



Bioelectricity and CO₂ credit: an opening for Walloon biomass

Conversion of thermal power stations to run on wood, cogeneration fuelled by palm oil, etc.: biomass-to-energy projects have been mushrooming all over the Walloon Region in recent months, stimulated by the green certificate scheme and ratification of the Kyoto Protocol. The whole of the Region's agricultural and forestry sector ought to be reaping the benefits. However, it turns out that most of the biomass is imported from abroad (South Africa and North America, notably!). Why is the Walloon Region missing out on this opportunity?

There are currently no pellet manufacturers in the Walloon Region, and so operators like Electrabel have to source their wood overseas. While production costs are perceptibly lower in many countries, such as Brazil, Australia or Western Canada, shipping biomass to the Walloon Region over such distances causes extra fossil CO₂ emissions, which in turn penalises the awarding of green certificates to promote electricity generation from renewable sources in the Region.

In cooperation with some ten scientific institutions spread across four continents who have signed up to the International Energy Agency's Bioenergy Agreement, the CRA-W is studying and modelling the parameters affecting the installation of biomass power

stations and their supply chains. Incorporating the savings due to lower CO₂ emissions into the supply chain selection and optimisation process ought to encourage the emergence of competitive local production chains in the near future.

Environmental problems and economising are becoming increasingly interconnected at a global level. Development of bioenergy sectors can play a part in reducing the former and improving the latter. However, it is desirable for such expansion to be optimised at supranational level. Through its research and development work combined with technology transfer to countries in the southern hemisphere, the CRA-W provides the expertise that enables industrialists and political decision-makers to make reasoned choices with respect to setting up bioenergy projects as part of sustainable development.

Contact: Jean-François Vanbelle
van_belle@cra.wallonie.be

POTATO VIRUS Y: A BIG HEADACHE FOR GROWERS

Widespread in Western Europe and carried by several common species of aphid, potato virus Y (PVY) can infect up to 60% of the plants in unprotected fields in a single season. The yield from a crop infected during development is not affected; on the other hand, plants grown from infected tubers are stunted and very unproductive. It is therefore essential to produce healthy young plants. In this part of the world a high standard of plant quality is ensured by rigorous production systems involving stringent health inspections, regular renewal of the seed material and intensive use of plant protection products. Without these measures, which are costly in both economic and environmental terms, potato growing would be virtually impossible, as most of the varieties grown here are susceptible.

The CRA-W has been trying for the past ten years to improve the management of this tricky problem. Flights of aphid vectors have been studied, as have the kinetics of spreading of the virus Y within potato fields. The effectiveness of chemical control has also been examined, with reference to the various components. Interesting results have been obtained over the years and have just been written up as a doctoral thesis.

Flights of aphid vectors, measured with the aid of suction traps and coloured water tanks, appear to be homogeneous over a region as large as Northern France and Belgium in terms of both dynamics (intensity

and frequency) and composition (proportion of species). Over the whole of the plant growing period, aphid flights were found to be made up of over 70% individuals belonging to species that carry the virus Y.

A clear relationship has been found between the intensity of flights measured from April to June, the time of year when the crop is most susceptible, and certain climatic parameters such as mean temperatures from December to March. Forecasting can thus be carried out on this basis.

A method has been developed and validated for calculating the weekly infection pressure during the season. This is based on the one hand on the numbers of the different species of aphids, some being more efficient carriers of the virus Y than others, and on the other hand on the stage of plant maturity. A relationship has been demonstrated between the aggregate infection pressure over the whole season and the downgrading level of batches of plants inspected for certification purposes.

A study of the spatio-temporal spread of infection through plots has revealed the determining role of sources of contamination in the crop, highlighting the vital need for healthy plants for seed potato purposes.

Paraffin oils are perceptibly more effective in controlling the spread of the virus than insecticides. Tests have shown that reducing insecticide applications does not jeopardize crop quality when the main factor

leading to downgrading is virus Y, as is the case here. Non-use of insecticide did not lead to higher levels of potato leaf roll virus (PLRV) infection in the trials. The use of plant protection products can therefore be cut back, provided that high quality stock is used for propagation and that propagation areas vulnerable to external sources of contamination are avoided.

Finally, the use of genetic resources to create new varieties could go some way to solving this problem. Total infection resistance genes in fact occur in some wild *Solanum* species and can easily be introduced into cultivated varieties by classic hybridization. The GASORE variety created at CRA-W has resistance and therefore does not require chemical protection to control virus Y infections. However, this kind of variety does not always go down well with the industry, whose economic growth is based, among other things, on regular, necessary renewal of plants from susceptible varieties.



Contact : Jean-Louis Rolot,
rolot@cra.wallonie.be

PLANT HEALTH MONITORING: RIVERBANK WATCH

The spread of *Phytophthora alni*, the pathogen responsible for alder disease, has wasted over one-quarter of the Walloon Region's river-bank alders in recent years. An on-going study of the epidemiology of the disease has enabled measures to be taken to safeguard our river ecosystem and has also shown that wider phytosanitary monitoring is necessary in order to tackle other problems that could interfere with river management. Woody plants in fact play a key role in river bank maintenance and the disappearance of some trees can significantly change the river facies, with the result that some developments need to be reviewed.

The CRA-W therefore launched a new study in 2004 with the aim of describing the phytosanitary state of all the woody species found growing by rivers in the region. The object of the monitoring exercise is to provide a general picture of the diseases and pests currently occurring in riverbank environments and to enable any new "threats" to woody riverside plants to be detected. A network of 105 sampling units covering the whole of the Walloon Region was selected

from a database compiled by the Forestry Resources and Natural Environments Management Unit (FUSAGx). This network of experimental plots is covered twice per year and diseases and pests are listed and identified in twenty-two woody genera. Photographs are taken and samples are collected and brought back to the laboratory for identification of the different pathogens. A total of 1192 trees were examined in 2004 and 530 disease observations and 3356 pest observations were made. The phytosanitary situation was generally found to be "balanced". The problems occurring in spring and summer were chiefly due to insect pest larvae defoliating the trees, sometimes to a significant extent. Later on, towards the end of the summer and in autumn, some foliar and wood-destroying fungi appeared. Some diseases that can cause rapid tree wilt were noted, namely *Phytophthora* infections including *P. alni*, which causes alder disease, along with some types of rot (*Armillaria* sp.) and other wood-destroying fungi. At the end of this first year of observation a provisional version

of a visual guide was produced. Designed for everyone involved in river management, the guide is an aid to on-the-spot identification of the main diseases and pests affecting woody riverbank plants.



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Contact : Stéphane Abras,
abras@cra.wallonie.be

NATURALLY OMEGA 3 RICH PORK

Pork accounts for over 50% of our total meat consumption. This is an indication of how keen players in the sector are to satisfy consumers' requirements. Attention is currently focussing on certain fatty acids considered beneficial to health. Increasing the concentration of these in the meat would be an innovation for the pork industry.

Like poultry meat, pork is lean, containing under 2% lipids. Compared to the meat of ruminants it is also richer in unsaturated fatty acids. The challenge now is to reduce the omega 6/omega 3 fatty acid ratio in line with nutritional recommendations. One way to do this is to naturally enrich the meat with omega 3 fatty acids.

The CRA-W has conducted a study on the introduction of linseed into pig feed. The aim of the study was to establish the effects of reducing the feed omega 6/omega 3 ratio on the quality parameters of meat from pigs fattened according to the 'Farm Pork' specifications (PQA). Two different feeds were formulated containing extruded linseed mixed in proportions such that the omega 6/omega 3 ratio was equivalent to one-third (L3) and one-fifth (L5) respectively of that of the control

feed (T). The diets were fed either throughout the fattening period or during finishing only.

The results showed that these experimental diets enriched the meat (*Longissimus dorsi*) naturally with alpha-linolenic acid and also one of its long chain derivatives, EPA, which is particularly significant to lipid metabolism in humans. The meat omega 6/omega 3 ratio was in fact significantly improved to levels of 4.9 and 3.7 respectively with L3 and L5 diets, which were fed to the animals throughout fattening, as compared to 10,0 in the control. The level was thus below the upper limit of 5,0 recommended by the French Food Safety Body, AFSSA, in 2003. Confining the experimental feed to the finishing stage did not prove so effective, producing ratios of 6.9 and 5.5 respectively with feeds L3 and L5.

The feeds in the trial did not affect production performance (mean daily weight gain, FCR-Food Conversion Ratio) or carcass quality (conformation, fattening state, yield, pH and conductivity 45 min. and 24 hours *post mortem*) or meat quality (DM, fat, shearing force, loss of juices, loss of juices in cooking, lipid oxidability

6 and 10 days *post mortem*, luminance and red and yellow indices 30 minutes and 6 and 10 days *post mortem*).

It is thus possible by slightly altering the fat composition of pig feed to improve the nutritional quality of the meat with no impairment of technological quality.



Contact : José Wavreille,
wavreille@cra.wallonie.be

TRAPPING BARK BEETLES IN THE FORESTS: SLOW AND STEADY WINS THE RACE!

In the seventies, identification and synthesis of aggregative pheromones of *Ips typographus* and *Pityogenes chalcographus* suggested that mass trapping would facilitate population management of these two bark beetles, which are major pests throughout Europe, with thousands or indeed tens of thousands of insects being caught in each trap. Thirty years on, however, storms or droughts are still invariably followed by population explosions, with extensive damage being caused by these two beetles.

Other unusual climatic events, for instance sudden temperature drops, can damage trees, leaving them temporarily vulnerable to wood-eating beetles such as *Trypandendrons*. Something of the sort occurred recently in the beech forests of the Ardennes. Here too, the trapping techniques developed by the CRA-W and the ULB's Animal and Cellular Biology Laboratory enabled large numbers of bark beetles to be captured, though it was not possible to stop the damage.

Why does trapping, although obviously effective, not prevent bark beetle damage? To understand this paradox it has to be borne in mind that most of the trapping and bark beetle population management studies have been carried out at times of

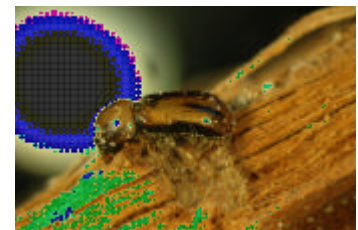
"gradations", in other words, crisis periods when the forest environment is particularly favourable to bark beetle breeding. At such times trapping, even intensive trapping, is not enough. The only way to limit population explosions is proper crisis management, which is restrictive, expensive and needs to be carried out on a large scale.

Like the unusual climatic events that trigger them, bark beetle "gradations" are unpredictable, but their extent depends on the initial population levels. So, rather than further refining crisis management methods, the CRA-W and the ULB's Animal and Cellular Biology Laboratory are now exploring more preventive approaches and have undertaken to characterise endemic bark beetle populations. The aim is to determine the critical population levels above which action should be taken by forest managers in order to avoid an unforeseen possible gradation which, starting from a high population level, is always disastrous.

The work aims initially to develop reliable techniques for measuring bark beetle populations over areas of 100 to 200 km². Such measurements cannot be made at individual planting level, due to the aggregative distribution of bark beetles in

space. Current trials therefore involve networks of small pheromone traps, which are very cheap, distributed within and outside forest.

Apart from the bark beetle issue, a feasibility study financed by the DGRNE (DNF) has been launched with the aim of setting up a general forest health monitoring network. The first phase of this study involves taking an inventory firstly of actual or potential forest health problems and secondly, the scientific, technical and regulatory expertise that exists at regional, national and European level. In the next stage a structure and a method of operation will be proposed for the most effective use of each player's data, tools and particular skills.



Contact : Michel De Proft
deproft@cra.wallonie.be

BERRY FRUITS ARE COMING...

Establishing a quality image for products has to be one of the Walloon Region's priorities nowadays. Like any other crop, berry fruits have to meet ever more stringent environmental requirements while maintaining good taste and health quality for the consumer over the years. The only way to achieve this "quality" objective is to manage all the production factors by means, in particular, of integrated techniques and careful variety selection.

Systematic plant health control is not the answer to producing healthy fruit free from pesticide residues over the legal limits. While regular treatment does keep the plantations relatively healthy, in the medium to long term this method causes environmental pollution problems and resistance to or the disappearance of natural predators, in turn causing an upsurge of diseases and pests.

It is the case that berry fruits are particularly susceptible to a number of pests and fungus diseases. Plant health protection based on treating each problem arising in the crop would require very frequent treatments. What is more, few products are currently authorised for such crops in Belgium. Effective control is thus difficult and it is essential to develop a more environmentally friendly, integrated approach.

Through trials combining variety selection, crop husbandry parameters and integrated control techniques, the CRA-W hopes to provide growers with the necessary knowledge to enable them to manage the crops for quality produce.



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Contact :

Stéphanie Farvacque,
farvacque@cra.wallonie.be

CRA-W AT LIBRAMONT AGRICULTURAL FAIR: RESEARCHERS AND PROUD OF IT!

During the Libramont, Agricultural Fair the researchers from the Walloon Agricultural Research Centre look forward to seeing you at Walexpo, where they will be sharing a site with the other principal departments of the Ministry of Agriculture, Rural Affairs, the Environment and Tourism. Each day, the CRA-W stand will be manned by researchers from some very different disciplines who all share a passion for and pride in their forward-looking work.

Friday 29 July: Researchers in the forest

- New technologies for growing quality Christmas trees.
- Bark beetles: little animals that do a lot of damage! Explanation of the research undertaken by the CRA-W and observation of living insects.
- Wild apple trees: a genetic source for improving cultivated apple trees.
- Our alders are diseased; so what are the researchers doing about it?

Saturday 30 July: Plant doctors

An outline of research in the three aspects of crop modern protection:

- Safeguarding and utilising genetic diversity.
- Study of plant pests and their impact.
- Development of crop protection techniques that are friendly to humans and the environment.

Are your azaleas or your lettuces looking poorly? Come and show us on the CRA-W stand! Come and learn how to recognize plant enemies.

Sunday 31 July: Breeder and researcher ... passion for one's work!

- Presentation of the CRA-W's research work in the area of breeding, based around an exhibition of photographs taken by breeders.
- Free NIRS analysis of your forages with immediate interpretation of the results.
- Animal welfare forum: we are waiting for your questions.
- Drawing competition for children, with prizes to be won throughout the day.

Monday 1st August: Biotechnology and Quality for life and health

- Molecular biologists are not magicians: they are going to extract the DNA from kiwi fruit in front of your very eyes, using household products! They will also extract proteins for analysis and reveal all sorts of things with strange names, such as "electrophoresis", "DNA typing", etc. Budding researchers, it's your turn! Come and find out how to use a micropipette and discover the structure of DNA with the aid of a 3D puzzle.
- Healthy eating... but what makes a product "good"? Let the researchers explain how quality is measured and talk about the issues involved.
- The CRA-W serving society in the Walloon Region: video montage (routine GMO analysis).