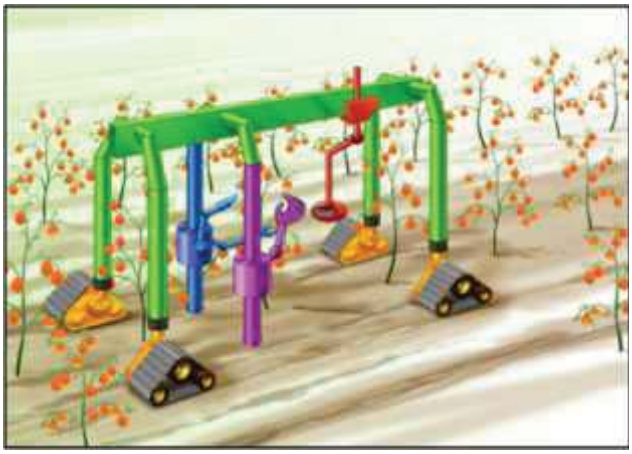
EU funded research - collated by David Tinker

Agricultural Engineering and Technologies, AET, is a group that lobbies to have agricultural engineering topics included in research calls, particularly those of the FP7 research programme. AET is chaired by Prof Peter Pickel of John Deere, and himself the leader of an FP7 project 2ndVegOil (http://2ndvegoil.eu). Although the discussions and talks included very many acronyms that have to be slowly absorbed there were two talks that I thought were technically interesting and would interest EurAgEng members. In July 2010 there was an FP7 research call on *Automation and robotics for sustainable crop and forestry management*. You may remember, or even have been involved in one of the 19 proposals that were submitted. Two proposals were successfully funded, have started now and gave presentations at the AET workshop.

CROPS, Clever Robots for Crops, will develop scientific know-how for a highly configurable, modular and clever carrier platform that includes modular parallel manipulators and intelligent tools (sensors, algorithms, sprayers, grippers) that can be easily installed onto the carrier and are capable of adapting to new tasks and conditions. Several technological demonstrators will be developed for high value crops like greenhouse vegetables, fruits in orchards, and grapes for premium wines.

The CROPS robotic platform will be capable of site-specific spraying (targets spray only towards foliage and selective targets) and selective harvesting of fruit (detects the fruit, determines its ripeness, moves towards the fruit, grasps it and softly detaches it).

Artist's impressions of two CROPS harvesting robots

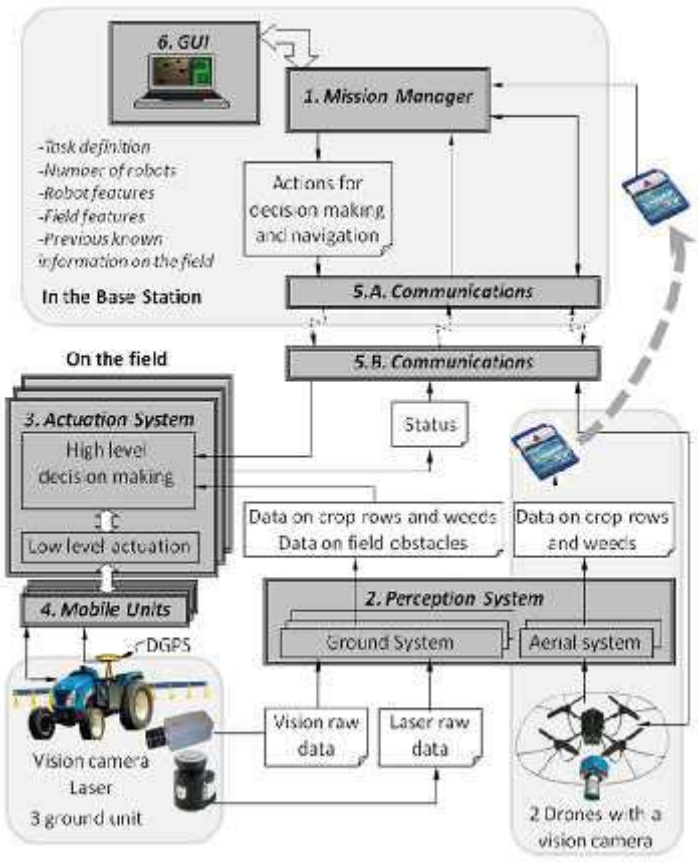


Another objective of CROPS is to develop techniques for reliable detection and classification of obstacles and other objects to enable successful autonomous navigation and operation in plantations and forests. The agricultural and forestry applications share many research areas, primarily regarding sensing and learning capabilities.

Coordinated by Wageningen UR from The Netherlands the project includes nine universities and research organisations with four commercial companies participating.

At the CROPS website www.crops-robots.eu there is plenty more information for dissemination including project workshop presentations on Sensing and Mechanical Design, and Horticultural Engineering.

The second project **RHEA**, Robot Fleets for Highly Effective Agriculture and Forestry Management, is devoted to the application of Precision Agriculture techniques. RHEA is focused on the design, development, and testing of a new generation of automatic and robotic systems for both chemical and physical effective weed management in agriculture, covering narrow and wide row crops and woody perennials. Coordinated by the Spanish Center for Automation and Robotices (UPM-CSIC) the consortium of 15 organisations has a mix of commercial and research organisations with expertise in robotics, agronomy, perception and action, manufacture of agricultural equipment and use by operators.



RHEA System Breakdown

RHEA RobotFleet

Two main scenarios are to be considered for robotic pest management. In annual crops, aerial units will periodically inspect fields for problems and this data will enable site-specific treatments with computer programs designed for the decision-making process. Weed control with chemical, mechanical or thermal weeding will depend on efficacy, profitability and environmental effects.

Routing, for both individual, autonomous, ground units and of the fleet, will be planned and coordinated for maximum effective weed control, minimal crop damage and optimal cost/benefit relationships. Aerial units will continue to monitor the fleet.

The second scenario will focus on insect and disease control in woody crops (agricultural or forestry) with chemical application based on different types of air-blast sprayers controlled by sensors.

To achieve these goals, numerous innovations will be required: from vision systems, actuation systems, communication systems and location as well as user interfaces.

Equipment will include aerial units based on improved quadrotors with monitoring cameras. Weed maps will be generated and provided to a fleet of autonomous medium-size sprayers. These vehicles, with GPS systems and innovative chemical injection systems will enable variable rate spatially controlled application of appropriate herbicides. In maize, a wide row-crop, aerial scouting will provide basic information on weed patches but actual weed detection will be conducted with cameras on the vehicle. This information will be provided online to a mixed, mechanical-thermal actuation system including non-selective weed control between rows and more selective intra-row control.

In olive and forestry crops two types of applicators will be tried. In olives, RHEA will use a lateral "Octopus Sprayer" with control of diffuser inclination and airflow by sensors. In forestry applications the plan is to use the "Cannon Boom" type of applicator with a single diffuser and a series of nozzles using a telescopic vertical pipe for height control and variable inclination.

AGREE, Agriculture and Energy Efficiency, is a networking type project which has just been awarded and includes several partners with links to EurAgEng and ENGAGE. Energy efficiency in agriculture, except for use in greenhouses, has received little attention so far but it is considerable, especially when indirect energy is considered. The objective of AGREE is to show the potentials for short term and long term energy efficiency gains. AGREE has brought in partners covering south-eastern, south-western, north-eastern and north-western agricultural production systems. Evidence at country level will be brought together at the transnational level to identify an agenda for transnational collaboration to understand energy use efficiency. AGREE will link up with ENGAGE (and EurAgEng) to help implement the results and it also has links with the Collaborative Working Group on Agriculture and Energy and into SCAR.

Expect to see more information on AGREE via EurAgEng publications, the website and at AgEng conferences over the next few years as the project progresses. See http://cordis.europa.eu/search/index.cfm?fuseaction=proj.document&PJ_LANG=EN&PJ_RCN=12258280&pid=4&q=7696F5B889BB15C113B3512D7F576954&type=sim

The Future

Although it is always useful to understand the acronyms, inter-relationships and complexities of the EC funded research and innovation programmes, it is more important to be aware that such programmes exist and to network with other research and commercial organisations so that when a suitable call comes along there is a potential consortium that has ideas for a project. It is almost certain that someone will have an understanding of the general framework and we at EurAgEng do try to let members know about research calls promptly when they are announced. At the AET workshop we were told that a second call for the ERA-Net ICT-Agri (Google ICT-Agri) will be published early in 2012. We'll have details about the call in the EurAgEng Email Update when we hear. The first call was very popular with 44 proposals leading to seven funded projects.

The EurAgEng Email Update, Newsletter, AgEng Conferences and the EurAgEng website will have items of project news, calls for proposals whether in ICT-Agri ERA-NET, FP7 (and FP8 which is to be called "Horizon 2020") and events such as AET Workshops, partners brokerage and conferences and seminars.

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- **En-bloc membership**
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- **Affiliate membership**
  Organisations may become affiliate members of EurAgEng and enjoy the same benefits as en-bloc members. The fee depends on the size of the organisation but can be as little as €150 per year.

For more information on membership visit www.eurageng.eu/membership or contact the Secretary General secgen@eurageng.eu