Relevant ICT-AGRI topics:

- ICT applications
- Automation of machinery / equipment

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: No

Comments:

The programme is specifically aiming at stimulating innovation and collaboration between public research and industry. Expected market value is an important criterion in the selection of projects.

3.4 The Food Research Programme (Fødevareforskningsprogrammet)

- Owned by:
Food Industry Agency, Ministry of Food, Agriculture and Fisheries, Conny Wang Hansen, 3395 8314, cowh@dfre.dk
- Managed by:
Food Industry Agency, Ministry of Food, Agriculture and Fisheries, Conny Wang Hansen, 3395 8314, cowh@dfre.dk
- Website:
ferv.fvm.dk/Fødevareforskningsprogram_2009.aspx?ID=52762

Relevant ICT-AGRI topics:

- ICT applications

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Permitted
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Yes

Comments:

Annual calls.

3.5 Innovation in Danish Food Industry (Innovationsloven)

- Owned by:
Danish Food Industry Agency, Ministry of Food, Agriculture and Fisheries, Anne Svendsen, 3395 8317, udviklingsstotte@ferv.dk
- Managed by:
Danish Food Industry Agency, Ministry of Food, Agriculture and Fisheries, Anne Svendsen, 3395 8317, udviklingsstotte@ferv.dk
- Website:
ferv.fvm.dk/Innovationsloven.aspx?ID=29675

Relevant ICT-AGRI topics:

- ICT applications
- Automation of machinery / equipment

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Permitted
- Participation of industry: Required
- Participation from foreign countries: Unknown
- Contribution to ICT-AGRI calls: No

Comments:

Dedicated to innovation in Danish food industry, including ICT and robotics.

3.6 Rural Development Programme (Landdistriktprogrammet)

- Owned by:
Danish Food Industry Agency, Ministry of Food, Agriculture and Fisheries, Rita Munk, 3395 8989, netvaerkscenter@dffe.dk
- Managed by:
Danish Food Industry Agency, Ministry of Food, Agriculture and Fisheries, Rita Munk, 3395 8989, netvaerkscenter@dffe.dk
- Website:
www.landdistriktsprogram.dk/Rural_development_Programme.aspx?ID=42277

Relevant ICT-AGRI topics:

- ICT applications
- Automation of machinery / equipment

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Permitted
- Participation of industry: Required
- Participation from foreign countries: Not required
- Contribution to ICT-AGRI calls: No

3.7 Tax and Production Levy Fonds (Promille- og produktionsafgiftsfondene)

- Owned by:

Danish Food Industry Agency, Ministry of Food, Agriculture and Fisheries, Lars Kolze, 3395 8000, juridisk@dffe.dk
- Managed by:

Danish Food Industry Agency, Ministry of Food, Agriculture and Fisheries, Lars Kolze, 3395 8000, juridisk@dffe.dk
- Website:

ferv.fvm.dk/Fonde.aspx?ID=13511

Relevant ICT-AGRI topics:

- ICT applications

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Permitted
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: No

Comments:

Income from tax on agricultural land and production levies are returned to agriculture, including support of the agricultural advisory services. This accounts for a part of the research and development of ICT for agriculture in Denmark.

3.8 Pesticide Research (Miljøstyrelsens program for Bekæmpelses middelforskning)

- Owned by:

Danish Environmental Protection Agency, Danish Ministry of the Environment, Jørn Kirkegaard, 7254 4174, jki@mst.dk
- Managed by:

Danish Environmental Protection Agency, Danish Ministry of the Environment, Jørn Kirkegaard, 7254 4174, jki@mst.dk
- Website:

www.mst.dk/Bekaempelsesmidler/Pesticider/Forskning/

Relevant ICT-AGRI topics:

- ICT applications

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Permitted
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: No

Comments:

Funding is based on a levy on pesticides and used to reduce the negative impacts of pesticides on the environment, including projects on decision support systems.

3.9 Regional ICT Efforts (Regional IKT Satsning)

- Owned by:
The Danish Council for Technology and Innovation, Ministry of Science,
Technology and Innovation, Peter Holsøe, pho@fi.dk
- Managed by:
The Danish Council for Technology and Innovation, Ministry of Science,
Technology and Innovation, Peter Holsøe, pho@fi.dk
- Website:
www.jylland-fyn.dk

Relevant ICT-AGRI topics:

- ICT applications
- Automation of machinery / equipment

Brief characterisation:

- Region: Jutland, Funen
- Geographic scope: Regional
- Participation of research institutes: Permitted
- Participation of industry: Required
- Participation from foreign countries: Not possible
- Contribution to ICT-AGRI calls: No

Comments:

A temporary programme dedicated to support ICT research and development outside Copenhagen.

Mapping of national research institutes

4.1 Aarhus School of Engineering

Contact

Thomas Skjødeberg Toftegaard, tst@iha.dk

Research expertise

Aarhus School of Engineering (ASE) is a joint partnership between Aarhus University (AU, www.au.dk) through its Faculty of Natural Sciences and the Engineering College of Aarhus (IHA, www.iha.dk). ASE represents all engineering studies in Aarhus, bachelor as well as master studies and associated PhD programs within the engineering sciences.

The engineering studies include major technical fields with associated research and development. This full spectrum of ASE activities is actively engaged in industrial collaborations, participate in national research and development collaborative actions and engage itself vigorously in international partnerships.

Activities are located in several venues, among them the Engineering College at Dalgas Avenue 2, Dalgas Avenue 4 and at the AU campus all of them 8000 Aarhus C.

At the Engineering College the project IIOSS was started in September 2008. The project will finish in august 2010.

IIOSS is an acronym for “Intelligent Identifikation og Overvaagning af Slagtesvin og Soeer” in Danish, ”Intelligent Identification and Observation of Slaughter Pigs and Sows” in English. The goal of the project is to use high end pervasive and mobile technologies to help the farmer to identify and observe animals in modern pig-stables, where they move freely in the stable.

It is necessary to locate each animal in an easy way in order to inspect activity and welfare. As a result of the project new products is developed as prototypes. These products are based on existing hardware technologies in a new setup, and based on development of new software functionalities and algorithms as a result of the research.

The prototype products are developed as collaboration between small and medium sized companies in Denmark and ASE. When IIOSS is finished these companies can complete the prototypes, so they can be introduced as new products for commercial use. The project manager of IIOSS is Torben Gregersen, Associate Professor at ASE (email: tg@iha.dk).

Research facilities

- IIOSS-Lab: A workshop for development of solutions for pig stables.
- 3 Pig stables for testing the solutions

Research priorities

- Camera vision based identification of large groups of sows and slaughter pigs

- Wireless sensor networks transferring g- and temperature measurements from farrowing sows
- RFID identification of slaughter pigs
- Human Machine Interface (HMI) in pig stables

4.2 Agrotech

Contact

Esben Wolf, esw@agrotech.dk

Research expertise

AgroTech holds general expertise in software and systems development, covering mainstream technologies (C, C++, C#, .NET, Java, VHDL, PHP, SQL, etc.) and experience in general system construction, including web technologies and database systems.

We have experience in FPGA-based development focused on pattern recognition (mostly video signal input).

We create and use ICT solutions for monitoring of biological and technological systems. Analyzing the huge amount of data from such surveillance systems is a core competence of AgroTech. We create models delivering correct and necessary information, using advanced statistical and multivariate methods and tools like R, ARM etc.

Research facilities

Our facilities cover standard ICT development environments and platforms including FPGA platforms as well as the necessary tools and technologies.

We create ICT prototypes and solutions for our customers, mostly combining ICT competences with the general and high-level agricultural, horticultural, biological and chemical competences of Agro-Tech's other departments.

Research priorities

For the upcoming year we prioritize research in:

- Interoperability at the farm level
- Traceability
- Generalized analysis platforms
- Pattern recognition

4.3 Alexandra Institute

Contact

Martin Møller, martin.moller@alexandra.dk

Research expertise

The Alexandra Institute is a research-based limited company that bridges the gap between the IT corporate sector, research and education.

The Alexandra Institute is based in the IT City of Katrinebjerg. The objective of the Institute is to participate in creating IT innovation in the corporate sector based on research results as well as providing researchers and students with an opportunity of testing their theories and ideas in practice and get inspiration through concrete collaboration projects with the companies.

The institute's innovation process integrates the three important areas of innovation (business, ICT, and users) into an integrated process based on the newest research.

We have general competencies in:

- Matchmaking - good matchmaking between public and private organizations is based on deep respect for the interests of the parties involved. Businesses participate to obtain innovation boosts and growth, researchers to gain new knowledge, insights and inspiration.
- Research-based knowledge - our research and innovation projects constitute the engine that creates new knowledge of benefit to the participants in the projects. We also bring this knowledge into play in our consultancy services and our research networks. In this way, the Alexandra Institute contributes to improving the innovation processes in Danish organisations and to enhancing their competitive position.
- User-driven innovation - the Alexandra Institute has a long tradition for userdriven innovation. Users are involved in all phases of the innovation process to ensure that design and functionality accommodate actual needs and challenges.

Research priorities

The Institute has currently eight different focus areas:

- Pervasive Positioning
- Business Understanding
- Software Infrastructure
- Pervasive Healthcare
- New Ways of Working
- Interactive Spaces
- IT Security
- Advanced Visualisation and Interaction

4.4 Danish Technology Institute

Contact

Kurt Nielsen, kurt.nielsen@teknologisk.dk

Research expertise

The Danish Technological Institute (www.dti.dk) is a leading technological service provider to Danish industry and society with a strong European and international project portfolio.

Established over 100 years ago the institute today employs nearly 1000 well-qualified professionals in 33 specialist centres and three foreign affiliates. The Institute's main activities in robotics are located in Odense in the Centre for Robot Technology, where the Institute has established a close and strategic working relation with University of Southern Denmark (SDU). Centre for Robot Technology employs around 30 specialist within robotics (1/3 is Ph.D. and 2/3 higher level qualification). Centre for Robot Technology is part of the leading organs in the International Federation of Robotics (IFR) and is member of both European Robotics Platform (EUROP) and European Robotics Network (EURON).

Centre for Robot Technology has numerous activities within agriculture and Green robotics in general. Green robotics covers all areas where robots interplay with plants and animals. It ranges from surveillance of pigs at the farmer to plant nursing of green areas in the public sector. Generally seen the goal is to bring out environmental and energy efficient solutions, improve animal welfare and at the same time secure a higher process quality. An important aspect is the robots interaction with human and animals. The robot should be considered as a natural and efficient helper in the everyday life and should not appear frightening, neither for human or animals. This requires advanced and cognitive aimed sensor and robot technologies.

Centre for Robot Technology has prior experiences from a number of research and industrial projects where new innovative solutions had to be found by implementing existing technologies for new products. One example is the "Apple picker" where a robot based on known technology has been applied to pick apples at a rate of 120 pieces/minutes more carefully than a human. Another is the "Hybrid Gripper" where a low-cost and flexible gripper is constructed using existing sensor technology.

Research facilities

- RoboLab: A workshop for development of robotic solutions.
- Innovatorium for Robot Technology: A show and demonstration room for state-of-the robot technology.
- Mobile robot testcenter: A facility for testing and experimenting with new mobile robot solutions.
- GripperLab: A facility for developing, testing and experimenting with robotic grippers

Research priorities

- Human robot interaction
- Vision Mobile robots
- Cooperating robots and Multi-Agent Systems
- Robotic system design
- Sensors and sensor fusion
- Situation assessment to make service robots reliable and capable of error handling
- Advanced gripping.

4.5 RoboCluster

Contact

Keld Kjærhus Bertelsen, keld.bertelsen@robocluster.dk

Research expertise

RoboCluster is a national network for innovation within robotics and automation. The goal is to maintain and further expand the robotics sector in Denmark, by generating and ensuring optimal conditions for innovation in new, as well as existing, enterprises and mobilize robotics in existing fields such as hospitals, farming, industry, play and education.

Through specific development projects and network activities, RoboCluster brings suppliers, producers, scientists and researchers together to share and develop knowledge and knowhow. The purpose is to create technical innovation, business development and scientific research that heighten market opportunities nationally and internationally.

RoboCluster has as one of four areas several projects on the area of robotics and automation within biological production. E.g the project 'The intelligent sprayer boom' which will be a new generation of sprayer booms for the farming industry that will be able to detect where the weeds are, and spray in one and same procedure. RoboCluster also runs the network Agribotic Network with the main objective to further expand the cooperation and development within the agricultural robotic field.

Research facilities

RoboLab - an interdisciplinary laboratory hosting related projects within RoboCluster

Research priorities

RoboCluster sets focus on four areas within robotics and automation:

1. Industrial Production
2. Biological Production
3. Healthcare
4. Play and Edutainment

4.6 University of Aarhus, Faculty of Agricultural Sciences

Contact

Morten Dam Rasmussen, mdr@agrsci.dk

Research expertise

The department of Bio-system Engineering is developing automation and systems technology for dynamical systems that interact with natural and biological objects. Research that will benefit the development of technology and production systems that reduce the environmental impact, increase precision and efficiency, and allow care and management of crops and animals in new ways. Of particular interest are robotics, sensor systems,

implement technology, operational management, and decentralized production systems for organic farming.

Expertise within the area of ICT:

- Information system design (Soft Systems Modeling, Science and Practice based modeling)
- Feasibility and valuation of information systems and innovative technologies (e.g. robotic systems being introduced into the agricultural production system)
- Information modeling (system engineering principles for the identification of decision processes and information flows)
- Development of methodologies and models for targeted operations management models/tools as benefit from enhanced ICT systems (advanced planning and scheduling tools, including detailed modeling and prescription of the motion (e.g. coverage planning, route planning, resource optimisation, process planning, logistics, fleet management) of mobile units both in semi – and fully autonomous mode together with an optimized coordination of multiple homogenous or non-homogenous and cooperative or non-cooperative mobile units)
- Development of system architecture involving the information flow, and the balance between decentralized and centralized, on-line and off-line, long-term and short-term use of information by decision making software tools dedicated to cultivation strategies (e.g., crop rotation), operational (e.g., treatment intensity, treatment frequency, machinery assignment), and execution aspects (e.g., machinery units routing and coordination, and tire pressure adjustment).

Expertise within the area of Robotics:

- Sensor technology (design and configuration of sensor networks, remote sensing)
- Imaging technologies for real-time recognition of plant species (e.g. using different optical sensors like hyper- and bi-spectral imaging and chlorophyll fluorescence imaging)
- Autonomous vehicles and implements that navigate on basis of computer vision, GPS and distance/range sensors.
- RTK-GPS based auto-steering
- Novel PC architecture and web server technology for tractor/implement communication
- Spraying technologies down to leaf scale level
- Physical weed control tools operating a single plant treatment (intra-row and close-to-crop weed control)
- Intelligent sprayer boom and implement control

Research facilities

- Robot workshop and electronics workshop for the development and testing of innovative technologies within the area of ICT and robotics
- A 25 ha research platform on future arable cropping systems based on an extended use of information and communication technologies (ICT) and adaptable cognitive automation.

- The overall mission of the platform will be to enhance arable cropping systems in terms of documentation quality, process activities, and labour environment and increase the overall system's efficiency while at the same time maintain its environmental benefits such as bio-diversity and reduced fossil energy consumption. Also, the objective of the platform will be to support the research and development of an ICT infrastructure based on the spatial monitoring of biological entities such as weed population, and yield, spatial-temporal monitoring of field operations such as tillage, and manure application), combined with sensing of physical entities such as water capacity, texture, humus and carbon content, clay, and mineral composition.

Research priorities

Robotics, sensor systems, implement technology, operational management, and decentralized production systems for organic farming.

4.7 University of Copenhagen

Contact

Svend Christensen, +45 51489421, svc@life.ku.dk

Research expertise

Research in automation and field robotics for agriculture at the University of Copenhagen takes place in the Department of Agriculture and Ecology, Faculty of Life Sciences (KU-Life) (www.en.agri.life.ku.dk). Collaboration in precision farming across the Faculty is coordinated through the Center for Precision Farming (www.cpf.life.ku.dk). The main areas of expertise in the group are precision farming, automation, and stereology and image analysis.

Dr sc agr Hans W. Griepentrog, Associate Professor, leads research on technology within precision farming and automation. The developed control and application techniques allow precise navigation of vehicles and tools for seeding, weeding, fertilizers and autonomous vehicles in general. Projects have involved the integration of systems for safe and reliable operation of robotic tractors, real-time control of implements, GPS controlled seed map-ping, and optimal seeding patterns to enhance crop competition against weeds.

PhD PEng Dvorlai Wulfsohn, Associate Professor msk, leads research in the area of stereology and geostatistics (spatial estimation and prediction, respectively). The emphasis is on the development of sampling methodologies for optimising positioning and configuration of optical sensors (lasers, cameras) to enable accurate and rapid quantification of spatial-temporal distribution of 3D crop structure. The goal is to define where in 3D space to position / orient sensors and how to utilize sensor data to obtain maximum information from small sample sizes, thereby enabling real-time decision making. Recent projects include the development of efficient image-based monitoring of crop growth and yield estimation, non-destructive and unbiased estimation of canopy surface area, and adaptive gain and exposure control of a stereo camera for an orchard robot.

Professor, Head of Department Svend Christensen and Associate Prof. Christian Andreasen are weed scientists that have been carrying out research on site specific weed management and decision algorithm for robotic weeding. A series of experiments aims at developing a real

time decision algorithm in the High-Tech Foundation project “The Intelligent Sprayer Boom”. This project aim at developing a new generation of spray booms for the farming industry that will be able to detect where the weeds are and spray in one and the same procedure.

Associate Professor Jesper Rasmussen works on automatisisation of mechanical weed control in the perspective of decision support algorithms for mechanical weed control based on real time adjustments of broadcast cultivators and intra-row cultivators.

Research facilities

The core agricultural engineering staff includes two permanent scientists, an electrical engineer, mechatronics and mechanical construction technicians. Facilities include an automatic field tractor (www.cpf.life.ku.dk/research/ams.aspx) equipped with RTK-GPS, laser scanner, stereo camera, precision seeding and mechanical weeding devices; Electronics and mechanics laboratories; Bioimaging workstation and digital thermal and multispectral cameras; Field weather station; UV-NIR spectrometers; Experimental greenhouses, fields and orchards.

Research priorities

The research focus is on intelligent machines for plant-scale precision farming in organic and conventional farming systems and horticulture. See also research interests of researchers mentioned in the expertise section.

4.8 University of Southern Denmark

Contact

Rasmus Nyholm Jørgensen, rasj@kbm.sdu.dk

Research expertise

Five institutes at the Faculty of Engineering work interdisciplinary within ICT and robotics and have expertises within a range of generic technologies and engineering disciplines such as: Robotics, mathematical modelling, mechanics, electrotechnics, energy technology, sensor technology, digital platforms, software systems development, artificial intelligence, industrial design & interaction design.

The core competences directly related to agriculture and environmental issues are

- Biosystems technology including bioproduction systems, recirculation of nutrients and intelligent methods and technologies for the reduction in the use of pesticides.
- Real Time Crop / Weed classification under field conditions including embedded visual odometry and targeting with laser, celle spraying, and Droplet On Demand technologies
- Wireless Sensor Networks - For classification of animal behaviour and positioning of sensors in different bio-materials like silage and grain
- Plant Nursing Robotics / Mobile platforms - omnirotational wheel module, navigation sensors, mapping, and adaptive and cognition based real time route planning

Research facilities

- RoboLab - an interdisciplinary laboratory hosting the projects related to robotics within the Technical Faculty and managed by RoboCluster
- Cognitive Vision Lab (CoViL)- focusses on the understanding of the human visual and cognitive system and the development of artificial systems with similar structure and strength.
- RoboCluster- focal point for robotics projects in Denmark

Research priorities

- Real time Crop/weed classification
- Classification of animal behaviour using wireless sensor networks
- Positioning with bio-materials using wireless sensor networks
- Adaptive and cognition based real time route planning for plant nursing applications

ICT-AGRI Country Report



ICT-AGRI Country Report FINLAND

MTT Agrifood Research Finland, Technology Research, Vakolantie 55, FI-03400 Vihti, Finland

Authors: Liisa Pesonen and Frederick Teye

1. Introduction

The main national agricultural research financier is the Ministry of Agriculture and Forestry (MMM) in Finland. MMM has so called "free competitive funding" to share yearly for agricultural research, lately also for ICT projects.

Academy of Finland finances scientific research within a wide scope in Finnish society, and also in agriculture. Academy of Finland has recently opened programme calls concerning ICT topics, which are also open for agricultural research.

Tekes – the Finnish Funding Agency for Technology and Innovation - is the main public funding organisation for research, development and innovation in Finland. The calls are open also for agricultural-related topics.

The Finnish innovation system has recently incorporated the so called "competence clusters" for different sectors. They are limited companies owned by Finnish companies and research institutes. They create research programmes with topics important for the company owners. The actual research work is done in the projects by top research groups relevant to the topics. Companies participate on the research both as financiers and research partners. Programmes are open also for agricultural topics.

All research programmes favour international cooperation in proposed projects.

The organisation of the Finnish innovation system is described thoroughly in <http://www.research.fi>

The overall *science and innovation policy* is prepared by the Science and Technology Policy Council of Finland, reporting directly to the Government and headed by the Prime Minister. The mainstream of Finnish science and technology policy is implemented through Ministry of Education and Ministry of Trade and Industry.

Science policy, basic research and education is under the responsibility of Ministry of Education controlling Finnish Universities, and the Academy of Finland, a research council supporting basic research of all kind.

Technology policy and the related goal-oriented industrial research is under the responsibility of Ministry of Trade and Industry controlling Tekes - National Technology Agency of Finland, a research council supporting applied research and technology development, and VTT - Technical Research Centre of Finland. Tekes - National Technology Agency of Finland mainly supports projects with high relevance to the food industry. Tekes Technology programmes are a tool to create cooperation and synergy between industry and academia. Research Programmes of the Academy of Finland are more basic research oriented

Sectoral issues are dealt with by relevant ministries, which have own respective state owned research institutes and competitive research funding to commission policy oriented research.

State Research Institutes:

The Ministry of Agriculture and Forestry has responsibility for *policy in the utilisation of natural resources (agriculture, forestry, fisheries and game, aquatic resources and rural affairs) and food safety*. Five research institutes report to the ministry:

MTT Agrifood Research Finland

Finnish Food Safety Authority Evira

Finnish Forest Research Institute (Metla)

Finnish Game and Fisheries Research Institute (RKTL)

Finnish Geodetic Institute

In agricultural research, the Ministry of Agriculture and Forestry plays a significant role with its governmental research institutes, and with its competitive research budget. The ministry directs its competitive funding to projects providing science-based evidence to political decision making, as well as providing innovative technologies to help improve competitive and environmentally and ethically sustainable production technologies and to ensure food quality and safety. With its competitive research budget, the ministry also co-operates with other research funding bodies in relevant themes and ERA-NET-schemes. *The Advisory Board for Agri-Food Research* assists the ministry in the preparation of Agri-Food related research policy, and in the selection of research projects applied from the ministry.

Research financing:

Nearly EUR 6.9 billion was spent on research and development activities in Finland in 2008. In 2009 R&D expenditure is estimated to remain more or less at the level of 2008.

R&D expenditure has been growing without interruption since the early 1990s, mainly owing to business enterprises but in recent years also due to risen expenditure in the higher education sector. Business enterprises nowadays account for 74 per cent of R&D expenditure. The increase in business enterprise R&D expenditure is due to the electronics industry.

Government budget appropriations or outlays on research and development (GBAORD) for 2010 amount to EUR 2.055 billion. Government R&D expenditure as a proportion of overall government spending exclusive of debt servicing stands at 4.3 per cent. The share of public R&D funding of GDP rises to 1.17 per cent.

2. Mapping of national funding bodies

2.1 Academy of Finland

Contact: Mikko Ylikangas, +358977488481, motive@aka.fi

The Academy of Finland is the prime funding agency for basic research in Finland. The Academy operates within the administrative sector of the Ministry of Education. The Academy of Finland's mission is to advance scientific research and its application, support international scientific cooperation, act as an expert organ in science policy issues and allocate funding to research and other advancement of science. The Academy works to promote the progress of science by allocating funding to the highest-quality and the scientifically most innovative research. The Academy is committed to raising the productivity and strengthening the impact of research funding and science policy by:

- emphasising interdisciplinarity and innovativeness in its reviews and assessments of scientific quality
- granting funding to research projects rated as excellent
- promoting the interaction and collaboration between researchers and knowledge end-users.

2.2 Tekes – the Finnish Funding Agency for Technology and Innovation

Contact: Riikka Heikinheimo, +358 10 60 55887, [riikka.heikinheimo @tekes.fi](mailto:riikka.heikinheimo@tekes.fi)

Every year, Tekes grants more than EUR 500 million towards innovative projects aimed at generating new know-how and new kinds of products, processes, and service or business concepts.

Tekes facilitates collaboration and networking

- Between small and large businesses
- Industry and academia
- Public and private sector and non-governmental organisations
- Globally - nationally - regionally

Tekes's customers include companies, universities, research institutions, government organisations, local and regional authorities and other organisations operating in Finland.

Tekes can also finance R&D projects undertaken by foreign-owned companies registered in Finland. International companies with R&D activities in Finland do not need to have a Finnish partner to be eligible for funding. The financed project should, however, contribute to the Finnish economy.

With a view to promoting international R&D cooperation, Tekes funds collaborative research and development projects and facilitates researcher mobility.

2.3 Sitra - the Finnish Innovation Fund

Contact: Kosonen Mikko, +3589618 991, [mikko.kosonen @sitra.fi](mailto:mikko.kosonen@sitra.fi)

Sitra, the Finnish Innovation Fund is an independent public fund which under the supervision of the Finnish Parliament promotes the welfare of Finnish society. Sitra's responsibilities have been stipulated in law.

Since its establishment, Sitra's duty has been to promote stable and balanced development in Finland, the qualitative and quantitative growth of its economy and its international competitiveness and co-operation. Our operations are governed by a vision of a successful and skilled Finland. We have always approached our operations with strong belief in the future and in the ability of the latest technology to generate well-being.

All the programmes and other activities put special emphasis on taking account the following topics when promoting reforms in the programme area:

- Efficiency and transparency
- Empowerment and active citizenship
- Human -centric technology
- Cooperation between private sector, public sector and citizens

2.4 Ministry of Agriculture and Forestry

Contact: Elina Nikkola, +358 9 1605 5203, elina.nikkola@mmm.fi

In agricultural research, the Ministry of Agriculture and Forestry plays a significant role with its governmental research institutes, and with its competitive research budget. The ministry directs its competitive funding to projects providing science-based evidence to political decision making, as well as providing innovative technologies to help improve competitive and environmentally and ethically sustainable production technologies and to ensure food quality and safety. With its competitive research budget, the ministry also co-operates with other research funding bodies in relevant themes and ERA-NET-schemes.

2.5 Ministry of the Environment

Contact: Hannele Pokka, +358916039400, hannele.pokka@ymparisto.fi

The Ministry of the Environment co-ordinates the environmental cluster research programme, and is the programme's main source of funding. This programme aims to find new ways to help improve the environment, and to develop related products, while improving co-operation between researchers, businesses, the authorities and funding organisations.

3. Mapping of national research programmes

3.1 Measurement, Monitoring and Environmental Assessment (Mittaus, monitorointi ja ympäristötehokkuuden arviointi)

- Owned by:

The Energy and Environment Strategic Centre, CLEEN Ltd, Tommy Jacobson, tommy.jacobson@cleen.fi
- Website:

http://cleen.fi/en/index.php/Measurement,_monitoring_and_assessment_of_environmental_efficiency

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Potential

3.2 Energy and life cycle efficient machines

- Owned by:

Finnish Metals and Engineering Competence Cluster, FIMECC Ltd.
- Managed by:

VTT Technical Research Centre of Finland
Ismo Vessonen, +35820722111, ismo.vessonen@vtt.fi
- Website:

http://www.fimecc.com/en/index.php/Intelligent_Solutions

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Potential

3.3 Ubicom - Embedded ICT 2007-2013 (Ubicom - Sulautettu tietotekniikka 2007-2013)

- Owned by:

Tekes – the Finnish Funding Agency for Technology and Innovation
Kimmo Ahola , +358106055756, kimmo.ahola@tekes.fi

- Managed by:

Tekes – the Finnish Funding Agency for Technology and Innovation
Kimmo Ahola , +358106055756, kimmo.ahola@tekes.fi

- Website:

<http://akseli.tekes.fi/opencms/opencms/OhjelmaPortaali/ohjelmat/Ubicom/en/etusivu.html>

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Permitted
- Participation of industry: Required
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Potential

The Ubicom – Embedded ICT program run by Tekes is focused on developing and piloting embedded IT solutions. Relevant connection to AGRI sector: ICT based measurements, monitoring, control, sensor networks, real time situational awareness technologies, systems and applications.

3.4 Intelligent Machines Cluster Program (Älykkäät koneet osaamiskeskus)

- Owned by:

Hermia Ltd.
Toni Sulameri, + 358505249609, toni.sulameri@hermia.fi

- Managed by:

Seinäjoki Technology Centre
Marja Vainionpää, +358201244000, marja.vainionpaa@stoy.fi

- Web Page URL:

<http://www.intelligentmachines.fi>

Brief characterization:

- Region: Finland
- Geographic scope: National
- Participation of research institutes: Permitted
- Participation of industry: Permitted
- Participation from foreign countries: Unknown
- Contribution to ICT-AGRI calls: Potential

3.5 Ubiquitous computing and diversity of communication (Jokapaikan tietotekniikka ja monimuotoinen viestintä)

- Owned by:
Academy of Finland
Mikko Ylikangas, +358977488481, motive@aka.fi
- Managed by:
Academy of Finland
Mikko Ylikangas, +358977488481, motive@aka.fi
- Website:
<http://www.aka.fi/en-gb/A/Science-in-society/Research-programmes/Ongoing/Motive/>

Relevant ICT-AGRI topics:

- ICT applications

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Not permitted
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Potential

3.6 Free competitive research funding

- Owned by:
Ministry of Agriculture and Forestry
Suvi Ryynänen, +358 9 1605 2385, suvi.ryynanen@mmm.fi
- Managed by:
Ministry of Agriculture and Forestry
Suvi Ryynänen, +358 9 1605 2385, suvi.ryynanen@mmm.fi

- Website:

<http://www.mmm.fi>

Relevant ICT-AGRI topics:

- ICT applications
- Automation of machinery / equipment
- Standardisation of data dictionaries and communication
- ICT in environmental regulation
- Effects of ICT and automation
- Structures in sale and support of ICT and automation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Permitted
- Participation from foreign countries: Potential
- Contribution to ICT-AGRI calls: Potential

Comments:

Free competitive research funding finances agricultural research in Finland in a wide scope, and also ICT and automation related projects. Call for projects is open once a year.

4. Mapping of national research institutes

4.1 Aalto University, School of Science and Technology, Faculty of Electronics, Communication and Automation

Contact

Arto Visala, +358 9 470 23301, arto.visala@tkk.fi

Research expertise

The faculty conducts academic research in the fields of electronics, electrical engineering, communications engineering, automation and bioinformatics technology. Based on the fundamental and applied research in these fields, the faculty provides top level education in undergraduate, master and doctoral programmes.

The Faculty of Electronics, Communications and Automation focuses its research on automation and systems technology, electronics, micro and nanosciences, communications, radio science and engineering, as well as electrical engineering and energy technology, radio astronomy and the related equipment development and space research. The faculty has 45 professors.

In agrotechnology the main expertise is in areas of:

- Automation
- Autonomous systems
- Robotics
- Information management in automation

The faculty is engaged in international research; for example, one sixth of our doctoral students are international students. The faculty is also home to two Centres of Excellence in Research appointed by the Academy of Finland: the Centre of Excellence in Smart Radios and Wireless Research (SMARAD) and the Centre of Excellence in Generic Intelligent Machines Research (GIM).

Research facilities

The faculty has many internationally unique research facilities such as the Metsähovi Radio Observatory, the high voltage laboratory and a national standards laboratory for the measurement of optical quantities. The top researchers of micro and nanotechnology come together in Micronova, a shared research institute of the Aalto University School of Science and Technology and VTT Technical Research Centre of Finland, equipped with, e.g. the largest cleanroom in the Nordic countries.

Research priorities

Our high-quality research seeks to promote, e.g. energy efficiency in the transmission, distribution and consumption of power, the development of electronics furthering wellbeing and healthcare research, and accelerating wireless data transfer. We also focus on developing technologies needed for the future Internet as well as building intelligent robots to

support other disciplines and to help the average consumer. In agrotechnology research the main topics are:

- Assisting automation in agricultural machinery, ISOBUS, field robots
- Farm management information systems in precision farming

4.2 University of Helsinki, Department of Agricultural Sciences Agrotechnology

Contact

Jukka Ahokas, +3589191 58502, jukka.ahokas@helsinki.fi

Research expertise

The mission of Department of Agrotechnology is the discovery and dissemination of knowledge related to agricultural engineering, environmental engineering, the processing of agricultural biomaterials and cleaning technology in the field of hygiene. The department utilizes its expertise in the field of agricultural production system, clean processing environment of food industry and clean indoor environment. With respect to Agrotechnology, the main research areas are:

- Agricultural engineering
- Measuring techniques
- ICT in animal production
- Environmental engineering,
- Processing of agricultural biomaterials
- Cleaning technology in the field of hygiene

Research facilities

- Laboratories
- Test fields and dairy cattle house instrumented with data collection

Research priorities

- Agriculture and energy
- Automation and modelling of agricultural production
- Environment and plant production
- Animal welfare and health

4.3 University of Eastern Finland, Faculty of Science and Forestry

Contact

Arja Hirvonen, +358 44 716 3422, arja.hirvonen@uef.fi

Research expertise

Kuopio campus

Research and education in the Faculty of Natural and Environmental Sciences concentrate on natural sciences that support the research of health and environment. The main focus is on the following areas: Biosciences, Applied Physics, Science and Engineering, and Environmental Sciences. A special feature of the research in the Faculty is interdisciplinary cooperation. The Faculty takes part in two national Centres of Excellence (the departments of Physics and Environmental Sciences) Specific areas of research expertise are:

- Plant Biotechnology
- Tissue engineering, biomaterials and stem cells
- Nutrition and Food Biotechnology
- Animal behavior and welfare
- Aquaculture
- Environmental microbiology
- Biogeochemistry
- Chemical ecology
- Optical sensors and sensing systems for environment
- Biomaterial technology
- Aerosol Physics

Joensuu campus

The strengths and areas of expertise are: Education and human development: This area of expertise rests on multidisciplinary research and teaching relating to education and human development, pedagogy and educational technology, learning and learning communities, as well as to counselling and life course studies.

Forests and the environment: This area of expertise rests on research and teaching relating to the study of environmental and natural resources within forestry and natural sciences, as well as on related research in social sciences and law.

Optics, new materials and information technology: This area of expertise rests on research and teaching relating to optics, information and communication technologies, as well as on research and teaching relating to new materials and bio-molecules.

Border studies and Russia: This area of expertise rests on humanistic, theological and sociological research and teaching relating to state borders and cultural boundaries, as well as on research and teaching relating to law, forestry, environmental sciences and education. The border of the European Union and North-West Russia is geographically of special interest to the University of Eastern Finland. With respect to ICT in agriculture the relevant research topics are:

- Forests, wood and the environment

- Optics, new materials and information technology
- Water Ecosystem Research
- Water Ecosystem Research

Research facilities

Kuopio campus

- Laboratory of Optical Sensor Technology
- The Fine Particle and Aerosol Technology Laboratory
- Laboratory of Applied Environmental Chemistry
- Noise Laboratory

Joensuu campus

- Atmospheric composition aerosol and climate laboratories
- Mekrijärvi Research Station for natural sciences, ethnological research
- Nordic Health with Whole Grain Food research laboratories

Research priorities

Kuopio campus

- Optical sensors and sensing systems for environment
- Biomaterial technology
- Environmental Informatics
- Aerosol Physics
- Embryo Technology
- Animal Behaviour and Welfare
- Aquaculture Research
- Nutrition and Food Biotechnology
- Plant Agrobiotechnology

Joensuu campus

- Climate change
- Forest, water and natural ecosystems
- Bio-energy
- Optics, new materials and information technology

- Identification and evaluation of the state of the environment based on an understanding ecological and ecotoxicological mechanisms of action
- Environmental restoration and biotechnology, water treatment
- Environmentally friendly industrial production processes
- Technology, assessment and management of environmental stress

4.4 University of Jyväskylä

Contact

Jukka Rintala, +358 14 260 2316, jrintala@jyu.fi

Research expertise

The Institute for Environmental Research is a national university level institute set up to produce research data on the environment. The Institute conducts scientific research, and provides authorities, private and public organisations, and enterprises with services and training in the environmental field. The Institute also provides accredited laboratory services. Research and Technology Profile of the University of Jyväskylä

- Human-centered information and communication technology
- Paper manufacturing technology
- Nanotechnology
- Accelerator-based technology
- Environmental technology
- Wellness technology
- ICT in learning
- Aquatic Sciences
- Cell and molecular biology
- Ecology and evolutionary biology
- Environmental science and technology

Research facilities

- Laboratory for Composting and Anaerobic Treatment
- Laboratory for Air Technology
- Return to Environmental science main page
- Geographic Information Systems Laboratory
- Accelerator Laboratory is a national facility with an extensive international collaborative programme in nuclear, accelerator and applied physics

Research priorities

- Ecotoxicology and Environmental Technology
- Environment, energy and environmental Impact Assessment
- Waste Treatment and Composting of Biowastes
- Landscape Ecology and Conservation Biology
- Research methodology in human-centered sciences

- Children, young people and their growth environments
- Multiculturalism and interaction
- Ageing and well-being

4.5 University of Oulu

Contact

Leila Risteli, +35840502 8751, leila.risteli(at)oulu.fi

Research expertise

Researchers at the University of Oulu are active in different fields of study. In basic research, they seek to deepen our understanding of the functioning of organic and inorganic matter, of the structure of the universe and of humans, culture and technology. Harnessed to the service of applied research and development, this knowledge results in the creation of inventions and innovations that benefit society. Research conducted under the banner of information technology and wireless communication centres on future telecommunication solutions, electronics and photonics, ubiquitous computing, machine vision and intelligent systems, welfare technology and the application of micro- and nanotechnology to new electronic devices and systems. In biotechnology and molecular medicine, current efforts are on one hand directed toward genetics and protein structures and on the other toward the application of molecular, cell biology and genetic engineering methods to the study of animals, plants and humans. Other significant research projects include finding causes of and treatments for connective tissue and cardiovascular diseases. Applying a multi-disciplinary approach, the focus area of northern and environmental issues explores how climate and environmental changes are impacting northern flora and fauna. The ultimate aim is to find new, sustainable ways of protecting and using the northern environment and its natural resources. Other interests include studying the health, welfare and culture of the people living in the area. In short the three key areas of research are:

- Biosciences and Health
- Information Technology
- Cultural Identity and Interaction
- Environment, Natural Resources and Materials
- Business Studies and Economics
- Science-based Education
- Mining and steel industry

Research facilities

- Biocomputing and bioinformatics
- Gene analysis service (Microarray and DNA sequencing core facilities)
- Tissue Imaging Center: Imaging core facilities (Light and electron microscopy)
- Proteomics and protein analysis
- Protein sequencing and amino acid analysis
- Protein crystallography
- Transgenic animals

- Gene transfer/silencing using viral vectors

Research priorities

- Global Change
- Land Use and Land Cover
- Circumpolar Health and Wellbeing
- Circuits and Systems
- Intelligent Systems
- Machine Vision
- Media Research
- Wireless Communication Systems
- Biomedical Engineering
- Electronics Materials, Packaging and Reliability Techniques
- Human Interaction with Advanced Mobile Services and Intelligent Environments

4.6 University of Tampere, Faculty of Information Sciences

Contact

Hannele Auffermann, +358 40 544 1841, hannele.auffermann@uta.fi

Research expertise

Research and teaching in the Faculty are intended to respond to the increasing demands for information technology in today's society. The Faculty engages in research on the development of new technology and information services based on research findings. Research conducted at the departments of the Faculty focuses on the methods and techniques of information organization, processing and use. The related research in terms of ICT and agricultural fields are:

- Computer-Human Interaction research
- Information, Media, Customer and Innovation Management
- Computer Virus Research

Research facilities

- Research Laboratories

Research priorities

- Data Analysis Research
- Conceptual Modelling
- Information Retrieval
- Information and Media Practices
- Information Security
- Visual Interaction
- Multimodal Interaction
- eHealth
- Emotions, Sociality, and Computing
- Speech-based and Pervasive Interaction

4.7 University of Turku, Department of Biochemistry and Food Chemistry

Contact

Heikki Kallio, +358 2 333 6870, heikki.kallio@utu.fi

Research expertise

At the department the main focus areas in the research are biochemistry, biotechnology, food chemistry and plant physiology and molecular biology. The four disciplines are also actively working together in common research projects. Furthermore, the research groups at the department participate in several collaborative projects inside the University of Turku. The collaboration with other universities, research institutes and companies in Finland and internationally is active, as well. The ongoing research projects are funded by the Academy of Finland, TEKES (technology development agency in Finland), European Union, private companies and foundations. The key areas of expertise are:

- Biochemistry
 - Nucleic acid diagnostics
 - Food diagnostics
 - Markers of prostate cancer - MPC
 - Point - of - care diagnostics
 - Molecular engineering of binder proteins
 - Bioaffinity assay technology research
- biotechnology
 - Sensory quality of food
 - Instrumental food analysis
 - Nutrition and biochemistry
- food chemistry and plant physiology
 - Photosynthetic membrane protein complexes: biogenesis, regulation and signalling
 - Systems biology of plant chloroplast redox compounds
 - Chloroplast components of alternative electron transfer
 - Gene regulation in cyanobacteria
 - Cross-talk between light acclimation and defence reactions in plant
 - Plant-fungus interactions, biodiversity and biological control
 - Functional analysis of small RhoGTPases and cytoskeleton in a wood-rotting fungus and ectomycorrhiza

Research facilities

- Central Animal Laboratory
- Centre for Biomaterials laboratory
- Functional foods forum

Research priorities

- Development chain of the functional food
- Food nutrition and biochemistry
- Sensory quality of food
- Instrumental food analysis

- Plant Biophysics
- Plant virus
- Plant-fungus interactions, biodiversity and biological control

4.8 University of Vaasa, Faculty of Technology

Contact

Reino Virrankoski, +358 44 024 4384, reino.virrankoski@uwasa.fi

Research expertise

The main focus area of the faculty of technology in the University of Vaasa is distributed energy production with energy chain control and management. The faculty also performs advanced research related to embedded systems in agricultural machines, autonomous robotics, biofuels, biogas, engines, power distribution systems and tactical communication systems. In addition to pure technology also service business related to pre-mentioned application areas is considered. Faculty is one of the expert members in the Agrotechnology Network of the Federation of Finnish Technology Industries (Teknologiateollisuuden Agroteknologiaverkosto). Among the Finnish universities and universities of applied sciences the research collaboration is especially intensive with Aalto University's School of Science and Technology as well as with Seinäjoki University of Applied Sciences.

- Distributed energy production
- Energy chain control and management
- Embedded systems in agricultural machines
- Greenhouse and cattle house automation
- Autonomous robotics
- Biofuel and biogas production
- Energy efficiency and biofuels in engines
- Tactical communication systems
- Service business in pre-mentioned application areas

Research facilities

- Technobothnia research laboratory (<http://www.technobothnia.fi/en/>)
- Biofuel laboratory
- Vaasa Energy Institute (<http://www.vei.fi>)

Research priorities

- Energy chain control and management, Smart Grid
- Wireless Automation
- Embedded systems in agricultural machines
- Biofuel and biogas production
- Service business

4.9 CENTRIA Research and Development, Ylivieska

Contact

Mika Luimula, Senior Research Scientist, Ph.D., +358444492543, mika.luimula@centria.fi

Research expertise

CENTRIA Research and Development is the R&D unit of the Central Ostrobothnia University of Applied Sciences in Finland. CENTRIA makes R&D-projects in co-operation with enterprises. The testing systems development team of CENTRIA Research and Development carries out projects related to applied electronics and testing technology. We provide research and expert services in our key expertise areas like wireless applications for machines and systems. The mobile technologies and smart environments team of CENTRIA Research and Development carries out projects related to mobile technologies and smart environments. The team has developed CENTRIA's Locawe platform for smart environments including technologies for locating, identifying and sensing objects in indoor and outdoor conditions. The Locawe platform is a client-server solution, and information about tracked objects can be shared for the users with 2D and 3D user interfaces. CENTRIA has made many publications of wireless applications in machines and systems and cooperates nowadays with many research institutes around the Europe.

Research facilities

- RFMedia Laboratory
 - mobile computing
 - ubiquitous computing
 - applied electronics
 - testing technology
- CENTRIA Test Laboratory
 - EMC testing
 - environmental testing
- Production Technology Laboratory
 - digital manufacturing
 - robotics

Research priorities

- Research Focus: Wireless Applications for Machines and Systems
(<http://www.rfmedia.fi/wams2010/>)

- Geosensor Networks (OGC Sensor Web Enablement)
- Embedded Systems
- Radio Frequency Identification (LF, HF, UHF, Active RFID, Smart Labels)
- Indoor Positioning (WiFi, ZigBee/6LoWPAN, Chirp Nanoloc)
- 2D and 3D In-house Map Engines Context-Aware UIs
- Virtual Environments for Simulations and Remote Monitoring (Game Engines, Simulation Tools)
- Mobile Robots (Industrial Robots, Service Robots)
- Safety in Automation
- Human-Computer Interaction
- Human-Robot Interaction
- 4G Telecommunication (Mobile WiMAX, LTE)

4.10 HAMK University of Applied Sciences

Contact

Jussi Horelli, +358 40 551 6411, jussi.horelli@hamk.fi

Antti Peltola, +358 03 6461, antti.peltola@hamk.fi

Research expertise

- Culture
- Natural Resources and the Environment
 - Agriculture
- Natural Sciences
- Social Services, Health and Sports
- Technology, Communication and Transport
 - Automation Engineering
 - Construction Engineering
 - Industrial Management
 - International Business
 - Mechanical Engineering and Production Technology
 - Supply Chain Management

Research facilities

- Automation laboratories
- Research and educational farm (Mustiala)

Research priorities

- Maintenance in automation (AutoMaint)
- Information and production technology

4.11 Helsinki Metropolia University of Applied Sciences

Contact

Sami Kalliokoski, +358207836233, sami.kalliokoski@metropolia.fi

Research expertise

- Imaging and radiography
- Energy and environmental technology
- Nanotechnology
- Environmental Emissions

Research facilities

- Mobile Application Laboratory
- Automation Laboratory
- Environmental Technology Laboratory
- Prometric Testing Center for example Microsoft, Oracle, Apple, Sun, HP, Citrix and IBM

Research priorities

- Treacability and RFID technology in Food chain
- Energy and environmentally clean technology
- Intelligent systems and services in agriculture

4.12 Jyväskylä Polytechnic University of Applied Sciences

Contact

Pasi Raiskinmäki, +35853095359, pasi.raiskinmäki@jamk.fi

Research expertise

- Bio-Energy
- Rural Services
- Production Technology
- environmental care

Research priorities

- Telematical Environment Measuring in Logistics
- Development of Supply Chain Management Operations
- Development of a Bioenergy Networks
- Development of Wastewater Treatment in Rural Areas

4.13 Savonia University of Applied Sciences

Contact

Eero Antikainen, +358447856325, eero.antikainen@savonia.fi

Research expertise

- Mechanical and Production Engineering
- Sensor and Information Technology
- Electric Power and Automation Technology
- Energy and Environmental Technology
- Building and Wood Technology

Research facilities

- Environmental technology laboratory: laboratory pilot study of surface water utility equipment
- Biogas reactor

Research priorities

- Water-related applied R & D activities are concentrated in the water treatment processes
- Bio-energy, the action is concentrated in particular biogas technologies and the development of the agricultural utilization of sludge
- Development of Sensor and Information Technology

4.14 Turku University of Applied Sciences

Contact

Ari Putkonen, +35850598515, ari.putkonen@turkuamk.fi

Research expertise

- Sustainable use of natural resources and fishing management
- Low-emission technologies
- Environmental monitoring technologies in the development of low emissions technology and emission abatement
- Environmental communication and environmental data to better access to the development of methods

Research priorities

- Control of scattered loading by dikes and wetlands
- Water metering of water eutrophication, global warming, environmental kemikalisoituminen, and other environmental problems are a major challenge for environmental monitoring and improvement.
- Aquaculture, fish processing, enterprise finance, ecology, water system analysis and water system protection, restoration, and environmental accounting.

4.15 SEAMK University of Applied Sciences

Contact

Hannu Haapala, +358 (0)20 1245035, hannu.haapala@seamk.fi

Research expertise

- Agro Living laboratories
- Rural tourism
- Bioenergy
- Forest and virtual forest office

Research facilities

- Rape seed diesel laboratory
- 5-D cave for visual experiments
- Computer research
- Experimental Dairy and Greenhouse facilities

Research priorities

- Agricultural engineering and tractor automation
- Bioenergy research; biogas, biodiesel, rapeseed oil
- Forest product and forest production research
- Rural tourism

4.16 North Karelia University of Applied Sciences, Centre for Business and Engineering and Centre for Natural Resources

Contact

Lasse Neuvonen, +358 50 555 8986, lasse.neuvonen@pkamk.fi

Research expertise

- Development of decentralized energy-related systems
- Information Model in Construction and Building Technology
- Embedded Electronics and Micro-optics, abbreviated
- Ultra Precision Unit, Nanoscience Machining
- Product Lifecycle Management
- Development of Plant-Specific Production Logistics and Resource Planning

Research facilities

- Laboratories
- Research and educational farm (Koivikko)

Research priorities

- Technologies in biomass and fuel production
- Building technology
- Models of energy business

4.17 Oulu University of Applied Sciences, School of Renewable Natural Resources

Contact

Irene Isohanni, +358505909669, irene.isohanni@oamk.fi

Research expertise

- Geographical information systems in agriculture
- Bioenergy production: Biogas, Pellets

Research facilities

- Laboratories (biotechnology and energy)

Research priorities

- Sustainable bioenergy production
- RFID in Agriculture and animal welfare
- Geographical information systems in agriculture

4.18 Finnish Environment Institute (SYKE)

Contact

Juha Kämäri, +358405456910, juha.kamari@ymparisto.fi

Research expertise

Research conducted at the Finnish Environment Institute (SYKE) examines changes in our environment, and evaluates how society can resolve environmental problems.

The research themes range from global problems, such as climate change and declining biodiversity, to regional and local environmental issues. Important issues are the state of the Baltic Sea and the inland waters of Finland, possible water protection measures, identification and assessment of the risks associated with noxious substances, and technological solutions that reduce the load on the environment.

Environmental issues are approached from a multi-disciplinary perspective which integrates socio-economic considerations into scientific research. Projects are conducted in close co-operation with research institutes, universities and enterprises in Finland and in other countries.

Research facilities

The Finnish Environment Institute (SYKE) provides a wide range of laboratory services in the environmental field. Chemical and biological testing and analytical services are available. SYKE's laboratory is recognised as the national reference laboratory in the environmental field, and is fully accredited for analytical work as testing laboratory T003 by the Finnish Accreditation Services, FINAS (accreditationcode: T003 SFS-EN ISO/IEC 17025).

Research vessel Muikku

R/V Muikku is equipped with a wide range of sampling and measuring systems enabling detailed investigations of the state of aquatic environments in the Baltic Sea, the Saimaa Lake System. The ship is also used for the purposes of environmental training. The ship is owned by the Finnish Environment Institute SYKE.

- Research vessel Muikku, The Baltic Sea Portal (SYKE, Finnish Meteorological Institute, Ministry of the Environment)
- R/V Muikku, Large Lakes Research (University of Joensuu)

Research vessel Aranda

R/V Aranda is a modern, ice-reinforced research vessel adapted to multidisciplinary marine research around the year. Aranda was originally planned for the Baltic Sea research, but has proved herself on the high seas as well. The ship is owned by the SYKE.

- Research vessel Aranda, The Baltic Sea Portal (SYKE, Finnish Meteorological Institute, Ministry of the Environment)

Research priorities

- Global Change
- Production and Consumption
- Contaminants and Risks
- Integrated River Basin Management
- Marine Research
- Biodiversity
- Environmental Policy
- Geographical Information Systems (GIS) and remote sensing

4.19 The Finnish Geodetic Institute (FGI)

Contact

Risto Kuittinen, +358 9 295 55 331, risto.kuittinen@fgi.fi

Research expertise

The Finnish Geodetic Institute is a research institute specializing in geodesy and geospatial information science and technology. The FGI is an innovative and flexible operator with good cooperation skills and high expertise in geospatial information. The FGI carries out national and international research and conducts scientific observations in collaboration with academia, public-sector bodies and the geospatial business sector in Finland and elsewhere in Europe.

The expert areas are:

Geodesy and Geodynamics

The Department of Geodesy and Geodynamics creates and maintains national coordinate, height, and gravity systems. The permanent Finnish GPS network, FinnRef, and the adjacent 100-control-point network define the national Euref-Fin reference frame. A national N2000 height system, which is based on the third precise levelling (1978-2006), has been in use since 2007. National systems are tied to corresponding European systems and the networks of neighbouring countries. The Metsähovi Fundamental Station, equipped with a variety of instruments, is a member of various international networks, the purpose of which is to maintain global reference frames, compute navigation satellites' orbit data, and participate in diverse geodetic research projects.

The department of Geodesy and Geodynamics also conducts research on geodynamics, e.g., land uplift, and gravity with terrestrial and space-borne techniques. In addition, it has a statutory responsibility to maintain the national standards of acceleration of free fall and geodetic length.

Geoinformatics and Cartography

The research conducted by the Department of Geoinformatics and Cartography focuses on the inter-operability of geospatial services, quality of geographic information, 3D modelling, usability research on map user interfaces (UIs), mobile cartography, and context-sensitive maps. In the EU FP7 project Haptic, Audio and Visual Interfaces for Maps and Location Based Services (HaptiMap), the department develops multimodal map UIs for special user groups such as the elderly and visually impaired people. An extensive test environment in Nuukio National Park has been developed by the Department for testing geospatial applications for personal navigation. The test environment is based on laser scanned data and utilization of other new technology for data acquisition. The department participates actively in several projects that aim to advance spatial data infrastructure (SDI) both nationally and internationally. These projects include the National Geographic Information Strategy and the EU project European Spatial Data Infrastructure Network (ESDIN) that is related to the implementation of the INSPIRE directive.

Remote Sensing and Photogrammetry

The Department of Remote Sensing and Photogrammetry concentrates on quality issues related to modern mapping techniques and instrument, and promoting the development and introduction of new mapping methods and algorithms in Finland. The department is also an active participant in the defining of national best practices for remote sensing data acquisition. The focus areas include digital aerial imaging, terrestrial and airborne laser scanning, and SAR interferometry. The characteristics that describe the operation of the department are competitive basic research, applied development work conducted in cooperation with the industrial sector, and international cooperation. The department has participated in the development of the new laser scanning based digital elevation model production, transmission to laser scanning in forest inventory, and the development of a FLPIS quality system for the Ministry of Agriculture and Forestry, and the production of a satellite-based snow map in the Finnish Environment Institute.

Navigation and Positioning

The Department of Navigation and Positioning conducts innovative research to discover navigation and positioning solutions, such as the new positioning algorithms and the adaptation of new positioning sensors. The department is currently engaged in research in the areas of satellite navigation, personal navigation, location-based services, integration of multiple sensors for positioning in both indoor and outdoor environments, mobile mapping systems, and intelligent transport systems.

The department has coordinated projects funded by the EU and ESA. Currently, it coordinates an international cooperation project for developing a 3D personal navigation system for mobile phones that will be demonstrated at the World Exposition in Shanghai in 2010. The department hosts the satellite monitoring station of the first European satellite navigation system, EGNOS (European Geostationary Navigation Overlay Service).

Research facilities

The Metsähovi research station is subordinated to the Department of Geodesy and Geodynamics. The research station consists of the space geodetic station, gravity laboratory and affiliated research station at Sjöckulla. At the research station there is a coordination group representing all the departments, led by the head of the research station. The group deals with subjects concerning the organisation and maintenance of the research station.

Finnish permanent GPS network (FinnRef[®]) is maintained by the Finnish Geodetic Institute. The Finnish permanent GPS network FinnRef[®] is a part of the Fennoscandian Regional Permanent GPS Network, which was established by the Nordic Geodetic Commission in response to the initiative of the directors of the Nordic Mapping agencies. Finnref[®] creates a backbone for the EUREF-FIN coordinate system and provides a connection to international and national coordinate systems. FinnRef[®] is also used to study the postglacial rebound in Finland.

Research priorities

The Finnish Geodetics Institute:

- develops methods aimed at acquiring, processing, disseminating and utilising geospatial data to serve the needs of the information society
- studies and develops methods and instruments in the field of geodesy, geodynamics, geoinformatics, cartography, remote sensing, photogrammetry, navigation and positioning
- promotes the adoption of new methods and technologies in geodesy, geoinformatics, remote sensing and navigation
- acts as an expert and research institute for the Ministry of Agriculture and Forestry.

4.20 Finnish Meteorological Institute

Contact

Heikki Tuomenvirta, +358 9 19294122, heikki.tuomenvirta@fmi.fi

Research expertise

The main research target of the Finnish Meteorological Institute (FMI) is the Earth's atmosphere in a holistic way. As complementary research topics, FMI performs studies on the near space and solar influences on Earth's and other planets' atmospheres. FMI research is multidisciplinary including meteorology, physics, chemistry, statistics, engineering, high-performance computing and biology. FMI develop high-quality services from research and development outputs for a wide-range of end-users (public, private, and authorities).

Many FMI's research and development activities addressed or are based on remote sensing and Earth observation technologies.

Research priorities

Meteorological research addresses atmospheric modelling (model, processes, data assimilation) to develop numerical weather prediction models and a wide range of application models, e.g. for wind energy, pollen transport, agro-meteorology, smart transport, etc. Climate research aims at providing robust, comparable and objective climatological data and information for various societal needs (such as for agricultural applications) as well as at assessing the type and strength of changes to be expected from various climate change scenarios. FMI also investigates, monitors and forecasts UV- radiation for various users (e.g. agriculture communities).

Air quality research includes atmospheric dispersion modelling, atmospheric chemistry research and air quality monitoring and assessment (ozone, nitrogen and sulphur compounds, particles, heavy metals and biogenic volatile organic compounds). Space research includes research topics like the Earth magnetosphere, northern lights, the atmosphere of planet Mars, the moon Titan of planet Saturn and the dust and radiation in our solar system. Through a dedicated Unit and focal area, Polar and boreal research addresses special requirements for knowledge and data on related specific conditions and ecosystems.

4.21 MTT Agrifood Research Finland

Contact

Markku Järvenpää, +358 9 2242 5266, markku.jarvenpaa@mtt.fi

Research expertise

MTT has organised its research operations into research areas and research programmes.

Research areas:

- Biotechnology and Food Research
- Animal Production Research
- Plant production research
 - Plant protection

- Horticulture
- Plant production
- Soil and plant nutrition
- Economics
 - Rural Policy
 - Agricultural Policy and Markets
 - Environmental Economics
 - Business Economics
 - Business Accounting
- Technology Research
- Environmental Research

Research programmes:

- Rural Future
- Tomorrow's farm
- Responsible food economy
- Well-being through food
- From fossils to renewables
- Changing climate and agriculture
- Sustainable use of genetic resources

Research facilities

MTT Agrifood Research Finland has at its disposal modern equipment and work premises and facilities for agricultural and food research, and varied and attractive settings for the practical testing work as well. Our advanced equipment, up-to-date software and suitable premises provide a favourable base for research.

Extensive data material, good analysis capabilities and the ability to interpret the results ensure the reliability of research results and the quality of work. Our highly skilled personnel also further the research conducted in MTT.

The different domains of research take place in well-equipped laboratories and other research facilities. A supercritical fluid extractor is one example of the state-of-the-art technology managed by the Chemistry Laboratory which provides services for the entire Research Centre.

MTT Agrifood Research Finland also houses modern DNA sequencers used for genetic research involving microbes, plants and animals. Several of MTT's laboratories, their testing and analysis services, as well as the official plant variety trials performed in MTT, follow standard quality systems.

MTT's pilot plant for food technology includes top equipment for research and product development concerning milk, eggs and vegetables. Moreover, MTT has a pilot dairy where new dairy products are developed and different cheeses are produced on a small scale.

In addition facilities in technology research related to ICT and automation:

- Machine construction shop for mobile work units in Vihti, Southern Finland
- Large cold chamber (x m3) from -40 to +60 °C in Vihti, Southern Finland

- CropInfra technology platform in Vihti, Southern Finland
 - CropInfra incorporates technical infrastructure for information management in crop production farms, utilising the latest research information. The infrastructure, making use of novel measurement techniques in automation, information transfer and communication, will support efficient crop production as well as enable the management of farm-specific environmental and traceability information.
- Test fields in several places in Finland
- Laboratories for soil, plant, feed and water analysis in Jokioinen, Southern Finland
- Greenhouses in Piikkiö, South-West Finland and Jokioinen, Southern Finland
- New research building for dairy cattle with data acquisition in Maaninka, Eastern Finland

Research priorities

In technology research related to ICT and automation:

- Assisting automation in agricultural machinery, ISOBUS, autonomous systems
- Work safety in automation
- Wireless sensor networks for agriculture and the environment
- Smart and sustainable greenhouse systems
- Remote sensing of animal welfare

4.22 VTT Technical Research Centre of Finland

Contact

Abdul Samad (Sami) Kazi, +358 20 722 6666, sami.kazi@vtt.fi

Research expertise

VTT Technical Research Centre of Finland is the biggest multitechnological applied research organisation in Northern Europe. VTT provides high-end technology solutions and innovation services. From its wide knowledge base, VTT can combine different technologies, create new innovations and a substantial range of world class technologies and applied research services thus improving its clients' competitiveness and competence. Through its international scientific and technology network, VTT can produce information, upgrade technology knowledge, create business intelligence and value added to its stakeholders.

Research facilities

VTT offers its customers access to cross-disciplinary technological and business expertise, unique research infrastructure, and comprehensive partnership networks. Customized solutions are created in close co-operation with the customer.

Service offering

- Technology and business foresight
- Strategic research
- Product and service development
- IPR and licensing

- Assessments, testing, certifications and inspections
- Innovation and technology management
- Technology partnership

Research priorities

- Applied materials
- Bio- and chemical processes
- Energy
- Industrial systems management
- Information and communication technologies
- Microtechnologies and electronics
- Services and the built environment
- Business and innovation research

4.23 Seinäjoki Technology Centre

Contact

Marja Vainionpää, +358201244000, marja.vainionpaa@stoy.fi

Research priorities

- Development of technology companies (especially in the field of agrotechnology and food processing technology)
- Development of innovation environments, activities and networks

4.24 Finnish Metals and Engineering Competence Cluster, FIMECC Ltd.

Contact

Seppo Tikkanen, seppo.tikkanen@fimecc.com

Research expertise

Competence cluster in metals and machine building.

FIMECC Ltd. – Finnish Metals and Engineering Competence Cluster, works to boost strategic research in metals and engineering industries. The aim of FIMECC Ltd. is to increase and deepen the cooperation between companies, universities and research institutes in the area of top quality research. FIMECC Ltd. manages research in the area of five strategic research themes through research programs that address specific issues and research questions mentioned in the Strategic Research Agenda. FIMECC is the right cooperation partner for any organization willing to co-create knowledge through strategic pre-competitive research.

Research priorities

Finnish Metals and Engineering Competence Cluster strategic research themes are:

- Service Business
 - Business and earning logic
 - Service productization
 - Service production and management
 - Profitability and productivity
 - Conceptualizing and categorization
- User Experience
 - Design strategy: Horizon
 - Design process: Factory
 - Industrial design: Human interface
- Global Networks
 - Strategy and global networks
 - Value network design and management
 - Product life-cycle management in dispersed global networks
 - Efficient and environmental-friendly logistic solutions
- Intelligent Solutions
 - Intelligent products and concepts
 - Intelligent automation and systems
 - Intelligent production
 - Life cycle management
 - Modelling and simulation
- Breakthrough Materials.
 - Light constructions (e.g. nanotech.)
 - Cutting, forming, joining and surface treatments
 - Active and functional solutions
 - Demanding applications
 - Production technology

4.25 The Energy and Environment Strategic Centre, CLEEN Ltd

Contact

Tommy Jacobson, tommy.jacobson@cleen.fi

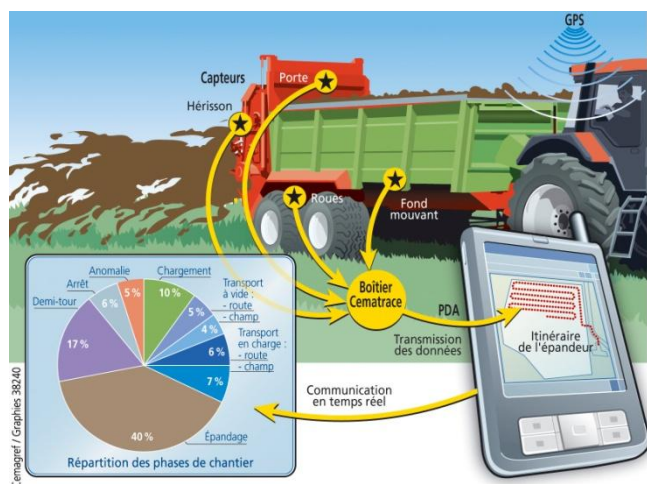
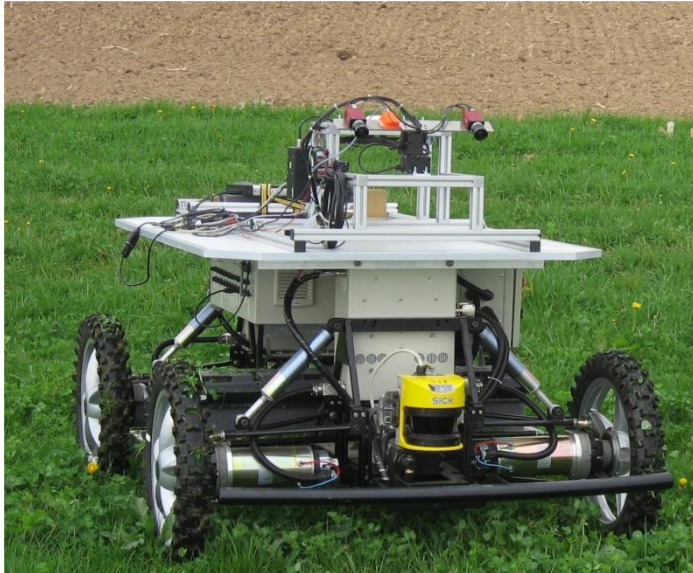
Research expertise

CLEEN Ltd is a completely new way to organise the energy and environmental research in Finland. It is designed to bring focus and industry lead to the research. Therefore it is expected that the efficiency of research and use of research resources will increase considerably. The CLEEN Ltd's operation as the energy and environment strategic centre for science, technology and innovation is based on the common vision and strategic research agenda defined by the centre's owners, i.e., companies and research institutes.

Research priorities

- Carbon neutral energy production
 - Large scale heat and power from biofuels and wastes
 - Heat and Power at Pulp Mills
 - Wind energy
 - Zero emission fossil power production
 - Nuclear power technology
- Distributed energy systems
 - House heating and other small scale applications
 - Municipal and industrial plants, CHP and district heating
 - Transportation of merchandise and powering of ships
 - Waste to energy
- Sustainable fuels
 - Solid biofuel production, fuel chains
 - Biofuels for transport
 - Hydrogen production for fuel cells
- Energy market and smart grids
 - Future infrastructure of energy systems
 - Intelligent management and operation of smart grids
 - Customer gateway
 - Energy and emission services
- Efficient energy use
 - Decrease of energy intensity in products and services
 - Improvement of energy efficiency in industrial processes
 - Development of the components or sub processes
 - Energy management
- Resource efficient production technologies and services
 - Process and product optimisation
 - Efficient water purification systems
 - Resource efficiency
 - External purification methods
- Recycling of materials and waste management Advanced solutions for recycling of complex and new materials
 - Refining concepts for wastes
 - Decentralized waste management and recycling
 - Innovative technology - service concepts
 - Service as an activity
- Measurement, monitoring and assessment of environmental efficiency
 - Development of assessment methodologies (including life cycle models)
 - Assessment of the environmental effectiveness
 - Development of on-line monitoring technologies
 - Service and business models

ICT-AGRI Country Report



ICT-AGRI Country Report FRANCE

*Cemagref - French Institute in Sciences and Technologies for Environment, Parc de
Tourvoie, BP 44, F 92163 Antony Cedex, France*

Authors: Dominique Didelot, Jean Pierre Chanet and Michel Berducat

1. Introduction

About the content of this report and the used method:

This mapping is the first step for identifying the landscape of available skills in each country. The French team has managed this task by proceeding in two stages:

- ☞ by questioning the databases of publications (web of sciences, CAB, Scopus) in order to list the actors involved on the "Era-net Agri keyword" fields
- ☞ by using the address books of the three French coordinators

By this method, 82 targeted persons have been contacted by Email, then sometimes by phone, for filling a relatively simple standard survey, on a model provided by the general coordination. Some of them have forwarded the survey to other relevant persons, or have clearly answered their no interest.

Thus, this national report is a picture of motivated institutions for being involved in potential projects around the Era-net topics. But, at this stage, **we have questioned essentially the public organisations**. It seems to be a compulsory to complete in second stage with a specific questioning of the private sector: industrial manufacturers via their professional trade union, SME specialised in electronic equipments, Service companies for Informations Systems, ...

General elements on French research programmes

Since 2005, an important reformation has been put in place in France with the setting-up of The **French National Research Agency** (Agence nationale de la recherche: **ANR**). ANR is a funding agency for research projects, which works within three articulated steps: programming, research proposal selection (with a part of foreign scientists), and funded projects follow-up.

ANR launches calls for proposals in a large number of scientific and technological fields: Sustainable Energy & Environment / Sciences & Technologies for Information & Communication / Engineering, Processes and Security /Health - Biology /Ecosystems & sustainable development /Humanities & Social Sciences. Some Non-thematic programmes are also available: Chairs of Excellence / Young Researchers / Blanc, for stimulating knowledge production and scientific progress, regardless of discipline. . Some cross cutting programmes encourage innovative and interdisciplinary approaches: Contaminants, Ecosystems and Health / Complex systems and mathematical modelling/ ...

Specifically on ERANET ICT-AGRI fields, we have analysed the ANR calls launched in 2009. On 45 calls, 16 have some interesting keywords, but no one speaks especially about "automatics and robotics applied to agriculture" and 2 or 3 ones only speak about "the ICT applied to agriculture and environment". So, in this national report, we have listed the ANR programmes which have accepted in the past years or are susceptible to accept projects on

the applicative areas of ERANET ICT-AGRI. This observation emphasizes the need to develop some specific cross-thematic calls at the initiative of ERANET ICT-AGRI.

ANR international activities grew as a result of more agreements and original calls for proposals launched together with Germany, United Kingdom, China, etc. Obviously, ANR also participated in a lot of ERA-NETs.

The ANR addresses both public research institutions and industries with a double mission of producing new knowledge and promoting interaction between public laboratories and industrial laboratories through the development of partnerships. About "public – private" partnerships, ANR managed various funding mechanisms for research, namely, Carnot institutes (like Fraunhofer institutes in Germany – NB: There is a strong link between the two networks), Competitiveness clusters, incubators, (read ahead)

This institution centralizes now the major funds for the public research. But, it remains some other specific financial resources through the traditional ways of the ministries: Higher Education and Research - Agriculture – Environment – Industry – etc, or funding agencies (Ademe, OSEO, ...). These other research funding supports are generally oriented on dedicated and applied thematics.

On agricultural application sectors, the French Ministry of Agriculture (MAAP-DGER) manages some programmes directly or through mandated organisations. We can mention CASDAR programme (Call for Rural and Agricultural Development) which is aiming on good diffusion of methods and tools in agriculture, with partnership with public research. Cemagref has the management of "A2PV" programme which one of the main targets is to develop innovative technological approach for reducing pesticide uses, or "Docteurs pour l'entreprise" programme which wants to encourage doctors' recruitment for boosting Eco-innovation in the companies.

France decided in 2004 to combine the key factors of competitiveness into its new industrial policies, especially for innovation. More than 60 "competitiveness clusters" have been defined on the features following: association of companies, research centres and educational institutions – with a common development strategy – to generate synergies in the execution of innovative projects in the interest of one or more given markets. The aim of this policy is to encourage, then support, projects initiated by the economic and academic players in a given local area. So, when a research project is labelling by a "competitiveness cluster", the chances to be funded by ANR are increasing.

To support applied research at the stage of innovative products and services development, a framework is used and called FUI (Fonds Unique Interministériel): Interministerial unique funds. It funds R&D and collaborative projects of the "competitiveness clusters". FUI is located within Ministry of Industry but now is managed by OSEO (innovation agency) for simplifying the procedures.

The French Ministry of Industry, ADEME (Agency for Environment and Energy) and OSEO are also involved in the promotion of Eco-innovations (innovations which are more environmental), especially through some initiatives like "Eco-industries" call.

2. Mapping of national funding bodies

2.1 ANR

For thematics covered by this ERANET:

Contact for Intern relationships: Vodjani Nakita , +33178098013,
Nakita.VODJDANI@agencerecherche.fr

For Agriculture: Griffon Michel, +33178098030, michel.griffon@agencerecherche.fr

For ICT: Bertrand Braunschweig, +33178098016,
bertrand.braunschweig@agencerecherche.fr

2.2 Ministere Agriculture

Contact: Pascal Bergeret, +33149554598, pascal.bergeret@agriculture.gouv.fr

Grenier Pierre, +31(0)149554456 , pierre.grenier@agriculture.gouv.fr

2.3 INRA Unité support

Contact: Avelange Isabelle , +33(0)142759493, systerra@paris.inra.fr

2.4 ACTA - Association for Technical Coordination in Agriculture

Contact: BRUN François, +33561285025, francois.brun@acta.asso.fr

2.5 ADEME

Contact: Petit Nicolas & Yves Duclos, +33241204248 , ecotechnologies@ademe.fr

2.6 Cemagref - Scientific Direction

Contact: Givone Pierrick , +33140962257, pierrick.givone@cemagref.fr

3. Mapping of national research programmes

3.1 Systerra - Ecosystems, living resources, landscapes and agriculture (Systerra - Prog Ecosystèmes et développement durable)

- Owned by:
ANR, Griffon Michel, +33178098030, michel.griffon@agencerecherche.fr
- Managed by:
INRA Unité support
Avelange Isabelle, +33(0)142759493, systerra@paris.inra.fr
- Website: <http://www.agence-nationale-recherche.fr/AAP-276-Systerra.html>

Relevant ICT-AGRI topics:

- ICT applications
- Automation of machinery / equipment
- ICT in environmental regulation
- Effects of ICT and automation
- Structures in sale and support of ICT and automation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Potential

Comments:

The national call open from beginning of december 2009 include a topic mentioning ICT-AGRI areas (precision agriculture) - closed at 29/03/2010

3.2 ECOTECH (Programme Production Durable et Technologies de l'Environnement)

- Owned by:
ANR Freyssinet Philippe, +33(0)178098000,
philippe.freyssinet@agencerecherche.fr
- Managed by:
ADEME - Petit Nicolas & Yves Duclos, +33241204248,
ecotechnologies@ademe.fr
- Website: <http://www.agence-nationale-recherche.fr/AAPProjetsOuverts?NodId=17&IngAAPId=257>

Relevant ICT-AGRI topics:

- ICT applications
- Automation of machinery / equipment
- ICT in environmental regulation
- Effects of ICT and automation
- Structures in sale and support of ICT and automation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Potential

Comments:

This call has followed PRECodd programme - New call since beginning of december 2009

3.3 Rural and Agricultural Development (Développement agricole et rural d'innovation et de partenariat)

- Owned by:
Ministere Agriculture - Sarton Jean-Yves, +33149555090, jean-yves.sarton@agriculture.gouv.fr
- Managed by:
Ministere Agriculture
Sarton Jean-Yves, +33149555090, jean-yves.sarton@agriculture.gouv.fr
- Website: <http://agriculture.gouv.fr/sections/thematiques/recherche-developpement>

Relevant ICT-AGRI topics:

- ICT in environmental regulation
- Effects of ICT and automation
- Structures in sale and support of ICT and automation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Permitted
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Not possible

3.4 ANR - Embedded systems & large infrastructure programme (ANR - prg Systemes embarqués et Grandes infrastructures)

- Owned by:
ANR, Franck Barbier, +33178098116, Franck.Barbier@agencerecherche.fr
- Managed by:
ANR, Franck Barbier, +33178098116, Franck.Barbier@agencerecherche.fr
- Website: <http://www.agence-nationale-recherche.fr/AAPProjetsOuverts?NodId=17&IngAAPId=271>

Relevant ICT-AGRI topics:

- Automation of machinery / equipment
- Standardisation of data dictionaries and communication
- Effects of ICT and automation
- Structures in sale and support of ICT and automation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Potential

Comments:

Agricultural robotics and automatics could be presented in this call - closed at 22/02/2010

3.5 ANR - Prg Content and interactions (ANR - Prg Contenus et Interactions)

- Owned by:
ANR
Braunschweig Bertrand, +33178098016,
bertrand.braunschweig@agencerecherche.fr
- Managed by: ANR
Braunschweig Bertrand, +33178098016,
bertrand.braunschweig@agencerecherche.fr
- Website: <http://www.agence-nationale-recherche.fr/AAP-273-CONTINT2010.html>

Relevant ICT-AGRI topics:

- ICT applications
- Automation of machinery / equipment

- Standardisation of data dictionaries and communication
- ICT in environmental regulation;

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Permitted
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Potential

Comments:

On numerical contents and perception and cognition issues - If Agriculture is not mentioned, it is possible - Closed at 25/02/2010

3.6 ANR - Interactif systems and robotics (ANR - prg Systemes Interactifs et robotique)

- Owned by:
ANR Vodjani Nakita, +33178098013, Nakita.VODJDANI@agencerecherche.fr
- Managed by:
ANR Vodjani Nakita, +33178098013, Nakita.VODJDANI@agencerecherche.fr
- Website: <http://www.agence-nationale-recherche.fr/DeptUK>

Relevant ICT-AGRI topics:

- Automation of machinery / equipment
- Standardisation of data dictionaries and communication
- Effects of ICT and automation
- Structures in sale and support of ICT and automation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Potential

Comments:

Closed at 27/03/2007 - Has provided at least 2 projects on "robotics in agriculture": Impala and Fast projects

3.7 A2PV- viticulture and reduction of pesticide use

- Owned by:
Ministere Agriculture
Grenier Pierre, +31(0)149554456, pierre.grenier@agriculture.gouv.fr
- Managed by:
Cemagref - Scientific Direction Givone Pierrick , +33140962257,
pierrick.givone@cemagref.fr
- Website: <http://agriculture.gouv.fr/sections/outils/marches-appels-projets/appel-projets-recherche>

Relevant ICT-AGRI topics:

- ICT applications
- Automation of machinery / equipment
- Standardisation of data dictionaries and communication
- ICT in environmental regulation
- Effects of ICT and automation
- Structures in sale and support of ICT and automation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Potential

3.8 Agricultural technical Institutes (Instituts techniques agricoles)

- Owned by:
Ministere Agriculture
- Managed by:
Ministere Agriculture
Sarton Jean-Yves, +33149555090, jean-yves.sarton@agriculture.gouv.fr
- Website: <http://agriculture.gouv.fr/sections/thematiques/recherche-developpement>

Relevant ICT-AGRI topics:

- ICT applications
- Automation of machinery / equipment
- ICT in environmental regulation
- Effects of ICT and automation
- Structures in sale and support of ICT and automation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Potential

Comments:

Deadline for projects: 01 march 2010

3.9 ECO INDUSTRIES (ECOINDUSTRIES)

- Owned by:
Ministère de l'Economie, de l'Industrie et de l'Emploi
- Managed by:
Ministère de l'Economie, de l'Industrie et de l'Emploi
- Website: http://www.industrie.gouv.fr/portail/une/index_appe_cours.html

Relevant ICT-AGRI topics:

- Effects of ICT and automation
- Structures in sale and support of ICT and automation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Not possible

Comments:

One topic of this call is targeted on ETV (Environmental Technology Verification) system implementation - This call is again open for 2010 since beginning of december 09

3.10 Eco technologies and sustainable development (Programme Ecotechnologies et Développement Durable)

- Owned by:
ANR Freyssinet Philippe, +33(0)178098000,
philippe.freyssinet@agencerecherche.fr

- Managed by:
ADEME Petit Nicolas & Yves Duclos, +33241204248 ,
ecotechnologies@ademe.fr
- Website: <http://www.agence-nationale-recherche.fr/templates/appele-a-projet.php?NodId=17&lngAAPId=77>

Relevant ICT-AGRI topics:

- Automation of machinery / equipment
- Standardisation of data dictionaries and communication
- ICT in environmental regulation
- Effects of ICT and automation
- Structures in sale and support of ICT and automation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Potential

Comments:

This programme is closed - ECOTECH programme has followed it - Some current projects (ANR-ECODEFI, ...) are active

3.11 Doctors for enterprise (Docteurs pour entreprise)

- Owned by:
Ministere Agriculture, Grenier Pierre, +31(0)149554456 ,
pierre.grenier@agriculture.gouv.fr
- Managed by:
Cemagref - Scientific Direction, Gérard Chuzel, +33140966124,
gerard.chuzel@cemagref.fr
- Website: <http://agriculture.gouv.fr/sections/thematiques/recherche-developpement>

Relevant ICT-AGRI topics:

- ICT application
- Automation of machinery / equipment
- Structures in sale and support of ICT and automation

Brief characterisation:

- Geographic scope: Trans-national

- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Confirmed

Comments:

Direct link is established with ICT-AGRI for funding the first call of 2010

4. Mapping of national research institutes

4.1 ACTA - Association for Technical Coordination in Agriculture

Contact

BRUN François, +33561285025, francois.brun@acta.asso.fr

Research expertise

- Decision support system at field scale: precision agriculture on arable and perennial crops: disease development diagnosis models, technical operation optimization models (to adjust fertilizers and pesticides dose/application), agricultural practices planning (spraying, spreading, irrigation ...), agricultural machinery (for spraying, spreading, irrigation ...) with optical vision...
- Capacity to disseminate information about ICT developments up to farmers and advisors as well as to searchers
- Decision support system at farm scale: farm steering (environmental impact of livestock farms, environmental impact of fertilization...), GIS and spatial modelling (pest distribution simulation...)
- Traceability and quality of products
- Precision livestock farming (electronic identification – RFID tags and use for feeding, milking robots...)
- In-depth knowledge and experience of adoption of ICT in Agriculture

Research priorities

Some current projects:

- GI-E-EA: Environmental traceability (FR)
- AgriXchange: Information exchanges between farms and their environment
- Modelia : network of French labs involved in modeling activities in agriculture and biology. <http://www.modelia.org/moodle/>
- Network of French labs involved in livestock and environment (Melodie = modelling the environmental impact of livestock farms)
<http://www.rmtelevagesenvironnement.org/index.htm>
- Network of French labs involved in fertilizer application and environment (DSS Azosystem, ...) <http://195.101.239.116/rmtferti/moodle/>
- ENDURE, European Network for the Durable Exploitation of Crop Protection Strategies. <http://www.endure-network.eu/>

4.2 AgroSup Dijon - Higher Educational Agronomic School of Dijon

Contact

GEE Christelle, +33(0)380772771, c.gee@agrosupdijon.fr

Research expertise

Image processing for agricultural applications - mainly concern the reduction of chemical inputs for a sustainable agriculture.

Two applications are developed : a survey on fertilizer distribution on centrifugal spreaders / Plant characterisation for a site-specific weed management in crop field.

Other researches deal: Conception and development of acquisition system (an in-field image or not) and the associated treatments allowing to simplify the counting operations, to quantify a disease's rate, to evaluate an earlier yield ...

Research facilities

Cameras (B&W and RGB), 4-filter wheel camera (B,G,R,IR)

Research priorities

- Fertilizer distribution on centrifugal spreaders
- Crop/ weed discrimination in image for precision sprayer
- Fast imagery to characterize herbicides for vineyard
- In-Field Wheat ears Counting Using Color-Texture Image Analysis

4.3 Cemagref - Unit TSCF (Technologies and Informations systems)

In relation with information and communication technologies (ICT), the major research topics are focused on the interoperability of the heterogeneous information systems used by farmers and their institutional and economical partners, the data exchange and communication between environmental information systems and the associated conceptual design methodologies. CEMAGREF works for several years on the use of wireless sensor network in agricultural and environmental context. We also develop wireless distributed information system for agricultural robot, to allow mobile to work in a collaborative way. We were involved in different FCPR research projects like TWISTER, NETADDED which develop broadband access in rural area with heterogeneous solutions (Satellite and WiFi for instance). We also develop information system for environmental application (i.e. OTAG: project for operational traceability in extensive bovine production) based on spatial data warehouse solutions.

In automation and robotic equipment for agriculture CEMAGREF has profound experiences with projects in collaboration with international industrial partners. Recent examples include the 2003-2005 research project with CLAAS company (Germany) on Accurate RTK GPS based guidance of agricultural vehicles operating on slippery grounds, the participation between 2000-2003 in the LOW-COST NAVIGATOR project from ESA - European Space Agency (THALES, Nottingham Scientific Limited, Aerodata, GMV, CEMAGREF) and since 2004, the coordination of the Out-doors localisation module inside the MiniRoc project from French DGA (French General Direction of Armament).

Contact

Didelot Dominique , +33 473440664, dominique.didelot@cemagref.fr

Michel Berducat, +33473440675, michel.berducat@cemagref.fr

Jean Pierre Chanet, +33473440678, jean-pierre.chanet@cemagref.fr

Research expertise

Technologies for the Characterisation of Ecosystems and Agrosystems

Technologies and Reduction of Agricultural Pollution

Technologies for Mobility and Safety in Agro equipment - Assistance driving and Robotic systems

Technologies for Information and Communication for Integrated Environmental Management

Research facilities

- PEE technological Platform - A core facility dedicated to organic and inorganic matter spreading
- PAVIN -VMN Platform - for mobility, robotics and guidance experimentations in low structured outdoor applications
- Real time embedded middleware tool for sensors and actuators management
- Experimental farm at Montoldre (Dept 03) for technological implementation in real case
- This Unit belongs to the Research Federation called Technologies for Information Support, Mobility and Security (TIMS) with about 200 researchers and engineers from 6 laboratories on academic campus of Clermont Ferrand.

Research priorities

- Accurate guidance of agricultural vehicles operating on slippery grounds
- Out-doors perception and control/command modules for robotics applications, obstacles avoidance, autonomy increasing of robots in low structured environment
- Dynamics models for stability vehicle control
- Improvement of organic, mineral and pesticide spreading
- Interoperability of the heterogeneous information systems used by farmers and their institutional and economical partners
- Wireless Sensor Network for agriculture and environment
- Information System and Data warehouse for Geo Decision
- Life Cycle Analysis applied for agrotechnological systems

4.4 Cemagref - Joint research unit ITAP (Information and Technologies for Agrosystems)

Contact

Jean Michel Roger, +33467046383, jean-michel.roger@cemagref.fr

Bernadette Ruelle, +33467166411, bernadette.ruelle@cemagref.fr

Gilles Rabatel, +33467046358, gilles.rabatel@cemagref.fr

Research expertise

- Characterisation of agroproducts and agrosystems through the development of optical sensors, the characterisation of plots and crops through modelling tools, information processing and decision-support systems
- Research engineering for traceability of agricultural pesticides application / embedded electronic system and mechatronic.
- Environmental assessment by Life Cycle Analysis

Research facilities

- Reducpoll: Specific technology platform for research on plant protection product application equipment and techniques
- ELSA: Research Group on Environmental Lifecycle and Sustainability Assessment (<http://www.elsa-lca.org/>)

Research priorities

- Automatic, geo-referenced traceability of plant protection product applications
- Sensors design and development on environment perception
- Methodologies of environmental assessment: LCA applied to bio-systems engineering and water management

4.5 CIRAD - Persyst UR 102 (Annual cropping systems)

Contact

Maraux Florent, +3346761563, florent.maraux@cirad.fr

Research expertise

In order to optimize the using of machine in the small agricultural farms we have need to collect informations.

During several years, we developed a system for recording farming data by using embedded system, more specifically on the sugarcane harvesters.

At the moment, we are working on the localization of data on map (Geographic Information System) and in the future, we will wish to study a project for database setting up as decision support implement.

Research facilities

In response to the economic, social and environmental changes resulting from globalization, CIRAD has renewed its scientific strategy, which now centres on six priority lines of research, accompanied by a new geographical partnership strategy aimed at expanding and consolidating its international cooperation structure.

The world around us is ever-changing, largely as a result of pressure from economic globalization and new communication methods.

The growth in food and energy requirements has put agriculture firmly back in the international spotlight. The future of agricultural activities and of the people involved in them is a major global issue.

An agricultural science that crosses borders, that is open to the outside and respects people, territories and the environment, is what is required to address the major development issues.

The major global development issues, which are both complex and ever-changing, call for substantial operational responses and resources. CIRAD has therefore opted to centre its operations on six priority lines of research.

The six priority lines of research:

- Ecological intensification
Helping to develop ecologically intensive agriculture in order to feed the world.
- Biomass energy and societies in the South
Studying how we can ensure that the emergence and development of bioenergies favour people in developing countries
- Accessible, quality food
Innovating to make food accessible, varied and safe.
- Animal health and emerging diseases
Foreseeing and managing the infectious disease risks linked to wild and domestic animals.
- Public policy, poverty and inequality
Supporting public policies aimed at reducing structural inequality and poverty.
- Agriculture, environment, nature and societies
Understanding the relations between agriculture and the environment and between human communities and nature better so as to manage tropical rural areas sustainably.

Research priorities

Farm management systems

Information systems

Monitoring systems

Decision support systems

Data and knowledge sharing systems

4.6 Esitpa Master school of agriculture

Contact

Llorens Jean-Marc, jean-marc.llorens@agrinovatech.fr

Research expertise

Our main expertise is the global analysis of crop production.

Our specific expertises are

- 1- Mineral nutrition of crops
- 2- Crop system economic analysis
- 3- Economic modelling at various of territorial levels
- 4- Crop modelling
- 5- Geostatistic analysis

Research facilities

dedicated agronomic trials sites for precision agriculture

Research priorities

- Developing sensor to detect specific crop biomass to use site-specific pesticide spreaders
- Developing crop models to predict the use of precision agriculture techniques

4.7 National Federation of the agricultural equipment cooperatives

Contact

GUISCAFRE Pierre, +33144175797, pierre.guiscafre@cuma.fr

Research expertise

The FNCUMA is at the head of the Cuma network, which represents about 13 000 cooperatives through the territory. Some Cuma can be experimental and diffusion areas of those new technologies and they answer to the major condition of development and dissemination of those new technologies.

Research priorities

Some current projects: Tic Sad / Energetic / Res Agri (pilot Agroedi Europ)

4.8 FOOTWAYS

Contact

Dubus Igor, +33 238 636 465, i.dubus@footways.eu

Research expertise

FOOTWAYS is a start-up company specialized in developing offline and online tools to evaluate – and reduce – the risks of pesticides reaching and impacting on surface water and groundwater across the EU. The company was recently founded by Dr Igor Dubus, the former founder and coordinator of the EU-funded project FOOTPRINT, and Dr Stefan Reichenberger, a leading European scientist in the field of pesticide risk assessments.

FOOTWAYS has the ability to undertake risk assessments for pesticides at all scales (farm, catchment, region, country and the EU) and for all pesticide stakeholders (from decision

makers right down to farmers and extension advisers). FOOTWAYS' approach relies on i) a detailed characterisation of environmental conditions where pesticides are applied; and, ii) the deployment of pesticide fate models originating from research.

The modelling is undertaken on a supercomputer which was developed specifically to perform environmental fate modeling. This computing power allows detailed spatial risk assessments and advanced related studies such as sensitivity and uncertainty analyses to be undertaken.

Research facilities

Supercomputer dedicated to the modelling of pollutant fate in the environment and associated risk assessments at the farm, catchment, regional, national and EU level.

15-year expertise in predicting the transfer of pesticides to water resources (surface water and groundwater).

Research priorities

Development of functional tools to help stakeholders evaluate and reduce the risks of agricultural pollutants reaching water resources (nitrate, phosphorus, veterinary medicines, human medicines applied to land as sewage sludge).

Research to facilitate the adoption of ICT tools by farming communities.

4.9 French Network of Livestock and Farming ICT resources

Contact

ROGNANT René, +33(0)140045194, rrognant@fie-arsoe.com

Research expertise

Farm information system
Cattle information system
Mobile devices
Web sites
Collective data base
Robotics
Precision farming
Dairy farming

Research facilities

FIEA manages a network of 8 ICT centres with teams of IT specialists –

FIEA is member of the French network of cattle organizations(breeding, animal recording, genetics,).

Research priorities

Data exchange modelization and standardization

Names of current projects on this cross-thematic: Res-agri (French Industry Ministry) / ORI Automat (Standardized data exchanges between automats and fixed cattle equipments)

4.10 IFMA - French Institute for Advanced Mechanics

Contact

Ray Pascal , +33473288023, Pascal.Ray@ifma.fr

Research expertise

School of engineers in mechanical and production systems

IFMA and the associated research lab LaMI have multidisciplinary competences in Engineering Sciences (mechanics, electronics, robotics, data acquisition and treatment)

They have expertise on the design of innovative machines (agricultural tools, specific all-terrain vehicles, tree climbing robots) and modelling of their real behaviour (skid-steering, fertilizer spreading, branch pruning).

Research facilities

technological platform in mecatronics and robotics for factories: MECAPROD - belongs to the Research Federation called Technologies for Information Support, Mobility and Security (TIMS) with about 50 researchers and engineers from 4 laboratories on academic campus of Clermont Ferrand.

Research priorities

- Machine, Robot and Vehicle design
- Mechanics and Mechatronics
- Innovative Design and Creativity
- Modeling of the Real Behaviour of Machines

4.11 INRA - Ecodevelopment Unit

Contact

TCHAMITCHIAN Marc, +33432722561, marc.tchamitchian@avignon.inra.fr

Research expertise

- Protected cultivation and systems design or improvement based on the use of models (whether quantitative or qualitative) to simulate or evaluate the properties of cropping systems
- Optimization methods (optimal control, automatic learning) to vegetable production systems

- Appraisal and qualification of growers and expert knowledge to merge it to scientific results in order to enlarge the overall knowledge applied to design pesticide-free vegetable cropping systems
- Formalization of methods to accompany growers in coping with the changes needed by today's evolution of the agriculture, by partnership with growers and extension services, but also on models and computer systems to help assessing the quality or the properties of the proposed innovations.

Research facilities

- Protected vegetable grower's network (a group of about 15 growers granting access to their plastic greenhouses to monitor soil-borne diseases)
- Extension services network (a group of local advisers and extension engineers cooperating on experimentation of pesticide-free techniques combination and field surveys, as well as on the design of innovating vegetable cropping systems)

Research priorities

- Decision support systems (diagnostic models for diseases)
- Environment friendly production systems (evaluation tools and assisted design tools)

4.12 INRA - Environmental Biotechnology Laboratory

Contact

Jean-Philippe Steyer, +33468425151, steyer@supagro.inra.fr

Research expertise

- Instrumentation, modeling, control and diagnosis of wastewater treatment processes (WWTPs) with special emphasis on agricultural wastes.
- Telemonitoring and database development for remote supervision of WWTPs.
- Life cycle analysis of WWTPs and bioenergy production systems

Research facilities

Innovative Platform to assess and to evaluate waste and wastewater treatment processes:
ELSA: Research Group on Environmental Lifecycle and Sustainability Assessment
(<http://www.elsa-lca.org/>)

Research priorities

- Modeling, control and optimization of waste and wastewater treatment processes
- Life Cycle Analysis of waste treatment and bioenergy production systems

4.13 INRA - Joint research unit on Dairy Production

Contact

Faverdin Philippe, +33223485095, philippe.faverdin@rennes.inra.fr

Research expertise

- Decision Support system. Ex: Development of softwares to help farmers and advisors to formulate animal diet and to manage grazing systems.
- Environment and livestock farming system. Ex: Development of a simulator of animal farms to evaluate environmental consequences of system management (Melodie).
- Precision Livestock Farming. Collaboration to develop and evaluate animal biological or behavioural sensors. Ex : ruminal cardio-thermo bolus and interpretation of continuous ruminal temperature sequences.

Research priorities

Decision Support system / Environmental evaluation of livestock farming system / Precision Livestock Farming

Current projects: SPA/DD and ACCASYA (ANR Project)/ INRAtion Software / MOZAE (CasDar Project)/ RedNex (UE project in progress) / Grazemore (UE project completed)

4.14 INRA – Biometry and Artificial Interlligence

Contact

Roger Martin-Clouaire, +33 561 285 286, rmc@toulouse.inra.fr

Research expertise

Modeling of dynamic agro-ecosystems
Modeling of work organization and decision processes at farm level
Simulation platforms
Simulation-based design and optimization

Research facilities

Simulation platforms

Research priorities

Modeling of dynamic agro-ecosystems
Resource management in agricultural production systems
Uncertainty management in decision processes at farm level
Modeling and optimization in problems having a spatial structure
Simulation-based design and optimization

4.15 INRA – Herbivores Research Unit

Contact

Pérochon Laurent , +33 473 624 535, laurent.perochon@clermont.inra.fr

Research expertise

Expertise on multi-agents simulation, data bases, compartment models, bovine production systems, relationship between animal – plants – food

Research priorities

Bovine production systems
relationship between animal – plants – food

4.16 INRIA - French national institute for research in computer science and control

Contact

MOISAN Sabine, + 33 4 92 38 78 , Sabine.Moisan@sophia.inria.fr

Research expertise

Video camera network to detect and count early infestations of bio aggressors in greenhouses

Research facilities

Vision platform (SUP) for video processing

Research priorities

- Video and knowledge-based methods for early bio-aggressor detection and recognition
- Decision support systems
- Integrated protection/production management
- Plant production

4.17 Interprofessional Technical Center for Fruits and Vegetables

Contact

Vincent MATHIEU, +33(0)466011054, mathieu@ctifl.fr

Research expertise

Link between orchard and mechanical tools, development of tools to measure or assess quality, development of tools for decision support

Research facilities

Two experimental centers for implementation of precision agriculture: Ctifl - Centre de Lanxade / Ctifl - centre de Balandran

Research priorities

Orchard mechanization (thinning, disease prevention ...)
Quality assessment

4.18 ISIR - Institut of Intelligent Systems and Robotics

Contact

FAIZ Ben-Amar, +33 1 44 27 63 4, amar@isir.upmc.fr

Research expertise

Off-road vehicle control and design
Modeling wheel-ground interaction
Mobile robots applications
Fast mobile robot
Omnidirectional vision
Localisation and mapping
Environment sensing and sensor fusion

Research facilities

Agile off-road mobile demonstrator robots
Fast off-road mobile demonstrator robots

Research priorities

Automation and Robotics

4.19 ITB - Technical Institute for Sugar beets

Contact

Cédric ROYER, +33142933285, royer@itbfr.org

Research expertise

- Machinery of sugar beet: drilling, hoe, harvest and beet cleaner.
- Tests, study of costs, advice for farmers

Research facilities

Regional experimental sites

Research priorities

- Reduction of the use of herbicides on sugar beet by machinery
- Decrease soil tare

4.20 LAAS - Laboratory for Analysis and Architecture of Systems

Contact

LACROIX - Simon, +33 561 33 62 66, Simon.Lacroix@laas.fr

Research expertise

A wide variety of problems are studied, from the classic foundations of robotics (environment perception and modeling, path planning, task planning, task execution control, motion control...) to more advanced topics (decisional architecture, heterogeneous multi-robots systems, learning, human robot interaction...) in unknown, unstructured environment.

Our current focus is on aero-terrestrial multi-robot systems, that make sense for a wide range of missions (exploration, surveillance, intervention). Most of our research in field robotics are now targeted towards such systems, within which many basic robotics functionalities must be completely revisited and numerous new challenges are to be tackled. Two main threads of research, naturally not independent, are considered: environment modelling and vehicle localization from multiple sources, and distributed decision making within multiple robot systems.

Research facilities

- Two fully equipped rovers (100 kg class)
- Several drones able to flight autonomously

Research priorities

- Environment perception and modeling for robotics
- Robot localization, Simultaneous localization and mapping
- Decision making for high level autonomous mission achievement (task planning, supervision and execution control)
- Distributed multi-robot systems

4.21 LASMEA - Laboratory of Sciences and materials for Electronics and Automatization

Contact

THUILOT Benoit, +33 4 73 40 52 1, benoit.thuiot@lasmea.univ-bpclermont.fr

Research expertise

- High accuracy guidance of autonomous agricultural vehicles
- On-line estimation of grip conditions at tire/ground interface
- Active security devices for off-road vehicle rollover prevention
- Cooperative control of a fleet of networked off-road vehicles
- Nonlinear control, adaptive control, predictive control, observers

- Data fusion (Radar / Lidar / Camera / GPS) for vehicle localisation and Scenes understanding

Research facilities

PAVIN UV experimental Site: a 5.000m² area (focussed more on urban environment) dedicated to Intelligent Transportation Systems assessment (including 320m long asphalted streets, 260m long tracks and 5 electric vehicles equipped with RTK GPS sensors, camera, laser rangefinder sensors, wireless communication, etc)

Research priorities

- autonomous agricultural vehicles
- networked cooperating vehicles
- active security devices for off-road vehicles

4.22 LIMOS – Laboratory on System Information Modeling and Optimization

Contact

Paris Jean-Luc, +33 473 288 024, paris@ifma.fr

Research expertise

Organization of production systems (manufacturing systems, food-processing industry, services). Logistic. Growth management of SMEs. Knowledge management.

Research facilities

Laboratory of Computing for the Modelling and the Optimization of Systems UMR CNRS 6158

Member of the Poles of competitiveness “Viaméca” and Innoviandes

Research priorities

Organization of production systems (manufacturing systems, food-processing industry, services)

Logistics

Growth management of SMEs

Knowledge management

Geographical Information Systems

Wireless Sensor Network

4.23 LIRIS - Lyon Research Center for Images and Intelligent Information Systems

Contact

Servigne Sylvie, +33 4 724 38 483, sylvie.servigne@insa-lyon.fr

Research expertise

- Spatial data quality
- Spatio-temporal data indexation
- Sensor data management

Research priorities

Quality of data for sensor driven agriculture

Agri-datawarehouse for decision making

4.24 LIRMM - Laboratory of computer Science robotics and microelectronics of Montpellier

Contact

LIBOUREL Thérèse, +33467418534, libourel@lirmm.fr

Research expertise

With a broad range of skills in information science and technology, communication and systems, LIRMM research activities revolve around modeling and designing various hardware and software systems (such as robots and integrated circuits), as well as research on algorithmics, bioinformatics, databases and artificial intelligence.

Leveraging this diversity, LIRMM reinforces its originality by combining theory, tools, experiments and applications in all its areas of scientific expertise, favoring the emergence of interdisciplinary projects with its laboratory (such as image, digital security, handicap ...) and in contact with other laboratories and scientific fields (such as mathematics, life sciences, health, neuroscience, environment...).

- Informatics
- Algorithmics and computational theory
- Databases and information systems
- Software engineering
- Artificial intelligence
- Human-computer interaction

Research priorities

- Information systems, databases, data warehouse.
- Software engineering (model driven engineering, web services, components...).
- Methodologies and tools for geographical information systems (modeling, model integration, model traceability, metadata...).
- Process chains for geographical and biological tools.
- Environmental metadata and ontology building.
- Image processing.
- Data mining.

Projects and tools:

- COPT (Conception d'Observatoires de Pratiques Territorialisées)
- PPF Parties (Partage d'applications réparties en environnement)
- MD-WEB <http://www.mdweb-project.org>

Current partners in research: UMR TETIS (CEMAGREF, CIRAD, Agroparistech), US ESPACE IRD Drafting team Inspire

Some current projects: COPT (Conception d'Observatoires de Pratiques Territorialisées) / PPF Parties (Partage d'applications réparties en environnement)/ MD-WEB <http://www.mdweb-project.org>

4.25 LSIS - Information Science and Systems Laboratory

Contact

NAAMANE Abdelaziz, + 33 4 91 05 60, aziz.naamane@lsis.org

Research expertise

For Greenhouse activities:

identification and modeling of the greenhouse microclimate - Automatic and systems

Keywords:

- Multi-model and multi-structure method
- Soft computing (fuzzy logic and neural networks)
- Parametric identification
- Data analysis for modeling and diagnosis (Principal Component Analysis, Neuronal Non Linear PCA)

For Autonomous systems:

Non-linear and complex systems, Variable Structure Systems
Automatic Control Systems, Adaptive and Robust Control,
Robotics and Mechatronics for autonomous systems
Signal processing, Diagnosis and Observation in Complex systems
Vehicles Dynamics and robots, Driving assistance

Research facilities

For Greenhouse activities:

We dispose on the university campus of an experimental greenhouse (80m2) interfaced on intranet and internet

For autonomous systems:

Driving Simulator Scanner II, which is a simulation tool

Research priorities

For Greenhouse activities:

- Modeling and control of MIMO system like greenhouse
- Software sensors (nonlinear observers) : application to wastewater treatment

For Autonomous systems:

Autonomous vehicle and Control Systems

- Observation, estimation and diagnosis
- Motion and trajectory planning, Navigation
- Simulation, prototyping and teleopération
- Data Processing and diagnosis
- Informations and Control Systems

4.26 Montpellier SupAgro - international center for higher education in agriculture sciences

Contact

TISSEYRE Bruno, +33499612335, tisseyre@supagro.inra.fr

Research expertise

- Precision viticulture, remote sensing applied to viticulture
- Data extrapolation (plant water status) based on auxiliary data (biomass index, soil apparent conductivity)
- Decision support on the opportunity to manage the variability.

Research priorities

- Precision agriculture
- Decision support

4.27 Regional Chamber of Agriculture of Brittany -

Contact

Augeard Philippe, +33(0)223482800, philippe.augeard@bretagne.chambagri.fr

Research expertise

The applied research department carry out an applied research program:

- In dairy and beef production. 30 engineers and veterinaries lead study in experimental farms and in pilot farms networks. Contact : Rémi Espinasse
- Pig housing and especially new technologies for piggeries or equipments: piggeries for the future with low energy consumption, for the welfare of pigs, with low gas emissions, equipments to reduce the hardness of the work, equipments to centralize the economical and technical information. Contact : Brigitte Landrain

- Ag equipment: Characterisation work mechanized farms, with information system with data recording geo-located work and fuel consumption on all tractors of several farms and feeding of a database. Techniques for application of organic fertilizers. Mechanical weeding techniques. Contact: Pierre Havard

The applied research department transfers the results to farmers and advisers by using sessions of training and monthly technical magazines.

Research facilities

- Trevarez Experimental Farm: 150 dairy cows - project to invest in a mobile milking robot
- Mauron Experimental Farm: 220 young bull, bullock, beef heifers or culled cows - a electronic earring system to weighing and sorting livestock
- Guernévez Experimental Farm: equipments and buildings for pigs
- Cormiers Experimental Station: Ag equipment with Ecofuel information system and Bench test for manure and slurry spreader.
- Kerguehennec Experimental Farm: Agricultural crop production
- Crecom Experimental Farm: pig production

Research priorities

- Mobile automatic milking system
- Health and reproduction monitoring of dairy cows by using new data recording systems : activity-meter, rumination sound, ruminal temperature
- Automatic silage feeding systems for cattle
- Electronic earring system for cattle identification
- Software for cattle farm management
- Equipments and buildings for animal welfare
- Pig housing to reduce gas emissions, with recycled effluent and slurry treatments
- New energies development and low cost energy in pig housing
- Ecofuel: Knowledge of fuel consumption, working time, size of materials used in farms according to production techniques. Simulation of fuel consumption, working time, size of material.
- Application of organic fertilizers.
- Mechanical weeding and reduced tillage

Names of current projects: Testing activity and rumination sound meter on dairy cows / Setting up a mobile automatic milking system in Trévarez farm / Using electronic earring system to connect cattle management software to electronic equipments

4.28 Sciences for the environment Laboratory - UMR CNRS 6134

Contact

Delhom Marielle, +33 495 450 160, delhom@univ-corse.fr

Research expertise

We are computer researchers and we work on the modeling and the simulation of complex systems.

We are particularly interested by the study of natural or environmental systems.

Our researches can be used to develop Decision Support systems.

Research facilities

Computers

Software : Arcview, Map Info

Modeling & Simulation Environment

Wireless Sensors Network (WSN)

Research priorities

Decision Support Systems

Multi-agent Systems

Geographic Information Systems

Environmental monitoring with WSN

Modeling & Simulation

4.29 XLIM - CNRS/Limoges University joint lab

Contact

MEIZEL Dominique, + 33 555 42 36 8, dominique.meizel@xlim.fr

Research expertise

- Kinematical and dynamical Modeling of wheeled vehicles especially in 3D terrain
- Localization by data fusion
- Software sensors (observers)
- Optimal hybridizing of human energy

Research facilities

- Portable onboard instrumentation for vehicle dynamic analysis
- Portable onboard instrumentation for localisation
- Electronic compatibility analysis in instrumentation

Research priorities

- Security management of displacements

AGRI Country Report



ICT-AGRI Country Report GERMANY

Federal Agency for Agriculture and Food, Deichmanns Aue 29, D- 53179 Bonn, Germany

Authors: Elke Saggau and Kristina von Bobrutzki

1. Introduction

In Germany the landscape of players in the ICT-AGRI relevant field of research and the landscape of research programmes in this area are very diverse.

Actually research and development for the application of ICT in the field of agriculture (including environmental issues) is a booming sector in Germany. This national report presents the German public and federal research institutes involved in ICT-AGRI research topics. The German private sector is not in the focus of this first report, although industry and SMEs play an important role within the development of highly innovative marketable products for ICT in agriculture.

The ICT-AGRI relevant public research landscape is rather fragmented with a wide range of institutions: Both, basic and applied research is carried out by

- public universities,
- universities of applied sciences (Fachhochschulen),
- institutes belonging to one of the four major non-university research organisations, the Leibniz-Institutes and Fraunhofer-Institutes representing the main players in the ICT-AGRI field,

and last but not least by

- the four German federal research institutes within the remit of the German Federal Ministry of Food, Agriculture and Consumer Protection (Ressortforschungseinrichtungen).

Altogether all these institutes form the German scientific community.

In the national public funding of research and development for ICT in Agriculture in Germany following four Federal Ministries are involved:

- The Federal Ministry of Food, Agriculture and Consumer Protection (BMELV),
- The Federal Ministry of Education and Research (BMBF),
- The Federal Ministry of Environment, Nature Conservation and Nuclear Safety (BMU) and
- The Federal Ministry of Economics and Technology (BMWi).

Further funding institutions are

- The German Federal Environmental Foundation (DBU) and
- The German Research Foundation (DFG).

The relevant ICT-AGRI funding is organized by 14 major research programmes.

Within these programmes basic research is funded but there exists also a priority for the funding of public-private-partnerships to foster the sustainable collaboration of the public research sector with partners from SMEs and industry in joint projects and networks. Examples are the programmes “Funding for Innovations” and “KMU innovative”.

However, the funding programmes relevant for ICT-AGRI also place a strong emphasis on the aspects of sustainability and environmental compatibility of agricultural production. Examples are the programmes “Environmental Protection in Agriculture” and “Research for Sustainability”.

2. Mapping of national funding bodies

2.1 The Federal Ministry of Economics and Technology (BMWi)

Contact: see contact information under: <http://www.bmwi.de>

2.2 The Federal Ministry of Education and Research (BMBF)

Contact: see contact information under: <http://www.bmbf.de>

2.3 The Federal Ministry of Environment, Nature Conservation and Nuclear Safety (BMU)

Contact: see contact information under: <http://www.bmu.de>

2.4 The Federal Ministry of Food, Agriculture and Consumer Protection (BMELV)

Contact: see contact information under: <http://www.bmelv.de>

2.5 German Research Foundation (DFG)

Contact: see contact information under: <http://www.dfg.de>

2.6 German Federal Environmental Foundation (DBU)

Contact: Holger Wurl, +49 (0) 54196 33340, hn.wurl@dbu.de

3. Mapping of national research programmes

3.1 Advisory and Decision-making Support (Deckung von Entscheidungshilfebedarf)

- Owned by:
Ministry of Food, Agriculture and Consumer Protection (BMELV)
- Managed by:
The Federal Agency for Agriculture and Food (BLE)
Dr. Elke Saggau, +49 (0)22868453930, elke.saggau@ble.de
- Website:
<http://www.ble.de>

Relevant ICT-AGRI topics:

- ICT applications to be used in primary agricultural or horticultural production, including online resources
- Standardisation of data dictionaries and communication protocols for use in primary agricultural or horticultural production
- ICT and automation in environmental regulation of primary agricultural or horticultural production
- Effects of ICT and automation on competitiveness, profitability, and environmental impacts of agricultural or horticultural production

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Unknown
- Contribution to ICT-AGRI calls: Potential

3.2 Environmental Protection in Agriculture (Umweltschutz im Agrarbereich)

- Owned by:
Ministry of Food, Agriculture and Consumer Protection (BMELV)
- Managed by:
The Federal Agency for Agriculture and Food (BLE)
Dr. Elke Saggau, +49 (0)22868453930, elke.saggau@ble.de

- Website:

<http://www.ble.de>

Relevant ICT-AGRI topics:

- ICT applications to be used in primary agricultural or horticultural production, including online resources
- ICT and automation in environmental regulation of primary agricultural or horticultural production
- Effects of ICT and automation on competitiveness, profitability, and environmental impacts of agricultural or horticultural production

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Unknown
- Contribution to ICT-AGRI calls: Potential

3.3 Funding for Innovations (Innovationsförderung)

- Owned by:

Ministry of Food, Agriculture and Consumer Protection (BMELV)

- Managed by:

The Federal Agency for Agriculture and Food (BLE)

Dr. Elke Saggau, +49 (0)22868453930, elke.saggau@ble.de

- Website:

http://www.ble.de/cln_090/nn_467262/DE/04_Forschungsfoerderung/01_Innovationsfoerderung/Innovation

Relevant ICT-AGRI topics:

- ICT applications to be used in primary agricultural or horticultural production, including online resources
- Automated or semi-automated machinery / equipment for primary agricultural or horticultural production
- ICT and automation in environmental regulation of primary agricultural or horticultural production
- Effects of ICT and automation on competitiveness, profitability, and environmental impacts of agricultural or horticultural production

Brief characterisation:

- Geographic scope: National

- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Unknown
- Contribution to ICT-AGRI calls: Potential

3.4 German Federal Environmental Foundation (Deutsche Bundesstiftung Umwelt)

- Owned by:
German Federal Environmental Foundation
Holger Wurl, +49 (0) 54196 33340, hn.wurl@dbu.de
- Managed by:
German Federal Environmental Foundation
Holger Wurl, +49 (0) 54196 33340, hn.wurl@dbu.de
- Website:
<http://www.dbu.de>

Relevant ICT-AGRI topics:

- ICT applications to be used in primary agricultural or horticultural production, including online resources
- Automated or semi-automated machinery / equipment for primary agricultural or horticultural production
- Standardisation of data dictionaries and communication protocols for use in primary agricultural or horticultural production
- ICT and automation in environmental regulation of primary agricultural or horticultural production
- Effects of ICT and automation on competitiveness, profitability, and environmental impacts of agricultural or horticultural production

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Unknown
- Contribution to ICT-AGRI calls: Potential

Relevant ICT-AGRI topics:

- ICT and automation in environmental regulation of primary agricultural or horticultural production
- Effects of ICT and automation on competitiveness, profitability, and environmental impacts of agricultural or horticultural production

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Unknown
- Contribution to ICT-AGRI calls: Potential

3.5 Germany's Climate Initiative

- Owned by:
The Federal Ministry of Environment, Nature Conservation and Nuclear Safety (BMU)
- Managed by:
Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH
Agentur für marktorientierte Konzepte (AgenZ)
- Website:
<http://www.bmu-klimaschutzinitiative.de>

Relevant ICT-AGRI topics:

- Effects of ICT and automation on competitiveness, profitability, and environmental impacts of agricultural or horticultural production
- ICT and automation in environmental regulation of primary agricultural or horticultural production

Brief characterisation:

- Geographic scope: EU
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Unknown
- Contribution to ICT-AGRI calls: Potential
- Financing in 2009 for the whole programme (ICT included): 120 Million €

3.6 Central Innovation Programme for SMEs (ZIM-KOOP)

- Owned by:
The Federal Ministry of Economics and Technology (BMWi)
- Managed by:
German Federation of Industrial Research Associations (AIF)
- Website:

<http://www.zim-bmwi.de>

Relevant ICT-AGRI topics:

- ICT applications to be used in primary agricultural or horticultural production, including online resources
- Standardisation of data dictionaries and communication protocols for use in primary agricultural or horticultural production
- ICT and automation in environmental regulation of primary agricultural or horticultural production
- Business structures in sale and support of ICT and automated machinery in agricultural or horticultural production

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Unknown
- Contribution to ICT-AGRI calls: Potential
- Financing in 2008 for the whole programme (ICT included): 192 Million €

3.7 Central Innovation Programme for SMEs (ZIM-SOLO)

- Owned by:
The Federal Ministry of Economics and Technology (BMWi)
- Managed by:
Project Management Agency EuroNorm GmbH
- Website:
[http:// www.zim-bmwi.de](http://www.zim-bmwi.de)

Relevant ICT-AGRI topics:

- ICT applications to be used in primary agricultural or horticultural production, including online resources
- Standardisation of data dictionaries and communication protocols for use in primary agricultural or horticultural production
- ICT and automation in environmental regulation of primary agricultural or horticultural production
- Business structures in sale and support of ICT and automated machinery in agricultural or horticultural production

Brief characterisation:

- Geographic scope: National

- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Unknown
- Contribution to ICT-AGRI calls: Potential

3.8 ICT 2020 - Research for Innovation (IKT 2020 - Forschung für Innovation)

- Owned by:
The Federal Ministry of Education and Research (BMBF)
- Managed by:
German Aerospace Center - Project Management Agency (PT-DLR)
- Website:
<http://www.bmbf.de/en/9069.php>

Relevant ICT-AGRI topics:

- ICT applications to be used in primary agricultural or horticultural production, including online resources
- ICT and automation in environmental regulation of primary agricultural or horticultural production
- Effects of ICT and automation on competitiveness, profitability, and environmental impacts of agricultural or horticultural production

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Unknown
- Contribution to ICT-AGRI calls: Potential

3.9 IT goes green

- Owned by:
The Federal Ministry of Environment, Nature Conservation and Nuclear Safety (BMU)
- Managed by:
Bundesverband Informationswirtschaft, Telekommunikation und neue Medien e.V. (BITKOM)
The Federal Environment Agency (UBA)
KfW Bankengruppe

- Website:

<http://www.green-it-projektberatung.de>

Relevant ICT-AGRI topics:

- Standardisation of data dictionaries and communication protocols for use in primary agricultural or horticultural production
- Business structures in sale and support of ICT and automated machinery in agricultural or horticultural production

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Unknown
- Contribution to ICT-AGRI calls: Potential
- Financing in 2009 for the whole programme (ICT included): 40 Million €

3.10 KMU innovative (KMU innovativ)

- Owned by:

The Federal Ministry of Education and Research (BMBF)

- Managed by:

German Aerospace Center - Project Management Agency (PT-DLR)

- Website:

<http://www.hightech-strategie.de>

Relevant ICT-AGRI topics:

- ICT applications to be used in primary agricultural or horticultural production, including online resources
- Standardisation of data dictionaries and communication protocols for use in primary agricultural or horticultural production
- ICT and automation in environmental regulation of primary agricultural or horticultural production
- Business structures in sale and support of ICT and automated machinery in agricultural or horticultural production

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Required

- Participation from foreign countries: Unknown
- Contribution to ICT-AGRI calls: Potential

3.11 Research for the environment

- Owned by:
The Federal Ministry of Education and Research (BMBF)
- Managed by:
Project Management Agency Jülich (PTJ)
- Website:
<http://www.bmbf.de>

Relevant ICT-AGRI topics:

- ICT applications to be used in primary agricultural or horticultural production, including online resources
- Standardisation of data dictionaries and communication protocols for use in primary agricultural or horticultural production
- ICT and automation in environmental regulation of primary agricultural or horticultural production
- Business structures in sale and support of ICT and automated machinery in agricultural or horticultural production

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Unknown
- Contribution to ICT-AGRI calls: Potential

3.12 Research for sustainability (Forschung für die Nachhaltigkeit)

- Owned by:
The Federal Ministry of Education and Research (BMBF)
Frau Loske; +49 (0) 2289957
- Managed by:
Project Management Agency Jülich (PTJ)
- Website:
<http://www.fona.de>

Relevant ICT-AGRI topics:

- ICT applications to be used in primary agricultural or horticultural production, including online resources
- Standardisation of data dictionaries and communication protocols for use in primary agricultural or horticultural production
- ICT and automation in environmental regulation of primary agricultural or horticultural production
- Effects of ICT and automation on competitiveness, profitability, and environmental impacts of agricultural or horticultural production

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Unknown
- Contribution to ICT-AGRI calls: Potential

**3.13 Research Programmes of the German Research Foundation
(Deutsche Forschungsgemeinschaft)**

- Owned by:
German Research Foundation (DFG)
- Managed by:
German Research Foundation (DFG)
- Website:
<http://www.dfg.de>

Relevant ICT-AGRI topics:

- ICT applications to be used in primary agricultural or horticultural production, including online resources
- Standardisation of data dictionaries and communication protocols for use in primary agricultural or horticultural production
- ICT and automation in environmental regulation of primary agricultural or horticultural production
- Effects of ICT and automation on competitiveness, profitability, and environmental impacts of agricultural or horticultural production

Brief characterisation:

- Geographic scope: EU
- Participation of research institutes: Required
- Participation of industry: Required

- Participation from foreign countries: Required
- Contribution to ICT-AGRI calls: Potential

3.14 The Federal Organic Farming Scheme (Bundesprogramm Ökologischer Landbau)

- Owned by:
Ministry of Food, Agriculture and Consumer Protection (BMELV)
- Managed by:
The Federal Agency for Agriculture and Food (BLE)
Dr. Elke Saggau, +49 (0)22868453930, elke.saggau@ble.de
- Website:
<http://www.bundesprogramm.de>

Relevant ICT-AGRI topics:

- ICT applications to be used in primary agricultural or horticultural production, including online resources
- ICT and automation in environmental regulation of primary agricultural or horticultural production

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Unknown
- Contribution to ICT-AGRI calls: Potential

4. Mapping of national research institutes

4.1 University of Kassel – Department of Agricultural Engineering

Contact

Oliver Hensel, agrartechnik@uni-kassel.de

Research expertise

The department of agricultural engineering at Kassel University is part of the faculty of organic agricultural sciences and is located on the Witzenhausen Campus north of Kassel. Head of the department (since 2004) is Prof. Dr. Oliver Hensel, who is graduated from Hohenheim University in Stuttgart. In 2009 the department has 24 PhD candidates from seven countries and covers a bright range of international research projects. Main objectives are tillage and irrigation, post harvest technologies and mechatronic applications in monitoring both plant production and animal husbandry.

Research facilities

- Extension farm (340 ha, organic farm “Bioland”)
- own research side for irrigation and renewable energy (2,7 ha)
- workshop and special test stands for:
 - tillage implement control, acoustic sensors, machine vision, aerodynamics in storage facilities, thermal weed control, grassland machinery and balers.

Research priorities

- Automatic control for tillage equipment
- Applications in organic farming
- Yield control (other than grain)
- Monitoring of animal husbandry
- Sensors for moisture (soil)

4.2 University of Bonn – Institute of Agricultural Engineering

Contact

Wolfgang Büscher, buescher@uni-bonn.de

Research expertise

The Institute of Agricultural Engineering (www.landtechnik.uni-bonn.de) has three Sections with different options in research and teaching:

- Technology of Crop Farming (Prof. P. Schulze Lammers)
- Household and Appliance Technology Section (Prof. R. Stamminger)
- Livestock Technology (Prof. W. Büscher)

Research facilities

Actual Research Topics of Technology of Crop Farming (Prof. P. Schulze Lammers)

- Developing a field sprayer using real time direct injection units
- Laser based weed control
- Position controlled parallel seed of row crops to optimize weed control
- Foundations for the technical-sensorical measurement of odours (methods for ,elektronic noses')
- Mechanical regulation of crop load in fruit trees
- Ridge Cultivation of Sugar Beets
- Soil stress through heavy harvesting machine
- Development of a dual-sensor penetrometer for simultaneous measurement of cone index and soil moisture content
- Development of a quality management system for growing fibre hemp

Mission statement of Livestock Technology (Prof. W. Büscher)

The main subjects of research and teaching in Livestock Technology range from supply engineering (for feed, water, air) to environment-friendly utilization of co-products (in particular manure and exhaust air). The technical development focuses on animal husbandry (recumbency, walking, feeding) and product gain (e.g. milking).

The objectives of the technical developments are the reduction of physiological stress, effective use of resources and reduction of environmental loads. Since teaching has a high local value, it is significant for lessons in the advanced study period to include recent results of research projects. Also, the application of computer technologies in livestock farms is an important part of the courses offered.

Research priorities

There are three main research subjects at the chair of Livestock Technology of Prof. W. Büscher:

- Corrosive gases and airborne particles in livestock houses, its source strengths and transmission properties
- Long-term-stability of conserved feeding stuffs
- Energy consumption in animal husbandry, planning data and efficiency analyses

4.3 University of Hohenheim - Faculty of Agricultural Sciences

Contact

Stefan Böttinger, +49 (0) 711 459 23200, boettinger@uni-hohenheim.de

Research expertise

The Faculty of Agricultural Sciences at the University of Hohenheim covers with 17 departments and 51 full professors the whole area of agricultural studies. Research takes place at the departments, in cooperation with international partners and industry and also together with the five research stations / experimental farms of the University.

At the Department of Agricultural Engineering four chairs are located: Fundamentals of Agricultural Engineering, Livestock Systems Engineering, Process Engineering in Plant Production and Agricultural Engineering in the Tropics and Suptropics.

ICT related activities of this Department can be summarized to:

- Information technology for and automation of agricultural machines, e.g. control
- of combine harvesters; GPS guided autonomous forage harvester
- Simulation and verification of mobile machines (driving dynamics, efficiency)
- Precision Farming: Sensing of soil moisture, soil texture and straw coverage of a field; on-the-go control of soil working depth and of seeding devices according to these sensed parameters
- Precision Livestock Farming: sensing and information gathering in livestock systems regarding animal and environmental protection and economic sustainable production; network system for data gathering and analysis in pig production (farming cell); implementation of ISOAgriNet and of AgroXML
- Together with the Department for Farm Management, Chair for Computer Applications
- and Business Management in Agriculture and other several research-partners the interdisciplinary research project IT FoodTrace (www.itfoodtrace.de) was realized. The aims are to achieving traceability and quality assurance along the food chain of "meat and meat products".
- The interdisciplinary research project SenGIS (supported by Carl Zeiss Stiftung) develops together with several internal and external research partners a sensor platform with mounted sensors to derive the variability of the plant canopy and the soil parameters.

Research facilities

- Testing facilities for sensors to monitor animal related parameters, for control systems of technical plants and of environmental systems. High end reference units to compare and to develop further new sensors and control systems for livestock systems.
- Tractor and combine harvester equipped with GPS, inertia platforms, acceleration
- sensors, tire force measurement can be used as reference systems.

4.4 Leibniz Centre for Agricultural Landscape Research (ZALF)

Contact

Sigrid Baur, +49 (0) 33432 82 201, sbaur@zalf.de

Research expertise

The Leibniz Centre for Agricultural Landscape Research (ZALF) was founded in 1992 with its main site located in Müncheberg. According to the statutes the mission of ZALF is to „do research on ecosystems within agricultural landscapes and to develop ecological and economical sound land use systems“.

To fulfil this mission, ZALF applies the approach of an interdisciplinary and trans-disciplinary landscape research. Thus, Landscape research at ZALF means dealing with interdependencies and interactions between the single compartments/systems from viewpoints of natural sciences, engineering and socio-economics.

Methodological approach and purpose of landscape research

- Problem identification
- Targeting problems via objects by systems analysis (holistic)
- Analysis of processes mainly between sub-systems
- Interpretation of interdependencies between sub-systems
- Strategies for sustainable problem solving

Research facilities

- Equipment (Scientific & technical facilities)
- Experimental Field station
- Central Laboratory
- Libraries
- Part of Department of landscape information systems
- Hydro-Technikum
- Phytotron
- Isotope laboratory
- Wind channel
- Lysimetry facilities
- Scanning electron microscope

Research priorities

Recent and planned research:

- Climate change, new frame conditions of the European agricultural policy, implementation of modern technology in agriculture and increasing changes of intensities in landscape use, demographic change, increased expectations of the society related to protection of environment and consumer result in alterations of the development of rural regions.
- Six institutes and several central services work on these topics within four programme sections as well as in national and international joint projects.

4.5 Leibniz Institute for Agricultural Engineering (ATB)

Contact

Christiane von Haselberg, +49 (0) 3315699811, cvhaselberg@atb-potsdam.de

Research expertise

The Leibniz Institute for Agricultural Engineering Potsdam Bornim is a non-university research institute funded by the German Federal Ministry of Agriculture (BMVEL) and the Ministry for Agriculture, Environment and Consumer Protection of the Federal State of Brandenburg (MLUV). The ATB mission is to develop sustainable technologies for the resource efficient and carbon neutral utilization of biological systems to produce food, raw materials and energy in response to the challenges of climate change and changes in framework conditions on global scale.

The multidisciplinary research activities at ATB are both application-oriented and of fundamental character. They concentrate on the development of process-engineering bases and technical solutions in all areas of agricultural engineering with ICT and sensor-based approaches playing crucial roles.

Main research fields are

- environmentally sound and competitive methods of agricultural production,
- the quality and safety of foodstuffs and animal feed, and
- renewable raw materials in rural areas or industrial feedstock and energy sources from biomass.

Sustainable development in rural areas on the one hand and high resource efficiency combined with carbon neutrality on the other hand are cross cutting issues.

At the ATB, natural, engineering, business and social sciences work in close collaboration at all times. The research takes account of the sometimes very different expectations of consumer, environmental and animal protection. Climate change and the incipient changes in the structure of agriculture represent particular challenges for agricultural engineering research. The Institute's research work addresses topical scientific questions and contributes to the call for practical guidance and support in the domains of politics, industry, agriculture and horticulture.

ATB has multi-disciplinary research teams with currently 170 staff members, 65 of them scientists and PhD students. The institute owns a well equipped infrastructure, research labs and halls, 50 hectares of experimental lots and several pilot plants. Intensive networking with universities, other non-university research institutions and enterprises on national and international level contributes largely to elaborate solutions for the agricultural and food industry.

Research facilities

- Laboratories for optical and physical product properties (e.g. thermography, spectrometry, laser, acoustic-impulse resonance)
- Wind tunnel and ionisation test stand
- Emission measuring laboratory
- Laboratory for climatic and respiration measurements
- Test stand and facility for milking
- Ergonomics laboratory

- Electronic laboratory for the development of test units and experimental devices
- Pilot plants for the bioconversion of starchy plant biomass to lactic acid and for the preparation and processing of preserved natural fibres

Research priorities

Precision agriculture

- Development and integration of sensors for acquisition of morphologic crop parameters (Laser rangefinder), determination of soil strength and moisture and detection of plant diseases (e.g. *fusarium* in grain crops)
- Development of sensors with regard to automation of spacial processes
- Precision horticulture ("Technology Garden", sensor-based automated cultivation measures in orchards, precision irrigation)
- Digital soil mapping
- System analysis, georeferencing, modelling and algorithms for autonomous flying drones with regard to environment friendly land use

Precision livestock farming

- Control of the environmental impact and animal welfare (indoor climate control using animal response, sensors and algorithms for emission control)
- ICT and robotics in milk production (udder quarter specific milking cluster with a high degree of automation in conventional milking parlours, online-measurements of milk quality for consumer protection and disease control, automation of oestrus detection and behaviour observation)
- Implementation of automated monitoring systems to improve animal production, welfare and health

Post harvest process engineering

- ICT based quality management systems
- Intelligent system for monitoring quality relevant parameters along the whole supply chain via telemetry data loggers (temperature, air humidity, mechanical stress) or intelligent labels based on internet and data-base supported system
- Sensor-based technologies and integrated assessment models in food production chains
- Acoustic resonance analysis for the automated state analysis of horticultural products
- Sensor and ICT-based risk-management-system and logistic in food and non-food supply chains

Ergonomics in agriculture

- 3-D-motion analyses of agricultural and horticultural workplaces

4.6 Leibniz-Institute of Vegetable and Ornamental Crops (IGZ)

Contact

Reinhard Schmidt, +49 (0) 33701784, schmidt@igzev.de

Research expertise

Vegetable and ornamental plants are not mass products; they must be of a high quality. They should also come from production systems that not exploit resources. And, for successful marketing, they should be affordable. The Leibniz-Institute of Vegetable and Ornamental Crops (Leibniz-Institut für Gemüse- und Zierpflanzenbau, IGZ), which has sites in Großbeeren and Erfurt, focuses on understanding plant physiological and ecological processes. Our work contributes towards designing ecologically sustainable and economically successful horticultural systems. We investigate the growth, development, and quality of plants under optimum and stress conditions. The effects of changing environmental conditions on horticultural production are determined in several projects. We cooperate closely with universities, other research institutions and producers, not only within Germany and Europe but also worldwide.

The IGZ is a member of the Leibniz Association of research institutes, and is one of the largest publicly funded horticultural research institutes in Germany. We combine knowledge and ideas from modelling, plant propagation, plant quality, plant health and plant nutrition. Our work is interdisciplinary, covering several fields of horticultural and food production research. The aim of our researchers is to use new insights into genetic or ecological processes to solve problems in vegetable or ornamental crop production or the use of horticultural products.

Research facilities

- Plant growth/developmental control – from lab to greenhouse
- Molecular and physiological tools to proof the function of mycorrhiza inocula.
- Quantification of marker gene expression in model plants (tomato, *Medicago truncatula*, petunia) indicating the amount of phosphate which is taken up by the mycorrhizal or the plant epidermal pathway
- Photosynthetic parameters indicating the increase in CO₂ assimilation in mycorrhizal plants
- Fructose concentration in roots indicating the amount of C transfer to the fungus
- Secondary metabolites play an important role in the interaction of plants with their environment
- Identification and quantification of secondary metabolites (HPLC/DAD/MS)
- Determining flavour (GC/MS; GC/O)
- Sensoric
- Analyzing sustainability and nutrient efficiency of different fertilization strategies in long-term field experiments
- Development and application of a multi sensor system to generate digital soil maps

Research priorities

Agro-ecosystem models for optimising sustainable production in both low-input and high-input farming.

4.7 Research Institute for Farm Animal Biology (FBN)

Contact

Norbert K. Borowy, +49 (0)3820868605, borowy@fbn-dummerstorf.de

Research expertise

The FBN operates as a public-law foundation and conducts basic and applied research. It is a member of the Leibniz Science Association. FBN studies the functional biodiversity of livestock as a basis for domestication and as a key component of sustainable agriculture and food supply. Research on the functional biodiversity of farm animals is made possible by studying their vital processes using a holistic approach which is based on the traits they show in specific environments. Interdisciplinary, coordinated research is the key.

FBN is located in Dummerstorf near Rostock. Of its 228 staff positions, 66.5 are held by scientists. A fluctuating number of additional positions are financed from third-party funding. The interdisciplinary research approach taken at FBN is based on geographically and thematically focused cooperation between its six research units.

Research facilities

FBN is equipped with Experimental Farm Animal Units (designed for up to 450 Livestock Units) comprising of cattle, pigs, horses, goats and sheep.

A so called „Tiertechnikum“ is used to conduct fundamental research covering the entire organism at all levels of trait expression. An operation theatre including laboratories and special experimental facilities needed for nutrition-physiological research, constitute the experimental function units which cover 1,670 square meters.

An experimental slaughter facility is integrated in the Research Unit Muscle Biology and Growth. It provides an ideal basis for comprehensive sampling and data collection for interdisciplinary investigations.

Furthermore, a unique collection of long-term selected mouse lines (phenotype-derived models) has been established at FBN. These mouse lines comprise a complex collection of naturally occurring genomic mutations, which candidate for altered phenotypic performance. In order to attribute specific functions to distinct genes of interest, transgenic mouse lines (genotype-based models) are used. By the complementary approach employing both phenotype-derived and genotype-based mouse models physiologically relevant hypotheses can be generated. Those hypotheses will be studied in further detail with a particular interest in questions important for farm animals. We concentrate our strengths on the control of growth and differentiation, fertility and life span.

In Addition, FBN can fulfil transcriptome und metabolom-analyses by using Technology-Platforms for monitoring the interactions between genome, transcriptome and metabolome.

Our Equipment includes "next generation sequencer" (Solexa, Illumina), Mikroarray-Scanner for SNP-Genotyping und Transkriptom-Analyse (Illumina-iScan, Affymetrix-Scanner, Agilent-Plattform), RealTime-PCR-Geräte, Orbitrap ESI-Masssspektrometer)

Also, FBN has a facility for measuring indirect colorimetry in large farm animals (dairy cows, bulls, pigs). See our recent paper Derno et. al. Journal of Dairy Science 2009, 92:2808-2808.

Finally and of special importance for the suggested research aims might be

- Noise reduced experimental acoustic chamber for pigs
- IT and expertise for bioacoustic analyses
- Call-feeding equipment (Call feeding stations)
- Know how of optimum operant training strategies for group-housed farm animals

Research priorities

- Automatic on-farm detection and diagnosis of diseases and welfare-impairments
- Automatic surveillance and control of micro-environmental conditions in farm houses and transport cars.
- ICT-controlled combined systems for animal supply and environmental enrichment.
- Innovative integrated technology for communication between environment, supply-equipment, and animals.
- Development of standardised interfaces for ICT elements in the entire production chain.
- Automated young animal breeding: Monitoring growth, development and behaviour and diseases in young farm animals by using a probe or sensor that is fixed at the animal (outside or inside) and provides the farmer with data on a daily basis.
- Monitoring metabolism of dairy cows by using milk samples: Metabolites that can function as biomarkers in dairy cows should be measured on-line during milking. The farmer can use these data immediately to recognise cow with critical metabolic state and could take care of it
- Molecular phenotyping of farm animals, Identification of Biomarkers and Analysis of molecular mechanisms for the Expression of relevant markers in dependency of environment and Genotype

4.8 Friedrich-Loeffler-Institut (FLI) - Institute of Animal Welfare and Animal Husbandry

Contact

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Research expertise

As a federal research institute and independent higher federal authority under the Federal Ministry for Food, Agriculture and Consumer Protection the Friedrich-Loeffler-Institut (FLI) provides the scientific basis for political decisions to be made by the Federal Government.

At the Institute of Animal Welfare and Animal Husbandry research is made in the fields of improvement of farm animal husbandry, applied farm animal behaviour, and animal welfare during transport, stunning and slaughter.

Our research can be assigned to four main topics:

- Investigation of the basic mechanisms of farm animals to adapt towards housing conditions and of factors that are modifying these reactions.
- Development and application of welfare indicators and of welfare assessment protocols.
- Improvement of housing conditions for farm animals with respect to animal welfare.
- Improvement of farm animal transport, stunning and slaughter.

Within these topics computer-based monitoring systems play an important role for automatic welfare monitoring systems as well as for the improvement of housing conditions, e.g. by including the animals' response into an integrated control of housing conditions (precision livestock farming). In addition, several computer-controlled experimental devices have been developed in the institute. Examples are automatically animal location systems (based on transponders, video-imaging), computer-controlled learning devices for laying hens, activity monitoring system (based on motion sensors).

Research facilities

- Research station for housing of poultry, cattle and pigs.
- Experimental compartments for poultry.
- Laboratory for the development of computer-controlled electronic experimental devices (mechatronics).
- Test device for controlled experiments with gases used for stunning.

Research priorities

- Precision livestock farming:
- Integration of behavioural responses into the control of housing conditions (animal-based climate control)
- Animal welfare monitoring systems:
 - Automatic detection of diseases on farm
 - Automatic detection of lesions at slaughterhouse
 - Automatic control of farm animal transport
 - Automatic control of stunning effectiveness at slaughterhouse

4.9 Federal Research Centre for Cultivated Plants (JKI)

Contact

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Research expertise

The Julius Kühn Institute (JKI), Federal Research Centre for Cultivated Plants, came into existence on 1st January 2008 as a result of the act on the reorganization of research within the remit of the Federal Ministry of Food, Agriculture and Consumer Protection (BMELV). The new institute emerged from three research centres: the Federal Biological Research Centre for Agriculture and Forestry, the Federal Centre for Breeding Research on Cultivated Plants and two institutes of the Federal Agricultural Research Centre. In its function as research institute and scientific advisor to the BMELV, the JKI is in charge of all departmental tasks relating to cultivated plants. This responsibility comprises the fields of plant genetics, agronomy, plant nutrition and soil science as well as plant protection and plant health.

Its diverse tasks are stipulated in legal acts such as the Plant Protection Act, Genetic Engineering Act and Chemicals Act, and in corresponding legal regulations. Furthermore, a research programme aligned with the BMELV goals provides the basis to perform its tasks. Its principal duty is to render advisory services to the federal government and the BMELV in particular and to provide decision guidance on issues relating to cultivated plants.

The Julius Kühn Institute is a higher federal authority and a federal research institute. It is structured into 15 institutes and several service units, which in future will be concentrated on six sites (Quedlinburg, Braunschweig, Kleinmachnow, Dossenheim, Siebeldingen, Dresden-Pillnitz), complemented by an experimental station for potato research at Groß Lüsewitz. The head office of the federal research institute is located in Quedlinburg.

The President is in charge of the institute's scientific and administrative leadership, he presents the institute and presides over the Scientific Council. The Scientific Council, that advises the President and prepares recommendations, consists of the President, the Vice President as his permanent deputy, the heads of institutes, six scientists elected to the Council, and the head of administration in an advisory capacity. In the year 2008, the Scientific Council met twice.

As at 1 January 2008, the federal budget envisaged a total of 831.25 positions for civil servants and employees at the JKI. Taking all part-time positions and third-party funded staff into account, the JKI employed in its founding year 1,150 persons, of which 250 were scientists. This statistics also counts the employees being in their passive phase of partial retirement. By the end of the restructuring process, the JKI will have 706 positions, including 191.5 for scientists. In the period under review, two appointment procedures for institute directors were successfully completed and the heads of the Institute for Plant Protection in Fruit Crops and Viticulture and of the Institute for Biosafety of Genetically Modified Plants assumed office. The JKI currently offers interesting trainee positions in twelve different trades in the fields of agriculture, horticulture, viticulture, laboratory training, skilled trades, administration, library, and information technology. At the beginning of the new year of training (as of 15.10.2008), the JKI employed 59 vocational trainees.

Research facilities

- Laboratories, greenhouses, climatic chambers and special equipments for testing machinery in plant protection
- The experimental plots available at the different JKI locations for outdoor testing total 577 hectares and are under cultivation of agricultural crops, fruit, grapevine,

vegetable, and ornamentals. In addition, the JKI maintains a forest area of around 66 hectares.

- Own gene bank collections for fruit and grapevine
- The fruit gene bank of the JKI is part of the German Gene Bank for Fruit Crops. The fruit gene bank is responsible for the collection, maintenance and evaluation of genetic resources of different pome and stone fruits, soft fruit and wild species. The collections find wide application, ranging from breeding and orcharding to landscaping and including pomological, taxonomic and phytopathological purposes. The grapevine gene bank, being the greatest collection of its kind in Germany, stores more than 3,000 accessions and puts high emphasis on “resistance to pathogens” and “adaptation to climate”. With its fruit and grapevine collections, the JKI makes a decisive contribution to preserving a high diversity in fruit and grapevine.

Research priorities

Development of decision support models in agriculture, for example for plant diseases.

4.10 Institute for Agricultural Engineering and Animal Husbandry at the Bavarian State Research Center for Agriculture (LfL)

Contact

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Research expertise

In accordance with its agricultural and public-welfare mandate, the Bavarian State Research Centre for Agriculture (LfL) focuses on current and future problems of land use and nutrition in Bavaria, including quality management and production. The main activity is problem-oriented and applied research.

The Institute of Agricultural Engineering and Animal Husbandry (ILT) develops tests and evaluates sustainable technologies for plant production and animal husbandry (machines, equipment, farm buildings and processes) as well as environmental related technologies for biogas production and emission protection. Furthermore ILT designs and builds measurement and control systems for applied research applications.

The working groups of ILT have high-level technical know-how in agricultural production techniques (plant production and animal husbandry), mechanisation, farm buildings, precision agriculture, precision livestock farming, waste management and environmental technology. The LfL and ILT have a broad and worldwide network with universities, research organisations, companies and leading farmers.

Research facilities

- Mechatronics and mechanical construction department with CAD 2-D and 3-D development and construction capabilities
- Mechanical workshop with different CNC machines to adapt or modify machinery and to manufacture prototypes or small series

- Electronic development department for the development of electronic systems for agricultural applications
- Electronic workshop for prototyping and production of small series
- Measurement laboratory specialized on the development and calibration of data acquisition systems for most measurement categories of agricultural systems
- Experimental farms with a wide range of agricultural operations in the areas of plant production and animal husbandry for field tests.

Research priorities

- Automated systems in plant production and horticulture:
- Robots with sensors and actuators for inter and intra row weeding of row crops
- Robots with sensors and actuators for harvesting of speciality crops
- Automated systems for grassland: robots with sensors, actuators and adapted equipment for pasture care in grazing systems and alpine agriculture
- Automated systems in dairy husbandry
- Feeding robots for roughage feeding
- In-line sensors for milk quality and ingredients
- Cleaning and litter robots for cubicles in barns
- Local positioning systems (indoor GPS) for cow monitoring

4.11 University of Applied Sciences Osnabrück

Contact

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Research expertise

At the University of Applied Sciences Osnabrück (Germany) teaching and research are application-oriented.

About 80 Bachelor and Master programs, 3 research farms, more than 80 laboratories and academic staff with at least 5 years of practical experience in addition to their academic-scientific qualification are excellent boundary conditions for close cooperation with business, industry and other research institutes. The interdisciplinary research in agricultural engineering is one major focus of the University, based on the cooperation between the Faculties of Engineering & Computer Science and Agriculture Science & Landscape Architecture.

As part of this competence centre of applied agricultural engineering COALA a number of research topics in information and communication technologies - such as sensors, tractor-implement communication or field robots - are in the focus of research groups.

Examples are the research centres ISYS (Intelligent Sensor Systems), KOMOBAR (communication structures), PIROL (precision farming) and the competence centre CC-ISOBUS e.V. as an initiative of companies to turn the agricultural bus systems into practice.

A large number of (interdisciplinary) research projects (funded by German Ministries, EU and companies) has resulted in a broad network, ranging from scientific cooperation to practice-oriented developments with companies (the region Osnabrück includes a worldwide relevant number of companies for agricultural technology).

Research facilities

- COALA: Competence of Applied Agricultural Engineering; Interdisciplinary cooperation of several laboratories within the University of Applied Sciences Osnabrück, (Faculty of Engineering and Computer Science, Faculty of Agriculture and Landscape Architecture)
- Research farms (conventional, organic) with precision farming technologies
- Competence Center ISOBUS e.V. (University and several companies)
- Interdisciplinary Research Centre for Intelligent Sensor Systems (ISYS)
- Research Centre PIROL (Precision Farming)
- Research Centre KOMOBAR (decision and communication structure for mobile cooperating machines in agriculture)
- Competence Network WeGa (horticulture, coordinated by University Hanover)

ICT and robotics technology examples:

Dynamic measurement setups for sensor systems, test vehicles for greenhouse and outdoor measurements, precision farming technologies for field tests, autonomous field robots, indoor parcours for autonomous field robots, ISOBUS test equipment

Research priorities

- Agricultural and technological approaches for an agriculture based on autonomous field robotics
- Development of robust sensors and data interpretation for agricultural instructions (examples: on the go measurement of soil parameters, e.g. pH-value, EC, spectral imaging VIS/NIR and NMR for crop analysis, application-oriented sensor and data fusion)
- Usability concepts for complex agricultural machinery
- Data management and interpretation of decentralized, highly heterogeneous public/private information sources
- Driving dynamics of agricultural machinery

4.12 Technische Universität München – The Hans-Eisenmann-Zentrum

Contact

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Research expertise

The Hans-Eisenmann-Zentrum is a central comprehensive scientific institution for Agricultural Science of the Technische Universität München.

The function is to further develop the inter- and trans-disciplinary as well as the system science characteristic of Agricultural Science at the location of the campus of Weihenstephan.

The Hans-Eisenmann-Zentrum networks the Agricultural Science Institutes of the Technische Universität München and is the apparent contact of Agricultural Science inside and outside the faculty. Furthermore the Hans-Eisenmann-Zentrum assists in making contact to agricultural practices.

In the Hans-Eisenmann-Zentrum four Sections work in the field of ICT-AGRI with different options in research and teaching:

Organic Agriculture and Agronomy

(Prof. K. J. Hülsbergen; Email: sekretariat.oekolandbau@wzw.tum.de)

The main fields of research are based on different aspects of agricultural science, organic farming systems, agronomy and land use for various system levels and scales:

- Investigation of genetic potential, interactions between fertilizing systems, plant growth and their development
- Sensor based methods for detection of crop characteristics (biomass, yield, nutrient supply)
- In the animal husbandry area: different aspects of animal behavior and interactions of animal behaviour and housing systems are researched
- Interactions of crops and crop rotations in farming systems
- Nutrient and energy flows in combination with further variables as criteria for assessment and evaluation of sustainability

Plant Nutrition

(Prof. U. Schmidhalter; Email: schmidhalter@wzw.tum.de)

The main fields of research are based on developing environmental friendly strategies to optimize site-specific plant nutrition and fertilizer application in integrated and organic farming.

- Optimising nitrogen and water balances, which mostly affect crop productivity, land use and the environment
- Precision farming and precision phenotyping, by developing strategies to abate nitrous oxide and ammonia emissions from fertilizer application
- Adaptation of crops to climate impacts (drought and salinity), and the optimization of quality in crop production

Agricultural Systems Engineering

(Prof. H. Bernhardt; Email: agrarsystemtechnik@wzw.tum.de)

The main fields of research are based on:

- Precision farming technologies
- Individual controlled animal husbandry
- Logistics
- Quality management of agricultural systems

Field of Horticultural Engineering

(Prof. J. Meyer; E-Mail: joachim.meyer@wzw.tum.de)

The main fields of research are based on:

- Greenhouse engineering
- Climate control in greenhouses
- Alternative energy resources
- Energy saving in greenhouses
- Artificial light systems
- Documentation and evaluation of production processes

Research facilities

- Research station Lange Point; Laboratory for chemical plant and soil analysis, soil physical analysis (Prof. K. J. Hülsbergen)
- Research station for field experimentation and greenhouse experiments, lysimeters, rain-out shelter, long-term experiments, growth chambers (Prof. U. Schmidhalter)
- Laboratory analytical instruments and equipments (ICP, HPLC, HPIC, mass spectrometer; Prof. U. Schmidhalter)
- Measuring laboratory, workshop, drain gutter (Prof. H. Bernhardt)
- New research greenhouses at "Queckbrunnerhof", Schifferstadt, in cooperation with „Dienstleistungszentrum Ländlicher Raum“, Neustadt an der Weinstraße (Prof. J. Meyer)

Research priorities

- Speaking plant algorithms for climate control in protected cultivation.
- On-line documentation and evaluation of the production process in protected cultivation.
- High-throughput precision phenotyping technologies for field-based experimentation
- The goal of this project is to develop technologies that will enable the high-throughput precision-phenotyping under both, non-stress and abiotic conditions in field experimentation. This project represents a research initiative based on a novel concept that will be verified in close cooperation with agronomists, physiologists, geneticists, breeding institutions and the industry. The project therefore embraces the whole value chain of scientific research. The project will demonstrate that key breeding traits can be characterised by advanced non-destructive sensors used under field conditions that will increase the speed of measurement by at least an order of magnitude over existing methods.

4.13 Christian-Albert-Universität zu Kiel - Institute of Agricultural Process Engineering

Contact

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Research expertise

The institute of Agricultural Process Engineering is organised within the faculty of Agricultural and Nutritional sciences. <http://www.ilv.uni-kiel.de/>.

The institute is focused on the development, setup and validation of innovative procedural solutions in the field of agricultural and renewable production.

In the field of ICT-AGRI based applications there are following approaches:

- On-line analyses of contents
- On-line Biogas process control
- Cultivation of soil and after-crop management
- Nutrient based and site specific slurry application
- Precision Farming
- Dairy farming with characterisation of milk and composition
- Precision Livestock Farming
- Image recognition in aqua culture

Research facilities

In the field of ICT-AGRI based applications there are following approaches institute's features:

- Prototyping, manufacturing and optimisation of sensor-equipped technologies
- Spectroscopic systems (esp. near-infrared spectroscopy; NIR) and chemometric calibrations/classifications for on-line/on-farm analyses while different processes like harvesting, milking, biogas production and nutrient based and site specific slurry application, respectively
- Camera setups for image recognition in aqua culture and precision livestock farming
- Sensing soil parameters and on-the-go control of work depth and -quality
- Systems for variable rate of fertilizer and/or plant protection products/devices

Research priorities

- Non-invasive, spectroscopic on-the-go monitoring of quality-parameters of agricultural crops, products and processes
- On-line detection of fungal diseases and mycotoxins
- Cross-linking of process information in agricultural production
- Sensor-based automatic milking systems for better milk quality and herd management
- On-line applications for optimised conservation tillage

4.14 University of Gießen, Technology in companies of Food and Service

Contact

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Research expertise

The Department of Technology in companies of Food and Service of the University of Gießen examine ecological evaluation of complete process chain in food production (primary food production included). Further the influences of logistics and size of the company towards the efficiency of the food production present another research field.

Increase of operational efficiency by robotics and a consequent decline of environmental pollution. There were investigations towards this topic in the framework of a DFG funded project with title "Ecology of Scale" (<http://www.uni-giessen.de/fbr09/pt>).

Research priorities

- Impact of ICT toward ecological efficiency within primary food production (e.g. climate relevance)

4.15 University of Potsdam – Institute of Geosciences

Contact

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Research expertise

The foundation of a university department is to examine a broad spectrum of topics and disciplines. This is crucial to ensure an adequate, prospective and up-to-date training of undergraduate and graduate students.

At our department, the six basic research units comprise such a diversified expertise, crossing the classical disciplines of geology, geophysics and mineralogy/petrology. This diversity is also apparent in the research profile of the entire department ranging from deep crustal and mantle studies to near-surface and surface related studies.

Nevertheless, the expertise of the individual units meets at some central topics, reflecting the main directions of research at our department. These central topics are Earth's surface processes, geohazards, as well as resources, and geomaterials.

Research facilities

- Understanding climate-driven erosion processes and interactions between climate and tectonics, characterizing spatiotemporal variations in neotectonics.
- Unraveling climate-biosphere linkages in complex topographic settings.
- Deciphering seismic source processes and Earth's structure using passive imaging techniques and to developing new tools for observational seismology and seismic hazard assessment.
- Developing geophysical tools to explore and quantitatively characterize the shallow subsurface including relevant processes such as water flow and transport phenomena.
- Defining the impact of climatic change on the marine biosphere in the realm of continental margins and tracking changes in carbonate sedimentology through Earth history.

- Deciphering the record of the past encoded in rocks now at the surface (how deep, how hot, and how fast) in order to provide the fundamental boundary conditions necessary to allow realistic and reliable future prediction of Earth behaviour via modelling.
- Research Groups
 - Applied Geophysics
 - Exogenic Dynamics/Sedimentology
 - General Geology
 - General Geophysics/Seismology
 - Mineralogy
 - Petrology
- Laboratories
 - Applied Geophysics Field Laboratory
 - Sedimentology Laboratories
 - Argon/Argon Laboratory
 - ICP-AES laboratory
 - X-Ray Diffraction Laboratory
 - Wet Chemistry laboratories
 - Fission Track Laboratory
 - Raman Spectroscopy laboratory
 - Seismological Array
 - Scanning Electron Microscope
 - Geophysics laboratories
 - Rock Preparation laboratory
 - Computer Laboratories for Students

Research priorities

- Development/improvement/adoption of techniques to generate 3-dimensional soil maps from geophysical data using geoelectrical method, electromagnetic and georadar (ground penetrating radar)
 - In geosciences several methods exist which should be verified for agriculture – especially for plant production. Up to now efforts were mostly done to get information about the lateral variability of the soil. But water and nutrient availability is also influenced by vertical stratification and geophysical methods can give these information.
- Software development to invert data – especially conductivity data
 - EM-systems like equipment sold by DUALEM (Canada) and GSSI (USA) measure with varying coil distances/orientations or with several frequencies. Thereby they are capable to give 3-dimensional soil information. But there is no commercial software available to handle these data and to perform a 2- or 3-dimensional inversion.

- In the past existing software tools for inverting the geoelectrical data were developed only for restricted data volumes measured with fixed electrodes. However, data inversion will be adopted also for mobile mapping which generates large datasets.
- Multisensor platforms combining different methods to limit the ambiguousness in data interpretation
 - Using only one physical soil parameter ambiguousness can occur in interpretation. A combination of different methods is useful to delimitate this. Especially the combination of electrical conductivity sensors and natural gamma-measurements seems to be worthwhile.
 - Electrical methods can deliver more information than are used at the moment. Considering the frequency dependence of polarization is one way to get more information about the soil.
- Practical support to the farmers
 - It can be observed a big gap between research and practical guidelines for the farmers. The correct use of modern sensors and techniques requires complex knowledge. Often it is not possible to simplify the sensors but practical support is necessary.

4.16 Institute of Industrial Data Processing and Communication at Mannheim University of Applied Sciences

Contact

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Research expertise

The Institute of Industrial Data Processing and Communication has long-term experience in the development of sensor and communication systems for agricultural applications. Strong expertise is in the field of soil moisture sensors using electromagnetic measurement methods. This includes low cost point sensors with small measurement volume, radar sensors and innovative large area soil moisture monitoring systems at field and regional scale. Complete systems including sensors, wireless data transmission and irrigation control are developed. Wireless sensor networks are getting more and more important for agricultural applications and the institute is cooperating with leading institutes in this area worldwide.

Research facilities

- Soil moisture sensor laboratory
 - Development of sensing elements and electronic circuits
 - Calibration facility
 - Dielectric spectroscopy from 20 Hz to 6 GHz
 - Radar test site
- Wireless sensor network laboratory

- Development of radio modules (hard- and software) for wireless sensor networks
- Antenna measurement test site
- Radio range modelling and measurement tools
- Field test sites
 - Operational wireless sensor network in two vineyards with each 80 soil moisture sensors and long range data transmission
 - Underground wireless soil moisture monitoring system

Research priorities

- Wireless sensor networks for agricultural applications (especially soil moisture measurement for irrigation)
- Large area soil moisture monitoring
- Innovative low cost sensors for soil moisture and plant parameter measurement

4.17 The State Authority for Mining, Energy and Geology (LBEG)

Contact

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Research expertise

The State Authority for Mining, Energy and Geology (LBEG) is the Mining Authority as well as the geological and soils science survey of Lower Saxony.

Soil data are collected by mapping and sampling.

Soil data are also collected and updated by other institutions and planning authorities, but the LBEG assures the data's quality.

The data are digitally provided in the Lower Saxony Soil Information System (NIBIS®). Additional to the soil data, the NIBIS® includes a variety of data evaluations such as determination of the useful field capacity, pot. soil erosion, pot. Need of irrigation et alii. The soil data will transfer to the user either by a set of different maps or as data records.

Research facilities

The following data can be provided:

- Standardized data sets according to the soil mapping instruction
- Data evaluation of the NIBIS®

The LBEG operates 90 permanent soil observation quarries, where data about the soil-status are continuously collected.

The LBEG has a wide experience of preparation and interpretation of geophysical data for soil mapping.

Research priorities

From our point of view, the following subject should be represented:

- Impact of climate change to the soil, the water household in the soil and need of irrigation et alii.
- Soil erosion
- A research platform for permanent soil observation quarries

Precision farming: as a foundation for a more efficient agriculture and a better groundwater protection

4.18 Association for Technology and Structures in Agriculture (KTBL)

Contact

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Research expertise

The Association for Technology and Structures in Agriculture (KTBL) is a registered association with about 400 members. KTBL is promoted by the German Federal Ministry of Food, Agriculture and Consumer Protection. The main office resides in Darmstadt, where a staff of approx. 60 employees supports the areas of activity. We coordinate about 50 work groups, with 8-12 honorary volunteered experts. The mandated mission of KTBL is technology transfer.

Our tasks are:

- to acquire and disseminate a planning basis for agriculture
- risk-benefit assessment for new technologies
- to describe the state of the art and define good working practice in agriculture
- to cooperate in the elaboration of national and international regulations concerning agriculture and environment
- to consort conflicting interests
- to provide a forum for scientists, consultants, administrators, agriculturalists and representatives of trade and industry to initiate and coordinate research

Research facilities

KTBL has profound experience in managing working groups and committees. In the past it has worked on all kinds of questions arising in the agricultural domain and captured research knowledge in publications for farmers to help them plan and to prepare the way for new technologies. It can thus rely on a large network of experts being able to contribute to knowledge transfer work.

In addition to that, the KTBL is able to refer to a large pool of planning data for agriculture. It has collected the necessary data in a data base and can make it available for the implementation of decision support systems etc.

In recent years, information technology has gained increasing importance for planning, guidance and implementation of agricultural production processes. The KTBL has initiated development of agroXML as a data interchange standard interfacing the farm to the outside world. Necessary IT infrastructure for doing XML development is available. Tools for collaborative development are used by the agroXML team and in the past a number of different methods and technologies for data modelling and format specification have already been evaluated. Access to other relevant specifications for standards in agriculture and knowledge on their use is either already available or can be requested from the KTBL's expert network.

Research priorities

- Cross-functional data exchange in agriculture

To be able to conduct sustainable agriculture, a circular flow has to be managed to minimize losses or accumulations that could lead to adversary effects on the environment and food quality. Information technology could provide necessary decision support to solve a number of problems concerning these issues. To be able to maintain productive, efficient and environmentally friendly cultivation and livestock farming systems in a world, it is necessary to create technological solutions allowing for networking and exchange of information in the agricultural sector.

- Data exchange in supply chain communications

Agriculture is embedded into a production chain of goods. Farms are delivering raw materials mostly for the food industry but also increasingly for energy and industrial material production. However, there are also goods entering the farm being used as operating supplies, e. g. fertilizers, animal feed etc. To be able to optimally manage the agricultural stage of production in the supply chain, data from lower and upper levels on the goods entering and leaving the farm is needed.

- Integrating data sources to allow for reaching and fulfilling environmental policy goals
- Agriculture can have a high influence on environmental quality.

The impact can be both in a positive as well as in a negative way. Large databases have been built for example for the Integrated Administration and Control System (IACS) of the EU. The current deficit is that most of these databases act only as a sink. There is no sharing of data sets and assessments based on different data sources are very difficult to do due to a lack of an infrastructure. Pure data exchange is only one aspect of the problem, also lacking is a network to exchange models and knowledge. Additional challenges arise in this setting from data ownership and data protection issues.

- Robotics in agriculture

The preconditions for robot use in agriculture are actually different. Environmental conditions can not be controlled at all, automated machinery has to react and adapt quickly to changes and has to interact with humans and/or other machinery. Up to now, no examination of the potential of these new developments in robotics in agriculture has been done. A challenge lies in embedding the technology into existing field work processes. A communication layer is necessary, that can currently not be provided by existing systems and IT standards in agriculture.

- Service architectures and the semantic web in agriculture

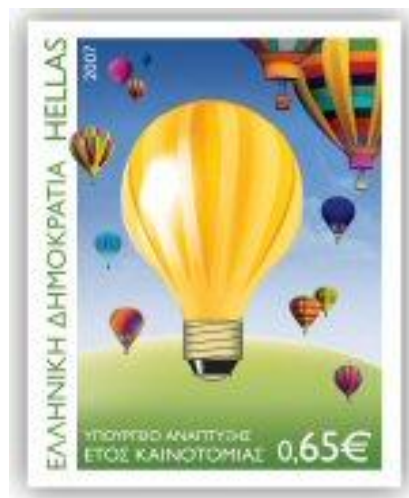
Service Oriented Architectures have received a lot of attention in the past few years. However, implementations using the most prevalent technologies like UDDI for service discovery and SOAP for messaging still only work in restricted and controlled environments and mostly in intra-enterprise settings. Real dynamic runtime binding is currently infeasible. To be able to loosely couple systems, the resources they provide have to be described clearly and in a machine readable manner.

- Process integration by standardization
- Analysis and design of communication systems

Research priorities

- Development a design of knowledge, decision and processing structures
- Development of computer aided systems (hard and software)
- Organization of information and communication systems which are adapted to practical needs of agriculture, agribusiness, the food industry, agricultural policy, the environment and other related fields.

ICT-AGRI Country Report



ICT-AGRI Country Report GREECE

GRNET S.A., Messogion Av. 56, 115 27 Athens, Greece

Authors: Xenophon Tsilimparis

1. Introduction

Access and use of international knowledge and the internationalisation of the Greek R&D System.

“Aggressiveness” of Greek researchers in applying successfully for EU-RTD funds is identified as a strength in the innovation governance SWOT overview included in the Trend chart 2006 Greece’s country report. Indeed, the high percentage of Greek researchers having studied abroad, their strong networking capacity combined to the limited national RTD funds led Greek research teams to seek funding from international sources.

The EU Framework RTD programmes in particular provided the means to access additional funds for research. Furthermore, their highly competitive selection procedures opened the gates of international cooperation to the most competent Greek research teams. Much of the national RTD landscape depends on the EU research policy since approximately 1/10 of the GERD is funded through projects of the EU Framework Programme, while another tenth from the EU Structural Funds⁵³.

Furthermore, the concept of the European Research Area, launched in the beginning of the current decade was positively received at the policy making and academic levels. Greece, being at the same time less technologically advanced and geographically isolated from the core of Europe, traditionally supported initiatives facilitating networking with European partners and intake of spill-overs developed elsewhere. Furthermore, the specific location of the country in the crossroad between East and West has been considered as an advantage in bridging Europe to other regions of the world, the Balkans, Mediterranean and the Black Sea regions in particular.

The Greek EU presidency in 2003 promoted the idea of ERA, worked to extend it to innovation and produced a document aiming to further investigate issues that are strongly related to the implementation of ERA (Opening-up national RTD programmes, integration of European Research Organizations, RTD Infrastructures and Eureka)⁵⁴.

Opening up of the national RTDI system remains one of the main priorities of the national RTDI policy. Exchange of knowledge and technology is mainly obtained through academic and research networks in which Greek teams (comprising researchers and businessmen) participate, as well as via almost all RTD projects, including the investment Law.

In general Greek participation, as an E.U. member, in different levels of E.U decision making, forums, committees, working groups etc. for the planning and implementation of different RTDI actions constitute a basic source for inward and outward flows of knowledge and technology and participation in international linkages. The same applies also in the case of Greece’s full membership in International Organizations like CERN, ESA, ESF, EMBL/ EMBC/ EMBO, NATO.

Co-operation with foreign providers of knowledge- Development and status of Greek participation in European S&T Cooperation; Co-operation within the EU Framework Programmes

The share of the Greek research community in RTD projects and funding of the EU is at a much higher level than its size, as measured by the GERD or the number of researchers. Most of the researchers found only benefits in extending the limited national opportunities for financing their research at Community level. The broadness of the Framework Programmes' objectives covered a very large part of the projects of existing research teams.

The General Secretariat for Research and Technology is supporting the participation of research centres and Universities to the Framework Programmes' activities by providing "matching funds". The performances of the Greek researchers in attracting funding from abroad are also satisfactory, mainly from the EU Framework Program for Research Technological Development and Demonstration. Greece is estimated to attract around the 3% of this competitive program funds, with annual inflows from 90 to 100 mil € towards Greek organizations. These funds almost represent the 10% of the research funding in Greece, one of the highest percentages in Europe. The success percentage of the Greek organizations, as it is expressed from the number of participations in the awarded projects, is high, especially in specific sectors like information and communication technologies, the viable development, the international change and the ecosystems, as well as nanotechnology – nanosciences, multi-operational materials and new production processes and layout.

As it can be argued by analyzing relevant data, that Information Society Technologies is the field with the highest number of Greek participations and the highest funding, reaching up to 3,87% of the total EU funds for that field. Other areas with substantial Greek participation, as a percentage of the total EU financial contribution to member states, are "Research & Innovation" and "International Cooperation". Nanotechnologies, Aeronautics and Space, Sustainable Energy and Global Change and Ecosystems follow.

2. Mapping of national funding bodies

The General Secretariat for Research and Technology, Ministry of Education:

- **Supports** through its programmes, the research activities of both the country's scientific research institutes and those of its productive industry, focussing on areas that are important for the national economy and for the improvement of the quality of life.
- **Promotes** the transfer and dissemination of advanced technologies throughout the country's productive sector, thus ensuring early utilisation of the results of research activity.
- **Contributes** to the reinforcement of the country's research manpower.
- **Represents** Greece in relevant institutions of the European Union, thus bringing the country's research and technology activities into line with the requirements of the international community.
- **Promotes** cooperation with other countries and international organisations on research and technology issues.
- **Establishes** new institutes and technological centres in support of sectors of high priority for the development of the Greek economy.
- **Supervises** underwrites the fixed costs of, and otherwise provides support for 21 of the country's best-known research and technological centres.
- **Supports** the dissemination of research and technology information throughout the country and internationally by means of advanced IT systems and networks.
- **Encourages** activities aimed at raising awareness of the general public about research and technology issues.

GSRT supervises the following research Institutions:

- National Observatory of Athens
-
- National Centre for Scientific Research "DEMOKRITOS"
-
- Biomedical Sciences Research Center "Alexander Fleming"
-
- Foundation for Research and Technology - Hellas (FORTH)
-
- National Documentation Centre
-
- Hellenic PASTEUR Institute
-
- The National Hellenic Research Foundation
-
- Centre for Research and Technology (C.E.R.T.H.)
-
- Centre for Renewable Energy Sources

General Secretariat for Research and Technology, 14-18 Mesogeion Av., 115 27 Athens,
Tel: +3 210 7458000, www.gsrt.gr

3. Mapping of national research programmes

3.1 RTD Consortia in sectors of national priority

- Owned by:
General Secretariat of Research and Technology (GSRT)/Ministry of Education
- Managed by:
GSRT
- Website:
www.gsrt.gr

Brief characterisation:

- Region: the whole country
- Participation of research institutes: Open to all
- Participation of industry: Open to all
- Participation from foreign countries: Not excluded, but limited in practice

Comments:

The general objective of the Programme is to promote collaborations between business enterprises and research organizations through long-term research and technological development projects and demonstration projects. The target is to develop innovative products and services and to meet social and cultural needs and thus promote economic competitiveness. The public contribution to the total budget of the projects selected by peer reviewing ranges from 50% to 70%, according to the thematic field.

The Programme focuses on certain priority fields or objectives:

- **Natural Environment and Sustainable Development**
- Renewable Energy Sources and Energy Saving
- Culture – Knowledge Intensive Tourism
- Sports
- **Food – Agriculture – Aquaculture**
- Transport and Navigation Technologies
- Health – Biomedical Research – Diagnostics and Therapeutics
- Built Environment and Risk Management
- New Forms of Business, Work and Training Organization
- E-learning, e-business (General Secretariat for Information Society)
- Imaging -Speech – Language

The Programme supports basic research, industrial research and initial demonstration.

The intensity of the aid varies accordingly (up to 100% for basic, 50% for industrial research and 35% for initial demonstration). Some examples of good practices of European interest

have been identified in the framework of the Programme. However, the overall impact of the Programme has not been assessed yet.

Overall budget (2000 – 2006): 225,6m€ (grant: 123,1m€) also the budget allocated to projects funded by Regional Operational Programmes is included.

3.2 Greek Information Society Operational Programme (GRNET3): Development of the National Research and Technology Network

- Owned by:
GRNET
- Managed by:
Greek Research and Technology Network (GRNET SA)
- Website:
<http://www.grnet.gr/default.asp?pid=28&la=2>

Relevant ICT-AGRI topics

- ICT/High speed Networking

Brief characterisation:

- Geographic scope: Entire country
- Participation of research institutes: As users of the network and its services
- Participation of industry: As ICT equipment suppliers
- Participation from foreign countries: Collaboration in the framework of the GEANT network

4. Mapping of national research institutes

4.1 Agricultural University of Athens

Contact

Kostas G. Arvanitis, +30-210-5294034, karvan@aua.gr

Research expertise

Application fields of: Environmental management, weather modifications operations, energy systems, Water Resource Management, Water Network Management, Plant and Animal Factories, Hydroponics, Integrated Production Management, Food Traceability, GIS and Precision Agriculture, Robotics for agricultural processes, advanced automation applications, mechanisation and automation in Agriculture, SCADA systems.

Basic fields of: Operations research, code design, analysis and design of optimal control systems, instrumentation and signal processing, process control, biological modelling, bio-electronics and biosensors, neural networks, fuzzy systems.

Process Control, Analysis and Design of Optimal Control Systems, Instrumentation and Signal Processing, Automation in Agriculture, Environmental Control Systems for Plants and Animals, Control of Irrigation Canals, Water Network Management, Hydroponics, Integrated Production Management, Precision Agriculture, Robotics for Agricultural Processes, Sensors, Biosensors and Wireless Sensor Networks, Artificial Intelligence in Agriculture, SCADA systems.

Research facilities

- Electronics Development
- Software Development
- Hydraulic Testing Systems
- Instrumentation and Measurement
- Control System Modules, PLCs and Microprocessors
- Electronics Development
- Software Development
- Hydraulic Testing Systems
- Instrumentation and Measurement
- Control System Modules, PLCs and Microprocessors

Research priorities

- Process Control in Agriculture
- Robotics in Agriculture
- Electronics
- Instrumentation and Measurements Sensors and Biosensors
- Decision Support Systems
- SCADA Systems
- Wireless Data Collection
- Traceability Systems

4.2 Agricultural University of Athens

Contact

Alexander B. Sideridis as@aia.gr, +30 210 5294171

Research expertise

The Informatics Laboratory (INFOLAB) of the Agricultural University of Athens (AUA) is an educational and research unit of AUA. Research activities combine ICT innovations, methodologies and applications in Agriculture. An important area of Laboratory's research is Artificial Intelligence (AI) in Agriculture. In particular, the last twenty years, the AI group of researchers are dealing with diagnostic Expert Systems development, using expert system shells or building expert system development tools for specific purposes. This activity includes the development of systems combining expert systems and GIS in order to be used for land evaluation. Decision Support Systems design, development and implementation is another field of interest of the AI group.

In general the experience of the staff of Infolab includes knowledge engineering, artificial neural networks, knowledge management and location based services in problems concerning bio and earth sciences.

Research facilities

The Laboratory of the AUA comprises three fully equipped computer rooms with the capacity of about 80 microcomputers connected in a LAN. Three servers are also used for research purposes.

There is also a GIS unit.

Apart from the basic software Infolab possesses specialized software concerning development of Expert Systems and Artificial Neural Networks.

Research priorities

- Intelligent Systems in Agriculture
- Expert Systems in Agriculture
- Neural Networks in Agriculture
- Decision Support Systems in Agriculture

4.3 Aristotle University of Thessaloniki, Faculty of Agriculture, Agricultural engineering Laboratory

Contact

STAVROS VOUGIOUKAS, bougis@agro.auth.gr, +302310998718

Research expertise

- Autonomous vehicles in agriculture: motion planning, control and sensing, coordination

- In-field operations planning and logistics for teams of agricultural machines, large scale optimization
- In-field traceability for manually harvested produce with wearable devices
- Modeling and control of processes in agriculture

Research facilities

- RFID radar and passive/active tags
- Wearable worker localization device (pedometer) by Honeywell
- Laser scanner for robotic applications
- Home-built robotic vehicle platform
- Various GPSs
- Commercial optimization packages (Knitro, CPLEX)

Research priorities

- Robotics in agriculture: motion planning, control and sensing, coordination
- Logistics for teams of (semi)autonomous vehicles in agricultural production
- ICT for traceability for manually harvested produce

4.4 Center for Research and Technology of Thessaly (CERETETH)

Contact

Nikos Katsoulas, nkatsoul@uth.gr, +302421-093249

Research expertise

- Protected cropping, smart greenhouses, Precision Farming, Agricultural instrumentation, On Farm energy systems, Precision cultivation, Agricultural information systems, Agricultural robotics, Precision irrigation, Controlled Environment Agriculture, On Farm Energy Systems, Automation & Sensors

Greenhouses (environment & equipment), crop stress, environmental physics, hydroponics systems, Geostatistics.

Research facilities

- Agricultural robot called ZEUS (under development)
Multispectral camera, RTK GPS
- Infrared high precision camera
- Phytomonitoring system
- Wireless meteorological stations
- 3 full equipped and automated greenhouses (total 0.5 ha)
- Climate, water and soils sensors
- Software (CFD, Geostatistics, GIS, EnergyPlus, Data management)

4.5 Democritus University of Thrace

Contact

Dr. Lazaros S.Iliadis, +30-25520-41135, liliadis@fmenr.duth.gr

Research expertise

- EXPERT SYSTEMS
- Forest Informatics

Research facilities

- Laboratory of 30 PCs network, with a Laser Printer, a scanner, two video Projectors, and two Laptops
- Advanced Professional Software for Building Artificial Neural Networks, Fuzzy Intelligent systems and Expert Systems
- JADE Software Platform and extended Object Oriented Programming Experience for building
- Distributed Networks of Intelligent Agents used in environmental and Forestry Applications (State of the art for REAL TIME ARTIFICIAL INTELLIGENCE APPLICATIONS).
- GIS (Geographical Information Systems) MATLAB

Research priorities

- Artificial neural networks
- fuzzy logic and systems modeling
- multiagent systems/distributed multiagents networks
- autonomous agents
- machine learning (supervised or not)
- Support Vector Machines
- expert systems
- decision support systems
- Fuzzy Inference Systems
- Fuzzy Adaptive Clustering/Fuzzy c-means clustering

4.6 Department of Agriculture Crop Production, University of Thessaly

Contact

Spyros Fountas, sfountas@uth.gr +30 24210 93232

Research expertise

- Precision agriculture applications in cotton, cereals, apples, olives and vines. Including yield and quality mapping, soil properties mapping, vegetation indices mapping, ECa mapping.
- Research on correlation between measured properties and yield.

- Flower distribution correlation in apple orchards with yield distribution using image analyses.
- Modeling of crop response to inputs using fuzzy cognitive maps.
- Developing variable rate application technology for fertilizer and irrigation. Developing a DSS for the farmer posted in the web. Development of a research robotic platform for crop monitoring.

Research facilities

- Yield monitors for cotton and cereals
- RTK GPS
- Crop Circle and multispectral camera
- EM 38
- Variable rate applications under development
- Easy Guide 500 Trimble
- Precision Agriculture Software
- Research robotic platform for crop monitoring
- NIR sensor for protein and oil measurements
- Wireless sensor network for soil moisture sensors
- Wireless weather station

Research priorities

- precision agriculture
- precision viticulture
- soil and water stress predictions
- DSS in agriculture
- robotics in agriculture and natural environment

4.7 GRNET SA

Contact

Mr. Tryfon Chiotis, +30210-7474-240 tchiotis@grnet.gr

Research expertise

- Development and deployment of high-speed networking infrastructure serving Universities and Research Centers in Greece
- Development and deployment of policies regarding the uptake of ICTs in the Greek economy and society

Research facilities

GRNET2 constitutes a new generation optical fiber of WavelengthDivisionMultiplexing – WDM technology at extra high speeds (1-2,5 Gbps). All the nodes are based on routers of Gigabit speeds and are interconnected with a network of 2.5 Gbps speeds over DWDM technology with leased wavelengths from the incumbent (OTE). In the region of

Crete, two more nodes are based on switching technologies, defining this way the MAN network of Crete.

Research priorities

- High-speed optical networking
- Grid and Super-Computing
- Cloud computing
- E-science

4.8 Institute for Space Applications and Remote Sensing/National Observatory of Athens

Contact

Haris KONTOES, 30-2108109186, kontoes@space.noa.gr

Research expertise

- Continuous monitoring and early assessment of damages in agricultural production using satellite observations acquired at ISARS/NOA stations.
- Assessment of extreme climatic conditions namely heat excess, frost and drought conditions based on historical records, satellite observations and meteo data, recorder and archived at ISARS/NOA premises.
- Spatial mapping of indexes relating to crop health, evapotranspiration and vegetation vigour. Development of a decision making and forecasting system for imminent damages in agricultural production. Dissemination of early warnings to farmers.
- Development of advanced modeling techniques for land use/ land cover mapping in natural ecosystems including agricultural areas. Development of dedicated algorithms for operational detection of land cover changes, using satellite observations and CVA techniques.
- Integration of the Evidential Theory of Dempster & Shafer for Post-Classification Pixel Labeling in agricultural class classification and crop identification.

Research facilities

- Models & algorithms (pixel, object oriented) for processing of high to very high spatial resolution satellite data, for agricultural mapping and agriculture statistics generation.
- Models & algorithms for operational Land Use/ Land Cover mapping in agricultural and natural vegetation areas.
- Continuous monitoring and assessment of extreme climatic conditions (heat excess, frost, draught conditions) affecting agricultural production and practices. Use of satellite data in conjunction with meteorological observations acquired at ISARS/NOA stations.
- Algorithms for Land Cover Change Detection in agricultural areas at the fringe of natural ecosystems, using high spatial resolution satellite data and Change Vector Analysis techniques.

- Models for retrieving the spatial expression of indexes relating to crop health, agronomy, vegetation vigour and climate conditions using satellite observations, namely NDVI, CVI, LAI, VIs, evapotranspiration, surface temperature.

Research priorities

- Precision farming
- Space based information systems for agriculture. Integration of EO, GPS, Agronomy and Telecom to support decision making in agricultural practices.
- Integration of satellite sensors to early warning in agricultural production and assessment of income losses.

4.9 Mediterranean Agronomic Institute of Chania (MAICH)

Contact

Ioannis MANAKOS, +30 28210 35040,, manakos@maich.gr, alkinoos@maich.gr

Research expertise

The Geoinformation in Environmental Management program focuses on the ever growing demand for highly specialized and effectively educated scientists to tackle significant environmental issues in today's natural environment, agro-environmental issues and land use functions. Graduates, professionals and specialists from the Mediterranean and Balkan region majoring in a compatible discipline and background knowledge on Environmental issues have the opportunity to specialize on (a) Geographical Information Systems and Remote Sensing, their application to Environmental Management and other problems related to Environment, (b) Utilization of quantitative and decision support tools to strategic and environmental impact assessment within the environmental policy and legislative framework of the European Union. The attainment of the M.Sc. degree qualifies them with in depth academic knowledge and practical skills in Environmental Management, which enable a successful continuation of their doctorate studies and/or pursue of an international career in both the public and private sector.

Already undertaken research concerns:

- Desertification Monitoring,
- Environmental Resource Management,
- Environmental Impact Assessment,
- Landscape Ecology,
- Soil Erosion Risk Assessment,
- Agricultural Practices Monitoring,
- Precision Agriculture,
- Forest Fire Risk Assessment
- Fire Behavior Modeling & Effectiveness of Fire Retardants,
- Management of Mediterranean Ecosystems, and
- Regional and Rural Development

Research facilities

Laboratories supporting education and research activities consist of the following:

Laboratory of Geographic Information Systems and Remote Sensing supported by:

- Automated Cartography Unit.
- Field Survey Unit.
- Forest Fire Wind Tunnel Simulator Laboratory.
- Unit for field spectroradiometric measurements.

The laboratory provides a computer network with competitive hardware profile and yearly updated and renewable software accessible to each student. In this context postgraduate students develop hands on skills in Remote Sensing and geographical information technology and analysis.

ArcGIS (ArcInfo, ArcView), ERDAS Imagine, ENVI, eCognition, GRASS, and IDRISI software modules along with an extensive range of academic PC supporting software are available.

The Information Systems and Technology team of MAICh supports through the deployment of modern network technology and expertise in Informatics on daily basis the education and research activities.

Automated Cartography Unit

Unit equipped for capturing, processing, integrating, archiving and printing of raster, vector, and other datasets. The Unit includes: 1 A0 Scanner, 1 A3 Scanner, 1 A0 Digitizer, 1 A3 Digitizer, 1 A0 HP Plotter, 1 Desk Trimmer, 1 A3 HP cp 1700 color inject printer, 2 HP 2100 laser printers, and 1 HP 950C color inkjet printer.

Field Survey Unit

Unit consisting of the necessary equipment and tools to carry out field campaigns, such as: Differential GPS (single frequency) with sub-meter accuracy, Handheld Hyperspectral Radiometer, Range Finder (Laser Hypsometer), Bark diameter (DBH), Compass, Video camera, Digital camera, Laptop and Pocket PC equipped with embedded GPS receiver and ArcPad.

Forest Fire Wind Tunnel Simulator Laboratory

The wind tunnel facility of MAICh was built in 1999 and is used in different research projects related to forest fires. It meets all the international specifications for simulated fire and wind experiments. The tunnel's dimensions are: 10.3m length, 1.8m height and 1.6m width. The wind speed is adjustable at a range of 0.0-2.5m/sec by two ventilators (60cm diameter each) that regulate laminar air flow through suction. The wind tunnel was constructed with fire proof materials and it is equipped with a data acquisition system with thermocouples connected to a computer, digital hotwire anemometer, digital video camera, hydrometers, thermometers and accessories.

Unit for field spectroradiometric measurements

Unit for reflection registration of materials and characterisation according to established spectral libraries. The Unit is equipped with: ASD Field Spec 3 Hi Res Spectroradiometer

(range 450-2500 nm), a mobile fully automated all-terrain platform that reaches 9m height, tripod, and accessories.

Research priorities

- Desision Support Using Remote Sensing and GIS in agricultural &
- environmental issues (see point 4.)
- Agroenvironmental Modeling and Management with focus on
- Mediterranean Ecosystems
- Spectroradiometry for plant communities/ cultivations identification and discrimination
- Forest Fire Risk Assessment & Fire Behaviour Modelling & Effectiveness of Fire Retardants

4.10 National Technical University of Athens, Surveying Engineering Dept.

Contact

Prof Demetrius Argialas, argialas@central.ntua.gr, + 30 2107722595

Research expertise

- Remote Sensing Techniques for Water Resource and Pollution Assessment
- Expert System for the Monitoring, Management & Protection of the Natural Landscape & Environmental Resources

Research facilities

- VNIR Spectrographic Imaging System CASI-550
- Thermal Imaging System TABI-320
- GER 1500 Spectroradiometer with Magellan GPS

Research priorities

- Satellite Image Processing
- Neural networks
- Applications in Agriculture
- Land-Use

ICT-AGRI Country Report



ICT-AGRI Country Report IRELAND

Teagasc, Oak Park, Carlow, Ireland

Authors: Raymond Kelly

1. Introduction

Ireland has seen an exponential growth in research funding in the last ten years. The current Strategy for Science Technology and Innovation (2006 – 2013) seeks to double the number of PhD students in Ireland over the lifetime of the programme. The Irish Government has committed €8.2 billion to ensure the implementation of this strategy.

Research funding for agriculture is principally administered through the Department of Agriculture, Fisheries and Food (DAFF). This department directly funds the Teagasc research programme. Teagasc is the Food and Agriculture Development Authority of Ireland. It undertakes research, advisory and education for the agriculture and food industry. Teagasc research focuses on

- animal bioscience and grassland
- crops and land use
- environment and soils
- rural economics
- food

DAFF also administers a competitive funding call entitled “Research Stimulus Fund”. Funding in excess of €43m has been provided under Calls held in 2005, 2006 and 2007 in respect of 85 projects in the Agri-Environment: Biodiversity, Nutrients and Gaseous Emissions, Animal Bioscience, Plant Bioscience, Non-Food Uses of Agricultural Land/Produce, Plant Health, Forestry and Agri-Economy & Policy areas.

A range of other funding bodies are sponsored by other government departments. One of the largest funding bodies is Science Foundation Ireland (SFI) which is headed by Prof. Frank Gannon, the former Executive Director of EMBO. SFI has three funding streams: Biotechnology; ICT; and Sustainable energy and energy-efficient technologies.

2. Mapping of national funding bodies

2.1 Department of Agriculture, Fisheries and Food

Contact: Richard Howell, 353-1-6072572, richard.howell@agriculture.gov.ie

2.2 Teagasc

Contact: Raymond Kelly, +353-59-9183505, raymond.kelly@teagasc.ie

3. Mapping of national research programmes

3.1 Research Stimulus Fund (Research Stimulus Fund)

- Owned by:
Department of Agriculture, Fisheries and Food
Richard Howell, 353-1-6072572,
richard.howell@agriculture.gov.ie
- Managed by:
Department of Agriculture, Fisheries and Food
Richard Howell, 353-1-6072572,
richard.howell@agriculture.gov.ie
- Website:
<http://www.agriculture.gov.ie/research/researchstimulusfundrsf/>

Relevant ICT-AGRI topics

- ICT applications
- Automation of machinery / equipment
- Standardisation of data dictionaries and communication
- ICT in environmental regulation
- Effects of ICT and automation
- Structures in sale and support of ICT and automation

Brief characterisation:

- Region: Ireland
- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Unknown
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: This may be possible in the long term, but not at the present time.

3.2 Research Management Information System (Research Management Information System)

- Owned by:
Teagasc
Frank O Mara, 353-59-9183488, frank.omara@teagasc.ie
- Managed by:

Teagasc
Owen Carton, 353-59-9183485, owen.carton@teagasc.ie

Relevant ICT-AGRI topics

- Automation of machinery / equipment

Brief characterisation:

- Region: Ireland
- Geographic scope: National
- Participation of research institutes: Permitted
- Participation of industry: Permitted
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Potential

3.3 Walsh Fellowship Programme (Walsh Fellowship Programme)

- Owned by:
Teagasc
Frank O Mara, 353-59-9183488, frank.omara@teagasc.ie
- Managed by:
Teagasc
Owen Carton, 353-59-9183485, owen.carton@teagasc.ie
- Website:
<http://www.teagasc.ie/research/postgrad/>

Relevant ICT-AGRI topics

- Automation of machinery / equipment

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Permitted
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Potential

4. Mapping of national research institutes

4.1 Teagasc

Contact

John Upton, +3532542670, john.upton@teagasc.ie

Research expertise

Teagasc is a leading internationally recognised independent research institute with decades of experience in the development of innovative dairy technology. It has key research facilities including a new milking research laboratory. Teagasc has a very close working relationship with key stakeholders in the dairy industry which include Department of Agriculture, Food and Fisheries, dairy farmers, dairy co-ops, Irish and international Universities and research institutes and milking machine manufacturers. The milk meters and wide-bore tapered liners used by major milking machine manufacturers have also been developed by Teagasc. The Teagasc Animal & Grassland Research and Innovation Centre provides training for milking machine technicians and calibration of milking testing equipment at its Moorepark laboratory. Teagasc personnel are involved with most companies throughout the dairying industry in developing new standards and test procedures on an ongoing basis.

Research facilities

The Teagasc Animal & Grassland Research and Innovation Centre, located in Moorepark, Co. Cork has extensive research facilities including over 500 hectares of farmland and a new milking research laboratory. This modern facility contains calibrated instrumentation along with reprogrammable data acquisition and analysis hardware and software. The portable milking machine simulator developed in the Animal & Grassland Research and Innovation Centre together with custom built software is used routinely for identifying vacuum losses in milking machines, designing high performance milking machines and calibrating milking machines for trial work.

Research priorities

Increased labour efficiency is a pre-requisite for increasing the competitiveness of the dairy industry. Labour efficiency on dairy farms will have to increase significantly in the future if average quota size increases as suggested in the Prospectus Report for the Strategic Development Plan for the Irish Dairy Processing Industry. The milking process accounts for over 35% of total labour demand on Irish dairy farms. Current research prioritises in the area of Robotics and Automation in Agriculture and focuses on reducing labour input in the milking routine through the development of next generation automation in the areas of cluster attachment, udder identification and automated udder disinfection. Identifying the key drivers for adoption of further automation on dairy farms is another area of focus.

4.2 Dublin City University

Contact

Fiona Brennan, +353-(0)1-700781, fiona.brennan@dcu.ie

Research expertise

- Nanotech, new materials particularly stimulus responsive/adaptive materials
- Smart packaging – sensors integrated in packing
- Tracking food quality throughout the entire harvest to home sequence, linked to sensor-web research led by CLARITY CSET
- Monitoring of the environmental impact of food production and distribution on the environment – both water and air quality monitoring using remotely deployable autonomous sensors integrated with wireless communications.
- Robotics and Automation
- Expertise in all aspects of the generation of fluorescence-based optical platforms for use in biochips, arrays and sensors.

Research facilities

- Advanced process monitoring facilities
- High Information Content Analytical Equipment including LC-MS, MALDI-TOF, GC-MS, range of spectroscopies, electroanalytical techniques etc.
- Materials testing inc. SEM-EDX, AFM, Profilometry, Surface RAMAN, IR, Fluorescence, range of imaging microscopies

Research priorities

- **Agriculture**
 - With Teagasc (Moorepark) on automated sensing of mastitis during milking (Bill Meanie, D Diamond DCU)
 - Smart Packaging for the food industry (with Teagasc Ashtown Food Centre); mainly targeting fish industry but directly transferrable to other packaged foodstuffs. Patent granted for some of this technology (D. Diamond DCU, Marine Institute, Errigal Iasc, Donegal).
 - Automated sensing of pH and temperature transients in pig carcasses (D Diamond DCU, Galtee Meats, Joe Kerry, UCC)
 - Monitoring of temperature profiles of fish catches from harvest to packaging (D. Diamond DCU with BIM, Errigal Iasc, Donegal)
 - With Teagasc (Moorepark) on Automated Milking Systems (Dr. Brian Corcoran, Dr. Harry Esmonde, DCU – see section 4.3)

- **Environmental protection**

- **Autonomous Phosphate Analyser for Water Quality Monitoring**

- Project team: Dr. John Cleary, Damien Maher, John Healy

- Funding body: Enterprise Ireland

- This project is being carried out in collaboration with Episensor Ltd., an Irish SME based in Limerick. The goal of the project is to commercialise the phosphate monitoring technology which has been developed at the ASG. Researchers from the ASG are working closely with Episensor personnel in order to optimise the performance, cost base and deployability of the system.

- **Wireless Autonomous Nutrient Detector**

Project team: Dr. John Cleary, Dr. Stephen Beirne

Funding body: Enterprise Ireland

The objective of this project is to further develop the analyser platform which is the basis of the phosphate sensor developed by the ASG. Electrochemical and optical methods for the detection of other environmentally important targets, including the nutrients ammonia and nitrate are being developed and integrated into the system so as to produce a multi-analyte analyser system. The overall performance of the system will also be improved by incorporating new components developed in the Adaptive Sensors Group, such as more sensitive detectors and low-powered pumping systems based on polymeric biomimetic actuators.

- **Analytical Platforms for Environmental Monitoring**

Project team: Dr. Martina O'Toole, Cormac Fay

Funding body: Science Foundation Ireland (CLARITY CSET Award, €16.4 million)

The aim of this research is to generate a low cost, reproducible, robust and accurate fully integrated field deployable chromatography system for the real-time separation and detection of multiple anions (e.g. nitrate, nitrite, phosphate, bromide etc.) which builds upon previous successful research in this area within the ASG and Professor Brett Paull's team in the recently established SFI Irish Separations Science Cluster. The system comprises of low power patented LED based optical detectors (PEDD) coupled with microfluidic pumps and a low pressure monolithic column which will be integrated with existing wireless communication platforms and data analysis software employed within the group.

- **SmartBay**

Led by the National Centre for Sensor Research (DCU), with core academic partners based at NUIM (National Centre for Geocomputation), NUIG (Martin Ryan Institute, Environmental Change Institute, DERI) and UCD (CLARITY), 'SmartBay' is a key element of national infrastructure which is of critical importance for the rapid in-situ validation of emerging marine technology platforms. This is a central pillar of the Marine Institute strategy 'SeaChange', whose primary goal is 'to drive the development of the marine sector as a dynamic element of Ireland's knowledge economy', consistent with the National Strategy for Science, Technology and Innovation, launched in June 2006. Located in Galway Bay, SmartBay will consist of a communications and sensing infrastructure linking surface buoys, submarine cabled systems, autonomous underwater vehicles, satellite based sensing and shore deployed units together. Information arising from these various forms will be analysed dynamically to enable multiple contributions to the status of the bay environment to be monitored and potentially adverse conditions identified at an early stage. WiFi communications infrastructure is currently being installed and tested by INTEL, while IBM is involved in developing an environmental portal to make the information harvested easily accessible to the general public and specialists alike.

See www.marine.ie/home/research/SeaChange/InfrastructureProgramme/ for more information on the 'SeaChange' strategy.

- **Collaboration with IBM Centre of Excellence in Water Management**

Recently IBM's Centre of Excellence in Water Management has worked on SmartBay which is the next generation of advanced coastal and marine monitoring and management. Two projects which have grown from SmartBay are:

- (i) Integrating the cyber-physical environment: IBM developed an embedded sensor platform (in collaboration with CLARITY) to measure phosphate levels in water.
- (ii) Integrating environmental information through an interface with advanced visualisation capabilities: IBM developed a SmartBay Portal to integrate data from various environmental sources.

Jer Hayes is an embedded IBM researcher working directly with CLARITY on a number of projects related to SmartBay. Research is being undertaken in the integration of in-situ sensor data with remote sensing data and examining how data should be managed and tagged to automate event detection. Thus far this has involved the monitoring of atmospheric NO₂ and water quality (e.g. sea surface temperature in Galway bay) using remote sensing data sources and in-situ sources. Further work is being undertaken on water quality around the country. A biopathogen sensor is installed in the Cork area and recorded a change in water quality during the recent flooding event in November 2009.

- **Miniaturized All-Solid-State Sensors for Trace Analysis of Substances Relevant to Health and Welfare**

Project team: Dr. Aleksander Radu, Dr. Salzitsa Anastasova

Funding body: Enterprise Ireland

The aim of this project is to develop miniaturised all-solid-state ion sensors with low detection limit based on recent advances in materials science and ion selective electrodes technology. The sensors will be constructed based on novel conducting polymers to facilitate electron-ion transduction coupled with novel ion-selective membranes to achieve trace-level ion detection and stable sensor performance. This project envisages a complete miniaturized potentiometric device for determination of toxic heavy metals and other ions of importance to human health and welfare.

- **China-Ireland Research Centre for Advanced Material and Sensor Research**

This joint research centre was set up in NorthEastern University of China (NEU), Shengyang, in 2008, through the China-Ireland Collaboration Programme between NEU and DCU by Prof. Liu (NEU), Prof. Dermot Diamond and Dr. Kim Lau. The research lab brings together members from 4 universities including JiaoTung University (JTU), Shanghai, China; China Three Gorges University (CTGU), Yichang, China; NorthEastern University (NEU), Shenyang, China and Dublin City University. The focuses of the collaboration are on materials research and environmental monitoring. Three Gorges University is situated in the heart of the Three Gorges Dam area and is interested in monitoring the water quality of the Yantze river. JiaoTung university is currently undertaking one of the biggest environmental water monitoring projects in China (4 billion RMB, appr €40 million) focussing on the water quality of a number of lakes in mid and western China. NEU is working on sensors for toxic gas

detection. DCU/ASG offers expertise in material research, sensor development and wireless/remote sensing within the collaboration works.

- **Real Time Marine Water Quality monitoring**

Project team: Dr. Kim Lau, Michelle Reynolds

Funding body: Marine Institute (Beaufort Marine Research Award, €2.4 million)

Total budget: This work is funded under the overall Beaufort Marine Research Award

Real time autonomous marine water quality monitoring is still very challenging even though many technologies are available for measuring water parameters. However, issues with power consumption, biofouling, and restricted sample pretreatment capability (e.g. separation) etc. have serious impact on the working lifetime, stability, selectivity and sensitivity of deployable sensing systems based on such sensors. A different strategy is the sensor network approach. Very low cost, low power wireless sensors that provide in real time simple water quality parameters such as colour and turbidity, together with data from simple imaging technique are used for marine bio-event tracking (e.g. algal blooms).

- **Development of Novel Methods for the Determination of Microbiological Contamination of Water**

Project team: Dr. Yuliya Shakalisava, Wojtek Hahnel, Christina Doherty

Funding body: Marine Institute (Beaufort Marine Research Award, €2.4 million)

Microbial contamination of public water resources represents a serious health risk. Monitoring of microbial water quality rely on culture growth methods and require at least 18-24 hours for analysis. This project evaluates several strategies for utilising surrogate measurements of water quality, such as turbidity, particle size and video sensing, as early warning systems for microbiological contamination, using parallel cell-based measurements for reference purpose. A prototype turbidity meter and particle size sensor has been developed and tested. In the longer term, a microfluidic system is planned that can provide a more specific determination of E. coli contamination and will be capable of remote sampling & analysis over extended periods of time. An extensive survey of the microbiological condition of rivers and coastal regions adjacent to Dublin has recently been completed as part of this project.

- **WANDA (Wireless Aquatic Navigator for Detection and Analysis)**

Project team: Cormac Fay

Advanced autonomous platforms capable of performing complex analytical measurements at remote locations still require individual power, wireless communication, processor and electronic transducer units. The cost base for these systems is still relatively high. The WANDA project presents an alternative approach for water quality monitoring using a low cost mobile sensing platform with an integrated low-power wireless video camera, powered by a polymer artificial muscle actuator. The sensing platform is housed within biomimetic polymer structure modelled on fish 3-d form and in concept, it will patrol a defined region within which there are numerous deployed ultra low-cost indicator stations. These have an integrated chemo-responsive material that changes colour relative to the

concentration of contaminants in the local environment. The mobile platform is used to interrogate each station using the camera and harvest information about the water quality. Collaborators at the University of Wollongong in Australia have been working on the polymer actuator to improve the mobility of the system, while the ASG has been developing the imaging and sensing technology in Dublin that allows "Wanda" to monitor conditions in the aquatic environment, such as a change in acidity.

4.3 School of Mechanical and Manufacturing Engineering, DCU

Contact

Harry Esmonde / Brian Corcoran, +353-(0)1-700509
harry.esmonde@dcu.ie; brian.corcoran@dcu.ie

Research expertise

The school of Mechanical Engineering at DCU has a vibrant teaching and research background which is of particular relevance to the ICT/Agriculture sector. One of the flagship programmes delivered at undergraduate level is the Mechatronic engineering course. This programme is delivered jointly by the schools of Mechanical and Electronic Engineering at DCU. The programme at the moment is a level eight course but will soon be expanded to provide level 9 awards comparable to a taught master's degree. Mechatronics relies on a synergy between mechanical, electronic and software engineering approaches to solve technical problems and produce intelligent systems. The combination of ICT and agriculture is exactly what mechatronic engineering is about.

A classic example of this is the area of robotics. Research is currently underway between Teagasc and DCU in the area of Automated Milking. Mechatronic graduates have continued their studies by conducting research into the optimal methods for automated milking as practised in the Irish context. This work is highly relevant to the European Agriculture sector given the increased need for greater yields and efficiencies while at the same time avoiding increased costs. While the work conducted in this area is relevant to milk production worldwide it has not been extended outside of Ireland at this point. It is believed that international cooperation would greatly enhance the research and increase the benefits that are envisaged for the technology sector .

Research facilities

The school of Mechanical Engineering has extensive computing, design, modelling/simulation and workshop capabilities. Having recently moved into a new bespoke building it boasts some of the best facilities in the country and is easily on a par with the best engineering schools.

The latest CAD/CAM systems have been used already in the design and manufacture of a novel robotic milking system applicable to rotary milking parlours. Trials have been conducted at the Robotics laboratory yielding positive results. Provision has been made for development and testing of advanced sensing and robotic systems.

Research priorities

Milk production is becoming more highly automated. Perhaps one of the best examples is the use of totally automated milking units as employed in shed-based dairy farming. However this technology is not suitable for Irish and many other European farms where animals live and feed outdoors. A new type of automated milking system is required that can be adapted to parlours where the animals are brought in from pasture on a herd basis. Ideally it should be possible to retrofit the new technology to existing parlours and in particular to the high throughput, carousel type parlour. This will require the development of high speed sensing technology and advanced robotic manipulation. The overarching objective is to allow for fully automated milking and at the same time minimise on labour costs during milking. The farmer will thus be able to deal with large herd sizes and spend more time on value added tasks such as improving milk quality.

4.4 National University of Ireland, Maynooth

Contact

A Stewart Fotheringham, +353-1-7086455, Stewart.fotheringham@nuim.ie

Research expertise

Precision agriculture / precision viticulture. Highly detailed sensing of small areas of agriculture (field) and linking soil, drainage, terrain features etc to yields for very small sub-parcels of the land.

Research facilities

State of the art 360 degree LiDAR scanner, thermal imaging camera, multispectral cameras, GPS and INU equipment for precision location. Various other sensors. High-end computing facilities (hardware and software) to undertake analysis. Skills in spatial sensors, algorithms, spatial analysis and visualisation

Research priorities

Linking yields to various features of soil, topography, aspect, fertilisation etc for very small land units (square metres) within a field.

4.5 University College Cork - Tyndall National Institute

Contact

Brendan O'Flynn, +353-(0)21-49040, Brendan.oflynn@tyndall.ie

Research expertise

Wireless Sensor Network Systems

Tyndall National Institute (TNI)/UCC is developing, as part of national and international collaborative projects, the next generation of wireless sensor systems and deploying these in real scenarios and deployments for environmental monitoring, ranging from water quality monitoring, building metering and monitoring of horticultural settings. TNI is employing a system level design methodology focusing on the development of the embedded software

and energy aware system intelligence, the necessary deployment tools to get systems into the field and ensure long lifetime deployments.

One of the key area of expertise within TNI's Wireless Sensor Network Group relevant to this research activity is in ambient intelligence system integration, developed within EU and national research programmes. This encompasses miniaturized wireless sensor system architecture design and development, Robust RF system design simulation test and prototype manufacture, Antenna design and development, 3-D micro-integration technologies, flex technology development, software for ad-hoc wireless sensor networks and issues relating to deployment scenarios and system evaluation and reliability analysis.

One of our areas of expertise is in designing hardware for wireless sensor networks (WSN). Apart from over 10 years of experience and knowhow in this area we also have developed a WSN platform ('the Tyndall mote') that has been successfully deployed in over 40 technology applications.

The key research skills which TNI has developed in the course of deploying these sensing platforms lie in the areas of sensor system integration, low power embedded system design and development (hardware and software), system miniaturization, RF system design and optimization and system deployment.

Life Sciences

ICT research is currently focused on the development of integrated multi-parameter multi-sensing lab-on-chip platforms that are capable of real time continuous monitoring cellular health. Combining instrumental and new sensory methods through integration of multi-sensing microsystems technologies will enable significant advances in cell monitoring processes. Through development of such microsystems and smart miniaturised systems, improvements in reliability and cost reduction will be achieved. The added value of these systems is that it enables integration of both optical and electronic devices for monitoring cellular behaviour of various toxins, thus allowing long-term measurement of cytotoxicity. This platform will also be beneficial for reporting on acute cytotoxicity and it is envisaged that it could ultimately be used to predict chronic cytotoxicity. This biochip platform together with proprietary assays will address markets including the pharmaceutical industry, environmental monitoring, health-care and security/defence sectors.

Other activity relates to biochemical and electrochemical sensing systems development including sensor and instrumentation development, system integration and system modelling, development of signal processing and data interpretation algorithms implemented in corresponding user-friendly software. This activity results in a number of practical developments of various application-specific instrumentation systems built accordingly to end-user specification. Environmental application is in the list of the applications on which these systems are targeted at. In particular it can be detection of heavy metal, pesticide, oil/oil derivatives or organic contamination in the soil and water courses, the presence of these pollutants in the products of the agroindustrial complex.

Research facilities

Tyndall National Institute is Ireland's largest research institute with over 350 personnel. Ref www.tyndall.ie

<http://www.tyndall.ie/research/mai-group/>

As part of the Institute's strategic planning, the Wireless Sensor Networks (WSN) and Life Science Interface (LSI) research teams have received significant funding from the EU (FP5, FP6, FP7), the Irish Higher Education Authority, and Enterprise Ireland which has facilitated the establishment of a strong multidisciplinary team in the area of sensor network development and deployment in conjunction with industry and academic partners.

Resources in the area of ICT include personnel, laboratory facilities and equipment.

Personnel: Multi-disciplinary team members with expertise in RF and system integration, embedded software development, engineering, chemistry, physics, biology etc...

Laboratory Facilities: RF Lab and characterisation capabilities, Life Science Interface laboratory and Tissue Culture facility.

Equipment:

- Electronic and RF characterisation equipment, (VNA, oscilloscopes, signal generators etc)

- Microelectronic component and system design tools

- Multi-sensing cell based platform system for toxicity monitoring.

- Babyplast 6/10P microinjection-moulding machine.

- Bridgeport VMC GX 480 micromachining system.

- Leybold LAB600 e-beam for fabrication of sensors.

At TNI we are involved in the DEPLOY project funded by the EPA and the Marine Institute, project partners include NCSR-DCU, SWRBD (south western river basin district), and our Industrial Partner is Intelligent Data Systems (previously known as Marine Informatics), DEPLOY is a technology demonstration project which aims to investigate how state of the art technology can be implemented for cost effective, continuous, real-time monitoring of a river catchment.

The deployment demonstrates sensor network capability in collecting real-time water quality data using state of the art water quality monitoring systems and deployment infrastructure (wireless data transfer mechanisms, novel sensors, sensor interfacing etc.) required to meet the demands of the European Water Framework Directive legislation.

The deployment aims to demonstrate sensor network capability in collecting real-time water quality data, and has been designed to interface novel sensors and associated aquatic focussed technologies as they are developed in parallel funded programs

The demonstration sites chosen are based in the River Lee, which flows through Ireland's second largest city, Cork, and were designed to include monitoring stations in five zones considered typical of significant river systems.

Parameters Monitored Include:, Conductivity, Chlorophyll-a, Dissolved Oxygen, Temperature, pH, Turbidity, Depth, and is updated on the web page interface at approximately 10 minute intervals. The access to this data and the visualization of the different streams of data at appropriate granularity can inform environmental scientists as to the changing water quality parameters and develop models around the catchment area in

question. The data can also be used to inform decision makers as to other catchment-related scenarios outside the realm of water quality monitoring per se, flood monitoring

To facilitate sensing system development TNI has:

- Silicon fabrication facilities for microsystem and sensor production (micro and nano size)
- A number of electrochemical workstation for sensor development and characterisation
- Full scale facilities for the low-noise instrumentation development: corresponding electronic equipments (oscilloscopes, signal generators, counters, impedance and network analyzers) for circuit development, testing and debugging; dedicated software for electronic circuit and system design and simulation.

Facilities for investigation of biological objects.

Research priorities

- Low Power Consumption, Long life and easily deployable Wireless Sensor
- Network Systems
- Deployment of Real life systems in rugged environment
- Sensor Data Analysis, Multi Sensor Visualisation and Fusion
- Integrated biosensor platform systems
- Lab on chip systems
- Multi-sensing systems
- Biochemical and electrochemical sensing systems development
- Micro and nano sensors
- Low-noise sensing instrumentation
- Signal processing and data interpretation algorithms

4.6 University College Dublin

Contact

Nicholas Holden, +353 1 716 7460, Nick.Holden@ucd.ie

Research expertise

Sustainable Nutrient Management Decision Support Systems

- Agrometeorological tools (including work for UN CAgM)
- Agricultural systems models: climate change drivers, impacts and adaptation; environmental impact
- User interaction design

Research facilities

UCD Bioresources Research Centre (multidisciplinary research centre focusing on sustainable use of bioresources, environment, bioenergy and green technology)

Research priorities

- Sustainable Nutrient Management Decision Support Systems
- Agricultural System Modelling

ICT-AGRI Country Report



ICT-AGRI Country Report ISRAEL

*Institute of Agricultural Engineering, Agricultural Research Organization, P.O.Box 6, Bet
Dagan 50250, Israel*

Authors: Victor Alchanatis and Avital Bechar

1. Introduction

Agricultural research in Israel is carried out by the public and the private sectors and is primarily funded by the public sector (85%), of which the Ministry of Agriculture and Rural Development (MOARD; www.moag.gov.il) provides the major share (approximately € 50 millions in 2009, the major part of it associated with plant science research). Other sources of funding include national, bi-national and international funds. The farming sector funds research through the production and marketing boards, and the Farmers Organization. The private sector funds the other 15% of the agricultural research, which is carried out mainly by manufacturers of agriculturally related products (e.g. fertilizers, seeds, irrigation equipment, pesticides etc.) and is partially supported by the Office of the Chief Scientist (OCS) of the Ministry of Industry and Trade.

MARD Chief Scientist's major goals are to identify agricultural problems in which knowledge gaps exist, to determine research goals aimed to bridge such gaps, to fund such research activity and to monitor research performance.

Financial support is given for research programs within ministry units as well as to universities and other research centers.

The major subjects that are currently supported and controlled by MARD Chief

Scientist are:

- Agricultural biotechnology and its regulation
- Animal and Aquaculture production
- Coping with foreseen agricultural threats arising from possible future climate changes
- Economical, marketing and rural development policy
- Food safety and quality
- Horticulture and ornamental molecular and conventional breeding and production of new varieties for exportation
- Irrigation and water management (potable; brackish; recycled; desalinated)
- Marketing driven R&D for new agricultural products
- Organic farming
- Pest management aimed at reducing the use of pesticides and herbicides
- Post harvest improvement of shelf-life and surface transportation of exported fresh agricultural products
- Reducing man-power needs by improved and innovative technologies
- Sustainable agriculture

2. Mapping of national funding bodies

2.1 Flowers board

Contact: Haim Hadad

2.2 ICA

Contact: Yaki

2.3 The Ministry of Agriculture and Rural development, Chief scientist

Contact: Yuval Eshdat, +972 3 9485552, yuvale@moag.gov.il

2.4 Ministry of Science - Space Agency

Contact: Zvi Kaplan, kaplan@most.gov.il

2.5 Plant Board

Contact: Zvi Alon

3. Mapping of national research programmes

3.1 Labor saving

- Owned by:
Ministry of Agriculture and Rural development
Chief scientist, Yuval Eshdat, +972 3 9485552,
yuvale@moag.gov.il
- Managed by:
The Ministry of Agriculture and Rural development
Chief scientist, Yuval Eshdat, +972 3 9485552,
yuvale@moag.gov.il
- Website:
<http://www.science.moag.gov.il/frameEnglish.html>

Relevant ICT-AGRI topics

- ICT applications
- Automation of machinery / equipment

Brief characterisation:

- Region: All regions
- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Not permitted
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Potential

3.2 Precision Agriculture

- Owned by:
Ministry of Agriculture and Rural development
Chief scientist, Yuval Eshdat, +972 3 9485552,
yuvale@moag.gov.il
- Managed by:
Ministry of Agriculture and Rural development
Chief scientist, Yuval Eshdat, +972 3 9485552,
yuvale@moag.gov.il
- Website:
<http://www.science.moag.gov.il/frameEnglish.html>

Relevant ICT-AGRI topics

- ICT applications
- Automation of machinery / equipment
- Standardisation of data dictionaries and communication
- ICT in environmental regulation
- Effects of ICT and automation

Brief characterisation:

- Region: All regions
- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Not permitted
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Potential

3.3 Business oriented R&D

- Owned by:
Ministry of Agriculture and Rural development
Chief scientist, Yuval Eshdat, +972 3 9485552,
yuvale@moag.gov.il
- Managed by:
Ministry of Agriculture and Rural development
Chief scientist, Yuval Eshdat, +972 3 9485552,
yuvale@moag.gov.il
- Website:
<http://www.science.moag.gov.il/frameEnglish.html>

Relevant ICT-AGRI topics

- Structures in sale and support of ICT and automation

Brief characterisation:

- Region: All regions
- Geographic scope: National
- Participation of research institutes: Permitted
- Participation of industry: Required
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Potential

3.4 Regional development

- Owned by:
ICA
- Managed by:
ICA, Yaki

Relevant ICT-AGRI topics

- ICT applications
- Automation of machinery / equipment
- Effects of ICT and automation

Brief characterisation:

- Region: Negev, Arava, Galil
- Geographic scope: Regional
- Participation of research institutes: Required
- Participation of industry: Unknown
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Not possible

3.5 Fruit crops R&D

- Owned by:
Plant Board, Zvi Alon
- Managed by:
Plant Board, Zvi Alon

Relevant ICT-AGRI topics

- ICT applications
- Automation of machinery / equipment
- Effects of ICT and automation

Brief characterisation:

- Region: All regions
- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Unknown
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Not possible

3.6 Vegetables board R&D

- Owned by:
Plant Board
- Managed by:
Plant Board, Zvi Alon

Relevant ICT-AGRI topics

- ICT applications
- Automation of machinery / equipment
- Standardisation of data dictionaries and communication
- Effects of ICT and automation

Brief characterisation:

- Region: All regions
- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Not permitted
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Not possible

3.7 Flowers R&D

- Owned by:
Flowers board
- Managed by:
Flowers board, Haim Hadad
- Website:
<http://www.agriculture.gov.il/research/researchstimulusfundrsf/>

Relevant ICT-AGRI topics

- ICT applications
- Automation of machinery / equipment
- Effects of ICT and automation

Brief characterisation:

- Region: All regions
- Geographic scope: National
- Participation of research institutes: Required

- Participation of industry: Unknown
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Not possible

4. Mapping of national research Institutes

4.1 Ben-Gurion University of the Negev

Contact

Yael Edan, +972 8 6477149, yael@bgu.ac.il

Research expertise

Robotics, sensors, system architectures, simulation, decision making systems, with major contributions in the introduction and application of intelligent automation and robotic systems to the field of agriculture.

Relevant research includes robotic and sensor performance analysis; robotic gripper analysis and design; systems engineering of robotic systems; robotic control of dynamic tasks; sensor selection procedures; sensor fusion; multi-robot control methodologies; telerobotics control; and human-robot collaboration methods.

Research facilities

- Mobile Robotics laboratory:
<http://cmsprod.bgu.ac.il/Eng/engn/ie/Research+and+Laboratories/Labs/IntManLab/mobile.htm>
- Intelligent Systems laboratory
http://cmsprod.bgu.ac.il/Eng/engn/ie/Research+and+Laboratories/Labs/IntManLab/default_test.htm
- Telerobotics laboratory
<http://cmsprod.bgu.ac.il/Eng/engn/ie/Research+and+Laboratories/Labs/IntManLab/telere.htm>

Research priorities

Intelligent automation systems

Agricultural robotics

4.2 Institute of Agricultural Engineering, Agricultural Research Organization, The Volcani Center

Contact

Victor Alchanatis, +972 3 9683504, victor@volcani.agri.gov.il

Research expertise

The activities of the Institute are mostly application-oriented and R&D projects that cover a wide range of subjects, such as harvest and post-harvest systems, greenhouse technologies and environmental control, zoo-technology, soil disinfestation and chemical application systems, quality control and production management. The Institute has successfully completed numerous R&D projects, whose applications can be seen in action both throughout Israel and overseas.

A wide range of research activities place particular emphasis on:

Development of novel technologies and mechanization for postharvest treatments of fruits and vegetables; these developments include separating, sizing, sorting, hulling, cracking and handling systems;

Techniques for identification and measurement of internal and external indicators of quality attributes of agricultural produce, by nondestructive techniques and methods, including: near-infrared, magnetic resonance imaging, ultrasonics, dielectric properties, computer vision, and bio-sensors;

Methods and means of transportation and of automated treatment and handling of products at various stages of the growing process; The activities include harvesting, electrostatic spraying, and pollination;

Optimization of various processes by means of integrated Geographic Information System (GIS) and Global Positioning System (GPS);

Development of precision agriculture systems, including site-specific spraying and fertilization of field crops, and orchards;

Development of robotic systems for harvesting of field and orchard crops;

Development of field machinery;

Applications of information technology.

Research facilities

Institute of Agricultural Engineering has a wide range of sensing instrumentation for laboratory as well as field sensing. Optical sensing systems include machine vision cameras and processing units, spectral imaging, thermal imaging and high speed systems. A robotics lab includes small scale platforms for developing autonomous navigation. A GIS lab is equipped with software for projects on precision farming and application of information and communication technologies in agriculture. A mechanical shop serves for prototyping of machines and systems in advanced stages of development and field tests.

Research priorities

Advanced technologies for labor saving.

Mechanization for sustainable agriculture.

4.3 ORT Braude College for Engineering - Mechanical Engineering Dept

Contact

Uri Ben-Hanan, +972 4 9901830, ubenhana@ort.org.il

Research expertise

The mechatronic department includes several researches with expertise in mechatronic design and especially in the amalgamation of mechanical and control within a product development. The knowledge and experience of the faculty members covers both theoretical and implementation related knowledge. Apart from our publication in this fields we are now involved with several projects where we build medium size robots and vehicles.

Research is focused on design of linear control systems, design and implementation of digital control system using PC computers and imbedded micro controllers and on design and simulation of mechatronic systems, evolutionary multi objective optimization and especially as related to set-based evolution, optimization by using heuristics (e.g., genetic algorithms) for optimising both engineering products as well as UMVs' trajectories, truck transmissions loads, damping torque vibrations, development of transmissions load mode synthesis method based on load type analysis and automobile movement simulation under operational conditions.

Research facilities

Control and Mechatronic laboratory. The laboratory includes process control loops (level, temperature, pressure) and mechanical control loops (inverted pendulum, robotic arms, motors). A workshop that includes Lath and Milling machines, rapid prototype machine and cutting material and welding facilities. Several mobile robots and testing robotic platforms are available (e.g. Khepera). Optimization and design software like modeFRONTIER, and other software including MATLAB, LabVIEW, Pro-e and Solidworks.

Research priorities

Mechanical solutions to maneuverability and for job execution, Optimization of mechatronic solutions, sensor fusion, trajectory and motion planning, interactive control.

4.4 Technion – Israel Institute of Technology, Faculty of Civil and Environmental Engineering

Contact

Raphael Linker, +972 4 8295902, linker@tx.technion.ac.il

Research expertise

Automatic control; optimization; sensing. Numerical simulation of dynamic systems; soil-platform interaction

Research facilities

Numerical multi-body dynamic simulation of off-road platforms. Tele-operated/autonomous tractor equipped with low- and high-level control and sensors. Indoor soil bin facility for testing performance of off-road platforms, tires and sensors

Research priorities

Autonomous and non-autonomous off-road platforms

ICT-AGRI Country Report



ICT-AGRI Country Report ITALY

Ministry of Agricultural, Food and Forestry Policies (MIPAAF)

Authors: Alberto Masci, Annamaria Stella Marzetti and Valentina Ulissi

1.Introduction

The Italian research on agriculture refers to many national and regional public Institutions.

The Ministry of Agricultural Food and Forestry Policies (MIPAAF) is the main funding body for agricultural, agro-food and forestry issues. It is responsible for the definition of national research programmes in all areas of agriculture and forestry and during the period 2001-2007 financed agricultural research programmes and projects with 290 Million Euros (about 70% of national agricultural research funding).

The “Research and experimentation” Office (SVIRIS IV) of MIPAAF promotes and funds national research programmes and projects with duration of several years, investigating problems related to all aspects of a specific production chain (cereals, fruits, vegetables, industrial crops, etc.) and/or horizontal issues (soil-water-energy management, plant nutrition, plant pathology, mechanization, product transformation technologies).

The technical staff of the SVIRIS IV Office has to manage a yearly budget of € 35-40 million for financing specific research programmes and projects and approximately € 90 million to fund the maintenance and the ordinary research activities of the recently established CRA (the Council for Research and experimentation in Agriculture). Beside these activities the technical staff has also the task to monitor the implementation of the funded programmes and projects.

Furthermore, MIPAAF also contributes to scientific education and research training financing fellowships, grants (including also PhD grants) and contracts for young researchers. The MIPAAF budget specifically devoted to education and research training during the last years (2008-2009) has been of 5,5 M€.

For what concerns research programmes and projects relevant to the employment of ICT in agriculture, the Office has already financed several projects , according to the guidelines of the National Plan of the Research (PNR) for 2005/07, which identifies the ICT sector as a priority cross thematic issues.

Initiation of research, stakeholder engagement and management of calls

Overall research programme (including agriculture)

Since 1998 a national law (D.L. 204/98) on reorganization of the whole public research system has provided instruments and established rules to programme, finance and evaluate research and to reorganize public research structures. The general policy guidelines and the three-year National Research Programme (PNR) include strategic priorities and actions for agriculture and rural development research proposed by MIPAAF as well. PNR represents the national research framework which all the specific programmes and projects refer to. It also provides financial instruments (e.g. FISR- Fund for Strategic Research) allowing national bodies to launch co-financed research programmes through public calls.

To identify R&D requirements and investment priorities a wide consultation with stakeholders, regional governments, farmers and industrial associations, academia and

public and private research institutions has been carried out under the coordination of the Ministry of Education, University and Research.

The first National Research Programme (PNR 2005-2007) was launched in March 2005 and was in force for more than the expected next three years and included strategic macro-objectives to pursue as life quality (health, safety, environment) and sustainable development, among which the strategic program n.9 on “ Typical agro-food products exploitation and food safety through new systems to characterize products and to ensure quality” is specifically focused on the agro-food sector.

In november 2009, the new National Research Programme (2010-2012) has been launched and, once more, one of the most important objectives set has been the development of ICT.

MIPAAF research in ICT-AGRI and robotics

Furthermore, MIPAAF is also responsible for programming and supporting the national research in agriculture, under the provision of the general long-term law for Agriculture (499/99).

To identify agricultural research needs and define strategic objectives and actions, permanent consultation groups with farmers, agro-industry associations, scientific community and regional governments are coordinated by MIPAAF.

Even though there is not an official programme devoted to the development of ICT-AGRI and robotics defined by MIPAAF and before the guidelines given in the PNR, since 2001 there has been an increasing submission of projects for evaluation, aimed to develop robotics or ICT devoted to agriculture.

Regional and local research

Regions and Provinces can also autonomously define research programs and fund research projects tailored to the specific requirements of their local agriculture and agro-industry system.

They have recently agreed on common approaches and methodologies to identify aspirations and research needs, priorities and research management procedures. An inter-regional network of regional research representatives has been established to create synergies, develop common procedures and give technical support to regional policy makers on agriculture research. This network operates through temporary groups with competence on different production chains or more general subjects, ICT and robotics included. The research and investment priorities defined by the groups of competence after local consultations and approved at political level by the Conference of Regions' and Province Governors become the basis to launch common research calls at regional and inter-regional level.

The inter-regional network of research representatives has actively cooperated with the MIPAAF research Office and the network of agriculture research Institutes related to the Ministry (now CRA) both on definition of research management methodologies and procedures and on national research priorities identification.

Financing schemes of MIPAAF research

There are three different ways to finance research: public calls, voluntary submission and direct assignment to carry out a specific project.

1) Public call: a call represents a specific set of rules to assign a certain budget to selected actions and it is published on the Official Journal of Italian Republic and on the web site of MIPAAF. The call is issued on the basis of EU and national regulations and it contains admitting requirements and evaluation criteria for presentation of proposals. The requirements can be defined from time to time, according to needs of a specific thematic area (i.e. ICT-AGRI).

A call must contain the following items:

- admission requirements;
- general objectives and indications of research actions to be financed;
- budget;
- rate of co-financing, if any;
- type and duration of projects which can be financed;
- evaluation criteria and their relative weight in relation to the type of project (specific annex for each call) ;
- deadline, procedures and organisms involved in proposal selection and conditions to negotiate the contract (financing and scientific-technical assessment);
- general conditions of the research contracts: eligible costs, cost statement, monitoring, etc..

2) Voluntary submission: since 2003 to 2005, every year from 1st April to 30th September researchers can submit an *expression of interest* proposal to apply for the annual budget assigned to “*curiosity driven*” projects or to parts of projects supported by other Institutions, to be co-financed.

If the project *expression of interest* is approved an extended and detailed project can be submitted. Nowadays this procedure is still used but the research areas where it is possible to submit *expression of interests* are defined in advance.

3) Direct assignment: this way is used for relevant research actions of public interest and carried out by specific expertises. Also in this case the scientific and technical quality of the proposal is evaluated through the general procedure described below.

2 Mapping of national funders

2.1. National funders

2.1.1 Ministry of agricultural food and forestry policies (Mipaaf)

Contact:

Dott. Giuseppe Blasi (General Director)

General Direction for rural development, infrastructures and services

Via XX Settembre, 20 – 00187 Rome

Tel: +39 06 46655056-7

Fax: +39 06 4881707

Email: g.blasi@politicheagricole.gov.it - sviris.segreteria@politicheagricole.gov.it

URL: www.politicheagricole.it

Dott. Marina Montedoro (Head Office)

Via XX Settembre, 20 – 00187 Rome

Tel: +39 06 4883152

Fax: +39 06 4819580

Email: m.montedoro@politicheagricole.gov.it

2.1.2 Ministry of education, University and research (MIUR)

Contact:

Dott. Antonio Agostini (General Director)

General Direction for research coordination and development

Piazza John Fitzgerald Kennedy, 20 - 00144 Roma

Tel: +39 06 97727131

Fax: +39 06 9607727153

Email: direzione.ricerca@miur.it

URL: www.miur.it

2.1.3 Ministry of foreign affairs (MAE)

Contact:

Dott. Francesco Maria Greco (General Director)

General Direction for cultural promotion and cooperation

Piazzale della Farnesina, 1 – 00135 Rome

Tel: +39 06 36913055

Fax: +39 06 3222734

Email: dgpc.segreteria@esteri.it

Dott. Barbara Bregato (Head Office)

Piazzale della Farnesina, 1 – 00135 Rome

Tel: +39 06 36912735

Fax : +39 06 36917121

Email dgpc5@esteri.it.

2.2 National managers/funders

2.2.1 CNR - National Research Council

Contact:

Prof. Luciano Maiani (President)
Piazzale Aldo Moro, 7 - 00185 Rome
Tel + 39 06 4993 3200 +39 06 4993 3246
Fax: +39 06 490134
Email: presidenza@cnr.it
URL: www.cnr.it

Dott. Alcide Bertani – Agrofood Department (Director)
Via dei Taurini, 19 - 00185 Rome
Tel: +39 06 49937802 – 06 49937803
Fax: +39 06 49937691
Email: direttore.daa@cnr.it - segreteria.daa@cnr.it
URL: www.daa.cnr.it

Prof. Francesco Beltrame – ICT Department (Director)
Piazzale Aldo Moro, 7 - 00185 Rome
Tel: +39 06 49932065
Fax: +39 06 49933842
Email: direttore.dict@cnr.it - segreteria.dict@cnr.it
URL: www.ict.cnr.it

2.2.2 – Research and experimentation Council for Agriculture (CRA)

Contact:

Dott. Giovanni Lopiparo (General Director)
Via Nazionale, 82 – 00184 Rome
Tel: +39 06 47836589
Fax: +39 06 47836449
Email: direttoregenerale@entecra.it – cra@entecra.it
URL : www.entecra.it

Dott. Riccardo Aleandri
Via Nazionale, 82 – 00184 Rome
Tel: + 39 06 47836250
Fax: +39 06 47836210
Email: direzionescientifica@entecra.it

2.2.3 ENEA-Italian National Agency for New Technologies, Energy and Sustainable Economic Development

Contact:

Ing. Giovanni Lelli (Commissioner)

ENEA - Centro Roma Sede

Lungotevere Thaon Di Revel, 76 -00196 Roma

Tel: +39 06 36272202

Fax: +39 06 36272943

e-mail: giovanni.elli@enea.it

URL: www.enea.it

3. Mapping of national research programmes

3.1 Adaptation of Italian agriculture to climate changing - Different case studies on relevant macroareas.

- Owned by:
Mipaaf
- Managed by:
CRA-CMA Research unit for climatology and meteorology applied to agriculture. Coordinator: Domenico Vento, domenico.vento@politicheagricole.it
- Website:
www.agroscenari.it

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Permitted
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Potential

3.2 SIT – Integration of agricultural and land information systems

- Owned by:
Mipaf
- Managed by:
INEA - National Institute of Agricultural Economics,
Coordinator: Iraj Namdarian, +390647856530, namdarian@inea.it

Relevant ICT-AGRI topics

- ICT in environmental regulation
- Effects of ICT and automation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Permitted
- Participation of industry: Unknown
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Potential

4. Mapping of national research institutes

In Italy ICT-AGRI research is carried out by many research centres and universities. It does not exist a single centre devoted exclusively to ICT-AGRI research. An overview of the research centres grouped under the reference administrations is following:

A) MIPAAF - Ministry of agricultural food and forestry policies.

1. CRA - National Council of Agriculture Research and experimentation (<http://www.entecra.it>); most of the MIPAF research centres (30 different Institutions) have recently been reorganized under this national research body. CRA has institutional competence on different field of agricultural research and its structures are also involved in ICT and robotics projects.
2. INRAN - National Research Institute for food and human nutrition (<http://www.inran.it>)
3. INEA - National Institute of agricultural economy (<http://www.inea.it>)
4. ISMEA - Institute for study of agricultural market (<http://www.ismea.it>)

B) MIUR - Ministry of Education, University and Research.

1. Universities: in Italy there are 23 Faculties of Agriculture, many of them carrying out one or more research projects on ICT supported by national or regional authorities.

Università degli Studi di ANCONA <http://www.unian.it>

Università degli Studi di BARI <http://www.uniba.it>

Università degli Studi della BASILICATA <http://www.unibas.it>

Università degli Studi di BOLOGNA <http://www.unibo.it/>

Università degli Studi di FIRENZE <http://www.unifi.it>

Università Cattolica del Sacro Cuore (PIACENZA) <http://www.unicatt.it>

Università degli Studi del MOLISE <http://www.unimol.it>

Università degli Studi di NAPOLI "Federico II" <http://www.unina.it>

Università degli Studi di PADOVA <http://www.unipd.it>

Università degli Studi di PALERMO <http://www.unipa.it/>

Università degli Studi di PERUGIA <http://www.unipg.it>

Università di PISA <http://www.unipi.it> and <http://www.agr.unipi.it>

Università degli Studi MEDITERRANEA di REGGIO CALABRIA <http://www.unirc.it/>

Università degli Studi di TORINO <http://www.unito.it> and <http://www.agraria.unito.it>

Università degli Studi della TUSCIA <http://www.unitus.it>

Università degli Studi di UDINE <http://www.uniud.it>

Università degli studi di CATANIA <http://www.unict.it>

Università degli studi di FOGGIA <http://www.unifg.it>;

Università Statale di MILANO <http://www.unimi.it>;

Università di MODENA e REGGIO EMILIA <http://www.unimo.it>;

Università di PARMA <http://www.unipr.it>;

Università di SASSARI <http://www.uniss.it>

Università di TERAMO <http://www.unite.it>

In the academia context also the Agricultural Science Department of S. Anna School of Advanced Studies in Pisa (<http://www.sssup.it>), integrated with the State University, carries out research on ICT-AGRI and robotics. In addition to the Agrarian Faculties, also the Engineering Faculties carry on research on ICT-AGRI and robotics. In Italy there are 44 Engineering Faculties as given below:

Università degli Studi di L'AQUILA <http://www.univaq.it>

Università degli Studi della BASILICATA www.unibas.it/

Università della CALABRIA www.unical.it

Università degli Studi Mediterranea di REGGIO CALABRIA www.unirc.it/

Università degli Studi del SANNIO www.unisannio.it

Seconda Università degli Studi di NAPOLI www.unina.it/

Università degli Studi del MOLISE www.unimol.it

Università degli Studi di NAPOLI "FEDERICO II" www.unina.it/

Università degli Studi di NAPOLI "PARTENOPHE" www.uninav.it/

Università degli Studi di SALERNO www.unisa.it

Università degli Studi di BOLOGNA www.unibo.it/

Università degli Studi di FERRARA www.unife.it

Università degli Studi di MODENA e REGGIO EMILIA www.unimore.it

Università degli Studi di PARMA www.unipr.it/

Università degli Studi di TRIESTE www.univ.trieste.it

Università degli Studi di UDINE www.uniud.it

Università degli Studi di CASSINO www.unicas.it

Università "CAMPUS BIO-MEDICO" di ROMA www.unicampus.it

Università degli Studi di ROMA "LA SAPIENZA" www.uniroma1.it/

Università degli Studi di ROMA "TOR VERGATA" web.uniroma2.it

Università degli Studi di GENOVA www.unige.it

Università degli Studi di BERGAMO www.unibq.it

Università degli Studi di BRESCIA www.unibs.it

Università degli Studi di PAVIA www.unipv.it

Università Politecnica delle MARCHE www.univpm.it

Politecnico di TORINO www.polito.it

Politecnico di BARI www.poliba.it www-de.poliba.it

Università degli studi di LECCE www.unisalento.it

Università degli Studi di CAGLIARI www.unica.it

Università degli Studi di CATANIA www.unict.it

Università degli Studi di MESSINA www.unime.it

Università degli Studi di PALERMO www.unipa.it

Università degli Studi di FIRENZE www.unifi.it

Università degli Studi di PISA www.unipi.it

Università degli Studi di SIENA www.unisi.it

Università degli Studi di TRENTO www.unitn.it

Università degli Studi di PERUGIA www.unipg.it

Università degli Studi di PADOVA www.unipd.it

Politecnico di MILANO www.polimi.it

Università CARLO CATTANEO LIUC www.liuc.it

Università degli Studi "ROMA TRE" www.uniroma3.it

Università degli Studi di BOLOGNA www.unibo.it

Libera Università della SICILIA CENTRALE "KORE" www.unikore.it

Università telematica INTERNAZIONALE "UNINETTUNO" www.uninettunouniverssity.net

All the Italian universities can release two different degrees: a 3 years degree (1st level, L bachelor equivalent) and a 2 years master degree (2nd level, LM).

The research institutes listed below are the operative branches of CNR, CRA, ENEA and some University, relevant for ICT-AGRI and robotics.

4.1 Institute of ecosystem study (ISE)

Contact

Director: Dott. Rosario Mosello

Largo Vittorio Tonolli, 50-52 - 28922 Pallanza Verbania VB Piemonte

Phone: (+39) 0323-518300 0323-518323

Fax.: (+39) 0323-556513

E-Mail: direzione@ise.cnr.it

Sections: Sede distaccata di Firenze - Sede distaccata di Pisa

- Sede distaccata di Sassari

URL: <http://www.ise.cnr.it>

Research fields:

The research fields of the Institute are:

- Limnology and ecophysiology of aquatic ecosystems
- Ecology of population
- Evolutionary biology, biodiversity, and nature conservation
- Macro- and micro-pollutants
- Integrated biological control

- Soil ecosystem, control and recovery of soil quality

4.2 Water research institute (IRSA)

Contact

Director: Dott. Pettine Maurizio

Via Salaria Km 29,300 C.P. 10 - 00016 Monterotondo Stazione RM Lazio

Phone: (+39) 0690672850

Fax.: (+39) 0690672787

E-Mail: direzione@irsa.cnr.it

Sections: [Sezione di Brugherio](#) - [Sezione di Bari](#)

URL: <http://www.irsa.cnr.it/>

Research fields:

The research fields of the Institute are:

- Management of water resources
- Water quality
- Water treatment

4.3 Institute of atmospheric sciences and climate (ISAC)

Contact

Director: Dott. Domenico Anfossi

Via Piero Gobetti, 101 - 40129 Bologna BO Emilia Romagna

Phone: (+39) 0516399619 - 0516399626 - 0516399618 (direzione)

Fax.: (+39) 0516399658

E-Mail: direttore@isac.cnr.it

Sections: [Unità Organizzativa di Supporto di Roma](#) - [Unità Organizzativa di Supporto di Torino](#)

- [Unità Organizzativa di Supporto di Lecce](#) - [Unità Organizzativa di Supporto di Padova](#) - [Unità Organizzativa di Supporto di Lamezia Terme](#) - [Unità Organizzativa di Supporto di Cagliari](#)

URL: <http://www.isac.cnr.it>

Research fields

The research fields of the Institute are:

- Meteorology and its applications
- Climate variability, changes and forecastability
- Atmosphere structure and composition
- Earth observations.

4.4 Institute of methodologies for environmental analysis (IMAA)

Contact

Director: Prof. Vincenzo Cuomo

Contrada S. Loja - C.P. 27 - 85050 Tito Scalo PZ Basilicata

Phone: (+39) 0971427260 - 0971427232

Fax.: (+39) 0971427 264 - 0971 427271

E-Mail: info@imaa.cnr.it

URL: <http://www.imaa.cnr.it>

Research Priorities

The research fields of the Institute are:

- Earth observations from ground, aircraft, and satellite aimed at the study of atmosphere, hydrosphere, lithosphere, and their interactions in meteo-climatic applications and risk forecasting, prevention, and mitigation;
- Chemical-physical characterisation of soil and subsoil; Monitoring, anthropic pressure, and management of agricultural and natural resources;
- Development of new environmental monitoring techniques based on the integration of chemical-physical, biological, and geological methods in situ and in remote sensing; Integrated methodologies for environmental planning.

Research Facilities

- Mobile systems

Mobile systems consist of: a mobile differential absorption lidar system, an interferometric and radiometric measurement system, chemical-physical and geo-physical measurement system, a geo-chemical and mineralogical measurement system

- Experimental field for Hydro-geo-site

Tests for studying, in controlled environment, phenomena of contamination of grounds and strata through chemical-physical, geo-chemical and geo-physical techniques. The experimental field is the first example in Italy and the second in Europe of full-scale laboratory for studying hydro-bio-geo-physical processes (in progress at the new CNR pole of Marsico Nuovo).

- Receiving/processing and archiving facility of satellite data
 - an HRPT (High Resolution Picture Transmission) antenna for receiving NOAA data, now including the X band
 - an HRIT (High Resolution Image Transmission) antenna for receiving MSG data
 - a storage system allowing to have on-line up to 80 Tbytes of data
 - a storage system allowing to have of-line up to 30 Tbytes of data
 - a high speed network (10 Gb/s)
 - a high speed computational infrastructure framed on two poles to be able to experiment GRID technologies

- cluster with 16 quad-processor nodes at 64-bits, rack-mounted, highly scalable, specifically designed for intensive computing applications implemented in native source codes, as well as running in advanced computing and development environments

- Experimental field for Atmospheric Radiation measurements

The main instrumentation is constituted by:

- a Raman lidar system for aerosol measurements,
- a Raman lidar system for the profiling of water vapour,
- a high resolution Fourier transform spectrometer in the TIR (BOMEM),
- a high resolution Fourier transform spectrometer in the FTIR,
- a 12 channel MW profiler,
- a Mechelle radiometer in the VIS-NIR,
- a Cimel radiometer,
- a ceilometer,
- a BSRN station for solar radiation measurements,
- an automatic radio-sounding system by VAISALA.

4.5 Institute for the Dynamics of Environmental Processes (IDPA)

Contact

Director: Dott. Pietro Mario Rossi

E-Mail: pietro.mario.rossi@idpa.cnr.it

Address: Calle Larga Santa Marta, 2137 - 30123 Venezia VE Veneto

Phone: (+39) 0412348547 - 0412348922

Fax.: (+39) 0412348549

URL: <http://www.idpa.cnr.it>

Research fields

The research fields of the Institute are the following:

- Methodologies for the study and representation of the environment
- Environment and evolution of environmental systems.

Research facilities

- mass spectrometry lab ICP-SFMS e ICP-QMS
- mass spectrometry lab GC-HRMS/HPLC-MS
- clean room
- cold room -20°C

4.6 Institute For Biometeorology (IBIMET)

Contact

Director: Prof Giampiero Maracchi

E-Mail: g.maracchi@ibimet.cnr.it

Address: Via Giovanni Caproni, 8 - 50145 Firenze FI Toscana

Phone: (+39) 0553033711

Fax.: (+39) 055308910

URL: <http://www.ibimet.cnr.it>

Research fields

The research fields of the Institute are:

- Evaluation of global changes impact on agriculture and forests, man and his health, territory and landscape
- Development of models for innovation and optimization of agro-forest systems
- Climate and weather interaction with product quality and rational use of climatic resources
- Weather and seasonal forecasting in agriculture
- Crop monitoring systems, harvest and product quality forecasting systems.
- Analysis and implementation of methodologies for territory sustainable management and enhancement of natural, anthropic and historical-cultural resources
- Study of strategies for prevention and fighting of natural ecosystems risks.

4.7 Institute of chemistry and technology of polymers (ICTP)

Contact

Director: Prof. Cosimo Carfagna

E-Mail: direttore@ictp.cnr.it

Address: Via Campi Flegrei, 34 - c/o Comprensorio "Adriano Olivetti" - Edificio 70 - 80078 Pozzuoli NA

Phone: (+39) +39 081 867 5111

Fax.: (+39) +39 081 867 5230

URL: <http://www.ictp.cnr.it>

Research fields

The activities of the Institute are the following:

- Correlation among molecular characteristics, morphology and structure, and physical-mechanical properties of polymeric systems.
- Determination and control of molecular, physical and structural factors devoted to design and realize innovative polymeric systems.
- Chemical technologies, and innovative and ecosustainable working processes to develop special polymers.

4.8 Institute of molecular science and technologies (ISTM)

Contact

Director: Dott. Rinaldo Psaro

E-Mail: direttore@istm.cnr.it

Address: Via Camillo Golgi, 19 - 20133 Milano

Phone: (+39) 0250314401

Fax.: (+39) 0250313927

URL: <http://www.istm.cnr.it>

Research fields

The research fields of the Institute are:

- Theoretical and experimental modeling of molecular systems and nanosystems
- Design, synthesis and characterisation of precursors and functional molecules
- Technological applications in fine chemistry, materials for information/telecommunication and cultural heritage.

Major Research Facilities and Equipment

- [Single crystal X-ray diffraction](#)
- [Computing facilities in Milano](#)
- [Computing facilities in Perugia](#)
- [EPR/ENDOR facility](#)
- High field NMR facility

4.9 Institute for microelectronics and Microsystems (IMM)

Contact

Director: Dr. Rosario Corrado Spinella

E-Mail: corrado.spinella@imm.cnr.it

Address: Ottava strada, 5 (Zona Industriale) - 95121 Catania CT Sicilia

Phone: (+39) 095-5968211/212/279/280/283

Fax.: (+39) 095-5968 312

URL: <http://www.imm.cnr.it>

Research fields

The research fields of the Institute are:

- Materials and processes for Microelectronics
- Sensors and Microsystems
- Optoelectronics and Photovoltaics
- Development of new characterisation techniques.

4.10 Institute for informatics and telematics (IIT)

Contact

Director: Dott. Domenico Laforenza

E-Mail: direzione@iit.cnr.it

Address: Via Giuseppe Moruzzi, 1 - 56124 Pisa PI Toscana

Phone: (+39) +39-050-3152123

Fax.: (+39) +39-050-3152113

URL: <http://www.iit.cnr.it>

Research fields

The research fields of the Institute are:

- Information and communication technologies : Data transfer networks and internetworking techniques; Network security and information protection; Certified electronic transactions; Telematic applications.
- Computational sciences: Algorithmics and computational complexity Parallel and distributed computing; Cryptography and security; Computational biology; Algorithmics for WEB technologies.

4.11 Institute for applied mathematics and information technologies (IMATI)

Contact

Director: Prof Franco Brezzi

E-Mail: info@imati.cnr.it

Address: Via Ferrata, 1 - 27100 Pavia PV Lombardia

Phone: (+39) 0382548211

Fax.: (+39) 0382548300

URL: <http://www.imati.cnr.it>

Research fields

The research fields of the Institute are:

- Mathematical informatics
- Differential modeling and numerical analysis
- Mathematical statistics

4.12 Institute for system analysis and computer science "Antonio Ruberti" (IASI)

Contact

Director: Dr. Giovanni Rinaldi

E-Mail: iasi@iasi.cnr.it

Address: Viale Manzoni, 30 - 00185 Roma RM Lazio

Phone: (+39) 0677161

Fax.: (+39) 067716461

URL: <http://www.iasi.cnr.it>

Research fields

The mission of the Institute is:

(a) to develop mathematical and logic methods for modeling, optimising, and controlling complex natural and artificial systems; the focus is on biomedical, information, transportation, communication, service, and environmental systems;

(b) to carry out experimental studies on these systems. Scientific contributions are given to the fields of Biomathematics. Physiopathology, Metabolism, and Immunology. Theoretical Computer Science. Operations Research. Knowledge Based Systems. System and Control Theory. and Computational Biology.

4.13 Institute for high performance computing and networking (ICAR)

Contact

Director: Prof. Domenico Talia

E-Mail: cosenza@icar.cnr.it

Address: Via Pietro Bucci - Cubo 41C - 87030 Rende CS Calabria

Phone: (+39) 0984 831720

Fax.: (+39) 0984 839054

URL: <http://www.icar.cnr.it>

Research fields

- Warehousing and mining of large data sets and knowledge representation and discovery
- Cognitive agent systems for robotics and for the intelligent delivery of sensory data and advanced services
- Intelligent services for computational grids and peer-to-peer systems
- Pervasive computational grids for high performance computing
- Highly immersive virtual reality systems and advanced algorithms for image analysis
- Service-oriented multi-multimedia content management and integration
- Evolutionary Computing methodologies and tools and their application to modelling and optimization in Complex Systems
- Intelligent data analysis for comprehensive security
- Machine learning models and techniques for bioinformatics
- Advanced algorithms and architectures for bioinformatics

4.14 Institute of information science and technology "Alessandro Faedo" (ISTI)

Contact

Director: dott. Claudio Montani

E-Mail: direzione@isti.cnr.it

Address: Via Giuseppe Moruzzi, 1 - 56124 Pisa PI Toscana

Phone: (+39) 0503152878

Fax.: (+39) 0503152811

URL: <http://www.isti.cnr.it>

Research fields

The research fields of the Institute are:

Formal Methods and Tools, Software Engineering, System and Software Evaluation High Performance Computing, Dependable Computing, Wireless Networks, Networked Multimedia Information Systems, Information Systems, Knowledge Discovery and Delivery, Human Interfaces in Information Systems, Creative Virtual System, Home Automation and Computer Aids for Disabled and Elderly Persons, Visual Computing, Signals and Images, Mechanics of Materials and Structures, Space Flight Dynamics.

4.15 Institute of Electronics, Computer and Telecommunication Engineering (IEIIT)

Contact

Director: Dr. Riccardo Tascone

E-Mail: direttore@ieiit.cnr.it

Address: Corso Duca degli Abruzzi, 24 - 10129 Torino TO Piemonte

Phone: (+39) 0115645400

Fax.: (+39) 0115645429

URL: <http://www.ieiit.cnr.it>

Research fields

Information and communication technologies (ICT)

4.16 CRA - CIN Research centre for industrial crops

Contact

Director: Dr. Walther Faedi

E-Mail: walther.faedi@entecra.it - cin@entecra.it

Address: Via di Corticella, 133 - 40128 - BOLOGNA

Phone: (+39) 051 6316811

Fax.: (+39) 051 374857

URL: <http://www.cra-cin.it>

Project coordinator: Marcello Donatelli

E-Mail: marcello.donatelli@entecra.it

Address: Via di Corticella, 133 - 40128 - BOLOGNA

Phone: (+39) 051374857

Research fields

The Research Centre for Industrial Crops deals with agronomy, biochemistry, genetics, pathology and technology for the main agro-industrial crops and products: sugar, fruit, vegetables, food and technical oils, protein, fiber, specialty chemicals as well as biofuels (biodiesel, bioethanol and biomass). The Centre collaborates with Universities and Research Centres at national and international level operating in such areas as: i) agro-meteorology, agrobiological and agro-systems modeling; ii) conservation and processing of agricultural products, including chemistry and technology of non-food crops; iii) genetic improvement, genetics and genomics of plant species of industrial interest; iv) metabolomics, technology of enzymes, secondary metabolites and nutraceuticals; v) plant biology and plant protection. Functionally, the Centre belongs to the Department of "Transformation and Development of Agroindustrial Products".

4.17 CRA - CMA Research unit for climatology and meteorology applied to agriculture

Contact

Director: Dr. [Luigi Perini](#),

E-Mail: luigi.perini@entecra.it - cma@entecra.it

Address: Via del Caravita, 7/A - 00186 - ROMA

Phone: (+39) 06 695311

Fax.: (+39) 06 69531215

URL: <http://www.ucea.it>

Research fields

Researches on agro meteorology and climatology and on the meteorology influence on spontaneous and cultivated plants (phenology)

4.18- CRA - ING Research unit for agricultural engineering

Contact

Director: Dr. Giovanni Santoro

E-Mail: giovanni.santoro@entecra.it - ing@entecra.it

Address: Via della Pascolare, 16 00016 - MONTEROTONDO

Phone: (+39) 06 90675240

Fax.: (+39) 06 90675239

URL: <http://ing.entecra.it>

Project coordinator: Dr. Paolo Menesatti

E-Mail: paolo.menesatti@entecra.it - ing@entecra.it

Address: Via della Pascolare, 16 00016 - MONTEROTONDO

Phone: (+39) 06 90675255

Fax.: (+39) 06 90675239

Research fields

- Study and research on agricultural mechanization in the context of farm total mechanization
- Assessment of the performances of tractors and tillage tools.

4.19- CRA - SCA Reseach unit for dryland agricultural systems

Contact

Director: Donato Ferri

E-Mail: donato.ferri@entecra.it - sca@entecra.it

Address: Via Celso Ulpiani, 5 - 70125 - BARI

Phone: (+39) 080 5475011

Fax.: (+39) 080 5475023

URL: <http://www.inea.it/isa/>

Research expertise

- plants nutrition and physiology
- cropping systems modelling
- tillage
- cultivation techniques, particularly those involving irrigation and fertilizers (mineral and manures)
- agro meteorology
- soil fertility balance

4.20 - CRA-IAA Research unit for agro-food industry processes

Contact

Director: Roberto Giangiacomo

E-Mail: roberto.giangiacomo@entecra.it - iaa@entecra.it

Address: Via Venezian, 26 - 20133 - MILANO

Phone: (+39) 02 239557224

Fax.: (+39) 02 2365377

Project coordinator: Andrea Maestrelli

E-Mail: andrea.maestrelli@entecra.it

Address: Via Venezian, 26 - 20133 - MILANO

Phone: (+39) 02 239557208

Fax.: (+39) 02 2365377

Research fields

- transformation and preservation technology for fruits and vegetables
- definition of evaluation methods to assess the quality both of the raw materials and the processed food

**4.21 Department of agricultural engineering and territorial agronomy
University of Naples**

Contact

Director: Dr. Stefania De Pascale

E-Mail depascal@unina.it

Phone: (+39) 0812539127

URL: <http://www.diaat.unina.it/>

Research priorities

The Department of agricultural engineering and AGRONOMY of the territory is a newly established derived from the consolidation of different structures so as to better respond to the growing educational needs and research in the field of technological applications and engineering to Agriculture Department. Together with their teaching duties emanating lessons the Department carries out research and experimentation time, on the one hand, up-to-date educational quality and the development of agriculture and techniques for optimal use of water resources.

4.22 Department of animal production - University of "Tuscia" – Viterbo

Contact

Director: dr. Alessandro Nardone

E-Mail: nardone@unitus.it

Phone: (+39) 0761357433

URL: <http://www.unitus.it/dipartimenti/dipa/INDEX.HTM>

**4.23 Department of security and development Agroalimentare –
University of Bologna**

Contact

Director: dr. Maria Elisabetta Guerzoni

E-Mail: guerzoni@foodssci.unibo.it

Address: Via Zamboni, 33 - 40126 Bologna

Phone: (+39) 051209783

URL: <http://www.diproval.unibo.it/DIPROVAL/default.htm>

Research fields

DIPROVAL - Department of security and development Agroalimentare, plays teaching, scientific research and services in the areas of protection of plants, economic development management of the economy agri-environmental and agricultural engineering, zootechnical herds, genetic, improvement of the quality and the processing plant and livestock production. The site provides information relating to different sectors of activity and the staff.

4.24 Department of computer science and systems theory - University "La Sapienza" Rome

Contact

Director: Dr. Antonio Sassano

E-Mail: sassano@dis.uniroma1.it

Address: Via Ariosto 12, 00185 Rome

Phone: +39: 0677274140

Fax.: +39 06 77274074

URL: <http://www.dis.uniroma1.it/>

Research fields

DIS laboratories are devoted both to research and educational activities, focusing on service and industrial robotics, and on the development of experimental software, the main areas of research are: Algorithm Design and Engineering; Artificial Intelligence and Knowledge; Representation Combinatorial Computer; Networks and Pervasive Systems Optimization; Computer Vision, Computer Graphics, and Perception Continuous; Optimization Data Management and Service-Oriented Computing; Distributed Systems; High Performance and Dependable Computing Systems; Human-Computer Interaction; Hybrid Control Systems; industrial Organization and Management; Modeling, Simulation, and Control in Biological and Biomedical Systems; Multi-Agent and Multi-Robot Systems; Networked Systems; R&D, Innovation and Internationalization; Robotics Robust and Nonlinear Control; Web Algorithmics and Data Mining

4.25 Department of information engineering and applied Mathematics – Research Centre of pure and applied mathematics – University of Salerno

Contact

Director: Prof. Vincenzo Loia

E-Mail: loia@crmpa.unisa.it

Address: via Ponte Don Melillo, 84084 Fisciano (Sa)

Phone: +39 089 964189
Fax.: +39 089 964191
URL: <http://www.crmipa.it/>

Chief Scientist: Prof. Saverio Salerno

E-Mail: salerno@unisa.it

Phone: +39 089 964189

Fax : +39 089 964191

Prof. Matteo Gaeta

E-Mail: gaeta@crmpa.unisa.it

Address: via Ponte Don Melillo, 84084 Fisciano (Sa)

Phone: +39 089 96 4189

Fax.: +39 089 96 4191

4.26 Department of electronic and information, University Politechnic of Milan (DEI)

Contact

Director: Prof. Gianantonio Magnani

E-Mail: direzione@elet.polimi.it

Address: via Ponzio 34/5, 20133 Milano

Phone: +39 02 23993400

Fax.: +39 02 23993587

URL: <http://www.dei.polimi.it/>

Prof. Piero Paolini

E-Mail: paolini@elet.polimi.it

Address: via Ponzio 34/5, 20133 Milano

Phone: +39 02 23993520

Fax.: +39 02 23993411

4.27 ENEA-Italian National Agency for New Technologies, Energy and Sustainable Economic Development

Research expertise

research and technological innovation and providing of advanced services in sectors such as energy focusing on nuclear energy and sustainable economical development.

Departments

NUCLEAR FUSION AND FISSION AND RELATED TECHNOLOGIES

ENEA - Frascati Research Centre

Via Enrico Fermi, 45

00044 Frascati (Rome)

Tel. +39 06-94005478
Fax +39 06-94005770
e-mail: emilia.batisti@enea.it, giovanna.lazzarini@enea.it

THE ENVIRONMENT, GLOBAL CHANGE AND SUSTAINABLE DEVELOPMENT

ENEA - Casaccia Research Centre
Via Anguillarese, 301
00123 S. Maria di Galeria (Rome)
Tel. +39 06-30483237
Fax +39 06-30486758
e-mail: eleonora.rosticci@enea.it

ENERGY TECHNOLOGIES, RENEWABLE ENERGY SOURCES AND ENERGY SAVING

ENEA - Casaccia Research Centre
Via Anguillarese, 301
00123 S. Maria di Galeria (Rome)
Tel. +39 06-30483039
Fax +39 06- 30484990
e-mail: rosa.provaroni@enea.it, gabriella.cirombella@enea.it

ADVANCED PHYSICAL TECHNOLOGIES AND NEW MATERIALS

ENEA - Casaccia Research Centre
Via Anguillarese, 301
00123 S. Maria di Galeria (Rome)
Tel. +39 06- 30486039
Fax +39 06- 30484290
e-mail: adriana.birelli@enea.it, tania.procaccini@enea.it

BIOTECHNOLOGIES, AGROINDUSTRY AND HEALTH PROTECTION

ENEA - Casaccia Research Centre
Via Anguillarese, 301
00123 S. Maria di Galeria (Rome)
Tel. +39 06- 30483541
Fax +39 06- 30486025
e-mail: bas@enea.it

Research centres

ENEA - Ispra Research Centre
Director: Dr. Enrico Nicotera
e-mail: centroispra@ispra.enea.it

Via Enrico Fermi 20120 Ispra (Varese)
Tel. +39-0332-788111
fax +39-0332-788240

ENEA – Saluggia Research Centre
Director: Eng. Mario Chiadò Rana

e-mail: mario.chiadorana@saluggia.enea.it
tel. +39-0161-483111
fax +39-0161-483397
e-mail: centro@saluggia.enea.it
Strada per Crescentino n° 41
13040 Saluggia (VC)

Headquarters

Via Martiri di Monte Sole, 4 - 40129 Bologna
tel. +39-051-6098111
fax +39-051-6098639
Via Don Fiammelli, 2 - 40129 Bologna
tel. +39-051-6098111
fax +39-051-6098639

Via dei Fornaciai - 40129 Bologna
tel. +39-051-6098111
fax +39-051-323388

ENEA Montecuccolino Laboratories
Director: Dr. Mafalda Valentini
e mail: direzione.centro@bologna.enea.it
Via dei Colli, 16 - 40136 Bologna
tel. +39-051-6098111
fax +39-051-6098187

ENEA – S. Teresa Marine Environment Centre
Director: Eng. Antonio Mori
e-mail: antonio.mori@enea.it
19036 Pozzuolo di Lerici (La Spezia)
C.P. 224
19100 La Spezia
Tel. +39-0187-9781
fax +39-0187-978213

ENEA-Faenza Research Centre
Director f.f.: Mafalda Valentini
Tel. + 39 051-6098203
e-mail: mafalda.valentini@enea.it
Via Ravegnana, 186
48018 - Faenza (Ravenna)
Tel. +39 0546-678511
Fax + 39 0546-678503

ENEA - Brasimone Research Centre

Director: Eng. Domenico Cassarini

e-mail: domenico.cassarini@brasimone.enea.it

Località Camugnano

40032 Camugnano (Bologna)

Tel. +39-0534-801111

fax +39-0534-801321

e-mail: brasimone@brasimone.enea.it

ENEA – Frascati Research Centre

Director: Eng. Gaetano Maurizio Monti

e-mail: direzionecentro.frascati@enea.it

Via Enrico Fermi 45

00044 Frascati (Roma)

Phone: ++39- 06-94001

Fax: ++39-06-94005400

ENEA - Casaccia Research Centre

Director: Eng. Pasquale Giampietro

e-mail: pasquale.giampietro@casaccia.enea.it

Via Anguillarese, 301

00123 S. Maria di Galeria (Rome)

Tel. +39-06-30481

fax +39-06-3048203

ENEA-monte aquilone experimental centre

Director: Ezio Terzini

Centre Director's Office

Tel.+39 0884-543493

Fax +39 0884-543940

e-mail: ezio.terzini@portici.enea.it

S.S. Garganica, 89

Km 178,700

71043 - Manfredonia (Foggia)

Tel. + 39 0884-543493

Fax +39 0884-543940

ENEA - Portici Research Centre

Director: Dr. Ezio Terzini

80055 Portici (Naples)

Tel.+39-081-7723111, fax +39-081-7723345

e-mail: ezio.terzini@portici.enea.it

ENEA - Brindisi Research Centre

Director

eng. Pietro Talmesio

e-mail: info.brindisi@enea.it

S.S. Appia - km 706 - 72100 Brindisi

Tel. +39-0831-201111;

Fax +39-0831-201219

ENEA - Trisaia Research Centre

Director Dr. Donato Viggiano

e-mail: donato.viggiano@trisaia.enea.it

S.S. Ionica, km 419.5 75026 Rotondella (Matera)

Tel. +39-0835-974111

fax +39-0835-974292

Research priorities

The Agency's activities are carried out in the following four areas:

- Clean Energy
- Technologies for the Territory
- Technologies for the Future
- Advanced Applications of Technologies.

4.28 INEA - National Institute of Agricultural Economics

Contact

Director: Prof. Alberto Manelli

Via Barberini, 36 - 00187 Roma

Tel: +39 06483890; 06-47856306/307

Project coordinator: Iraj Namdarian, ,

Tel: +39 06 47856530

e-mail: namdarian@inea.it

Research expertise

INEA carries on activities of research, survey, analysis and estimation on structural and socio-economy of agro-industrial, forestal and fishery sectors. Recently the activities of the Institute have been expanded in supporting the Public Administration to accomplish the agricultural policies in accordance to the EU policy.

Research priorities

Economical and political research in the agro-food sector;

Economical and political research for rural areas

4.28 SIN srl

Contact

Director: Paolo Gulinelli, ,
Via Salandra. 13 – 00187 Roma

Tel: +39 06 49499538

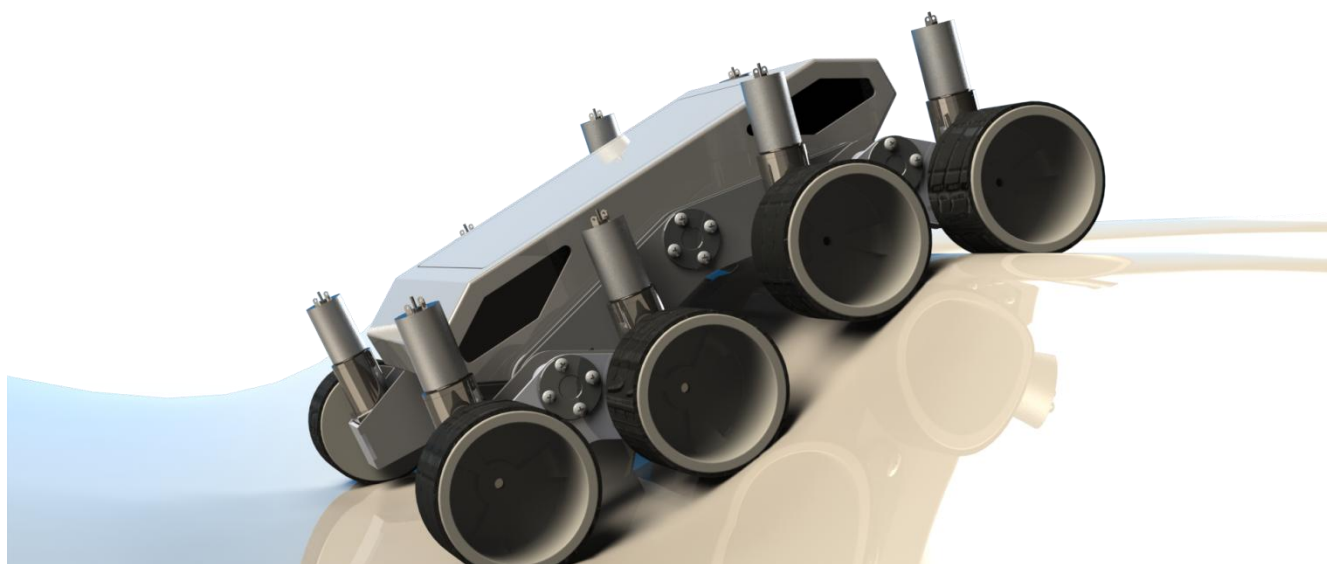
Fax: +39 06 49499539

e-mail: p.gulinelli@agea.gov.it

Project coordinator: Angelo Libertà

e-mail: Angelo.Liberta@sin.it

ICT-AGRI Country Report



ICT-AGRI Country Report LATVIA

*Riga Technical University, Department of systems theory and design, 555. cab., Meza street
1/4, Riga, Latvia, LV1048*

Authors: Agris Nikitenko

1.Introduction

In Latvia State research programmes are developed following the priorities of the research defined by the Council of Ministers. Funding of state research programmes started in 2006. Cabinet on Ministers determined 9 priorities in research for period 2006-2009 and after that 9 relevant state research programmes were funded. Two of them included possibilities for joining to the research planned in ERA-Net „ICT-AGRI” namely „Innovative materials and technologies” and „Investigation and sustainable exploitation of native resources”. In 2009 Cabinet of Ministers has determined 5 priorities of research for period 2010-2013 and new State research programmes will start in 2010.

2. Funding bodies

2.1 Ministry of Education and Science

Contact: Irina Arhipova, 371-67047896, Irina.Arhipova@izm.gov.lv

3. Programmes

3.1 Scientific Foundations of Information Technologies (Informācijas tehnoloģiju zinātniskā bāze)

- Owned by:
Ministry of Education and Science
Irina Arhipova , 371-67047896, Irina.Arhipova@izm.gov.lv
- Managed by:
Latvian Academy of Sciences
Ivars Bilinskis, +371 755 4500, bilinskis@edi.lv
- Website:
<http://www.itprogramma.lv/?lang=en>

Relevant ICT-AGRI topics

- ICT applications
- Automation of machinery / equipment
- ICT in environmental regulation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Not permitted
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Potential

Comments:

Programme ends in 2009, the call for new state research programmes has been launched, date of the submission of proposals is 21st December 2009. The themes will be announced in 2010. The new state research programmes will start in 2010.

3.2 Innovative technologies for high-quality, safe and healthy food production from the genetic, physiological and biochemical diverse plant and animal material (Inovatīvas tehnoloģijas augstvērtīgu, drošu un veselīgu pārtikas produktu ieguvei no ģenētiski, fizioloģiski un bioķīmiski daudzveidīga augu)

- Owned by:
Ministry of Education and Science
Irina Arhipova , 371-67047896, Irina.Arhipova@izm.gov.lv

- Managed by:

Latvian Academy of Sciences

Daina Karklina, 371-63022829, daina.karklina@lu.lv

Website:

[http: // www.inoteh.lv](http://www.inoteh.lv)

Relevant ICT-AGRI topics

- ICT applications
- Automation of machinery / equipment
- Standardisation of data dictionaries and communication
- ICT in environmental regulation
- Effects of ICT and automation
- Structures in sale and support of ICT and automation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Not permitted
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Potential

Comments:

Programme ends in 2009, the call for new state research programmes has been launched, date of the submission of proposals is 21st December 2009. The themes will be announced in 2010. The new state research programmes programmes has started in 2010 May.

4. Research Institutes

4.1 Faculty of computer science and information technology, Riga Technical University

Contact

Agris Nikitenko, +371 67089550, agris@cs.rtu.lv / agris.nikitenko@rtu.lv

Research expertise

- Industrial automation and robotics, industrial modeling;
- Autonomous robotics (indoor and outdoor);
- Robotics modeling and simulation;
- Intelligent software;
- Machine learning and data mining;
- Symbolic artificial intelligence and logic;
- Multiagent systems;
- Sensors and sensor networks;

Research facilities

- Long term cooperation agreement with Microsoft Inc. and IBM that allows to access and use for scientific purposes software of the mentioned companies, including development tools, modeling tools etc.;
- Different agent modeling and agent development software packages;
- Computing center with multicore servers and HPC abilities. HPC is used for multiagent systems modeling;
- 3COM certified Wireless communication laboratory with fast prototyping facilities and parts;
- ABB IRB 1600 robotic cell that is equipped with appropriate software (RobotMaster) and is used as large scale CNC machine for rapid prototyping of large objects;
- Well equipped mechanical workshops and device test premises for prototyping and experiments;
- Mechanical and electronic design software tools, including Solidworks, Autocad etc.
- Mathematical modeling tools Matlab and Mathcad.
- Electronic equipment testing center (<http://www.leitc.lv/>), that is a part of our university.
- Long term agreement with iRobot representatives that enables to use Roomba and other robot platforms as a testbed for single or multi agent robotic systems;
- Agreement with Riga Technical College that enable to access industrial CNC equipment for fast and precise prototyping;

Research priorities

Currently our research priorities are:

- Multiagent robotic systems for use in agriculture and household applications;
- Autonomous, highly mobile robotic platforms for use in outdoor environments;
- Intelligent control over industrial equipment;
- Knowledge management;
- Service-oriented software development. We use Microsoft .NET and IBM Websphere-based solutions;

4.2 Faculty of Computing, University of Latvia

Contact

Leo Selavo, leo.selavo@lu.lv

Research expertise

The relevant expertise includes wireless sensor networks (WSN), including projects in collaboration with other research institutions in Latvia, Sweden and USA. The application area examples are Environmental sciences (LUSTER project), WSN for health care and assisted living (AlarmNet), WSN for data fusion, and sensor networks in fruit orchard.

In addition we have developed small robotics vehicles that have received top prizes at the national and participated at international level robotics competitions.

Research facilities

Considerable computing facilities

Wireless sensor network testbed (20-50 nodes)

Equipment for the design, assembly and testing of electronic embedded systems

Research priorities

Wireless sensor networks, communications and system design

Intelligent transportation systems

4.3 Institute of Electronics and Computer Science

Contact

Modris Greitans, +371 67554500, modris_greitans@edi.lv

Research expertise

The Institute of Electronics and Computer Science (IECS) is an independent public R&D institution. The institute currently has about 70 researchers, including 25 Dr. Sc. and 45 technical staff within five R&D laboratories. IECS has received funding from national research programs, projects supported by EU Structural funds, contracts with industry and from international joint R&D projects. IECS has research expertise in Advanced Digital Signal Processing, Event Timing, High Sensitivity Signal Conversions, Embedded Systems, Wireless Sensor Networks, Energy Efficient Data Acquisition, Low Power Communication, Smart Sensor Systems, Distributed Data Processing and Computer Network Management.

IECS is actively participating in joint research projects funded by the EC, long term scientific co-operation with other European Universities. IECS has received the European IT Prize in 1997, awarded for DASP technology for fully digital signal processing at frequencies up to several GHz. Currently, IECS is the developer and the producer of high-precision (<5ps) Event Timing technology for Satellite Laser Ranging.

Research facilities

Laboratory equipment: „Tektronix” Digital phosphor oscilloscope DPO70604, Mixed signal oscilloscope MSO6052A, Logic analyser TLA5204, Digital sampling oscilloscope DSA8200, „Rohde&Schwarz” RF Signal generator SMA100A, Spectrum analyzer FSU8, „Agilent” Arbitrary waveform generator N6031A, LCR meter 4263B, Digital multimeter 34401A.

Workstations with software tools: MATLAB, NI LabView, Tanner Tools Pro, EAGLE Professional, P-CAD, Altium Designer, Quartus II.

Development kits: TMS 320C6000 series DSK, ALTERA Development Kit Stratix II GX, BeagleBoard OMAP3530, Spectrum Digital Incorporated DM355EVM, ALTERA Cyclon II DK CYCII-2C20N, DK-DSP-3C-120N.

Equipment for hardware prototyping: LPKF multi-layer PCB fast prototyping station, „PDR” infrared soldering station.

High-performance test instruments: GPS-disciplined Rubidium standard from Pendulum, reference timing instruments, programmable temperature-controlled chamber (BINDER).

Research priorities

Advanced Digital Signal Processing approaches, including non-uniform signal processing, event driven A/D conversions, signal-dependent transforms, non-stationary signal processing.

Extra-fine resolution (<5ps) event timing for Satellite Laser Ranging, highly precise continuous time interval measurements.

Data Acquisition, Processing and Transmission based on Embedded Systems, Wireless Networks and development of specialized integrated circuits for smart sensors.

Sampling high-sensitivity waveform-preserving frequency down-conversion, UWB signal generation, registration and processing.

4.4 Latgale Sustainable Development Research Institute

Contact

Andris Martinovs, +371- 2832- 5519, andris.martinovs@ru.lv

Research expertise

Development and improvement of environmentally friendly agrotechnologies suitable for soil and climate conditions in Latvia (cultivated plants: flax for oil and fiber, hemp, winter and

summer canola, reed canarygrass (*Phalaris arundinacea* L.), winter and summer crops etc.); as well as improvement of technological equipment.

Development of new types of fuel based on local, bio and technogenic resources.

Development of technologies for environmental purification, e.g. purification of water contaminated with oil products, leachate treatment in landfills.

Examination of mechanical properties of elastomers

Chemical analysis

Design of boiler systems and heat pumps

Mathematical modelling of processes

Automation of manufacturing processes and technologies, development of mechatronic equipment and sensors, PLC and frequency changers programming

Research in area of computer management systems of artificial intelligence
Design and making of prototypes.

Research facilities

Development and improvement of environmentally friendly agrotechnologies: testing grounds for agricultural crops and free land to establish new testing grounds, 30 ha in total; complete set of equipment necessary to implement agrotechnologies: tractors, plows, cultivators, sowing machines, sprayers, combine harvesters, dryers etc.; Infratec™ 1241 Grain Analyser.

Development of environmental purification and new fuel technologies: Perkin Elmer Optical Emission Spectrometer Optima 2100 DV; Perkin Elmer Gas chromatograph Clarus 500; Carbon/Sulfur Determinator ELTRA CS 2000; Perkin Elmer Diamond DSC Differential Scanning Calorimeter; Microwave- system MWS-2 Speed Wave; Water deionizer - Adrona Laboratory systems Crystal 10; Hanna portable test kits for water analysis (pH, electrical conductivity, Fe, Cl, P etc.), digital microscope, instruments for free oxygen detection in water etc.

Mechanical testing of materials: Zwick/Roell materials testing machine Z-150 (non-contact video Extensometer „videoXtens”, 2 Xforce load cells for loads from 4N to 150 kN with precision 1%; with options to perform tension, compression, bending, cyclical and variable speed mechanical loads tests.

Automation of manufacturing processes and technologies, development of mechatronic equipment: PLC- Siemens S7-313 and OMRON SYSMAC CPM2A with software (SIMATIC Step7, CX_Programmer); AC variable speed drives for servo motors (frequency changers) Emerson Digitax ST and SINAMICS G110 with software; universal programmer SmartProg2; sensors – inductive, optical, capacity; IDV electro hydraulic and electro pneumatic test benches; electrical gauges - millimeters (Fluke 189 etc.), generators, oscilloscopes.

Equipment for design and making of prototypes: industrial licenses - SolidWorks, Mastercam; plastic rapid prototyping equipment FDM TITAN; equipment for injecting plastic and elastomers in silicone molds in vacuum; electrical erosion cutting machine ROBOFIL 240; universal CNC mill Hermle; CNC turn Schaublin Machines SA 125CCN; 3-dimensional scanner; 3D measuring machine EROWA PRESET 3D CNC etc.

Research priorities

Development and improvement of environmentally friendly agrotechnologies suitable for soil and climate conditions in Latvia

Development of technologies for environmental purification

Development of new types of fuel based on local, bio and technogenic resources and relevant boiler systems

Automation of manufacturing processes and technologies, development of mechatronic equipment

Design and making of prototypes

4.5 Latvian University of Agriculture

Contact

Peteris Rivza, +371 630 05633, zinpror@llu.lv

Research facilities

- Digital control and computer-based measurement laboratory;
- Electronics prototyping laboratory equipped with PCB prototyping line LPKF ProtoMat - S62;
- Optical and digital measuring microscopes for equipment inspections and quality control;
- Software packages: CircuitCam, ProtoMat, Altium Designer6, etc...
- Other relevant equipment including oscilloscopes, soldering stations, high precision multimeters, laboratory grade power sources etc.
- Process automation laboratory including programmers, PLCs, emulators, interface simulators, etc..
- Computer modeling equipment and relevant software packages: Matlab with Simulink, Labview.

Research priorities

- Robotic farm;
- Farm environment control;
- Talking animal;

4.6 Ventspils University College

Contact

Sergejs Hilkevics, sergejs.hilkevics@venta.lv

Research expertise

Ventspils University College (VUC) is an accredited state higher school founded in 1997 due to the support and initiative of the local authority in Ventspils. VUC has three faculties, which offers academic and professional studies in Interpreting and Translation (TSF), Economics and Business Administration (EPF), Information Technologies (ITF), Engineering and Electronics (IZN). During the academic year 2009/ 2010 there were about 850 students studying at VUC, there are more than 100 members of the teaching and research staff, half of them hold the doctoral degree.

Research facilities

Three research institutions registered in National Register of Scientific Institutions with 40 members (Engineering Research Centre, International Radioastronomy Centre, Applied Linguistics Centre)

Good IT infrastructure - more than 250 computers, optical network connection with KTH in Sweden, high-performance computer cluster

International Radioastronomy centre with largest in West Europe 32m and 16m diameter antennas

Research laboratories of Engineering Research Centre with modern equipment for ICT and robotics

Common with industrial partners research laboratories on the territory of working industrial electronics enterprises

Research priorities

Information and communication technologies (ICT)

Mathematical modelling

CAD/CAM

Electronics

Economics and Business Administration

ICT-AGRI Country Report



ICT-AGRI Country Report THE NETHERLANDS

TNO Information & Communication Technology, Department Business Information Services,
Colosseum 27, 7521 PV Enschede

Authors: Jack Verhoosel

1. Introduction

The situation in The Netherlands on research in the area of ICT/Robotics in the agricultural sector is very diverse.

The landscape of institutions doing research in this area is quite straightforward. Actually, the main institutions in this field are Wageningen University (WUR) and TNO. Within WUR, there is a long track record of research in the field of agriculture and in the last decennium also in the ICT for agri field. Within TNO, there is a focus on greenhouses and the productchains between producers and consumers of agricultural products, ranging from food to flowers/plants. TNO ICT, which is one of the 5 pillars of TNO, works on various ICT technologies and methodologies that can be applied to a diverse range of sectors including agriculture.

The landscape of research programmes and projects is in contrast to the landscape of institutions very scattered. In one sentence: There is no programme targeted towards ICT/Robotics for the Agricultural sector. In all programmes/projects, the starting point is solving an agricultural problem or contributing to a societal issue. Whether ICT plays a role in the solution is not part of the starting point of the approach in these programmes/projects. As a consequence there is a reasonable amount of projects in the agricultural research arena in which ICT is considered as a possible solution. Unfortunately, the coherence between these programmes/projects is very small.

The funding infrastructure in The Netherlands is similar to the landscape of research programmes/projects. Most of the funding in the area of ICT/Robotics in agriculture comes directly or indirectly from the Dutch Ministry of Agriculture, Nature and Food. The focus of this Ministry is on contribution to societal issues, like energy management, environment, sustainable agriculture, pollution and so on. The use of ICT/Robotics to solve these issues is of secondary importance. Besides this Ministry there are also a number of more general ICT-related funding possibilities in which agriculture can only be one of the application areas.

Summarizing, the research landscape of ICT/Robotics in agriculture is characterized by only a small number of research institutes and no real targeted funding for research programmes in this area. Despite this fact, the involved research institutes, TNO and WUR, are currently actively lobbying in The Netherlands for revived attention to this topic.

2. Mapping of national funding bodies

2.1 Ministry of Agriculture, Nature and Foodquality

Contact: Ms J.A. Hoekstra, +31-70-3786868, j.a.hoekstra@dwk.agro.nl

2.2 Ministry of Economic Affairs

Contact: Mark Frequin, +31-70-3798911, m.frequin@minez.nl

2.3 Public-Private Partnership

3. Mapping of national research programmes

3.1 Future Internet Use (Future Internet Use)

- Owned by:
Ministry of Economic Affairs
Mark Frequin, +31-70-3798911, m.frequin@minez.nl
- Managed by:
TNO ICT
Erik Fledderus, +31-15-2857095, erik.fledderus@tno.nl
- Website:
http://www.tno.nl/content.cfm?context=kennis&content=thema_programma&laag1=435&item_id=32

Relevant ICT-AGRI topics:

- ICT in environmental regulation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Permitted
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Potential

3.2 Food quality and production (Voedselkwaliteit en productie)

- Owned by:
Ministry of Agriculture, Nature and Foodquality
Ms J.A. Hoekstra, +31-70-3786868, j.a.hoekstra@dwk.agro.nl
- Managed by:
TNO KvL, Ronald Visschers, +31-30-6944662, ronald.visschers@tno.nl
- Website:
http://www.tno.nl/content.cfm?context=kennis&content=thema_programma&laag1=426&item_id=8&Taal=2

Relevant ICT-AGRI topics:

- ICT applications

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Permitted
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Potential

3.3 Food safety (Voedselveiligheid)

- Owned by:

Ministry of Agriculture, Nature and Foodquality
Ms J.A. Hoekstra, +31-70-3786868,
j.a.hoekstra@dwk.agro.nl
- Managed by:

TNO KVL
Jan Pieter van der Lugt, +31-30-6944693,
jan_pieter.vanderlugt@tno.nl
- Website:

http://www.tno.nl/content.cfm?context=kennis&content=thema_programma&laag1=426&item_id=7

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Permitted
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Potential

3.4 Chains and Agri-logistics (Ketens en Agrologistiek)

- Owned by:

Ministry of Agriculture, Nature and Foodquality
- Managed by:

WUR-LEI, Sjaak Wolfert

Relevant ICT-AGRI topics:

- ICT applications
- ICT in environmental regulation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Unknown
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Potential

3.5 Perspective Agri-chains (Perspectievolle Agroketens)

- Owned by:
Ministry of Agriculture, Nature and Foodquality
- Managed by:
WUR-Greenhouse Horticulture, Sjaak Bakker

Relevant ICT-AGRI topics:

- ICT applications
- ICT in environmental regulation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Unknown
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Potential

3.6 Sustainable Production, Transition and Agriculture (Verduurzaming productie, transitie en duurzame landbouw)

- Owned by:
Ministry of Agriculture, Nature and Foodquality
- Managed by:
WUR-Greenhouse Horticulture, Eric Pekkeriet

Relevant ICT-AGRI topics:

- ICT applications
- Automation of machinery / equipment

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required

- Participation of industry: Unknown
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Potential

3.7 Greenhouse-specific Innovation Programme (Glastuinbouw-specifiek Innovatie Programma)

- Owned by:
TNO ICT, Freek Bomhof
- Managed by:
TNO Strategy & Policy

Relevant ICT-AGRI topics:

- ICT applications
- Standardisation of data dictionaries and communication
- Structures in sale and support of ICT and automation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Not possible

3.8 Intelligent Sensor Networks (Intelligente Sensor Netwerken)

- Owned by:
Ministry of Economic Affairs
Mark Frequin, +31-70-3798911, m.frequin@minez.nl
- Managed by:
TNO ICT, Nico Pals

Relevant ICT-AGRI topics:

- ICT applications
- ICT in environmental regulation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Permitted
- Participation from foreign countries: Not permitted

- Contribution to ICT-AGRI calls: Potential

3.9 From knowledge to practice for arable farming (Kennis op de Akker)

- Owned by:
Public-Private Partnership
- Managed by:
ZLTO, Peter Paree
- Website:
www.kennisopdeakker.nl

Relevant ICT-AGRI topics:

- ICT applications
- Automation of machinery / equipment
- Standardisation of data dictionaries and communication

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Not permitted
- Participation of industry: Required
- Participation from foreign countries: Unknown
- Contribution to ICT-AGRI calls: Potential

3.10 Program Precision Agriculture (Programma Precisielandbouw)

- Owned by:
Public-Private Partnership, Theo Meijer
- Managed by:
ZLTO, Peter Paree

Relevant ICT-AGRI topics:

- ICT applications

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Not permitted
- Participation of industry: Required
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Potential

4. Mapping of national research institutes

4.1 TNO B&O

Contact

Egon Janssen, + 31 6 53467664, egon.janssen@tno.nl

Research expertise

TNO is an independent research organisation whose expertise and research make an important contribution to the competitiveness of companies and organisations, to the economy and to the quality of society as a whole. TNO is divided into 5 core area's and TNO Build Environment and Geosciences is one of them.

TNO BEG uses its knowledge to help customers in sectors like ground and water, construction, greenhouse horticulture, and oil and gas. In the area of ICT in the agricultural sector, TNO BEG has developed a range of products together with other TNO core areas. Examples are:

- sensiplant, wireless use of sensing the aqua-level of plants
- design for human performance
- detailed air quality measurement
- humidity regulation
- sensors and vision
- capture your own insufficient CO₂ in the greenhouse

Research facilities

TNO BEG has three locations in The Netherlands, in Delft (west), Utrecht (middle) and Apeldoorn (east). At these locations in total 850 researchers and innovators are working on a variety of topics including: Policy and Planning, Geosciences, Sustainable Transport Systems, Infrastructure and Organisation, Ecology and Buildings and Building Structures.

On top of that, TNO BEG is involved in a prototype greenhouse facility that is situated in the Westland of the country where most of the greenhouses are located. In this facility tests and demo's are organised to make more efficient use of space, soils and energy to help the environment and climate.

Research priorities

Each year TNO formulates new research programmes on pertinent themes of society as determined by the Dutch Cabinet. TNO as a whole works on twelve themes of society of which food, energy (management) and optimum use of ICT have a link with the topic of ICT/Robotics in the Agricultural sector.

TNO BEG concentrates on the energy management theme especially in relation to greenhouse cultures. Research priorities are:

- Agrologistics

- CO2 techniques
- Energy-efficiency climatising
- Greenhouse constructions
- Compact agriculture
- ICT in greenhouse and chain
- Men in the greenhouse
- Water recycling
- Day- and artificial light

4.2 TNO ICT

Contact

Jack Verhoosel, +31-6-51894657, jack.verhoosel@tno.nl

Research expertise

TNO is an independent research organisation whose expertise and research make an important contribution to the competitiveness of companies and organisations, to the economy and to the quality of society as a whole. TNO is divided into 5 core area's and TNO Information and Communication Technology is one of them. Getting cleverer with ICT so that business and government get more out of their investments. TNO research leads to innovative ICT applications in the field of operational and information management.

TNO ICT uses its knowledge to help customers with their innovation issues. In the area of ICT in the agricultural sector, TNO ICT is involved with a lot of different parties in the agricultural chain ranging from producers of agricultural products, ICT equipment suppliers, brokers of products, transport suppliers, branche-organisations and government.

Research facilities

TNO ICT has three different locations in The Netherlands, in Delft (west), Groningen (north and Enschede (east). At these locations in total 400 ICT researchers and innovators are working on a variety of ICT topics that are applied in around 15 different sectors. The agricultural sector is one of these sectors.

On top of that, TNO ICT is involved in a prototype greenhouse facility that is situated in the Westland of the country where most of the greenhouses are located. In this facility new (ICT) technology is being tested with various different players in the greenhouse sector, ranging from farmers, climate computer suppliers to greenhouse equipment suppliers.

Research priorities

Each year TNO formulates new research programmes on pertinent themes of society as determined by the Dutch Cabinet. TNO as a whole works on twelve themes of society of which food, energy (management) and optimum use of ICT have a link with the topic of ICT/Robotics in the Agricultural sector.

TNO ICT contributes to research on these themes in close cooperation with the other TNO core areas. In 2009, TNO ICT had three main programmes on the optimum use of ICT:

- Connected Services

The aim of the demand-driven programme Connected Services is to improve the application of ICT to enhance the operational information and communication infrastructure within and between organisations. The reasons for this can be found in the increasing involvement and influence of (end) users on ICT services, the required interoperability between and within organisations, and the desired security level of data flows. The main priorities in this programme are: chain and network innovation, service oriented organisation, security and empowered users.

- Ambient Networks & Services

Whether in the car, at home or at work. It is important to users to be able to consult or give the right information at any moment. Current technology meets that demand to a certain degree but we have not yet reached the limits by a long way. This programme is less important to ICT-AGRI.

- Societal impact of ICT

The impact of ICT innovation penetrates deep into our society. The complex interrelationship involve technological, social, economic, organisational, institutional and political dimensions. A good understanding of this enables consumers and business, citizens and government to benefit optimally from new technologies. This programme is also less important for ICT-AGRI.

Currently, TNO (ICT) is redefining its research programmes for a new strategic period of 2011-2014. It looks like the three current programmes will be reshuffled to fit better to the current and near future issues in society. The titles of these new research programmes are:

- Future Internet Use
- Vital ICT Infrastructures
- Societal Impact of ICT

Of these three new programmes both FIU and VII have a close link to the topic of ICT/Robotics in the Agricultural sector.

In the area of ICT for agriculture, the focus of TNO is mainly on greenhouses and the entire chain that is used to get greenhouse products to the end-customer.

4.3 TNO KvL

Contact

Jan Pieter van der Lugt, +31-30-6944693, jan_pieter.vanderlugt@tno.nl

Research expertise

TNO is an independent research organisation whose expertise and research make an important contribution to the competitiveness of companies and organisations, to the economy and to the quality of society as a whole. TNO is divided into 5 core area's and TNO Quality of Life is one of them.

Under the heading 'Quality of Life', TNO carries out research aimed at providing concrete solutions to problems encountered by industry and government bodies. TNO develops knowledge for important national and international market clusters such as 'Agriculture and Nutrition' and 'Chemistry and Pharmaceuticals'. Additionally TNO is an important partner for the government and public sectors in the area of (health) care and employment issues.

Research facilities

TNO QoL operates, just like its customers, internationally with offices in the Netherlands, the USA and Japan. The research is performed predominantly in laboratories in Zeist, Leiden and Eindhoven. We innovate and extend our expertise by actively investing in scientific developments.

TNO is one of the few organisations within the EU capable of covering the entire spectrum of consultancy and research for customers: from process technology and concept development to safety, health claims and registration.

Research priorities

Each year TNO formulates new research programmes on pertinent themes of society as determined by the Dutch Cabinet. TNO as a whole works on twelve themes of society of which food, energy (management) and optimum use of ICT have a link with the topic of ICT/Robotics in the Agricultural sector.

TNO QoL contributes to research on the theme of food. In 2009, TNO QoL had two main programmes with a scope that relates to ICT in the Agricultural sector:

- Food quality and production

The increasing individualisation and promotion of health is being translated into considerable diversity of consumer demand for food products. This is coupled to a limited willingness to pay more. Excellent taste and texture as well as ease of preparation and use are key success factors. TNO is developing knowledge, technology and services to support industrial innovation in ingredients, products and processes.

- Food safety

We hear it frequently, the justifiable claim that our food is safer than ever. But the world is changing and other, new dangers may emerge from developments in society and the marketplace, such as new sources and processes for food production along with increasing internationalisation and intensification of food production networks. For TNO the key challenge remains to maintain and improve food safety levels.

4.4 WUR-Greenhouse Horticulture

Contact

Sjaak Bakker

Research expertise

Wageningen UR Greenhouse Horticulture continuously develops new concepts and components for greenhouse production systems. Current projects include air conditioned cultivation, energy-producing greenhouses and fully automated production systems.

Activities also include optimization of existing greenhouse horticulture systems by the development of new crop protection strategies and growing methods, optimal environmental control, crop growth control, innovative energy saving technology and economic farming.

Wide range of expertise

To provide an optimal response to questions from and developments within the sector, Wageningen UR Greenhouse Horticulture has assembled an excellent team that features all the relevant expertise, and state-of-the-art research facilities in Bleiswijk and Wageningen. Solid cooperation with various partners within and outside Wageningen University and Research Centre allows us to react promptly to changing demands from greenhouse horticulture. This is why Wageningen UR Greenhouse Horticulture is your ideal partner for innovations and groundbreaking research.

Research facilities

Dutch greenhouse horticulture is one of the most innovative sectors and is world leader. This is also true for Wageningen UR Greenhouse Horticulture, the largest and most innovative research institute in this field.

Employees of Wageningen UR Greenhouse Horticulture have for many years been having strong links with horticulturists and other partners in and around the sector. These good contacts enable us to quickly act upon questions and to work on desired developments for the short as well as for the long term.

The links with horticulturists have in recent years further been strengthened by establishing (practical) networks around topical issues. Together with growers, the supplying industry and other knowledge partners we are building and exchanging knowledge and we are testing, introducing and widely stimulating innovative, sustainable techniques.

To provide an optimal response to questions from and developments within the sector, Wageningen UR Greenhouse Horticulture has assembled an excellent team that features all the relevant expertise, and state-of-the-art research facilities in Bleiswijk and Wageningen.

Solid cooperation with various partners within and outside Wageningen University and Research Centre allows us to react promptly to changing demands from greenhouse

horticulture. This is why Wageningen UR Greenhouse Horticulture is your ideal partner for innovations and groundbreaking research.

Research priorities

The topics of expertise and priority are:

- Business and innovation
- Climate
- Crop protection
- Energy
- Greenhouse covering
- Greenhouse design
- Industrial systems and robotics
- International research
- Models and sensors
- Root environment
- Taste panel
- Top quality and products

4.5 WUR-LEI

Contact

Sjaak Wolfert

Research expertise

LEI develops economic expertise for government bodies and industry in the field of food, agriculture and the natural environment. By means of independent research, LEI offers its customers a solid basis for socially and strategically justifiable policy choices.

Research facilities

The mission of LEI is to promote the quality of food, the living environment and living conditions within (international) society.

LEI forms part of Wageningen University and Research Centre, within which it combines with the Department of Social Sciences to form the Social Sciences Group.

In 2005 LEI employed about 300 people. The turnover amounted to 24,5 million and the operating result was 488,000

LEI carries out its research in close consultation with clients and other concerned parties within society. Besides it collaborates with a great many scientific partners, both within the Netherlands and in other countries. The most structural way of cooperation is that with the Social Sciences Department of Wageningen University. Together with this department LEI forms the Social Sciences Group of Wageningen UR.

Research priorities

The Agricultural Economics Research Institute (LEI) covers a wide research area. LEI priorities are aimed at the economy of both agriculture, forestry and fisheries as well as nature and landscape. Except for the agricultural sector, LEI research relates to agribusiness and to the consumption of food and other agrarian products and services. In most of these themes there are different levels of scale. Both business level as well as industry level are considered. Depending on the type of the question, problems will be analysed from a local up to a global level. The research areas are:

- International policy
- Development issues
- Consumers and supply chains
- Sectors and enterprises
- Environment, nature and landscape
- Rural economy and use of space

LEI dossiers are themes that are currently in the news and that bear a relation to the LEI research areas, programmes or projects. In each dossier you will find related publications, projects and a statement by a LEI expert in the field concerned. The moment anything relevant happens in the field of the LEI priorities, we will update or add a dossier to our site. Some examples of dossiers are:

- WTO and Agricultural Policies
- EU Agricultural Policy
- Biotechnology
- Food safety
- Greenhouse energy
- Central and Eastern Europe

ICT-AGRI Country Report



ICT-AGRI Country Report SPAIN

Instituto de Fomento Región de Murcia (INFO Murcia), Avda. de la Fama, 3 - 30003 Murcia

Authors: Luisa Lopez

1. Introduction

Instituto de Fomento de la Región de Murcia (INFO MURCIA), public Regional Development Agency from Murcia, is a driving force behind the regional economy, promoting and supporting regional business sector through different aid mechanisms and technical services provided for the improvement of business competitiveness. Its main actions are: improving financial situation of SMEs, fostering innovation management and increasing of quality standards, internationalisation and foreign promotion of products, improvement of competitiveness and promotion of the local and social development.

INFO participates in committees in charge of the planning and programming of the Regional Economic and Development Plans, as well as Strategic Economic and Development Plans. The Development Agency also works closely with regional partners in preparing the regional innovation strategy. In all this documents is mentioned the importance of fostering transnational cooperation in RTD.

Financial support is tailored to meet the real needs of companies in terms of interest rates and payment periods, through lines of support in collaboration with financial entities and other official organizations, promotes the extensive industrial manufacture of Murcia in foreign markets, and acts as catalyst for new projects and tools that increase efficiency and provide continuity to the presence of exporters from Murcia in European and international markets.

It has been established various aid programmes aimed at fostering the incorporation of SMEs in RTD, information and communication technologies, together with industrial design programmes. Furthermore, a regional network of 10 technology centres has been promoted by INFO to foster sectorial research and technological development.

The Development Agency takes part of Europe Enterprise Network (EEN) promoting Technology Transfer and VII Framework Programme. In this environment, INFO organizes biannual "Food Brokerage Event" which provides an international, technological scenario for companies interested in finding out about the latest European creations in food technology or partners for RTD cooperation EU projects in holding bilateral meeting. In 2009, 912 meetings were organized with 260 representatives from almost every European countries.

Furthermore, INFO has signed a contract with the Spanish National Contact Point (CDTI) to promote VII Framework Programme, and other national and international programmes.

2. Mapping of national funding bodies

2.1 Info Murcia

Contact:

Rafael Martínez

Rafael.martinez@info.carm.es

Luisa Lopez

Programamarco@info.carm.es

3. Mapping of national research programmes

3.1 Research and Development Programme (Programa de Investigación y Desarrollo)

- Owned by:
INFO MURCIA
- Managed by:
INFO MURCIA
- Website: www.institutofomentomurcia.es

Relevant ICT-AGRI topics

- ICT applications
- Automation of machinery / equipment
- Standardisation of data dictionaries and communication
- ICT in environmental regulation
- Effects of ICT and automation
- Structures in sale and support of ICT and automation

Brief characterisation:

- Geographic scope: Regional
- Participation of research institutes: Permitted as subcontracted by SMEs
- Participation of industry: Required only SMEs
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Confirmed

Comments:

This programme is aimed at SMEs. Participation of research institutes and foreign countries are permitted, but it is only include in the grant as a subcontractors of proponent SMEs. This programme is now available for every sector.

4. Mapping of national research institutes

4.1 Association Enterprises Metal Technology Centre

Contact

Fernando Hidalgo
fhidalgo@ctmetal.es

Research expertise

This research institute is one of the Spanish experts of the EraNet. Its experience is classified as:

- INDUSTRIAL SAFETY AND QUALITY

The key factor behind the services is a very high level of specialisation in metal-transformation industries.

- QUALITY MANAGEMENT SYSTEMS

Together with consultancy services for implanting ISO 9000 systems (preparation of manuals and procedures, implantation and certification), a maintenance service is provided for companies who already have a system of this type.

- ENVIRONMENTAL MANAGEMENT SYSTEMS

Consultancy service and implantation of management systems based on the UNE-EN-ISO 14001:2004 standard, drawing up the corresponding initial and environmental reports on the company's situation and its compliance with the standard, as well as the preparation of all the applicable procedures in accordance with the standard.

- EC MARKING

Preparation of documentation (technical reports, user manual, etc.). Consultancy services for the design of machinery to comply with EC safety directives. Consultancy services are also provided in industrial safety.

- INDUSTRIAL DESIGN

- Design and development of industrial machinery and mechanical systems.
- Computer-aided calculation and design of structural and machine elements.
- Industrial technical drawing.
- Plans for the Technical EC Marking Report.

- PRODUCT DESIGN

- Functional and conceptual product design.
- Creation of CAD 3D models.
- Model digitalisation and inverse engineering.
- Comprehensive development of parts and products made of plastic, metal sheeting and hybrids, from design to pre-industrialisation.

- INDUSTRIAL AUTOMATION AND ROBOTICS

- Technical and economic viability studies for the installation of handling and welding robots.
- Tools and tooling design.
- Robot programming.
- Processing of the implantation of turnkey robot installations.
- Specialised training.

- PHYTOSANITARY MACHINERY TESTING LABORATORY

This laboratory has been officially recognised by the Department of Agriculture, Water and the Environment of the Region of Murcia for the technical inspection of phytosanitary application resources for regular revisions of the equipment used to apply phytosanitary products.

- IRRIGATION MATERIALS LABORATORY

This laboratory tests the mechanical and functional specifications of the extremely wide range of irrigation equipment, which mainly use the various types of polyethylene, polyvinyl chloride (PVC) cast copper and cast ductile steel. As far as the irrigation systems and accessories are concerned, the staff have received the appropriate training and the equipment and procedures that are used have been adapted for the following tests:

- Emission pipe systems.
- Low-density polyethylene pipes for micro-irrigation systems.
- Polyethylene pipe couplings with mechanical accessories for pressurised fluids.
- Localised irrigation emitters.
- The various types of polyethylene pipes and accessories.
- Couplings and accessories made of various materials.
- All the accessories and systems are tested according to the applicable technical standards

Research facilities

- The staff is constituted by 30 people: 1 PhD, 14 superior degrees, 2 engineers, 4 qualified and 9 professionals.
- The building has an auditorium, library, computer room and meeting room with 1718 m²
- Industrial building of 400 m² with laboratories, workshops, crane bridge.
- Electronic, electric and mechanic workshop
- Plant protection machinery testing laboratories
- Located irrigation transmitter pipes testing laboratories
- Metrology and dimensional calibration laboratory
- Manometer calibration laboratory
- Analysis and testing material laboratory

- Industrial building of 100 m² with underwater swimming bottles inspection laboratory.
- Specific designed building for fire testing with 8000 m³ , and testing materials laboratories

Research priorities

- ICT systems for monitoring and managing environment impact in greenhouses and livestock
- Robotics
- Standardisation
- Agricultural information systems

4.2 CEBAS-CSIC Spanish National Research Council

Contact

Yolanda Hernando Saiz, +34 968 39 63 56

yhernando@cebas.csic.es

Research expertise

The Centro de Edafología y Biología Aplicada del Segura (CEBAS-CSIC) is a research institute of the Spanish National Research Council (CSIC)- the first national research agency in Spain. CEBAS-CSIC carries out scientific research and develops technology directed at improving agricultural and food development within a sustainable use of natural resources in semiarid environments. CEBAS-CSIC has more than 50 years research experience which guarantee its quality and compromise with excellence in research.

Research facilities

CEBAS-CSIC boasts modern installations, opened in 2000, with laboratories and equipment for food, plant material and water analysis. In addition there is a range of equipment, experimental apparatus and pilot plants for specialised research work like:

- Plant growth chambers.
- In vitro culture chambers.
- Ioniomic laboratory equipped with ICP and ion detector.
- Experimental field station (30 ha).
- Intelligent greenhouses.
- Confinement greenhouse.
- High precision agricultural equipment.
- Waste composting pilot plant.
- Controlled atmospheres and ready to use products pilot plants.
- Food ozonisation equipment.
- Cold storage chambers.

- Experimental field station for automatic measurement of water and climatic parameters as well as erosion events.

Research priorities

- ICT systems for monitoring and managing environmental impact in greenhouses and livestock.
- Speaking plant and speaking animal
- Soil and water management.
- Standardisation
- Agricultural information systems
- New post-harvest applications
- Applications for biosensors based systems

4.2.1 CEBAS-CSIC. Irrigation Department.

Contact

Juan José Alarcón Cabañero, +34 968 396303
jalarcon@cebas.csic.es

Research expertise

This is a concrete department of CEBAS-CSIC.

The Consejo Superior de Investigaciones Científicas (CSIC) is the largest public multidisciplinary research organisation in Spain. It has a staff of more than 10000 employees, among these 3202 scientists and about 3802 pre and postdoctoral researchers. The CSIC has been the 5th organisation in Europe in project execution and funding in 6th Framework Programme. Irrigation Department of CEBAS-CSIC carry out scientific research and develop technology directed at improving agricultural development within a sustainable use of natural resources for more than 20 years.

Juan José Alarcón (Co-ordinator of FP6-EU-funded project IRRQUAL and FP7-EU-funded project SIRRIMED) is a Professor Research of CEBAS Irrigation Department from 1996. Previously, he reached the Ph.D. degree from Murcia University and he obtained a postdoctoral fellowship in the Horticulture Research Institute of Wellesbourne (England). He is expert in:

- Plant physiology under water stress
- Irrigation water management.

In the last years he has participated in 25 Research Project supported by UE, National Plans and Private Firms; he has published 60 articles in SCI Journals and he has been invited in different International Congresses and Conferences related with water irrigation management in arid environments. From the same department the following researchers are involving:

- Dr. Emilio Nicolás is a senior researcher with high experience in plant-soil-water relationships, crop physiology, advanced modeling and crop water relations.
- Dr. Oussama Mounzer has postdoctoral research experience in precision agriculture and irrigation scheduling at farm scale.

Presently the group is involved in three important projects related to this call:

- European project: Sustainable orchard irrigation for improving fruit quality and safety (IRRIQUAL-FP6-FOOD-CT-2006-023120). Coordinated by J.J. Alarcón. (www.irriqual.com).
- National grant: Programa Integral de ahorro y mejora productiva del agua de riego en la horticultura española. (RIDECO-Consolider Ignenio 2010-CSD2007-0067). Coordinated by Partner 7 (UCO-E.Fereres) (www.rideco-consolider.es)
- European project: Sustainable use of irrigation water in the Mediterranean region (SIRRIMED-FP7-KBBE-200-3-245159).

Research facilities

- Irrigation Department of Cebas-Csic has an important number of well equipped laboratories (chemistry, physiology, hydrology, growth chambers, geographic information system, etc.), standard field equipments and pilot experimental orchards to work at field scale.
- Knowledge and techniques apported by Irrigation Department of Cebas-CsiC:
 1. Development and application of regulated deficit irrigation strategies.
 2. Development and application of precision irrigation techniques.
 3. Development of automatisms and robotic systems.
 4. Development of irrigation scheduling software and hardware.
 5. Use of trunk thickness transducers, sap flow equipments and soil capacitive probes.
 6. Use of sensors for water quality analysis.
 7. Analysis of plant and soil mineral composition.
 8. Development and application of plant and soil models in order to simulate the use of water and the crop quality production.
- Great experience as coordinator of FP6 and FP7 Projects.

Research priorities

- Robotics
Robotic and intelligent control systems find an increasing place in many agricultural disciplines. This may include robotic systems for field crops, orchards and grooves, as well as protected crop environment (greenhouses and net houses).
- Speaking plant and speaking animal
Individual tree monitoring. Development of monitoring systems that can

evaluate the status of trees (including biosensors). Decision support systems and models that link tree status to agro-technical applications.

- Soil and water management
Soil and water management systems: development of systems for site specific irrigation and fertilization application, development of sensing systems (including biosensors) for mapping field characteristics for precision farming, use of GIS systems for interpretation of the maps.

4.3 Technological Centre of Information Technologies and Communications (CENTIC)

Contact

Pedro Arques, +34968964400

Pedro.arques@centic.es

Research expertise

This is one of the Spanish experts of the EraNet.

The Technological Centre of Information Technologies and Communications (CENTIC), is a non-profit business association founded in August 2004 under the auspices of the Universities, Enterprises and Research Regional Ministry, the Regional Development Agency of Murcia (INFO MURCIA), The Murcian Association of Information Technologies and Communication Companies (TIMUR) and, above all, ITC sector companies as principal developers of its constitution.

CENTIC principal aim is the technological improvement of the companies in the ITC sector and other companies related to Information Technology, Telecommunications, Contents and Electronics.

Our main objectives are: innovation, knowledge management, quality increase, promotion of research, technological generation and development, and all actions which contribute to strengthen the competitive capacity and its progress in the fields of technology and company design in this sector.

CENTIC is carrying out the following programs for the achievement of the above mentioned objectives:

- Research, Development and Information (RDI) on a cooperative basis.
- Technology transfer to associate companies.
- Technological Watch, Advice and Audit.
- Diagnoses and Technological Selection and Evaluation.
- Technological training.
- Standardization, certification and quality.

Moreover, CENTIC develops binding or collaboration agreements for the development of its activities with national or foreign entities related to the aims of the Association.

Research facilities

CENTIC offers its associate companies the following list of services:

- Personal advice in defining technological projects. We help companies in their organization and the search of technological project resources for their later realization, as well as subvention processing, aid processing, etc. including writing reports.
- Participation in cooperative and/or open projects offered and administered by CENTIC.
- Advice and consulting in Innovation Management, with the purpose of facilitating the implementation and improvement in RDI processes management, favouring, this way, the companies innovation process.
- Organization of Training Activities, CENTIC organizes technological conferences, seminars and specialized courses in emerging technologies, with important discounts for its associates.
- Organization of Technology Missions, with the purpose of favouring the exchange of knowledge and agreement between companies.
- Technological Watch Service, systematically developing the capture, analysis and circulation of technological information, offering the companies a strategic knowledge on decision making and training on how to anticipate changes.
- RDI News Bulletin, which periodically informs about subvention calls, news, and other CENTIC activities.
- CENTIC's Web and Intranet, Publication of news and calls of interest for the sector. Intranet offers its associates a place where to exchange knowledge, download documents of interest, book classrooms, check their e-mail accounts, etc. Cattic: online application through its web www.cattic.es, which offers a tracker of ITC companies with information about their technological profile.
- Technical support for its associates with meeting rooms and projection systems at their request.
- Digital Television Interactivity Laboratory: It offers the associates the possibility to develop MHP prototypes under DVBC and DVBT standards.

Research priorities

- 0 1. ICT systems for monitoring and managing environmental impact in greenhouses and livestock
- 0 4. Soil and water management
- 0 5. Standardisation
- 0 7. Agricultural information systems
- 0 11. Towards open source & more user friendly systems (incl. man-machine biosphere interface)

4.4 Universidad Politécnica de Cartagena

Contact

Maria Jesús Legaz

Research expertise

The Universidad Politécnica de Cartagena (UPCT) was established in 1998, and as such is the youngest technical university in Spain. However engineering studies has a long tradition in Cartagena because many of the schools were founded in the beginning of the last century. This union between youth and tradition give a dynamic and innovative character but also a well tried one with a solid foundation. UPCT is a Spanish academic and public institution, also involved in Research and Development processes. Our main focus is in Technical, and Engineering degrees.

The Universidad Politécnica de Cartagena is devoted to the preparation of its students for the professional world, opening their minds to the most recent knowledge and discoveries. With over 72 active research and development groups, this University aims to be not only a place for the diffusion of knowledge, but also a source of scientific and technological creation. These groups carry out basic and applied research into a broad variety of fields, ranging from automatic control, fluid mechanics, aerobiology and environmental toxicology, mechanical and electrical engineering to business economics, applied mathematics, chemical engineering, metallurgy, physics, plant production and naval technology, to mention just a few.

Research facilities

- Institute of Plant Biotechnology
- Experimental Food-processing station “Tomas Ferro”

Research priorities

- Biotechnological Processes, Technology and Engineering
Development and application of biotechnological processes technology and engineering, for obtaining innovative and/or bioactive packaged food products and beverages. Active and intelligent packaging. Valuation of by-products and food wastes. Bioethanol. <http://sicarta.upct.es/sicarta/coct2/indexFrames.jsp>
- Microbiology and Food Security
Control of foodborne pathogens and food spoilage microorganisms. Emerging technologies for food preservation. Risk assessment. Microbial stress response and protein expression (proteomic). <http://www.upct.es>
- Secondary metabolites
Plants as a source of bioactive compounds. Natural metabolites for food and pharmaceutical industries. Analysis of enzymatic and non-enzymatic antioxidant systems in plants and harvested products under normal and stressed conditions. Metabolic and proteomic markers for oxidative stress. <http://www.upct.es>
- Postharvest and Refrigeration
Technology for the industry of fresh and minimally processed fruits and

vegetables. Extended shelf life. Chilled storage, controlled and modified atmospheres and innovative treatments. Bioactive compounds in foods. Postharvest quality-oriented to plant breeding strategies/techniques.

<http://www.upct.es/gpostref>

- Crop Protection
Analysis of pests and diseases in commercial crops. Detection and diagnostic of plant parasites by molecular techniques. Characterisation of the resistance to insecticides. Development of strategies of biocontrol on the farm and during postharvest. <http://www.upct.es>
- Molecular Genetic
Development and application of molecular genetics to plant production and food industry. Advances in tools for functional genomics. DNA technology progresses in diagnostic for health and food industry.
<http://www.upct.es/~genetica>
- Plant Resources:
Introduction and adaptation of new food crops. Use and characterisation of germoplasm for plant production. Recuperation of endangered species.
<http://www.upct.es>
- Service robotics, industrial robotics and medical robotics
- Computer Vision
- Software Engineering
- Wireless Sensor Networks
- Real-Time Systems
- Power Electronics

4.5 University of Murcia

Contact

Antonio Skarmeta

skarmeta@um.es

Research expertise

Agriculture: watering control and greenhouses. Different projects have led towards various designs in the agriculture field. Firstly, a radio-communication system was developed and patented in a University of Murcia spin-off. The system consists on a sensor network scattered in the country (interconnected with a wireless network), connected with a central control system via a cellular network. The system is designed to work several years without any maintenance. Any node can be monitored and controlled through a SCADA (Supervisory Control And Data Acquisition) software. Later on, a greenhouse control systems was designed. A great quantity of sensors scattered in a greenhouse are connected to a embedded control system that implement de climatic control. Finally a new SCADA web based on Web 2.0 technology was design for control and tele-monitoring of the different embedded systems developed.

Energy efficiency: tele-monitoring of machinery, energy consumption, light adaptation, temperature adaptation, fault detection. The system consists on a Home Module (HAM), multi-technology-based, that connect with all the sensors and appliances. The HAM module can connect with sensors of the different technologies and manages the near control of the energy system. The software used was developed to design the pervasive computing strategies and communicate the intranet with Internet. Later on, the system was adapted to be used in big buildings with a HAM network and a wide range of sensors.

Research facilities

- Electronic and Sensor Lab system integration
- Greenhouse Modules for remote monitoring and management

Research priorities

- Agricultural information systems
- Real time systems for energy management
- Soil and water management
- ICT systems for monitoring and managing environmental impact in greenhouses and livestock

ICT-AGRI Country Report



ICT-AGRI Country Report SWITZERLAND

Federal Office for Agriculture FOA, Mattenhofstrasse 5, CH-3003 Bern, Switzerland

Authors: Markus Loetscher, Martin Holpp

Picture: Peter Wyss, Ittigen, Switzerland

1. Introduction

The Swiss Federal Office for Agriculture owns the Agroscope research stations. Agroscope comprises the three stations Agroscope Changins-Wädenswil ACW, Agroscope Liebefeld-Posieux ALP - Swiss National Stud and Agroscope Reckenholz-Tänikon ART. The vision of Agroscope is an agriculture for people and the environment: The research is aimed at providing healthy food and a region pleasant to live in. Agroscope is the driving force in agricultural research for sustained economic activity in the agricultural, nutritional and environmental sectors and develops scientific knowledge and basic technical principles for agricultural and environmental policy decisions and their legal implementation. Agroscope is geared towards the needs of its service recipients, including: People who work in agriculture, consumers and publicity and administration. Agroscope encourages a multifunctional and competitive Swiss agriculture, and focuses on economical, ecological and social issues. Agroscope orients itself towards future challenges and gives due significance to cross-disciplinary and innovative system approaches and operates in an application-oriented manner. www.agroscope.ch

The Swiss National Science Foundation (SNSF) is the most important Swiss agency promoting scientific research. It supports, as mandated by the Swiss Federal Government, all disciplines. SNSF supports targeted research in the form of two large research programmes: the National Research Programmes (NRP) and the National Centres of Competence in Research (NCCR). Both programmes provide funding for co-ordinated research with clearly defined goals for a limited time. The major objectives are collaboration with non-academic partners, knowledge and know-how transfer in education and practical work as well as the application of research results. Finding solutions to problems is the key objective of the NRP, whereas the NCCR (e.g. MICS) are mainly aimed at strengthening research structures. www.snf.ch

CTI is the Confederation's innovation promotion agency. For the past sixty years, it has fostered knowledge and technology transfer between companies and universities by bringing them together as partners on applied research and development projects. The CTI promotes R&D consortia (e.g. ICTnet). R&D consortia are ideal partners of Industry and Trade to enhance innovation in existing and future markets. The task of R&D consortia is to offer ambitious solutions to the economic partners with their competencies and resources in clearly defined industrial and trade sectors. www.kti-cti.ch

The ARAMIS information system contains information regarding research projects and assessments that are either run or funded by the Federal Administration. The ARAMIS Web site can be found under www.aramis.admin.ch.

2. Mapping of national funding bodies

2.1 Federal Office for Agriculture FOAG

Contact: Markus Loetscher, +41 31 325 60 85, markus.loetscher@blw.admin.ch

2.2 Federal Office for Professional Education and Technology OPET

Contact: info@bbt.admin.ch

2.3 KTI-CTI - Innovation Promotion Agency

Contact: Leuenberger, Regula, +41 31 322 24 40, regula.leuenberger@bbt.admin.ch

2.4 Swiss National Science Foundation (SNSF)

Contact: Christ, Urs, +41 31 308 23 50, nccr@snf.ch

3. Mapping of national research programmes

3.1 NCCR on Mobile Information and Communication Systems (NFS MICS)

- Owned by:
Swiss National Science Foundation (SNSF)
Christ, Urs, +41 31 308 23 50, nccr@snf.ch
- Managed by:
EPF IC PRN MICS
Bovay, Jacques, +41 21 693 56 38, jacques.bovay@epfl.ch
- Website:
<http://www.mics.org/>

Relevant ICT-AGRI topics

- ICT in environmental regulation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Permitted
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Not possible

3.2 Agroscope Work Programme (Agroscope Arbeitsprogramm)

- Owned by:
Federal Office for Agriculture FOAG
Markus Loetscher, +41 31 325 60 85, markus.loetscher@blw.admin.ch
- Managed by:
The directors of the Agroscope research stations
- Website:
www.agroscope.ch

Relevant ICT-AGRI topics

- ICT applications
- Automation of machinery / equipment
- Standardisation of data dictionaries and communication

- ICT in environmental regulation
- Effects of ICT and automation
- Structures in sale and support of ICT and automation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Permitted
- Participation of industry: Permitted
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Potential

3.3 KTI-CTI (KTI-CTI)

- Owned by:
Federal Office for Professional Education and Technology OPET
- Managed by:
KTI-CTI - Innovation Promotion Agency
Leuenberger, Regula, +41 31 322 24 40, regula.leuenberger@bbt.admin.ch
- Website:
www.kti-cti.ch

Relevant ICT-AGRI topics

- ICT applications
- Automation of machinery / equipment
- Standardisation of data dictionaries and communication
- ICT in environmental regulation
- Effects of ICT and automation
- Structures in sale and support of ICT and automation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Potential

Comments:

CTI provides funding to

- Market-oriented R&D projects, which companies and universities work together on to develop products and services.

- The creation and expansion of scientifically-based companies
- Knowledge and technology transfer through platforms and networks

4. Mapping of national research institutes

4.1 Agroscope Changins-Waedenswil Reserach Station ACW

Contact

Samietz, Jörg, +41 44 783 61 93, joerg.samietz@acw.admin.ch

Research expertise

Plant research, plant-derived food research, related research disciplines (crop science for food (arable and horticultural crops) and feed, plant breeding, genetic resources, molecular diagnostics, pathology, entomology, nematology, pest and disease modeling, food analytics and technology, sensory science, health and nutrition).

Research facilities

Modern field trial, laboratory and IT facilities for conducting competitive, peer-reviewed research.

Research priorities

Food quality and safety are being strengthened, as well as research relating to the area of nutrition and health. Crop protection related research is maintained as strong pillar of ACW, while production technology and production systems development related research is being re-focused. A transversal (inter- and transdisciplinary) research approach will be strengthened by research programmes, running since 2008. Applying a systems and crop chain approach allows for a holistic research approach that develops synergies among the research disciplines. Strong stakeholder orientation and excellent stakeholder access along the production and supply chain of plant food allow focusing on urgent (short term) and important problems for extension-like research and on a longer term) concentration on research areas with peer review quality, that are nevertheless connected with important stakeholder problems and extension-like research for ready-to-apply technology solutions. The internationalization of all research will be strengthened while maintaining the strong client orientation and competence for conducting extension-like research with ready-to-apply results.

4.2 Agroscope Reckenholz-Taenikon Research Station ART

Contact

Kaufmann, Robert, +41 52 368 33 11, robert.kaufmann@art.admin.ch

Research expertise

Natural Resources and Agriculture

www.agroscope.admin.ch/forschung/00237/index.html?lang=en

- Air Pollution / Climate
- Water Protection / Nutrient and Pollutant Flows
- Soil Fertility / Soil Protection

- Swiss Soil Monitoring Network
- Analytical Chemistry

Agricultural Economics and Engineering

www.agroscope.admin.ch/forschung/00239/index.html?lang=en

- Socioeconomics
-> ICT-AGRI relevant topics: Development of ICT based models for prediction of agricultural development and for scenario development.
- Farm Management
-> ICT-AGRI relevant topics: Development of a software tool for machine cost calculations; development of software tools for analysis of reference farms' bookkeeping.
- Buildings, Animals and Work
-> ICT-AGRI relevant topics: Development of software tools for work economic calculations, for planning of agricultural buildings, for planning of solar powered hay dryers.
- Agricultural Engineering Systems
-> ICT-AGRI relevant topics: Development of a software tool TASC (Tyres/tracks And Soil Compaction) for prevention of soil compaction; development of an automatic steering system for fruit farming; development of a 3D single plant detection for plant specific actions like spraying, weeding etc.
- Centre for Proper Housing of Ruminants and Pigs
-> ICT-AGRI relevant topics: Development of ICT applications for estimation of animal friendliness of livestock facilities.

Arable Crops and Pasture Systems

www.agroscope.admin.ch/forschung/00226/index.html?lang=en

- Forage Production / Grassland Systems
- Fodder-Crop Breeding
- Ecological Farming Systems
- Ecological Plant Protection
-> ICT-AGRI relevant topics: Development of PhytoPre, a forecast system for fungi infections of potatoes
- Varieties and Seeds

Biodiversity and Environmental Management

www.agroscope.admin.ch/forschung/00237/index.html?lang=en

- Agricultural Landscapes and Biodiversity
- Life Cycle Assessment
- Biosafety
- Molecular Ecology

Research facilities

Branch Taenikon

- Tractor and motor testing station including emission measurements
- Electronics support with abundant measurement equipment
- Mechanical workshop
- Research farm with 100 ha arable and grassland farming, research stables with 50 milk cows, 50 goats, 50 sows with fattening pigs

Branch Reckenholz

- Research farm
- Greenhouses
- Modern analytic laboratories
- GIS equipment

Research priorities

Vision

Agriculture for people and the environment: Our research is aimed at providing healthy food and a region pleasant to live in.

Goal and purpose

Agroscope is the driving force in agricultural research for sustained economic activity in the agricultural, nutritional and environmental sectors. Agroscope develops scientific knowledge and basic technical principles for agricultural and environmental policy decisions and their legal implementation.

Alignment

Agroscope is geared towards the needs of its service recipients, including:

- People who work in agriculture
- Consumers
- Publicity and administration

Agroscope encourages a multifunctional and competitive Swiss agriculture, and focuses on economical, ecological and social issues. Agroscope orients itself towards future challenges and gives due significance to cross-disciplinary and innovative system approaches. Agroscope operates in an application-oriented manner.

4.3 EPF IC PRN MICS

Contact

Bovay, Jacques, +41 21 693 56 38, jacques.bovay@epfl.ch

Research expertise

The School of Computer and Communication Sciences at the École Polytechnique Fédérale de Lausanne EPFL is one of the major European centers of teaching and research in information technology. The areas of research are inter alia: Algorithms, Architecture and integrated systems, Artificial Intelligence, Databases and Information Systems, Distributed Systems and Operating Systems, Human-Computer Interaction, Image and Signal

Processing and Networking. The research in the Distributed Information Systems Laboratory focuses on efficient peer-2-peer systems, trust management, large-scale semantic interoperability, and self-organization in decentralized information systems.

4.4 Swiss Federal Institute of Technology Zurich ETHZ

Contact

Nelson, Bradley, +41 44 632 55 29, bnelson@ethz.ch

Research expertise

The Institute of Robotics and Intelligent Systems IRIS at the ETHZ pursues a dynamic research program that maintains a strong robotics research focus on several emerging areas of science and technology. A major component of IRIS research leverages advanced robotics for creating intelligent machines that operate at micron and nanometer scales. IRIS research develops the tools and processes required to fabricate and assemble micron sized robots and nanometer scale robotic components. Many of these systems are used for robotic exploration within biological domains, such as in the investigation of molecular structures, cellular systems, and complex organism behavior.

ICT-AGRI Country Report



ICT-AGRI Country Report TURKEY

*Ministry of Agricultural and Rural Affairs, General Directorate of Agricultural Research,
Istanbul Yolu Uzeri Tarım Kampusu PK.51, 06171, Yenimahalle/ANKARA/TURKEY*

Author: Fatma Sarsu

*The Scientific and Technological Research Council of Turkey (TUBITAK), Agriculture,
Forestry and Veterinary Research Grant Committee (TOVAG), Tunus cad No:80 06100
Kavaklıdere/Ankara/TURKEY*

Author: Meltem Soydan Karabacak

1. Introduction

There are several organizations which provide support for R & D studies in Turkey. These are mainly TUBITAK, Ministry of Industry and Trade, KOSGEB (Small and Medium Enterprises Development Organization), TTGV (Technology Development Foundation). Many ministries also support the projects going on in their institutes and in the scope of their field. General Directorate of Agricultural Research (GDAR) under Ministry of Agriculture and Rural Affairs (MARA) supports agricultural research projects. In addition, State Planning Agency supports R & D infrastructure projects like establishment of excellence centers, central laboratory of universities. Since these are not specific projects, they are not included in the report. The Ministry of Foreign Affairs also performs a guiding function for all public agencies and institutions in terms of policy priorities.

The General Directorate of Agricultural Research (TAGEM-GDAR) has responsibility in agricultural research and has a - 84 year- experience in funding and coordinating research and development projects in the field of agriculture. GDAR is the center of the national agricultural research system. Under the Administration of GDAR, there are 1931 researchers in 58 research institutes which are responsible for carrying out agricultural R&D activities in the areas of plant breeding, production and protection, animal breeding, husbandry and health, fishery and aquaculture, food and feed, post-harvest technologies, biodiversity/genetic resources, organic agriculture, bio safety, soil and water resources management and rural development. (www.tagem.gov.tr)

Agricultural research has a mission to develop and transfer solutions to agricultural problems of national priority and provide information access and dissemination to ensure high-quality, safe food and other agricultural products; assess the nutritional needs of Turkish people; sustain a competitive agricultural economy; enhance the natural resources and the environment; and provide economic opportunities for rural citizens, communities, and society as a whole. In order to do this, General Directorate of Agricultural Research (GDAR) sets up priorities of Agricultural Research for the Country and allocates the available resources to the programs and projects according to the priorities. GDAR also follows the application of the projects, to disseminate and publish the research results. To improve the productivity and quality of agricultural products through research and to help improving the incomes of farmers, GDAR carries out empirical researches and projects at the national and international levels all over the country.

GDAR carry out its research activities under two support programs: The support programme for public research institutions: The GDAR is the central public funding organisation in charge of promoting multidisciplinary and multi-institutional research programs which are carried out by their research institutes. The Support Programme for Private Sector and Non-Governmental Organizations: the main objective of this programme is to promote private sector involvement in agricultural research. It is relatively new program that gives the support on the project bases.

The Scientific and Technological Research Council of Turkey (TÜBİTAK) is the leading agency for management, funding and conduct of research in Turkey. It was established in 1963 with a mission to advance science and technology, conduct research and support Turkish researchers. The Council is an autonomous institution and is governed by a

Scientific Board whose members are selected from prominent scholars from universities, industry and research institutions. TÜBİTAK is responsible for supporting, coordinating, promoting, monitoring and carrying out research & development activities in the S&T area and develop programs and projects for this purpose, provide consultation to the government on determination of science and technology policies, carrying out research on the strategic areas, developing support programs for universities, public sector and incentive programs for private sector. TÜBİTAK is the highest science and technology policy making body in Turkey. Setting its vision as to be an innovative, guiding, participating and cooperating institution in the fields of science and technology, The Council serves for improvement of the life standards of our society and sustainable development of our country. Besides conducting and funding research, the Council publishes scientific journals, popular science magazines and books, organizes science and society activities and supports undergraduate and graduate students through scholarships.

TUBITAK is the contact point for the Framework Programs of the European Union since 2003. Additionally, bilateral agreements with 23 institutions in 18 different countries were made by TUBITAK. These are presented below;

- United States of America - National Science Foundation,
- Belarus–National Academy of Sciences of Belarus,
- Bulgaria– Bulgarian Academy of Sciences,
- Germany–Deutsche Forschungsgemeinschaft (DFG) and Ministry of Education and Research (BMBF),
- France– Centre Nationale de la Recherche Scientifique & Ministry of Foreign Affairs
- South Korea–Korea Research Foundation,
- India–Council of Scientific and Industrial Research,
- Italy– National Research Council of Italy (CNR)and Ministry of Foreign Affairs,
- Hungary– National Office for Research and Technology (NKTH),
- Macedonia–Ministry of Education and Science,
- Mongolia– Mongolian Academy of Sciences,
- Pakistan–Ministry of Science and Technology (MOST),
- Romania–The National Agency for Science, Technology and Innovation of Romania
- Slovakia– Slovakian Academy of Sciences,
- Slovenia–Ministry of Education, Science and Sport of the Republic of Slovenia
- Tunisia– Ministry of Higher Education, Scientific Research and Technology of Tunisia (SERST)
- Ukraine– National Academy of Sciences of Ukraine (NASU) and Ministry of Ukraine for Science and Technology,
- Greece–General Secretariat of Research and Technology

Multilateral agreements of TUBITAK with regional & international organisations; COST,ESF, EuroHORCs, EUREKA, OECD, NATO, UN (UNIDO, UNESCO etc.), IEA, ICSU, EMBC, ICGBE, BSEC, ECO.

R & D Support programmes of TUBITAK can be categorized into three according to target groups; private sector, public sector and finally universities & research institutes (Figure 1). Academic research funding programmes for Universities & research institutes summarized below (Table 1, Figure 2) are managed by Academic Research Funding Programmes Directorate (ARDEB). Support programme (1007) for public sector is managed by Public Research Grant Committee. Support programmes for private sector are managed by Technology and Innovation Funding Programmes Directorate (TEYDEB). There has been no targeted project support program in TUBITAK, yet. Thus, in all support types open calls are conducted, but since broader impact is one of the evaluation criteria, usage of novel technologies is encouraged indirectly. Being in national priorities is also a subcriteria in the broader impact. Supported Projects on ICT-AGRI topics are present in several different programmes (Table 3).

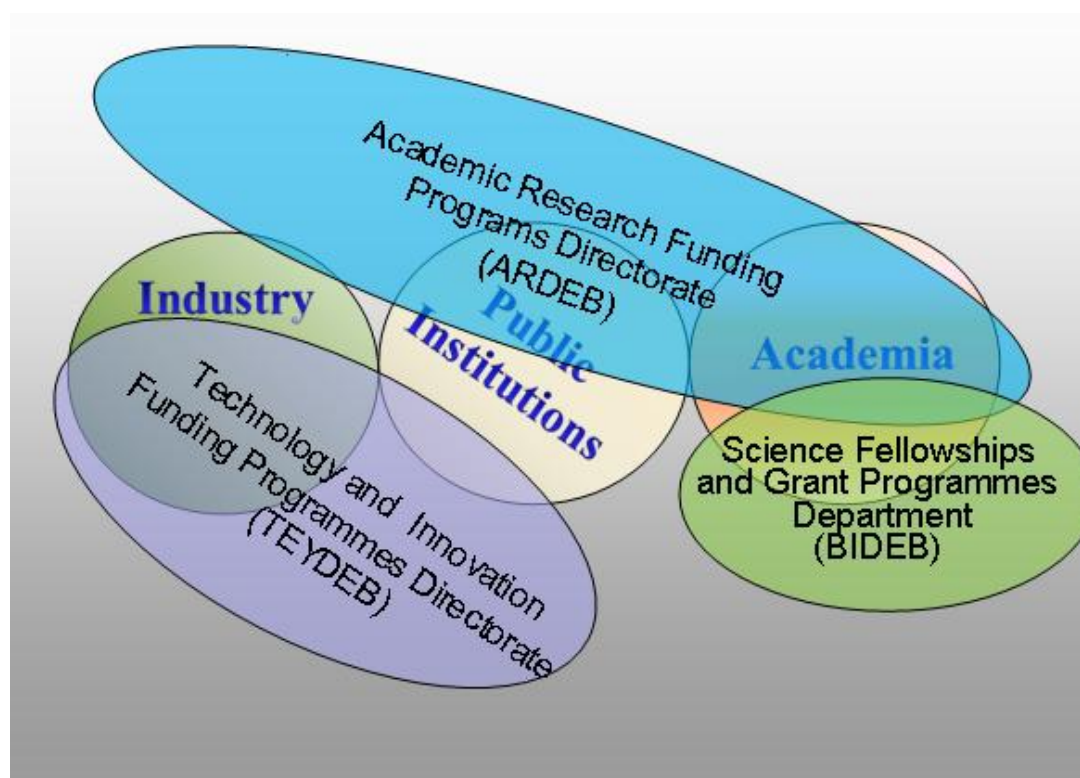


Figure 1. Customers and related departments of TUBITAK

Table 1. Academic Research Funding Programmes in TUBITAK-ARDEB

Acronym	Name of the Programme
1001	The Support Programme for Scientific and Technological Research Projects *
1002	Short-Term R&D Funding Programme
1008	Patent Application Promotion and Support Programme
1010	Global Researcher Programme (EVRENA)
1011	The Participation Programme for International Scientific Research Projects

1301	The Support Programme for the Initiative to Build Scientific and Technological Cooperation Networks and Platforms (İSBAP)
3501	National Young Researchers Career Development Programme (Career Programme)

* Calls in an ERA-NET coordinated in ARDEB-TUBITAK are subjected to regulations of this programme.

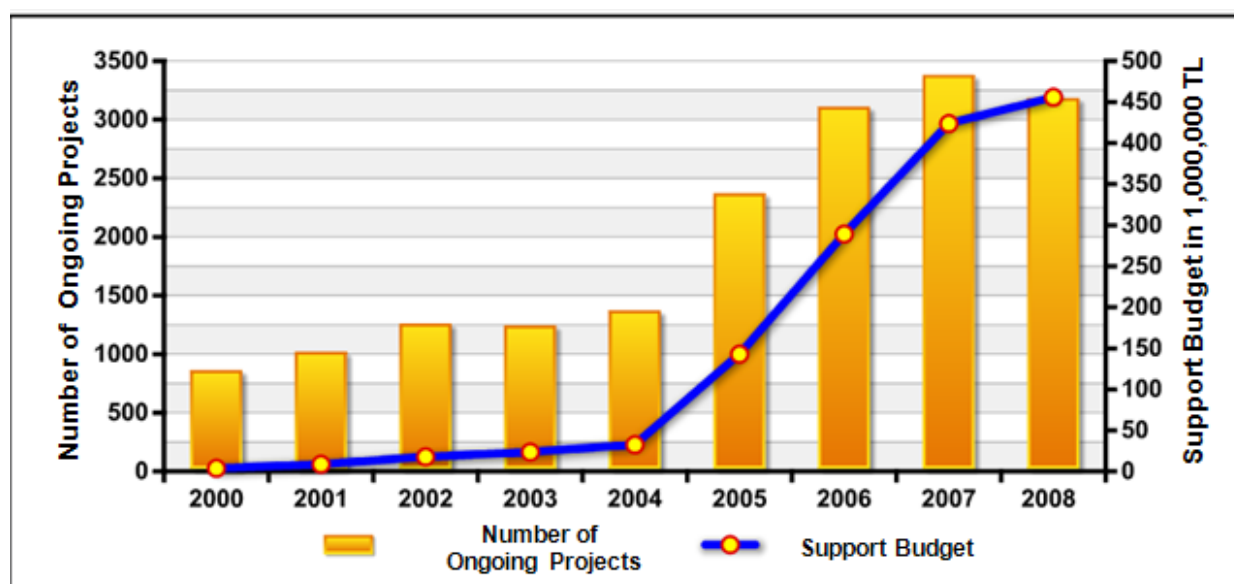


Figure 2. Academic research projects funded by TUBITAK-ARDEB

Table 2. Support Programmes for Private Sector in TUBITAK-TEYDEB

Acronym	Name of the Programme
1501	Industrial R&D Funding Programme
1507	SME Funding Programme
1508	Techno-entrepreneurship Funding Programme
1503	Project Brokerage Events Funding Programme
1509	Industrial R&D Funding Programme (Eureka, Eurostars, Cornet, Joint Technology Initiatives.etc.)

Technology Development Foundation of Turkey (TTGV), works for the mission of supporting the development of technological innovation capacity of Turkish industry, which will improve international competitive position of Turkey. Supporting R&D and technological innovation projects of the private sector in Turkey since 1991, TTGV is a successful example that Turkey introduced in Europe; an innovative and dynamic intermediary mentioned in EU

Lisbon Communiqué as an organization required to reach public R&D support to private sector. Support mechanisms are developed in order to enhance R&D and innovation activities in our country and to improve the National Innovation System. Main support programmes are;

- R&D Project Supports: Technology Development Project Support, Commercialization Project Supports, Joint Technology Development Projects
- Environmental Projects* (Subject specific, now, Support for Renewable Energy Projects, Energy Efficiency Projects and Environmental Technologies Projects are provided.
- Technological Entrepreneurship Supports

Ministry of Industry and Trade has several R & D support programmes for private sector. Main ones are Industry Thesis Programme, Precompetitive Collaboration Projects Support Programme and Techno-venture Capital Support Programme. Under the body of the Ministry of Industry and Trade, **KOSGEB** (Small and Medium Enterprises Development Organization) support SMEs in Turkey. Its actions are summarized below. R & D projects are supported under Technology Development and Innovation Supports.

- Consultancy and Training Supports
- Entrepreneurship Development Supports
- Information Technology Supports
- International Cooperation Development Supports
- Market Research and Export Promotion Supports
- Quality Improvement Supports
- Regional Development Supports
- Technology Development and Innovation Supports
- International Cooperation Development (visit purposed to export and matching studies)

Table 3. Funded Projects relevant to ICT-AGRI

	Number of Ongoing Projects on ICT-AGRI	Total Budget (EURO)
TÜBİTAK		
ARDEB (Academic research)	12	695.524,74
TEYDEB (Private sector)	4	1.051.540,75
KAMAG (Public sector)	10	8.122.006,13
TOTAL	26	9.869.071,62
Ministry of Industry and Trade		
SANTEZ (Industrial Thesis Program)	13	1.161.477,83
Tech-venture Capital Support	1	47.169,81
Precompetitive collaboration Projects	0	0
TOTAL	14	1.208.647,64

*May 2009 numbers

** KOSGEB and TTGV has no directly ICT-AGRI related ongoing projects for now.

R & D Support programmes, researchers working in the scope of ICT-AGRI and facilities of their institutions are given below.

Related Web pages:

www.tubitak.gov.tr	: The Scientific and Technological Research Council of Turkey
www.tagem.gov.tr	: General Directorate of Agricultural Research
www.tarim.gov.tr	: Ministry of Agriculture and Rural Affairs
www.ttgvt.gov.tr	: Technology Development Foundation of Turkey
www.dpt.gov.tr	: State Planning Organization
www.kosgeb.gov.tr	: Small and Medium Enterprises Development Organization
www.sanayi.gov.tr	: Ministry of Industry and Trade

2. Mapping of national funding bodies

2.1 General Directorate of Agricultural Research

Contact: Fatma SARSU, +90 312 327 36 78, fsarsu@tagem.gov.tr

2.2 Ministry of Agriculture and Rural Affairs

Contact: Fatma SARSU, +90 312 327 36 78, fsarsu@tagem.gov.tr

2.3 TÜBİTAK

Contact: Meltem SOYDAN KARABACAK, 90 312 468 53 00/1172, meltem.soydan@tubitak.gov.tr

Contact: Saner DEDE, 90 312 468 53 00/1178, saner.dede@tubitak.gov.tr

2.4 KOSGEB- SME Development & Support Presidency

Contact: Baha Bülent ANDIÇ, 90 312 595 29 35, baha.andic@kosgeb.gov.tr

2.5 T.C. Ministry of Industry & Trade

Contact: İvgen ÖZDAL, 90 312 219 40 34, ivgen@sanayi.gov.tr

2.6 TTGV- Technology Development Foundation of Turkey

Contact: Yücel TELÇEKEN, 90 312 265 02 72, info@ttgv.org.tr and ytelceken@ttgv.org.tr

3. Mapping of national research programmes

3.1 The Support Programme for Public Sector Agricultural Research and Development Projects (KAMU SEKTÖRÜ TARIMSAL ARAŞTIRMA VE GELİŞTİRME PROJELERİNİ DESTEKLEME PROGRAMI)

- Owned by:

Ministry of Agriculture and Rural Affairs

Masum BURAK, +90 312 344 13 80, mburak@tagem.gov.tr

- Managed by:

General Directorate of Agricultural Research

A. Ahmet YUCER, +90 312 315 76 29, ayucer@tagem.gov.tr

- Website:

English web page for brief information
<http://www.tagem.gov.tr/eng/anasayfa.htm>

Relevant ICT-AGRI topics

- ICT applications
- Automation of machinery / equipment
- Effects of ICT and automation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Required
- Participation of industry: Permitted
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Confirmed

3.2 The Support Programme for Private Sector and Non-Governmental Organizations Agricultural Research and Development Projects (ÖZEL SEKTÖR VE SİVİL TOPLUM KURULUŞLARI TARIMSAL ARAŞTIRMA VE GELİŞTİRME PROJELERİNİ DESTEKLEME PROGRAMI)

- Owned by:

Ministry of Agriculture and Rural Affairs

Masum BURAK, +90 312 344 13 80, mburak@tagem.gov.tr

- Managed by:

General Directorate of Agricultural Research

A. Ahmet YUCER, +90 312 315 76 29, ayucer@tagem.gov.tr

- Website:

English web page for brief information
<http://www.tagem.gov.tr/eng/anasayfa.htm>

Relevant ICT-AGRI topics

- ICT applications
- Automation of machinery / equipment
- ICT in environmental regulation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Permitted
- Participation of industry: Permitted
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Confirmed

3.3 The Support Programme for Scientific and Technological Research Projects (BİLİMSEL VE TEKNOLOJİK ARAŞTIRMA PROJELERİNİ DESTEKLEME PROGRAMI)

- Owned by:

TÜBİTAK
Nüket YETİŞ, 90 312 468 53 00, aysegul.gungor@tubitak.gov.tr

- Managed by:

TÜBİTAK-ARDEB
M. Arif ADLI, 90 312 468 53 00, havva.erturk@tubitak.gov.tr

- Website:

English web page for brief information:
<http://www.tubitak.gov.tr/home.do?ot=1&sid=991&pid=547>

Relevant ICT-AGRI topics

- ICT applications
- Automation of machinery / equipment
- Standardisation of data dictionaries and communication

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Permitted

- Participation of industry: Permitted
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Potential

3.4 Support Programme for Research Projects of Public Institutions (TÜBİTAK KAMU KURUMLARI ARAŞTIRMA VE GELİŞTİRME PROJELERİNİ DESTEKLEME PROGRAMI)

- Owned by:
TÜBİTAK
Nüket YETİŞ, 90 312 468 53 00, aysegul.gungor@tubitak.gov.tr
- Managed by:
TÜBİTAK-ARDEB
M. Arif ADLI, 90 312 468 53 00, havva.erturk@tubitak.gov.tr
- Website:
English web page for brief information:
<http://www.tubitak.gov.tr/home.do?ot=1&sid=991&pid=547>

Relevant ICT-AGRI topics

- ICT applications
- Standardisation of data dictionaries and communication
- ICT in environmental regulation
- Effects of ICT and automation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Permitted
- Participation of industry: Permitted
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Not possible

3.5 Industrial R&D Funding Program (SANAYİ AR-GE PROJELERİ DESTEKLEME PROGRAMI)

- Owned by:
TÜBİTAK
Nüket YETİŞ, 90 312 468 53 00, aysegul.gungor@tubitak.gov.tr
- Managed by:
TÜBİTAK-TEYDEB
Ömer Z. CEBECİ, 90 312 468 53 00, handan.kazanc@tubitak.gov.tr

- Website:

English web page for brief information:

<http://www.tubitak.gov.tr/home.do?ot=1&sid=997&pid=547>

Relevant ICT-AGRI topics

- ICT applications
- Automation of machinery / equipment
- ICT in environmental regulation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Not permitted
- Participation of industry: Required
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Not possible

3.6 SME Funding Programme (KOBİ Ar-Ge Başlangıç Destek Programı)

- Owned by:

TÜBİTAK

Nüket YETİŞ, 90 312 468 53 00, aysegul.gungor@tubitak.gov.tr

- Managed by:

TÜBİTAK-TEYDEB

Ömer Z. CEBECİ, 90 312 468 53 00, handan.kazanc@tubitak.gov.tr

- Website:

English web page for brief information:

<http://www.tubitak.gov.tr/home.do?ot=1&sid=997&pid=547>

Relevant ICT-AGRI topics

- ICT applications
- Automation of machinery / equipment

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Not permitted
- Participation of industry: Required
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Not possible

3.7 Industrial Thesis Programme (Sanayi Tezleri Programı)

- Owned by:
T.C. Ministry of Industry & Trade
- Managed by:
T.C. Ministry of Industry & Trade , Yavuz CABBAR
- Website:
<http://www.sanayi.gov.tr/webedit/gozlem.aspx?sayfaNo=3093>

Relevant ICT-AGRI topics

- ICT applications
- Automation of machinery / equipment
- Standardisation of data dictionaries and communication
- Effects of ICT and automation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Permitted
- Participation of industry: Required
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Not possible

3.8 Precompetitive Collaboration Projects Support Programme (Rekabet Öncesi İşbirliği Projeleri Destekleme Programı)

- Owned by:
T.C. Ministry of Industry & Trade
- Managed by:
T.C. Ministry of Industry & Trade , Yavuz CABBAR
- Website:
<http://www.sanayi.gov.tr/webedit/gozlem.aspx?sayfaNo=4088>

Relevant ICT-AGRI topics

- ICT applications
- Automation of machinery / equipment
- Standardisation of data dictionaries and communication
- Effects of ICT and automation

Brief characterisation:

- Geographic scope: International
- Participation of research institutes: Permitted
- Participation of industry: Required
- Participation from foreign countries: Permitted
- Contribution to ICT-AGRI calls: Not possible

3.9 Techno-venture Capital Suport Programme (Teknogirişim Sermayesi Desteği)

- Owned by:
T.C. Ministry of Industry & Trade
- Managed by:
T.C. Ministry of Industry & Trade , Yavuz CABBAR
- Website:
<http://www.sanayi.gov.tr/webedit/gozlem.aspx?sayfaNo=4372>

Relevant ICT-AGRI topics

- ICT applications
- Automation of machinery / equipment
- Standardisation of data dictionaries and communication

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Not permitted
- Participation of industry: Required
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Not possible

3.10 Technology Development Projects Support (Teknoloji Geliştirme Projeleri Desteği)

- Owned by:
Undersecretariat of the Prime Ministry for Foreign Trade
- Managed by:
TTGV- Technology Development Foundation of Turkey
T. Fikret YÜCEL

- Website:

<http://www.ttgvl.org.tr/en/page.php?id=19>

Relevant ICT-AGRI topics

- ICT applications
- Automation of machinery / equipment
- ICT in environmental regulation
- Effects of ICT and automation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Permitted
- Participation of industry: Required
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Not possible

3.11 Joint Technology Development Projects (Ortak Teknoloji Geliştirme Projeleri Desteği)

- Owned by:

Undersecretariat of the Prime Ministry for Foreign Trade

- Managed by:

TTGV- Technology Development Foundation of Turkey
T. Fikret YÜCEL

- Website:

<http://www.ttgvl.org.tr/en/page.php?id=84>

Relevant ICT-AGRI topics

- ICT applications
- Automation of machinery / equipment
- ICT in environmental regulation
- Effects of ICT and automation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Permitted
- Participation of industry: Required
- Participation from foreign countries: Not permitted
- Contribution to ICT-AGRI calls: Not possible

3.12 Technology R&D and Innovation Supports (Teknoloji Araştırma ve Geliştirme Destekleri)

- Owned by:
KOSGEB- SME Development & Support Presidency
- Managed by:
KOSGEB- SME Development & Support Presidency
- Website:
<http://www.kosgeb.gov.tr/Destekler/destek.aspx?dID=17>

Relevant ICT-AGRI topics

- ICT applications
- Automation of machinery / equipment
- Standardisation of data dictionaries and communication
- ICT in environmental regulation
- Effects of ICT and automation
- Structures in sale and support of ICT and automation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Unknown
- Participation of industry: Unknown
- Participation from foreign countries: Unknown
- Contribution to ICT-AGRI calls: Not possible

Comments:

No matter the project topic is, there should be a service or product that is commercialised at the end of the project. thus, a specific topic is not selected.

3.13 International Industry Research and Development Support Programme (Uluslararası Sanayi Ar-Ge Projeleri Destekleme Programı)

- Owned by:
TÜBİTAK
Nüket YETİŞ, 90 312 468 53 00, aysegul.gungor@tubitak.gov.tr

- Managed by:

TÜBİTAK-TEYDEB

Ömer Z. CEBECİ, 90 312 468 53 00, handan.kazanc@tubitak.gov.tr

- Website:

<http://www.tubitak.gov.tr/home.do?ot=1&sid=997&pid=547>

Relevant ICT-AGRI topics

- ICT applications
- Automation of machinery / equipment
- ICT in environmental regulation

Brief characterisation:

- Geographic scope: National
- Participation of research institutes: Not permitted
- Participation of industry: Required
- Participation from foreign countries: Required
- Contribution to ICT-AGRI calls: Not possible

4. Mapping of national research institutes

4.1 Central Research Institute for Field Crops, Geographic Information and Remote Sensing Research Department

Contact

Ediz ÜNAL , + 90 312 3157623, eunal@tagem.gov.tr

Research expertise

Agrometeorological simulation models and crop yield prediction , climatic data analysis, drought monitoring, main expertise is GIS& Remote sensing applications in agriculture and environment, image processing for land use, land cover mapping.

Research facilities

There are ESRI- ArcGis and Erdas Imagine software licences and necessary hardware at the department. The department has also NOAA satellite antenna and receiving station.

Research priorities

Agrometeorological simulation modelling, Agricultural decision support systems, Geospatial decision support for drought risk management, Determining of agroecological zoning and crop suitability areas.

4.2 Menemen Soil and Water Resources Research Institute

Contact

Yıldırım KAYAM, +90 232 832 10 0, menementopraksu@menementopraksu.gov.tr,

Research expertise

Basic research :soil, water management, catchment management

Applied research: Irrigation,Water transfer (management),wastewater treatment,Soil fertility, Agricultural machinery,Soil conservation,Agricultural economics, Precision farming and precision irrigation.

Research facilities

The Institute has a Experimental Station with 60 hectares, and The Insititute has Soil, Water and Plant Laboratory,GIS-RS Lab and automated meteorology station connected to the national meteorology service.

Research priorities

- Soil erosion, conservation and reclamation
- Water resources and management
- Agricultural machinery and economics
- Climate change
- Precision farming and precision irrigation.

4.2.1 Menemen Soil and Water Resources Research Institute

Contact

Nejat ÖZDEN, 90 232 832 10 02, oznejat@yahoo.com

Research expertise

Menemen Soil and Water Resources Research Institute is an establishment has been carrying out research activities to improve, conserve and use efficiently of soil and water resources in Aegean Region.

The research activities are carried out on four main departments;

Catchment Management : Hydrology, Agro meteorology and soil conservation

Water Management: Irrigation, drainage, soil physics, agro hydrology, constructed wetlands

Soil Management: Soil fertility and nutrition, organic farming, agro ecological zoning and microbiology

Investment Management: Agricultural economics and statistics, agro machinery, land leveling, soil tillage.

Research facilities

- The Institute has got a Soil, Water and Plant laboratory to analyze samples from farmers or research activities.
- In addition, the Institute has got many computers and related equipments which are convenient for GIS or RS applications.

Research priorities

- Agricultural drought and mitigation
- Soil conservation
- Organic farming
- Soil and land Information systems
- Sustainable soil efficiency
- Sustainable water management
- Agro hydrology
- Soil microbiology

4.3 Soil and Water Resources Research Institute of Tokat

Contact

Atila ALTINTAŞ , +90 356 2521250, atilaaltintas@tokatopraksu.gov.tr, atilaaltintas@gmail.com

Research expertise

Statistics of Agricultural Economics

- Econometrics

- Economic Analysis of Farms and Planning
- Rural development economies and socio-economic problems
- Input optimization in agricultural investments and financial models for rural societies
- Precision Farming

Research facilities

- Research Center Station in Tokat (10 km from Tokat on Turhal road)
- Soil analysis laboratory, organic fertilizer-plant analysis laboratory, chemical fertilizer analysis laboratory, saline and alkaline soils laboratory, water analysis laboratory, irrigation and soil physics laboratory
- Lysimeter
- Automatic Meteorology Station (agricultural drought monitoring station)
- 2 Meeting rooms (one is for 30 and the other is for 150 person)

Research priorities

- Precision Farming
- Agricultural economics researches
- Natural resources and environmental economics researches
- Agricultural policy researches
- Rural development economies
- Researches of farm size in sufficient income
- Socio-economic researches
- Survey

4.4 Soil Fertilizer and Water Resources Central Research Institute

Contact

Suat AKGÜL , +90 312 3155056, suatak64@tgae.gov.tr, suatak64@gmail.com

Research expertise

Expertise areas in research projects for

- sustainable soil, fertilizer and water management,
- determination of contaminated soil and water resources and their reclamation
- water management under limited water resources
- conserving and improving soil quality
- reclamation of saline and alkaline soils
- soil and water conservation
- snow hydrology
- climate change and drought
- Geographical Information System and Remote Sensing for soil and water resources management
- precision farming

- rural development economies and socio-economic problems
- input optimization in agricultural investments and financial models for rural societies

Research facilities

- Research Station in Sarayköy (30 km from Ankara on İstanbul road)
- Snow Hydrology Research and Training Center at Ilgaz Mountain
- Soil analysis laboratory, organic fertilizer-plant analysis laboratory, chemical fertilizer analysis laboratory, soil microbiology laboratory, saline and alkaline soils laboratory, water analysis laboratory, irrigation and soil physics laboratory, GIS and Remote Sensing laboratory
- Microbial Fertilizer Production Plant and a Greenhouse and a Workshop
- 2 Meeting rooms (one is for 70 and the other is for 25 person)

Research priorities

- Precision farming and precision irrigation
- Sustainable soil and water management
- Climate change and drought, hydrological modelling, snow hydrology
- Reclamation of saline and alkaline soils
- Investment management, rural development economies and socio-economic problems

4.5 Akdeniz University Remote Sensing Research and Implementation Center

Contact

Namık Kemal SÖNMEZ, 90 242 3106566, nksonmez@akdeniz.edu.tr

Research expertise

Researches on implementation of remote sensing and geographical information system on agriculture is conducted in the center. Planning of agricultural area usage, agricultural field management, soil survey and mapping are other expertise areas.

Research facilities

- Archived and updated satellite data
- Remote Sensing and and Geographical Information System software programmes
- ASD hand spectroradiometer
- Plotter, Scanner (A0)
- Computers

Research priorities

- Remote sensing and and geographical information system
- Monitoring
- Field Use Planning

- Fundamental soil survey and mapping

4.6 Ankara University, Faculty of Agriculture, Dept. of Agricultural Machinery

Contact

Mehmet Ali DAYIOĞLU, 90 312 596 15 96, dayioglu@agri.ankara.edu.tr

Research expertise

- Greenhouse technology,
- Energy, climate and fertigation management in greenhouses,
- Agricultural electronics, sensors and communication technologies,
- CAN network
- Wireless network, Bluetooth, Zigbee applications,
- Automatic data gathering for precision horticulture
- Sensing and automating control applications for greenhouses
- Greenhouse climate control
- Greenhouse fertigation control
- Precision crop farming
- Energy use in agriculture.

Research facilities

- Research greenhouse (64 m2, Venlo, polycarbonate cover)
- Research Lab. (Electronic and Measurement Lab., Soil Lab)
- Workplace (1000 m2)

Research priorities

- ICT systems for monitoring and managing environmental impact in greenhouses
 - Real time systems for energy management in greenhouses
 - Agricultural communication systems
- Wired: Modbus, CAN; wireless: Zigbee
- Soil and water management
 - Agricultural information systems
 - Agricultural decision support systems
 - Fully robotised greenhouse

4.7 Ankara University, Faculty of Agriculture, Dept. of Agricultural Machinery

Contact

Ufuk TÜRKER, 90 312 596 1610, uturker@agri.ankara.edu.tr

Research expertise

- Precision crop Farming
- Water and soil management
- Agricultural electronics, sensors and communication technologies,
- Automatic data gathering for precision horticulture
- Energy use in agriculture.

Research facilities

- Research greenhouse (64 m2, Venlo, polycarbonate cover)
- Research Lab. (Electronic and Measurement Lab., Soil Lab)
- Workplace (1000 m2)

Research priorities

- Precision farming and site specific crop management
- Soil and water management
- Agricultural information systems

4.8 Çanakkale 18 Mart University, Faculty of Agriculture, Dept. of Agricultural Machinery

Contact

İsmail KAVDIR, 90 286 2180018 E, kavdiris@comu.edu.tr

Research expertise

- Sorting of agricultural products, image processing, NIR spectroscopy applications in sorting of agricultural products, post harvest technology,
- Automated, non-destructive ways to sense inner and outer quality of products
- Seeding machinery

Research facilities

- FT-NIR spectrometer (transmission, reflection modes, 780-2500 nm range), and the software
- NIR spectrometer (reflection mode, 350-1000 nm range), and the software
- Apparatus needed to hold products and light guides in acquiring the spectroscopy of the products.
- Equipment to measure fruit-vegetable firmness, colour, sugar content, and other basic laboratory equipment (scaling, drying, cooling etc.)

Research priorities

- Non-destructive fruit/vegetable quality detection (inner-outer) systems with high recognition accuracy

- Non-destructive quick fruit/vegetable contamination detection (purity analysis for liquid foods)

4.9 Cukurova University, Faculty of Agriculture

Contact

Zeynel CEBECİ, 90 322 3386084 (cebeciz@gmail.com, zcebeci@cukurova.edu.tr)

Research expertise

Cukurova University occupies a foremost place among other Turkish universities with its 10 faculties, 3 colleges, 7 vocational colleges, 3 institutes and 26 research and application centers. The University counts with motivated staff, innovative labs and modern libraries. The University, with its 1903 member teaching staff, offers courses to over 30000 undergraduate, post graduate and doctorate students. The Agricultural Faculty has nearly 300 academic staff, and offers four year BSc degree under five programmes (Plant Production, Agricultural Technology, Animal Production, Landscape Architecture and Food Engineering) in cooperation with ten departments (Agricultural Machinery, Animal Science, Farm Structures and Irrigation, Field Crops, Food Engineering, Horticulture, Landscape Architecture, Plant Protection, Agricultural Economics and Soil Science). The goals of the faculty are to generate information and skills through research directed to the agricultural problems of the region and the country in order to increase agricultural production both quantity and quality wise, to find and extend new information and techniques, and to furnish students with the most up-to-date information and ability in agricultural disciplines. Agricultural education and research in the Çukurova Region, one of main agricultural production areas of Turkey is widely supported by the Faculty of Agriculture, and this goal has become integral part of the strategic plan of its development. Faculty carried out many projects to improve economical and social welfare of farmers, to introduce modern agricultural techniques in collaboration with centers of excellence (universities and research institutes), to improve research capacity of the regional institutes through collaborative research, training, education and extension, to create alternative income sources for the resource-limited farmers for the dry areas, to introduce sustainable agricultural production techniques for environmental safety, to preserve exceptional genetic material and maintain biodiversity, to improve infrastructure of education, research and extension, to provide opportunities for training and education of young scientists, to create and support scientific exchange programmes to share knowledge, experiences and technologies and to seek solutions for the priority agricultural production constraints.

Research facilities

- 10 research and education departments, 300 academic and research staff
- +10000 dekar multicultural and subtropical farming area, many greenhouses, citrus collection orchards,
- Barns, poultryhouses, beekeeping stations, fish ponds etc. (300 heads cows, 200 heads goats and sheep with various breeds from Saanen to Rambouillet)
- 40+ well equipped laboratories in various departments covering all areas of agriculture and food technology

- Developed computing facilities and research capability on ICT projects for agriculture, food and environment
- Good expertise and success to participate in many nationwide and EU-level projects
- Very well developed and beautiful campus area (the largest in TR) with every kind of infrastructure from transport to library to food and recreational needs.

Research priorities

- Agricultural Information Systems & Databases
- Remote Sensing and soil mapping systems
- Food traceability systems
- Agroecology and Biodiversity monitoring systems
- Precision farming and livestock production systems

4.10 Cukurova University, Faculty of Agriculture, Dept. of Agricultural Machinery

Contact

Sait Muharrem SAY, 90 322 338 61 95, saitmsay@cu.edu.tr

Research expertise

Research on Adoption possibilities of Precision Farming into Cukurova Agriculture

Research facilities

Please look at text about Cukurova University Faculty of Agriculture.

Research priorities

Adoption of Precision Farming

4.11 Cukurova University, Faculty of Agriculture, Dept. of Agricultural Structures and Irrigation

Contact

Mahmut ÇETİN, 90 322 338 68 77, mcet64@cu.edu.tr

Research expertise

Prof. Dr. Mahmut CETIN graduate of Agricultural Structures and Irrigation Department, Cukurova University, Turkey. His career started as Drainage and Soil Survey Engineer at the Planning Section of the Sixth Regional Directorate of State Hydraulic Works (DSI), Adana, Turkey in 1987. His career is as follows;

1989-1993: Drainage and Weed Control Engineer at the Department of Chief Engineering for Maintenance and Operation of Lower Seyhan Irrigation Project Division (ASO) of the Sixth Regional Directorate of State Hydraulic Works (DSI), Adana, Turkey. In charge of

Maintenance and Operation of Irrigation and Drainage Systems of the Lower Seyhan Irrigation Project (ASO).

1993-1997: Drainage and Soil Survey Engineer at the Planning Section of the Sixth Regional Directorate of State Hydraulic Works (DSI), Adana, Turkey. In charge of drainage and land survey for preparing Drainage, and Irrigated Land Classification Projects at the Planning Stage for the development of the soil and water resources in the Eastern Mediterranean Region of Turkey.

Dr. CETIN joined University of Cukurova in 1997 as a research assistant and has been an active researcher and lecturer at the Department of Agricultural Structures and Irrigation, Faculty of Agriculture. His main research interest areas are Agricultural Hydrology and Water Resources, Drainage Engineering, Geostatistical Applications on Soil and Water Resources, and Applied Time Series Analysis and Probabilistic approaches in Hydrology and Hydro-Meteorology. He has participated in many research projects related to soil and water salinity, groundwater, flood control and saving irrigation water without reducing yield in the Mediterranean region of Turkey. He is currently coordinating an EU funded project entiteled Diagnosis and Control of Salinity and Nitrate Pollution in Mediterranean Irrigated Agriculture: QUALIWATER (EEC/FP6, Contract # 015031). Additionally, he is the coordinating a joint reasearch project of the MedSaline (Analysis and optimization of irrigation efficiencies in order to reduce salinization impacts in intensively used agricultural landscapes of the semiarid Mediterranean Turkey) financed by International Bureau of the BMBF in Germany and TUBITAK in Turkey (<http://www.tubitak.gov.tr/home.do?ot=5&rt=3&sid=0&cid=11942>) in the framework of Intensified Cooperation (IntenC): Promotion of German-Turkish Higher Education Research

Research facilities

- Soil and water analysis laboratories,
- Fertiliser analysis laboratories and related equipment
- Remote sensing and GIS laboratories including all kind of software
- Surface and subsurface hydrological observations equipment,
- Soil salinity determination equipment
- Hydrologically well-defined agricultural catchment including hydro-meteorological observation equipment with shallow groundwater wells to test hydrological models and to conduct water, salt and nitrogen mass balance studies.

Research priorities

- Hydrological model testing
- Climate change and its impact on water resources and agricultural production systems
- Water resources system analysis
- Drought assessment and monitoring
- Salinisation of soil and water resources
- Mass balance studies (water, salt and nitrogen)
- Remote sensing and GIS in water resources

4.12 Cukurova University, Faculty of Agriculture, Dept. of Soil Science

Contact

İbrahim ORTAŞ, 90 322 338 68 19, iortas@cu.edu.tr

Research expertise

Biological diversity,

Mycorrhizae,

Soil Biology,

Soil Quality

Soil technology

Carbon sequestration

Sustainable management of environmental Technologies related with agriculture.

We are dealing and our group being specialized in optimising growth of crops with soil biodiversity, soil organisms, including mycorrhizal fungi, increasing soil quality and soil fertility. We are dealing with biological properties of soil, phosphorus, nitrogen and carbon cycling, environmental pollution, mycorrhizal fungi and its involvement in nutrients cycling, studies on plant nutrient uptake especially for horticultural and crop sciences (vegetables, fruit trees, annual and cereal plants) and transport, nutrient deficiencies, mechanisms involved in adaptation of plants to abiotic stress factors. I have wide experience in research on the application of mycorrhizal fungi on crops for the Mediterranean region. Also, we have good contact with Turkish organizations which will facilitate the restoration of degraded and desertified soil with mycorrhizal fungi by the local communities at large scale.

So far we have achieved to produce soil microorganisms and to use in horticulture.

-In Rhizosphere and soil quality lab, we are dealing with 33 different plant species. Mainly we use citrus, tomato, pepper, melon, watermelon, garlic, onion, wheat, maize, cotton, and soybean, cherry, pistachio. Since plain of Cukurova have diverse plant species, we are testing several plants with several mycorrhizal fungi for optimum yield and sustainable agriculture.

- I am the member of Management Comity of COST 838. COST 870, COST E38, COST FP0803. I have been taken part in several meetings and congresses and presented several papers.

- I get several national and international awards.

Research facilities

- Greenhouse

- Fisher-2000 model CNS analyzer

- WinRHIZO root analyzer

- Microscopes

- spectrophotometer

- Flame Spectrophotometer

- X-ray

Research priorities

- Role of mycorrhizae on carbon sequestration
- Role of mycorrhizae on soil quality development relates with carbon pool
- Effect of mycorrhizae on plant health and sustainable agriculture
- Mycorrhizae in ecological farming
- Role of mycorrhizae on food quality

4.13 Dicle University, Faculty of Agriculture, Dept. of Horticulture

Contact

Gültekin ÖZDEMİR, 90 412 248 85 09, gozdemir@dicle.edu.tr – gozdemir@gmail.com

Research expertise

- 1996-2005: Research assistant, 2005: PhD , 2005- : Assistant Professor
- Main Research Interests: Viticulture, Agricultural Information Systems, Remote Sensing, Geographic Information Systems.
- I have been preparing agricultural databases since 1996. For example, www.tarimfirmalari.com , www.tarimsalhaber.com , www.tarimsiteleri.com , www.tarimilan.com , www.tarimuzmanlari.com
- In 2005, International Congress on Information Technology in Agriculture, Food & Environment (ITAFE05), 12-14 October, 2005. Cukurova University, Adana, Turkey. I was a member of organization committee.
- I am studying Agricultural Remote Sensing and Geographic information system.
- I have just prepared and submitted a project entitled as “Determining Vineyard Lands and Creating Viticulture Database in Diyarbakir Province Using Remote Sensing Techniques and Geographic Information Systems” to TÜBİTAK.
- I have just prepared a project entitled as “Develeping Geographic Information Systems of Dicle University Campus” to TÜBİTAK and Dicle University.

Research facilities

- Greenhouse (fully automated greenhouse)
- Computer Laboratory
- Plant Biotechnology Lab.
- Vineyard Area
- Orchard Area
- Field Crops Area

Research priorities

- Agricultural Information Systems
- Remote Sensing
- Geographic Information Systems
- Farm Management Systems

- Precision Agriculture

4.14 Ege University, Faculty of Agriculture, Dept. of Agricultural Machinery

Contact

Arif Behiç TEKİN, 90 232 342 76 42, behic.tekin@ege.edu.tr

Research expertise

PhD. in Agricultural Mechanisation (2005)

Ege University, Graduate School of Applied Sciences, Dept. of Agricultural Mechanisation
Izmir, TURKEY

With a project entitled "A Research on Designing of Double Spinner Disc Variable Rate
Fertilizer Applicator"

Being in Agricultural Mechanization (1995) (Graduated with the highest GPA)

Ege University, Faculty of Agriculture, Dept. of Agricultural Mechanization
Izmir, TURKEY

Electric Technician (1990)

Manisa Technical High School, Dept. of Electrics&Electronics

Software;

-Geostatistic, GS+, Surfer

-Machine Design, Solid Works 10.0

-Data Mining & Database Management, Access, SQL

-GIS

Projects;

-Designing of Granule Fertilizer Applicator for Variable Rate Application. Supported by State
Planing Organization of Turkish Prime Ministry.

-A Design of Electronic Control Unit for Variable Rate Application on Agricultural Machinery.
Supported by Ege University Scientific Research Fund.

-A Research on Designing Variable Rate Fertilizer Applicator. Ege University Scientific
Research Fund.

-Determination of Soil Characteristics of Farms for Precision Farming Applications, Mapping
and Application to the Field Supported by Republic of Turkey, Ministry of Agriculture and
Rural Affairs, General Directorate of Agricultural Research;

Research facilities

- Electrics and Electronics Workshop

- Mechanical Technology Workshop

- Test and Research Laboratory for Agricultural Machinery

- Test Laboratory for Metals
- Pesticide Application Laboratory
- Laboratory for Soil Mechanics – Biological Materials and Planting Techniques
- Test Laboratory for Irrigation Machinery
- Test Area and Field for Practical Applications
- Soil Bins

Research priorities

- Robotics
- Fully robotized greenhouses
- Soil and water management
- Speaking plant and animal
- Applications for biosensor based systems, Agricultural information systems

4.15 Erciyes University, Faculty of Engineering, Dept. of Civil Engineering

Contact

Mehmet ARDIÇLIOĞLU, 90 352 4374901/32326, mardic@erciyes.edu.tr

Research expertise

River Modeling
Urban substructure
Water Management

Research facilities

- Flow Measuring studies by Aquastic Doppler Velocimeter,
- River and flow modeling studies by HEC RAS and conversional methods,
- Urban substructure modeling, both water supply and waste water structure design.

Research priorities

- Water Management
- River Modeling
- Urban substructure

4.16 Gaziosmanpaşa University

Contact

Sefa TARHAN, 90-356-2521616, sefatarhan@hotmail.com

Research expertise

- Automation of harvest and postharvest Process Machines (Dryers, Sorting Machine, etc.)

- Sensor development to determine the quality status of agricultural products (ripening stage, etc).
- Construction of databank for weed, soil and water sources
- Diseases forecasting for special crops
- Construction of databank and decision support systems for bioenergy resources and production...etc.

Research facilities

Drying Laboratory

Soil Laboratory

Analog and Digital Electronics Laboratory

Instrumentation Laboratory

PLC Laboratory

Electrical Machine Laboratory

Mechatronics Laboratory

Plant Laboratory

Weed Laboratory

Research priorities

- Automation of harvest and postharvest Process Machines (Dryers, Sorting Machine, etc.)
- Sensor development to determine the quality status of agricultural products (ripening stage, etc).
- Construction of databank for weed, soil and water sources
- Diseases forecasting for special crops
- Construction of databank and decision support systems for bioenergy resources and production

4.17 Gaziosmanpaşa University, Faculty of Engineering, Dept. of Mechatronics Engineering

Contact

Sefa TARHAN, 90-356-2521479/2250, sefatarhan@hotmail.com

Research expertise

same as Gaziosmanpasa University

Research facilities

same as Gaziosmanpasa University

Research priorities

same as Gaziosmanpasa University

4.18 Hacettepe University, Faculty of Engineering, Dept. of Food Engineering

Contact

İsmail Hakkı BOYACI, 90 312 297 6146, ihb@hacettepe.edu.tr, ihb37@yahoo.com

Research expertise

- Development of biosensor
- Development of bioassay
- Real time analysis of soil contaminants and compounds
- Artificial intelligent methods for processing agriculture data

Research facilities

Different instrumentations for development of biosensor such as; electrochemical and optics (fluorescence, SPR, SERS)

Instrument for monitoring molecular interaction and determination thermodynamic constants of interactions

Instrument for quality inspection of agri-products based on artificial intelligent technology

Research priorities

- Applications for biosensor based systems
- Soil and water management
- Intelligent control systems

4.19 Harran University, Faculty of Agriculture, Agricultural Economics

Contact

Turan BİNİCİ, 90 414 344 00 72, turanbinici@yahoo.com

Research expertise

Soil salinity, Remote sensing, Food safety

Research facilities

- Remote Sensing lab
- Food science lab
- Plant protection lab
- Soil science lab

Research priorities

- Soil salinity
- Food safety
- Plant protection

4.20 Kahramanmaraş Sutcu Imam University, Faculty of Agriculture, Dept. of Soil Science

Contact

Recep GÜNDOĞAN, 90 344 219 16 47, rgundogan@ksu.edu.tr

Research expertise

Digital soil mapping, soil and water conservation, geographic Information system, Remote sensing, precision agriculture, soil plant water relationships

Research facilities

- ICP
- Green house with computerAutomated (6000 m2)
- Atomic absorption spectrophotometer
- Spectroradiometer
- Soil moisture equipments: Time Domain Reflectometer (TDR), Pressure membrane, neutron meter, infrared thermometer
- Softwares of Geographic Information System: ArcGIS, Intergraph, ILWIS, ERDAS Imagine,
- Photosynthesis meter, leaf area meter, Thermal cycler, Chromometer,

Research priorities

- Precision agriculture,
- Digital soil mapping, land use/land cover, erosion mapping
- Soil water conservation
- Soil plant water relationships

4.21 Mustafa Kemal University, Faculty of Agriculture, Dept. of Agricultural Machinery

Contact

Muharrem KESKİN, 90 326 2455829, keskin@mku.edu.tr, mkeskinmku@yahoo.com

Research expertise

Dr.Muharrem Keskin

- Farm machinery
- Power and machinery in agriculture
- Precision agriculture
- Sensors and control applications in agriculture
- GPS/DGPS applications in agriculture

Dr.Serap Gorucu Keskin

- Precision soil tillage

- Conservation soil tillage
- GIS applications in agriculture
- Farm machinery
- Power and machinery in agriculture
- Precision agriculture

Research facilities

- Research and application farms of Mustafa Kemal University (animal farm, field crops farm, horticulture (citrus) farm, fruit tree farm)
- Greenhouses
- Research laboratory
- GIS laboratory

Research priorities

- Autosteering of tractors and agricultural machines
- Variable rate application of fertilizers/herbicides/pesticides
- Variable depth soil tillage
- GPS/GIS applications

4.22 Ondokuz Mayıs University, Faculty of Agriculture, Dep. of Animal Science

Contact

Soner ÇANKAYA, 90 362 3121919, scankaya@omu.edu.tr ; sonercankaya@gmail.com

Research expertise

- Biostatistics, applied statistics, biometry, bioinformatics and animal breeding.
- Experimental designs and analysis.
- Design and Analysis of Experiments with Computer Applications (SPSS, MINITAB, SAS, STATISTICA, MATLAB and R program)
- Statistics

Research facilities

- Experimental designs and analysis
- Multivariate Statistics (Canonical Correlation Analysis, Principle Component Analysis, Cluster Analysis, Discriminant Analysis)
- Robust Regression Techniques (M-estimation, LMS, LTS, LAD, etc.)
- Variance Components Models (ANOVA, ML, REML, MIVQUE),
- Lactation Curve Models (Wood, Cobby and Le Du, Dhanoa, Wilmlink, Exponential, Parabolic)

Research priorities

Model development

4.23 Ondokuz Mayıs University, Faculty of Agriculture, Dep. of Animal Science

Contact

Hasan ÖNDER, 90 362 3121919, hasanonder@gmail.com

Research expertise

Biostatistics, bioinformatics, animal breeding

Software development for animal breeding and distance learning

Research facilities

- Experimental designs and analysis
- VB programming
- Web programming with ASP
- Database management

Research priorities

- Model development
- Software or Web development for animal breeding and agricultural processes
- Software or Web development for distance learning

4.24 Osmaniye Korkut Ata University

Contact

Aykut GÜL, 90 328 825 05 06, aykutgul@osmaniye.edu.tr

Research expertise

Agricultural Economics

Farm Management

Computer Applications in Agriculture

Research facilities

- Science Labs
- Engineering Labs
- Conference Center

Research priorities

- Environment
- Renewable Energy

- Agricultural Economics
- Biotechnology
- Training

4.25 Selcuk University, Faculty of Agriculture, Dept. of Agricultural Machinery

Contact

Cevat AYDIN, 90 332 223 28 27, caydin@selcuk.edu.tr

Research expertise

A-Engineering properties of biological materials

- A1. Aydin, C., , Physical Properties Of Hazel Nuts, BioSystems, 82, 3, 297 - 303, 2002
A2. Aydin, C.; Özcan, M. , Some Physico Mechanic Properties Of Terebinth , Journal of Food Engineering, 0, 53, 97 - 101, 2002
A3. Cevat Aydin, Some engineering properties of peanut and kernel, Journal of food Engineering, 79(2007) 810-816.
A4. Yildirim, İ.; Aydin, C. , Taşıma Titreşim Simulasyonunun Bildiricilerin Besi Performasına Etkisi, Tavukçuluk Araştırma Dergisi, 4, 1-2, 35 – 37, 2002

B-Agricultural automation and robots

- B1. Aydin, C., Şeker, C. , Mushroom cultivation in automatically controlled room, Agro-Teknik, 1, 7, 55 – 56, 1991
B2. Demir, F.; Aydin, C. , Electronically measurement possibility of seed distribution in mechanic precise seeding machines, Selçuk Üniv. Ziraat Fak. Dergisi, 7, 9, 56 – 63, 1995
B3. Karakaplan, S., Aydin, C. , Research on automatical control of soil humidity, Ondokuz Mayıs Üniv. Ziraat Fak. Tarım Makinaları Bölümü Tarımsal Mekanizasyon 14. Ulusal Kongresi, Samsun, 574 - 583, 1992
B 4. Determination of variable herbicide application parameters with artificial neural network in order to fight with weeds in sugar beet farming (ongoing research, image processed plant protection tool will be constructed at the end.)

C- ERGONOMY

- C1. Aydin, C., Çarman, K. , Variation In Human Response To Vibration In Mass Transport Vehicle, AgEng 2002, International conference on agricultural engineering, Budapest, 78 - 79, 2002

D- Drying of products

- 8.9 Mengeş, H.; Aydin, C. , Factors affecting hot air drying of stanley type plums grown in Konya region, Tarımsal Mekanizasyon 19. Ulusal Kongresi, Erzurum, 2000

E- Plant Protection Tools

- E 1 Mengeş, H., O., Aydin, C. Konak, M , Effect of vibration on nozzle performance in some pulverization nozzles, Tarımsal Mekanizasyon 21. Ulusal Kongresi, Konya , 245 - 252, 2003

Research facilities

Agricultural Machinery Atelier, revolver, drill, welding machine, biologic material test laboratory, precision farming lab., bio-diesel test lab.

Research priorities

1. ICT systems for monitoring and managing environmental impact in greenhouses and livestock
2. Robotics
3. Soil and water management
4. Standardisation
5. Real time systems for energy management
6. Agricultural information systems
7. New post-harvest applications (sorting, storing, quality control, ...)
8. Fully robotised greenhouse

4.26 University of Çankırı Karatekin

Contact

Sabit ERŞAHİN, 90 276 212 2626, ersahin@karatekin.edu.tr; acapsu@gmail.com

Research expertise

Application of Geostatistics in Soil science
Application of Fractal Mathematics in Soil Research
Hydropedology
Modeling Nonequilibrium transport of reactive and nonreactive chemicals in soil
Modeling nitrate leaching in field and regional scales
Modeling water flow in soils
Modeling organic matter dynamics in response to climate change

Research facilities

- Soil sampling equipments for disturbed and undisturbed soil sampling are available.
- Laboratory facilities for basic analyses of soil physical, chemical, and microbiological properties are available.
- Facilities for column studies of chemical transport in disturbed and undisturbed soils are available
- Software for geostatistical analyses of spatial variations of natural resources are available.
- Infrastructure for plant molecular biology is available.

Research priorities

- Modeling organic matter dynamics in response to climate change
- Developing new technologies to increase water and fertilizer use efficiency in response to climate change

4.27 University of Çankiri Karatekin, Faculty of Forestry

Contact

Ceyhun GÖL, 90 376 212 27 57, ceyhungol@karatekin.edu.tr

Research expertise

watershed management, land use planning, soil physics, watershed development

Research facilities

- laboratories for watershed management, soil science, silviculture, biotechnology, forest diseases, herbarium, biology researches where all soil and water analysis can be conducted.
- afforestation implementation area
- research application forest
- climatized room and cabin

At the university, natural science faculty and organic farming Highschool are going to be established.

Research priorities

- watershed and soil management using GIS
- geostatistic applications
- detailed land survey and mapping

4.28 University of Mersin, Faculty of Engineering, Dept. of Food Engineering

Contact

Ferruh ERDOĞDU, 903243610001/719, ferruherdogdu@yahoo.com,
ferruherdogdu@mersin.edu.tr

Research expertise

processing of seafood products,
shrimp-prawn cooking,
mathematical modeling - simulation,
canning, freezing,
heat and mass transfer in food processing and engineering, optimization,
unit operations in food engineering

Research facilities

- Research facilities and laboratories in the department of food engineering at the University of Mersin.
- Facilities of food research and application center at the University of Mersin
- Virtual laboratory with simulations on food engineering

Research priorities

- seafood processing – improvement in quality attributes
- canning – improving thermal processing
- using mathematical simulations for improving food safety concerns

4.29 Namik Kemal University

Contact

Fatih Konukcu, 00 90 282 293 38 66/150, fkonukcu@nku.edu.tr

Aylin Adiloglu, 00 90 282 293 14 42/130, a_adiloglu@hotmail.com, aadiloglu@nku.edu.tr

Research expertise

Interdisciplinary investigations of natural resources management, with a particular focus on environmental and livelihoods impact of water resources management.

Water scarcity and mitigation of drought impacts on agriculture and water harvesting

Water saving irrigation Technologies automation.

Water quality management and salinity management in dry areas

Research facilities

Equipment to monitor irrigation (soil, plant, atmosphere sensors: TDR, neutron probe, photosynthesis systems, automatic portable meteorology station)

Research priorities

Arable farming and orchards: decrease of negative impact to environment, promotion of sustainable crop production, decrease of CO₂ emissions, reduction of labour demands, reduction of chemicals application, optimisation of water and soil management (irrigations and fertilisation optimisation, water savings)

Greenhouses: promotion of efficient energy use, decrease of CO₂ emissions, reduction of labour demands, reduction of chemicals application, optimisation of water and soil management (irrigation and fertilization optimisation, water saving)

ICT-AGRI Country Report



ICT-AGRI Country Report

UNITED KINGDOM

*Department for Environment, Food and Rural Affairs (DEFRA), 17 Smith Square,
London SW1P 3JR, United Kingdom*

Authors: Lucy Foster

1. Introduction

Research in the UK relevant to ICT and robotics for agriculture and related environmental issues is potentially fundable from three sources, depending upon the topic and whether the goals are basic strategic or applied.

Defra is the lead Department in England and Wales for strategic research to support government policy objectives, with DARD (Department of Agriculture and Rural Development) in Northern Ireland and RERAD (Rural and Environment Research and Analysis Directorate) in Scotland. Each has scope to support relevant strategic research, though recently topics in ICT and robotics areas have predominantly been supported through the LINK programmes (see below).

Basic and applied research is supported by the Research Councils, and BBSRC (Biotechnology and Biological Sciences) takes the lead for all agricultural topics, and both food security and technology development are strategic priorities for BBSRC. The basic underpinning research on ICT and robotics is the responsibility of EPSRC (Engineering and Physical Sciences). This may include developing new concepts in ICT or robotics which can have a number of generic applications and could include agricultural/environmental.

The LINK programmes on Sustainable Arable, Sustainable Livestock, and Advanced Food Manufacturing have been a vehicle for joint industry/government projects, often of an applied strategic nature, and much of the relevant ICT and robotics projects have been funded through this route. LINK projects are funded with up to 50% from government sources (whether Research Councils, Defra or others) and the rest from industry, as cash or in kind.

Following the announcement of the Sustainable Agriculture and Food Innovation Platform in autumn 2009, the Defra LINK programmes have been closed to new research proposals. The current funded programmes will continue to run until the completion of existing projects. BBSRC however still maintains a LINK programme, which covers all areas within their remit, including agricultural technology development. The Sustainable Agriculture and Food Innovation Platform is led by Technology Strategy Board with co-funding from Defra and BBSRC. This Programme supports innovative technological research and development in areas such as crop productivity, sustainable livestock production, waste reduction and management, and greenhouse gas reduction. The programme includes technology development and adoption, product introduction, efficient use of resources and good farming and manufacturing practices. The first call for proposals is for research on "New Approaches to Crop Protection".

Applied projects that are not funded by individual commercial concerns may also be funded from funds levied on the agriculture and horticulture sectors under UK legislation. The levy bodies are now under the umbrella of the Agriculture and Horticulture Development Board. Though some small applied projects have been solely funded by levy bodies, the major contribution has been as an industry sponsor to projects under the LINK programme.

In the context of the last ten years there has been significant research activity on ICT and Robotics for Agriculture in the UK. The main strands have included:

- Decision support systems for arable and horticultural crops

- Precision arable agriculture
- Precision horticulture
- Food – automation, sensors

The example projects include decision support for arable weed control based on optimisation using mathematical models (ICT input from Cranfield University), spatial variable application of pesticides and fertiliser (ICT, modelling and control input from The Arable Group and Rothamsted Research) and machine vision guided control of mechanical weeding (with ICT and robotics input from Tillett and Hague Technology Ltd).

2. Mapping of national funding bodies

2.1 Department for Environment, Food & Rural Affairs

Contact: Lucy Foster (Food Chain Research Programme Manager); David Cooper (Farming and Biodiversity Programme Manager)

Defra is the lead department responsible for agriculture and food including the development and implementation of policy on the environment, rural affairs, farming and food production.

Defra funds applied strategic research on food and agriculture in England and Wales (£65 million) which contributes to policy development on sustainable farming and biodiversity, agriculture and climate change, water management, and efficiency and resilience in the food chain, plant and bee health, research to underpin GM risk assessment. Defra also supports research on animal health and welfare.

To support businesses, Defra funds innovative research with industry which has a greater emphasis on competitiveness through its co-sponsorship of the new Technology Transfer Board-led Sustainable Agriculture and Food Innovation Platform to stimulate the development of new technologies that will increase food productivity whilst decreasing the environmental impact of the farming and food industries. Historically research on ICT and robotics has been primarily funded under Defra's LINK Programmes on food, horticulture, sustainable arable and sustainable livestock which were co-sponsored by BBSRC and the Scottish Government.

Research Councils

RCUK

Research Councils UK (RCUK) is a strategic partnership between the seven UK Research Councils. RCUK was established in 2002 to enable the Councils to work together more effectively to enhance the overall impact and effectiveness of their research, training and innovation activities, contributing to the delivery of the Government's objectives for science and innovation. One of the key activities RCUK undertakes is the coordination of cross-council programmes.

BBSRC is leading for RCUK on the development of a new food security research programme, which includes all of the relevant Research Councils and Government Departments. The main funders of research relevant to ICT and robotics for agriculture are part of this programme, and it is anticipated that this will provide a key mechanism for further coordination and joint working in this area.

BBSRC

The Research Council supports basic, strategic and applied research relating to the understanding and exploitation of biological systems, including agricultural systems. Technology development is a BBSRC strategic priority, in addition to the food security priority of which agriculture is a key component. In addition to funding research and training the BBSRC provides strategic funding to research institutes most of which are in the agricultural sector (Rothamsted Research, John Innes Centre, Institute for Animal Health; and IBERS

and Roslin Institutes which have now been transferred to the HEI sector).In addition to co-funding the TSB Sustainable Agriculture and Food Innovation platform, BBSRC also runs a number of schemes relevant to industrial collaboration.

2.2 Engineering and Physical Sciences Research Council

The Research Council is the main UK government agency for funding research and training in the engineering and physical sciences, investing more than £800 million a year in broad range of subjects. Its portfolio includes research on robotic technologies such as navigation, control, image recognition and also information and communication technologies. This research can have a number of generic applications and may include those agricultural/environmental sectors.

Contact: Robotics – Stephen Kemp (*Control, Systems Engineering and Robotics Portfolio Manager*)

2.3 Agriculture and Horticulture Development Board

This body incorporates sector divisions that develop and manage levy funded activities including research. Research funded must be relevant to priority concerns of the sector, and this is best identified through approaching the individual sector bodies, particularly HGCA for arable crops, HDC for horticulture and the Potato Council Ltd (PCL).

Contact: HGCA - Susannah Bolton (Head of R&D and KT); HDC - Bill Parker (Horticulture Director); PCL – Mike Storey.

3. Mapping of national research programmes

3.1 Horticulture LINK Programme

- Managed by:
Department for Environment, Food & Rural Affairs, (Responsible Department)
- Website:
<http://defrafarmingandfoodscience.csl.gov.uk/unit/floatingpage.cfm?id=2>

Relevant ICT-AGRI topics

- Automation of machinery / equipment
- ICT in environmental regulation
- Effects of ICT and automation
- Structures in sale and support of ICT and automation

Brief characterisation

- Geographic scope: UK
- Participation of research institutes: Required
- Participation of industry: Required
- Participation from foreign countries: Limited
- Contribution to ICT-AGRI calls: N/A

Comments

This programme is now closed to new submissions; future activities may be covered in calls from the Sustainable Agriculture and Food Innovation Platform being run by the Technology Strategy Board

3.2 Advanced Food Manufacturing LINK Programme

- Responsible Department:
Department for Environment, Food & Rural Affairs (responsible Department)
- Managed by:
Department for Environment, Food & Rural Affairs
- Website:
<http://defrafarmingandfoodscience.csl.gov.uk/0/programme.cfm?programmeid=23&unitid=2>

Brief characterisation:

- Geographic scope: UK
- Participation of research institutes: Permitted

- Participation of industry: Permitted
- Participation from foreign countries: Limited
- Contribution to ICT-AGRI calls: N/A

Comments:

This programme is now closed to new submissions; future activities may be covered in calls from the Sustainable Agriculture and Food Innovation Platform being run by the Technology Strategy Board.

3.3 Sustainable Arable LINK

- Responsible department:
Department for Environment, Food & Rural Affairs (Responsible Department)
- Managed by:
Department for Environment, Food & Rural Affairs
- Website:
<http://defrafarmingandfoodscience.csl.gov.uk/unit/floatingpage.cfm?id=1>

Relevant ICT-AGRI topics

- Automation of machinery / equipment
- Effects of ICT and automation

Brief characterisation:

- Geographic scope: UK
- Participation of research institutes: Permitted
- Participation of industry: Permitted
- Participation from foreign countries: Limited
- Contribution to ICT-AGRI calls: N/A

Comments:

This programme is now closed to new submissions; future activities may be covered in calls from the Sustainable Agriculture and Food Innovation Platform being run by the Technology Strategy Board.

3.4 Sustainable Agriculture and Food Innovation Platform

- Responsible Department:
Department for Business Innovation and Skills
- Managed by:
Technology Strategy Board

- Website:

<http://defra.farmingandfoodscience.csl.gov.uk/unit/floatingpage.cfm?id=1>

Relevant ICT-AGRI topics

Any areas of ICT and robotics that support technology development and adoption, product introduction, efficient use of resources and good farming and manufacturing practices and are covered in a call for proposals;

Brief characterisation:

- Geographic scope: UK
- Participation of research institutes: Permitted
- Participation of industry: Required
- Participation from foreign countries: Limited
- Contribution to ICT-AGRI calls: N/A

Comments:

This programme was launched in autumn 2009 with a first call on “New Approaches to Crop Protection” announced in early 2010.

BBSRC Stand Alone LINK programme

- Managed by:

BBSRC

Responsible department: Department for Business Innovation and Skills

- Website:

http://www.bbsrc.ac.uk/business/collaborative_research/link/

Relevant ICT-AGRI topics

Any area within BBSRC remit including technology development in agricultural research

Brief characterisation:

- Geographic scope: UK
- Participation of research institutes: Permitted
- Participation of industry: 50% cash or in-kind from industry is required to qualify for this scheme

Comments:

BBSRC manages a stand-alone LINK programme through its standard responsive mode system, which accepts applications from eligible PIs in BBSRC remit when there is no other appropriate complementary funding scheme for that application. Currently BBSRC co-sponsors TSB agriculture innovation platform and are co-sponsors in the Defra led LINK programmes which are complementary to the stand-alone LINK scheme.

BBSRC Tools and Resources development fund

- Managed by:
BBSRC
Responsible department: Department for Business Innovation and Skills
- Website:
http://www.bbsrc.ac.uk/funding/opportunities/2009/tools_and_resources_development_fund.html

Relevant ICT-AGRI topics

Any areas of technology development underpinning biological applications including agriculture

Brief characterisation:

- Geographic scope: UK
- Participation of research institutes: Permitted
- Participation of industry: Encouraged
- Participation from foreign countries: N/A
- Contribution to ICT-AGRI calls: A number of applications have been received in this area

BBSRC Industrial Partnership Awards

- Managed by:
BBSRC
Responsible department: Department for Business Innovation and Skills
- Website:
http://www.bbsrc.ac.uk/business/collaborative_research/industrial_partnership_awards.html

Relevant ICT-AGRI topics

Any area within BBSRC remit including technology development in agricultural research

Brief characterisation:

- Geographic scope: UK
- Participation of research institutes: Permitted
- Participation of industry: 10% cash from industry is required to qualify for this scheme
- Participation from foreign countries: N/A

Comments:

Comment, this scheme is run through the BBSRC responsive mode mechanism

BBSRC responsive mode

- Managed by:
BBSRC
- Responsible department:
Department for Business Innovation and Skills
- Website:
<http://www.bbsrc.ac.uk/funding/grants/index.html>

Relevant ICT-AGRI topics

Any area within BBSRC remit including technology development in agricultural research

Brief characterisation:

- Geographic scope: UK
- Participation of research institutes: Permitted
- Participation of industry: Encouraged, and if at certain levels certain schemes may apply
- Participation from foreign countries: N/A

Comments:

Comment BBSRC responsive mode accepts eligible applications in all areas of BBSRC remit. These are academic led proposals, though industrial partnership is encouraged, which aim to solve a biological problem.

4. Mapping of national research institutes

Since the closure of Silsoe Research Institute in 2006 there is no specific Research Institute in the UK for ICT and Robotics for Agriculture. However, there are a number of Universities and research institutes with strong research departments relating to these technical areas and some have experience and interest in scientific and technical advances that have relevance to biological systems including agriculture and horticulture.

Active or interested parties include:

University of Warwick: Various elements of the University including Warwick HRI, Warwick Manufacturing Group and the Intelligent Systems Engineering Laboratory in the School of engineering are active in robotics including automation in vegetable production, data analysis and sensor fusion, and machine vision for horticulture quality assessment. Projects have included a robotic mushroom picker, a robot grass cutter, an inflatable conveyor belt system (Aeropick) to aid the agricultural and horticultural harvesting process. There is also active ICT for decision support, building on the successes of MORPH.

Contacts: Richard Napier (Richard.Napier@warwick.ac.uk), Rodney Edmondson (Rodney.Edmondson@warwick.ac.uk), Evor Hines (E.L.Hines@warwick.ac.uk), Ken Young (K.W.Young@warwick.ac.uk)

Bristol Robotics Laboratory: The laboratory is a collaborative venture between the University of Bristol and University of the West of England (Director: Chris.Melhuish@brl.ac.uk). Professor Simon Blackmore has specific interests in field robots, behavioural robotics, instrumentation, and artificial intelligence, and has developed concepts in agricultural service robots

Contacts: Simon Blackmore (simon@unibots.com)

Tillett and Hague Technology Limited: This is a small research enterprise set up by scientists who were active at Silsoe Research Institute on its closure. They pursue research on vision guided systems and mechanical weeding.

Contact: Nick Tillett (nick.tillett@thetechnology.co.uk)

Silsoe Spray Applications Unit: This unit is part of The Arable Group (TAG), and the unit is active in advanced methods for crop protection including patch spraying and other aspects of precision agriculture.

Contact: Paul Miller (Paul.Miller@thearablegroup.com)

Rothamsted Research (Institute of BBSRC): The Environmetrics programme within the Biomathematics and Bioinformatics Department is active in developing techniques for addressing the variability in cropping systems, and provides key inputs to new approaches to precision agriculture.

Contact: Murray Lark (murray.lark@bbsrc.ac.uk)

Silsoe Technology Limited: This small research and development enterprise was established by engineers active at Silsoe Research Institute when it closed. They pursue

innovative automation and mechanical engineering, linked to automation in agriculture and horticulture as well as the food sector.

Contact: John Reed (john.reed@silsoeresearch.org.uk)

University of Manchester, Syngenta Sensors University Innovation Centre: Dr Bruce Grieve is addressing sensing, on-line analysis, measurement and informatics R&D, particularly linking to the agricultural sector.

Contact: Bruce Grieve (Bruce.Grieve@manchester.ac.uk)

National Physical Laboratory (NPL): This laboratory is the UK's National Measurement Institute and has recently been active in developing microwave technology and expertise to address crop harvesting.

Contact: Richard Dudley (richard.dudley@npl.co.uk)

Cranfield University: David Parsons with colleagues has contributed to a range of research projects defining modelling and optimisation methods to deliver decision support for agricultural systems and processes

Contact: David Parsons (d.parsons@cranfield.ac.uk)

ICT-AGRI Country Report



Executive Summary

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Introduction

The EU funded ERA-NET *Coordination of European Research within ICT and Robotics in Agriculture and related Environmental Issues* (ICT-AGRI) is a trans-national network that aims to foster pan-European collaboration in research and technological development activities related to ICT/Robotics in the area of agriculture and environmental protection. The ICT-AGRI ERA-NET has five main goals:

1. A comprehensive, publicly accessible **mapping and analysis of existing research and future needs**
2. A widely accepted **Strategic Research Agenda**
3. Successful **calls for transnational projects**
4. **Viable networks** for funders as well as for researchers and developers
5. **Supplementary support actions** for coordinated research and development

Knowledge about existing research, national R&D programmes, infrastructures and resources available for ICT and Robotics is a prerequisite towards developing joint research activities and a common Strategic Research Agenda adopted across Europe.

This document gives a brief summary of 15 national country reports with information on national research programmes, funding bodies and structures, as well as national research institutes and facilities. The report is a part of a mapping process of ICT and Robotic research and application in the agricultural sector, carried out as an element of the ICT-AGRI ERA-NET.

The country report itself will serve as a reference book for researchers, policymakers and other stakeholders. It is our hope that it will become a useful tool to get an overview of the research programmes currently running and to get a deeper insight into the research funding bodies and structures in the partner countries. It can also help the reader to find suitable partners for research cooperation. Based on the descriptions of institutes, expertise, infrastructures and priorities, project consortia can be formed to participate in future calls by ICT-AGRI or non-competitive collaborative actions (e.g., PhD and post-doctoral research, exchange of hardware resources, exchange of researchers, etc.). We thus encourage our readers to share this report with their colleagues.

The information contained in the country reports is available online in the ICT-AGRI Meta Knowledge Base, reachable via the ICT-AGRI website. The Meta Knowledge Base is a tool for gathering knowledge about research organisations and projects as well as research expertise and facilities. The Meta Knowledge Base is open to all interested researchers and developers. We invite our readers to enter his/her profile, research or policy area and expertise in the Meta Knowledge Base.

ICT-AGRI is funded by the European Commission's ERA-NET scheme under the 7th Framework Programme for Research.

Further information is available from the ICT-AGRI website: www.ict-agri.eu.

Methods


Considering the many national differences in funding structures and research organisations, we needed a well-thought-out framework to map all this information. Several methods used in the mapping exercises by other ERA-NETs (questionnaires - either online or sent out in hard copy, literature reviews, bibliographic measurements, etc.) were studied. But none of them could meet all our requirements. We needed: (1) A user-friendly method (2) to gather relevant information (3) in a standard structure (4) that results in an efficient output (5) which is useful for all stakeholders (6) with potential to continue beyond the lifetime of ICT-AGRI. In addition, we aimed to start the mapping at the beginning of the project, so all partner countries were directly involved and the first results of the mapping could be of use for the upcoming calls. We chose to store the data in an online database. Before starting to build the database, the term “relevant information” needed to be defined. Based on a study of the output of several other ERA-NETs, it became clear that several subjects (e.g., selection criteria and evaluation procedures in research programmes) has been mapped by other ERA-NETs. Consequently, the mapping of this information would have resulted in duplication with little added value. The subjects found relevant for this ERA-NET could be classified in two groups: 1) a set of subjects for which information could be gathered from the funders by the ICT-AGRI partners on short term, and 2) a second set of subjects that need to be provided by the research community in order to guarantee the quality of the information.

Therefore, a two step mapping process was adopted.

The first step was the development of country reports containing information on national funders, research programmes and research institutes and facilities. The second step was the development of a website (ICT-AGRI Meta Knowledge Base) with online input of information by researchers and developers.

The country reports (the first step) hold information about national research institutes with activities within the field of ICT-AGRI, including their expertise, sharable research facilities and future research priorities. In the information about research funders and research programmes, special attention was paid to the added value on a European level to ensure that the information will be useful for stakeholders all over Europe. The information therefore includes whether participation of foreign countries is allowed.

To facilitate collection of the data, a database with online input forms was constructed. A comprehensive online guide was added to the database, explaining how to operate the ICT-AGRI database as an editor. The data were filled in by the ICT-AGRI partners, who were defined as “editors”. They had full writing and reading rights to their own data. After successful login, they could enter, edit or remove their own data. At the final stage each national report, called the country report, was generated automatically and exported to a Word document, which could be further edited. All national country reports were merged and published as the reference book entitled *Reports on organisation of research programmes and research institutes in 15 European countries*.



Mapping of Research Programmes

Work Package 2

Ministry of Agriculture of the Flemish Community, Institute for Agricultural and Fisheries Research

[Programmes](#)
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[Profiles](#)
[Report](#)
[Overview](#)
[Organisations](#)
[Persons](#)
[Help](#)
[Partner info](#)
[Partners](#)
[Log out](#)

[List](#)
[Add](#)
[New](#)

Profiles of research organisations being potential partners in ICT-AGRI research proposals

Organisation	Contact	Expertise	Facilities	Priorities
All national universities	One contact person for each university			
Applied Biological Science - Department of Bioengineering- University of Antwerp	D'Haese Luc			
Applied research centers	Els Lapage	Topic specific research centers are foun ...		
Biomaterial science - Division Mechatronics, Biostatistics and sensors - Katholieke Universiteit Leu	Engelbert Tijssens	The overall aim of this research group i ...		
Biostatistics - Division Mechatronics, Biostatistics and Sensors - Katholieke Universiteit Leuven	Bart De Ketelaere	The increasing complexity of signals whi ...		
Biosystems Dynamics - Division Mechatronics, Biostatistics and sensors - Katholieke Universiteit Le	Herman Ramon	System dynamics involves a structural wa ...	Test hall equipped with Stewart-platform ...	See research expertise
Computational biology - Division Mechatronics, Biostatistics and Sensors - Katholieke Universiteit L	Nico Scheerlinck	Today, biosystems are studied in many fi ...		
Computational Modeling Group-Faculty of Science-Vrije Universiteit Brussel	Ann Nowé	The Computational Modeling (COMO) Lab ha ...	One hundred state-of-the art environment ...	o Machine learning o Data mining o Wir ...
Data Quality Management - Measure, Model & Manage Bioresponses (M3-BIORES)- Katholieke Universiteit	Eddie Schrevens	1. Mixture systems optimisation The r ...		
Databases and Theoretical Computer Science-Faculty of Sciences-Universiteit Hasselt	Marc Gyssens			
Department of Biosystems Engineering - Ghent University	Jan Pieters	Research within the department always de ...	Simulation software: COMSOL, Fluent, TRN ...	Modelling and control of gree ...
Department of Electronics and Informatics-Faculty of Engineering Science-Vrije Universiteit Brussel	Johan Stiens	o Contact-free non-destructive measure ...	o Quasi-optical free-space network ana ...	o Research work is ongoing related to ...
Distributed decision support-Campus Kortrijk of K. University of Leuven	Patrick De Causmaecker			
Geomatics and Forest Engineering - Division of Monitoring-Modelling-Management of Bioresponses - K.	Pol Coppin	The Geomatics Engineering Research Group ...	1 ASD full-range field spectror ...	Hyperspectral, hypertemporal an ...
Institute of Agricultural and Fisheries Research	Lieve Herman	General: The research focuses on innova ...	1. Spray Tech Lab 2. Mobile Unit for Em ...	1. Spray Application Technology ...
M3-BIORES: Measure, Model & Manage Bioresponses - Division of Monitoring-Modelling-Management of bio	Daniel Berckmans	Measure, Model & Manage Bioresponses (M3 ...	- Measurements of ammonia concentrations ...	
MeBioS Biosensor group - Division Mechatronics, Biostatistics and Sensors - Katholieke Universiteit	Jeroen Lammerlyn	The fundamental research activities are ...	Equipment used at MeBioS Biosensor group ...	Because the MeBioS biosensor group close ...
Other Universities working in the field of ICT and robotics (less agriculture related)		1. University of Antwerp - Department of		

Figure 1. The online database showing part of the input from Belgium on “profiles”.

Results and discussion

The individual country reports within this document were finalised in January 2010. The publication reflects the status quo at that point in time.

All country reports in this publication have a standard structure. A short introduction explains national funding structures, national motivation and incentives for European coordination. The following chapter describes the national funding bodies and their national research programmes within research disciplines covering ICT and Robotics in the agricultural sector. The last chapter provides a list of existing national research institutes and facilities within the ICT-AGRI area, including information about research expertise, infrastructures and priorities.

Even though a strict web based format was used, some remarkable differences between the country reports exist, mainly due to the different approaches by the authors, but in some cases due to fundamental differences between research programmes.

Participation

Fifteen countries have entered their input in the online database. Besides the partner countries, some of the observer partners also voluntarily participated in this mapping exercise and described their funding bodies, research programmes and research institutes. Twelve of the 27 EU Member States and three non-EU countries participate in this mapping exercise. Belgium and Spain are represented by the region of Flanders and the region of Murcia, respectively.

Funding organisations, research programmes and research institutes

Large differences can be noticed between the funding structures in the different countries and regions. In general, the number of funders within one country or region is in proportion with the population of that country or region ($r = 0.63$, Fig. 2).

The term “research programmes” can be interpreted in different ways. Within this mapping, a research programme was defined as: “a cluster or series of research projects or activities with a common thematic focus and/or a common funding, management and evaluation mechanism. A research programme may have a single call on a specific topic, or the research programme may run over a number of years and have several calls.” Analysing the nature of mapped research programmes, it became clear that the funding of ICT-AGRI related topics differs between the countries. While some countries mainly fund ICT and robotics in agriculture through research programmes with a general purpose (for example, a PhD programme), other countries mainly offer research programmes with a specific scientific topic. Besides these different funding objectives, the number of research programmes within a country or region seems to be positively correlated with the population in that country or region ($r = 0.59$, Fig. 2).

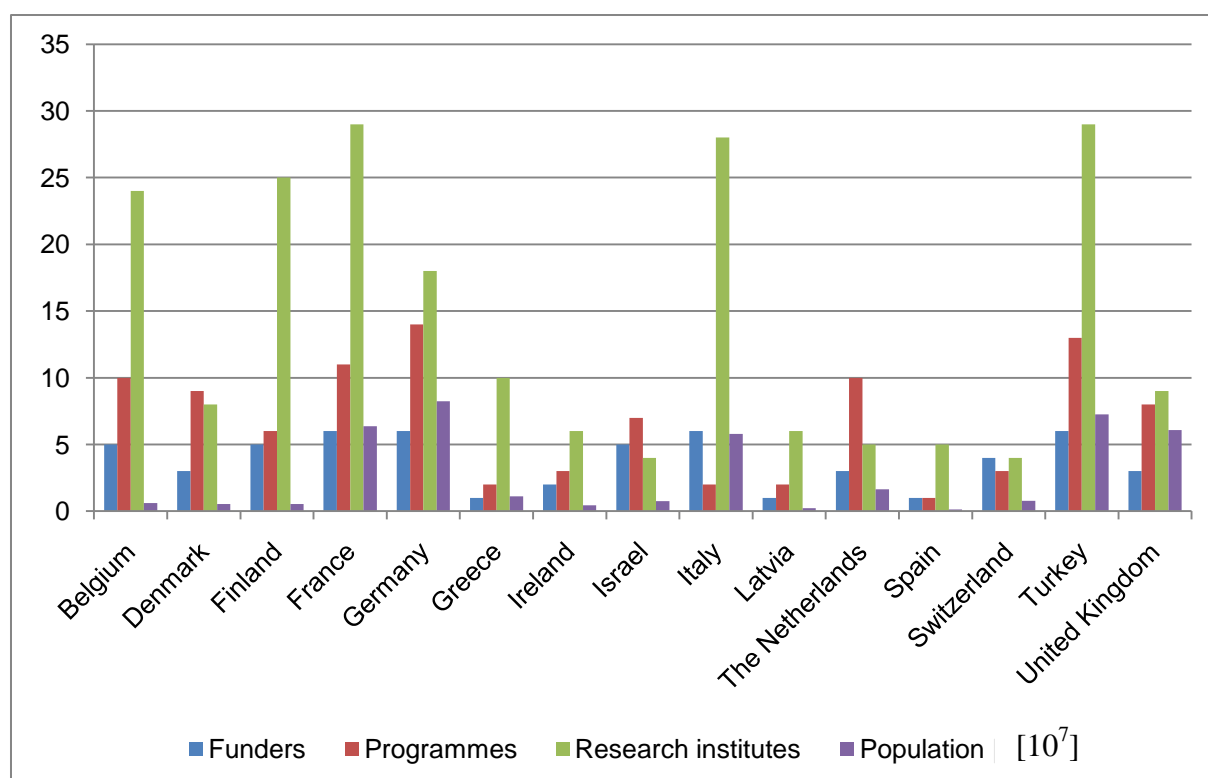


Figure 2. Number of funding organisations, research programmes and research institutes relevant for ICT-AGRI, and population by country or region.

In addition to funding organisations and research programmes, 210 research institutes in the field of ICT-AGRI have been described in this country report. In general, the number of research institutes within a country or region was positively correlated with the amount of funders in that region ($r = 0.75$, Fig. 3).

When analysing the different research institutes, it must be noted that a large diversity exists between different countries or regions as well as within countries or regions. First, the nature of the research institute can differ from private to public or governmental. Further, large differences can be found in the size of the research institutes. Yet, no relation was found between the size of the research institutes and their relevance for ICT-AGRI. For example, the research groups working in the field of ICT-AGRI in a large research institute are smaller than a moderate research institute totally dedicated to ICT and robotics in agriculture. Finally, a difference was found in the interpretation of “research in the field of ICT-AGRI”. For most of the research institutes the term must be interpreted in the strict sense, namely the use of ICT and robotics in agriculture. Nevertheless, a small part of the mapped research institutes are specialised in ICT or robotics in other application areas than agriculture. The large number of mapped research institutes, together with the large variety between them, makes this country report a good reference book and interesting tool to find partners in different countries. Based on the described research expertise, research facilities and research priorities, it is possible to identify other research institutes working in the same research area or complementary research.

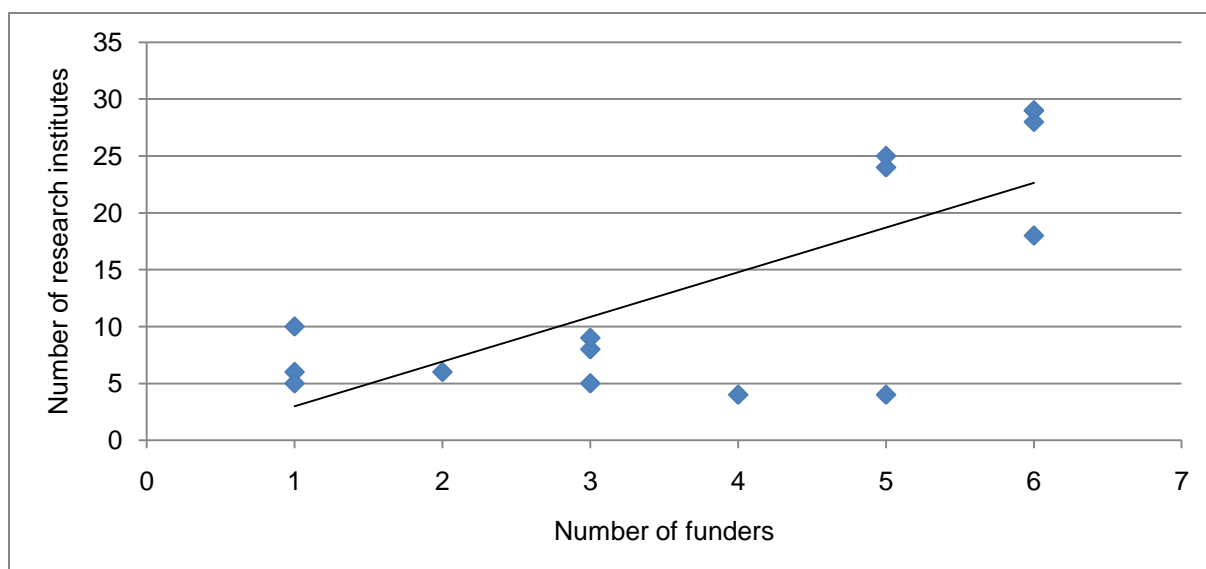


Figure 3. Relation between the number of funding organisations and the number of research institutes mapped in this country report.

ICT-AGRI relevant topics

For each programme that was entered by the national contact point, the ICT-AGRI relevant topics were checked. Five different topics were suggested in the database, namely

- **ICT applications** to be used in primary agricultural or horticultural production, including online resources
- **Automated or semi-automated machinery**, equipment for primary agricultural or horticultural production
- **Standardisation of data dictionaries and communication protocols** for use in primary agricultural or horticultural production
- **ICT and automation in environmental regulation** of primary agricultural or horticultural production
- **Effects of ICT and automation on competitiveness, profitability, and environmental impacts** of agricultural or horticultural production
- **Business structures in sale and support** of ICT and automated machinery in agricultural or horticultural production

At least one of these topics had to be present in the research programmes included in this country report. Several or all topics might be present in the research programmes.

The topic most covered by all mapped research programmes was “*ICT application to be used in primary agriculture or horticultural production, including online resources*” (Fig. 4). The second most covered topic was “*Automated or semi-automated machinery, equipment for primary agricultural or horticultural production*”. In contrast, fewer programmes are available for research on the topic “*Business structures in sale and support of ICT and automated machinery in agricultural or horticultural production*”. The latter might be explained by the fact that this kind of research is mainly funded by industry itself.

In light of these results, it can be stated that fewer programmes focus on “*Standardisation of data dictionaries and communication protocols for use in primary agricultural or horticultural production*”, “*ICT and automation in environmental regulation of primary agricultural or horticultural production*” and “*Effects of ICT and automation on competitiveness, profitability, and environmental impacts of agricultural or horticultural production*”. This suggests that programme owners found these topics less important. However, in this mapping, each research programme was counted as “one” and no weight was attributed to the different programmes in terms of amount of research projects or amount of money. Moreover, the resulting frequencies of topics need to be compared with the research needs of the different stakeholders.

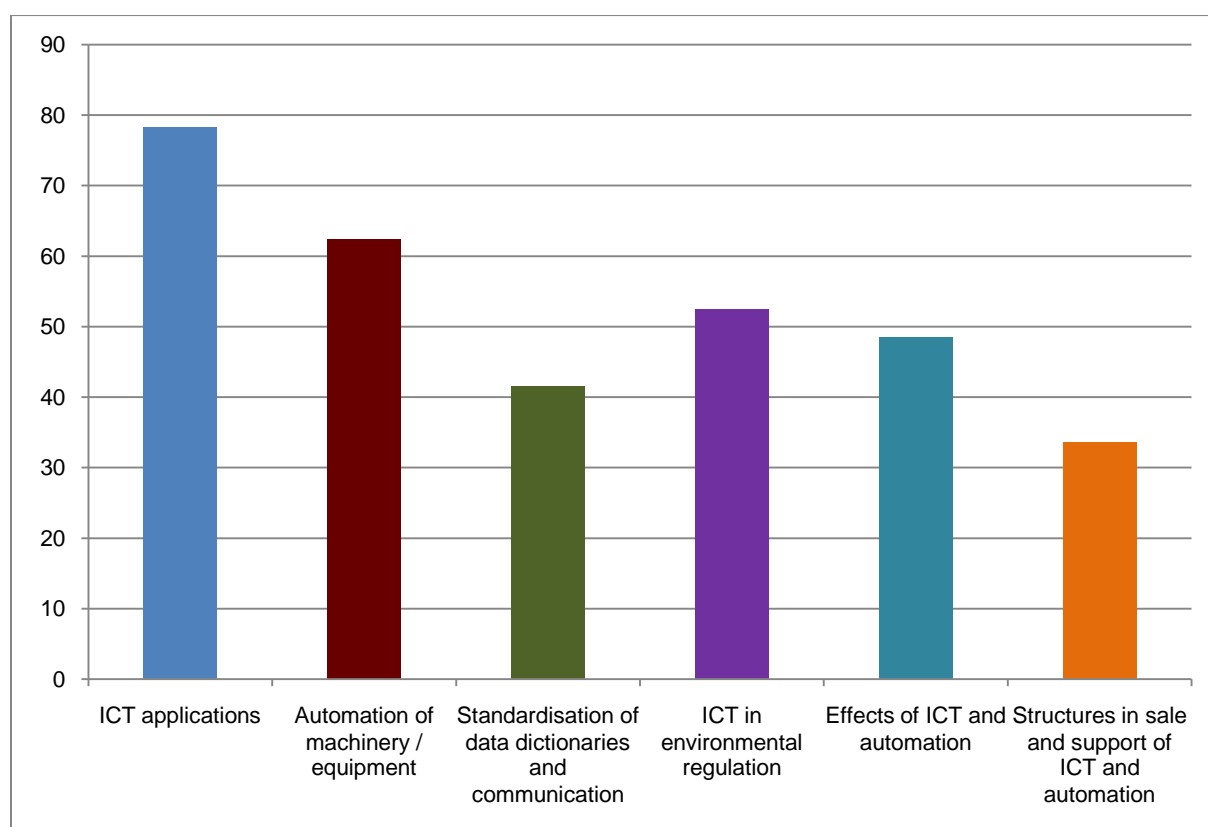


Figure 4. The frequency of the ICT-AGRI relevant topics present in the mapped research programmes.

Further analysis of these data reveals some important differences in the frequency of topics between the different countries and regions (Fig. 5). Some examples:

- The main focus of ICT application in Ireland and the UK is related to the development of “*automated or semi-automated machinery and equipment for primary agricultural or horticultural production*”. Similarly, Israel and Latvia have a focus on “*ICT applications for use in primary agriculture/horticulture production, including on-line resources*”.
- Although in general the topic “*ICT and automation in environmental regulation of primary agricultural or horticultural production*” is less covered (Fig. 4), in Germany, Greece, Latvia and Switzerland this topic was the most frequent.

For France “*Business structures in sale and support of ICT and automated machinery in agricultural or horticultural production*” was the most frequent.

- Almost no differences between frequencies of topics were found for Belgium and Spain.

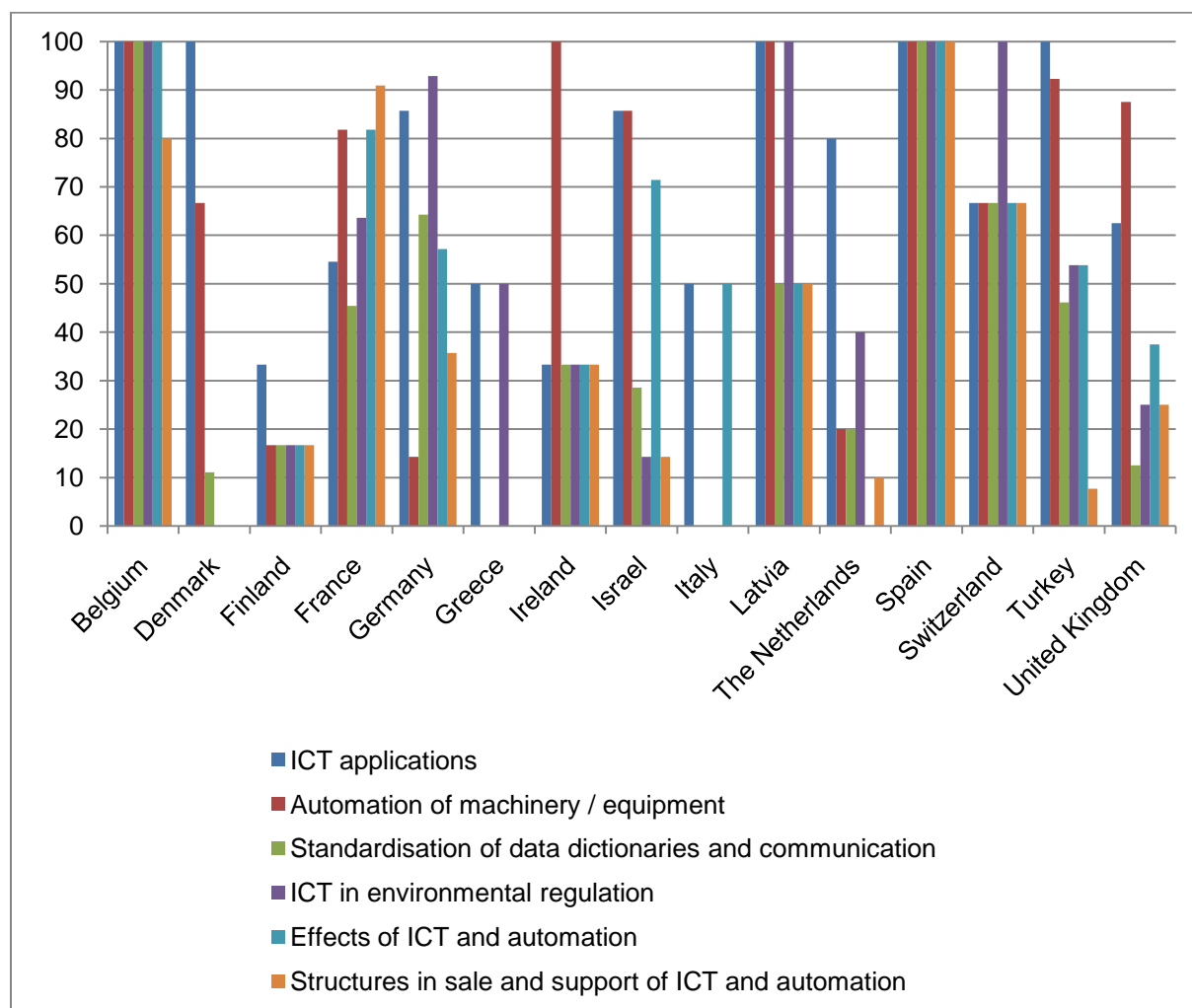


Figure 5. The frequency of ICT-AGRI relevant topics present in the mapped research programmes.

Again, these figures must be interpreted with care. The topics may not have been explicitly present in the programmes as formulated in this report; the choices made by the editor are made on an interpretation of the call text in the programmes. This text may be more or less explicit, and in some cases only one or two topics are possible and in other cases all topics are possible. Fig. 5 clearly shows differences between countries in this respect. However, there seems also to be substantial differences in the importance the national programmes have attributed to the topics.

Geographic scope

The geographic scope determines for which geographic regions the funding is available. For each programme, the geographic scope was investigated. Five options were available: regional, national, trans-national, international and EU scope.

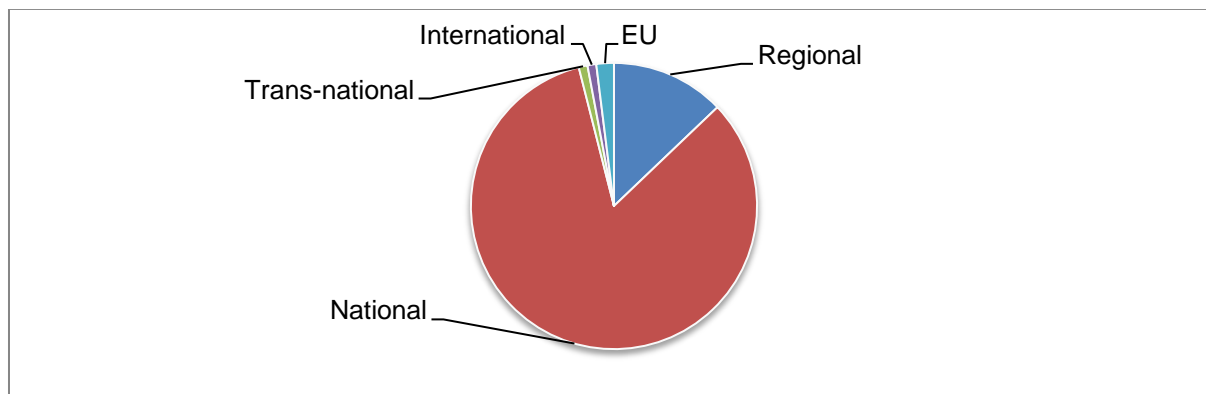


Figure 6. Geographic scopes of the mapped research programmes.

Fig. 6 gives an overview of the results. By far, most programmes were “national” or “regional”. Trans-national, international and EU programmes were found in France, Turkey and Germany, respectively (data not shown).

Participation of research institutes

For each research programme, the possibility for research institutes to participate (Fig. 7) was recorded.

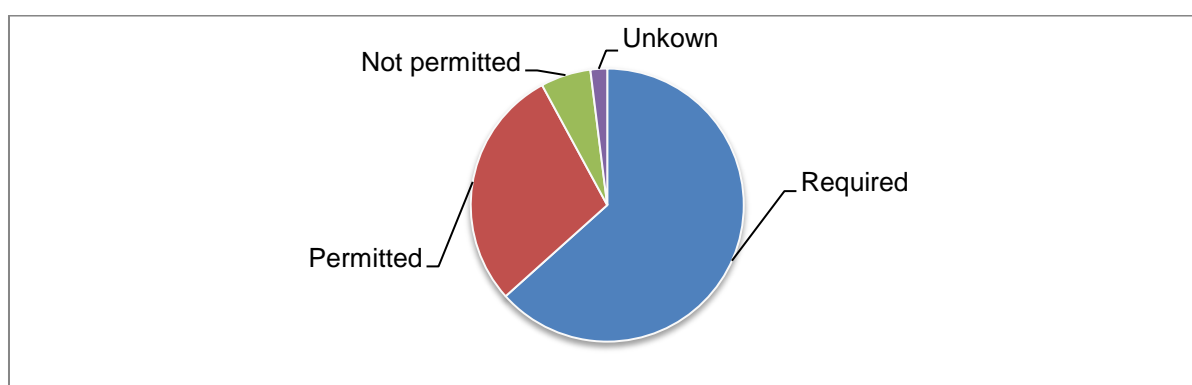


Figure 7. The possibilities for research institutes to participate in the mapped research programmes.

In general, the participation of a research institute was required by more than 60% of the mapped research programmes. The participation of a research institute was obligatory for all programmes in France, Germany and Latvia (Fig. 8).

In 29% of the research programmes, participation of research institutes was permitted, but not obligatory (Fig. 7). This was the case for all Spanish and Greek research programmes (Fig. 8).

Programmes for which the participation of research institutes was not permitted were only found in The Netherlands and Turkey (Figure 8).

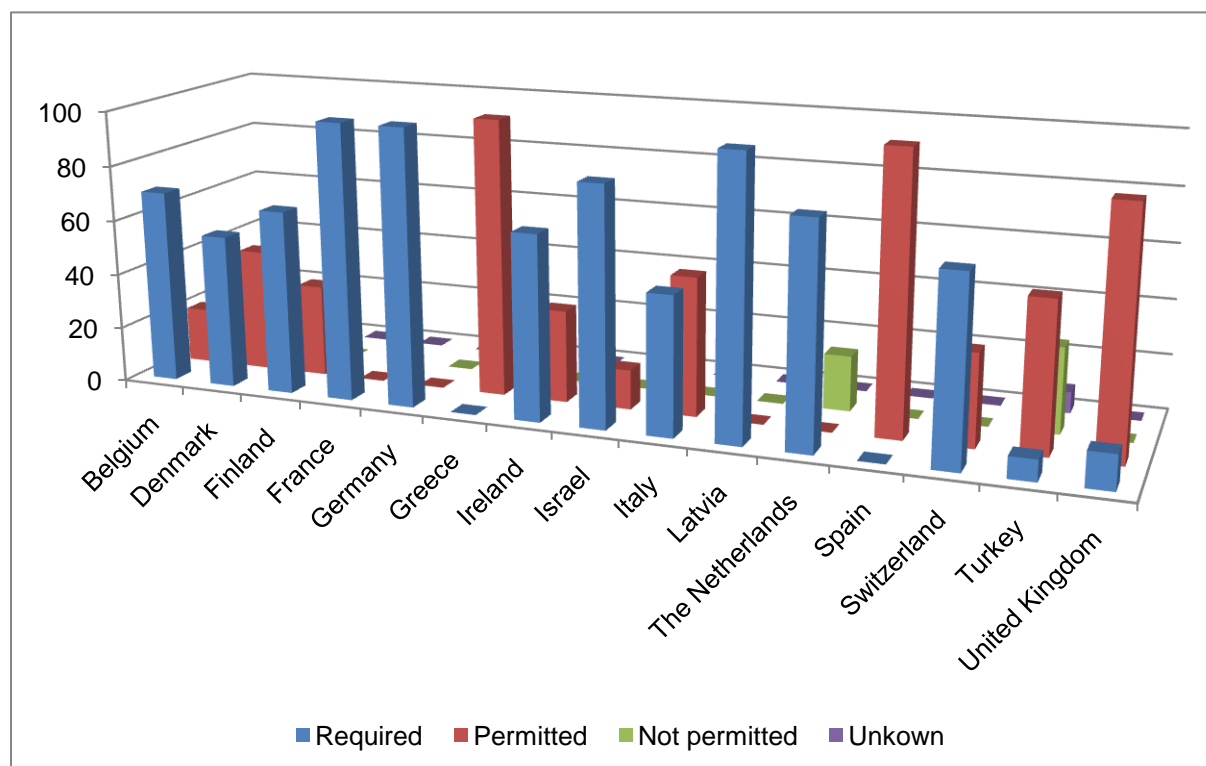


Figure 8. The possibilities for research institutes to participate in research programmes by country or region (%).

Participation of industry

Fig. 9 gives an overview on how the participation of industry is regulated in the research programs in general, whereas Fig. 10 gives the participation of industry for each mapped country or region. Three possibilities were possible: required, permitted, and not permitted. "Unknown" was possible when the role of the industrial partners was not clearly described.

In more than 50% of the research programmes the participation of industry was required. More specifically, this was the case for all described research in Germany and Spain. Obligatory participation of industry was not found in for research programmes of Greece, Ireland and Italy (Fig. 10).

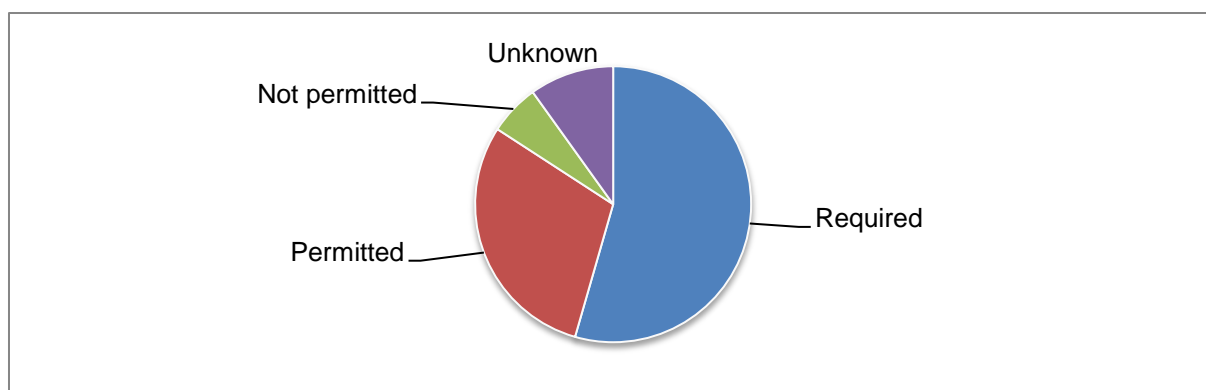


Figure 9. The possibilities for industry to participate in the mapped research programmes.

In 30% of the research programmes, this participation of industry was possible (Fig. 9). Only in a minority of the research programmes was participation of industry not possible. In Latvia participation of industry was not possible (Fig. 10).

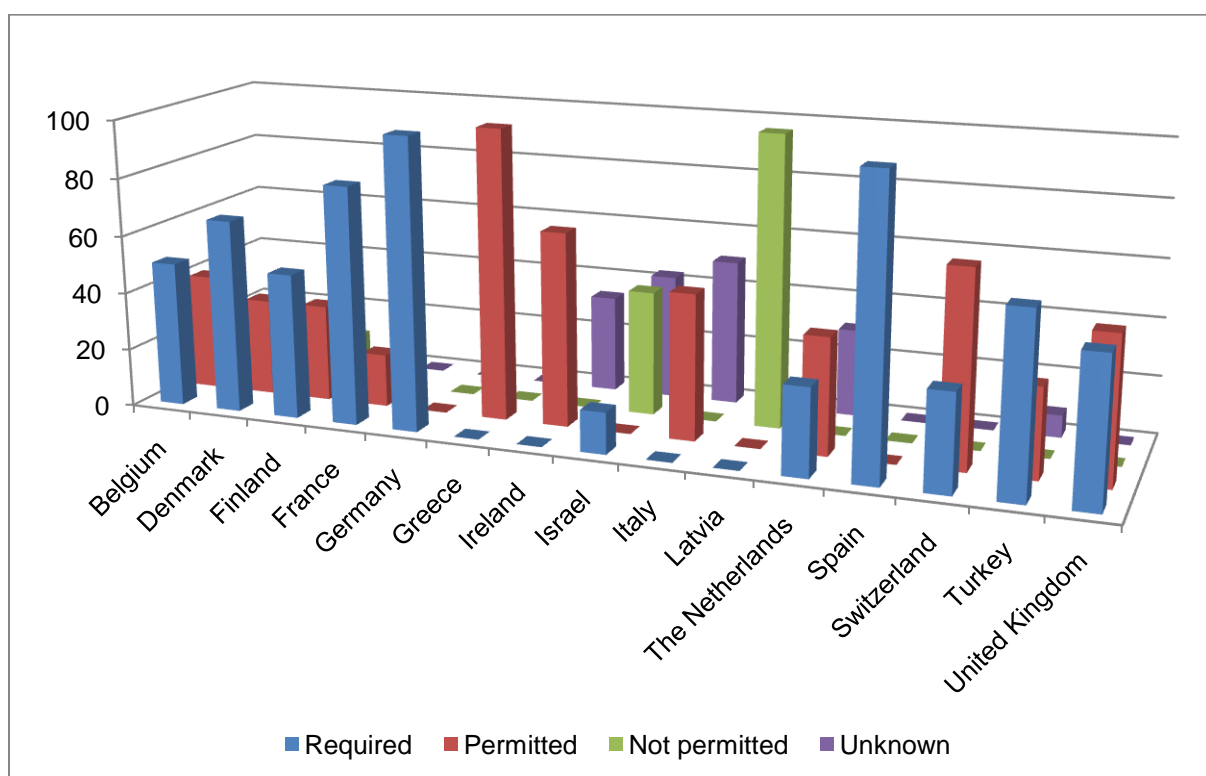


Figure 10. The possibilities for industry to participate in research programmes in the different countries or regions (%).

Conclusion

The country report gives a useful overview of the funding structure, the funding organisations and the research programmes related to ICT and automation in agriculture and agri-environment in Europe.

It is remarkable that the national research programmes included in this report are almost exclusively reserved for national organisations. Participation by industry is allowed in the majority of the research programmes, but a great deal of variation exists between countries.

The country report includes 210 research institutes relevant to the ICT-AGRI research area, which makes this book a useful tool to find partners with the same competences or complementary competences. Consequently, this book contributes to the general goal of ICT-AGRI, namely to strengthen the trans-national research in the field of ICT and robotics in agriculture.

Nevertheless, the country report also has some important limitations. The mapping for this country report was finalised by the end of 2010. Consequently, this book represents a status quo at that time. Research programmes are changing to keep pace with national and European gaps and needs and variation in the economic situation.

The mapping behind the country report was only a first small step of the whole mapping process. The mapped information in this step was limited and the results presented in this country report are mainly descriptive. During the next mapping step, done via the *ICT-AGRI Meta Knowledge Base*, more specific information about research projects and profiles of researchers and research organisations will be mapped. The result will be a more clear overview of the current strengths and gaps in the research area of ICT and robotics in agriculture and agri-environment. The work carried out for the country report formed the basis for the development of the Meta Knowledge Base.