CRA-W NEWS

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Happy Birthday!

On 15th and 17th September 2006, the Walloon Agricultural Research Centre organised a celebration at Libramont to mark over eighty years of work in the Central Ardennes, twenty years more than originally planned! Back in 1925 the Plant Breeding Station, the parent Station of the Farming Systems Section, was already conducting research into potatoes in Ardennes. Four years later, an ancillary station, aiming to improve potato production, was opened at Orgeo. This ultimately moved to Libramont and gradually diversified its lines of research. Alongside the various activities connected with the potato (production of base materials, variety selection, value in use, etc.), approaches to the qualification of agricultural products (biochemical analyses and near infrared spectrometry), crop husbandry and the enhancement of forage crops in the South-Eastern part of Belgium were developed, focussing specially on pasture. This led to the development of specific approaches on grazed grassland. The last evolutions followed the integration of the Mussy-la-Ville unit, with virus free, fruit tree production, and the development of global studies of agrarian systems in link to their territory and taking into account the different actors of the food production chains.

On the occasion of this anniversary the Minister for Agriculture, Mr B. Lutgen, toured the Centre and saw some of our work at first hand. He took the opportunity to acknowledge the dynamism of the CRA-W staff and to express his satisfaction at seeing this institution so highly developed and effective today. Driven by the desire to progress and develop our expertise, fresh priority activities will now be defined to enable the Centre to meet the new expectations of agriculture and Walloon society.

The event was also an occasion for many of our past and present staff to meet. The oldest guest present was Mrs Germaine Jacques, who joined the Section in 1944. She was impressed by the changes that have taken place since then. These open days, which attracted a total of more than 500 people, were also our opportunity to display to the general public the know-how acquired by all our staff over the years.

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Plant transgenesis, in the filiation of developments in science and techniques

In this world of increasingly widespread development of innovative techniques and tools, agronomic research comes up in the lineage of rapid scientific advances, taking economic and environmental concerns into account while extending fundamental knowledge.

The plant transgenesis work carried out at CRA-W is conducted in this context. Based on tissue culture and molecular biology techniques, plant transgenesis allows the insertion of one or more genes into the genetic material of a cell or a plant.

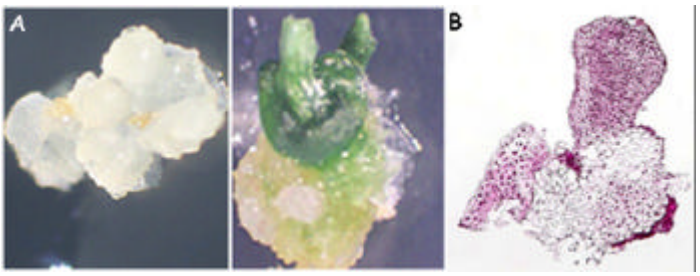
In plant breeding, transgenesis is an additional tool to supplement conventional methods. It provides the means to create new cultivars that can not be obtained by traditional crossing/breeding methods or by more sophisticated somatic hybridization techniques.

Apart from some rare practical developments resulting in transgenic varieties appearing on the market, the main benefits of genetic engineering are advances in fundamental knowledge through the creation and provision of additional tools that open up new avenues for exploring and understanding the living world. The valuable information gained in this way relates to a number of fundamental processes, such as the molecular bases of plant-pathogen interaction, stress resistance or the nutritional value of plant products.

Our research focuses on wheat, the most widely grown cereal in the world, as the technology for its genetic transformation is still far from routine or optimal.

We have developed a simple, functional transformation protocol. The *in vitro* regeneration process is based on somatic embryogenesis, in which fragments of wheat tissue develop and form somatic embryos whose morphology is similar to that of embryos generated by fertilisation. This regeneration process is combined with the particle bombardment DNA transfer technology.

This model offers an area of research for gene identification or study of the expression of known genes. Our study focuses on the genes involved in defence mechanisms, cell proliferation, organ development, etc... The ability of some cells to start building an embryo, event that requires extensive reprogramming of the expression of their genetic material, illustrates their adaptive response to the environmental constraints of *in vitro* culture conditions.



In vitro **culture of wheat tissue and plantlet regeneration (A) and histological section (B)**

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Belgian National GMO Reference Laboratory: CRA-W is part of

On 1st July 2006 the consortium formed by the CRA-W's Quality of Agricultural Products Department, SBB (Biosecurity and Biotechnology Section, Scientific Institute of Public Health, Brussels) and ILVO's Technology and Food Unit (Melle) was selected by the Belgian Federal Agency for the Food Chain (FASFC) as a national reference laboratory (NRL) for genetically modified organisms (GMOs). These three laboratories are already members of the European Network of GMO Laboratories (ENGL) and all have considerable experience in techniques for the detection of GMOs and their derivatives. This NRL has been set up under Regulation (EC) no. 1829/2003 with the aim of ensuring high-quality GMO detection analyses.

The NRL's mission and tasks are established in a contract with FASFC. Its tasks include in particular:

- organisation of interlaboratory comparisons for the Belgian laboratory network
- passing on information and documentation to the Belgian laboratory network and providing technical assistance if necessary
- maintaining contact with the European Network of GMO Laboratories – ENGL (http://engl.jrc.it/) and with the Community reference laboratory for GMOs (http://gmo-crl.jrc.it/)
-participation in case of crisis or incident by providing technical and scientific assistance to FASFC.

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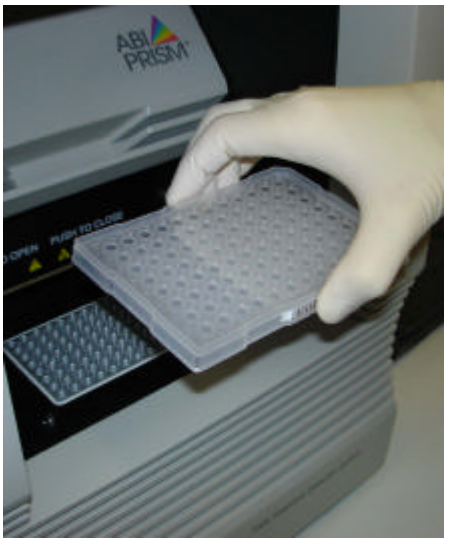
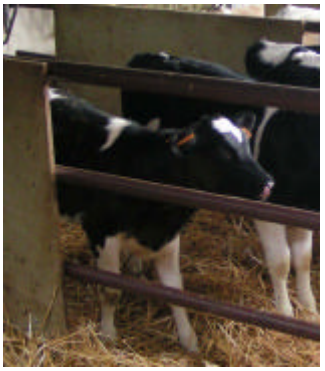


Improving rearing practices for young dairy cattle: a study in full partnership with farmers

A dairy cow has no productive value for the first two years of its life. However, these young animals are tomorrow's dairy herd and will be responsible for the farm's future profitability. Unfortunately, they do not always receive all the care and attention necessary for optimum development. For example, it has been clearly shown that a first calving between 24 and 26 months, at a liveweight of 625 kg, considerably reduces the cost of the rearing phase, maximises production per day of life as well as the cow's longevity and results in more fertile animals compared with heifers that calve late or have poor conformation. To achieve this aim the heifers need to be carefully managed. They should attain high growth rates between 0 and 6 months and at the end of pregnancy (mean daily weight gain > 900 g/d) and they should grow more slowly at puberty (mean daily weight gain < 800 g/d from 8 to 15 months) to avoid affecting their udder development and fertility. To make dairy farmers aware of these things, the Department of Agriculture (Development Division) has just granted the CRA-W a subsidy for the purpose of identifying the critical points in dairy heifer rearing. This project has been developed in full cooperation with Messrs G. De Munck (Department of Agriculture) and L. Fabry (AWE) and farmers in Wallonia's two main dairy farming regions (the Herve and Chimay areas). At a round table the farmers clearly expressed their interest in having more information about the management of parasitism and the impact of housing on the physical development of young cattle. Fifteen or so farms in each region will be visited regularly for two years, during both the indoor housing period and in summer, to record the size and girth of the young cattle (as an indirect estimate of liveweight) in relation to their feed, the management factors, ambient conditions (temperature and humidity measured hourly, volume of air, space available). Management of parasitism will be assessed by measuring the blood pepsinogen when the animals are brought indoors. Whereas initially the project will mainly provide the dairy farmers with food for thought and bases for comparison, in the course of time it ought to enable the practices and know-how that result in optimum heifer development to be identified, thus giving them the best possible start to their life as dairy cows.



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Food value of maize silage: new approaches

In order to assess the nutritional value of forage, the *in vivo* digestibility of the organic matter has to be determined. This is generally done by carrying out a digestibility trial using animals housed in digestibility crates (reference method). The main drawbacks of this method are that it is expensive and it requires a large number of livestock to be managed. For the purposes of standardisation and simplification, research is therefore looking at the development of *in vitro* analytical methods for the evaluation of this parameter, based on enzymatic degradability. Recent studies indicate that determining *in vivo* digestibility is no longer sufficient to express the complete nutritional potential of a forage, and attention should be paid to the synchronisation of the energy and protein in the rumen. In this connection the kinetics of ruminal degradability of the main components of the organic matter in the feed have to be known in order to calculate the optimum feed rations.

The aim of the European project in which we have been involved for the last six years was to find simple chemical parameters that best reflect the food value of maize silage from the point of view of optimum uptake by dairy cattle. Eight European partners with complementary areas of expertise are participating in this programme. CRA-W was specifically asked to develop a methodology combining simultaneous fermentation of several maize forages in an artificial rumen and the use of near infrared spectrometry (NIRS) to analyse the incubation residues. A large capacity artificial rumen was designed for the purpose. The approach was based on transferring the nylon bag technique (in sacco technique) to mechanical incubators containing a buffered solution of rumen juice, held at a constant temperature, in a CO2 saturated atmosphere. By sampling the bags in a given order, the method permits definition of (1) the kinetics of degradability of the dry matter and (2) the kinetics of degradability of the main components of the organic matter (protein, starch, fibre, etc.) by recovering and analysing by NIRS, on the basis of pre-established predictive models, the residual matter in each incubated bag. The advantage of this method is that a large number of samples can be processed simultaneously in a very standardised manner.

Our results show very good repeatability between the incubators used. The technique appears relevant to the description of the kinetics of degradability of dry and organic matter and starch and calculation of the corresponding theoretical degradabilities. On this basis it appears possible to distinguish between different kinds of maize forages according to origin (effect linked to the growing site) and type (variety effect). It should be noted, however, that estimating fibre degradability by this method does not appear relevant at present, probably due to the excessive acidification of the incubation fluid. Future developments will endeavour to solve this problem.

European project : SILEGENEQA

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New tools for seed treatment quality control

Controls of correct plant protection product application to seeds are currently deficient for the want of a rapid, inexpensive analytical method.

Seed treatment quality control is attracting growing interest from many players, from raw material producers to finished product users. Chemical determination offers a reliable means of assessing seed treatment quality. Gas chromatography (GC) and high performance liquid chromatography (HPLC) can be considered reference methods for the identification and quantification of pesticides on treated seeds. These methods enable the average active ingredient content of a treated seed lot to be measured and also allow the active ingredient content to be determined in individual seeds, to assess the treatment distribution.

These methods have proved to be specific, accurate, reliable and sensitive. Their drawback, however, is that they are sophisticated, time-consuming and costly. They also require the use of expensive, polluting reagents, special facilities and a specialised team. They are not easy to use within the framework of direct quality control on a production line. All these considerations form the background to the application of near infrared spectrometry (NIRS).

NIRS is a physical analytical method based on the property of molecules of absorbing energy in the near infrared range. As an analytical method, it is rapid and non-destructive. Moreover, this technique is non-polluting, safer for the operator (no reagents or solvents are used) and usable for multiple analyses. The constraints associated with NIRS are the creation of solid databases and the development of reliable calibrations.

NIRS requires calibrations to be established for each active substance and each seed species before unknown samples can be measured. In order to develop calibrations, samples are measured by NIRS and by a reference chromatographic method. A predictive model (calibration equation) linking the spectral data to the analytical reference values is then built. The calibration equation is then validated using independent samples (not involved in standardisation) that have a known active substance content. Once the instrument has been calibrated by the reference method, it can be used to predict the active substance content of unknown samples.

NIRS enables quantitative determination of the average active substance content of a sample of treated seeds and also provides qualitative information on treatment distribution throughout the lot.

Cooperative links are now being formed between CRA-W and the agrochemicals and seed industries for the use of NIRS in seed treatment quality control.

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Award for CRA-W researcher

On the occasion of the 2006 International Diffuse Reflectance Conference (IDRC 2006, Wilson College, Chambersburg, Pennsylvania, USA), Dr Pierre Dardenne, Scientific Inspector at CRA-W, received an award within the framework of the competition to build the best mathematical model.

The IDRC is a biennial gathering of world experts in the field of infrared spectroscopy. At the 2006 conference more than 150 researchers from all the continents met to discuss recent advances in near infrared spectrometry. In addition to the papers and posters, a competition is held and a prize awarded to the best researcher in the field of chimiometry. This session, called “ShootOut”, is an opportunity for scientists to test their calibration methodology against one another.

Dr Pierre Dardenne is Head of the Quality of Agricultural Products Department, which comprises a section dedicated to physico-chemical methods and spectral data processing.

This section specialises in the use of infrared spectroscopy methods to determine the quality and safety of food products. This prize is a testimony to the quality of the research team led by Dr Pierre Dardenne.

http://www.idrc-chambersburg.org/pdfs/special_issue_2006.pdf

Dr Ir Pierre Dardenne, Scientific Inspector at CRA-W, congratulated by Dr Karl Norris, the father of the near-infrared spectroscopy

The beef market: issues and prospects

On 24th January 2007 the Walloon Agricultural Research Centre and Gembloux Agricultural University will hold the twelfth Carrefour des Productions Animales. The topic this year will be beef.

Espace Senghor, Gembloux

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