

Walloon Agricultural Research Centre  
*Scientific Excellence and Social Usefulness*

# ACTIVITY REPORT 2007|2008



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# ACTIVITY REPORT 2007 2008



## Foreword

This 2007-2008 Report is the last time the research work of the seven Departments and two Units of the CRA-W created by the 1995-1996 restructuring at federal level will be presented in this form.

CRA-W is to have a new structure in accordance with the Regional Government Order of 17 July 2008. It will henceforth comprise four scientific departments and one Common Services department.

As in the case of the previous biennial report, the 2007-2008 report does not aim to cover all the Centre's activities, but instead follows a structured, transverse approach to a set of research topics. This has the advantage of providing clearer, broader-based information about CRA-W's multidisciplinary activities and highlighting the Centre's successful research.

Many new agreements have got under way or been initiated during the two-year period 2007-2008. CRA-W is currently coordinating and taking part in numerous regional, national and international research projects. CRA-W can thus be proud of the effort made in-house to get research projects going with own funding, using the resources made available by allowance of the deduction at source granted to research institutions.

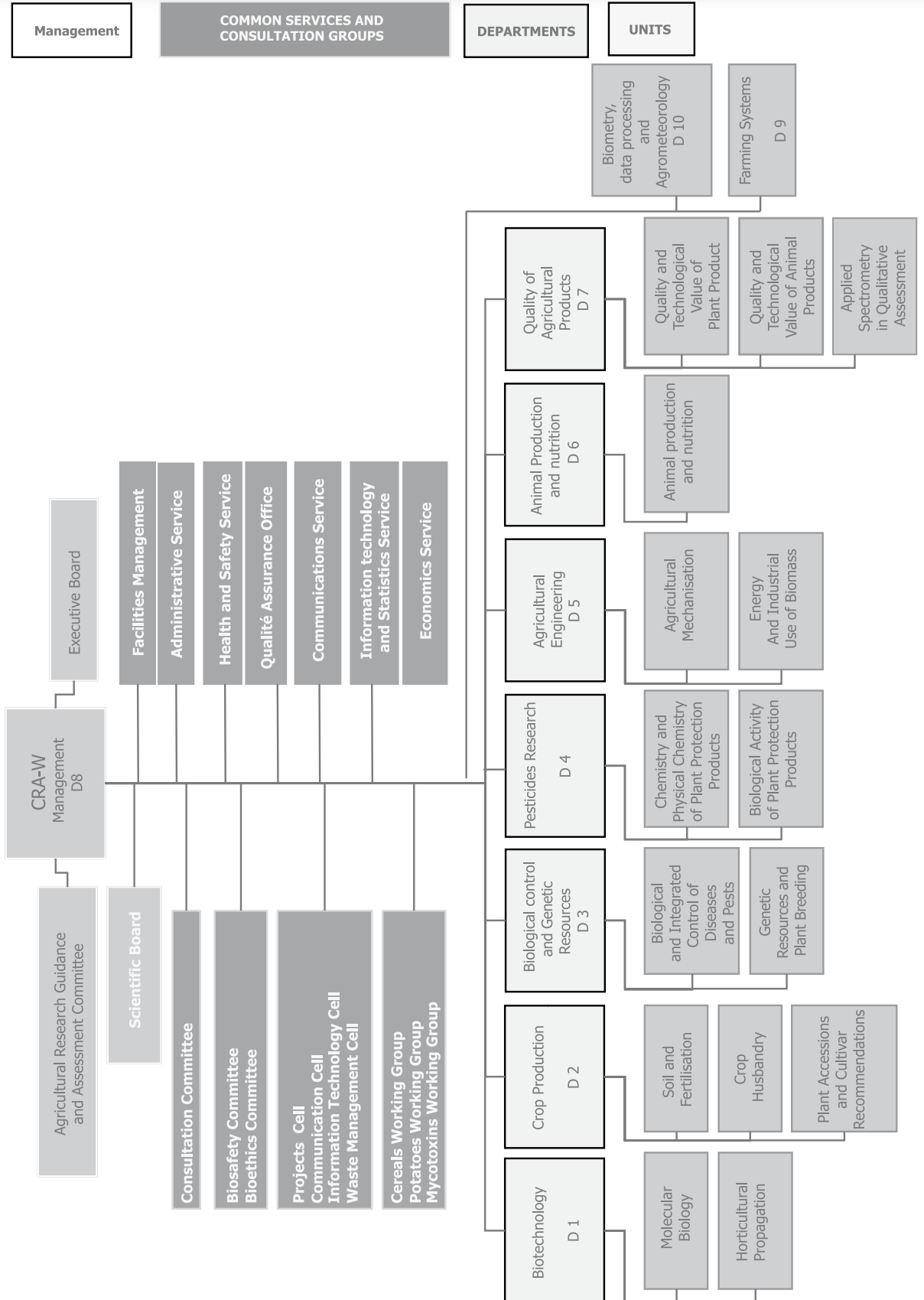
Following approval by the supervising Minister, four projects were started in 2008. Each of these projects, of three to four years' duration, was selected following submission of an application in accordance with strict criteria. These include the scientific and innovative nature of the research, its interdisciplinary nature, and presentation of deliverables in the form of doctorates and publications.

This Report is proof that, despite the various challenges that recent years have brought (regionalisation, creation of the public body, reorganisation following the audit and, now, restructuring), CRA-W continues to pursue its twin aims of scientific excellence and social usefulness.

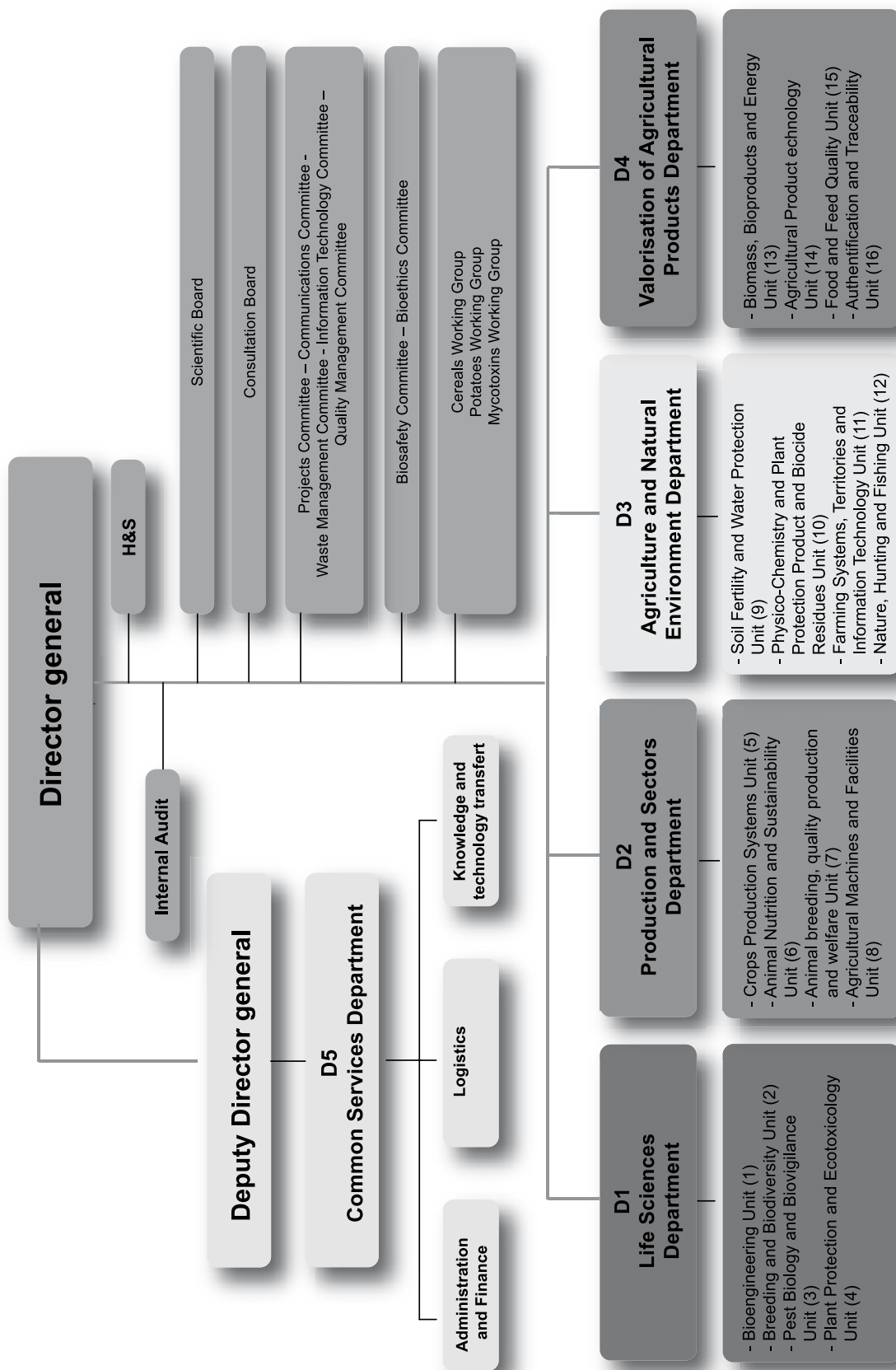
The future will no doubt hold fresh challenges for CRA-W. The new structure, and the synergies thus engendered, will enable the Centre to continue to perform its tasks of carrying out fundamental and applied research and undertaking related service activities.

**P. Meeùs**  
Director General

# Organigramme 2007-2008



## Organisation Chart from 1 January 2010



# Make-up of decision-making bodies

## **CRA-W Scientific Board**

### **Président :**

P. Meeùs, Director General, Walloon Agricultural Research Centre

### **Members :**

J.J. Claustrioux, Lecturer, Gembloux Agricultural University

H. Maraite, Lecturer, Faculty of Biological, Agricultural and Environmental Engineering, Louvain-La-Neuve Catholic University

P. Leroy, Lecturer, Faculty of Veterinary Medicine, University of Liège

## **College of Heads of Department**

### **Président :**

P. Meeùs, Directeur général f.f. du Centre wallon de Recherches agronomiques

### **Members :**

R. Piscaglia, Assistant Director General, Walloon Agricultural Research Centre

B. Watillon, General Scientific Inspector (Biotechnology Department)

M. Frankinet, General Scientific Inspector (Crop Production Department)

M. Cavelier, General Scientific Inspector (Control and Plant Genetic Resources Department)

M. Galoux, General Scientific Inspector (Pesticide Research Department)

M. Deproft, Scientific Director (Pesticide Research Department)

Y. Schenkel, General Scientific Inspector (Agricultural Engineering Department)

N. Bartiaux-Thill, General Scientific Inspector (Animal Production and Nutrition Department)

P. Dardenne, General Scientific Inspector (Quality of Agricultural Products Department)

R. Oger, General Scientific Inspector (Biometry, Data Management and Agrometeorology Unit)

D. Stilmant, General Scientific Inspector (Farming Systems Unit)

## **Agricultural Research Guidance and Assessment Committee (Decree of 3 July 2003)**

### **Président :**

P. Leroy, Lecturer, Faculty of Veterinary Medicine, University of Liège

### **Vice-President:**

J.P. Champagne, General Secretary of the Walloon Agricultural Federation

### **Members :**

J.J. Claustrioux, Lecturer, Gembloux Agricultural University

H. Maraite, Lecturer, Faculty of Biological, Agricultural and Environmental Engineering, Louvain-La-Neuve Catholic University

B. Godden, Lecturer, Faculty of Agriculture, Free University of Brussels

P. Lekeux, Lecturer, Faculty of Veterinary Medicine, University of Liège

P. Meeùs, Director General, Walloon Agricultural Research Centre

R. Piscaglia, Assistant Director General, Walloon Agricultural Research Centre

V. Thomas, Director General, Department of Agriculture

M.F. Closset, Department of Agriculture

A. Petre and P. Baré, representing professional organisations in agriculture

G. Guiot, Consumer Organisation Research and Information Centre

A. Reul and C. Le Borne, representing the processing industry

# Use of funds from allowance of the deduction at source granted to research institutions (Moerman Act)

## Interdisciplinary research topics

In the context of the Research lever of the Moerman Act, since 2008 CRA-W has been working on four projects based on innovative topics involving several research departments.

### **PESTEAUX: Development of a geographical information system, at plot scale, for assessment of the water pollution risk from pesticide use**

**Partners:** Three CRA-W departments and FUSAGx

The novelty of this system is that it will generate maps enabling the risks of diffuse transfer of plant protection products to water resources to be identified at plot level. Plots will be classified according to the potential contamination risk they present to water. This risk will be assessed from a study of three 'layers' of information: anthropic pressure, plot characteristics and climate. A risk value will be assigned to each plot on the basis of a decision-making grid taking into account the key factors of these information layers and their relative significance. This plot-based classification will enable at-risk areas to be mapped and plots of farm land which on their own could cause wider-scale pollution to be targeted. This system can be used in many ways to predict, assess and explain pollution risks. Potential users will therefore be Wallonia's public administration, federal public services (Public Health), etc.

### **BIOETHA2 : Contribution to development of the second generation bioethanol production sector**

**Partners:** Five CRA-W departments and SEED-ULg

The efficiency of biofuel production from energy plants is less than 50% if only the parts of the plant rich in oils and/or carbohydrates are used. An alternative is to utilise the whole plant, with the aim of achieving nearly 70% efficiency. As well as creating benchmarks in terms of crops and the eco-balances of energy plants such as Miscanthus, switchgrass and energy maize and developing a methodology for hydrolysis and characterisation of their cell walls, this project will use the methods provided by prospective analysis and multicriteria analysis to describe the future role of these second generation biofuel crops in Wallonia.

### **MIMOSA: Analysis of methods for integrating multi-sensor modelling and satellite information techniques into decision support systems**

**Partners:** Three CRA-W departments and two UCL units

The many challenges facing agriculture and farm of tomorrow are such that they increasingly require the setting up and use of decision support systems that favour integrated crop management at farm or territory level. Ideally, such tools should be based on a number of information sources including satellite imagery, which has become an essential component. Taking into account recent improvements in earth observation at both technical (spatial, temporal and spectral resolution) and methodological level (image analysis, modelling, etc.), the MIMOSA project has three main aims:

(i) To improve forage area monitoring capacity by integrating grassland growth data supplied by a multi-sensor, multi-model approach into the OptiMAE decision support system developed by CRA-W.

(ii) To identify the decision-making rules, in terms of forage resource management on grazing farms, and implement them in the OptiMAE model to facilitate grassland management and to quantify and qualify available winter supplies.

(iii) To link satellite information with the nitrogen status of potato and winter wheat crops and to integrate it into decision support systems studied at CRA-W and applied in Wallonia for crop nitrogen fertilisation management.

### **POMINNO: Research into rapid selection methods for new apple varieties of differentiated quality suitable for sustainable agriculture**

**Partners:** Three CRA-W departments, FUSAGx and INRA

Belgium's apple market is dominated by six varieties (Jonagold and its mutants account for 70% of the market). This makes apples more susceptible to diseases, especially scab. Research indicates that using varieties less susceptible to disease is the only way to cut down the costs in connection with plant protection products. Fruit growers must be offered new commercial varieties for renewal and diversification of the present range of varieties. One aim of the project is to innovate in the selection of new resistance genes in parents and their progeny using molecular biology techniques for identification. New rapid, non-destructive methods could also be developed (spectroscopy, chromatography, etc.). A further aim of the project is to develop the health aspects of the apple (antioxidant, Vitamin C, specific sugars, etc.) by selecting dietary and nutritional properties, promoting them and integrating them into new commercial concepts.



# Acronyms and Abbreviations

<b>ACF</b>	Automatic concentrate feeder	<b>FIWAP</b>	Wallon potato industry organisation (Filière wallonne de la pomme de terre)
<b>AEM</b>	Agri-environmental measures	<b>FLPLW</b>	Wallonia's Dairy and Dairy Products Sector
<b>AFSCA/</b>	Federal Agency for the Safety of the Food Chain (Agence	<b>FPW</b>	Wallon pork industry organisation (Filière porcine wallonne)
<b>FASFC</b>	fédérale pour la sécurité de la chaîne alimentaire)	<b>FUNDP</b>	Notre Dame de la Paix University, Namur, Belgium (Facultés Universitaires Notre Dame de la Paix, Namur)
<b>AWE</b>	Wallon Breeding Association (Association wallonne de l'élevage)	<b>FUSAGx</b>	Gembloux Agricultural University
<b>AWEX</b>	Wallon Export Agency	<b>FVBW</b>	Wallonia Beef Promotion Board
<b>BaMMV</b>	Barley Mild Mosaic Virus	<b>GC</b>	Gas chromatography
<b>BEPN</b>	Province of Namur Economic Agency (Bureau économique de la province de Namur)	<b>GEP</b>	Good experimental practice
<b>CAF</b>	Civil Service Self-Assessment Framework	<b>GIS</b>	Geographic Information Systems
<b>CAP</b>	Common Agricultural Policy	<b>GLP</b>	Good Laboratory Practice
<b>CARAH</b>	Province of Hainaut Applied Agricultural Research Centre (Centre agronomique de recherches appliquées de la province de Hainaut, asbl)	<b>GMO</b>	Genetically modified organism(s)
<b>CBD</b>	Convention on Biodiversity	<b>H&amp;S</b>	In-house Health & Safety Department (Service interne de prévention et de protection)
<b>CEB</b>	Biological Testing Centre (Centre d'essais biologiques, asbl)	<b>HDAC</b>	Human histone deacetylases
<b>CEHW</b>	Horticultural Testing Centre (Centre d'essais horticoles, asbl)	<b>HPLC</b>	High performance liquid chromatography
<b>CEN TC</b>	Technical Committees of the European Committee for Standardisation	<b>ILVO</b>	Instituut voor Landbouw and Visserij Onderzoek
<b>CER</b>	Centre for Rural Economics (Centre d'économie rurale, Marloie, Belgium)	<b>INRA</b>	National Agricultural Research Institute (Institut national de la recherche agronomique, France)
<b>CFGC-W</b>	Wallonia Field Crops Promotion Board (Conseil filière grandes cultures)	<b>IRMM</b>	Institute of Reference Materials and Measurements
<b>CFHO-W</b>	Wallonia Ornamental Horticulture Promotion Board	<b>ISO</b>	International Organization for Standardization
<b>CFPDT-W</b>	Wallonia Potato Promotion Board	<b>ISP</b>	Public Administration Institute (Institut de service public)
<b>CFWPHC</b>	Wallonia Edible Horticultural Product Promotion Board	<b>ISR</b>	Induced systemic resistance
<b>CIPAC</b>	Collaborative International Pesticides Analytical Council	<b>JMPS</b>	Joint Meeting on Pesticide Specifications
<b>CIRAD</b>	Centre for International Cooperation in Agronomical Research for Development, France (Centre de Coopération internationale en Recherche agronomique pour le Développement)	<b>MBM</b>	Meat and bone meal
<b>COLEACP</b>	Europe-Africa-Caribbean-Pacific Liaison Committee (Comité de Liaison Europe-Afrique- Caraïbes-Pacifique)	<b>MS</b>	Mass spectrometry
<b>CPP</b>	Potato Pilot Centre (Centre pilote pomme de terre, asbl)	<b>NIR</b>	Near infrared
<b>CRA-CIN</b>	Centro per la Ricerca in Agricoltura	<b>NIRS</b>	Near Infrared Spectroscopy
<b>CRL</b>	Community Reference Laboratory	<b>NRL</b>	National Reference Laboratory
<b>CRL-AP</b>	Community Reference Laboratory for Animal Proteins	<b>OCF</b>	Ovine Catarrhal Fever
<b>CRRG</b>	Regional Genetic Resources Centre (Centre régional de ressources génétiques)	<b>OEB</b>	Rumen-degradable protein balance (ontbestendige eiwit balans)
<b>DG</b>	Directorate-General (Direction générale)	<b>OECD</b>	Organisation for Economic Cooperation and Development
<b>DGA</b>	Department of Agriculture, Regional Government of Wallonia (former name) [Direction générale de l'Agriculture, Ministère de la Région wallonne (ancienne dénomination)]	<b>PBRP</b>	Pesticide and Biocide Reduction Plan
<b>DGARNE</b>	Department of Agriculture, Natural Resources and the Environment, Public Administration of Wallonia (Direction générale de l'Agriculture, des Ressources naturelles et de l'Environnement, Service public de Wallonie)	<b>PCR</b>	Polymerase Chain Reaction
<b>DGRNE</b>	Department of Natural Resources and the Environment, Regional Government of Wallonia (former name) [Direction générale des Ressources naturelles et de l'Environnement, Ministère de la Région wallonne (ancienne dénomination)]	<b>PPP</b>	Plant protection product
<b>EC-ERDF</b>	European Regional Development Fund	<b>PUFA</b>	Polyunsaturated fatty acids
<b>ECPRG</b>	European Cooperative Programme for Plant Genetic Resources	<b>PVY</b>	Potato Virus Y
<b>EFSA</b>	European Food Safety Authority	<b>QA</b>	Quality Assurance Department
<b>ELISA</b>	Enzyme-Linked Immunosorbent Assay	<b>QTL</b>	Quantitative Trait Loci
<b>ENGL</b>	European network of GMO detection laboratories	<b>REQUASUD</b>	Réseau wallon qualité sud asbl
<b>EPPO</b>	European and Mediterranean Plant Protection Organization	<b>RGF</b>	Fruit tree genetic resources (Ressources génétiques fruitières)
<b>ERDF</b>	European Regional Development Fund	<b>RTBF</b>	French-speaking Belgian public TV channel (Radio Télévision Belge de la Communauté française)
<b>ETCC</b>	Estimated tank cell count	<b>RW</b>	Regional Government of Wallonia
<b>EU</b>	European Union	<b>SFP</b>	Federal pesticide reduction plan (Plan fédéral de réduction des pesticides)
<b>FAO</b>	Food and Agriculture Organization of the United Nations	<b>SPGE</b>	Public Water Management Board (Société Publique de Gestion de l'eau)
<b>FIWAP</b>	Wallonia Goat and Sheep Promotion Board	<b>SPW</b>	Public administration of Wallonia
		<b>THC</b>	Tetrahydrocannabinol
		<b>UCL</b>	Leuven Catholic University
		<b>UG</b>	University of Ghent (Universiteit Gent), Belgium
		<b>ULB</b>	Free University of Brussels, Belgium
		<b>ULG</b>	University of Liège, Belgium
		<b>UPLC</b>	Ultra Performance Liquid Chromatography
		<b>WHO</b>	World Health Organization
		<b>WHOPES</b>	WHO Pesticides Evaluation Scheme

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The General Management coordinates the CRA-W's activities and scientific work. Among other things it is responsible for administrative, financial and technical management. The General Management is assisted in its work by a number of organisations, notably:

> **The Quality Assurance (QA) Office** sets up and maintains quality systems based on ISO 17025 standards and/or GLP (Good Laboratory Practice) throughout CRA-W. Staff training and development are organised by the QA Department (in coordination with the Regional Government of Wallonia Training Department) and play an important role in CRA-W's quality initiatives. Moreover, the CAF model of civil service self-assessment is applied to continuous improvement of the overall operation of CRA-W.

> **Legal Service, Human Resources, Accounts and Financial Management**

> **Communications Service**

> **The Health & Safety (H&S) Service** looks after the safety and health of workers while at work (Welfare at Work Act of 4 August 1996 and Royal Decrees of 27 March 1998 on health and safety at work).

> **The Working Groups** (Mycotoxins, Cereals, Rape, Potatoes, etc.) bring together the experts concerned in order to coordinate the research undertaken by the different departments and units within CRA-W on cross-disciplinary topics in liaison with the General Management

> **The Cells** (Projects, Communications, Waste Management) perform a cross-disciplinary think tank and consultancy role.

# Biotechnology Department

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The work of the Biotechnology Department centres around the deployment of biotechnology tools and is thus inevitably linked with the main social concerns facing agriculture today. Our choice of topic areas clearly shows the central role played by biotechnologies in issues such as protecting and enhancing biodiversity, making agriculture increasingly environmentally friendly, establishing production sectors for quality material, innovation to ensure the competitiveness of economic players, and improving food and human health. Founded on sound scientific and technological bases, the biotechnologies are now constantly widening their field of application and thus form one of the pillars of the "knowledge-based economy" which alone can support the long-term growth of Europe's economy and the welfare of its citizens.

This situation, full of hopes and opportunities for the future, at the same time presents a twofold challenge for our Department's scientific team: along with the need to maintain and develop our expertise there is also, more than ever, the need to put that expertise to work and to exploit new opportunities for the benefit of society as a whole.

#### Creating, safeguarding and using plant genetic diversity

The biomolecular tools developed at our laboratories permit the analysis and quantification of genetic diversity, the starter material for the breeder. Meanwhile, in vitro tissue culture techniques enable valuable genotypes to be safeguarded and new ones with improved characteristics to be produced.

#### Contribution to the development of environmentally friendly agriculture

A biochemical and molecular understanding of pathogens and their attack mechanisms leads to selection of more resistant varieties and environmentally friendly control methods, the bases of sustainable agriculture.

#### Establishing quality production sectors in Wallonia

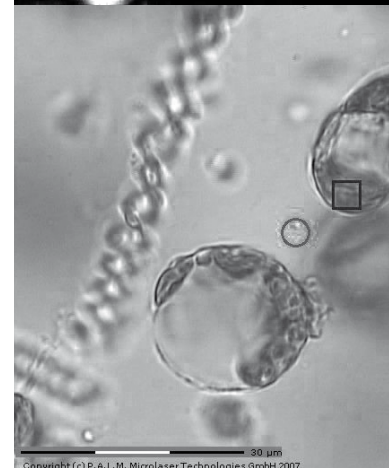
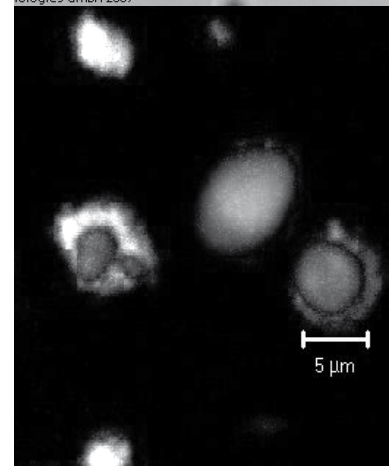
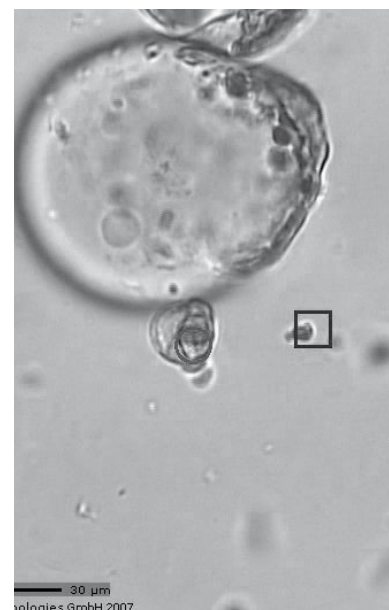
The results of our work contribute to the production and supply of healthy, quality controlled material as the prerequisites for the development of integrated sectors oriented to quality within the various branches of Wallonia's agriculture and horticulture.

#### Industrial innovation and entrepreneurial competitiveness

Conducted in partnership with private-sector economic players, our research into mass propagation of species with a high commercial potential results in the development of innovative, efficient tools that can be developed commercially.

#### Genomic approaches to food and human health

Systematic study of the fundamental life processes (the organisation and expression of genomes) leads to greater control both of agricultural production processes and of food products.



# Crop Production Department

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WAUWERMANS Joseph

## Asbl Conseil Filière Grandes cultures (CFGC-W)

**DANTAS PEREIRA Silvina,**  
**Project manager**

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THIRIONET Julie

The overall aim of the research undertaken by the Crop Production Department is to provide agricultural producers with benchmarks and decision support tools to give them a satisfactory level of income and ensure a product quality that meets the applicable standards and market requirements.

The research also takes account of current concerns in terms of preserving and improving soil fertility and environmentally friendly practices.

The expertise developed in the course of this research enables the Department to be a driving force both in product development (promotion boards, FIWAP, etc.) and in providing guidance and monitoring environmental legislation (European Directives, water, soil and air, sustainable management plan for nitrogen, etc.)

The experiments can be arranged under three main headings.

### **Managing the fertility of agricultural soils**

Long-term trials in the areas of organic and calcium amendments and the management of phosphorus and potassium fertilisation are aimed at designing a managed fertilisation policy in order to balance the input-output budget and ensure optimum bioavailability of nutrients.

With regard to soil physical fertility, research is focussed on the quantitative assessment of the arable layer structure using the variability of certain physical properties. The interpretation of penetrometer data in terms of regularity of the cultural profile and homogeneity of the structure aims to quantify and understand the effects of cultural practices (tillage, soil improvement, cropping patterns and so on) on the soil structure and its impact on the growth and development of cultivated plants. The ultimate aim is to refine our advice to farmers on soil management.

### **Nitrogen fertilisation**

The experiments in progress are aimed at developing diagnostic and forecasting tools for soil nitrogen supply (through mineralization of organic material) and plant nitrogen status in order to refine crop fertilisation management (field crops, field vegetable crops and market gardening).

Specific research methodologies include the use of the  $^{15}\text{N}$  isotope technique, decision support models (projected nutrient balances, spreading strategies) and non-destructive diagnostic techniques for crop nitrogen

status (chlorophyllometry, reflection or absorption of specific wavelengths by the foliage, etc.). More recently, satellite data have been used to assess a crop's nitrogen status. The ultimate aim is to integrate these quick measurements of nitrogen status during the season with decision support systems based on strategies of split applications in order to match nitrogen demand and supply correctly.

### **General and special crop science**

The studies undertaken under this heading comprise research and development in the areas of cultural practices and harvested crop storage. These techniques are applied to crop rotation, cropping patterns and cropping methods specific to the species and varieties proposed by breeders. Trials with industrial hemp and crops to promote the use of biomass (in particular as a second generation fuel) got under way in 2007. The aim of this research is to offer farmers advice to enable them to derive maximum benefit from the latest technical and biological innovations.

Research has also been conducted into the creation and management of wildflower strips in order to acquire data for use by advisors in the context of agri-environmental measures.





# Control and Plant Genetic Resources Department

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The main lines of work of the Department centre around the concept of biodiversity, using on the one hand the genetic resources of both cultivated and wild plants and, on the other hand, the diversity of microorganism and arthropod populations, and wildlife. The Department therefore investigates how these living realms interact with each other in a changing environment, due to such things as changes in pedoclimatic factors, evolution of species or human activity.

The Department is structured into seven different laboratories or disciplines: virology, mycology, entomology, ecotoxicology, river- and stream-dependent pests, cereal breeding and fruit germplasm. In addition, together with its Flemish counterpart (ILVO), the Department forms the National Reference Laboratory (NRL) for plant diseases. Two Quality Systems are in place: the Ecotoxicology Laboratory studies the impact of pesticides on beneficial arthropods, under GLP accreditation, whereas the Mycology and Virology Laboratories are FASFC approved to carry out analyses to detect quarantine organisms under an ISO 17025 certificate (342 – TEST). The Mycology Laboratory is also ISO 17025 accredited for screening of wheat crops for deoxynivalenol. Outdoor trials are increasingly conducted in accordance with Good Experimental Practice (GEP).

**Health watch.** The Department is involved in monitoring and tracking pathogens and pests in fruit crops, fruit tree, forestry and ornamental nurseries, field crops (cereals, potatoes), hop fields and in natural, urban and forested environments. It also monitors and tracks indigenous insect populations and invasive species as well as monitoring and tracking insect carriers of animal diseases (bluetongue of sheep and cattle).

**Plant protection.** The Department's research areas comprise the detection, biology and epidemiology of undesirable organisms and the detection and dynamics of pest populations; development of prevention-based control techniques; polygenic resistance of cultivated plants; induced systemic resistance; use of beneficials; and integration of all the factors conducive to natural control of diseases and pests and contributing to sustainable management of plant protection, a perceptible reduction in the use of plant protection products and, ultimately, to establishing conditions in which more environmentally friendly agriculture can flourish.

## Safeguarding and developing agricultural biodiversity.

The Department is developing its expertise in the area of safeguarding and developing our fruit genetic heritage for scientific, educational and cultural purposes, by creating a network of conservation orchards, setting up phenotype and genotype databases and creating disease-resistant varieties with good taste and nutritional, dietary and health properties. The Department is also a breeder of cereals and the variety creation leader for spelt (*Triticum spelta*), a hardy cereal which is very competitive in growing areas with poor weather or soil conditions.

The intrinsic characteristics of the successful varieties originating in Gembloux permit diversification of agricultural produce, development of organic farming and creation of ecologically intact areas.

**Management of natural resources.** The Muskrat Trapping Department of the Regional Government of Wallonia, assisted by the Department, pursues a control strategy with the aim of keeping muskrat populations at the lowest possible level while limiting animal suffering and safeguarding non-target species. In connection with an integrated water management policy in the Walloon Region, the Department monitors the health of woody species that help to stabilise river banks and contributes to identifying alders resistant to *Phytophthora alni*. The inventory begun four years ago should contribute to the setting up of a forest health monitoring organisation, which the Walloon Region so far lacks.





# Pesticides Research Department

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Crop protection is experiencing a period of **instability** mainly due to:

- The effects of climate change on pest distribution and impact
- Society's demands for pesticide use to be slashed
- The recent withdrawal of many plant protection products (PPP)

Protecting crops with **less PPP use** requires complex strategies to be put in place, involving a detailed understanding of interactions between plants, pests, cultural practices, environmental factors and, if applicable, the PPP. The work of the Department is therefore increasingly **specialised**: recent research is concerned with precise issues of crop protection as a whole, and draws on very detailed knowledge of chemistry and life sciences.

**Understanding plant protection products (PPP)** remains a cornerstone of our activities. This involves:

- Chemical and physico-chemical characteristics of PPP and biocides
- Characterisation and quality of substrate and seed treatments
- Effectiveness and selectivity of PPP; resistance to PPP
- Evolution of PPP in agricultural produce and in water (residues)
- PPP regulations and practical implications

Our understanding of PPP comes from:

- Research undertaken on our own initiative and funded by the Regional Government grant
- Agreements concluded with public lenders or international organisations
- Work undertaken either at the request of applicants in the chemical industry in the context of registration or on behalf of public authorities or various bodies (Registration Committee, Regional Phyto Committee, Service public de Wallonie - SPW, SPGE, producers' organisations, etc.)

This knowledge is used to:

- Contribute to developing **reliable crop protection systems** in line with society's and the authorities' demands for less PPP use
- Establish **specifications** that are acknowledged and can be used at international level for PPP and biocides
- Carry out studies in connection with processing of **registration** applications
- Develop **tools** for use in studying PPP (analytical methods, methods for assessing effectiveness) in consultation with international organisations (EPPO, CIPAC)
- Develop and promote plant protection **decision support systems and arrange seminars for farmers and advizers**
- **Assist** regional, national and international authorities

The services provided by the Department comply with internationally recognized Quality Systems such as GLP, GEP and ISO 17025.

Building on its PPP activities, the Department has come to specialise in chemical and physico-chemical characterisation of biocides and has been appointed a WHO Collaborating Centre for quality control of pesticides used in public health.



# Agricultural Engineering Department

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The Agricultural Engineering Department's two areas of special expertise are, on the one hand, mechanisation and agricultural buildings (machines and tractors, application of plant protection products, fertilizers, field crops, animal husbandry, economics of mechanisation) and, on the other, the use of biomass for energy and in industry (collection, processing, energy, industry).

The Department's research and development work is conducted in accordance with scientific and technical procedures guaranteeing the quality and objectivity of the results. Such procedures comply with quality standards or directives (ISO 17025, ISO 9001, Good Experimental Practice) or follow a recognised scientific approach. The Department is thus involved in national and international expertise networks.

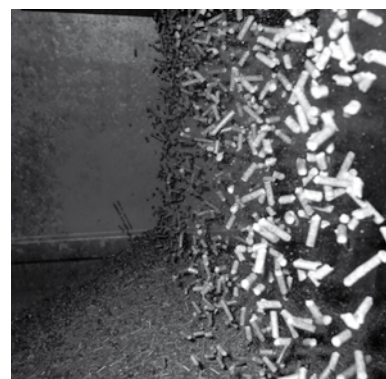
The Department's mission is through its research work to serve society by meeting society's expectations and future needs. First of all, this means that the staff of the Department must be in touch with society and social players, must understand these expectations and needs and, through its research and development activities, must play a part in fulfilling them. Various methods are used: meetings with farmers, businesses, professional associations and the authorities; analysis of political priorities (Contract for the Future of Wallonia, Declaration of Versailles, etc.); monitoring technological development (Internet, conferences, workshops, and so forth). Next, it has to be ensured that society effectively benefits from the results of the Department's research and development work, in the short term, medium term (applied research) and long term (fundamental research). Lastly, Department staff may be asked to provide advice and information or training at the request of other institutions, businesses or public-sector organisations; in this context, the Department is actively involved in scientific and technical expert networks at regional, national and international level.

Work under the heading of **agricultural mechanisation** covers four topics:

- Machines and tractors: performance, safety and economic and environmental optimisation (air, water, soil)
- Technical and environmental control of the application of inputs
- Agricultural infrastructure: development of storage facilities
- Water, pesticides and the environment

Work in connection with the **utilisation of biomass** focuses on three topics:

- Economic and environmental optimisation of the supply, processing and conversion into energy of solid biofuels
- Analysis and implementation of sectors for the sustainable use of biomass as energy and in industry
- Vegetable oil biorefineries and second generation biofuels



# Animal Production and Nutrition Department

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In an economic and regulatory context that restricts farmers' room for manoeuvre, apart from paying special attention to product quality and animal welfare, another priority is taking account of environmental aims with respect to feed and farm management (fossil fuels and water resources, biodiversity, greenhouse gases, etc.).

Our ultimate aim is to enable twenty-first century livestock farming to follow the path of sustainable development, meeting producers' economic and social demands and guaranteeing consumers healthy products as part of a balanced diet.

To meet these various expectations of the industry and society, the Department's activities are organised around the five subject areas described below.

#### **Nutrient digestion with a view to sustainability**

Being concerned with animal nutrition nowadays means developing feeding strategies for livestock (ruminants and monogastric animals) that meet the animals' nutritional needs (precision nitrogen feeding, for example) and health requirements (optimum growth, digestive well-being, especially at critical times, and lifespan), while controlling the environmental impact (mineral waste, greenhouse gas and acidifiers) and ensuring the economic sustainability of the recommended feeding method.

#### **Optimising the quality of animal products and fulfilling consumers' expectations**

Quality is a priority aim nowadays in animal production processes and is without a doubt a way of making our farms more competitive.

Our research aims, firstly, to study the impact of animal feed on the level of certain components of the animal products that are beneficial to human health, such as CLA-enriched cow's milk, and secondly to devise feeding strategies to improve the organoleptic quality (for instance, a diet supplemented with potato starch to avoid the boar taint encountered with entire male pigs) and the technological quality of the products (e.g. reducing the lipidic rendering of duck foie gras).

#### **Utilisation of local forage resources and agri-industrial co-products as animal feed**

Feed is a major component of the production cost. We strive to reduce costs, give farmers some degree of autonomy in animal feed management and widen the scope for more sustainable agriculture. We seek to do this by optimising the use of forage produced on the farm, improving traceability and ensuring judicious management of the plant-animal system and, lastly, by utilising agri-industrial co-products to make the relevant (food and non-food) sectors more competitive.

#### **Developing profitable, sustainable herd management methods**

The aim here is to make farmers aware of the scope for innovative products and to help them to continue to develop in a context of globalisation of markets and community constraints. It involves on the one hand experimenting with new herd management methods in order to diversify products activities (management of areas of high ecological value, for example) and, on the other hand, optimising herd management by means of proper record keeping, decision support tools and risk factor assessment.

#### **Animal welfare and behaviour**

Society's demands for greater farm animal welfare call for an ethical approach, linked to the sociocultural context, on the one hand (research into technical or other frames of reference relevant to consumers) and research into the conditions and factors that determine welfare, on the other. The impact on animal welfare therefore has to be assessed with regard to factors such as housing (group housing of pregnant sows with an electronic feed station) and social environment (calves' distress when separated from the mother at weaning, integration of heifers into a dairy cow herd before the first calving).

environment (calves' distress when separated from the mother at weaning, integration of heifers into a dairy cow herd before the first calving).



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The work of the Quality of Agricultural Products Department is mainly concerned with the **quality of raw materials and processed products** for animal or human consumption (feed and food). The **development of analytical methods** for determination of quality parameters, whether physical, chemical or microbiological, is a major focus of attention for the Department. At the same time, composition parameters such as proteins, fats, sugars, etc., are routinely determined to provide a reference for **scientific guidance to interprofessional organisations** or in order to build databases for use, in particular, in developing rapid spectrometry techniques. Through its work in analyses of this kind, the Department is part of the **national reference laboratory for milk and dairy products**.

Work in the area of product **traceability and authentication** has led to increased participation in some European programmes (FP6 TRACE <http://trace.eu.org/>) and is a cross-disciplinary topic for the different sections of the Department. This work covers a wide range of products (honey, beer, olive oil, beef). In this context the Department has also gained expertise in the development and maintenance of Websites and database management and use tools. Again in connection with traceability, the Department has used its analytical know-how in molecular biology to detect possible **wild transgenic rapeseed**. This research has shown that such genetically modified rapeseed does occur in the wild, though the origin is not always clear.

**Food safety** is another of the Department's research topics. This is essentially approached through research aimed at developing or refining efficient, innovative methods. In the field of **detection and quantification of genetically modified organisms (GMOs)** the Department is a member of the national reference laboratory for GMOs and is also a member of the European network of GMO detection laboratories (ENGL). The Department is involved in a European project studying GMO co-existence and traceability (<http://www.coextra.org/>) and a national project by SPF Public Health which is mainly concerned with unknown GMOs. The Department has also established itself as a leading European laboratory in the area of **detecting and identifying meat and bone meal in animal feed**. This led to its appointment as CRL – **Community Reference Laboratory** for the 2006-2011 period for the detection of animal proteins in animal feed (<http://crl.cra.wallonie.be>). Among the CRL's activities, special mention may be made of the building of a **micrography database** which is accessible via the CRL-AP intranet, as optical microscopy is still the official analytical method in this area. The CRL also has access to the results of research carried out in the framework of the European SAFEED-PAP (<http://safeedpap.feedsafety.org/>) project coordinated by the Department, which is devoted in particular to developing methods for identification of animal species from which transformed animal proteins originate. A more recent addition to this list of food safety topics is the research for alternative ways of detecting **botanical contaminants** likely to introduce **undesirable substances** (CONFIDENCE project <http://www.confidence.eu/>). In the area of mycotoxins the Department has developed multi-mycotoxin methods based on an ULPC-MS-MS method for cereal lot management at merchant level. This

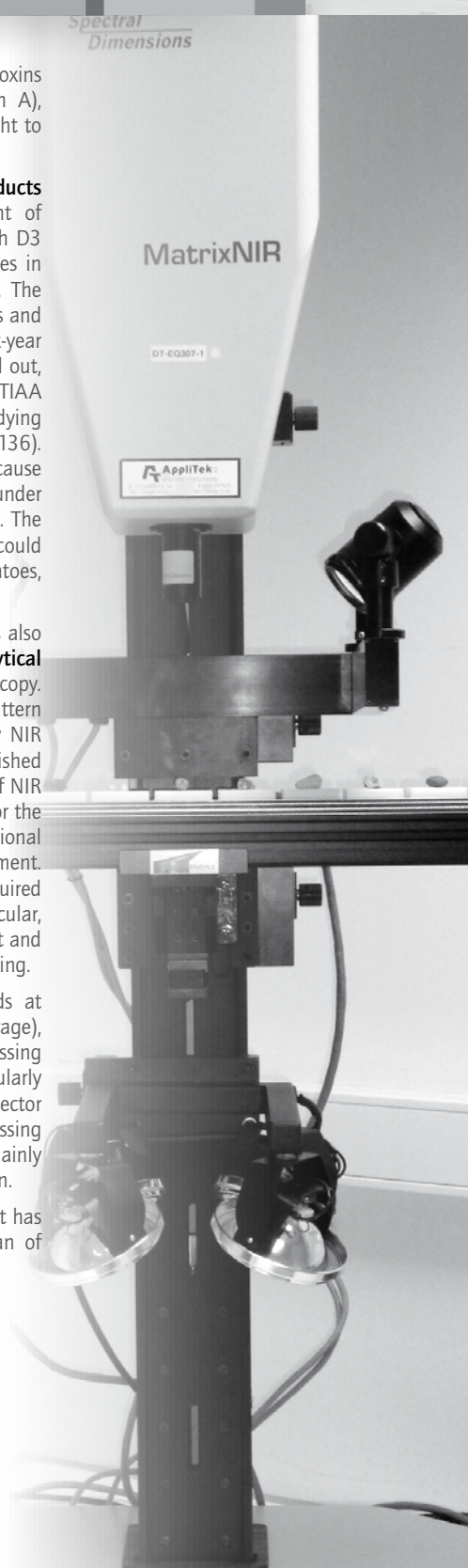
method has also revealed that, as well as the mycotoxins conventionally sought (deoxynivalenol, ochratoxin A), there are others, the 'hidden mycotoxins', that ought to be studied (such as glycosyl derivatives).

In terms of **enhancing the value of agricultural products** the Department contributes to the development of new wheat and spelt varieties (in cooperation with D3 and seed growers) and registration of new varieties in the national catalogue (in cooperation with D2). The suitability of wheat for milling/baking applications and starch glucose plants is part of our research. A six-year Department of Agriculture project has been carried out, in cooperation with the University of Gembloux (TIAA and Crop Husbandry Units), which involved studying the properties of wheat starch (project DGA D31-1136). Polyphenols are currently arousing great interest because of their antioxidant properties (Walnut-20 project under the Marshall Plan and Moerman Pominno project). The methods developed (UPLC, spectroscopic methods) could be useful for screening CRA-W's collections (potatoes, strawberries, apples, etc.).

The Quality of Agricultural Products Department is also active in **developing and validating rapid analytical methods** based on NIR, MIR and Raman spectroscopy. Examples include determination of the fatty acid pattern in dairy products by MIR and MBM detection by NIR microscopy. A methodology has also been established for transfer of databases between different types of NIR instruments. This enables us to market equations for the equipment concerned. Various national and international spectrometry networks are managed by the Department. Over a number of years the Department has acquired expertise in hyperspectral imaging applied, in particular, to single seed analysis and also in the development and refining of new algorithms for spectral data processing.

Online measurements by non-destructive methods at harvesting of plant products (cereals, maize, forage), during milking (MILKINIR project) or during processing (biomethanisation, seed crushing) are particularly studied to optimise the processes. The biofuels sector is an important area of work. This concerns processing wheat to obtain bioethanol, crushing of oilseeds (mainly rapeseed) and utilising biomass in biomethanisation.

Lastly, it should be mentioned that the Department has **BELAC ISO 17025 accreditation** for a wide span of activities involving all its laboratories.





# Farming systems Unit

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The Unit's brief is to develop research and support activities in fields connected with (1) breeding, maintenance, production and description of starter material for potato and fruit growing and (2) the development of ruminant farming systems in line with the expectations of society, the industry and the land in order to optimise their economic, environmental and social performance.

The aim pursued in both these areas of research is the development of efficient agriculture in a context of globalisation. To this end, our approaches aim to limit production costs by reducing inputs while optimising their use and the use of resources produced on the farm, or by exploiting the opportunities offered by highly specific niche markets, such as those linked to the development of a specific variety or those that promote a local area or production method.

### **Breeding and maintenance of starter material and production and description of starter material in potato growing and fruit growing**

Potato growing is often accused of putting too much pressure on the environment due, in particular, to a high level of pesticide use to limit the spread of viral diseases in plantlets and to control blight in ware potatoes and plantlets. In this context, our research, over the two-year period, has focused on:

- (1) acquisition of data with the aim of improving warning systems so that farmers can target treatments more effectively, by (a) characterising the pathogenicity of the strains of blight, occurring in this region, together with varietal resistance to such strains; (b) identifying and studying the various strains of the Potato Y Virus;
- (2) looking for viable alternatives to control blight, with a special attention for alternatives that could be applied in organic farming.

The experience gained shows that the best alternative for the sector is to develop varieties with lasting resistance to such diseases that meet the industry's requirements. The Unit has accordingly launched a programme for the accession and assessment of new varieties to meet these needs. The programme draws on all of the Unit's experience in connection with the potato: use of germplasm from a collection of more than 300 varieties, rapid supply of starter material of clones bred by in vitro micropropagation methods, field and laboratory assessment of the cultural value of using new clones, etc... In time this programme aims to supply our potato breederd with plantlets of protected varieties with a high added value, unlike the free varieties that are currently bred.

### **Development of ruminant farming systems in line with the expectations of society, the industry and the land in order to optimise economic, environmental and social performance**

Stock farming is often mentioned in the context of its attendant nuisances resulting from production unit size or concentration: managing the effluent, in connection with nitrate, greenhouse gas and acidifying gas emissions; unpleasant smells; product quality and food safety; competition with humans for food resources; animal welfare, and so on. Ruminants, nevertheless, hold a key position in this sector. Their ability to digest cellulose, which is unfit for human consumption, uniquely equips them to live on the pasture which covers 25% of non-flooded areas. By grazing these resources they can supply us with high food value proteins. In such areas their activity therefore enables the countryside to be kept open and attractive.

Our research aims to strengthen this link with the land by optimising the utilisation of grassland by ruminants while, at the same time, reducing their negative environmental impact (nitrate leaching, greenhouse gas, loss of biodiversity) and by characterising and describing the products obtained, by integrating, as much as possible all the players in the sector. By more effectively controlling the specific qualities of their products, the sectors concerned can thus aspire to differentiated quality status and create lasting added value for the production systems concerned.

### **Lignocellulosic biomass production: an alternative to ruminant farming for areas not suitable for field crops?**

Lignocellulosic biomass can provide an energy source under various transformation pathways such as combustion, biomethanisation and second generation bioethanol production. The Farming Systems Unit has also launched various initiatives, both at CRA-W level and at Large Region level within the INTERREG IV programme, to assess whether the development of such energy production chains would be pertinent from an economic, environmental and social point of view.



# Biometrics, Data Management and Agrometeorology Unit

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The main role of the Biometrics, Data Processing and Agrometeorology Unit is to develop research and support activities in areas connected with the utilisation and enhancement of agronomic data and the design of mathematical models to represent agri-environmental systems with spatio-temporal components. The Unit's work is generally closely linked to the implementation and management of databases aimed at providing users with data management tools on a range of topics connected with agrometeorology, product quality assessment and the environment.

Over the two-year period 2007-2008, activities have centred around three research topics relating to integrated management and use systems for agri-environmental data, food traceability and safety, and design of new methods and techniques for data analysis and utilisation.

#### **Integrated management systems for agri-environmental data**

The projects under this heading are aimed at developing relevant decision support systems for countryside managers in the context of application of agri-environmental measures. A further objective is to put in place geographical information systems for spatial mapping of information and compilation of regional inventories using satellite imagery data.

#### **Traceability and food safety**

The main aim of this work is to develop methodologies and computer infrastructures for the acquisition, transfer and processing of georeferenced data in the context of implementing geographical traceability of agricultural products. In this area the Unit was, in particular, a partner on an FP6 project (PETER) aimed at disseminating good traceability practices developed within the framework of various European research programmes (<http://www.eu-peter.org/>)

#### **New methods and techniques for data analysis and utilisation**

This work is principally concerned with using original statistical analytical methods to answer research questions raised by other CRA-W departments. It also has to do with studying constraints on interoperability and exchange of georeferenced data and developing specific quality control methodologies for management of large data sets.

Under the REQUASUD agreement, the Unit is responsible in particular for management and use of the central database and for assisting the analytical laboratories in performing statistical analyses in connection with implementation of quality systems. The Unit is also behind the development of a mapping portal for adapting soil sampling methods to agricultural plots.

# Quality Assurance Office



## Scientific personnel

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For CRA-W, quality can be measured in terms of our responses to the requirements and expectations of our clients or partners, in both the public and the private sector, with regard to analyses, studies, experimentation and research.

The mission of the Quality Assurance Office (QA Office) is to improve quality procedures at the CRA-W. To this end the QA Office assists each department with putting in place and maintaining an appropriate quality management system and harmonises procedures between departments.

The QA Office reports directly to the CRA-W General Management and is supported by quality correspondents within each department.

The quality management systems in place or under development are mainly based on the ISO 17025 standard (General requirements for the competence of testing and calibration laboratories) and GLP (Good Laboratory Practice, as defined by the OECD) with respect to studies of plant protection products.

The accreditations and certifications obtained to date are shown in the table below.

Département	Certificate Reference	Areas of Accreditation/Certification
Phytopharmacology (D4)	OECD / Institut Scientifique de Santé publique - Louis Pasteur - C04   189-Test	<b>BPL/GLP</b> Physico-chemical studies of plant protection product formulations. Study of plant protection product residues (including field trials).  <b>ISO 17025</b> Pesticide residue determination in fruits, vegetables, cereals and other products. Pesticide determination in treated seeds.
Agricultural engineering (D5)	 266-Test	<b>ISO 17025</b> Sprayer trials (transverse distribution and pressure). Physical and chemical analyses of solid biofuels. Physical analyses of fertilizers.
Quality of agricultural products (D7)	 300-Test	<b>ISO 17025</b> Milk: microbiology Dairy products, animal feed, cereals: physical and chemical analyses Food matrices: GMO screening
Farming systems (D9)	 333-Test	<b>ISO 17025</b> Forage and cattle mixed feed, cereals and cereal products: determination of starch and dry matter Potato leaf: virus detection (PLRV, PVY, PVX, PVS, PVM)
Biological Control and Plant Genetic Resources (D3)	OECD / Institut Scientifique de Santé publique - Louis Pasteur - C03   342-Test	<b>BPL/GLP</b> Ecotoxicological studies regarding the impact of pesticides on beneficial arthropods <b>ISO 17025</b> Wheat meal: deoxynivalenol (screening) Plant tissues: detection of <i>Phytophthora ramorum</i> Plant tissues: detection of <i>Monilia fructicola</i> Tomato (leaf or fruit): detection of <i>Pepino mosaic virus</i> Chrysanthemum leaf: detection of <i>Tomato spotted wilt virus</i>

Walloon Agricultural Research Centre  
*Scientific Excellence and Social Usefulness*

# ACTIVITY REPORT 2007 2008



## Research Topics

### Topic 1. Diversification and competitiveness of the agricultural processing industry Focus on production systems

#### Upgrading the quality and competitiveness of fonio in West Africa (FONIO)

This project, funded by the EU under FP6, was coordinated by CIRAD (France) and conducted in close cooperation with research teams in Guinea, Mali and Burkina Faso. It aimed at describing and comparing the performance of the most popular varieties of fonio (*Digitaria exilis* Stapf) in these West African countries. To this end, multisite variety trials were established in 2006 and 2007 along a rainfall and temperature gradient (600 to 1500 mm, with one of the sites at an altitude of more than 1,000 m). Only two sites characterised by heavy rainfall were monitored in 2006. The average yield was 855 kg/ha. In 2007 the average yield was 437, 498, 905 and 1,330 kg/ha at N'Tarla and Cinzana (Mali), and Bordo and Bareng (Guinea), respectively. Both in 2007 and 2006 the early varieties performed better than the late varieties, even at the sites with the longest rainy seasons. Their photoperiodism enables the labour-intensive harvesting and processing of these late varieties to be timed to coincide with favourable weather conditions, which may explain why they are retained in cropping systems.

Fertiliser trials carried out at the same time showed the value, in both economic and agricultural terms, of applying moderate quantities of different macronutrients rather than a large quantity of a single element. Fonio has a marked response to nitrogen fertilisation, even at rates of less than 30 kg/ha. Such fertilisation levels can be achieved using organic fertilisers or even by nitrogen fixation by legumes to be included in the rotation.

The quality of the samples collected during these various trials was characterised by developing corresponding NIRS calibrations.

Based on the results, demonstration trials were set up in six contrasting pedoclimatic regions.

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### Transformation of the tobacco chloroplast genome to produce proteins of pharmaceutical value belonging to the histone deacetylase families

This project develops and utilises the Biotechnology Department team's "biolistic" transformation expertise for the benefit of human health applications, in the context of a cooperative link with FSAGx Molecular and Cellular Biology Unit. The general aim of the project is to obtain transplastomic tobacco lines (i.e. with genetically modified chloroplasts) expressing human histone deacetylases (HDAC). These enzymes, which are involved in regulating many key processes (including carcinogenesis), are the subject of intense biomedical research work. Our main contribution is producing the modified plant material and taking part in its characterisation, the molecular constructs being supplied by our partner.

We have developed an original protocol for transformation of the tobacco chloroplast genome. To this end we have identified the optimum parameters for transformation of the chloroplast genome by direct "biolistic" transfer and we have developed an effective

regeneration and selection method that ensures the homoplasmy of the regenerated plantlets.

Application of this protocol has resulted in an assortment of transgenic lines for an appreciable range of sequences (SIRT 1 and 2; HDAC 3, 4, 5, 6 and 7). One of these, expressing class III human histone deacetylase (SIRT2), has been fully characterised to date (presence and integrity of the transgene in the chloroplast genome and revelation of the protein expression product). Meanwhile, other plantlets obtained by bombardment with the constructs corresponding to the other HDAC classes are currently in the process of selection, regeneration and characterisation.

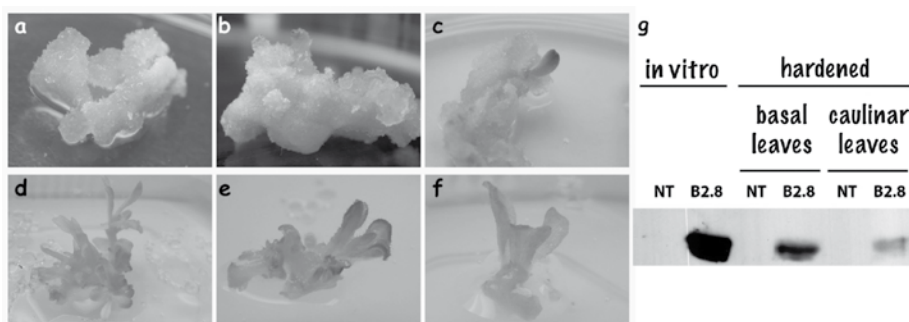
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### Production of fresh vegetables of specific quality (differentiated or other) in the context of sustainable agriculture in Wallonia

In partnership with Centre Maraîcher Interprofessionnel (C.I.M. asbl), CRA-W's Crop Production Department has been working since 2005 on a research project targeting four vegetable crops for the fresh market (fine curled-leaved endive and escarole, Welsh onion and carrots for loose sale). These crops were chosen according to economic, agricultural and environmental criteria. The study is being conducted with a view to developing the industry by organising production and marketing through the edible horticultural products sector and by developing a recognised specific quality for targeted Walloon market garden produce.

The ultimate aim of the project is to develop a tool for management of nitrogen fertilisation of these crops to achieve sufficient production with no loss of quality (nitrate content of harvested produce, storage of carrots, etc.) and to comply with the current environmental standards and those due to come into force with the Nitrate Directive. This tool is being developed via the balance method using the Azobil fertilisation recommendation software (Inra, Laon, France). It requires on the one hand a detailed survey of the plot characteristics and, on the other, knowledge of the plants' nitrogen requirements and growth kinetics so that applications can be matched to demand over time, by splitting the total nitrogen rate.

Results in the first two-year period 2005-2006 revealed a frequent problem of a high nitrogen load on market garden land due to intensification of shallow rooted crops and supply of organic matter. Trials in 2007 and 2008 on more suitable land (selected to limit this problem) showed correlations appearing between nitrate content and curled-leaved endive and Welsh onion growth with nitrogen fertilisation. These results indicate the possibility of splitting on the basis of measurements made with the aid of a chlorophyll meter (HNT, Yara) in fine curled-leaved endive and using the Zénit® system (Serail) in Welsh onions. Carrot trials results show that split nitrogen application is not warranted (no effect on yield), but the levels applied should be managed in relation to product quality and storability.



**Figure: Obtaining Regeneration of tobacco plants that produce molecules of biomedical value**

Cell proliferation and callogenesis (a and b), differentiation (c) and regeneration after bombarding with the parent vector, either unmodified (d) or containing the sequence Sirt2 (e) or HDAC3 (f) and application of the selection protocol. Immunodetection (Western blot) of the Sirt2 protein in transplastomic tobacco plants (clone B.2.8) cultivated in vitro or hardened in vivo; protein not detected in untransformed plant tissues (NT).



*Welsh onion crop trial (2008)*

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## Potato crop variety trial network in Wallonia

A potato crop variety trial network was set up in Wallonia in 2007 and 2008 at the initiative of various industry players R&D partners (CRA-W Gembloux and Libramont, CARAH and FIWAP) who have been active in variety assessment for many years. The launch and setting up of this network were made possible by two-year funding by the Department of Agriculture, Natural Resources and the Environment (formerly the Department of Agriculture) in the framework of a development project. The main purposes of this network are: - to study the potential of different varieties considered innovative for the industry and fresh market in Wallonia; - to promote variety diversification; - to rationalise and group individual variety trial initiatives; - to create synergies between the various partners in Belgium interested in variety diversification (breeders, agents, producers, merchants, industry, distribution); - to harmonise field experiment procedures and laboratory analytical procedures for tuber quality determination; - to harmonise variety assessment criteria while at the same time reviewing the criteria used in Wallonia for official testing for acceptance of varieties into the National variety Catalogue and – finally, to get ongoing variety trials under way (comparison, special crop husbandry, developing any Belgian cultivars), in the context of the project partners' research, development and extension work.

A total of around 60 varieties were tested in 2007 and 77 in 2008 throughout the network. Varieties are classed as early, firm fleshed, soft fleshed, chipping and crisp-making varieties. In each category, one or two known control varieties are used as a basis for comparison of the varieties studied. According to industry players' expectations and requirements, these varieties were tested in different types of trial set up at three sites (Ath, Gembloux and Libramont): - variety trials, involving several haulm destruction and/or harvesting dates at Ath and Gembloux, - late blight (*Phytophthora infestans*) susceptibility trials at Ath and Libramont, - plant husbandry trials with nitrogen fertilisation management at Ath and Gembloux, - storage trials for certain industrial varieties at Ath and Libramont. The results are distributed within the industry and compiled in a final report available from the project partners.

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## PROSPECTS

The network will continue to operate in coming years to meet demand from private industry players interested in the assessment and characterisation of varieties that are considered attractive for the various processing and fresh market sectors, in particular integrating ever-stricter criteria for good cultural practices into potato industry production in Wallonia.



*Variety trial plots at Gembloux and Libramont (CRA-W)*



## BOOSTING THE QUALITY OF ORGANIC WHEAT BY VARIETY SELECTION AND APPROPRIATE NITROGEN FERTILISATION

Organic wheats are characterised by a relatively low protein content, rarely rising above 11%. Although very good bread can be made with low protein flours, this is often the basis on which prices to the producer are fixed.

Moreover, yield is inversely proportional to protein content. The dilemma facing wheat growers is therefore whether to achieve a high yield with a low protein content or to limit production in order to attain a sufficient protein level.

Variety selection and nitrogen fertilisation as ways round this problem of organic wheat production were the two main lines of research pursued by the Crop Production Department in a joint undertaking with CEB (organic pilot centre for development of organic agriculture and horticulture) and the Development and Extension Section (Regional Government of Wallonia Department of Agriculture).

These trials have shown that a high yield (5,000 to 6,500 kg/ha) can be achieved with organically farmed wheat, that weeds can be controlled mechanically and that, overall, disease pressure remains acceptable.

As regards varieties, the results have confirmed the negative relationship between yield and protein content, but have identified some varieties that offer a good yield-quality compromise and have a sufficiently tall stem to compete with weeds.

With regard to fertilisation the two options were farmyard manure (cattle and poultry manure and pig slurry) or commercial fertilisers. Yield gains were very high in some cases, varying with the type of fertiliser and the quantity applied (+103 to +2,108 kg grains/ha). It may be noted that the higher yield was accompanied by improved quality (+0.5% protein on average), and the nitrogen remaining in the soil at harvesting was identical to the unfertilised control.

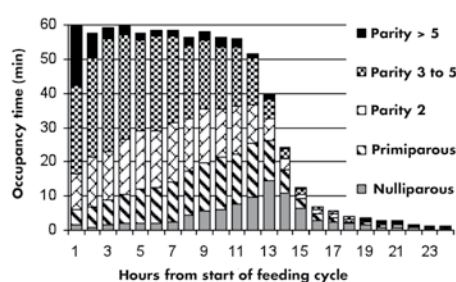
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## Patterns in the use of an electronic feeder (ESF) by pregnant sows

Attention to pig welfare in Directives 2001/88/CE and 2001/93/CE and in the Royal Decree of 15 May 2003 on the protection of pigs at pig farms has created an obligation to group house sows for a period starting four weeks after serving and ending one week before the scheduled farrowing date.

Research work focusing specifically on group housed sows is relatively recent. The main variants investigated have to do with the addition of fibre to the feed, the type of flooring, the area available for the animals and the feeder equipment. With regard to the latter, the electronic sow feeder is in the process of becoming established for large group management. It has the advantage of offering a stimulating social and physical environment which favours the expression of the pecking order. In dynamic group management, however, periodically altering the group make-up impacts on the hierarchy, results in higher aggression levels than in stable groups, and interferes with ESF use.

*Graph – Hourly ESF occupancy from start to end of the daily feeding cycle (min/h)*



Within the framework of a research project with the Animal Production Department at the ULg Faculty of Veterinary Medicine, funded by Federal Public Service (SPF) Public Health, Food Chain Safety and Environment, we have specifically studied the conditions of ESF use in dynamic group housing.

When an ESF is used, the sows feed separately in succession from the start of the feeding cycle. In our groups of 34 sows the ESF was occupied 96% of the time in the first twelve hours after the start of the daily feeding cycle and 15% of the time in the following twelve hours. The nulliparous sows tended to use the ESF around the 13th hour, when the higher parity sows had finished feeding. Sows of parity greater than 5 preferred to occupy the ESF in the first two hours (see graph). Likewise, resident sows used the ESF more than newer animals in the first 12 hours: 21.7 as against 17.4 min per sow for 12 hours. This difference was more specifically marked in the first three days following regrouping. The average pecking order of resident and newer animals was significantly different in the first seven days following regrouping. This reflects the newer sows' lower status in the pecking order. Hierarchy was also affected by parity, underlining the nulliparous sows' status problems during these three weeks.

From these results, the duration of disturbance of ESF use due to dynamic group-housing can be put at one week. The average feeding time was 23.4 minutes. This was in accordance with the scheduled feeding rate of 120 g/min. Taking this value into account and assuming 20 h/24 h ESF occupancy, the maximum number of sows per group was fixed at 52.

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## Improving the nitrogen efficiency of ruminants: case of growing and fattening young beef bulls

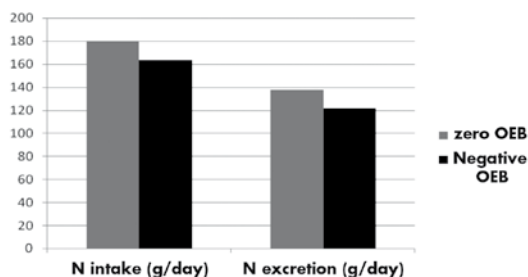
Ruminants have the ability to convert plant biomass, which cannot be used as a food source by other animal species, into high added value products, as milk and meat. However, at a nitrogen efficiency of around 30 to 35% they are very poor converters of plant proteins into animal proteins, and the environmental waste nitrogen they produce in the form of urea in urine remains significant.

Feeding a ruminant means feeding the microbial biomass of the rumen with energy and nitrogen. To decrease the nitrogen losses, the microbial flora can be forced to recycle some of the blood urea to meet its nitrogen requirements. This typically happens when the animals are fed diets with negative OEB values. OEB (ontbestendige eiwit balans or rumen degradable protein balance in the Dutch system) expresses the balance between the energy and the nitrogen available in the rumen for microbial synthesis. It still had to be shown that the animals were able of recycling blood urea over long periods. To this end, in cooperation with Gembloux Agricultural University, two diets based on pressed sugarbeet pulp, one with a zero OEB value and the other with a negative OEB value, were fed to growing double-muscléd Belgian Blue bulls. There were no significant differences in weight gain between diets (1.277 versus 1.284 kg/d for the zero OEB and the negative OEB diets, respectively). Likewise, dry matter voluntary intake per bull per day did not differ significantly.

Feeding the animals a negative OEB value diet significantly ( $P < 0.05$ ) reduced nitrogen release in the environment (Figure) without affecting either bull performance or carcass quality. According to our results, the averaged daily nitrogen release of a bull fed the negative OEB diet was 16.2 g N per day lower than another bull fed the zero OEB diet, i.e. a decrease of about 5.9 kg N per year. In view of the nitrogen directive imposed by Europe, this difference is far from negligible.

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Figure : Nitrogen intake and excretion as a function of the diet OEB value



## Nutritional value of potato protein concentrate for the Belgian Blue bull

Because of its high growth potential and lower intake than other beef breeds, the Belgian Blue bull requires precise feeding for optimum production performance. Plenty of soybean meal is added to the feed as a protein source but, like all legume-derived proteins, it contains little methionine and is mostly degraded by the ruminal microorganisms. Potato protein concentrate is a starch industry by-product. It is produced wholly in Europe and offers the Belgian Blue bull a better amino acid (AA) pattern in the case of seven of the nine essential AA compared with soybean meal. The study was designed to compare the nutritional value of these two protein sources on the basis of in vivo measurements and to assess the ability of potato protein concentrate to improve the digestible AA pattern at a practical level of feed supplementation.

The experiment confirmed that potato protein concentrate proteins were less degradable compared with soybean meal (43 versus 67%). However, no significant differences emerged as regards rumen fermentation parameters, nutrient digestibility in the small intestine, digestible protein flows of dietary and microbial origin and digestible AA flows in animals fed soybean meal based diets (12.8% DM intake, 52% proteins) or potato protein concentrate (6.0% DM intake, 85% protein). The animals' nitrogen retention, reflecting the growth increase, did not differ according to the type of feed. These results confirm the difficulty of improving the digestible amino acid pattern by modifying dietary protein sources in beef cattle feed, and suggest that potato protein concentrate has little value at the supplementation rate tested.

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## Topic 2. Production systems and sustainability

### Effects of soil tillage, crop rotation and application of different substances on soil physical fertility and crop development

Research on the impact of cultural practices on soil physical fertility is in line with the current drive to promote sustainable production systems. It involves permanent experiments established in the past five years with the aim of obtaining plots with standard structural states that contrast sufficiently for the following purposes:

- establishing, at macroscopic level (scale of around one square meter), a precise relationship between the structural state, on the one hand, and crop development and water movements within the arable layer, on the other;
  - gaining a better understanding, in the context of given tillage sequences, of the impact of the initial structural state (before tillage) on profile changes when tillage is carried out;
  - monitoring the year-by-year changes in the structural state of the arable layer and assessing the impact on such changes of applications of organic matter or various substances likely to affect the biomass and microbial activity;
- and, finally,
- identifying the interaction between cultural history and cultural practices on soil physical fertility.

Apart from gathering data on plant development and growth, a substantial portion of the research involves systematic plot characterisation in terms of the structural state of the arable layer (0-40 cm). To this end, a method for quantifying structural heterogeneity at a square meter scale by means of penetrometer data has been developed and is currently being validated for agricultural use. Data obtained to date are relevant for comparing plots at a given time *t*. However, a larger volume of results and more detailed analysis of the data available are necessary to describe and quantify the structural changes caused by cultural practices, and to identify the impact of specific agricultural activities (choice of crop rotation, application of fertilizers, tillage,

etc.) on maintaining, impairing or restoring soil physical fertility.

Moreover, these trials constitute an experimental platform that has yielded various types of data and has led to a project carried out in cooperation with the Agricultural Engineering Unit at Louvain-la-Neuve Catholic University with the aim of turning two key functions of agricultural soils, i.e. the physical medium function and the water flow regulating function, into synthetic indicators. The objective is to define soil function indicators that are more relevant than the conventional physical quality parameters (bulk density, resistivity measurements, pF curves, etc.) in order to account for the sustainability of certain agricultural practices. This project is funded by 'Service public de Wallonie' (project RW D31-1176) and began in spring 2008.

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### Controlling diffuse transfer in potato crops by tying ridges



Potato growing involves large quantities of plant protection products. This is also a crop which is susceptible to runoff and erosion causing some of these products to end up in streams and rivers. Two agri-environmental devices for reducing such transfers were tested between 2005 and 2007: grass buffer strips (12 m wide) and tied ridges, an innovative technique which involves making mini-dams at regular intervals between potato ridges (see picture). The usefulness of these devices was tested as part of the European LIFE SWAP-CPP project coordinated by Gembloux Agricultural University (Analytical Chemistry Unit) in which CRA-W was a partner along with the University's Agricultural Hydrology and Hydraulics Unit and the Temperate Regions Crop Husbandry Unit and FIWAP. The trial set up in 2007 compared quantities of water, sediment and plant protection products carried away from the crop in four scenarios: - no device (control); - grass buffer strip; - tied ridges; - combination of buffer strip and tied ridges. The results show that with a grass buffer strip only, runoff volumes were approximately halved and quantities removed were 2/3 in the case of sediment and nearly 70% on average for plant protection products. With ridge tying alone, runoff water volumes

and sediment and plant protection product quantities removed all dropped by more than 97%. A combination of grass buffer strip and tied ridges completely prevents any such transfer. Tying ridges offers the best cost-effectiveness ratio with an installation cost of EUR 45/ha, not counting the positive effects on marketable tuber yield. A plant protection product diffuse transfer modelling trial and identification of risky cultural contexts at European level were also undertaken.

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## PROSPECTS

**An effective ridge tying technique will be implemented in Wallonia in different slope, soil texture and potato variety contexts and its environmental, agricultural, technical and economic effectiveness will be assessed in 2009 and 2010 as part of a development project funded by SPW's Department of Agriculture, Natural Resources and the Environment and coordinated by CRA-W.**

### Strategies for reducing water pollution by pesticides

In the current political context and with the implementation of the Water Framework Directive (Dir 2000/60 EC) and the future Soil Directive, the environment and sustainable management are hot topics within the European Union. At Belgian level, a pesticide and biocide reduction plan (PBRP) has been put in place in response to the European Thematic Strategy on sustainable use of pesticides. This is the background to the development of 'water and pesticides' as a new environmental topic at CRA-W. This topic comprises a number of projects. Some of them, such as 'asbl PhytEauWal' and the 'catchment pesticide diagnostic unit' aim to develop strategies for reducing water pollution by pesticides. The PESTEAX project, meanwhile, seeks to prevent the risk of water pollution by targeting the most vulnerable areas. PhytEauWal is a non-profit making association formed in November 2007 with the object of assisting pesticide users (farmers, local authorities, park and garden contractors, etc.) and the competent public authorities to take the necessary measures to reduce the impact of these products on natural resources and the environment. The specific aim is to promote good plant protection product practices and the development

of biofilters in Wallonia. Biofilters are systems for treatment of sprayer rinsing and washing water. This association is the result of cooperation between CRA-W, Société Publique de Gestion de l'eau (SPGE), Phytofar, the Department of Agriculture, the Department of Natural Resources and Environment of the Walloon Region, Phytodis and the bank Crédit Agricole.

The catchment pesticide diagnostic unit was set up in 2007 and funded by the SPGE to tackle the growing problem of pesticide pollution of drinking water catchments. The unit brings together a variety of experts (hydrogeologist, pedologist, GIS specialist, agrometeorologist and agronomist) and aims to establish the causes of water catchment pollution and propose remedies. Making pesticide users aware of how their activities impact on water quality is a vital part of this work.

A more preventive approach to the problem of pesticides in water is taken in the PESTEAX project, which is funded under the Moerman Act. A detailed analysis of the causes of contamination reported on a large scale (e.g. catchment area) shows that this is often due to a few plots of higher risk. Specifically targeting those plots when putting protection strategies in place would therefore have a greater impact on the quality of the resources to be protected than applying blanket protection schemes. The project aims to develop a geographical information system for assessment, at plot level, of the potential risk of diffuse pollution of water resources by plant protection products. Various factors affecting the fate of pesticides and the water pollution risk are taken into account, such as land use, the intrinsic properties of pesticides, treatments, the pedological and hydrogeological context, and so on.

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## Assessing sow welfare: salivary cortisol as a welfare indicator



The issue of farm animal welfare and animal-friendly farming practices is at the forefront of the debates between agriculture and society, and also of regulations and research programmes. Animal welfare assessment can serve various ends: product certification, statutory inspections, system design and evaluation, advice to farmers and production of analytical findings. The tools used vary according to the purposes and their deployment will involve physical and organisational constraints imposed not only by the animals and the farmers but also by time and cost. Also, as animal welfare is a multidimensional concept (comprising the five freedoms, animals living in harmony with their environment, no suffering, positive experiences, physical and mental health, the animals' recognized susceptibility and, finally, the underlying moral considerations), a comprehensive assessment requires a set of indicators reflecting each dimension. Among these indicators, the parameters relating to the animals themselves could serve for direct assessment, hence the value of using the salivary cortisol approach to assess variations in the activity of the corticotropic axis in pregnant sows in stressful situations (research carried out within the Department of Animal Production and Nutrition for recognition of a foreign thesis).

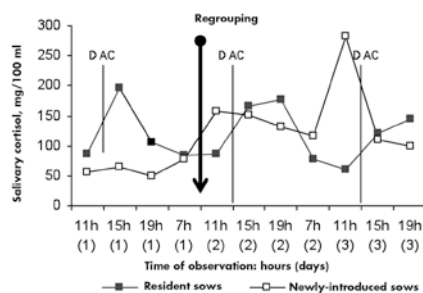
The first step was to establish the methodology. The repeatability and internal reproducibility of sampling were determined in order to validate sampling by two operators. Likewise, the absence of a circadian rhythm for salivary cortisol was established and the effects of feeding times on grouped sows housed on straw and fed by an electronic feed station (ESF) were revealed. Then, the 'salivary cortisol' indicator was studied when the sows were regrouped in dynamic group-

housing system. Regrouping unfamiliar sows after covering in fact leads to conflicts ultimately resulting in a stable social order. Salivary cortisol is able to provide an answer, in terms of sow welfare assessment, similar to the observed distribution of agonistic behaviour. Salivary cortisol sampling two hours before and two hours after regrouping reveals acute stress caused by regrouping, with new introductions perceiving regrouping as more stressful than resident sows. Different comparative situations likely to cause stress were then used to corroborate, through 14 successive regroupings every five weeks, the finding that salivary cortisol provides a measurement that tallies with semiological and agonistic measurements.

The biological indicator can be used to identify a group of sows within a herd that are experiencing stress and thus impaired welfare. It still has to be made compatible for use in other farm situations and categories.

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*Graph – Salivary cortisol trend associated with regrouping according to sow status*



## Two-stage weaning of calves from suckling cows

Among suckling cattle, the calf and its mother vocalize repeatedly in the three to four days following weaning. On the calf's part, lowing shows a state of stress and indicates distress due to the sudden cessation of suckling and contact with its mother. The two-stage weaning of calves aims to sever the bond between cow and calf without causing stress to the calf. The method involves attaching an antisucking device to the calf's nostrils for four to seven days (stage 1) before the physical separation from the cow (stage 2). The calves learn to stop suckling while remaining in contact with the mother.

The behaviour of 2 x 5 calves was compared in two-stage versus conventional weaning using pedometers and in situ observations of the calves before and after separation. The data were analysed according to a single fixed-factor analysis of variance.

The nose flap is not wholly effective; some successful attempts at suckling were observed. The calves fitted with a nose-flap spent significantly less time grazing (9% of the time compared with 18%;  $P < 0.05$ ). They attempted to compensate for the drop in food resources by spending more time at the feeder and at the trough (13% of the time compared with 4%;  $P < 0.05$ ). Calves weaned in two stages exhibited significantly less daily walking behaviour after separation (2,197 steps/day compared with 2,945;  $P < 0.01$ ), indicating less agitation. Likewise, the number of vocalizations was 77% lower (6.4 per calf per hour compared with 27.6;  $P < 0.001$ ). These results supported the hypothesis that two-stage weaning limits calf distress and is less stressful.

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## Cattle farming and greenhouse gas emissions: ways of tackling this issue



Cattle and their faeces are responsible for a sizeable part of the greenhouse gas emissions (N<sub>2</sub>O and especially CH<sub>4</sub>) attributed to farming. Practical ways of cutting down on these gas emissions have been undergoing trials for the last four years. Two main areas of the farm are considered: the cowshed and farmyard manure storage. After examining the role played by housing and strawing methods, the effects of feeding systems on CH<sub>4</sub> and N<sub>2</sub>O emissions were considered. During the winters of 2007-2008 and 2008-2009 beef bulls and heifers were fed with two contrasted rations, one 'farm-grown' based on grass silage and the other a more 'intensive' ration comprising concentrates mixed with straw. Gas emissions from stored farmyard manure were also measured and the effects of composting were tested. Results indicate that perceptibly less greenhouse gas (CH<sub>4</sub>) is produced in the cowshed when the cattle are fed the 'intensive' ration compared with the 'farm-grown' ration. The type of feed does not appear to affect emissions from stored farmyard manure. In barns, the main gas emitted in term of CO<sub>2</sub> equivalent is the CH<sub>4</sub> (more than 90%). During farmyard manure storage, the N<sub>2</sub>O emissions are sometimes equivalent CH<sub>4</sub> emissions. For farmyard manure, the main emissions occur during the first 50 days of storage. This indicates that evaluating impact of farmyard manure with fixed factors should take into account the storage length.

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## Developing a decision support system for nitrogen management on pasture

The decision support system has been developed according to the random tree classification method for disturbed samples with a high interaction structure. This system takes the form of a dichotomous key. The principle is to identify the parameters, i.e. the key descriptive variables, and their limit value in order to classify a set of data (plots) characterised by a particular parameter (PLN content) which is to be modelled and predicted. This classification parameter is not used as a descriptive parameter. It serves as a basis for defining classes according to the aims of the research. The number of groups depends on the data volume and the desired classification complexity. The other parameters, or descriptive variables, will serve as a basis for classification and segregation in order to produce the decision tree. The data used were obtained by monitoring 139 plots during the 2004 and 2005 grazing seasons. Only data that could readily be established by the farmer were used, namely the seasonal and late autumn stocking density, chemical, organic and total fertilisation and the number of cuts. The class limits were established according to the plot PLN content, in increments of 20 kg N/ha, to produce three classes: 0-19, 20-39 and 40 kg N/ha and more. The tree thus obtained has four levels and five branches, resulting in six risk levels. It shows the significant impact of stocking density, both throughout the season and in the late autumn, on soil N-NO<sub>3</sub>-levels in late autumn. The annual stocking density in fact occurs as a distinguishing criterion at first branch level, whereas the late autumn stocking density comes at the next two levels down. The critical threshold for annual stocking density, at more than 720 LU day/ha (or 4 LU/ha for 180 days' grazing) is close to, although higher than, that indicated in the literature (550 to 650 LU day/ha).

The system also confirms the need for fertilisation of grassland to be adjusted to its production and development potential. It also reveals the advantages of including mowing as part of plot management. The nitrogen removed by mowing perceptibly reduces the risks of late autumn leaching.

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Sampling of soil to estimate the potential leaching nitrogen level



## Topic 3. Agro-biodiversity and plant breeding

### **Germplasm management: CRA-W representation on regional, national and international bodies.**

Plant genetic resources are an invaluable asset for the future of agriculture and human society. In view of their significance as a historical, scientific and economic asset and as they do not qualify for protection under intellectual property laws, their management is a basic task for the Public Service, in partnership with the agricultural industry and the relevant organisations. Many old varieties are currently the subject of research and development projects aiming to enhance their economic and agronomic aspects, their disease resistance and their dietary and nutritional properties that are beneficial to human health. In addition, several breeding programmes run by CRA-W (spelt, wheat, apples, potatoes, pears, etc.) actively develop the germplasm collections managed by this institution, some of which are very original.

At international level we work in partnership both as participants in the European Cooperative Programme for Plant Genetic Resources (ECPGR), of which we are currently the National Coordinator, and in connection with management of a European database of pear species and varieties. CRA-W's best-known work is in developing fruit tree, spelt, potato and cherry tree dwarfing rootstock germplasm. All these aspects therefore militate in favour of continuing and stepping up our activities directed at ever more effectively managing this tremendous heritage handed down to us by several generations of farmers and researchers. Also, as an active member of Biodiversity International, formerly IPGRI, by ratifying the Convention on Biodiversity (CBD), the FAO's World Plan for Plant Genetic Resources and, at the same time, the International Treaty on Plant Genetic Resources for Food and Agriculture and the recommendations of the 2001 Gothenburg European Summit on national strategies for halting the decline in biodiversity: objective 2010, Belgium – and this region in particular – clearly have international duties and obligations in terms of sustainable management of our agricultural biodiversity.

By official request of the Food and Agriculture Organization of the United Nations (FAO), the Department of Biological Control and Plant Genetic Resources actively participated in writing the '**National Report on the State of Plant Genetic Resources for Food and Agriculture**', published in late 2008. Following a number of working meetings in 2007 and 2008, this report was produced by a multidisciplinary team representing the country's three Regions 2007-2008. As part of the project the Department conducted a national survey of most of Belgium's institutions in order to draw up a preliminary national inventory of germplasm collections. As a result of this work no fewer than 12,986 accessions currently maintained in Belgium have been entered in a database. The inventory also showed that CRA-W has by far the biggest collections of plant genetic resources in Belgium, totalling more than 40% of the accessions held nationally.

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### **AppleBreed Database: building a European database linking molecular and phenotypic data for perennial plant breeding**

As part of a European project (**HiDRAS**) funded by the 5<sup>th</sup> RTD Framework Program, the Department of Biological Control and Plant Genetic Resources and the Biometrics, Data Management and Agrometeorology Unit coordinated the work of creating the European **AppleBreed DB** database to serve as a model for apple tree cultivar breeding programme management. The aim of this project was to give the many scientists involved in the genetic improvement of the apple tree (*Malus domestica Borkh*) a working tool for producing disease-resistant varieties with high palatability. The database built for this purpose is an essential tool for managing a vast quantity of genetic information through the use of molecular markers such as SSR, as well as information on the agronomic, disease resistance and fruit quality traits of parents and their progenies.

The type of database developed to study interactions between genome and phenotype data is one of the innovative aspects of this work. Like most databases created for other cultivated plants, **AppleBreed DB** is designed as a relational database. The structure adopted allows individual observations of each genotype to be managed, while taking into account the highly diverse nature of the observations: molecular data on certain parts of the apple tree genome, physico-chemical measurements of fruit quality parameters, disease susceptibility scores and sensory analysis of fruit. Particular attention was paid to traceability and to data validation tools.

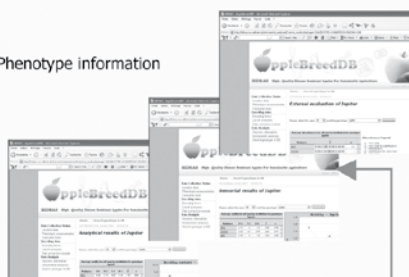
Query tools enable geneticists and breeders to select the relevant data from among the 2.2 million items currently encoded in the database in order to choose potentially the most desirable parents (for example, with good disease resistance, a particular fruit texture or skin colour preferred by consumers) and extract data in a format compatible with the new programs for calculating fruit quality and disease resistance

QTL (Quantitative Trait Loci). This tool is therefore one of a kind and will contribute both to advances in apple tree genetics and the creation of new disease-resistant cultivars with high fruit quality which will be more compatible with sustainable agriculture, as they will require less in the way of plant protection products.

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## AppleBreed database output

Phenotype information



Synonyms of selected genotype

**Synonyms of genotype: Cox's C**

42 synonyms are found in the database for this

- > Apelsinnyi renet;
- > Aranciati di Cox;
- > Cox Orange;
- > Cox;
- > Cox Narance Renet;
- > Cox Orange;
- > Cox Orange Pippin;
- > Cox Orangen Pippin;
- > Cox Orangen Reinette;
- > Cox Orangen Renette;
- > Cox Orangen;
- > Cox Orangen-renette;
- > Cox's Orange;
- > Cox's Orange Pepping;
- > Cox's Orange Reinette;
- > Cox's Orange-Peppin;
- > Cox's Orange-Pippeling;
- > Cox's Orangen Pippin;
- > Cox's Orangen Reinette;
- > Cox's Orangen-Renette;
- > Cox's Pomeranzan Pepping;
- > Cox's Pomeranzan-pepping;
- > Coxova Reneta;
- > Kemp's Orange;
- > Kemp's Orange;
- > Koksia Pomeranzanowa;
- > Koksiova oranjeva reneta;



Display of the loci scored of selected genotype

Loci scored on James Grieve

Marker	Score	Marker	Score	Marker	Score
CH03d12	1.00	CH03d13	1.00	CH03d14	1.00
CH03d15	1.00	CH03d16	1.00	CH03d17	1.00
CH03d18	1.00	CH03d19	1.00	CH03d20	1.00
CH03d21	1.00	CH03d22	1.00	CH03d23	1.00
CH03d24	1.00	CH03d25	1.00	CH03d26	1.00
CH03d27	1.00	CH03d28	1.00	CH03d29	1.00
CH03d30	1.00	CH03d31	1.00	CH03d32	1.00
CH03d33	1.00	CH03d34	1.00	CH03d35	1.00
CH03d36	1.00	CH03d37	1.00	CH03d38	1.00
CH03d39	1.00	CH03d40	1.00	CH03d41	1.00
CH03d42	1.00	CH03d43	1.00	CH03d44	1.00
CH03d45	1.00	CH03d46	1.00	CH03d47	1.00
CH03d48	1.00	CH03d49	1.00	CH03d50	1.00
CH03d51	1.00	CH03d52	1.00	CH03d53	1.00
CH03d54	1.00	CH03d55	1.00	CH03d56	1.00
CH03d57	1.00	CH03d58	1.00	CH03d59	1.00
CH03d60	1.00	CH03d61	1.00	CH03d62	1.00
CH03d63	1.00	CH03d64	1.00	CH03d65	1.00
CH03d66	1.00	CH03d67	1.00	CH03d68	1.00
CH03d69	1.00	CH03d70	1.00	CH03d71	1.00
CH03d72	1.00	CH03d73	1.00	CH03d74	1.00
CH03d75	1.00	CH03d76	1.00	CH03d77	1.00
CH03d78	1.00	CH03d79	1.00	CH03d80	1.00
CH03d81	1.00	CH03d82	1.00	CH03d83	1.00
CH03d84	1.00	CH03d85	1.00	CH03d86	1.00
CH03d87	1.00	CH03d88	1.00	CH03d89	1.00
CH03d90	1.00	CH03d91	1.00	CH03d92	1.00
CH03d93	1.00	CH03d94	1.00	CH03d95	1.00
CH03d96	1.00	CH03d97	1.00	CH03d98	1.00
CH03d99	1.00	CH03d100	1.00	CH03d101	1.00
CH03d102	1.00	CH03d103	1.00	CH03d104	1.00
CH03d105	1.00	CH03d106	1.00	CH03d107	1.00
CH03d108	1.00	CH03d109	1.00	CH03d110	1.00
CH03d111	1.00	CH03d112	1.00	CH03d113	1.00
CH03d114	1.00	CH03d115	1.00	CH03d116	1.00
CH03d117	1.00	CH03d118	1.00	CH03d119	1.00
CH03d120	1.00	CH03d121	1.00	CH03d122	1.00
CH03d123	1.00	CH03d124	1.00	CH03d125	1.00
CH03d126	1.00	CH03d127	1.00	CH03d128	1.00
CH03d129	1.00	CH03d130	1.00	CH03d131	1.00
CH03d132	1.00	CH03d133	1.00	CH03d134	1.00
CH03d135	1.00	CH03d136	1.00	CH03d137	1.00
CH03d138	1.00	CH03d139	1.00	CH03d140	1.00
CH03d141	1.00	CH03d142	1.00	CH03d143	1.00
CH03d144	1.00	CH03d145	1.00	CH03d146	1.00
CH03d147	1.00	CH03d148	1.00	CH03d149	1.00
CH03d150	1.00	CH03d151	1.00	CH03d152	1.00
CH03d153	1.00	CH03d154	1.00	CH03d155	1.00
CH03d156	1.00	CH03d157	1.00	CH03d158	1.00
CH03d159	1.00	CH03d160	1.00	CH03d161	1.00
CH03d162	1.00	CH03d163	1.00	CH03d164	1.00
CH03d165	1.00	CH03d166	1.00	CH03d167	1.00
CH03d168	1.00	CH03d169	1.00	CH03d170	1.00
CH03d171	1.00	CH03d172	1.00	CH03d173	1.00
CH03d174	1.00	CH03d175	1.00	CH03d176	1.00
CH03d177	1.00	CH03d178	1.00	CH03d179	1.00
CH03d180	1.00	CH03d181	1.00	CH03d182	1.00
CH03d183	1.00	CH03d184	1.00	CH03d185	1.00
CH03d186	1.00	CH03d187	1.00	CH03d188	1.00
CH03d189	1.00	CH03d190	1.00	CH03d191	1.00
CH03d192	1.00	CH03d193	1.00	CH03d194	1.00
CH03d195	1.00	CH03d196	1.00	CH03d197	1.00
CH03d198	1.00	CH03d199	1.00	CH03d200	1.00

Marker details

**CH03d12**

Marker features

Name	Sequence	Length (bp)
CH03d12.F	GCCGAGGACATAGCTAAACC	20 bp
CH03d12.R	ATTGCTCATGATAAAGGG	20 bp

SSR repeat type: Compound

Alleles size range: 100-154

Number of alleles detected: 7

Expected heterozygosity: 0.82

PCR amplification temp: 60

Sequenced allele size: 100-154

Locus type: single locus

Map location in: chr3

Fluorescence discovery: 100-154

Developed by: ETH Zurich

Reference publication: Liebhard et al 2002

Genotype	Allele reference size
CH03d12.F	100
CH03d12.R	154
CH03d12	100-154
CH03d12	100-154
CH03d12	100-154
CH03d12	100-154
CH03d12	100-154

Pedigree of selected genotype

**Pedigree of genotype: Apollo**



## Potato breeding

The Potatoes unit within the Farming Systems Section pools its expertise (assessment of quality in use, cultural value, cleaning, in vitro preservation, micropropagation, hydroponic techniques for growing under glass, etc.) in order to develop a programme of new potato variety accessions and breeding to meet the expectations of the industry, society and consumers. A further aim is to supply plant producers with protected varieties with a higher added value than the free varieties they currently breed.

To this end, two cooperative links have been established: one with a foreign scientific partner, the Potato and Beet Research and Development Institute in Brasov, Romania, funded by the CGRI, and the other with a private Belgian company (Euroseeds sprl) and an Italian research institute, (CRA-CIN Bologna, Centro per la Ricerca in Agricoltura).

In the case of the former we use the Brasov Institute's expertise in an attempt to improve the agronomic behaviour and properties in use of our by two varieties ('Gasore' and 'Mariline') while retaining their resistance characteristics (blight, PVY and Erwinia) and also to put in place a breeding strategy aimed at producing varieties with greater blight resistance.

In the latter case the primary objective is to obtain new genotypes with optimum agronomic qualities (yield, size distribution, tuber appearance, etc.) and technological qualities (chipping or crisp making, cooking properties, and so on).

Working directly with a private company means the results should be available for rapid application.

More than 20,000 seeds from 19 crossings were sown under glass in 2008. An initial selection was made. At the same time, several plots were established in the field: a first year assessment plot (1,082 clones), a multiplication plot for all the clones selected in previous years (140 clones, 33 crosses), a plot for assessment of cultural value and value in use (39 clones, 5 crosses) and a plot for assessment of blight resistance (35 clones, 5 crosses).

Some advanced stage clones were introduced into CRA-W's observation plots at Gembloux for additional observations. Starting next year, several clones from the 1999 and 2004 series will be introduced by the private company into the trials for registration in one of the EU national

catalogues. These are mainly clones derived from crosses between parents for industrial use ('Saturna', 'Innovator', 'Santana' and 'Agria'). These clones are currently undergoing accelerated multiplication using in vitro micropropagation techniques.

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## Reducing input in organic apple growing based on functional biodiversity (project subsidised by the RW, DA – Research)

Apple trees are currently among the most intensively grown crops. They require a large number of plant protection product treatments (chiefly against fungal diseases). It is not easy to convert this perennial crop to organic production methods, firstly because the commercial varieties currently grown tend to be very susceptible to diseases and secondly, because of the very small number of active ingredients that have been approved under European Organic Farming regulations.

Research undertaken in 2008 has identified several alternatives to copper which are of natural origin and are effective in controlling scab (*Venturia inaequalis*), the main disease of apple trees. Furthermore, trials with an innovative timing strategy for orchard treatments to target primary infection peaks (identified by the RIMpro warning program in conjunction with a weather station) have resulted in a nearly 60% reduction in the number of treatments to control this disease compared with current practice. In the case of a highly susceptible variety, despite strong disease pressure in 2008, applying ten treatments containing copper and sulphur sufficed to keep the disease below the economic tolerance threshold. The populations of *Typhlodromus pyri*, a useful beneficial for red spider control, were effectively maintained at this treatment frequency.

A comparison of the application effectiveness of spray mixtures showed that the 'tunnel' sprayer does not outperform the standard sprayer but it does, however, permit an approximately 30% saving on plant protection products.

In our experimental conditions where nearly 20% of the orchard area comprises set-aside land, as in previous years no insecticide treatment was necessary to control the Rosy Apple Aphid

(*Dysaphis plantaginea*), a major apple tree pest. Earthworm density within the organic orchard has increased significantly since 2006. This work will continue until 2011 as part of the INTERREG IV 'TransBioFruit' project.

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Fig 1

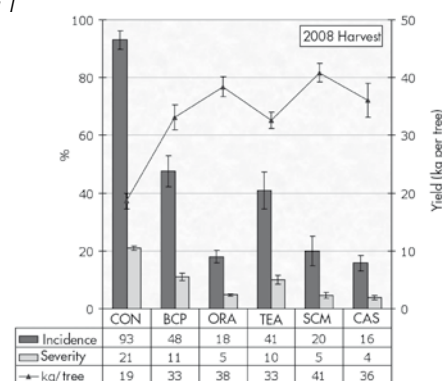


Fig 1 : Effect of treatment schemes on the incidence and severity of apple scab on fruits and on the weight of fruits harvested in 2008 (7<sup>th</sup> leaf) in the case of a susceptible variety, 'Pinova'. Population density = 1900 trees/ha. CON = Water control, BCP = Potassium bicarbonate, ORA = Orange bark extract, TEA = extract of *Chenopodium quinoa*, *Camellia* sp and *Trigonella foenumgraecum*, SCM = Sulphur/calcium mixture, CAS = copper and sulphur.

Fig 2

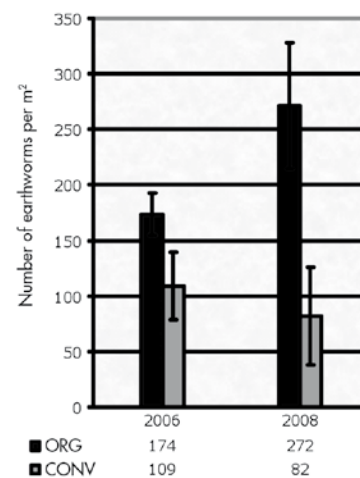


Fig 2 : Average numbers of earthworms per m<sup>2</sup> (epigeic and anecic groups) in two adjoining orchards, organic (ORG) and conventional (CONV) from 2006 to 2008. The error bars indicate the standard error of the mean.

## Apple variety diversity and potential in terms of nutritional and health factors

Identifying apple varieties with benefits for human health among the tremendous diversity of fruit collections is one line of research pursued by CRA-W as part of the 'POMINNO' project, subsidised by funding under the Moerman Act.

Analyses in the 2007-2008 period mainly concerned assessments of sugar content, vitamin C content, acidity and total polyphenols in various Braeburn apple lots harvested at different stages of ripeness using conventional analytical methods and a non-destructive method based on near infrared spectroscopy (NIR). The results show that the various components analysed can be predicted with a good degree of precision. Sugar content, vitamin C content and acidity are determined with a precision of 0.6° Brix, 2.15 mg/100 g and 1.31 eq.g malic acid/l, respectively. In the longer term, portable near infrared spectroscopy could become a harvesting aid in the orchard and a tool for assessing fruit quality in the context of our breeding programmes as well as commercially. Moreover, the results of these

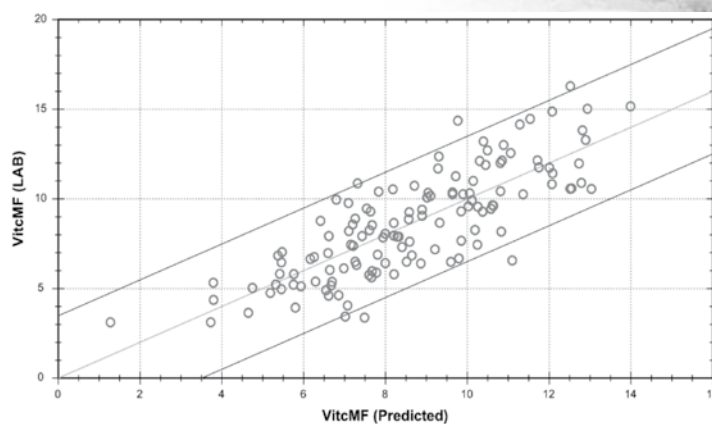
quality analyses will have to be integrated into breeding programmes aimed at developing and promoting varieties with beneficial health and nutritional properties, namely high vitamin C and polyphenol contents, and varieties suitable for diabetes sufferers.

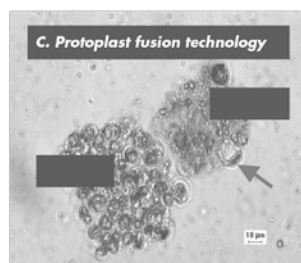
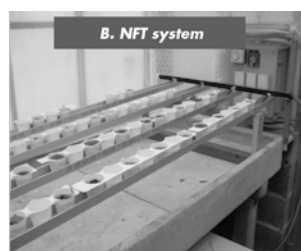
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Tableau - Results of grading for sugar content, vitamin C content and acidity

Component	N	Average	Standard deviation	Calibration error	R <sup>2</sup>	Validation error
Brix	116	11.3259	0.9412	0.5006	0.7171	0.6023
Vitamin C	132	8.6452	2.9275	1.7915	0.6255	2.1491
Acidity	117	9.7372	2.6421	1.1624	0.8064	1.309

Figure - Determination of vitamin C content of Braeburn variety. Vitc (LAB) and Vitc (Predicted) give the vitamin C values measured with the reference tools and the values predicted by near infrared spectroscopy, respectively.





### Genetic strawberry breeding

Product quality has always been very important to Wallonia's strawberry growers. To achieve that quality, three aspects of the specific features of the crop have naturally become the focus of attention: picking when ripe, short-route marketing and integrated production. However, the success of this three-pronged approach has resulted in increased demand for plants purchased from other countries (Spain, France and The Netherlands). In spite of all the health issues associated with these plants, mainly concerning *Phytophthora* sp. and *Verticillium* sp., and the related problem of Wallonia's agricultural land becoming infected, in the case of CAC material no 'Walloon' phytosanitary regulations for incoming inspection have been put in place and only 'European' certification applies. To overcome this major obstacle, Wallonia needs to have its own 'strawberry' industry. This could be accompanied by the accession of original new varieties taking the new European environmental requirements into account, in terms of for example chemical control (pesticides) and transport. With energy and environmental expenses becoming significant price factors, being at the leading edge of research into disease-resistant strawberry varieties is therefore becoming a strategic criterion and goes hand-in-hand with developing suitable integrated production methods.

In this context a five-year cooperation agreement has been concluded between the University of Talca (Chile) and CRA-W. The Biotechnology

Department is thus building up a growing collection of *Fragaria chiloensis* L., one of the two botanical ancestors of the cultivated strawberry, from four different parts of Chile. The collection is initially being assessed in terms of *Phytophthora* sp. resistance characters. This project involves the following successive stages: forming the collection of *F. chiloensis* accessions (Photo A); assessing the collection for *Phytophthora* sp. resistance by means of two comparative techniques - *in vitro* and *in vivo* or 'Nutrient Film Technique - NFT' (Photo B) and, finally, investigating the possibilities of transferring these resistance characters either by obtaining lines from protoplast fusion (Photo C) or by cross-pollination (Photo D).

More than 70 accessions are currently available in CRA-W's new collection. An NFT system is in operation and protoplast fusion techniques have been mastered. All of this progress forms the bases of an ambitious project to create a *Phytophthora* sp. resistant Walloon strawberry variety.

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### Federal Pesticide and Biocide Reduction Plan: fruit biodiversity for everyone's benefit!

Our fruit tree heritage comprises a wide range of varieties of inestimable value. Nevertheless, despite their low susceptibility to disease and their desirable agronomic characteristics, some of these varieties are likely to disappear. Accordingly, since 1985 the Fruit Tree Genetic Resources Laboratory has regularly distributed 'RGF - Gembloux' varieties for promotion through the professional nursery sector.

'RGF' varieties all come under the same philosophy. Firstly, they can in principle be grown by amateurs without any treatments. This is in line with the aims of the Pesticide and Biocide Reduction Plan (PBRP) for amateurs. Secondly, these varieties can be grown in any form (short, medium and tall stem) and, thirdly, they cover a wide range of flavours, shapes, colours, uses, ripening periods, etc... These varieties are assessed over several years and characterised before distribution. The main object is thus to widen the existing range of varieties offered by nurseries, without losing sight of some traditional varieties that continue to be benchmarks in this context.

As a result of our work on assessing and utilising genetic resources, two original varieties of pear labelled 'RGF - Gembloux' were distributed to the network of 27 professional nurserymen for the first time in 2008. The 'Saint-Mathieu<sup>RGF-CRRG</sup>' pear variety is distributed jointly by CRA-W and the Regional Genetic Resources Centre at Villeneuve-d'Ascq in France. This very old cross-border variety of rural origin is very scab resistant and is traditionally grown as standard trees in Hainaut and Nord Pas-de-Calais. This large, two-coloured autumn pear is mainly used in cooking. The second variety, 'Précoce Henin<sup>RGF</sup>' is an early (mid-August) dessert pear which is extremely resistant to pear scab. It originates from seeds sown about 1970 by Mr Henin, an amateur Belgian sower. The flesh melts in the mouth and is juicy, very sweet and slightly acid. Finally, 'Griotte de Schaerbeek<sup>RGF</sup>' is another new CRA-W accession obtained from clonal sowings of 'Griotte de Schaerbeek', a very old variety used in the past to make 'Kriek' beer. This variety is very tolerant of flower and fruit monilia. Its ease of growing, taste qualities and bright red juice make it particularly suitable for amateurs. The fruit can be eaten raw, but the wonderful flavour

is best enjoyed when cooked. The variety is available in all forms, notably on the **Inmil®** dwarfing rootstock, a CRA-W accession from the seventies, which enables tree growth to be greatly reduced for growing in small areas. Summary charts of the characteristics of the main pear varieties and data sheets on the most recent 'RGF – Gembloux' varieties have been produced for nurserymen and their customers.

As a result of coordination between different CRA-W departments, 'Virus Tested' budwood of seven 'RGF' apple varieties has been made available for the very first time, on a trial basis. Certified guaranteed identity budwood distribution continues to develop in cooperation with CEHW at Ormeignies, where several standard trees have been established.

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## Topic 4. Managed use of inputs

### Improving the effectiveness of nitrogen fertilisation in winter wheat

One focus of work has been the effectiveness of split nitrogen application in winter wheat (*Triticum aestivum*, L.). A doctoral thesis prepared in cooperation with the Temperate Regions Crop Husbandry Department at the University of Gembloux was presented in 2008 (N. Boulelouah). This involved a detailed study of the effect of fertilisation methods on nitrogen build-up and translocation and on biomass production in the grain in different winter wheat genotypes.

In the context of high fertility in Hesbaye, a two split application strategy (GS30-GS37) was found to be a useful alternative to the conventional three split application method (GS25, GS30, GS37). All the agronomic and physiological effectiveness indicators were positively influenced, as were the apparent and true recovery factor (the latter with <sup>15</sup>N) which reached or sometimes exceeded 80% at an average application rate of 180 kgN/ha. In addition, a 0.5% rise in the protein content was noted when the GS25 application was delayed while increasing the amount applied at GS37 (+30 to 50%).

It was found that the dynamics of remobilisation, translocation and build-up of dry matter and nitrogen in the grain were unaffected by the way fertilisation was split. The same was true for post-anthesis nitrogen uptake (which can be as high as more than 80 kgN for a total nitrogen uptake of more than 220 kgN/ha) and distribution in the various organs of the plant.

A model of predicting nitrogen build-up in the grain (Pan et al. model, 2006) was also tested as part of this research. With some adjustments, it suggested attractive prospects for various pedoclimatic conditions.

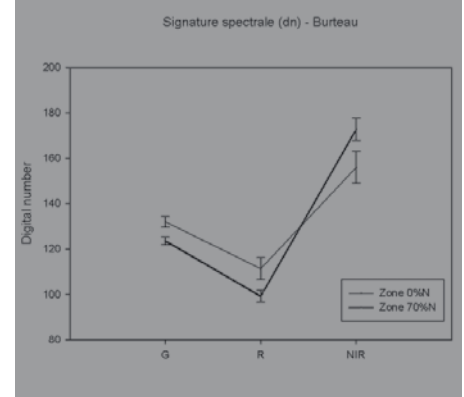
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## NITROGEN FERTILISATION MANAGEMENT IN POTATOES

Development of the strategy for managing nitrogen fertilisation in ware potatoes previously devised by CRA-W continued in 2007 and 2008, in cooperation with FIWAP and CARAH, as part of the Potato Pilot Centre programme (funded by SPW and DGARNE). Exploration of the potential of satellite images for measuring crop nitrogen status began in 2008 under the MIMOSA project (internally funded by CRA-W under the Moerman Act). In this context the possibility of using information supplied via light reflected by the vegetation during the season and picked up by the SPOT 5 satellite was studied (10 m spatial resolution). This is a multispectral approach including reflection in the visible (green and red) and the near infrared electromagnetic bands. Vegetation indices to be related to the canopy nitrogen status at agricultural plot level can thus be determined. The research aims to study the possibility of using these vegetation indices instead of the field measurements currently made with a chlorophyll meter (measuring light transmittance through the leaf) or via Cropscan (measuring light reflected by the vegetation).

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Figure : Example of spectral signatures (digital number - DN) in the green, the red and the near infrared obtained from a SPOT 5 satellite image at 10 m spatial resolution in the unfertilized (0%N) and fertilized (70%N) areas of a potato crop on 25 July 2008.



### Physico-chemical quality of plant protection products

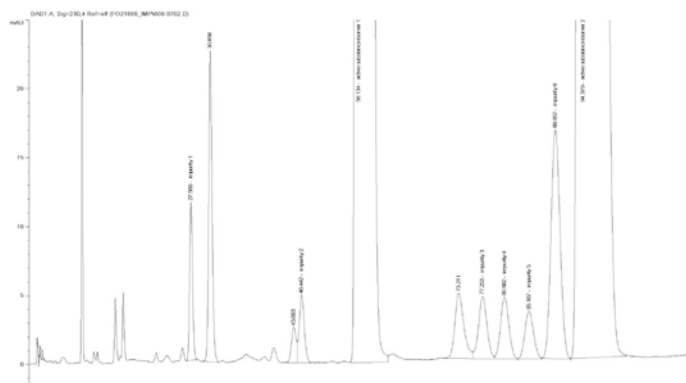
The physico-chemical quality of plant protection products affects their biological effectiveness, their selectivity and their potential risks to users, food consumers and the environment. CRA-W has for many years been conducting research into the physico-chemical characteristics of pesticides for agricultural and public health use. This involves determining a number of parameters, such as active ingredient and impurities content, product stability in storage, safety testing (flammability, oxidising properties, etc.), physico-chemical properties (pH, acidity, alkalinity, emulsifiability, suspensibility, wettability, particle size distribution, pourability, rinsing, viscosity, surface tension, and so forth). This work is undertaken for the purpose of authorisation of new products that are compliant with the regulations and safer for users, consumers and the environment, or as quality control of products on the market. To determine these physico-chemical parameters CRA-W develops analytical methods according to the active ingredients and different types of formulation.

A lot of useful work has been done in the past two years on developing and validating new analytical methods using HPLC and GC to determine active ingredients and manufacturing impurities. CRA-W has also, as part of a large-scale project funded by the FAO, tested pesticide formulations used in Africa for desert locust control. Similarly, 2007 and 2008 also saw significant development of our work on the physico-chemical characterisation of long-lasting insecticidal mosquito nets, which are regarded as formulations in their own right and are used in malaria control. CRA-W's recognition as a WHO Collaborating Centre for Pesticide Quality Control has also been renewed for another four years.

As a result of this work numerous study reports are produced for new product authorisation or quality control of products on the market. CRA-W is also very active in developing new analytical methods published by CIPAC (Collaborative International Pesticides Analytical Council) and in developing and publishing specifications in the framework of the FAO/WHO JMPS (Joint Meeting on Pesticide Specifications), for pesticide quality assurance. The Centre also works closely with WHOPES (WHO Pesticides Evaluation Scheme), provides expert opinions and advises numerous public authorities, international organisations, universities and scientific institutions, the plant protection product industry and the agricultural sector.

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Figure : Determining active ingredient impurities by HPLC



## HIGH-PRECISION MEASUREMENT OF SPRAY NOZZLE FLOW RATE

High-precision flow rate measurement will be part of the sprayer laboratory's scope of accreditation (ISO 17025). Two measurement methods are used on this bench, according to the type of test:

- reference nozzle flow rate measurements: using the weight-time method (mainly for manufacturers or to produce standard nozzles)
- routine nozzle flow rate measurements: using an electromagnetic flow meter (mainly for laboratories, phytosanitary companies or individuals carrying out field trials, whether or not under a quality label, etc.)

The measurement bench and the test method still have to be validated, notably on the basis of ISO 4185, ISO 7066-1 and OIML R76-1 standards. Another forthcoming task is to develop and implement the software for test management and automatic data acquisition (volume flow rate, relative pressure, temperature, weight, time).

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General view of flow measurement bench





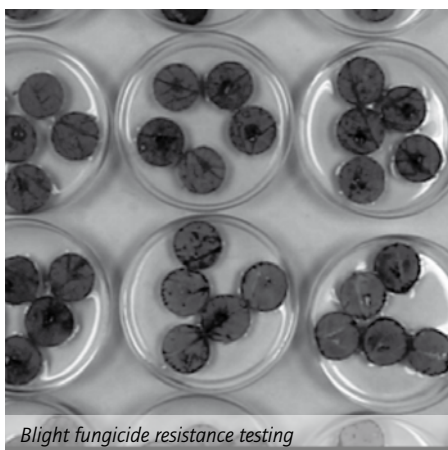
### Potato late blight: hard to keep under control

Despite the various plant protection products on the market, potato late blight is still hard to control. The number of *Phytophthora infestans* strains regarded as metalaxyl resistant is in fact increasing all the time. Tests carried out between 2000 and 2007 by the 'Potato' unit of the Farming Systems Section show a steady rise in the percentage of resistant strains, with 39%, 64% and 67% of strains identified as resistant in 2000, 2005 and 2007 respectively. This being so, CRA-W will continue testing the effectiveness of the main fungicidal active ingredients in order to detect the first signs of resistance and so advise the farmer on optimum product use.

To refine late blight trend prediction CRA-W also monitors sexual types occurring in Wallonia and the virulence of strains collected. Over the coming two years these tests will be supplemented by

aggressiveness testing of strains collected and genetic identification of those strains to study their origin and variations.

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Blight fungicide resistance testing



Blight strain aggressiveness testing

## Topic 5. Development of analytical methods in the field of food safety

### Pesticide residues analysis

The plant protection products used to protect our crops from diseases, pests and weeds can leave residues in the harvested products and in the environment. This is a big issue not only for consumers and regulatory authorities but also for the pesticides industry. Regulation EC 396/2005, amending Directive 91/414/EEC, establishes the new European regulations for the maximum permitted pesticide residue limits in foodstuffs. To comply with the increasingly stringent legislation, analytical methods that are reliable, robust and highly sensitive are needed. Of the existing analytical techniques, the most appropriate method for pesticide residue determination is undoubtedly mass spectrometry coupled with gas chromatography (GC-MS) or high performance liquid chromatography (HPLC-MS/MS).

For several years now CRA-W has invested in developing mass spectrometry analytical methods for the determination of pesticide residues and their metabolites in food (fruit, vegetables, cereals) and the environment (soil, water). Research in the past 2 years has focused on developing and validating new GC-MS and HPLC-MS/MS methods for determining the residues of insecticides (pyrethrinoids, neonicotinoids, etc.), fungicides (imidazols, strobilurins, carboxamides, anilinopyrimidins, cyanoacetamide oximes, etc.), herbicides (carbamates, sulfonyleureas, chloroacetamides, dinitroanilines, isoxazolidonones, etc.) and growth regulators in various foodstuffs. A GC-MS screening method has also been developed for the simultaneous detection of nearly 560 pesticides or endocrine disruptors (qualitative analysis) in water. These new methods have since been applied in experiments aimed at plant protection product authorisation or for research projects. The recent acquisition of an ultra high performance liquid chromatograph coupled with a triple quadrupole mass spectrometer (UPLC<sup>TM</sup>-MS/MS) has further boosted the laboratory's work. Compared with HPLC-MS/MS, this new technique offers several advantages such as very good specificity, greater sensitivity, faster method development and less sample preparation. It has very promising prospects for future pesticide and metabolite residue analysis.

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### Agronomic and agricultural products analysis

The UPLC-MS/MS method is also used by CRA-W to detect and quantify substances of interest, such as polyphenols and vitamin C, or to look for residues (antibiotics) and contaminants (e.g., mycotoxins, alkaloids). Polyphenols are a group of bioactive substances that occur widely in plants. These substances have anti-oxidant properties that can help to reduce the risk of cardio-vascular disease and some cancers. Producing plant extracts with proven anti-oxidant properties is an important topic of current research in this area. In addition to revealing the general activity, multicomponent techniques such as UPLC-MS/MS can be used to simultaneously determine and quantify catechins, phenolic acids, flavonols and anthocyanins. As these substances do not have the same anti-oxidant properties, it is important to determine and quantify the individual components. This approach is applied within the framework of the POMINNO and WALNUT-20 projects.

The example of vitamin C determination in apples shows the usefulness of switching from an HPLC method to UPLC<sup>TM</sup>-MS/MS. Compared with an HPLC-UV method (248 nm), the sensitivity and specificity of mass spectrometry overcome the problem of interference by other UV-absorbing components. Using this method, the analysis time decreases from 40 minutes to 1 minute, and so the time needed to analyze 100 samples falls from 156 to 8 hours (sample preparation or results processing time not included). In addition, these new analytical conditions ensure the stability of the active substance determined during the analysis. The volume of the solvent used per sample decreases from 28 to 0.8 mL, equivalent to a reduction in overall volume from 7.5 to 0.2 L of solvent. This work was carried out within the framework of the POMINNO and HIDRAS projects.

Currently, a multi-mycotoxin method is used to analyze 10 active substances (deoxynivalenol, nivalenol, fumonisin and their derivatives) in about 15 minutes (sample preparation time not included). This method

is regularly being extended to other active substances. In addition, the application of this technique reveals derivative forms of these mycotoxins (masked mycotoxins) not shown up by other tests, which can interfere with immunology testing based on antigen-antibody reactions. Understanding mycotoxin production mechanisms needs multi-mycotoxin analyses combined with a study of the fungal populations (variety effect, resistance, effects of the crop production or fungicidal treatments). This work is carried out by the Mycotoxins Unit.

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## DEVELOPMENT OF ANALYTICAL METHODS AND TOOLS FOR THE DETECTION, IDENTIFICATION AND QUANTIFICATION OF ANIMAL PROTEINS IN ANIMAL FEED

### Community Reference Laboratory for Animal Proteins (CRL-AP)

CRA-W was designated as the Community Reference Laboratory for the detection of animal proteins in 2006 (CRL-AP, European Regulation 776/2006). In this context, the Centre supervises a network of 26 European reference laboratories. An intranet has been set up to store the data needed to ensure smooth network operations and facilitate communication between participants (<http://www.crl.cra.wallonie.be/>). Various activities took place in 2007 and 2008: two European workshops were organized for representatives of each Member State, and inter-laboratory tests were organized to harmonize network performance and validate new analytical protocols. One of the key CRL-AP tasks is to ensure proper enforcement of Directive 126/2003 which describes the protocol to be followed for optical microscopic analysis. Accordingly, based on the results of the first inter-laboratory test, a course in optical microscopy and its application for the detection and identification of animal proteins was designed. This course is offered during the training of National Reference Laboratories (NRL) either at CRA-W or on site if required.

Within the framework of CRL-AP activities, CRA-W has also increased the number of ISO17025 accredited methods by adding three methods based on optical microscopy, near infrared microscopy and near infrared imaging to detect meat and bone meal (MBM). In the field of classical microscopy, some new protocols have been developed to quantify MBM, identify hair, calculate the limit of detection of a qualitative method and prepare slides for long-term storage.

In addition, a reference sample bank and an image bank containing hundreds of catalogued, high-quality micrographs have been set up and are available for all European control laboratories. A powerful computer tool for the management and traceability of a large number of samples, analytical results and images has been built and validated in-house by CRA-W. Another important area of CRL-AP activities concerns species detection of animal components occurring in MBM and compound feeds. The identification relies on the PCR method for detecting DNA of animal origin. CRA-W has continued to develop and validate this method and has prepared the way for an ISO17025 accreditation. Protocols for the detection of beef meal in pig meal using the immunological method, HPLC determination of protein size in hydrolyzed meal and lactose detection have been tested.

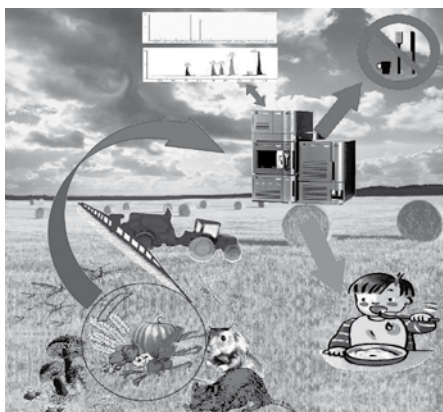
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### Research projects

CRA-W is the coordinator of the European SAFEED-PAP (FOOD-CT-2006-036221) research project in which 13 partners aim to develop analytical methods and tools for species-specific identification and quantification of processed animal proteins. As well as coordinating the project activities and being the public face of the project, CRA-W is also involved in developing new methods based on molecular biology, optical microscopy, classical microscopy and near infrared imaging. The Centre's activities also include the development of a website (<http://safeedpap.feedsafety.org/>), the preparation of a part of samples used in this project, the organization of the second FeedSafety conference, held in Namur, Belgium in November 2007, and participation in organizing a workshop in Vilnius, Lithuania for the new European Union Member States. Within the framework of this project, CRA-W has developed an innovative strategy for PCR method transfer and validated a method combining near infrared microscopy and PCR for species-level quantification of animal proteins. This method was developed within the framework of the FARIMAL project (<http://www.feedsafety.org/activities/farimal.php?menu=2>) funded

Figure : Pesticide residues, agricultural and food products analysis using ultra high performance liquid chromatography apparatus coupled with a quadruple triple mass spectrometer (UPLC-MS/MS)



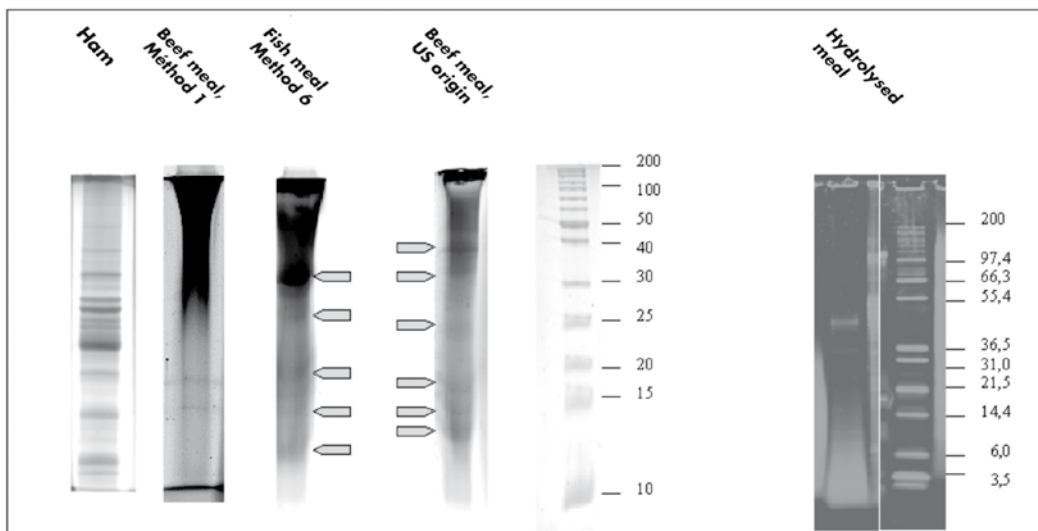
by the Federal Public Service (SPF), Public Health, which sought to combine the advantages of infrared microscopy and molecular biology.

All these activities contribute to the implementation of the FeedSafety platform (<http://www.feedsafety.org/>) initiated in 2006 in co-operation with JRC-IRMM and RIKILT. This platform is a network of research institutions, analytical laboratories and official organizations involved in the development, validation and use of analytical methods in the animal feed sector.

Research is also carried out as a part of a national project to assess the value of using proteomic techniques for analyzing the protein content of MBM. The aim is to resolve and identify, at species level, the proteins present in by-products of animal origin. The work aims to assist the proper enforcement of the regulations designed to ensure that these proteins are safe.

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*Figure. Resolution by one-dimensional electrophoresis on polyacrylamide gel of meal from various animal species under hydrolytic or thermal treatments of various intensities*



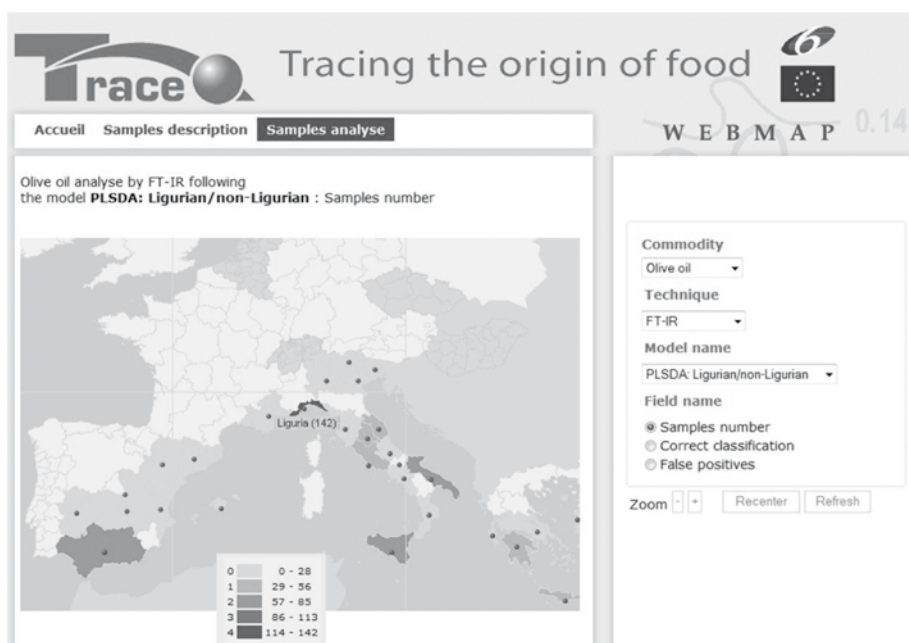
## Traceability/authentication

For several years CRA-W has been involved, within the context of several European projects, in developing and validating analytical methods for authenticating agricultural products. For instance, TRACE project (<http://www.trace.eu.org>) activities concerned the characterization of meat products by developing molecular markers to distinguish cattle breeds. CRA-W's role was to collect blood samples from 22 Belgian Blue bulls and to participate, with INRA, in the development and evaluation of PCR tests used to genotype the genes responsible for coat colour, based on the sequences of four genes involved in coat colour (Agouti, PAR2, MC1R and Silver) supplied by INRA. The Centre also took part in an inter-laboratory study of real-time PCR detection of plants present in honey as an authentication method. The ability of Fourier Transform Raman (FT-Raman) spectroscopy in the geographical authentication of virgin olive oil, honey and Trappist beers was also studied. The work focused on the optimization of spectroscopic analyses and testing various chemometric tools in order to extract and use relevant spectral information.

CRA-W collaborated with the Rochefort brewery within the framework of the TRACE project, and was responsible for the experimental plan and samples preparation. Researchers have also worked on developing a computer tool to display the analytical results of food product authentication.

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*Figure : Web tool developed within the framework of the TRACE project to display the results of the geographical origin authentication of a particular product.*



## Topic 6. Development of non-food sectors and diversification

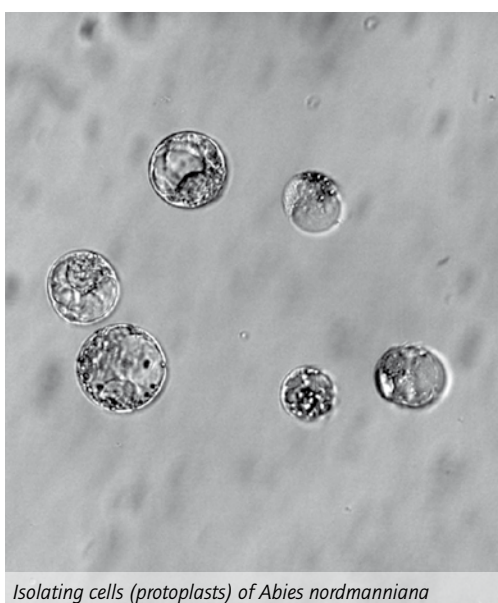
### New technologies for higher quality Christmas trees

Christmas trees are Wallonia's main horticultural export. To hold their own against foreign competition, Walloon growers emphasize differentiated quality and diversification. In this context the work undertaken by CRA-W since 1996 will help to ensure a regular supply of controlled origin plant material (seeds, cuttings, vitro plants) of *Abies nordmanniana*. More than 30 'elite' trees selected for their excellent habit have thus been fixed by an original field grafting technique. These now form the first seed orchard and are also a source of wood for any subsequent plantations. The results of initial trials to speed up flowering are also expected.

Cloning by cuttings of different *Abies* has resulted in rooting of cuttings from four-year-old and twelve-year-old ortets of *Abies nordmanniana*. June cuttings are more attractive in terms of growth than those taken in October or in spring. These plants will be used for behavioural observations and to start new lines. Rates twice as high (approx. 75%) have been obtained in the same environmental conditions with *Abies koreana* and *Abies balsamea*.

Somatic embryogenesis has been carried out from juvenile tissue to obtain plantlets. For large-scale plant production, though, the conditions of application will need to be extended to embryo maturity. In this regard anti-auxins would seem to offer significant breeding potential.

The focus of research has recently been shifted to creating aromatic lines of *Abies* by somatic hybridisation. This is done by combining the growth characteristics of *Abies nordmanniana* with the aromatic properties of *Abies balsamea* via embryogenic lines that can generate complete plants. The work involving characterisation of the aromatic patterns of the species concerned and their somatic fusion products is being carried out in cooperation with the General and Organic Chemistry Unit at the University of Gembloux (Professor J.P. Wathelet).



Isolating cells (protoplasts) of *Abies nordmanniana*

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## Environmental, economic and social sustainability criteria for biofuels

In the face of climate change and soaring energy prices, the use of bioenergy is increasing steadily in Europe and throughout the world. The TEXBIAG project, coordinated by CRA-W, falls within the current context of utilising agricultural biomass to produce energy with the aims of mitigating greenhouse gas emissions, securing the supply of energy and contributing to rural development.

Environmental sustainability is defined, on the one hand, from the point of view of fighting climate change, reducing greenhouse gas emissions and preserving or increasing carbon sinks (combating deforestation) and, on the other hand, from the point of view of protecting the environment, preserving biodiversity and maintaining air quality (limiting pollutant emissions), water quality (cutting down pollution and maintaining water reserves) and soil quality (limiting erosion risks and maintaining soil structure). The economic sustainability of agricultural bioenergy is demonstrated by rising farm revenues and regional economic development with direct and indirect job creation. Social sustainability specifically takes the form of good working conditions (reasonable hours, no child labour, right to strike, etc.) and observance of human rights and ownership. The indicators available for these criteria are generally derived from international conventions (UN, ILO, WTO, etc.).

Beyond the plantation and/or biomass or biofuel production industry scale, environmental, economic and social sustainability must also be able to stand up to the cross-cutting or global effects of bioenergy, at wider than local level. Effects such as indirect changes in land use or knock-on economic effects on a regional, national or global scale impact upon regions other than those where the biomass is produced. Such consequences may take the form of deforestation, loss of biodiversity or rising food prices and are difficult if not impossible to assess. Establishing criteria and indicators for measuring them will therefore require detailed studies and monitoring of data at global level.

The second phase of TEXBIAG will finalise the development of the criteria and indicators for the various topics selected and will incorporate them into two models developed jointly by the project partners: a monetization model for

the externalities of bioenergy and a political prediction model. These models also draw on a primary database relating to the externalities of bioenergy which has been developed by CRA-W. These three instruments together will provide political decision-makers with a valuable decision support tool for agricultural bioenergy development in the current context of combating climate change and tackling food and economic crises.

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## Producing pure vegetable oil from rapeseed for use in agricultural engines

Crushing and producing rapeseed oil on the farm for food or non-food uses (pure vegetable oil used as an agricultural fuel) requires analysis of the seeds, the oil and the cake produced. Ideally, these analyses should be rapid and inexpensive. Whenever possible, methods like near infrared spectrometry (NIRS) standardised from reference methods are used. Such techniques are also an aid to variety selection, crop husbandry and optimising crushing operations.

Once tools for seed and cake analysis were in place, pressing trials were carried out (FRIES pilot press lent by the Codeart association) in cooperation with APPO to assess the effects of the year of growing, the varieties and husbandry methods (nitrogen fertilisation). Seven varieties (**Catalina**, **Concorde**, **Exagone**, **Labrador**, **NK Roxet**, **Standing** and **Toccata**) grown over three years (2005, 2006 and 2007) were involved in the trial. Our research took account of the seed yield (kg seed/ha converted to 9% DM), the seed fat content, the pressing yield (kg oil extracted per 100 kg of seed) and, lastly, the quantity of oil extracted per ha. The latter mode of expression includes the agronomic yield (kg/ha), the seed oil content (% DM) and the pressing yield (g of oil per 100 g of seed).

The samples from the 2005 harvest are characterised by high seed yield (5 to 6,000 kg/ha) and a moderate pressing yield (18 to 30 kg/100 kg), with the quantity of oil extracted per ha ranging from 960 to 1,620 kg. The samples from the 2006 harvest are characterised by low seed yield (3,700 to 4,500 kg/ha) and a high pressing yield (29 to 39 kg/100 kg), with

the quantity of oil extracted per ha ranging from 1,080 to 1,670 kg. The samples from the 2007 harvest are characterised by low seed yield (3,400 to 4,100 kg/ha) and a low pressing yield (14 to 18 kg/100 kg), resulting in very low quantities of oil extracted per ha of between 500 and 700 kg. The 2007 harvest suffered both from low seed yield and very poor pressing behaviour, resulting in very low quantities of oil extracted compared with previous years.

Looking at the quantity of oil extracted and specifically at the 2005 and 2006 harvests it is evident that **Catalina** is the most productive variety, whereas **Labrador** is lagging behind. **Standing** exhibits good productivity along with good consistency in 2005 and 2006 (*graph a*).

Increasing amounts of nitrogen fertilizer were applied to the Labrador variety in 2005 and to the Standing and Babin varieties in 2006 and 2007 (*graph b*). The annual effect is apparent, with low productivity in 2007. In the case of the Labrador variety grown in 2005, optimum nitrogen fertilisation is achieved, bearing in mind the quantity of oil extracted per ha, at only 50 kg N/ha. The **Standing** and **Babin** varieties grown in 2006 show an optimum at 100 and 200 kg N/ha, respectively. In 2007 the optimum for both varieties occurs at 150 kg N/ha.

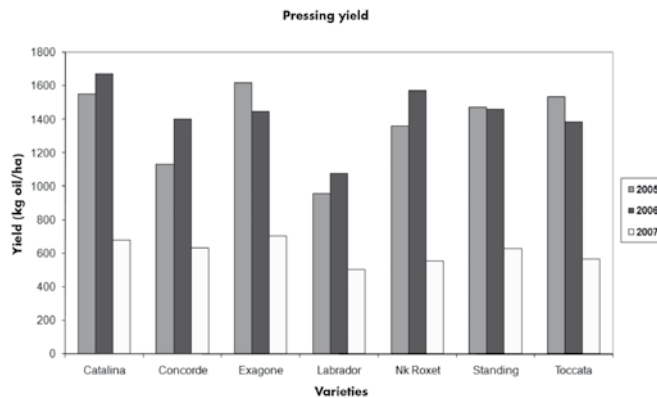
Some analytical methods still need to be developed as rapid techniques, such as near infrared spectrometry, for further work on extracted oil quality.

Five vegetable or fossil fuels were compared in a modern tractor. The aim was to compare performance as well as the exhaust CO<sub>2</sub>, CO, CH<sub>4</sub>, NO<sub>x</sub> and SO<sub>x</sub> content at various loads. The results clearly show that rated power and maximum power are affected by the fuel used. The engine develops approximately 8% less power when biofuel is used. Specific fuel consumption is lowest with diesel fuel and notably with premium fuel oil. However, the engine's power efficiency is independent of the fuel, showing that this is clearly a specific characteristic of the engine. With regard to exhaust, NO<sub>x</sub> and CO<sub>2</sub> levels were lower with fossil fuels. It was also found that pollutant concentrations are considerably greater at lower loads; this is the case especially with CO levels, where there is practically no difference between the fuels when the power developed exceeds 60 kW. Low-sulphur premium fuel oil produced the best results for SO<sub>2</sub>. However, the differences are slight when the power developed exceeds 60 kW.

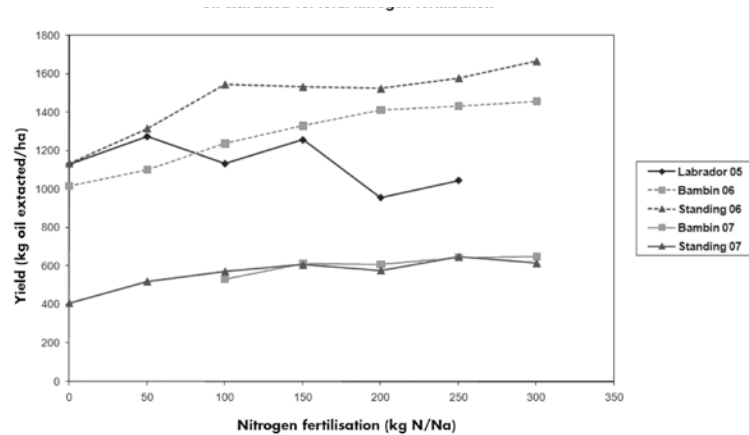
Waste CH<sub>4</sub> from biofuels is approximately twice as low as that from fossil fuels. The conclusion from these trials is that the technical comparison is generally favourable to fossil fuels; however, the results for the biofuels in terms of performance and waste are relatively similar. On the other hand, differences were noted between rapeseed oils of different origins. This aspect deserves further study, along with mechanical monitoring of modern engines running on these biofuels.

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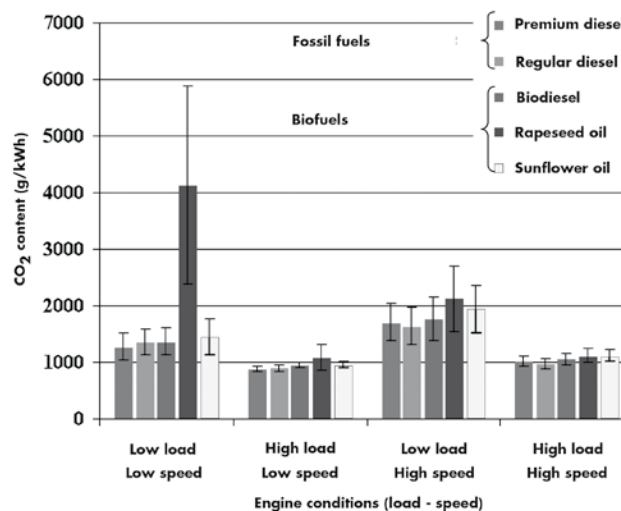
Graph a: yield from seven varieties of rapeseed (kg oil extracted/ha) from the 2005, 2006 and 2007 harvests



Graph b: yield trend in kg oil extracted per hectare as a function of nitrogen fertilisation for the Bambin, Labrador and Standing varieties grown in 2005, 2006 and 2007



Graph C: CO<sub>2</sub> content as a function of engine speed (Excel)





## Study of cultural practices for industrial hemp in Wallonia and analytical aspects



*hemp crop*

However, hemp has recently started to enjoy a renewal of interest as new outlets have opened up in construction (concrete, hemp coating, insulation), plastics processing and animal litter. The resurgence of hemp growing also coincides with the search for a preceding crop (or preceding crops) for wheat due to the decrease in the area planted with beet or chicory or left fallow. Hemp is also an ideal crop in terms of sustainable agriculture. Hemp traps CO<sub>2</sub> and requires little input.

Against this background CRA-W, in cooperation with the Development and Extension Department at Service Public de Wallonie (SPW), has set up a number of trials to assess the production potential for industrial hemp in Wallonia's pedoclimatic conditions and to research the most suitable cultural practices, notably as regards sowing (sowing date and density), nitrogen fertilisation and variety choice.

The results of trials conducted in 2007 and 2008 show that industrial hemp requires little input. Thanks to its rapid growth and impressive development (reaching over 3 metres in height) it is well able to compete with weeds and the use of herbicide is not justified. Moreover, no pathogens or insect pests were observed during the last two cropping years. Nitrogen fertilisation trials have confirmed that hemp has only a low nitrogen requirement, the optimum rate being about 100 kg N/ha.

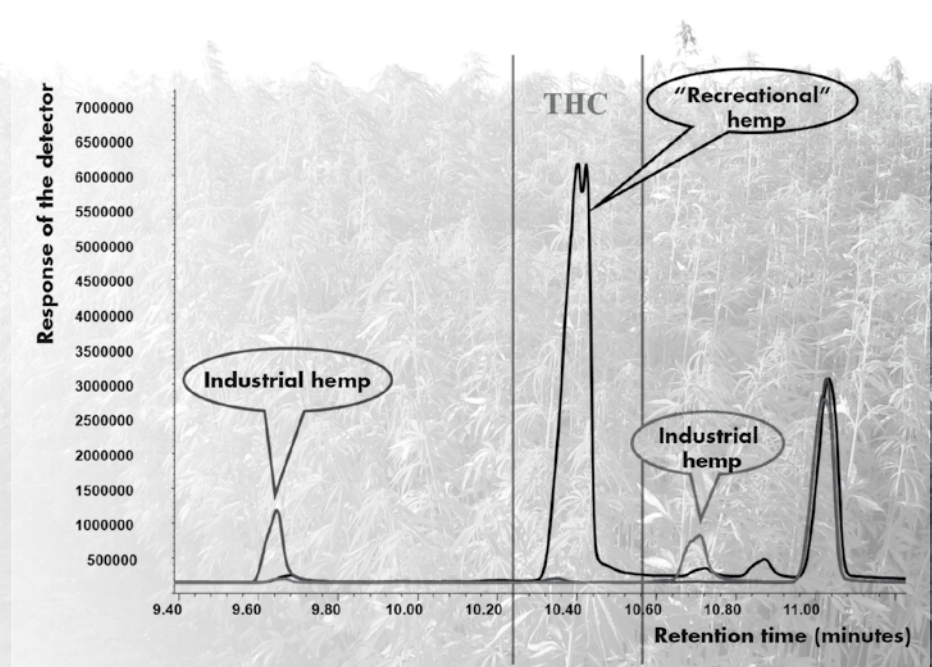
With regard to sowing conditions it was found that sowing in the latter half of April at a density of not more than 280 seeds per m<sup>2</sup> produced the best yield. The yield potential of different varieties of hemp was assessed during the two years of trials and the late varieties were found to perform best, with total DM produced per hectare exceeding 12 tonnes (average of three trials). In the same conditions USO 31, the earliest variety, yielded an average of 9 tonnes/ha. Whereas the main trends in terms of the cultural practices to be recommended are currently emerging from the data collected, some points still remain to be clarified concerning the harvesting conditions, where the variety choice will undoubtedly play a part.

CRA-W has established a method for quantifying the tetrahydrocannabinol (THC) content at the request of SPW's Department of Agriculture, Natural Resources and the Environment (D4). The method involves hexane extraction and THC analysis by gas chromatography. The retention time and peak area enable the active substance to be identified and quantified, respectively, by comparison with a pure THC standard. The method can be used to check that the THC content in dry matter is less than or equal to 0.2% and the variety is

therefore a permitted one. 'Recreational' hemp, on the other hand, has a THC content of between 1 and 10%

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*fig: tetrahydrocannabinol (THC) determination by gas chromatography. The peak at retention time 10.40 min corresponds to the THC and the area corresponds to the concentration present in the sample.*



## Topic 7. Risk analysis and assessment

**The orange wheat blossom midge, *Sitodiplosis mosellana* (GEHIN): Risk assessment and integrated management**



*The orange wheat blossom midge*

Its small size and secretive habits have so far enabled the orange wheat blossom midge to escape conventional observation by cereal growers and agriculturalists. This little dipteran pest, which grows on cereal grains, is nevertheless well established in Europe and North America. In recent years this insect has caused serious yield losses together with impaired cereal quality in the UK. The extent of the damage depends on how insect flights coincide with the susceptible stage of the cereal. The two periods are mainly regulated by weather conditions and are subject to wide variations. In addition, continual changes in cultural practices and the withdrawal of many insecticides from the market have also helped to create the need for a reassessment of the risks posed by the orange wheat blossom midge.

The twin aims of the research agreement (RW) are to put in place a reliable decision support system for dealing with this pest and to characterise the susceptibility or resistance of commercial wheat varieties.

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**Study of Potato Virus Y populations**

Potato Virus Y (PVY) is the commonest virus occurring in plant production in Western Europe. This is mainly because of its method of transmission (non-persistent virus). Its presence in officially certified lots of plants is tolerated, but is not permitted to exceed certain levels which vary according to the class of plants concerned. More than 90% of the instances of downgrading of plant lots after laboratory testing for official certification are due to excessively high prevalence of this virus in the lots examined. This clearly hits growers financially. The last ten years have seen a radical change in the composition of the various PVY strains in Western Europe, culminating in a marked increase in the occurrence of necrotic strains, including the NTN and N-Wilga variants or recombinants, in products. The latter strains are more easily transmitted than the old, 'ordinary' strain and could make control even more difficult. Population studies are in progress and this trend has been identified in Belgium. In cooperation with partners (CRA-W Department of Biological Control and Plant Genetic Resources, Phytovirus Biology and Evolution Research Unit at ARN, INRA-Le Rheu), we are developing various analytical methods (serology, indicator-based bioassays, SNaPshot molecular assays) to identify relative proportions of PVY<sup>O</sup>, PVY<sup>N</sup>, PVY<sup>NTN</sup>, PVY<sup>N-Wilga</sup> and PVY<sup>N :<sup>o</sup></sup> in the active population in Belgium. Initial results of this current work already show that more than 92% of the population are serologically related to the necrotic strains, whereas only 8% are still related to the 'ordinary' serotypes that formed the majority of the population only a few years ago. Bearing in mind that the N-Wilga necrotic variant is an 'ordinary' serotype, the proportion of necrotic strains could be even higher. Research carried out in the Netherlands and Germany indicates that 90 to 100% of the N serotypes in those countries comprise the NTN variant and 50% of the O serotypes are the N-Wilga variant. The situation in Belgium is probably the same.

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### Possibility of sexual reproduction of the fungus *Phytophthora ramorum*: are our forests at risk?

A new disease caused by *Phytophthora* was identified in rhododendrons in Germany and the Netherlands in 1993. Necrosis on branches, leaf spots and wilt were noted on infected plants. In the USA at the same time a new disease called 'sudden oak death' was reported in California and hectares of forest were lost.

The cause of both these phytosanitary problems was found to be a fungus called *Phytophthora ramorum*. In Europe this fungus, which mainly infests ornamental nurseries, is classed as a quarantine organism. It was first identified in Belgium in 2002 on a *Viburnum* plant from a nursery.

*Phytophthora ramorum* is a heterothallic species. This means that two types of strains, called A1 and A2, are needed for sexual reproduction. Until 2002, the two types of strains were geographically separate, with A1 strains occurring in Europe and A2 strains in the USA. In 2003, a Belgian isolate of the pathogen was identified as type A2, suggesting the possibility of crossing between A1 and A2 strains.

Within the framework of a project that aims to examine the risk posed by *Phytophthora ramorum* to forest species (PHYRAM project funded by Federal Public Service (SPF) Public Health in cooperation with ILVO, 2006-2009), *in vitro* pairing of compatible strains was carried out on a medium that had been optimised for sexual spore production. Viable progenies were obtained. This was the very first time functional sexual reproduction had been demonstrated in this species. This discovery is crucial to assessment of the risk presented by this quarantine organism (Pest Risk Analysis). Work is now in progress to assess the aggressiveness of the progenies on the main native forest species.

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*Intraguild predation between Ladybird larvae*



*Necrosis on Rhododendron twigs caused by Phytophthora ramorum*

### The Asian ladybird as a ladybird predator?

Introduced in the late 1990s for biological control in Belgium, the Asian ladybird *Harmonia axyridis pallas* spread fast throughout the country. It has now supplanted several native ladybird species from natural environments, parks, gardens and fields. Observations indicate that this invasive species competes with native ladybirds in the exploitation of food resources and regularly attacks larvae of other ladybird species (intraguild predation). In potato fields, monitoring of the Asian ladybird shows that the populations are lower than the native species at the beginning of aphid infestation period, but they grow steadily until they dominate the native species at the end of the season. When aphid populations decline, the Asian ladybird can survive by preying on other insects including native ladybird larvae. To assess this predation, a GC-MS method has been developed in collaboration with the ULB to detect exogenous alkaloids in the Asian ladybeetle body. These alkaloids come from native ladybird larvae that have been eaten by the Asian ladybird. The persistence of the alkaloids in the Asian ladybird allows an intraguild predation event to be detected several days after its occurrence. The analysis of *H. axyridis* larvae collected in potato fields reveals the effective predation on native species occurring in the crop: *Adalia bipunctata*, *Coccinella septempunctata* and *Propylea quatuordecimpunctata*. This method will be used in future on samples from different habitats in order to assess and quantify the predation frequency of the Asian ladybeetle on native ladybirds. Due to a lack of suitable methods, this aspect has been poorly assessed in the past in field conditions

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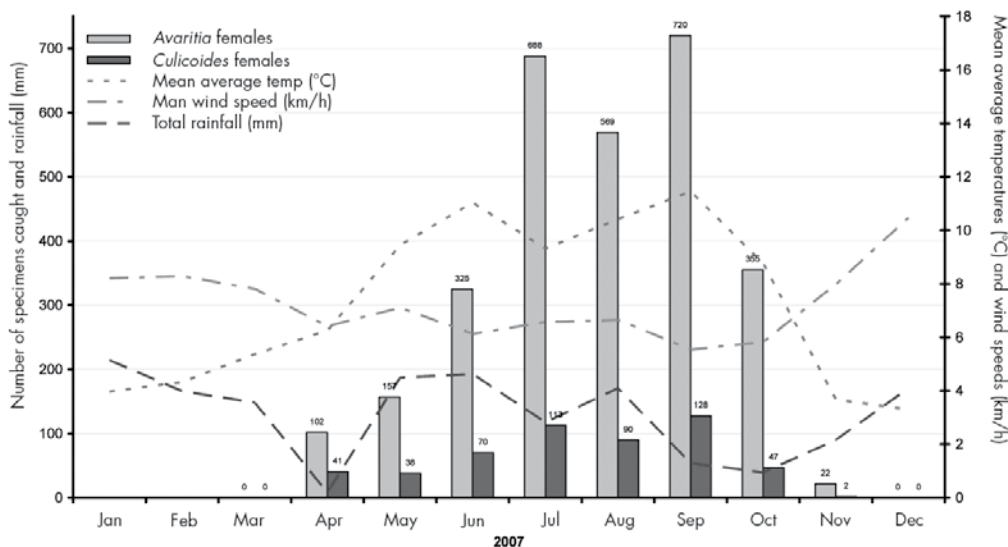
## Monitoring *Culicoides* for Bluetongue control

In response to EFSA recommendations, monitoring of *Culicoides* diptera, potential vectors of Bluetongue (viral disease: BTv8), was started in Belgium in August 2006 by teams from four institutions (IMTA, ULg, FUSAGx, CRA-W), with financial support from EFSA, FPS and FASFC. The aims of the survey are to assess the presence and distribution of *Culicoides* species suspected as potential vectors, to investigate their population dynamics, to ascertain their phenology in relation to weather factors and to gather a large volume of relevant ecological data. CRA-W's main contribution to this monitoring is the unusual use of two stationary Rothamsted suction traps together with an OVI light trap. These three traps have operated continuously since 2007 and several thousands of *Culicoides* have been caught. Processing of this material has already identified 30 species out of the 41 listed by the project partners (one-third of European taxa). The six most prevalent species belong to the *Avaritia* and *Culicoides* subgenera and these comprise the suspected disease vectors. The earliest and the latest species also belong to the vector group. They emerge as soon as the weather warms up and can remain active into the late autumn or even winter, thus favouring persistence of the virus. FASFC uses the changing physiological stages of the females over time (including drawing blood) as

an indicator of the start and end of the *Culicoides*' 'official' period of activity. This provides vital decision support at national level. Current monitoring of vector emergence from their resting places aims to generate detailed data on the *Culicoides*' bioclimatic and ecological requirements which can be used to devise ways of controlling vector populations. As the suction traps provide an image of the long-distance horizontal dispersion by wind, a study (VENTOMO project funded by Federal Public Service (FPS) Public Health, 2008-2009) was carried out using another trapping system developed jointly with Avia-Gis to determine the vertical distribution of *Culicoides* at altitude and the role of the wind factor in the geographical spread of the disease.

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Fig: Activity of *Avaritia* and *Culicoides* subgenera females recorded in 2007 at the Libramont Rothamsted suction trap in relation to Pameseb weather data



## Identifying and ranking risk factors for mastitis on dairy farms in Wallonia

Mastitis, an inflammation of one or more quarters of the udder of various origins, alone accounts for more than one-third of the direct and indirect costs of diseases in dairy farming. The multifactorial nature of the disease makes it difficult to prevent. The study aims to identify the main risk factors for mastitis in field conditions. The survey was conducted on 350 farms in Wallonia that are registered for milk testing. These were selected via a principal component analysis based on data from the Walloon Livestock Farming Association to represent the situation in Wallonia. Data were gathered by means of milking inspections and audits to identify milking methods, herd management (feeding, use of drugs, etc.) and cattle housing from more than 400 observations per farm. The data were analysed by selecting and/or grouping variables and performing univariate and multivariate tests taking into consideration interactions between the factors examined. Overall 19 factors were found to significantly affect the occurrence of mastitis, assessed by the estimated tank cell count (ETCC) from the last three milk tests. For example, multivariate analysis shows that a cowshed with a strawed area creates 2.4 times the risk of an ETCC greater than 400,000 cells than does cubicle housing. On the other hand,

access to a calving pen cuts the risk by a factor of 2.5, because of the better health conditions at the end of drying off and during calving. Multivariate analysis also reveals the role played by milking methods. For instance, omitting post-dipping of the teats, not stripping, and milking with dirty cup liners are all practices that at least double the risk of an ETCC greater than 400,000 cells. An analysis of a small number of farms also suggests that excess feeding promotes the occurrence of mastitis and that a mixed total ration results in a lower cell count that separate feeding of concentrate. For the future it would be useful to integrate all these data into a tool to help farmers identify the main risk factors for mastitis on the farm.

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## Topic 8. Agro-environment

### Impact of implementation of AEM on the functioning of agricultural systems in Wallonia

Agri-environmental measures (AEM) were introduced as part of the programme accompanying the reform of Common Agricultural Policy (CAP), to encourage farmers to use environmentally friendly production methods and preserve nature and cultivated landscapes, while safeguarding their income. In Wallonia as elsewhere in Europe, implementation of AEM raises new issues relating to the **functioning** of the agricultural systems concerned and their economic, environmental and social sustainability. A balance has to be struck between use of land and natural resources for agricultural production and society's needs in terms of preserving the environment and biodiversity, and the need to adapt to climate change. In more global terms, agriculture must also become part of a development (drive) based on fair trade. Consequently, the relationship with the market should also be approached by studying relevant socio-economic indicators and by focussing on product traceability, certification and transparency of production systems in relation to rural development and environmental protection.

To give farmers sound advice on the main direction of their production systems and, specifically, on whether or not to put AEM in place, CRA-W has developed a decision support tool called OptiMAE. This tool is used to model agricultural systems, thus providing a simple even if complete description of the methods and procedures followed by farmers when running their farms. The way farmers combine all their production factors (buildings, input, know-how) within production systems in order to maintain or develop their systems is modelled from statistical data, data from the literature and expert knowledge.

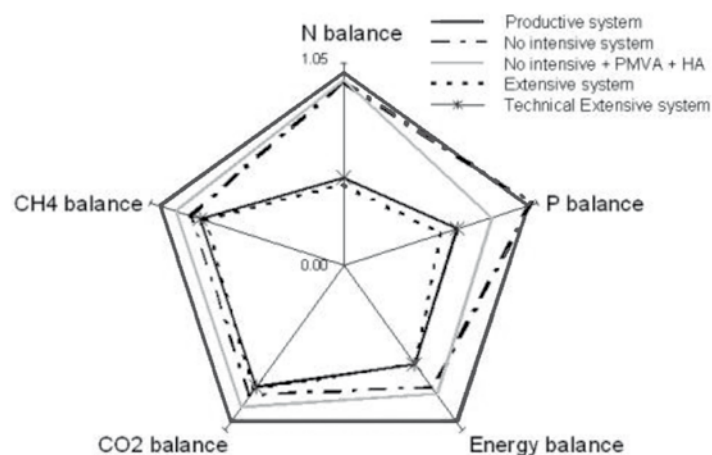
The main aim is to assess the alternative ways of fulfilling the CAP objectives, in particular by incorporating the alternatives proposed in the context of the second pillar.

To this end, OptiMAE provides an assessment, based on relevant indicators, of the impact of environmental and/or territorial issues on the technical and economic performances of farming systems, with the aim of optimising both the economic and the environmental performances of such systems. The decision support tool enables farmers and their advisors to determine consistent development paths for agricultural systems

aiming to join AEM programme. One main principle of OptiMAE is that it does not model a farm as such, but is based on a farm of a similar type. The types implemented in the program were derived from a functional typology of the farms included in a given territory. This has the undeniable advantage of providing a synthetic, rapid, global approach to the 'stakes', thus allowing diverse development scenarios to be explored with the farmer before going on to develop the one considered most appropriate.

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*Figure : Environmental indicator trend, expressed proportionally to the original farm, for four alternatives to a standard reference farm. The smaller the area of the pentagon, the less the pressure exerted by the farm on the environment.*



### Sowing cereals under white clover cover: a way of limiting nitrogen input and herbicide use?

Input costs, in particular fertilizer costs, are rising all the time, as are energy costs. The environmental efficiency of the farms that use them is under constant scrutiny. There is therefore good reason to explore the alternatives for ecological intensification of production systems based on reduced tillage and growing complementary species over time (rotation) or in space (mixed cropping).

Against this background, the Farming Systems Section at CRA-W has for the past five years been exploring the possibility of sowing cereal in white clover cover in Ardennes. Like all legumes, white clover has the ability to fix atmospheric nitrogen and transfer it to the companion crop while limiting weed invasion of the crop.

The results confirm that a cereal can be established in white clover cover after a single pass with the rotary hoe. The resulting clover fragments quickly started growing again, filling the gaps left by the cereal. In the first year a 20% drop in yield was noted in comparison with sowing after ploughing the clover cover in situ. In the latter case the cereal benefited fully from mineralization of the buried cover and was not in competition with the clover, which was obliged to regenerate using the available nutrients. In subsequent years the performance gap between sowing after ploughing or after a single hoeing did not close. This highlights the problem of competing species.

Prospects now rely on the use of a tool developed by the Crop Production Department which tills the sowing furrow over a 5 cm width to promote cereal emergence while maintaining the clover cover in the interrows, thus limiting the competition. It might also be expedient to use red clover in crops with a suitably upright habit. Red clover should be less invasive for the crop when sown, at least as far as winter crops are concerned.

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### Self-purifying effect of co-composting

Provided that it is obtained from clearly traced processing or sorting processes, some organic waste of industrial and/or urban origin may be regarded as non-hazardous and recoverable following treatments like co-composting or biomethanisation. However, the presence of contaminants such as heavy metals, organic micropollutants or undesirable microorganisms could hamper the use of co-composted material in agriculture, unless processing has a self-purifying effect. This was investigated in co-composting trials with green waste (75%) together with sewage sludge (25%).

The results show that co-composting does not affect the bioavailability of heavy metals. The only change is a re-concentration as a result of the reduction in mass. In the case of organic micropollutants, on the other hand, the mass balance shows an average reduction of 30 and 40% in quantities of the 'Borneff six', Fluoranthene and total Polycyclic Aromatic Hydrocarbons, respectively, occurring on completion of processing. Co-composting also has a very clear self-purifying effect on the potential microorganism pathogens, with populations shrinking by a factor of 10<sup>3</sup> to 10<sup>4</sup>. All these results show the benefits of properly managed co-composting with a good temperature rise in cleaning the associated organic materials for agricultural use. The only exception is heavy metals.

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### Management trials on wildflower strip establishment

One of the agri-environmental measures aimed at encouraging farmers to play an active part in improving the landscape and maintaining beneficial animal and plant species is the creation of managed field strips and, in particular, perennial 'wildflower' strips.

In 2007 and 2008 the Crop Production Department carried out management trials on wildflower strip establishment under an agreement funded by the Regional Government of Wallonia in cooperation with Gembloux University's Ecology Laboratory and Temperate Regions Crop Husbandry Unit.

In the course of these trials the success of the cover established and the necessary preliminary cultivation were assessed, the competitive behaviour of the mixes sown with respect to weeds was evaluated and their sustainability was considered. The latter aspect was approached by assessing the flowery appearance and by making quantitative and qualitative measurements of the forage production from the various covers as a result of different mowing practices.

From the observations and measurements made over the two years the following conclusions were drawn:

- Choice of field is a big factor in the success of cover establishment, chiefly with regard to the risk of weed invasion.
- If well established the cover can provide a sufficiently flowery appearance in the year of sowing and the following year, provided mowing is carried out in early summer.
- Forage production amounts to 4 t/ha in the year of sowing, with an energy value half-way between that of conventional June-cut hay and conventional late-cut hay, and 12 t/ha as the total of the two cuts in the second year of growing.

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## Very high resolution images as a tool for monitoring and overseeing agri-environmental measures

For agriculture and the environment, as in other areas, spatialized information plays a major part in understanding, analysis, diagnosis and decision-making processes. Remote sensing is increasingly used as a source – sometimes the only source – of spatialized information for spatial characterisation of an environment, or monitoring of agri-environmental systems over time and to define spatialized indicators to meet the needs of modellers or managers.

Within the framework of its research work under the heading of 'Remote sensing and spatial analysis for monitoring of agri-environmental systems' the Biometrics, Data Management and Agrometeorology Unit is involved in the ORFEO preparatory programme run by Centre National d'Etudes Spatiales (CNES-France). In parallel to development of the Pleiades (optical) and Cosmo-Skymed (radar) satellites as components of a future European system for very high spatial resolution earth observation, the programme also aims to prepare for, support and promote the use and application of images obtained from these sources.

In Wallonia's changing agricultural context and in view of the rapid growth of satellite technologies and possibilities, the research aims to identify and establish specifications for services and products derived from very high resolution imaging to analyse and model spatial structures and the temporal dynamics of agri-environmental and territorial systems. The work enables satellite designers to adjust their sensor characteristics, as well as providing managers and decision-makers with derived tools and data to refine the monitoring or overseeing of agri-environmental measures.

As well as developing specific services and products, the Unit has taken part in several studies of very high spatial, spectral and temporal resolution image analysis techniques. These studies were concerned in particular with object recognition and extraction with the aid of geometric, radiometric and contextual criteria (surroundings, distance between objects, etc.) for the purpose of identifying and classifying 'grass buffer strips'.

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## Qualifying 'organic beef' and sustainable consumption

If agriculture and the environment are to co-exist in harmony, it must be possible to differentiate and obtain added value from products obtained in environmentally friendly farming systems such as organic farming systems. This is the line followed by this approach.

Organic specifications established at European level impose a set of production standards that fundamentally change livestock farming practices. First of all, by prohibiting systematic caesareans the specifications force Belgian farmers to change breeds, and it is well known how fond the Belgian beef industry is of the Belgian Blue and the double-muscling bulls which produce remarkably lean, tender meat. Then, the specifications require grazing and place a limit on the use of concentrates, even those of 100% organic origin. These changes impact upon the carcasses produced, cutting methods and the characteristics of the meat on sale to consumers.

As a first step, a number of rearing and fattening methods complying with the organic specifications were selected and tested (Table new page). The various rearing and fattening methods and the meat obtained were then assessed according to three very different but complementary approaches:

1. Deliberative focus groups (consumer groups)
2. Laboratory technological analyses of *longissimus dorsi* (LD)
3. Sensory analysis of *longissimus dorsi* by a trained panel. The results are shown below.





Tableau : Descriptions des 5 itinéraires techniques d'élevage-engraissement

	Organic methods, Limousin breed	Number of animals	Grazing (1)	Concentrates (2)	Natural concentrates	Differentiation factors from the standard
B 1	Intensive bulls, no grazing	5	No	65%	Commercial	Breed + organic feed
B 2	Extensive bulls, no grazing	5	No	40%	Cereals and maize	Breed + organic feed + % cc
B 3	Extensive bulls, with grazing	5	Yes	40%	Cereals and maize	Breed + organic feed + % cc + grazing
H	Heifers with grazing	6	Yes	40%	Cereals	Breed + organic feed + % cc + grazing + sex
C	Cows with grazing	8	Yes	30%	Cereals	Breed + organic feed + % cc + grazing + sex + age

(1) At least one grazing season after weaning

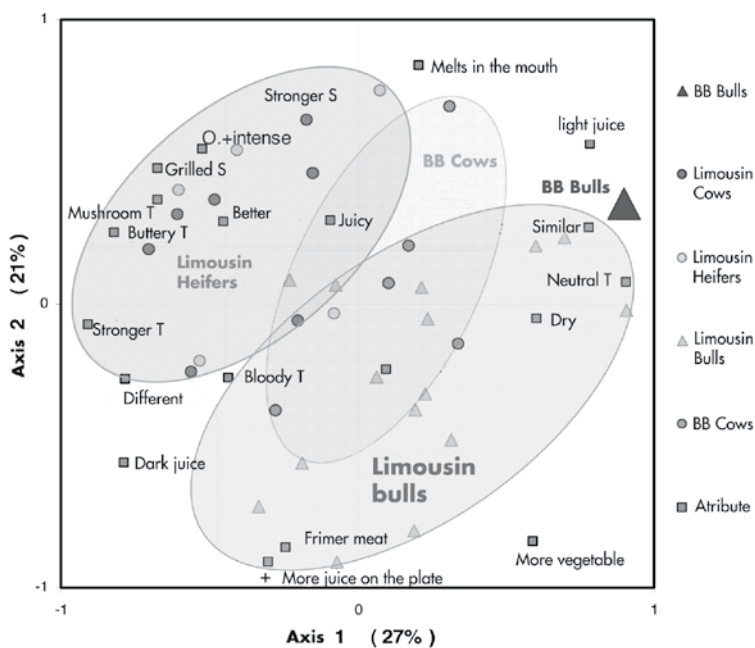
(2) Maximum concentrate percentage reached during the finishing period

Les résultats de l'analyse sensorielle sont The results of the sensory analysis were summarised by principal component analysis (PCA). Within the limits of intra-modality heterogeneity the panel found quite marked, relatively regular differences between female and male Limousins, on the one hand, and between the Limousin and Belgian Blue breeds, on the other. The meat of Limousin bulls differs from the Belgian consumer norm in terms of a more peppery (spicy) smell during cooking, a slightly bloodier taste, firmer consistency and a greater quantity of juice which is also darker in colour. In some cases it is closer to the norm, and then it is drier with a more neutral taste and scanty, light coloured juice. The meat of Limousin females differs from the

norm and is in fact fairly clearly differentiated from that of Belgian Blue females and from that of Limousin bulls, although confusion does sometimes occur. During cooking the smell is stronger and characteristic of grilled meat; the taste is stronger and is reminiscent of wild mushrooms cooked in butter; and it tends to be slightly juicier at the start and end of chewing (less dry). It was judged to be fairly tender and overall its characteristics were acceptable to the panel of tasters, who found it more consistent than Limousin bulls.

Fig: Position of fattening modalities in the sensory space defined by PCA and contribution of descriptors. The 'Belgian Blue bull' is the control used in the sensory tests.

(S – SMELL, T = TASTE)



As these results are for a limited number of animals and a single muscle, the conclusions should be treated with caution. These results confirm the difficulty of creating a perceptible, reproducible difference in the sensory characteristics of beef. From this point of view they do, however, show that the constraints of the organic farming specifications, which are not suited to bull meat production, may offer an opportunity for differentiation in terms of female meat production. The characteristics of the meat thus produced agree, at least in part, with consumer preferences in terms of taste and juiciness. It is essential for the industry to refine the definition of the organic product insofar as that will enable industry players to agree on a common quality target and help to familiarise consumers with the product offered. The aim of this research is not to lay down a hard-and-fast rule for organic beef, but to provide information

that will contribute to the development of the sectors that are interested in following this route. In order to develop differentiated quality beef products in an environmentally friendly way, there are many questions to be addressed at sector, farm, carcass and pack level and the answers will necessitate further exchanges of knowledge and expertise between the participants.

**Contact :** Daniel Jamar  
([d.jamar@cra.wallonie.be](mailto:d.jamar@cra.wallonie.be))



# Promotion boards in Wallonia: history and aims

Promotion boards were set up in Wallonia in 2003 in the wake of the Regional Government Order of 3 July 2003 establishing a list of the sectors for which promotion boards could be approved pursuant to the Decree of 19 December 2002 on the promotion of agriculture and the development of differentiated quality agricultural products (MB 1 August 2003, p. 39980).

The primary purpose of the promotion boards is, in consultation with APAQ-W, to contribute to the development, promotion and enhancement of the value of Wallonia's agricultural products, in particular differentiated quality products. The boards are forums for interprofessional consultation. The promotion boards have been formed as non profit-making organisations. The members represent the various links in the chain from producers to consumers, including the sector's scientific and technical advisors, such as CRA-W.

By reason of its expertise and know-how acquired over many years in the animal and plant sectors, CRA-W is a partner to several such boards and plays an active role in running them. A report on the boards concerned for the 2007-2008 period is given below.

## **Animal sector**

### **Wallonia Beef Promotion Board (FVBW)**

*Specific aims:*

- To boost sales through the use of a unifying brand like BBQS (Blanc Bleu Qualité Supérieure / Superior Quality Belgian Blue)
- To increase the share of beef in the hotel, restaurant and catering sector
- To be able to respond to changing consumer demand

*CRA-W's role or function on the Board:*

The Animal Production and Nutrition Department, represented by Eric Froidmont, has been a founder member since 2003. He sits on the managing board as a Technical Advisor and is a member of the Communication working party. He also acts as auditor.

*Institution chairing the Board: University of Liège (President : Pascal Leroy)*

*Topics addressed by the Board in 2007-2008 in which CRA-W was involved:*

- Establishing minimum criteria for differentiated quality beef (positive list of approved feedstuffs, etc.)
- Discussions on organising seminars, on a project aimed at assessing the impact of CO2 on meat production, and on the use of certain co-products as animal feed

### **Wallonia Goat and Sheep Promotion Board (FICOW)**

*Specific aims:*

- To promote, coordinate and stimulate activities relating to the development of the goat and sheep sector in Wallonia at producer, processor and distributor level.

*CRA-W's role or function on the Board:*

The Animal Production and Nutrition Department has been an active member of the managing board since its formation in 2003, in the person of Pierre Rondia. He Coordinates the activities of the AWEOC (Association Wallonne des Eleveurs d'Ovins et Caprins / Wallonia Sheep and Goat Breeders' Association)'s Dairy Sheep Breed Commission

*Institution and/or person chairing the Board: Président : Jean Devillers (farmer in Marchin)*

*Topics addressed by the Board in 2007-2008 in which CRA-W was involved:*

- Development of a traceability and reference tool (database)
- Introduction of a tool for calculating the cost of producing butcher's lamb.

### **Wallonia Pork Promotion Board (FPW)**

*Specific aims:*

- Pork production in Wallonia with a view to sustainable development of a quality sector
- Creation of a framework for developing upstream activities (feed manufacture, construction contractors, etc.), production activities and downstream activities (slaughter,

processing, distribution, etc.).

*CRA-W's role or function on the Board:*

The Animal Production and Nutrition Department houses the Board and employs its permanent staff. Nicole Bartiaux-Thill has been an expert member of the managing board since 2006 and is a member of the Environment and Regional Development working party. José Wavreille has been Secretary and Treasurer since 2004 and has chaired the Genetics, Animal Health and Feed working party since 2008. He regularly attends meetings of the various project and specific study support committees. Vincent Servais is conducting a survey of pig welfare following the appointment of the Promotion Board as Agricultural Consultant under a scheme run by the Department of Agriculture, Natural Resources and the Environment.

*Institution chairing the Board: Président : Mr Alain Debruyne (FWA)*

*Topics addressed by the Board in which CRA-W was involved:*

- Presentation on promoting pork's image.
- Study of "Potential for Developing Wallonia's Pork Industry" commissioned by Wallonia's Minister for Agriculture.

### **Wallonia's Dairy and Dairy Products Sector (FLPLW)**

*Specific aims:*

The aim is to develop Wallonia's dairy and dairy products sector, comprising upstream activities (production), downstream activities (distribution) and processing.

The main tasks are:

- To define development strategies for the sector as a whole
- To promote the sector by functioning as a tool for development and proposals
- To be a forum for all topics relevant to the sector

*CRA-W's role or function on the Board:*

The Quality of Agricultural Products Department is an active member of the managing board, in the person of Frédéric Dehareng (who took over from Pierre Dardenne in January 2008).

*President:* Pierre Ska (Fwa)

*Coordination:* Catherine Bauraind

*Topics addressed by the Board in which CRA-W was involved in connection with its R&D activities:*

- Member of the managing board
- Member of the steering committee
- Involved in developing a milk product for secondary schools

## Plant sector

### Wallonia Field Crops Promotion Board (CFGW-W)

*CRA-W's role or function on the Board:*

The Crop Production Department houses the Board and has chaired it, in the person of Jean-Pierre Destain, since its formation in 2003.

*Board Coordinator (salaried, under contract):* Sylvina Dantas Pereira

*Topics addressed by the Board in which CRA-W was involved:*

- Mycotoxins: setting up a prototype mycotoxin monitoring network to meet the cereal sector's expectations.
- Extension: creation of a website, participation in organising events to mark the 40th edition of the White Book, initiation of studies of the Field Crops sector's image as presented to the industry and to consumers
- Differentiated quality: study of ways for enhancing the value of Wallonia's products on added-value markets
- Self-regulation Sector Guide for Primary Crop Production and IQM Standard: involvement in drafting versions 2 and 3 of both documents

### Wallonia Potato Promotion Board (CFPDT-W)

*Specific aims:*

- To contribute to improving income and profitability in the potato sector
- To contribute to the development of the Wallonia potato plant
- To bring potato growing and production into line with society's expectations (quality and environmental friendliness)

*CRA-W's role or function on the Board:*

The Crop Production Department and the Farming Systems Section have been members of the organisation's managing board since its formation in 2003, in the person of Jean-Louis Rolot and Jean-Pierre Goffart respectively, the latter also holding the post of Treasurer on the committee of the Association.

*Institution chairing the Board:* CARAH (Ath), President: Christian Ducattillon

*Board Coordinator (salaried, under contract):* Monique Romain

*Topics addressed by the Board in which CRA-W was involved:*

- Differentiated quality: participation in the Terra Nostra technical advisory group (brand created back in 1998)
- Updating and participation in implementing the Strategic Plan for development of the potato sector in Wallonia (variety platform project, consultation on future blight warnings in Wallonia, project to enhance mass distribution potato quality)

### Wallonia Ornamental Horticulture Promotion Board (CFHO-W)

*Specific aims:*

- For growers of annual plants, nursery plants and Christmas trees: extension, quality initiatives and development of contacts with municipalities within Wallonia.
- Support for the sector's economic and commercial aspects (monitoring market trends, identifying promising new products and guiding producers towards them, supporting and promoting consolidation initiatives, etc.)

*CRA-W's role or function on the Board:*

The Biotechnology Department chairs the Promotion Board in the person of Bernard Watillon.

*Board Coordinator* (salaried, under contract):  
Alain Grifnée (Wallonia Horticulture Promotion  
Association, APHW)

*Topics addressed by the Board in which CRA-W  
was involved:*

- Setting up a Quality initiative in the Christmas tree sector (provision of "elite" breeding material).
- Identification of promising new products, in partnership with producers

#### **Wallonia Edible Horticultural Product Promotion Board (CFWPHC)**

*Specific aims:*

- To develop all activities relating to production, processing and distribution of products obtained from edible horticultural crops;
- To define global strategies for development and promotion of the sector as a whole;
- To contribute to creating a common base defining the basic quality of all products obtained from edible horticultural crops;
- To identify new products and make an inventory of products obtained from existing edible horticultural crops that can be integrated into the differentiated quality concept and be marketed under the relevant Wallonia brands

*CRA-W's role or function on the Board:*

The Department of Biological Control and Plant Genetic Resources represents CRA-W as an active member of the Association's managing board, in the person of Marc Lateur.

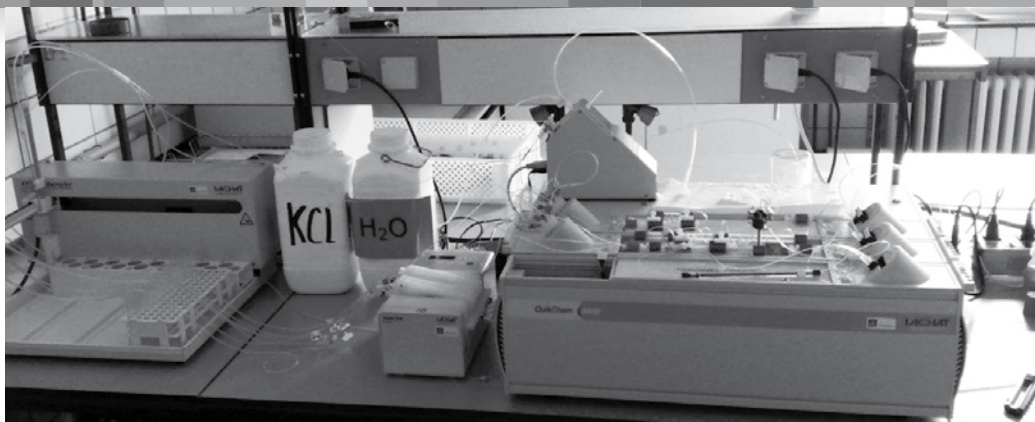
*Board chair and institution:* Pierre Roberti (Centre Maraîcher de Hesbaye)

*Board Coordinator:* Marc Schaus

*Topics addressed by the Board in which CRA-W  
was involved in connection with its R&D  
activities:*

- Assessment in connection with establishing specifications for Wallonia's differentiated quality products
- Involvement in setting up the Fruit School Scheme, a European project aimed at promoting fruit consumption in schools, taking into account sustainable development aspects (short routes, low input, etc.) and introducing pupils to different tastes.

## CRA-W Reference Laboratories



### National Reference Laboratory (NRL) – Plant Diseases

in a consortium with ILVO

Work in the disciplines of mycology and virology.

**Contact:**

Marc Cavalier ([cavelier@cra.wallonie.be](mailto:cavelier@cra.wallonie.be))

### WHO Collaborating Centre for the Quality Control of Pesticides

**Contacts:**

Michel De Proft ([deproft@cra.wallonie.be](mailto:deproft@cra.wallonie.be)) and

Olivier Pigeon ([pigeon@cra.wallonie.be](mailto:pigeon@cra.wallonie.be))

### Community Reference Laboratory for detection of animal protein (CRL-AP) in animal feed (2006-2011)

<http://crl.cra.wallonie.be>

**Contact:**

Vincent Baeten ([baeten@cra.wallonie.be](mailto:baeten@cra.wallonie.be))

### National Reference Laboratory for milk and dairy products (NRL-Milk) in a consortium with ILVO since August 2007

**Contact :**

Véronique Ninane ([ninane@cra.wallonie.be](mailto:ninane@cra.wallonie.be))

### National Reference Laboratory for genetically modified organisms (NRL-GMO)

in a consortium with ILVO and ISP since July 2006

<http://gmo-crl.jrc.ec.europa.eu>

**Contact :**

Gilbert Berben ([berben@cra.wallonie.be](mailto:berben@cra.wallonie.be))

### Regional Reference Laboratory for soil analyses

in the context of the Regional Government Order of 14 February 2008 establishing the conditions for approval of laboratories conducting soil analyses to quantify potentially leachable nitrogen content

**Contact :**

Véronique Reuter ([reuter@cra.wallonie.be](mailto:reuter@cra.wallonie.be))

### Benchmark supporting laboratory within the REQUASUD network for NIR analyses of forage and cattle feed

**Contact:**

Richard Agneessens ([agneessens@cra.wallonie.be](mailto:agneessens@cra.wallonie.be))

### Benchmark supporting laboratory within the REQUASUD network for NIR analyses of cereals

**Contact:**

Georges Sinnaeve ([sinnaeve@cra.wallonie.be](mailto:sinnaeve@cra.wallonie.be))

### Benchmark supporting laboratory within the REQUASUD network for NIRS (Near Infrared Spectrometry) modelling

**Contact:**

Vincent Baeten ([baeten@cra.wallonie.be](mailto:baeten@cra.wallonie.be))

### Benchmark supporting laboratory within the REQUASUD network for nitrate analyses in agricultural soils

**Contact:**

Jean-Pierre Destain ([destain@cra.wallonie.be](mailto:destain@cra.wallonie.be))

### Official inspection body for agricultural and orchard sprayers for the Regional Government of Wallonia

**Contact:**

Bruno Huyghebaert ([huyghebaert@cra.wallonie.be](mailto:huyghebaert@cra.wallonie.be))

# Regional and national research projects

## AGRILUS

Controlling the sinuate pear tree borer  
Federal Public Service (SPF) Public Health, Food  
Chain Safety and Environment -  
Contract P07 – C08/4  
**Contact:** Ir. Christiane Fassotte  
([fassotte@cra.wallonie.be](mailto:fassotte@cra.wallonie.be))

## ALIFERM

'Developing new production methods for dietary  
ferments'.  
DGTRE – RW Marshall Plan  
**Contact:** Dr. Georges Sinnaeve  
([sinnaeve@cra.wallonie.be](mailto:sinnaeve@cra.wallonie.be))

## Amidong

Characterisation of factors affecting starch  
structure and consequences for the development  
of wheat.  
RW, DGA  
**Contact:** Dr. Georges Sinnaeve  
([sinnaeve@cra.wallonie.be](mailto:sinnaeve@cra.wallonie.be))

## TECHNICAL ASSISTANCE - LUTANUIS

Technical assistance to the Muskrat Trapping  
Department (data processing and logistics) –  
Supplement to Interreg III – LUTANUIS  
RW, DGRNE, DCENN, Visa No 05-48148  
**Contact:** Ir. Pierre Joye  
([pierre.joye@spw.wallonie.be](mailto:pierre.joye@spw.wallonie.be))

## NITROGEN and VEGETABLES

Production of fresh vegetables of specific  
quality (differentiated or other) in the context of  
agriculture in Wallonia  
D GARNE, project D31/1145  
**Contact:** Dr. Jean-Pierre Goffart  
([goffart@cra.wallonie.be](mailto:goffart@cra.wallonie.be)); Sophie Renard  
([renard@cra.wallonie.be](mailto:renard@cra.wallonie.be))

## WILDFLOWER STRIPS

Scientific assistance with implementation of  
agri-environmental measures: wildflower strips  
and cornfield strips  
D GARNE, File 2796/2  
**Contact:** Ir. Luc Couvreur  
([couvreur@cra.wallonie.be](mailto:couvreur@cra.wallonie.be))

## BIOCIDES

Production of a report on developing our  
knowledge of biocide application techniques  
SPF Public Health  
**Contact:** Ir. Fabienne Rabier  
([rabier@cra.wallonie.be](mailto:rabier@cra.wallonie.be)), Ir. Stéphanie Noel  
([noel@cra.wallonie.be](mailto:noel@cra.wallonie.be))

## BIOETHA2

Contribution to development of the second  
generation bioethanol production sector  
- selected by the College of Heads of  
Department.  
CRA-W - Moerman Act funding  
**Contact:** Jérôme Delcarte  
([delcarte@cra.wallonie.be](mailto:delcarte@cra.wallonie.be))

## BIOMETHANISATION

'Feasibility study. Near Infrared Spectrometry for  
online management of the biomethanisation  
process'. In cooperation with PSPc. (Project  
launched 1 September 2008).  
RW, DGTRE  
**Contact:** Dr. Georges Sinnaeve  
([sinnaeve@cra.wallonie.be](mailto:sinnaeve@cra.wallonie.be))

## BIOMETHANISATION DR CONGO

Setting up of a pilot biomethanisation plant for  
technical and teaching purposes  
RW, DRI  
**Contact:** Ir. Fabienne Rabier  
([rabier@cra.wallonie.be](mailto:rabier@cra.wallonie.be))

## N'DEM PELLETS

BioTerre project: setting up of a pilot plant  
at N'Dem for production of fuel pellets from  
groundnut shells  
Wallonia Brussels International  
**Contact:** Ir. Michael Temmerman  
([temmerman@cra.wallonie.be](mailto:temmerman@cra.wallonie.be))

## BTV

Monitoring carriers of blue tongue of sheep in  
Belgium  
AFSCA.  
**Contact:** Ir. Christiane Fassotte  
([fassotte@cra.wallonie.be](mailto:fassotte@cra.wallonie.be))

## CANOUAL

Study of techniques for better control of the  
technical quality of duck foie gras  
RW, DGA, IG3 Quality, file 2870 (2006-2008)  
**Contact:** Dr. Nicole Bartiaux-Thill  
([bartiaux@cra.wallonie.be](mailto:bartiaux@cra.wallonie.be)) and Ir. P. Rondia  
([rondia@cra.wallonie.be](mailto:rondia@cra.wallonie.be))

## WHEAT BLOSSOM MIDGE

The orange wheat blossom midge: risk  
assessment and integrated management  
SPW  
**Contact:** Dr. Michel De Proft  
([deproft@cra.wallonie.be](mailto:deproft@cra.wallonie.be))

## CHALARA FRAXINAE

Monitoring and protecting the health of  
Wallonia's forests  
RW, DNF (via ULB)  
**Contact:** Dr. Anne Chandelier  
([chandelier@cra.wallonie.be](mailto:chandelier@cra.wallonie.be))

## CHICORY

Study of chicory sowing and harvesting methods  
Centre Betterave Chicorée  
**Contact:** Dr. Olivier Miserque  
([miserque@cra.wallonie.be](mailto:miserque@cra.wallonie.be))

## CLA-ALIM 1

Feeding strategies for sustainable production of  
CLA-rich milk by dairy cows  
RW, DGA, IG3 Research, project D31-1119  
(2005-2007)  
**Sponsor:** Prof. Y. Larondelle (UCL)  
**Contact:** Dr. Eric Froidmont  
([froidmont@cra.wallonie.be](mailto:froidmont@cra.wallonie.be))

## CLA-ALIM 2

Feeding strategies for sustainable production of  
conjugated linoleic acid-rich milk (CLA-rich) by  
dairy cows  
SPW, D GARNE, Research Department, project  
D31-1163 (2007-2009)  
**Sponsor:** Prof. Y. Larondelle (UCL)  
**Contact:** Dr. Eric Froidmont  
([froidmont@cra.wallonie.be](mailto:froidmont@cra.wallonie.be))

## CO-COMPOSTING

Environmental impacts of co-composting of organic materials of agricultural and food origin

SPW/DGARNE

**Contact:** Dr. Didier Stilmant  
([stilmant@cra.wallonie.be](mailto:stilmant@cra.wallonie.be))

## COLOSTRUM 2

Utilisation of bovine colostrum in pig production, before and after weaning, as an alternative to antibiotic food additives

RW, DGA, IG3 Research, project D31-1154 (2007-2008)

**Sponsor:** A. Théwis

**Contact:** Ir. José Wavreille ([wavreille@cra.wallonie.be](mailto:wavreille@cra.wallonie.be))

## CONSALIM

'Optimising food storage by understanding and controlling the mechanisms that cause deterioration'. DGTRE – RW Marshall Plan

**Contact:** Dr. Vincent Baeten ([baeten@cra.wallonie.be](mailto:baeten@cra.wallonie.be))

## COST OF USE

Updating and online launch of a program for calculating the cost of using tractors and agricultural machinery

SPW, DGARNE

**Contact:** Dr. Olivier Miserque ([miserque@cra.wallonie.be](mailto:miserque@cra.wallonie.be)),  
Ir. Fabienne Rabier ([rabier@cra.wallonie.be](mailto:rabier@cra.wallonie.be))

## DEVELOPMENT - TUNISIA

Study of the impact of using sewage effluent on the nitrogen cycle in agricultural soils and groundwater quality in Tunisia

WBI, project 6 – Section 2

**Contact:** Dr. Jean-Pierre Destain  
([destain@cra.wallonie.be](mailto:destain@cra.wallonie.be))

## DURAPORC

Making pork production sustainable

SPW, DGARNE, Development and Extension Section, contract No 2903 (2008-2010)

**Contact:** Ir. José Wavreille ([wavreille@cra.wallonie.be](mailto:wavreille@cra.wallonie.be))  
and Ir. Virginie Remience ([remience@cra.wallonie.be](mailto:remience@cra.wallonie.be))

## ECOGEST

Managing high ecological value environments: diversification for farms

SPW, Department of Rural Affairs and Watercourses, Countryside Section

**Contact:** Ir. P. Rondia ([rondia@cra.wallonie.be](mailto:rondia@cra.wallonie.be)) and Ir. Amélie Turlot ([a.turlot@cra.wallonie.be](mailto:a.turlot@cra.wallonie.be))

## ECOLIRI

Creation and launch of a woody ecotype production sector for the renaturation of river and stream banks

ERDF-RW (Interreg III WLL)

**Contact:** Dr. Ph. Druart ([druart@cra.wallonie.be](mailto:druart@cra.wallonie.be))

## ECOLIRIMED

Development of a woody ecotype production sector for the permanent consolidation and phytoremediation of river and stream banks

ERDF-RW (Interreg IV 'Large regions')

**Contact:** Dr. Ph. Druart ([druart@cra.wallonie.be](mailto:druart@cra.wallonie.be))

## ELISA 2007

Pre-certification virological analyses of potato plantlets

SPW/DGARNE/Department of Development/Quality Section

**Contact:** Dr. Jean-Louis Rolot ([rolot@cra.wallonie.be](mailto:rolot@cra.wallonie.be))

## ELISA 2008

Pre-certification virological analyses of potato plantlets

SPW/DGARNE/Department of Development/Quality Section

**Contact:** Dr. Jean-Louis Rolot ([rolot@cra.wallonie.be](mailto:rolot@cra.wallonie.be))

## ENVIRON 2

Environmental assessment of group sow housing in litter

RW, DGA, Rural Development, file 2740/2 (2006-2008)

**Sponsor:** B. Nicks

**Contact:** Ir. José Wavreille ([wavreille@cra.wallonie.be](mailto:wavreille@cra.wallonie.be))



### ENVIRON 3

Comparative environmental assessment of pregnant sows kept on straw floors SPW, Department of Rural Affairs and Watercourses, Countryside Section, contract No 2740/3 (2008-2010)

**Sponsors:** Prof. Baudouin Nicks (ULg) and Dr. Nicole Bartiaux-Thill ([bartiaux@cra.wallonie.be](mailto:bartiaux@cra.wallonie.be))

**Contact:** Ir. José Wavreille ([wavreille@cra.wallonie.be](mailto:wavreille@cra.wallonie.be))

### TRACTOR CALIBRATION TRIAL

Development of a Windows-based tractor testing program, installation of test benches and monitoring  
BP

**Contact:** Dr. Olivier Miserque ([miserque@cra.wallonie.be](mailto:miserque@cra.wallonie.be))

### WOOD ENERGY FACILITATOR

Carrying out of the programme 'Private Sector Wood-to-Energy Enabler' and 'Individual Biomass Enabler'  
RW, DGTRE

**Contact:** Ir. Nora Pieret ([n.pieret@cra.wallonie.be](mailto:n.pieret@cra.wallonie.be))

### FARIMAL

New methodology for determination of the species of products of animal origin in cattle feed: coupling of microspectroscopy and real-time PCR techniques. - Agreement No S-6168 SPF – Public Health, Safety of the Food Chain and the Environment - Contractual Research Project

**Contact:** Dr. Vincent Baeten ([baeten@cra.wallonie.be](mailto:baeten@cra.wallonie.be))

### FARR-WAL

Agriculture and renewable resources in Wallonia  
RW, DGA

**Contact:** Ir. Sandrine Dufourny ([s.dufourny@cra.wallonie.be](mailto:s.dufourny@cra.wallonie.be)), Ir. Nora Pieret ([n.pieret@cra.wallonie.be](mailto:n.pieret@cra.wallonie.be))

### BIOENERGY SECTOR

Setting up of a pilot unit for fuel nut production by biomass agglomeration  
RW, DRI

**Contact:** Ir. Michael Temmerman ([temmerman@cra.wallonie.be](mailto:temmerman@cra.wallonie.be))

### FIRST Entreprise - BLE

Assessment of the integration of new technologies for characterisation of the rheological properties of flours and whole wheat flours as tools for management of product technical and functional quality at Moulins de Statte.  
RW-DGTRE

**Contact:** Dr. Georges Sinnaeve ([sinnaeve@cra.wallonie.be](mailto:sinnaeve@cra.wallonie.be))

### FRFC-FA

Study of the genetic variability of milk fatty acids and development of methods and tools for differentiated breeding of dairy cattle for fatty acids (in cooperation with the University's Department of Animal Sciences).  
FRFC = Collective Fundamental Research Fund.

**Contact:** Ir. Frédéric Dehareng ([dehareng@cra.wallonie.be](mailto:dehareng@cra.wallonie.be))

### HEIFERS

Study of critical points in dairy heifer rearing in Wallonia  
RW, DGA, IG3 Development and Extension, file 2865 (2006-2008)

**Contact:** Dr. Eric Froidmont ([froidmont@cra.wallonie.be](mailto:froidmont@cra.wallonie.be)) and Ir. Pascale Picron ([p.picron@cra.wallonie.be](mailto:p.picron@cra.wallonie.be))

### GES

Cattle farming effluent management: environmental impact of production and storage – audit measurements  
SPW/DGARNE/Department of Development/Research Section

**Contact:** Ir. Michaël Mathot ([m.mathot@cra.wallonie.be](mailto:m.mathot@cra.wallonie.be)) and Ir. Virginie Decruyenaere ([decruyenaere@cra.wallonie.be](mailto:decruyenaere@cra.wallonie.be))

### GLOBO

Situation and risk analysis of the spread of the potato cyst nematode (*Globodera* spp.) in the potato sector in Belgium  
Federal Public Service (SPF), Public Health, Food Chain Safety and Environment (RF 6188 GLOBO)

**Contact:** Dr. Jean-Pierre Goffart ([goffart@cra.wallonie.be](mailto:goffart@cra.wallonie.be))

### GMODETEC

'Development of a global strategy for detection, identification and quantification of genetically modified material in food and feed'  
Federal Public Service (SPF) - Public Health, Food Chain Safety and Environment

**Contact:** Dr. Gilbert Berben ([berben@cra.wallonie.be](mailto:berben@cra.wallonie.be))

### GROPORC

Reducing stress in sows kept in dynamic groups and fed at an electronic feeding station  
Federal Public Service (SPF) – Public Health, Safety of the Food Chain and Environment, agreement No R-04/004-groporc-section 2 (2004-2007)

**Contact:** Dr. Nicole Bartiaux-Thill ([bartiaux@cra.wallonie.be](mailto:bartiaux@cra.wallonie.be)) and Ir. José Wavreille ([wavreille@cra.wallonie.be](mailto:wavreille@cra.wallonie.be))

### GUIDANCE LAIT

'Scientific support for Belgian Interprofessional Organisations in charge of official determination of milk composition and milk quality for payments to milk suppliers'  
Federal Public Service (SPF) - Public Health - AFSCA

**Contact:** Ir. Frédéric Dehareng ([dehareng@cra.wallonie.be](mailto:dehareng@cra.wallonie.be))

### INFOSOL

Towards soil function indicators: developing a methodological approach to characterisation of soil function within the framework of thematic soil strategy.

Project in partnership with the AGRO/MILA/GERU Unit - Louvain Catholic University (Professor Charles Biélders)  
DGA, project D31-1176/52

**Contact:** Dr. Christian Roisin ([roisin@cra.wallonie.be](mailto:roisin@cra.wallonie.be))

## SELECTIVITY LISTS

Compilation of pesticide selectivity lists with respect to beneficial insects in market garden crops in connection with extension of use of plant protection products to small-scale crops.

RW, DGA, DDV, - Project D33 - 2832/1

**Contact:** Dr. Jean-Pierre Jansen  
([labecotox@cra.wallonie.be](mailto:labecotox@cra.wallonie.be))

## NRL

Belgian national reference laboratory for plant diseases.

AFSCA – 10-ILVOCRA-PLANTS 2007 and 2008

**Contact:** Dr. Marc Cavalier ([cavalier@cra.wallonie.be](mailto:cavalier@cra.wallonie.be))

## AEM land consolidation

Development of an information system favouring the implementation of agri-environment action plans SPW/DGARNE/Department of Rural Affairs and Watercourses

**Contact:** Ir. François Ghysel ([f.ghysel@cra.wallonie.be](mailto:f.ghysel@cra.wallonie.be)) and Ir. Yannick Curnel ([curnel@cra.wallonie.be](mailto:curnel@cra.wallonie.be))

## MAMMITES

Ecopathological study of mastitis risk factors on dairy farms in Wallonia: management and data processing aspects

RW, DGA, IG3 Research, project D31-1115 Section 2 (2005-March 2008)

**Contact:** Dr. Eric Froidmont  
([froidmont@cra.wallonie.be](mailto:froidmont@cra.wallonie.be))

## MICROPROPAGATION 1

Assistance with developing the use of micropropagated plant material in the potato plantlet production sector in Wallonia

SPW/DGARNE/Department of Development/Development and Extension Section

**Contact:** Dr. Jean-Louis Rolot ([rolot@cra.wallonie.be](mailto:rolot@cra.wallonie.be))

## MICROPROPAGATION 2

Research into optimising production techniques by micropropagation of plant material to supply the potato plantlet production sector in Wallonia

SPW/DGARNE/Department of Development/Development and Extension Section

**Contact:** Dr. Jean-Louis Rolot ([rolot@cra.wallonie.be](mailto:rolot@cra.wallonie.be))

## MILKINIR

Research - Development of an automatic system for measuring milk composition and quality in the milking parlour.

RW-DGA

**Contact:** Ir. Frédéric Dehareng  
([dehareng@cra.wallonie.be](mailto:dehareng@cra.wallonie.be))

## MIMOSA (field crops part – Wheat and Potatoes)

Analysis of methods for integrating multi-sensor modelling and satellite information techniques into decision support systems

CRA-W – Moerman Act funding

**Contact:** Dr. Jean-Pierre Goffart  
([goffart@cra.wallonie.be](mailto:goffart@cra.wallonie.be)); Ir. Dominique Buffet  
([buffet@cra.wallonie.be](mailto:buffet@cra.wallonie.be))

## NATURA 2000

Impact of the constraints associated with Natura 2000 site management on farms' technical and economic efficiency – Support for farmers in connection with implementation of the Natura 2000 Directive

SPW/DGARNE/Department of Rural Affairs and Watercourses/Rural Development Section

**Contact:** Ir. Yves Seutin ([seutin\\_yves@cra.wallonie.be](mailto:seutin_yves@cra.wallonie.be)) and Ir. François Ghysel ([f.ghysel@cra.wallonie.be](mailto:f.ghysel@cra.wallonie.be))

## NITRATE

Creation and validation of good practice indicators for nitrogen management in grazed grassland

SPW/DGARNE/Department of Rural Affairs and Watercourses/Rural Development Section

**Contact:** Ir. Sylvain Hennart ([hennart@cra.wallonie.be](mailto:hennart@cra.wallonie.be))

## PESTS

River and stream rodents and other pests: nuisance assessment and prospects for control

RW, DGRNE, DCENN, Visa No 03-45574

**Contact:** Ir. Pierre Joye ([pierre.joye@spw.wallonie.be](mailto:pierre.joye@spw.wallonie.be))

## MONITORING

Monitoring of integrated management of field crop fertilisation and cultivated land quality in Wallonia

Department of Agriculture, project 2739/1

**Contact:** Dr. Jean-Pierre Destain

([destain@cra.wallonie.be](mailto:destain@cra.wallonie.be))

## OEB

Nitrogen efficiency of the Belgian Blue bull  
SPW/DGARNE/Department of Development/  
Research Section

**Contact:** Ir. Virginie Decruyenaere  
([decruyenaere@cra.wallonie.be](mailto:decruyenaere@cra.wallonie.be))

## OGM2

'Assistance with the analytical system for  
detection of GMOs'  
RW, DGA

**Contact:** Dr. Gilbert Berben  
([berben@cra.wallonie.be](mailto:berben@cra.wallonie.be))

## GM RAPESEED

'GM rapeseed search and detection in Wallonia'  
RW DGA

**Contact:** Dr. Gilbert Berben  
([berben@cra.wallonie.be](mailto:berben@cra.wallonie.be))

## SHEEP AND CATTLE

Diversification into sheep to optimise cattle  
farming performance  
SPW/DGARNE/Department of Development/  
Development and Extension Section

**Contact:** Ir. Virginie Decruyenaere  
([decruyenaere@cra.wallonie.be](mailto:decruyenaere@cra.wallonie.be))

## PESTEAUX

Development of a geographical information  
system, at plot scale, for assessment of the  
water pollution risk from pesticide use  
CRA-W – Moerman Act funding

**Contact:** Ir. Stéphanie Noël  
([noel@cra.wallonie.be](mailto:noel@cra.wallonie.be))

## PHYRAM-1

Phytophthora in the forest environment  
SPF – Public Health, Safety of the Food Chain  
and the Environment, Contractual Research,  
Project No RT-05/04-PHYRAM-1

**Contact:** Dr. Anne Chandelier  
([chandelier@cra.wallonie.be](mailto:chandelier@cra.wallonie.be))

## PHYTOMOL

Plant genomics and proteomics applied to plant  
polymers  
RW, DGTRE

**Contact:** Dr. B. Watillon  
([watillon@cra.wallonie.be](mailto:watillon@cra.wallonie.be))

## PHYTORIVE

Phytosanitary monitoring of woody species in  
riparian environments  
RW, DGRNE, DCENN, Visa No 05-47801

**Contact:** Dr. Anne Chandelier  
([chandelier@cra.wallonie.be](mailto:chandelier@cra.wallonie.be))

## POTATO VARIETY PLATFORM

Multifunctional testing, demonstration,  
development and extension network in the  
context of variety diversification in the potato  
plant and ware potato sectors in Wallonia  
DGARNE, project D33/2876

**Contact:** Dr. Jean-Pierre Goffart  
([goffart@cra.wallonie.be](mailto:goffart@cra.wallonie.be)) and Ir. Alice Soete  
([soete@cra.wallonie.be](mailto:soete@cra.wallonie.be))

## SILVERLEAF

Silverleaf, Chondrostereum purpureum  
Federal Public Service (SPF) Public Health,  
Budget fund for raw materials

**Contact:** Ir. Sophie Schmitz  
([schmitz@cra.wallonie.be](mailto:schmitz@cra.wallonie.be))

## POLYMYXA

Biological and molecular characterisation  
of cereal mosaic diseases and their vector  
Polymyxa graminis in Wallonia.  
RW, DGA, IG3 - Research, Project D31-1100 and  
D31-1147/S2

**Contact:** Ir. Stéphan Steyer  
([steyer@cra.wallonie.be](mailto:steyer@cra.wallonie.be))

## POMINNO

Research into rapid selection methods for new  
apple varieties of differentiated quality suitable  
for sustainable agriculture.

CRA-W – Moerman Act funding

**Contact:** Dr. Marc Lateur  
([lateur@cra.wallonie.be](mailto:lateur@cra.wallonie.be))

## WOOD-FIRED HEATING SYSTEM SUBSIDIES

Support for wood-to-energy facilities (subsidies)  
RW, DGTRE

**Contact:** Ir. Florence Van Stappen  
([vanstappen@cra.wallonie.be](mailto:vanstappen@cra.wallonie.be))

## WATER PROTECTION

Reduction of groundwater and catchment  
contamination by pesticides in particular  
SPGE

**Contact:** Ir. Stéphanie Noël  
([noel@cra.wallonie.be](mailto:noel@cra.wallonie.be)), Ir. Quentin Limbourg  
([q.limbourg@cra.wallonie.be](mailto:q.limbourg@cra.wallonie.be))

## Foie gras quality

Study of techniques for better control of the  
technical quality of duck foie gras. Cooperation  
with D6  
RW-DGA

**Contact:** Ir. Jean-Michel Romnee  
([romnee@cra.wallonie.be](mailto:romnee@cra.wallonie.be))

## WALLONIA NETWORK FGR 2

Creation of a multisite network of conservation  
orchards for regional fruit tree germplasm  
RW, DGA, Ig3 – Quality, Project D32-2884

**Contact:** Dr. Marc Lateur  
([lateur@cra.wallonie.be](mailto:lateur@cra.wallonie.be))

## ROMANIA

Romania/Wallonia Brussels mixed commission  
2008-2010 – 'Assessment and utilisation of  
potato germplasm'  
SPW/WBI

**Contact:** Dr. Jean-Louis Rolot  
([rolot@cra.wallonie.be](mailto:rolot@cra.wallonie.be))

## ISR

Research into new means of biological control  
of plant diseases based on induced systemic  
resistance: application to fruit crops and field  
crops

RW, DGA, IG3 - Research, Project D31-1131 and  
D31-1173

**Contact:** Dr. Marc Lateur  
([lateur@cra.wallonie.be](mailto:lateur@cra.wallonie.be))

## LYSIMETRIC MONITORING

Lysimetric monitoring using the 15N isotope  
tracer of autumn residual mineral N in the soil  
DGARNE, project 2798/1

**Contact:** Dr. Jean-Pierre Destain  
([destain@cra.wallonie.be](mailto:destain@cra.wallonie.be))

## TEXBIAG

Decision support tools for the development of bioenergy in agriculture  
Federal Scientific Services

**Contact:** Dr. Yves Schenkel ([schenkel@cra.wallonie.be](mailto:schenkel@cra.wallonie.be)),  
Ir. Florence Van Stappen ([vanstappen@cra.wallonie.be](mailto:vanstappen@cra.wallonie.be))

## VENTOMO

Study of the vertical dispersion of Culicoides in the lower troposphere to improve the accuracy of blue tongue wind dispersal models  
Federal Public Service (SPF) Public Health, Food Chain Safety and Environment -

'VENTOMO' contract RF6194.  
**Contact:** Ir. Christiane Fassotte ([fassotte@cra.wallonie.be](mailto:fassotte@cra.wallonie.be))

## ORGANIC ORCHARDS

Methodological research with a view to optimizing plant protection in organically farmed apple orchards  
RW, DGA, IG3 - Research, Project D31-1144

**Contact:** Dr. Marc Lateur ([lateur@cra.wallonie.be](mailto:lateur@cra.wallonie.be))

## VIABIO

Managing the growing/fattening period in cattle and intrinsic meat quality in relation to its development in organic farming  
SPW/DGARNE/Department of Development/Research Section

**Contact:** Ir. Daniel Jamar ([d.jamar@cra.wallonie.be](mailto:d.jamar@cra.wallonie.be))

## Walaid

'Setting up an interdisciplinary talent pool to ensure the competitiveness and sustainability of Wallonia's food sectors by reprocessing their related flows".  
RW Marshall Plan

**Contact:** Dr. Georges Sinnaeve ([sinnaeve@cra.wallonie.be](mailto:sinnaeve@cra.wallonie.be))

## WALNUT-20

'Developing products and ingredients to meet nutritional and/or health claims and appropriate/specific tools to that end.' Approved but without funding for CRA-W.

DGTRE – RW Marshall Plan

**Contact:** Dr. Vincent Baeten ([baeten@cra.wallonie.be](mailto:baeten@cra.wallonie.be))

## Detection and characterisation of bacterial pathogens in fruit horticulture

RW - Department of Agriculture (D31-1124)

**Contact:** Ir. A. Bultreys ([bultreys@cra.wallonie.be](mailto:bultreys@cra.wallonie.be))

## Increasing antimicrobial secondary metabolite secretion in the potato in order to improve its pathogen resistance

RW – Department of Agriculture (D31-1132/S2)

**Contact:** Ir. A. Bultreys ([bultreys@cra.wallonie.be](mailto:bultreys@cra.wallonie.be))

## Developing new technologies for producing quality Christmas trees

RW - Department of Agriculture (D31-1138)

**Contact:** Ir. A. Bultreys ([bultreys@cra.wallonie.be](mailto:bultreys@cra.wallonie.be))

## Genetic control of wheat Fusarium head blight

RW - DEPARTMENT OF AGRICULTURE (D31-1142)

**Contact:** Dr. J.M. Jacquemin ([jacquemin@cra.wallonie.be](mailto:jacquemin@cra.wallonie.be))

## Increasing antimicrobial secondary metabolite secretion in the potato in order to improve its pathogen resistance

RW – Department of Agriculture (D31-1174/S2)

**Contact:** Ir. A. Bultreys ([bultreys@cra.wallonie.be](mailto:bultreys@cra.wallonie.be))

## Research into aromatic Abies lines by somatic hybridisation – Biotechnological aspects

SPW – DGARNE (D31-1198/S1)

**Contact:** Dr. Ph. Druart ([druart@cra.wallonie.be](mailto:druart@cra.wallonie.be))

## Cleaning 6 varieties of peach tree


RW – Department of Agriculture

**Contact:** Dr. Ph. Druart ([druart@cra.wallonie.be](mailto:druart@cra.wallonie.be))

## Study of bacterial horse chestnut disease and search for solutions

Brussels-Capital Regional Government

**Contact:** Ir. A. Bultreys ([bultreys@cra.wallonie.be](mailto:bultreys@cra.wallonie.be))



**Production of transgenic plant lines  
for chloroplastic expression of animal  
proteins belonging to the TLK kinase  
and histone deacetylase families**  
////////////////////////////////////

FNRS – FRFC 2.4614.06

**Contact:** Dr. B. Watillon  
([watillon@cra.wallonie.be](mailto:watillon@cra.wallonie.be))

**Characterisation and analysis of the  
expression of candidate genes for  
embryogenesis in Phaseolus using  
molecular and histological techniques  
in order to facilitate the development  
of interspecific hybrids in P. vulgaris**  
////////////////////////////////////

FNRS – FRFC 2.4577.08

**Contact:** Dr. J.M. Jacquemin  
([jacquemin@cra.wallonie.be](mailto:jacquemin@cra.wallonie.be))

**Use of proteomy techniques for  
detection and identification of animal  
protein contaminants in animal feed**  
////////////////////////////////////

SPF Public Health, Food Chain Safety and the  
Environment, RF 6196 'Proteomy'

**Contact:** Ir. S. Mauro ([mauro@cra.wallonie.be](mailto:mauro@cra.wallonie.be))

**Cost/benefit analysis in the context  
of controlling Diabrotica virgifera Le  
Conte**  
////////////////////////////////////

Federal Public Service (SPF) Public Health

**Contact:** Dr. Ph. Burny

**Support for young farmers entering  
the industry and statistical survey of  
farming ventures by young farmers**  
////////////////////////////////////

Department of Agriculture project funded by  
the Young Farmers' Federation

**Contact:** Dr. Ph. Burny

**Survey of frying oil use**  
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University of Ghent

**Contact:** Dr. Ph. Burny

## European research projects

### AGROBIOGAS

An integrated approach for biogas production with agricultural waste

FP6-SME, Cooperative Research Project, Partner.

**Contact:** Ir. Sandrine DUFOURNY

[\*\(s.dufourny@cra.wallonie.be\)\*](mailto:s.dufourny@cra.wallonie.be)

<http://www.agrobiogas.eu>

### ASEMARS

Actions in Support of the Enlargement of the MARS crop yield forecasting system

JRC, ITT G03/02/04. Partner.

**Contact:** Dr. Robert OGER [\*\(oger@cra.wallonie.be\)\*](mailto:oger@cra.wallonie.be)

### BIODIMESTICA

Cross-border centre of excellence for dynamic management of domestic plant biodiversity

SPW - DGO & EC - ERDF, Project Interreg IV FW 4.1.2. Partner.

**Contact:** Dr. Marc Lateur [\*\(lateur@cra.wallonie.be\)\*](mailto:lateur@cra.wallonie.be)

### BIOENERGIS (new)

GIS-based decision support system aimed at a sustainable energy exploitation of biomass at regional level

IEE/07/638/SI2.499702. Partner.

**Contact:** Ir. Romain CREHAY [\*\(crehay@cra.wallonie.be\)\*](mailto:crehay@cra.wallonie.be)

### BIOGAS REGIONS

Promotion of biogas and its market development through local and regional partnerships

IEE, EIE/07/225/SI2.467622. Partner.

**Contact:** Ir. Sandrine DUFOURNY

[\*\(s.dufourny@cra.wallonie.be\)\*](mailto:s.dufourny@cra.wallonie.be)

<http://www.biogasregions.org>

### BIONORM II

Pre-normative research on solid biofuels for the improvement of European standards

FP6-SustDev, Specific Targeted Research Project. Partner.

**Contact:** Ir. Michaël TEMMERMAN

[\*\(temmerman@cra.wallonie.be\)\*](mailto:temmerman@cra.wallonie.be)

<http://www.bionorm2.eu>

### BOOSTING BIO

BOOSTING BIOenergy in Europe

IEE, EIE/04/132/S07.38592. Partner.

**Contact:** Ir. Didier MARCHAL

[\*\(marchal@cra.wallonie.be\)\*](mailto:marchal@cra.wallonie.be)

[http://www.aebiom.org/article.php?id\\_article=34](http://www.aebiom.org/article.php?id_article=34)

### CARAMCODEC

Improved Carbonisation and decentralised Forestry Control in Madagascar

IEE, EIE/06/244/SI2.449538. Partner.

**Contact:** Ir. Romain CREHAY [\*\(crehay@cra.wallonie.be\)\*](mailto:crehay@cra.wallonie.be)

<http://caramcodec.com/index.htm>

### CARTORA

Cross-border mapping of muskrat infestation

SPW - DGO & EC - ERDF, Project Interreg IV TRI 4.1.2. Partner.

**Contact:** Ir. Pierre Joye

[\*\(pierre.joye@spw.wallonie.be\)\*](mailto:pierre.joye@spw.wallonie.be)

[www.cartora.eu](http://www.cartora.eu)

### CO-EXTRA

GM and non-GM supply chains: their CO-EXistence and TRAcability

FP6-FOOD, Integrated Project. Partner.

**Contact:** Dr. Gilbert BERBEN

[\*\(berben@cra.wallonie.be\)\*](mailto:berben@cra.wallonie.be)

<http://www.coextra.org>

### CONFFIDENCE

Contaminants in food and feed: Inexpensive detection for control of exposure

FP7, Collaborative Project. Partner.

**Contact:** Dr. Vincent BAETEN

[\*\(baeten@cra.wallonie.be\)\*](mailto:baeten@cra.wallonie.be) and Ir. Philippe Vermeulen

[\*\(vermeulen@cra.wallonie.be\)\*](mailto:vermeulen@cra.wallonie.be)

<http://www.confidence.eu>

### COST ACTION 866

Green care in agriculture

EU, COST-European cooperation in the field of Scientific and Technical Research

(completed in March 2008)

**Contact:** Dr. Nicole Bartiaux-Thill

[\*\(bartiaux@cra.wallonie.be\)\*](mailto:bartiaux@cra.wallonie.be)

### **COST Action FAo8o2**

'Feed for Health', 2008-2012  
FP7-COST. Partner.

**Contact:** Dr. Vincent BAETEN  
([baeten@cra.wallonie.be](mailto:baeten@cra.wallonie.be)) and Ir. Philippe  
Vermeulen ([vermeulen@cra.wallonie.be](mailto:vermeulen@cra.wallonie.be))  
<http://www.feedforhealth.org>

### **COST-Action 864: "PomeFruitHealth"**

Combining traditional and advanced strategies  
for plant protection in pome fruit growing,  
2006-2011  
Partner

**Contact:** Dr. Marc Lateur  
([lateur@cra.wallonie.be](mailto:lateur@cra.wallonie.be))  
<http://128.131.132.151/>

### **ECOLIRI - Interreg III Wallonia- Lorraine-Luxembourg**

Creation and launch of a woody ecotype  
production sector for the renaturation of river  
and stream banks  
RW - DGRNE & EC - ERDF, Project Interreg III  
FW 2.3.2 Coordinator.

**Contact:** Dr. Anne Chandelier  
([chandelier@cra.wallonie.be](mailto:chandelier@cra.wallonie.be))  
<http://ecoliri.cra.wallonie.be>

### **ECOLIRIMED - Interreg IV Wallonia- Lorraine-Luxembourg**

Development of a woody ecotype production  
sector for the permanent consolidation and  
phytoremediation of river and stream banks  
SPW - DGO & EC - ERDF, Project Interreg IV -  
024-WLL-2-1-017. Coordinator.

**Contact:** Dr. Anne Chandelier  
([chandelier@cra.wallonie.be](mailto:chandelier@cra.wallonie.be))  
<http://ecolirimed.cra.wallonie.be>

### **ENEFIBIO**

Removal of non-technological barriers to  
encourage SME energy efficiency by the rational  
use of biomass  
IEE, Programme / COOPENER. Coordinator.

**Contact:** Ir. Romain CREHAY  
([crehay@cra.wallonie.be](mailto:crehay@cra.wallonie.be))  
<http://www.enefibio.com>

### **ENERBIOM**

Sustainable agricultural production of biomass  
for energy in areas with heavy environmental  
constraints: what alternatives for what sectors?  
INTERREG IV. Partner.

**Contact:** Ir. Thomas SCHIMT  
([t.schmit@cra.wallonie.be](mailto:t.schmit@cra.wallonie.be)) and Dr. Didier  
STILMANT ([stilmant@cra.wallonie.be](mailto:stilmant@cra.wallonie.be))

### **EUBIONET II**

Efficient trading of biomass fuels and analysis  
of fuel supply chains and business models for  
market actors by networking  
IEE/O7/777/SI2.499477. Partner.

**Contact:** Ir. Nora PIERET  
([n.pieret@cra.wallonie.be](mailto:n.pieret@cra.wallonie.be))  
<http://www.eubionet.net>

### **EUBIONET III**

Solutions for biomass fuel market barriers and  
raw material availability.  
IEE. EIE/O7/777/SI2.499477. Partner.

**Contact:** Ir. Nora PIERET  
([n.pieret@cra.wallonie.be](mailto:n.pieret@cra.wallonie.be))  
<http://www.eubionet.net>

### **FONIO**

Upgrading the quality and competitiveness of  
fonio for improved livelihoods in West Africa  
FP6-INCO, Specific Targeted Research Project.  
Partner.

**Contact:** Dr. Didier STILMANT  
([stilmant@cra.wallonie.be](mailto:stilmant@cra.wallonie.be)) and Ir. Brice DUPUIS  
([dupuis@cra.wallonie.be](mailto:dupuis@cra.wallonie.be))  
<http://inco-fonio.cirad.fr>

### **GEMINER**

Management of the natural environment and  
the countryside  
INTERREG III. Partner.

**Contact:** Ir. Daniel JAMAR  
([d.jamar@cra.wallonie.be](mailto:d.jamar@cra.wallonie.be)) and Dr. Didier  
STILMANT ([stilmant@cra.wallonie.be](mailto:stilmant@cra.wallonie.be))

### **GEOFAIRTRADE**

Geotraceability for Fair Trade  
FP7 THEME 6 Environment. Partner.

**Contact:** Dr. Robert OGER  
([oger@cra.wallonie.be](mailto:oger@cra.wallonie.be))  
<http://www.geofairtrade.eu>

### **HiDRAS**

High quality Disease Resistant Apples for a  
Sustainable agriculture  
EC, Project QLK5-CT-2002-01492, Partner.

**Contact:** Dr. Marc Lateur  
([lateur@cra.wallonie.be](mailto:lateur@cra.wallonie.be))  
[www.hidras.unimi.it](http://www.hidras.unimi.it)

### **LUTANUIS**

LUTANUIS – Cross-border cooperation on pest  
control: the muskrat  
RW - DGRNE & EC - ERDF, Project Interreg III  
FW.2.1.1. Partner.

**Contact:** Ir. Pierre Joye  
([pierre.joye@spw.wallonie.be](mailto:pierre.joye@spw.wallonie.be))

### **NETBIOCOF**

Integrated European Network for Biomass Co-  
firing  
FP6-SUSTDEV, Coordination Action. Partner.

**Contact:** Ir. Florence VAN STAPPEN  
([vanstappen@cra.wallonie.be](mailto:vanstappen@cra.wallonie.be))  
<http://www.netbiocof.net>

### **OPTENERGES**

Optimizing the energy efficiency of livestock  
farms and reducing their greenhouse gas  
emissions  
INTERREG IV. Partner.

**Contact:** Ir. Fabienne RABIER  
([rabier@cra.wallonie.be](mailto:rabier@cra.wallonie.be))

### **PATRIMOINE FRUITIER**

Cross-border fruit genetic heritage and  
biodiversity  
RW - DGA & EC - ERDF, Project Interreg III FW  
2.3.4. Partner.

**Contact:** Dr. Marc Lateur  
([lateur@cra.wallonie.be](mailto:lateur@cra.wallonie.be))  
<http://interreg3.cra.wallonie.be>

### **PETER**

Promoting European Traceability Excellence &  
Research  
FP6-FOOD, Specific Support Action. Partner.

**Contact:** Dr. Robert OGER  
([oger@cra.wallonie.be](mailto:oger@cra.wallonie.be))  
<http://www.eu-peter.org>

## PIP

Pesticide Initiative Programme  
European cooperation program. Partner  
**Contact:** Dr. Olivier PIGEON ([pigeon@cra.wallonie.be](mailto:pigeon@cra.wallonie.be))  
<http://pip.coleacp.eu>

## PORT CHECK

Development of generic 'on-site' molecular diagnostics for EU quarantine pests and pathogens  
FP6-POLICIES, Specific Targeted Research Project.  
Partner.  
**Contact:** Ir. Stephan STEYER ([steyer@cra.wallonie.be](mailto:steyer@cra.wallonie.be)) and Dr. Anne CHANDELIER ([chandelier@cra.wallonie.be](mailto:chandelier@cra.wallonie.be))  
<http://www.portcheck.eu.com>

## PROBIOGAS

Promotion of Biogas for Electricity and Heat  
Production in EU Countries  
IEE, EIE/04/117/S07.38588. Partner.  
**Contact:** Ir. Fabienne RABIER ([rabier@cra.wallonie.be](mailto:rabier@cra.wallonie.be))  
<http://web.sdu.dk/bio>

## RESIREA

Renewable energy sustainable programs for intelligent rural electrification and poverty alleviation  
IEE, Programme / COOPENER, the French Agency for Environment ADEME, and the participating organizations. Partner.  
**Contact:** Ir. Romain CREHAY ([crehay@cra.wallonie.be](mailto:crehay@cra.wallonie.be))  
<http://www.energies-renouvelables.org/resirea>

## SAFEED-PAP

Species-specific detection of processed animal proteins in animal feed  
FP6-FOOD, Specific Targeted Research Project.  
Coordinator.  
**Contact:** Dr. Vincent BAETEN ([baeten@cra.wallonie.be](mailto:baeten@cra.wallonie.be)) and Dr. Juan Antonio FERNANDEZ PIERNA ([femandez@cra.wallonie.be](mailto:femandez@cra.wallonie.be))  
<http://safeedpap.feedsafety.org>

## TRACE

Tracing food commodities in Europe  
FP6-FOOD, Integrated Project. Partner.  
**Contact:** Dr. Vincent BAETEN ([baeten@cra.wallonie.be](mailto:baeten@cra.wallonie.be)) and Ir. Philippe VERMEULEN ([Vermeulen@cra.wallonie.be](mailto:Vermeulen@cra.wallonie.be))  
<http://www.trace.eu.org>

## TRANSBIOFRUIT

Pooling cross-border expertise in organic arboriculture  
SPW - DGO & EC - ERDF, Project Interreg IV FW 4.3.1. Partner.  
**Contact:** Dr. Marc Lateur ([lateur@cra.wallonie.be](mailto:lateur@cra.wallonie.be))

## VETAB

Enhancing cross-border experience in organic farming  
INTERREG III. Partner.  
**Contact:** Dr. Didier STILMANT ([stilmant@cra.wallonie.be](mailto:stilmant@cra.wallonie.be))

## VETABIO

Enhancing cross-border experience in organic farming  
INTERREG IV. Partner.  
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# Events organised or jointly organised by CRA-W in 2007-2008

**21 January 2007**

Training in pruning espaliered trees, Enghien

**28 January 2007**

Training and demonstration of central leader training for fruit trees, Loupoigne

**24 January 2007**

12th Animal Production Forum, The beef market: Issues and prospects, Gembloux

**3 February 2007**

Training and demonstration of central leader training for fruit trees, Modave

**10 February 2007**

Exhibition of strawberry and berry growing equipment, Gembloux

**22 February 2007**

Cross-border seminar for fruit tree nurserymen (CRA-W and CRRG), Gembloux

**24 February 2007**

Training and demonstration of pruning espaliered trees and central leader training of standard trees, Temploux

**28 February 2007**

40 years of the White Book – Gembloux White Book on Cereals, Gembloux

**3 March 2007**

Training and demonstration of central leader training for fruit trees, Attert

**3 March 2007**

Training in pruning espaliered trees at Vauban historical garden, Lille

**6 March 2007**

Training and demonstration of central leader training for fruit trees, Strée

**17 March 2007**

Training and demonstration of central leader training for fruit trees, Olne

**27 March 2007**

Training and demonstration of central leader training for fruit trees, Schoppen

**28 March 2007**

Learning animal handling, Gembloux

**30 March 2007**

40 years of the White Book – Economics of Cereal Production in Belgium, Gembloux

**31 March 2007**

Grafting theory and practice, Gembloux

**5 April 2007**

Reconciling Livestock Farming and the Environment, what are the alternatives? Libramont

**16-18 April 2007**

First Workshop of the Community Reference Laboratory for animal proteins in feedingstuffs, Gembloux

**24 April 2007**

Pig welfare and conditionality, Gembloux

**25 April 2007**

40 years of the White Book – Statistics Serving Progress in Cereal Production, Gembloux

**25 April 2007**

40 years of the White Book – Traceability in Plant Sectors, Gembloux

**4-6 May 2007**

Fruit exhibition at the Aywiers Gardens, Lasne

**11 May 2007**

Training seminar, NRL for milk and dairy products: 'The new regulations for checking raw cow's milk', Brussels

**23 May 2007**

40 years of the White Book – Plant sector, animal sector: a win-win partnership, Gembloux

**22-24 June 2007**

40 years of the White Book – The story of a grain of wheat, Gembloux

**29 June 2007**

Practical management of the quality of apple-based processed products: the case of patulin, Gembloux

**27-30 July 2007**

The CRA-W stand at Libramont Agricultural Fair, Libramont



**23 August 2007**

LIFE SWAP-CPP project seminar, the case of potato growing, Gembloux

**5 September 2007**

The Gembloux fruit germplasm collections. Conference organised on behalf of the Nord Pas-de-Calais Pomological Association, Gembloux

**6 September 2007**

Training seminar organised by the NRL for GMO: 'Regulations and norms applicable to GMO analysis in food/feed', Brussels

**20 September 2007**

12th Forage News Conference, Fertilisation and Mineral Supplementation in Livestock Farming Systems, Fauvillers

**23 September 2007**

Exploring Biodiversity, open day at the Department of Biological Control and Plant Genetic Resources, Gembloux

**24 September 2007**

Fruit Germplasm Conference at Gembloux. Conference organised on behalf of the Haute Normandie Pomological Association, Gembloux

**4 October 2007**

NRL for milk and dairy products training seminar: 'Application of the new microbiological criteria to dairy products', Brussels

**17 October 2007**

7th Pork and Poultry Production Seminar, Gembloux

## 21 October 2007

CRA-W involvement in the Sustainable Management weekend, Sart-Bernard

## 27-28 October 2007

CRA-W involvement in organising Pom'Expo, Villeneuve-d'Ascq

## 7-8 November 2007

'What resources for tomorrow's biofuels?' in cooperation with VALBIOM asbl, Gembloux

## 8 November 2007

Multivariate Image Analysis, in cooperation with the Belgian Chemometrics Society, Gembloux

## 15 November 2007

Management of the natural environment and the countryside, GEMINER project, Thionville

## 23 November 2007

BPBa Symposium, in cooperation with BPBa, Gembloux

## 27 November 2007

Woody ecotype sector and renaturation of river and stream banks, ECOLIRI project, Luxembourg

## 27 November 2007

Seminar on fruit germplasm for the 4th and 5th year Masters in Bioengineering, University of Gembloux

## 27-28 November 2007

International conference: FEEDSAFETY 2007: Methods and Challenges, Namur

## 19 December 2007

Interview on the collection of old vine varieties harvested in Belgium and future prospects for viticulture in Belgium, RTBF television programme 'Au quotidien'

## 21 December 2007

New farm ventures in Wallonia. Who are the new farmers, how are they supported, what problems do they have?, in cooperation with the Department of Agriculture, Natural Resources and the Environment, the Regional Government and the Young Farmers' Federation, Namur

## 22 January 2008

'Biofuels: their future and their place in Belgium'. Round table on biofuels, Brussels

## 23 January 2008

13th Animal Production Forum, Question mark over ruminant farming: truths and untruths, Gembloux

## 12 February 2008

'Question à la Une', RTBF television, 'Is it OK to eat a waxy apple?', explanatory sequence on the formation of natural waxes produced by fruit

## 19 February 2008

Planting and pruning demonstration, Strée

## 20 February 2008

Gembloux White Book on Cereals, Gembloux

## 23 February 2008

Trained fruit tree pruning demonstration, Namur

## 25-29 February 2008

Training in infrared spectroscopy and chemiometry, Gembloux

## 12 March 2008

Training and demonstration of central leader training for fruit trees, Schoppen

## 18 March 2008

Grafting and pruning demonstration, Gesves

## 26 March 2008

'No Pesticides' conference organised by the Department of Biological Control and Plant Genetic Resources, Gembloux

## 11 April 2008

Double grafting demonstration, Gembloux

## 11 April 2008

9th Belgian Chemiometry Symposium, in cooperation with ULB, Gembloux

## 15-17 April 2008

Second Workshop of the Community Reference Laboratory for animal proteins in feedingstuffs, Namur

## 20 April 2008

'Planète nature', RTBF television, 'Sauve qui peut la Vie', presentation of a sequence on the importance of preserving the biodiversity of old fruit tree varieties

**23 April 2008**

11th ABER-BVLE Workshop for Young Agricultural Economists, in cooperation with ABER-BVLE, Gembloux

**29 April 2008**

Identifying and ranking risk factors for mastitis, Gembloux

**6 May 2008**

(recording / broadcasting date)

Sequence in the 'La Une' television news (RTBF) on the discovery of transgenic rape growing wild in Wallonia

**6 May 2008**

NRL for milk and dairy products training seminar: 'Heat treatment of milk: from technology, impact on shelf life and microbiological safety to the analytical assessment', Melle

**14 May 2008**

Dairy production in Wallonia: assets and prospects, in cooperation with Wallonia's milk and dairy products industry, Gembloux

**19 May 2008**

The main fruit tree diseases and pests, AID training, Gembloux

**20 May 2008**

NRL for GMO practical training provided by CRA-W: 'Practical training session on quantitative real time PCR (QrtPCR) in the GMO field', Gembloux

**22 May 2008**

'Les News', RTBF Television, 'Apple biodiversity: why and how', sequence on the value of preserving old varieties, as part of the International Conference on Agricultural Biodiversity

**22 May 2008**

'Au quotidien', RTBF television, 'Why we should protect Wallonia's fruit tree heritage', a sequence showing the wide diversity of apple varieties and their value, as part of the International Conference on Agricultural Biodiversity

**22 May 2008**

'Le Journal Télévisé', RTBF television, 'Varieties of spelt', a sequence on the value of preserving old varieties, as part of the International Conference on Agricultural Biodiversity

**22 May 2008**

Tour of the new semi-automated soilless production unit for starter plant material for Wallonia's potato plant industry, Mussy-La-Ville

**26 May 2008 (recording date) – 7 June 2008**

(broadcasting date)

Sequence on France 3's Nord-Picardie regional television news on the discovery of transgenic rape growing wild in Wallonia

**6 June 2008**

Ad Hoc Fruit Synonyms meeting, in cooperation with ECPGR Ad Hoc, Gembloux

**11-12 June 2008**

Visits to experimental sites (organic matter, tillage, varieties, N fertilisation management) for farmers as guests of TMCE (Belgium, France, Switzerland), Gembloux

**19 June 2008**

Meeting of NRL for milk and dairy products extension group, Brussels

**20 June 2008**

Workshop 'Crop Nitrogen Status assessment for use in DSS to improve N fertilisation management and efficiency', Gembloux, Belgium under the RW/Italy bilateral cooperation agreement

**24 June 2008**

European meeting of cherry tree, apple tree and pear tree germplasm experts within the framework of ECPGR to define a methodology for rationalising the numerous synonyms occurring in databases, Gembloux

**26 June 2008**

Biofuel Production Sustainability, Gembloux

**25-28 July 2008**

The CRA-W stand at Libramont Agricultural Fair, Libramont

**26 July 2008**

No Agriculture Without Biodiversity, in cooperation with Libramont Agricultural Fair, Libramont

**29 July 2008**

Juicing certified organically grown apples. Conference organised at the request of drinks manufacturer Pajottenlander, Gembloux

**30 August 2008**

'Journal parlé de la mi-journée' (midday radio news), RTBF radio, La Première. Sequence on the importance of preserving Wallonia's fruit tree heritage as part of a series of sequences on the topic of 'Trees and men'.

**8-11 September 2008**

Organisation of meeting of the French Forest Pathology Group, Anhéé

**11 September 2008**

Gembloux White Book on Cereals, Gembloux

**16 September 2008**

Workshop 'Improvement in Nitrogen and Water Use Efficiency: Interest of assessment tools in vegetable crops', ESA Conference 2008, in cooperation with the University of Bologna (Italy), Gembloux, Belgium under the RW/Italy bilateral cooperation agreement

**24 September 2008**

Biofuels and dedicated crops, Libramont

**24 September 2008**

'Planète Première', RTBF Radio, La Première. Sequence on CRA-W's biodiversity conservation orchards (Gembloux)

**27 September 2008**

Tour of the conservation orchards managed by the Department of Biological Control and Plant Genetic Resources, Gembloux

**29 September 2008**

Round table: 'Nurseries and old FGR fruit tree varieties' for nurserymen growing the old FGR varieties distributed by the Department of Biological Control and Plant Genetic Resources, Gembloux

## **30 September 2008**

Meeting of the NRL for GMO extension group, Brussels

## **30 September 2008**

Training seminar on 'Specific issues/problems in GMO detection' organised by the NRL for GMO, Brussels

## **5 October 2008**

Open Day for Business at the Quality of Agricultural Products Department, Gembloux

## **7 October 2008**

Potatoes in the world, Yesterday, Today and Tomorrow, organised by DISOP, under the auspices of FAO, IPBO-Gent, the Embassy of Peru, CRA-W, PUC and Belgapom, Brussels

## **9 October 2008**

Retsch seminar 'Sample Preparation and Analysis of Food Products – Theory and Practice', Gembloux

## **15 October 2008**

8th Pork and Poultry Production Seminar: Pork and poultry products : energy for sale!, Gembloux

## **23-24 October 2008**

Training for AFSCA inspectors, Brussels 'Quarantine organisms and alert list'

## **24 October 2008**

Animal genetic diversity in Wallonia: Heritage and Development, Namur

## **7 November 2008**

Secondary Metabolites and Molecular Farming, in cooperation with BPBA, Ghent

## **9 November 2008**

TV programme about fruit tree nurseries and old fruit tree varieties, 'Jardins et Loisirs' programme, RTBF

## **12-13 November 2008**

Farm Machinery & Process Management in Sustainable Agriculture, in cooperation with the University of Lublin (Poland), Gembloux

## **14 November 2008**

Involvement in the ceremony and official reception to mark the 15th anniversary of FIWAP, Gembloux

## **19 November 2008**

Canal Zoom report on 'CRA-W's certified laboratory for plant diseases'.

## **27-28 November 2008**

Training for AFSCA inspectors, Gembloux. 'Quarantine organisms in the potato'

## **1 December 2008**

Planting training, Stoumont

## **2 December 2008**

Plant health diagnosis, the cornerstone of plant pathology. One hundred years' expertise at CRA-W, Gembloux

## **2 December 2008**

Meeting of NRL for milk and dairy products extension group, Brussels

## **2 December 2008**

Training seminar run by the NRL for milk and dairy products: 'Chemical residues in milk: from legislation to analytical techniques', Brussels



## Scientific publications (with reviewers)

- > Adjolohoun, S., Buldgen, A., Adanedhan, C., Decruyenaere, V. & Dardenne, P. (2008). Yield and nutritive value of herbage and browse forage legumes in the Borgou region of Benin. *Tropical Grasslands*, 42, 104-111.
- > Aldaghi, M., Massart, S., Steyer, S., Lateur, M., Jijakli, M.H. [2007]. Study on diverse grafting techniques for their capability in rapid and efficient transmission of apple proliferation disease to different host plants. *Bulletin of Insectology* 60(2), 381-382.
- > Aldaghi, M., Massart, S., Roussel, S., Steyer, S., Lateur, M., Jijakli, M.H. [2007]. Comparison of different techniques for inoculation of "Candidatus *Phytoplasma mali*" on apple and periwinkle in biological indexing procedure. *Communications in Agricultural and Applied Biological Sciences* 72(4), 779-784.
- > Antofie, A., Lateur, M., Oger, R., Patocchi, A., Durel, C.E. & Van de Weg, W.E. (2007). A new versatile database created for geneticists and breeders to link molecular and phenotypic data in perennial crops: The *AppleBreed DataBase*. *Bioinformatics* 2007; doi: 10.1093/bioinformatics/btm013, 23 (7), 882-891.
- > Baeten, V., Fernandez Pierna, J.A. & Dardenne, P. (2007). Hyperspectral imaging techniques: an attractive solution for the analysis of biological and agricultural materials. In: *Techniques and Applications of Hyperspectral Image Analysis*, Editors, Hans F. Grahn & Paul Geladi. 289-311.
- > Baeten, V., Manley, M., Fernandez Pierna, J.A., Downey, G. & Dardenne, P. (2008). Spectrometric Technique: Fourier Transform Mear-infrared (FT-NIR) Spectroscopy. In: *Modern Techniques for Food Authentication*, Sun, Da-Wen. Dublin, Elsevier, 117-147.
- > Berben, G., Debode, F., De Loose, M., Janssen, E., Papazova, N., Sneyers, M., Taverniers, I., Leunda, A., De Schrijver, A. & Van den Bulcke, M. (2008). Challenges for future research in GMO detection. In: *Platform for scientific concertation : Food safety - towards a safer food supply in Europe*, Van Peteghem, Carlos, De Saegher, Sara & Daeseleire, Els. Brussels, Belgian Science Policy, 103-112.
- > Berben, G., Debode, F. & Janssen, E. (2008). Analytical sample preparation steps for GMO-analysis. In: *Platform for scientific concertation : Food safety - towards a safer food supply in Europe*, Van Peteghem, Carlos, De Saegher, Sara & Daeseleire, Els. Brussels, Belgian Science Policy, 88-94.
- > Bindelle, J., Buldgen, A., Wavreille, J., Agneessens, R., Destain, J.-P., Wathelet, B. and Leterme P. (2007). The source of fermentable carbohydrates influences the in vitro protein synthesis by colonic bacteria isolated from pigs. *Animal*, 1: 1126-1133.
- > Boudry C., Dehoux J-P., Wavreille J., Portetelle D., Thewis A. and Buldgen A. (2008). Effect of a bovine colostrum whey supplementation on growth performance, faecal *Escherichia coli* population and systemic immune response of piglets at weaning. *Animal*, 2:5, pp 730-737
- > Boukhatem N., Jdaini S., Muhovski Yordan, Jacquemin J.-M. and Bouali A (2007). Identification of *Bemisia tabaci* (Gennadius) (Homoptera : Aleyrodidae) based on RAPD and design of two SCAR markers. *Journal of Biological Research*, 8, 167-176.
- > Boukhatem, N., Jdaini S., Muhovski Y., Jacquemin J.-M., Del Rincone, C.L., Diez, M.J. and Bouali A(2008). Molecular characterization of Tomato yellow leaf curl virus Alm (Ma:BK:02) in Morocco: complete sequence and genome organization. *J. Plant Pathol.*, 90 (1), 109-112.
- > Boutet, X., Laurent, F. & Chandelier, A. [2008]. Influence of the medium-solidifying agent, the nutrient and the genotype on the production of gametangia by *Phytophthora ramorum* in vitro. *Mycological Research*, 113, 110-116.
- > Brulard, C., Burny, Ph. and al. [2007]. Micro-entreprises in rural areas: redeployment of rurality in Walloon Region. Proceedings, 18<sup>th</sup> European Seminar on Extension Education "Supporting viable rural communities", pp.89-96.
- > Burny, Ph. [2007]. Le secteur de la viande bovine dans l'Union européenne : situation et perspectives dans le contexte de l'environnement. *Sudica Universitatis, Babes-Bolyai, Ambientum*, 1, 1-2, 2007, p. 49-58.
- > Chandelier A. & Sinnaeve G. [2008]. Le déoxynivalénole et le blé tendre, le point sur les travaux menés en Wallonie. *Phytoma - La Défense des Cultures*, 613, 41-44.
- > Chakroun A., J.A., Ben Hamed K., Abdelli C., Druart P. (2007). Effet du nitrate d'ammonium sur le développement et l'activité des enzymes anti-oxydantes du fraisier (*Fragaria x ananassa* L.) micropropagé. *Biotechnol. Agron. Soc. Environ* 11(2): 89-95.
- > Coopman, F., Krafft, A., Dewulf, J., Van Zeven, A. & Gengler, N. (2007). Estimation of phenotypic and genetic parameters for weight gain and weight at fixed ages in the double-musled Belgian Blue Beef breed using field records. *J. Anim. Breed. Genet.*, 124, 20-25.
- > Dantinne D. & Jansen JP. [2007]. Assessment of side-effect of water-soluble nitrogen fertilisers applied as foliar spray on the parasitic wasp *Aphidius rhopalosiphii* (Destefani-Perez) (Hym; Aphidiidae). *Communications in Agricultural and Applied Biological Sciences*, Ghent University, 72/2, 2007, pp 217-219.
- > Dang Van C., Focant M., Pottier J., Deswysen D., Froidmont E., Mignolet E., Turu C., Larondelle Y. (2008). Influence of an increase in diet structure on conjugated linoleic acid content of milk of cows fed extruded linseed. *Animal* 10: 1538-1547.
- > Dardenne, P., Dehareng, F., Soyeurt, H. & Gengler, N. (2007). Prediction of fatty acid contents by mid-infrared spectrometry. *J. Animal. Sci.*, 85, Suppl. 1, 274.
- > De la Haba, M.-J., Fernandez Pierna, J.A., Fumière, O., Garrido Varo, A., Guerrero, J.E., Perez Marin, D., Dardenne, P. & Baeten, V. (2007). Discrimination of fish bones from other animal bones in the sedimented fraction of compound feeds by Near Infrared Microscopy (NIRM). *J. Near Infrared Spectrosc.*, 15 (2), 81-88.
- > De Proft, M. and J.-C. Grégoire (2007). "Attention scolytes : canicule en juillet 2006 et tempête en janvier 2007 : les ingrédients de la menace Ips typographus pour cet été." *Silva Belgica*(3): 28-31 pp.
- > De Vleeschouwer, C., F. Henriët, F. Cors, B. Huyghebaert and O. Pigeon (2007). PhytEauWal : development of biofilters and sharing of best management practices for pesticides. Biobed workshop. Ghent, Belgium.
- > Debode, F., Janssen, E. & Berben, G. (2007). Physical degradation of genomic DNA of soybean flours does not impair relative quantification of its Roundup Ready content. *Eur. Food Res. Technol.*, 226, 273-280.
- > Decruyenaere V., Lecomte Ph., Demarquilly C., Aufreze J., Dardenne P., Stilmant D., Buldgen A. (2008). Evaluation of green forage intake and digestibility in ruminants using Near Infrared Reflectance Spectroscopy (NIRS): developing a global calibration. *Anim. Feed Sci. Technol.* 10.1016/j.anifeedsci. 2008.03.007
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- > Escarnot E. [2007]. Etude quantitative et qualitative des fibres de l'épeautre et du froment dans différentes fractions du grain. Travail de fin d'études en vue de l'obtention du Diplôme d'Etudes Approfondies en Sciences Agronomiques et Ingénierie Biologique, Fusagx, Gembloux, Belgique, 105 pp.
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- > Fassotte C., Cors R., Defrance T. [2007]. Biting midges overwintering in Belgium. Letter to the Editor. *Vet. Rec.*, 160, 451-452.

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- > Froidmont, E., Bonnet, M., Oger, R., Decruyenaere, V., Romnée, J.M., Beckers, Y. & Bartiaux-Thill, N. (2008). Influence of the grinding level and extrusion on the nutritional value of lupin seed (*Lupinus albus*) for cattle in the context of the Dutch protein evaluation system. *Anim. Feed Sci. Technol.*, 142, 59-73.
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- > Geerts P, Druart Ph., Ochart S, Baudouin J-P. (2008). Protoplast fusion technology for somatic hybridisation in *Phaseolus*. *Biotechnol. Agron.Soc. Environ.* 12 (1), 41-46.
- > Goffart, J. P., M. Olivier, et al. (2008). Potato crop nitrogen status assessment to improve N fertilization management and efficiency: Past-Present-Future. *Potato Research*. 51: 355-383.
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## Awards to CRA-W scientists

- > Award to Dr Ir Pierre Dardenne, General Scientific Inspector for the best mathematical model, International Diffuse Reflectance Conference 2006, Wilson College, Chambersburg, Pennsylvania, USA.
- > The BIOMERIEUX AWARD 2008 sponsored by Biomérieux Industry was given to Dr Ir Viviane Planchon, research assistant.
- > Eric Froidmont, research assistant, won the 'Best Poster Award' at the 57th EAAP Congress (European Association for Animal Production) in Antalya, Turkey, last September.

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