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## ICT and Robotics in Agriculture and the Related Industries – a European Approach

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### Purpose

A Collaborative Working Group (CWG) under the Standing Committee for Agricultural Research (SCAR) has been formed to raise awareness on the research and development within the area of ICT and Robotics and to advise the European Commission. The CWG will assist in putting this field of research on the agenda in a European context as well as creating consensus among the most important stakeholders. This is done through dialogue and increased member state collaboration achieving synergy and creating optimal conditions for further development.

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### Assessing the Use of ICT & Robotics for Agriculture in Europe

The vision of the collaborative working group in ICT and Robotics is to shape and focus the research and development in ICT and robotics for the agriculture and related industries and provide a basis for member state collaboration. The working group brings together existing networks, achieves critical mass, and provides optimal conditions for the European work in ICT and robots for agriculture and related industries.

#### Why ICT and Robotics for Agriculture?

There is a growing worldwide need for the development of innovative technologies applicable for biological systems according to the global demand for food, food quality, and the increasing awareness of the impact of agriculture on animal

welfare and environment. This is accompanied by a significant potential in supporting the competitiveness of EU agriculture and related industries through mobilising research and innovation efforts on ICT and robotic technology.

New EU policies on traceability, food safety, agri-environmental and rural development have renewed the interest in ICT and robotics research as a solution to an efficient implementation of these policies. The policies are reflected in a demand by European agriculture and related industries for technological solutions: Solutions that can accommodate policy demands and provide competitive advantages in a market where increased consumer demands and environmental focus are on the agenda. There is a significant potential in supporting the technological development by mobilising research and innovative efforts on ICT and robot technology within the EU. The challenge is to support the emergence of biosystems management technologies capable of meeting environmental and ethical



requirements while promoting efficiency and a healthy work environment. Biosystems management technologies that can e.g. enhance the surveillance of crop and animals thereby optimising the quality and output or technologies that can minimize the effect from animal waste - odour, gas emissions, leaching etc. - through a more efficient and precise handling of the resource. The knowledge bases that exist in the implicated research areas will through a closer cooperation and

coordination be able to achieve a synergy that can create new innovative solutions in the applied research and production of the sector. The added value will be created through inter-professional network and the large growth potential of SMEs that can develop high-technological solutions in the cross field between biology and engineering, an area where the EU has the potential to take the lead.

## Benefits Expected from Joint Agricultural Research

The fundamental technologies play an increasingly important role in European national strategic research priorities and should be expected to do so in FP7 as well. There is a considerable scope for increasing member state collaboration and many reasons for doing so, including:

- Agriculture and the food industry in the member states face largely the same problems, and often initiate research and development in ICT and robotics independently of each other to solve these problems. The member states can benefit from collaboration in R&D and by **using each other's results**.
- Increasing demands for **traceability** are a threat to the free trade of food products in Europe, unless common solutions can ensure an efficient use of ICT and robotics in the exchange of products between member states.
- **Legislation** related to agricultural subsidies, environmental regulation, traceability, food safety, etc. is largely enacted at the EU level and efficient support of these policies requires coordinated research on ICT support.
- The costs of research and development in the field of knowledge intensive ICT and robotics are very high. There is a considerable scope for improving the **R&D efficiency** by cooperation between member states.
- Different expertise, research data and research facilities exist in different countries so international collaboration would allow an **integrated approach** to R&D issues.
- **Increasing the market presence** through collaboration between member states will provide improved opportunities for profitable R&D in agricultural ICT and robotics.
- National funding of R&D in agricultural ICT and robotics are often insufficient and difficult to obtain. However, an increased international collaboration may **well stimulate national funding** as well.
- EU agricultural machinery development is under pressure from producers outside the EU and there is a need for renewed European focus on the **next generation robotics** solutions that support key EU policies.

- ICT and robotics will ensure the productivity and **minimize the negative environmental impact** of the sector

## Agricultural Research at EU Level

The Standing Committee for Agricultural Research – SCAR - was established by the regulation (EEC) No. 1728/74 of the Council of 27 June 1974 on the coordination of agricultural research. SCAR advises the Commission in the field of the coordination of research in agriculture. SCAR management was in the middle of 2004 transferred to the European Commission DG (Directorate General) Research and a new more flexible SCAR was introduced to enable better cooperation and coordination in view of the European Research area within the agriculture sector.

## Towards a Knowledge-based Bio-Economy

The working group of SCAR proposed 11 themes for collaborative working groups - CWGs. Denmark is represented in 9 of the collaborative working groups – and coordinator of one: the CWG for ICT and Robotics in Agriculture and related Industries. Below is a list of the established CWGs for targeted actions:

- ICT and robotics in agriculture
- Utilisation of renewable raw materials for industry
- Sustainable livestock production from grasslands
- Mediterranean agriculture
- Agricultural and sustainable development
- Animal health
- Ecological networks and corridors
- Ecology for ecosystems & natural resources
- Development of sustainable agriculture in Baltic Sea Region
- Advanced Technologies for Climatic Control of Greenhouses and Livestock Housing
- Human alimentation & nutrition

The aim of the CWGs is to implement a Common Research Agenda in Europe in the field of agricultural research – where the term agricultural research is understood in a broad sense encompassing the so called ‘fork-to-farm’ concept, emphasising research for sustainable agriculture, and including biodiversity and rural development., thereby

addressing topics within a concept of a “the knowledge based

bio-economy”.

## Focus area – ICT and Robotics

The area of the CWG is specified in the figure below. The work area comprises the areas of agriculture and food processing industry until the retail part of the food chain. The group is at present in the state of mapping the national research programmes, generic knowledge and projects within the area, and formulating the R&D themes on ICT and robotics in agriculture and related industries within the next decade. The work will help to focus the group and its future effort.

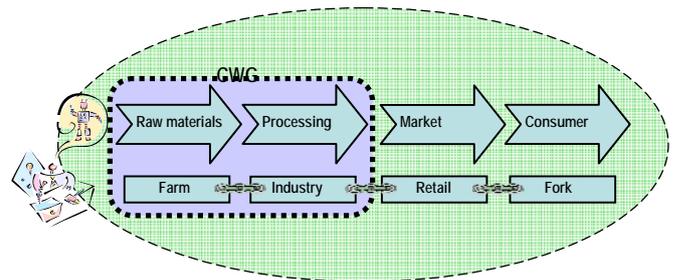
### Members

Presently 18 representatives have joined the CWGs. Their members come from 11 nationalities in the EU and associated countries, 8 countries of which have

contributed to the preliminary mapping of the R&D in the area.

Experts from Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Sweden and Switzerland form the basis of the group.

ICT and Robots in Agriculture and related Industries



## Mapping Research programmes

The national research programmes within the area of ICT and robotics in agriculture and related industries are very broad and often found within either agricultural or horticultural research programmes or more high technology or ICT-focused programmes. The national research programmes and strategies need to be examined more closely in order to step up the cooperation and coordination of research activities carried out at national level in the Member States and Associated States through the networking of research activities conducted at national level, and the mutual opening of national research programmes,.

### Projects on ICT & Robotics

The different national projects are mainly found within the area of ICT and concern areas as traceability, precision farming incl. positioning, data collection, and registration. There are fewer projects concerning robots and sensors. The

robot technology projects are primarily on guidance and control issues. Sensor projects are divided into projects with the aim of reducing the use of pesticides or improving the indoor climate of livestock buildings.

### More Generic Knowledge Needed

There are a great number of institutes that takes part in the knowledge within the area. What can be seen from the mapping is that the knowledge is very much dispersed on a national scale, and it is not possible to come to any conclusion based on the present material about the extend and importance of collaboration between institutes. Further studies should be undertaken to cover the entire European R&D stakeholders within the area – and the collaboration between them. To include a higher degree of industry driven R&D in the CWG the industrial stakeholders and organisations need to be examined and involved to a much more direct and greater extent than they are today.

## Future Themes

Following themes and their objectives are the result of a process in the SCAR Collaborative Working Group within ICT and Robotics in Agriculture and related Industries:

### Agricultural Product Quality Sensing and Documentation

The objectives of the theme are to include the whole production chain, managing and tracking, from raw materials to final products and the optimisation of logistics aspects and management, thereby increasing the value of the products by sorting out qualities that consumers ask for as well as to assure food safety.

## **Agricultural Information, Communication and Management Systems**

The objectives are to foster the creation of open and flexible software architecture based on emerging large scale distributed internet technologies. The software architecture will facilitate the integration of the results provided by the studies in many disciplines including technology development for short-range wireless networks and RFID or MEMS utilizing RF technology, micro-sensing, high frequency technology, networks, human interaction technologies and media.

### **Precision Livestock Farming**

The objectives are to integrate biological knowledge into ICT and robotics to survey individual animals or groups and use this information for management and decision support. Further objectives are the development of welfare promoting production principles in animal husbandry, e.g. through the use of new technologies for feed, milking, reproduction control and health surveillance.

### **Precision Crop Farming**

The objective is to optimise in- and output for each sub area of the field to increase the total efficiency as well as eliminating or reducing the negative effects and impact on the environment thus increasing competitiveness for the agricultural crop production in the EU.

### **Monitoring Agricultural Environment**

The main objective is to monitor the agriculture environment by identifying the most important factors effecting the environment, i.e. greenhouse gases, dust, pesticides, climate,

as well as finding and developing measures taken to eliminate or reduce this negative impact.

### **Automated Agricultural Machinery**

The objective is to address some of the key challenges in automation of agricultural equipment and to support the introduction of robotics in the agricultural domain. Autonomous robotic equipment that will reduce the environmental impact, increase precision and efficiency, and allow care and management of crops in new ways. The work will address the development of robotic systems that can handle the complex, dynamic and semi natural environment encountered in agriculture.

### **Future Initiatives for Food Safety and Sustainable Development**

ICT and robotics are prerequisites for food safety and a sustainable development of future farming and the related industries, and the CWG activities will continue to support the overarching objective to increase coordination of national agricultural research programmes through the following sub-objectives:

- information exchange and best practice
- common strategic issues
- joint activities
- joint/common calls

The research funding organizations and providers of the collaborative working group agree that an **ERA-Net** provides a potential coordination instrument for joint activities and joint/common calls within the focus areas, but there are also promising possibilities in the work within **Technology Platforms and Common Research Projects**.

## **Sources and References**

For any further information concerning the group please refer to Dr. Svend Christensen at [Svend.Christensen@agrsci.dk](mailto:Svend.Christensen@agrsci.dk)

Or take a look at the SCAR net homepage:  
[http://ec.europa.eu/research/agriculture/scar/index\\_en.cfm](http://ec.europa.eu/research/agriculture/scar/index_en.cfm)

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**About the EFMN:** Policy Professionals dealing with RTD, Innovation and Economic Development increasingly recognize a need to base decisions on broadly based participative processes of deliberation and consultation with stakeholders. One of the most important tools they apply is FORESIGHT. The EFMN or European Foresight Monitoring Network supports policy professionals by monitoring and analyzing Foresight activities in the European Union, its neighbours and the world. The EFMN helps those involved in policy development to stay up to date on current practice in Foresight. It helps them to tap into a network of know-how and experience on issues related to the day to day design, management and execution of Foresight and Foresight related processes.

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