



## GEREPHYTI: RESEARCH SERVING SELECTION IN POTATO GROWING

AS PART OF THE GEREPHYTI PROJECT, THE CRA-W STEPPED UP ITS POTATO IMPROVEMENT PROGRAMME BETWEEN 2013 AND 2017, HELPING TO ACHIEVE POTATO GENOTYPES THAT ARE MORE RESISTANT TO LATE BLIGHT BY MEANS OF CONVENTIONAL SELECTION AND CISGENESIS.

Conventional selection was introduced at the CRA-W in 2005, as a mean of creating improved genotypes. The selection model (see video <http://www.cra.wallonie.be/fr/la-creation-de-nouvelles-varietes-de-pommes-de-terre-en-wallonie>) was rendered more efficient. The choice of parents (or progenitors) is now based on assessing their level of resistance to late blight (caused by *Phytophthora infestans*): 127 varieties were tested under local pedo-climatic and epidemiological conditions during field trials at the Libramont and Gembloux sites. Only resistant varieties will be used for future crossings. As far as the methodology is concerned, GEREPHYTI has enabled acquisition of two rapid selection techniques that can be incorporated into the selection model. These are the **detached leaf test**, a protocol for testing susceptibility to mildew in the laboratory, and **molecular marker-assisted selection**, for early detection of the presence of resistance genes.

The second method used for creating improved material is **cisgenesis**. This is the process of transferring genes of interest between closely related plants, which could be crossed using conventional hybridization methods. Cisgenic varieties were obtained by selecting and isolating resistance genes in wild *Solanum* species (*S. bulbocastanum* and *S. pinnatisectum*). Techniques for the transfer of genes into the genome of varieties that are susceptible, but have other favourable qualities, were studied. This resulted in the production of more than 15 cisgenic clones of 3 varieties (Lady Rosetta, Charlotte and Louisa), which were consistent with the original variety and had increased resistance to late blight. Having acquired this new expertise, the CRA-W remains competitive in the field of new varietal improvement technologies, although cisgenesis is still covered by the same regulations as transgenesis.

### Louisa, a new variety in the catalogue

Meanwhile, the project has led to enhanced collaboration with the potato sector: farmers now have the option of testing clones in their own growing conditions. 5 clones are currently being investigated on 4 farms. Finally, a registration application, introduced in the national catalogue of varieties in 2014, has been successful: Louisa, a variety intended for the industrial production of crisps, with good resistance to late blight, is now included in the Belgian catalogue.

GEREPHYTI has successfully combined innovative research, a source of new expertise at the CRA-W, and support for agriculture in Wallonia, particularly in the potato sector.

*Project subsidised by Moerman funding.*

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*Photos: Conventional selection requires an assessment of several thousand clones every year*

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## DECIDE INNOVATES BY INCORPORATING AGRICULTURAL ACCOUNTING DATA!

YOU CAN NOW ESTIMATE YOUR FARM'S GREENHOUSE GAS (GHG) EMISSIONS AND STORAGE AND ENERGY CONSUMPTION AND SUPPLY USING THE AUTOMATED SYSTEM THAT IMPORTS FARM ACCOUNTING DATA INTO THE DECIDE TOOL DEVELOPED BY THE CRA-W.



To meet the demands of the European climate energy package, Belgium aims to reduce its GHG emissions by 15% by 2020.

According to sectoral inventories, Walloon agriculture contributes 12% of GHG emissions. However, the GHG emissions and energy consumption of agricultural systems are highly variable and are heavily dependent on farm types and farming practices.

The aim of the ENERGES project was to define the Walloon agrarian systems in terms of energy consumption and GHG emissions. It was also a matter of developing reference points that enabled farmers to identify improvement measures for their farm by comparing them with farms of similar structure, working under similar pedoclimatic conditions.

The first step was to develop a solid basis of comparison that included a high enough number and sufficiently wide variety of farms. This kind of reference system called for the automatisisation and standardisation of data collection from the accounts available in Wallonia, adapted where necessary.

The CRA-W, the AWE (Walloon Breeding Association) and the DAEA (Directorate of Agriculture and Economic Analysis) worked together to meet the objectives set by this project.

So an automated module was developed, importing the accounting data into the encoding forms of DECiDE (a tool for estimating the GHG and energy consumption balances of farms).

To enable the encoded farms to compare their results with others of the same type, a typology was introduced into the DECiDE tool. In order to validate this typology and provide sufficiently robust comparisons, it was necessary to set up a pool of reference farms. Project partners have provided datasets for 100 farms. Approximately 60% of the farms are currently encoded. The checking and addition of missing data are ongoing.

**It is therefore now possible to use agricultural accounting data to pre-fill the DECiDE tool and estimate the GHG and energy balances of a farm.** It will soon be possible to compare the assessment results obtained for a farm with the average assessment results of farms of the same type.

Calculate the energy and GHG assessments for a farm by visiting <http://decide.cra.wallonie.be/fr>

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## RESEARCH INTO WATER-BORNE ENDOCRINE DISRUPTORS

THE BIODIEN PROJECT IS INVESTIGATING THE PRESENCE OF ENDOCRINE DISRUPTORS WITH THE AIM OF CREATING A RISK ANTICIPATION MANAGEMENT TOOL.

The World Health Organisation defines endocrine disruptors (EDs) as exogenous substances that alter endocrine system function and consequently have adverse effects on organisms and populations. In other words, EDs mimic, block or modify the action of a hormone, acting at very low concentrations and within a specified range of concentrations, unlike other compounds whose toxicity increases with concentration. They therefore belong to a specific class of toxic substances that are considered to be particularly worrying. Some of them are included on the European list of priority substances in the field of water (Directive 2013/39/EU) and the European vigilance list (Implementing Decision (EU) 2015/495).

The BIODIEN project was initiated under the management of the Public Service of Wallonia (SPW) and associates three Walloon public laboratories (ISSeP, CRA-W and SWDE) within the GISREAUX (Walloon scientific interest reference group for water quality). The objective is firstly to determine the endocrine disruptor content in the water cycle in Wallonia and the Brussels Region. The search for these substances is carried out on a representative sample of groundwater, surface water, run-off, discharge from water treatment plants and bottled water. The search has involved a total of nearly 200 substances, including alkylphenols, phthalates, perfluorinated compounds, chlorophenols, PAHs, PCBs, polybrominated flame retardant compounds and some pesticides.

All information gathered is centralised in a database that enables collective analysis of this problem throughout Wallonia - Brussels. It will also serve as a medium and long-term risk management tool for the conservation of water resources.

*Funding: Service Public de Wallonie (SPW), Direction générale opérationnelle Agriculture, Ressources naturelles et Environnement (DGO3) [Public Service of Wallonia (SPW), Operational Directorate General, Agriculture, Natural Resources and Environment (DGO3)]*

*Further information about this project: <http://www.cra.wallonie.be/fr/biodien>*

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## TECHNOLOGICAL INNOVATION SERVING THE QUALITY AND AUTHENTICATION OF AGRICULTURAL AND FOOD PRODUCTION

AN INCREASING NUMBER OF PORTABLE INSTRUMENTS BASED ON NEAR-INFRARED SPECTROSCOPY HAVE NOW BEEN ON THE MARKET FOR A DECADE. THIS TECHNIQUE, WHICH HAS LONG BEEN USED MAINLY IN THE LABORATORY, IS EVOLVING TO BRING ITS USE CLOSER TO THE SAMPLE, AND CLOSER TO THE USER OF THE RESULT PROVIDED. HOW GOOD ARE THESE INSTRUMENTS? ARE THEY OF EQUAL QUALITY?

What distinguishes the various portable instruments is their compact appearance, ease of use, the fact that they can be controlled via a smartphone (or even a watch) with a wired or wireless connection, and their low cost compared with conventional infrared devices. Some can also be adapted to include predictive models for the simultaneous determination of various product parameters or criteria, or can be coupled to a GPS device enabling geolocation of measurements, or connected to the cloud in order to offer custom-made solutions, or directly embedded into a smartphone. These instruments make use of sensors that bring new technologies and strategies into play, to generate part of the near-infrared spectrum resulting from the interaction of light with matter.

The CRA-W has been evaluating some of these portable instruments for several years. This is because they must be subject to rigorous

evaluation to ensure that they represent a real opportunity for those working in the world of agriculture and food. Furthermore, they require optimisation of the measurement protocols in order to take into account the heterogeneity of the products, adaptation regarding the presentation of the sample, and the development of a calibration strategy adapted to the new technologies implemented. The CRA-W is also working on the most suitable methodology for transferring databases constructed decades ago, with laboratory devices, to portable instruments.

These portable devices will obviously play an increasing part in our farms and businesses, to determine the key parameters necessary to bring quality control as close as possible to the products. They will form an integral part of future decision-making tools, including precision food production, raw material quality control, batch segmentation, product

traceability and fraud detection. Due to their design, the new technologies involved can readily act as sensors in our processes. They will increasingly support the ongoing digital revolution in our farms and businesses.



Figure: Examples of portable spectrometers tested at the CRA-W.

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## MIXENABLE : A EUROPEAN PROJECT FOR THE IMPROVEMENT OF MIXED ORGANIC FARMING

THIS CORE ORGANIC COFUND PROJECT, IN WHICH THE CRA-W IS PARTICIPATING, WAS SET UP ON 1 APRIL 2018 TO STUDY THE IMPROVEMENT OF MIXED ORGANIC FARMING IN EUROPE.



The MIXENABLE CORE Organic Cofund project aims to identify measures for improving the efficiency of farms with mixed herds and polyculture. The main objective of this project, with 10 partners from 7 countries (France, Germany, Switzerland, Austria, Italy, Sweden and Belgium), is to develop the sustainability and resilience of mixed biological systems in Europe.

### Why mixed farming?

There are currently few references that expand upon the literature on mixed livestock and polyculture systems compared with

polyculture farming systems. However, the introduction of two or more animal species into the crop production within a farm can potentially offer many benefits, including more efficient use of grazing land and better management of parasitism.

Moreover, organic mixed farms tend to specialise, or have limited integration between their facilities, which may reduce the practical benefits of combining multiple livestock operations.

### For this project, the CRA-W aims to:

1. Define mixed organic farms by means of surveys. As a priority, assess the level of integration between their agricultural components (diversification facilities), their sustainability (environmental, economic, social) and resilience to adverse events, and to compare their performance with that of specialised farms;
2. Combine the knowledge gathered from the surveys and experiments in research centres into models that can simulate their performance in the face of climate and economic variations. Co-build,

through workshops with farmers, more sustainable and robust models for existing mixed farming systems;

3. Design a system of indicators for the assessment of mixed organic farms, to relate the sustainability and resilience of the farms surveyed to their degree of integration;
4. Simultaneously conduct experiments in research centres, to compare specific aspects of livestock farming (use of grazing land, animal health, etc.).

The results will be regularly shared in order to highlight innovative practices of breeders, the potential of mixed organic farms and the way in which they can be sustainably managed.

If you wish to apply the dynamics of this research project to your farm, contact us!

For further info: <http://www.cra.wallonie.be/fr/mixenable-1>

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## DESIGNING FREE-RANGE ENVIRONMENTS: SO CHICKENS CAN GO GREEN!

POULTRY FARMING IS A GROWING INDUSTRY IN WALLONIA, ESPECIALLY WITH ITS BOOMING ORGANIC AND OUTDOOR PRODUCTION. BUT HOW DO YOU DESIGN A FREE-RANGE ENVIRONMENT THAT LOOKS ATTRACTIVE?

An appropriately planned run (tree plantation and herbaceous cover) has many advantages. It supports the sustainability of the activity insofar as it meets the concerns of society (environment, animal welfare, image of the sector, ...). Consequently, the CRA-W has invested in setting up poultry run facilities through the monitoring of a regional reference and experimental centre (CRE). The aim of the CRE is to promote the development of runs with fruit trees, to be a place of experimentation in terms of the choice of meadow species to be planted, and to make technical information and the related results widely available.

The observations made in this context demonstrate the importance of sowing a diversified plant cover, combining grasses and leguminous plants as a minimum requirement (clover, alfalfa), to provide a continual herbaceous cover during the whole period that the chickens have access to the run. Adding chicory to the mixture is also beneficial. This plant is highly appetising, which one can see

by the traces of pecking on the leaves, and its erect growth adds relief to the plot (a visual guide that helps to disperse the poultry). The measurements collected show that the herbaceous cover is definitely eaten. However, its contribution to the nutritional intake of poultry is still not widely understood and requires further investigation, especially the method by which grass intake by the chicken is measured. The poultry run, which includes diversified feed mixtures, also has good nutritional value for ruminants and can therefore be appreciated by them (either by mowing or rotational grazing). The observations also highlighted the sensitivity of broiler chickens to their environment, particularly to climatic conditions (wind, cold, rain, sun, etc.).

Finally, the benefits of an herbaceous cover will be optimised once the shrubs and trees in the area have grown sufficiently to create relief (guiding the poultry), as well as shading and refuge areas (protection against the sun and predators).



*Designing a chicken run with a chicory-based mixture*

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## PRODUCING MILK USING MORE ENVIRONMENTALLY FRIENDLY PRACTICES: FARMERS AND THE CRA-W ARE COMMITTED TO IT

THE AIM OF THE QUALAITER PROJECT IS TO MEASURE GREENHOUSE GAS EMISSIONS AND DETERMINE HOW TO REDUCE THESE EMISSIONS FOR MILK PRODUCTION.



Environmental concerns, and economic and social change, have led Walloon milk producers to look for ways to measure and improve their environmental performance. This is borne out by the fact that twenty-six of them took part in this CRA-W study.

Our objective was to quantify environmental performances at system level (Life Cycle

Analysis), from various angles (eutrophication, global warming, acidification, energy consumption, use of surfaces,...) particularly involving sustainable use of the resources. The production of one kg of milk resulted, on average, in the emission of 1.21 kg of CO<sub>2</sub> and consumption of 4.35 MJ of energy. Considerable variation was nevertheless observed between the farms surveyed, which potentially implies that some agronomic practices are more favourable to the environment and therefore there are areas for improvement. These have been studied at constant production level and are based on technical optimisation, such as improvement of forage quality combined with a reduction in the amount of concentrates distributed (~ 9.5% greenhouse

gas emissions), a better use of farmyard manure, leading to a decrease in the use of chemical fertilisers (-12.4% acidifying substances emission), and the installing of a milk pre-cooler (-1.75% fossil energy consumption). The farmers have committed to the environmental progress initiatives under the supervision of the CRA-W. There are techniques to help them achieve this.

Through the provision of the Decide tool, developed by the CRA-W, it is now possible for many farmers to determine the greenhouse gas emission and energy consumption of their farm (see following article).

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## AGENDA

THE WALLOON CENTRE FOR AGRICULTURAL RESEARCH AT THE LIBRAMONT AGRICULTURAL FAIR

**FRIDAY 27 JULY**

at 16.00 at LEC3 hall 3

**Agroecology and Organic farming**

**SATURDAY 28 JULY**

at 11.00 at LEC3 hall 33 - **Round table**

**The farm of the future: How to create a new variety, and why?**

**More info: [www.cra.wallonie.be](http://www.cra.wallonie.be) | Contact: [communication@cra.wallonie.be](mailto:communication@cra.wallonie.be)**