



White Paper: “Cereals - Objective 40”

The “Cereals 2006” conference was held in Gembloux on 22nd February this year. Nearly 400 people attended the morning session and 300 in the afternoon. More than 1,000 copies of the White Paper were distributed on the first day.

Guest of honour this year was Serge Duvauchelle, Head of the Nord-Pas de Calais Regional Plant Protection Department in France. Following an introduction by the Principal of Gembloux University and the Director of CRA-W, Mr Duvauchelle explained how his original role as an adviser to farmers had developed into a more control-oriented brief. This was an interesting account by a man who, fortunately, has remained in touch with and at the service of Agriculture. His career as a unifier and his pragmatic approach certainly deserved recognition ... as well as getting him involved! Mr Duvauchelle in fact chaired both sessions, punctuating the papers that were read with some extremely pertinent questions to the speakers.

The main features of the past season were reviewed, notably the unusual weather conditions. The technical lessons learned from last year’s trials were described.

Lastly, advice and information were once again given on the basis of the situation observed at the end of the winter.

A considerable part of the papers and articles also covered the downstream sectors: the development of cereals for use as fuel, as a specific quality starch source and for chicken feed were each described in well-documented presentations. Attention to the fate of cereals produced is in line with the increasing specialisation of cereal products.

The fortieth edition of the “White Paper” is due to come out in February 2007. This will be an opportunity to celebrate an initiative by René Laloux, Professor of Crop Husbandry at Gembloux University, and Louis Detroux, Director of the Pesticide Research Station at CRA-W, both of them cereal lovers and tireless workers, who successfully filled their colleagues with enthusiasm for a substantial project serving the agricultural sector. And that enthusiasm generated forty years ago has not waned...

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Animal experiments: the Ethics Committee is keeping watch!

At present, given the limited response of alternatives to animal experimentation (cell cultures, immunochemical tests, mathematical models, etc.), testing on animals is the only real option if we want to understand biological mechanisms (metabolism, diseases, etc.), test the efficacy or toxicity of medical or dietary products, develop surgical methods applicable to humans, and so on.

But is all this acceptable? Do we have any right to experiment on live animals? If we do, how can we improve and assess the welfare of the experimental animal and, by extension, the welfare of the animal in the intensive production systems that are currently the norm in this part of the world?

It was partly to answer these questions that the Ethics in Animal Experimentation Committee was formed jointly by Gembloux Agricultural University, Notre Dame de la Paix University at Namur and CRA-W in 1998. The Committee's role is to assess the compatibility of proposed experimental protocols with the ethical principles of using experimental animals. The merits of the experiment have to be considered by weighing respect for the animal as a sentient being against the experimental need (1). It also ensures compliance with legislation concerning animal experiments (Council Directive 86/609/EEC on the Protection of Animals used for Experimental and other Scientific Purposes; RD of 15th November 1993, compiled in the coordinated version of the RD of 31st August 2001 at the Belgian level). The Committee is also required to find out and pass on information about new directives concerning laboratory animal welfare and use.

Experimental protocols are assessed objectively according to a matrix of ethics devised at national level. This matrix, for use by scientists at the three institutions, provides a means of evaluating the degree of 'suffering' or discomfort to which the experimental animal will be subjected. It also enables researchers to think about alternative approaches according to the **3 R's rule**: **R**eplacing experimental animals by in vitro techniques for example, **R**educing the number of experimental animals to the minimum necessary in order to obtain valid results and **R**efining, i.e. thinking about ways of minimising the animal's potential suffering during the experiment.

How does the Commission operate?

Each of the institutions has a Standing Panel on Ethics (at CRA-W: Chair: J. Wavreille; Secretary: V. Decruyenaere), which makes recommendations on its own institution's experimental protocols. The members of the Standing Panel then submit a summary of such protocols to the Committee.

The latter is multidisciplinary and comprises scientists from all three institutions, vets with responsibility for monitoring animal health and welfare, an independent member and an expert from Federal Public Service Public Health – Animal Welfare Department. The Committee, which meets twice yearly (in May and December), thus deals with both biomedical and agro-veterinary experiments. It is chaired by rotation, currently by CRA-W (Chair: N. Bartiaux-Thill).



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(1)Portetelle D., Bartiaux N., Théwis A.: Le bien être et l'éthique au cœur de la relation homme-animal (Welfare and Ethics at the centre of Man-Animal Relations), 10th Carrefour des Productions Animales, FUSAGx and CRA-W, eds, pp 72-84, 2005)

The agrometeorological bulletin : an objective tool for monitoring and assessing crop yield

While the weather is one of the main factors affecting agriculture, it is also the hardest to control and the one subject to the greatest uncertainty. That makes analysing weather conditions in growing seasons and thus issuing yield forecasts based on a scientific approach essential, in order better to understand the impact of extreme weather conditions and show up regional differences and medium or long-term trends.

Within the framework of projects financed by the Federal Scientific Policy Office, a number of scientific institutions in Belgium (CRA-W, ULg and Vlaamse Instelling voor Technologisch Onderzoek) have pursued research work into the adaptation of the European crop yield forecasting system. This work has led to the publication, since 2002, of a monthly agrometeorological bulletin issued in both national languages (French and Dutch) during the growing season (April to September).

The bulletin includes the weather situation for the month, satellite information on vegetation status, a short description of the crop status (winter wheat, winter barley, forage maize, sugar beet and potatoes) at the beginning of each month, the yield forecasting models used and, finally, the forecasts proper for the above five crops, both at national level and for the different agricultural regions.

Quality monitoring of crops and quantitative yield forecasting are based, among other things, on systematic measurements made from space by the NOAA-AVHRR and SPOT-VEGETATION earth observation satellites. Access to a historic series of images spanning a ten-year period, from 1989 in the case of AVHRR and 1998 in that of VEGETATION, with a 1x1 km² spatial resolution (pixel size) permits

comparative analysis (Figure) of the crop status for a given period of the year.

Different models of varying degrees of complexity, including a component linked to technological progress, several agrometeorological components and a remote sensing component, are used in order to improve forecasting results. The combined set of results produced by these forecasting models then forms the basis for the most probable estimates.

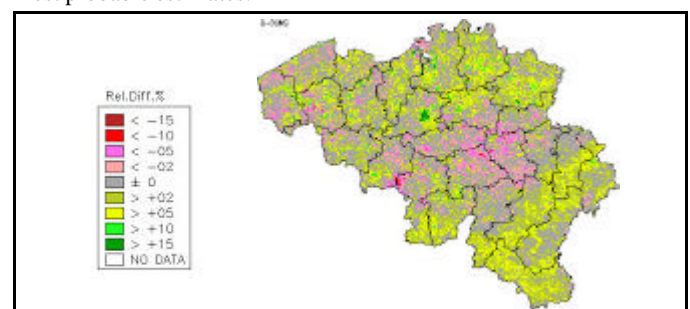


Figure Example of relative difference (%) in crop status (from SPOT-VEGETATION SATELLITE IMAGES) for the month of July 2005 compared to 2004. Agricultural division boundaries have been superimposed.

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At Gembloux, apples become more colourful...

Consumers use their eyes to choose the fruits that they will buy. For apples, the two-coloured ones are especially popular. But some particularly strict regulations about the proportion of the surface that is coloured, as well as coloration intensity, have been introduced for trade efficiency.

The consumer's primary choice must be encouraged. In addition, the intensity of the red coloration of apples is linked directly to the development of flavonoids, natural molecules credited with an important anti-oxidizing activity as well as with a list of health attributes that grows as medical studies progress.

In the orchard, coloration development varies from fruit to fruit. This development depends primarily on the variety (genetic factor), but also on production factors (age and fruit load of trees, nutrition and exposure of the fruit, etc.) and on environmental factors such as sunshine intensity, relative air humidity and night temperature.

In addition to continuous technical improvements, fruit growers are therefore looking for new varieties and particularly for mutants of known varieties, to make important improvements that meet the trade regulations. Such mutations occur naturally in orchards; their occurrence as well as their detection are random events that generate long and repetitive selection works.

However, the *in vitro* culture techniques, particularly those involving somaclonal variation, offer the possibility of generating in a shorter time numerous variants in which some features are modified, notably at the fruit level.

In the laboratory, adventitious buds of a red mutant of 'Jonagold' have been cloned from three successive subcultures of regenerating leaves. More than 200 variants, from three generations, were transferred to the orchard, where from 1995 trees looked similar to the original variety.

From 1998 to 2005, coloration characteristics as well as variations in sugar content, starch stage and fruit firmness have been measured on each of the 220 variants.

Among these variants, some take on their coloration very early (more than 2 weeks before the original cultivar coloration), and develop a plain or very streaky red coloration at maturity, covering almost 100% of the surface of every fruit. Other modifications worth noting include a more elongated shape or a greater firmness of the fruit. The continued observations of the original trees and of their variants have confirmed the stability and recurrence of these particular characteristics.

These trees demonstrate that somaclonal variation induced *in vitro* from leaf tissues is an efficient way of creating a great diversity that could be evaluated over a short selection period (5–6 years).



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Is Potentially Leachable Nitrogen (PLN) a relevant indicator?

In order to obtain a concession, with respect to the limits of 80 and 210 kg of nitrogen (N) that can be spread, in the form of organic manure, on crops and grassland respectively, farmers are expected to take part in quality monitoring. They are asked to measure the PLN present in the soils under a number of crops or grass fields. While the relevance of this indicator has been demonstrated with respect to crops and hay meadows, things are very different in grazed pastures. These are characterised by random, heterogeneous distribution of urine patch, each patch acting as a nitrogen sink due to their high urea levels, which can reach the equivalent of 1,000 kg N/ha. To take account of this significant variation, NITRAWAL has prioritized intensive soil core sampling, namely 30 core samples per field, to a depth of 30 cm rather than taking a smaller number of cores over the whole 0-90 cm profile. These 30 cores are mixed in a mean sample before to be analysed. How accurate is such a sampling plan in our grazed grassland?

This was the topic investigated by CRA-W, in cooperation with scientists of NITRAWAL and the Walloon Regional Livestock Association.

In order to define that accuracy we used the formula “number of samples to be taken = (standard deviation/desired accuracy)²”, which allows us, after first ascertaining the normal distribution of the parameter studied, to define the number of samples each sample includes 30 soil cores, that need to be taken in order to reach the desired level of accuracy. In our case the level is 10 kg of nitric nitrogen per hectare (N-NO₃⁻/ha), which corresponds to the laboratory analytical accuracy. This approach was then applied to grazed grassland or hay/grazed meadows at twenty-five dairy farms in Pays de Herve, Ardenne, Haute Ardenne and Gembloux. In each of these fields, 5 (in 2004) to 3 samples (in 2005), each including 30 cores, were taken in autumn. These fields represented a considerable gradient in terms of load (number of days' grazing/ha/y). Based on these results, we have

shown that the sampling plan proposed by NITRAWAL enabled an accuracy of 10 kg N-NO₃⁻/ha to be achieved in 58% and 52% of the samples fields respectively in 2004 and 2005. These percentages rise to 83% and 84% respectively if fields with average levels under 20 kg N-NO₃⁻/ha are included.

An alternative is to take not one, but two samples, each including 30 soil cores. This would result in an accuracy of 10 kg N-NO₃⁻/ha in 82% and 66% of the sampled fields respectively in 2004 and 2005. These percentages rise to 85% and 100% for grassland where the average levels are 30 and 20 kg N-NO₃⁻/ha respectively.



Project financed by the Regional Government of Wallonia, Department of Agriculture, Rural Management Division, agreement no. 2738/1.

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Sustainable management of fruit tree biodiversity: creating a network of standard orchards

Preserving genetic diversity is essential for the future success of agriculture. Plant breeding depends on the reserves of genetic variability contained in old cultivars and some of their wild relatives. The genetic diversity of the cultivated apple tree is currently very poor. Three varieties, namely 'Jonagold', 'Golden Delicious' and 'Elstar', make up almost 80% of the Belgian market. Such dependence on a very limited range of varieties makes our fruit growing industry very susceptible to setbacks. This has not always been the case, though in the late 19th century, nurserymen grew over 1,100 varieties of apples and pears, compared to around thirty nowadays.

For more than thirty years now CRA-W has been working to safeguard, characterise, assess and valorise old fruit tree varieties. Varieties of special interest (originality, low disease susceptibility, taste, historical aspect, etc.) that have a historical and cultural connection with this region are included in an extensive collection of fruit trees comprising over 3,400 accessions. This is one of the biggest collections in Europe in terms of both the number and the originality of the material. Currently the majority of material present in our collection are original "landraces". Valuable media coverage has helped stimulate interest in fruit tree diversity among the public, who continue to report valuable old varieties. Each year, between 500 and 1,000 fruit samples are brought in to us for identification. Our collections are a unique living heritage which deserves to be enhanced and preserved for future generations.

A project aimed at creating a network of repository orchards in the Walloon region got under way in January 2005. The main aim is to set up a regional organisation to coordinate initiatives for restoring or planting what are called "conservation" standard orchards. The objective is to ensure the survival of the rarest, most original varieties in our collections by reproducing them at a network of sites throughout the Walloon region. It is indeed advisable to conserve this unique

material at a number of different locations. The network presently comprises about twenty sites covering around 30 ha in total.

Conserving genetic resources in this way is in line with a European drive to develop "on farm" conservation linked to conservation in collections. Landraces and non-commercial old varieties are thus being reintroduced into their original environments and also into other areas, helping to increase fruit tree diversity in the Walloon region and bring these varieties to the attention of a wider public. The project also aims to integrate a whole series of initiatives, such as agri-environmental measures for farmers, Regional Government subsidies for fruit trees plantation many and educational projects to do with nature conservancy or agricultural diversification. Among other things, the project provides scientific and technical support for planting new orchards (area of at least one hectare) and assistance with preliminary pruning of standard trees for the first five years. Other aspects include creating data sheets and promoting the development of these fruit tree assets. The project will serve as a model for the setting up of a larger-scale organisation to manage our regional agricultural biodiversity.



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International Workshop on "Agriculture and Environment in the Balkans and Turkey: Networking Regional Experience"

3-4 July 2006, Gembloux, Belgium

The European Commission, Directorate General Joint Research Centre and the Directorate General Enlargement, in collaboration with the Gembloux Agriculture University, the Walloon Agriculture Research Centre, and the Wallonia Business House for EUROPE are organizing an International Workshop on "Agriculture and Environment in the Balkans and Turkey: Networking Regional Experience".

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Behind the standards, there are people! CRA-W at Libramont Agricultural Fair

The CRA-W researchers look forward to seeing you again this summer at Libramont Agricultural Fair, on the Regional Government of Wallonia stand at Walexpo. You know the format by now: each day will be devoted to a fresh topic. Come along and say hello – there are lots of things of interest for you to see.

Friday 28th July: Standards and laboratory — Saturday 29th July: Fruit and Vegetables

Sunday 30th July: Cereals — Monday 31st July: Water and Pesticides

Tuesday 1st August: participation in the Grass Day

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The 6th in our now-traditional series of seminars, "Pig and Poultry Products"

Wednesday 8th November 2006

will look at the topic of "Developing the pig and poultry sectors in the face of economic, social and political pressures"

Espace Senghor, Gembloux

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