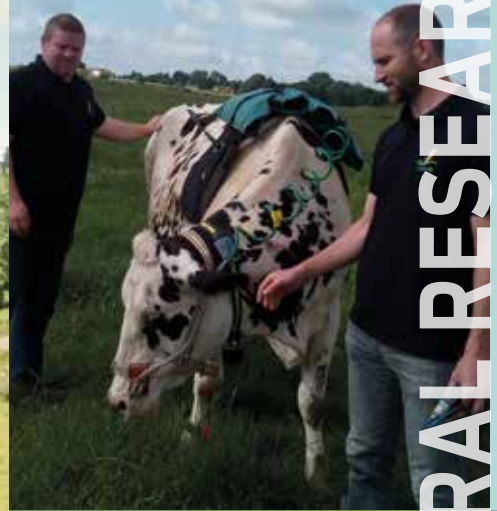




ACTIVITY REPORT

2016-2017-2018



WALLONIAN AGRICULTURAL RESEARCH CENTRE

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ABOUT

The organisation of agricultural research in Wallonia is based on the Strategic Plan for Walloon Agricultural Research adopted by the Government in December 2016. This long-term plan is broken down into operational objectives which, together, form a Three-Year Agricultural Research Plan (PTR). The 2017-2019 PTR therefore lists the main research objectives set by the Walloon authorities for this three-year period. The Walloon actors in agricultural research are invited to organise and direct their research so as to contribute to the achievement of the objectives set by the successive PTRs.

To help achieve these objectives, the CRA-W has organised its research and other activities into four main categories:



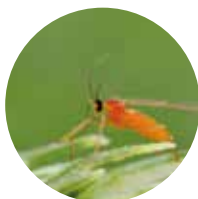
Precision agriculture

Combining state-of-the-art methods and technologies to make the right choice, at the right time, in the right place, with the right input and at the right dose



Precision livestock farming

Ensuring a balance between profitability and consumer expectations and integrating livestock farming better into ecosystems



Risk management

Eliminating, controlling and preventing risks



Understanding products

Understanding material, knowing what it contains, detecting unwanted substances

The CRA-W conducts about 120 research projects and offers more than 60 types of services. This report is therefore deliberately confined to presenting examples of some of the activities and the results achieved in the four main research fields. I hope this summary presentation will inspire you to look further and learn more about the activities and services offered by the CRA-W. I invite you to find out more from the CRA-W or its website www.cra.wallonie.be, and I hope you enjoy reading this report.

R. Poismans

General Manager

3 MISSIONS



- > applied and basic short- and medium-term scientific research



- > scientific research services to beneficiaries in the agricultural and agri-food sector

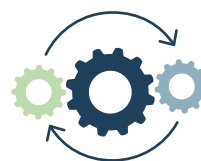


- > perspective view on the development of agriculture and livestock farming

HOW?

- > The functioning of the CRA-W should be understood as a **production process with requests** as the **inputs** and **results** as the outputs.

Its entire functioning is based on and organised according to the needs and questions of producers in the agricultural and agri-food sectors.



« To address today's questions and

WHO FOR?

beneficiaries

- > Through a multidisciplinary approach with a view to common and concerted research objectives with beneficiaries and partners
- > Listening to beneficiaries and partners to meet their expectations and benefit from their experience and knowledge
- > In a continuous improvement approach, the research results improve the quality of services for beneficiaries and boost innovation
- > Crop and livestock producers/market gardeners/foresters
- > Operators in the agri-food sector
- > The general public and the authorities

partners

- > Universities, university colleges, research centres
- > Training and public information operators
- > Governments and government agencies



WHAT FOR?

- > To perform innovative scientific research
- > To offer professional, effective services
- > To build creative forward thinking
- > Through a multidisciplinary approach with a view to common and concerted research objectives with beneficiaries and partners
- > Listening to beneficiaries and partners to meet their expectations and benefit from their experience and knowledge
- > In a continuous improvement approach, the research results improve the quality of services for beneficiaries and boost innovation

An organisation combining research, service and support functions in a joint response to external demands, providing results, analyses, equipment, advices and expertise.



to prepare tomorrow's challenges »

THE CRA-W IN FIGURES

FOR 2017

410 personnel, incl. 120 scientists



134 ongoing projects and research programmes in 2017

Resources:
+/- 34 million euros per year

Income

62% public funding

15% research & service agreements

14% miscellaneous income (contracts, sales, analyses, etc.)

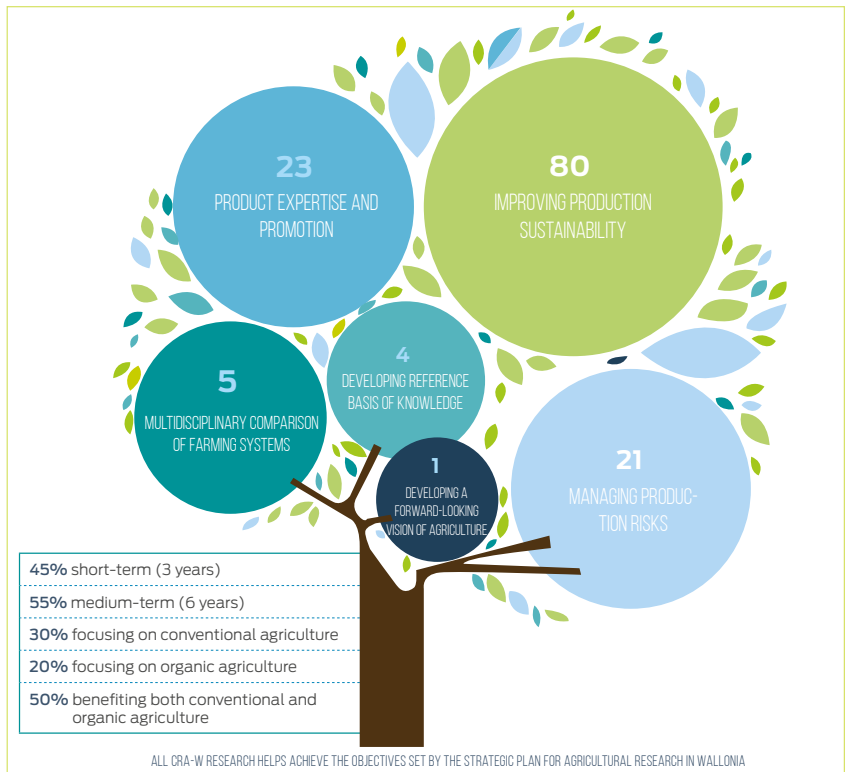
9% Moerman Fund

Expenditure

75% personnel costs

15% operating costs

10% capital spending



Events

THE CRA-W ORGANISED OR TOOK PART IN

53 conferences, study days and visits to trials, laboratories, orchards/demonstrations for interested parties in the fields of science, agriculture, market gardening or forestry

THE CRA-W RAN

81 training events for students and/or professionals in the fields of science, agriculture, market gardening or forestry

THE CRA-W TOOK PART IN

5 fairs and exhibitions, both national and international, for the general public and professionals, with a total of 10 different activities (stands, lectures, demonstrations)

CIRCULATION OF THE CRA-W'S QUARTERLY NEWSLETTER,

CRA-W info = **4** editions per year



• **1,000 printed copies** (for subscribers, conferences, trade fairs, etc.)



• **In the electronic version** on our website (in French and English), to a list of

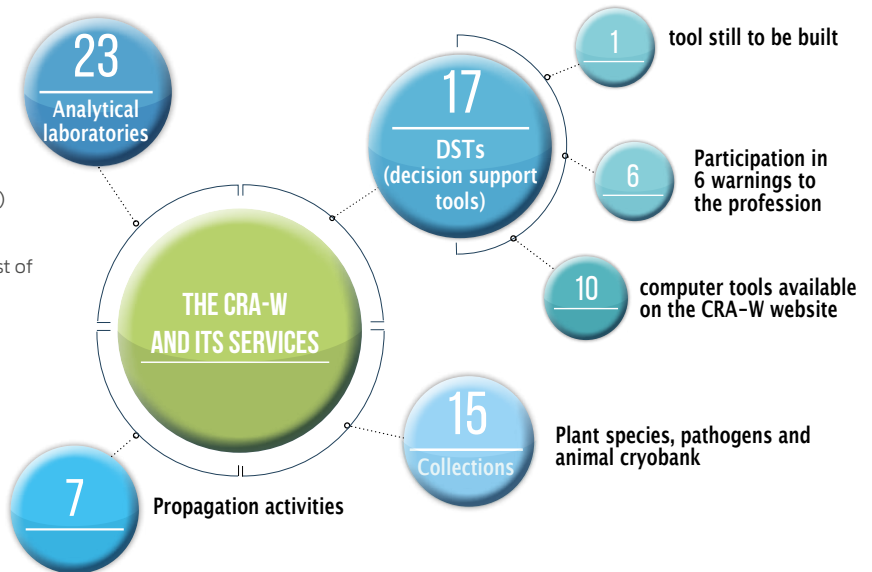
1,837 subscribers (French version) and

3,325 subscribers (English version)



1,527 subscribers

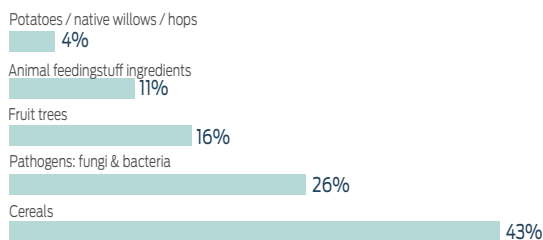
5,000 extra unique visits per year



Collections

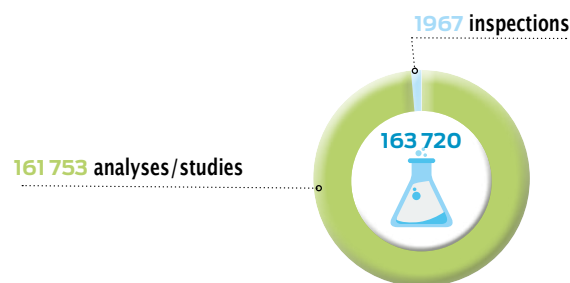
The CRA-W has **22,418** specimens

in its growing collections



Volume of activity in accredited laboratories/services

163 720 analyses/studies/inspections carried out in CRA-W-accredited laboratories/services as follows



The CRA-W and its reputation

38 areas of expertise at national and international level

THE CRA-W HAS **official recognition** IN THE FORM OF **ACCREDITATIONS/CERTIFICATIONS** RELATING TO THE FOLLOWING INTERNATIONAL STANDARDS:

14 ISO 17025 laboratories for laboratory tests

5 GLP laboratories (good practice laboratories)

2 ISO 17043 laboratories for the organisation of proficiency tests (interlaboratory tests)

1 ISO 17020 service for sprayer inspection

1 EXAMINATION BOARD service

recognised by the CPVO for cereals evaluation (DHS testing)



STATISTICS RELATING TO THE WEBSITE

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



CRA-W SERVICES

stable and long-term activities

The CRA-W provides services, analysis and expertise to both internal and external customers, and for both public and private operators.

These services include certification of products, seeds and laboratories, supply of propagation material and the issue of disease warnings and advices of all kinds. Finally, the CRA-W also carries out monitoring activities for third parties and provides reference services regarding the use of technology and equipment.

more than 60 services

- collections
- production of propagating material
- warning systems
- decision support tools
- training and information to different sectors
- propagating material quality and conformity certification
- analytical laboratories
- other

The system is not closed but relies on permanent contact between the sectors (agriculture, livestock farming, forestry, organic, etc.) and between each of the CRA-W's activities.

This means that the results of the scientific projects enable constant improvements to be made to the services provided through our ongoing activities. As well, the experiences and lessons learned from the ongoing activities both at the CRA-W and with external partners strengthen our expertise and experience, which in turn benefits our research activities.

This permanent interconnection, reinforced by the '3C' rule – Coherence, Consultation, Collaboration – enables the entire system to operate and improve while remaining multifunctional and adapted to the needs of Walloon operators.



Decision support tools - DSTs

To help the profession, the CRA-W has introduced a series of DSTs. Some are already available online on the CRA-W website others are under development in the field, in a network of farms.



Warnings

These decision support tools guide farmers towards economical, rational and effective protection of their crops. In collaboration with other organisations such as CADCO, FIWAP, CARAH, APPO and with the addition of an analysis of climatic data from the Pameseb network (Bilan agroclimatique de la Wallonie mensuel, available on the website cra.wallonie.be) the CRA-W has for more than 20 years been issuing warnings against cereal and rapeseed pests, cereal diseases and potato pests and warnings to help fight late blight.

A long-term service provided by the CRA-W: conducting official varietal trials

There is now widespread consensus that varietal choice is the most important lever of a sustainable agriculture in our country. Varietal assessment in our soil and climate conditions is therefore a key service for the sector.



The CRA-W **Variety Centre** sets up, monitors and disseminates the results of multi-locational and multi-year trial networks. In addition to the resultant research activities, this makes possible the **set up of trials for the Belgian catalogue** (registration trials) and the **provision of advice to farmers**.

The **registration tests** (DHS and VCU) consist of evaluating the suitability of selected products in order to submit information to the National Committee to enable it to decide on whether to accept or reject the variety. If the variety is included on the national list, it may be commercialized in Belgium and potentially in the rest of Europe. DHS tests are performed according to the standards set by the CPVO (Community Plant Variety Office).

In **varietal trials**, for each species (wheat, spelt, barley), between 20 and 30 characteristics are evaluated in both candidate varieties and collection varieties. The CRA-W's current cereal collection contains more than 1,000 varieties. In 2018, after four years of constant increase, trials evaluated

236 varieties from nine different crops (wheat, six-row barley, grain maize, silage maize, chicory, fodder beet, spelt, oats, potato).

The conduct of these varietal trials for each species of cereal enables the CRA-W to advise farmers efficiently on their choice of varieties.

During this three-year period, new observations were added to evaluate diseases and the impact of pests which are not regularly present. In particular, specific trials were carried out for fusariosis, barley's tolerance to viruses, and resistance to cold, lodging and over-ripening.

Low-input crop management trials further reinforce our expertise and allow us to speak with authority and enlighten farmers on the potential of cultivated varieties, with the aim of protecting our environment.

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CRA-W SERVICES

MECACOST, a tool for farmers
to assess the cost of using farm equipment

Analysing usage costs for agricultural equipment and the consumption rate of different agricultural tasks provides farmers with economic and technical information relevant to any new investment.

Mechanisation costs represent on average around €600/ha. This makes them an important factor in maintaining the **competitiveness** of farms.

Limiting individual over-mechanisation makes farms **more sustainable** from both an **economic** and an

use and performance, to adapt the calculation to each situation. In 2017, **MECACOST** underwent a major update of its economic (prices) and technical (new machines and technical data) database, and a new feature was added for evaluating the impact of

annual use on the cost of using a given machine. The project has been a success and over the years steady use has been made of the tool, especially by professionals from the agricultural sector (57% farmers). It is worth pointing out that this tool is also put to effective use in various research projects (at the CRA-W and elsewhere) and/or economic and social studies.

The project has been a success and over the years steady use has been made of the tool, especially by professionals from the agricultural sector (57% farmers).

environmental point of view (consumption of fuel and raw materials). The CRA-W's awareness these issues led to the development of **MECACOST**, a free online service www.mecacost.cra.wallonie.be which enables the usage cost of more than 380 agricultural machines to be calculated. Since 2008, this interactive site has allowed users to modify the calculation parameters, such as machine purchase price, annual

In 2017, 600 visits per month were recorded, leading to around 25,000 calculations being completed.

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The cryobank

The CRA-W's cryobank has been operational since 2018.
This activity relates to the conservation of animal biodiversity in Wallonia.

This activity relates to the conservation of animal biodiversity in Wallonia.

The Walloon cryobank has been established at UCL (primary site and presidency of the scientific and technical committee) and the CRA-W (secondary site). The newly arrived genetic material consists of three endangered local sheep breeds: Entre-Sambre-et-Meuse, Mouton Laitier Belge, and Ardennais Roux et Tacheté. Two local horse breeds, the Ardennes Draught Horse and the Belgian Draught Horse, will be arriving shortly. Initiatives are under way to accommodate salmon as part of a programme to rehabilitate the Atlantic Salmon in the Meuse basin (the Universities of Namur and Liège and the Walloon Fisheries Service).

The objectives of the cryobank are:

1. to avoid the loss of genetic resources generated by health accidents,
2. to be able to recreate a breed in the event of a drastic fall in numbers,
3. to support in situ conservation programmes by establishing a stock that can be made available to farmers,
4. to undertake a genetic diversity back-up without interfering with progress in selection,
5. to conserve material that is of interest for research.

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Research Field

Precision agriculture



Satellites improving potatoes production!

When tradition and technical and economic developments intertwine.

The Belgian potato sector, the custodian of a rich tradition (with our French fries shops now classified under the UNESCO cultural heritage scheme), is growing fast. More than a quarter of our national output is exported outside the EU, and Belgium can boast of being one of the world's largest exporters of frozen potato products. To ensure sustainable growth, it is necessary to increase the availability of potatoes as a raw material and to maximise yields.

Belgium can boast of being one of the world's largest exporters of frozen potato products.

The **WatchItGrow platform (WIG)**, developed as part of the iPot project (funded by BELSPO and involving teams from the CRA-W, VITO, ULg and BELGAPOM), is closely involved in this work, collecting all data relating to potato-growing in a single place on the Web. With joint use of satellite images from the European Space Agency (ESA) Copernicus programme, meteorological data and growth models, this platform makes it possible to evaluate, in

near-real time, the crop's stage of development and likely harvest date, to assess the risks of production/quality losses and to identify the spatial variability of the field and estimate and predict yields during the growing season.

The joint analysis of this information ensures effective monitoring of the growth and development of potatoes throughout the production area in Belgium for different commonly grown varieties and in a way that is adapted to different usages.

IN PRACTICAL TERMS THE WATCHITGROW (WIG) PLATFORM



Accessible to farmers
and potatoes
processors



Operational since
2017



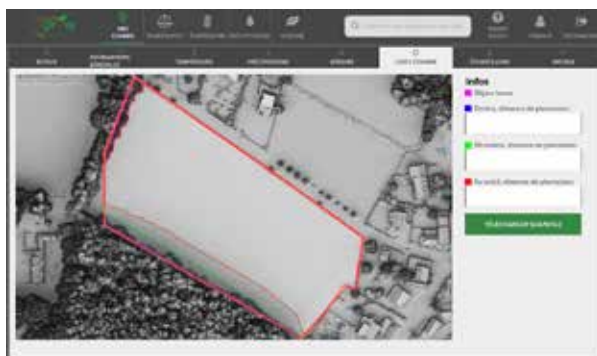
600
users



9,400 ha



1,900
plots



WWW.WATCHITGROW.BE

The platform is evolving and constantly offers new features created in consultation with end users. One of the latest is the shade map, which identifies shaded areas in a plot in order to adapt planting densities. If a lower planting density is used in shaded areas, the plants are better able to assimilate light, water and nutrients and hence produce a higher yield. Fewer plants and higher yields: a double benefit for the farmer!

Outlook : Given the platform's success, its use could be extended to other crops (e.g. maize, sugar beet, etc.) with the same objective: sustainable production.



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If tractors could talk...

Agricultural tractors are now among the best-equipped vehicles in terms of on-board electronics. This is a research opportunity that the GeoCAN project has seized upon.

'Geo' refers to geolocation by GPS and 'CAN' to the CAN bus, the communication technology used on most modern medium and high power tractors. The idea of the CAN, to summarise briefly, is to connect all the tractor's electronic components (sensors, controllers/actuators, displays) in a single line where they communicate with each other in turn. The project set out to detect, record, decode, and validate these communications in different tractors. Position, consumption, engine power and torque, speed, but also working depth, soil resistance, slipping and air temperature are among the many different, precise and high-frequency parameters that the project is now routinely able to recover. So the first finding is that tractors are not just noisy, they're talkative too!

The CRA-W's GeoCAN project demonstrates that CANs are a common feature of today's tractors, and that they are accessible, standardised and of unsuspected value to the farmers.

The wealth of information they have generated has created as yet untapped potential for improvements on farms, which the GeoCAN project can make generally available. Some of the many deliverables currently under study include cutting down on pollution and cost (fuel economy), reducing working hours (optimal

efficiency), making more objective investments at farm level, choosing ad-hoc cultivation techniques (to limit compaction) and above all the reappropriation of agronomic data by farmers.

Outlook: The project opens the door to numerous opportunities for professionals in the sector (decision support tools, remote operation management, eco-driving) and for research (measurement tools, overall assessments, big data) as well as for decision-makers (statistics).

So yes, tractors can talk, and indeed have a great deal to tell us.



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[HTTP://WWW.CRA.WALLONIE.BE/FR/GEOCAN](http://WWW.CRA.WALLONIE.BE/FR/GEOCAN)



Vitrovoc: a selection support tool at the *in vitro* lab

The CRA-W's *in vitro* laboratory has acquired a Vitrovoc. This technology is used to analyse volatile organic compounds (VOCs) emitted by plants growing under controlled conditions. Vitrovoc adds to the existing range of sanitation and propagation techniques new opportunities for selection and early assessment of the quality of plant material.

one of the main achievements of recent years has been to reduce the use of synthetic hormones by more than 60%.

At the centre of plant buds, even those that are sick, is the meristem, a microscopic region in which cells multiply faster than infections can progress. A comprehensive disease control programme can be carried out by taking these healthy cells, cultivating them on artificial media and then reconstituting millions of cloned plants, allowing the producer to reintroduce crops that are free from

fungi, bacteria and viruses. With this in mind, it is important to be able to measure the risks of non-conformity of plant material as early as possible in the propagation process in order to deliver healthy plants that maximise the use of inputs and considerably reduce the use of plant protection products.

While *in vitro* culture remains an artificial tool, one of the main achievements of recent years has been to reduce the use of synthetic hormones by more than 60% by focusing on better planning of the propagation stages. The results in the field (strawberries, raspberries, saffron, etc.) confirm from year to year that the risks of mutagenesis are now known and controllable.

DECISION SUPPORT TOOL

A new tool has thus been added to the laboratory: an 'artificial nose', or Vitrovoc, which allows non-destructive and early sampling of volatile organic compounds emitted by the plant in order to evaluate its state of health. This equipment can also be used as a decision support tool for the selection of valuable genotypes (e.g. aromatic and medicinal plants) or to study the effect of biotic or abiotic stress. In particular, it has been used to identify metabolites as stress markers for winter rapeseed plants subject to different concentrations of cadmium and epoxiconazole (a fungicide known to persist in soil).



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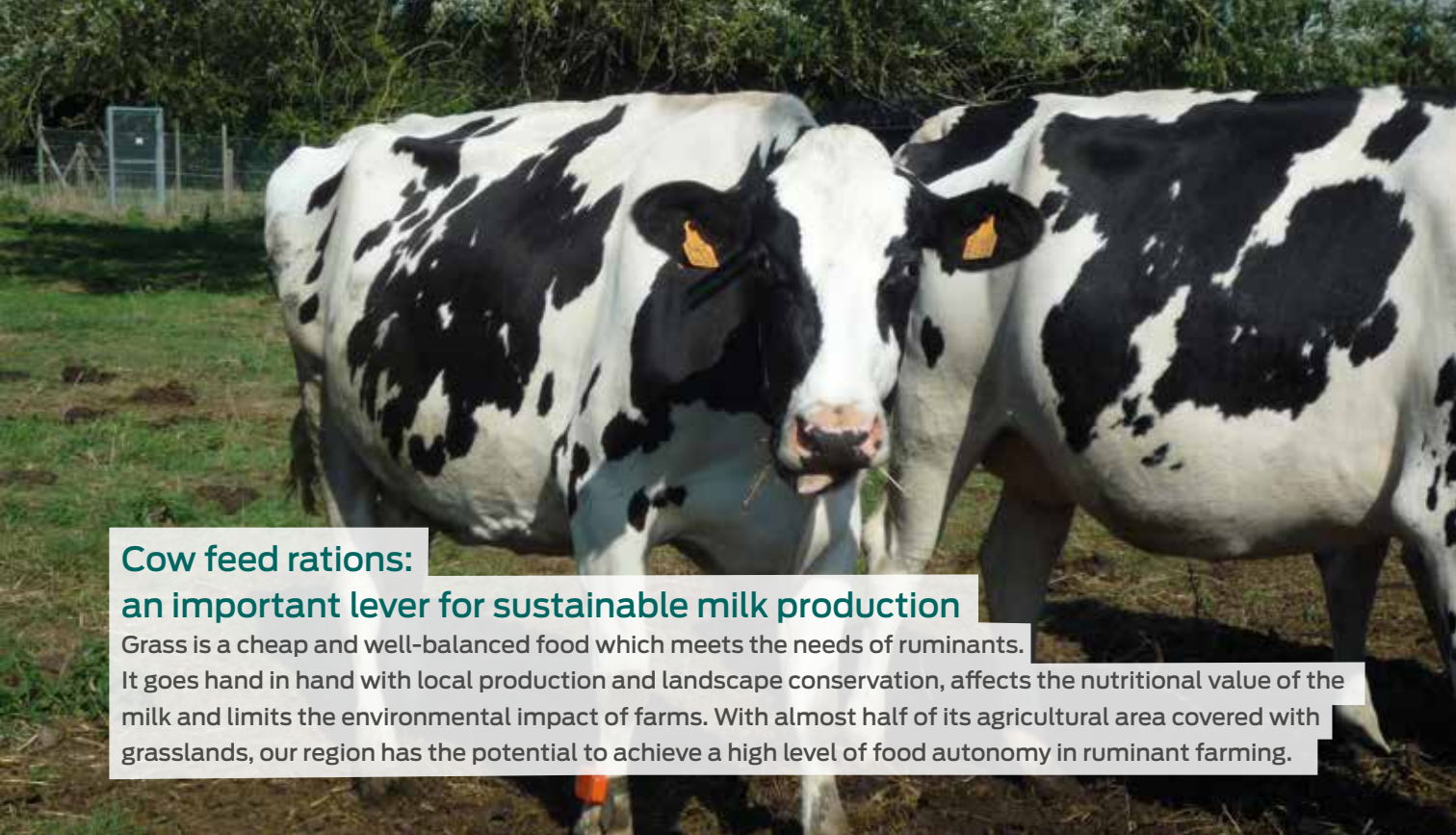
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Research Field

Precision Livestock farming



Cow feed rations: an important lever for sustainable milk production

Grass is a cheap and well-balanced food which meets the needs of ruminants.

It goes hand in hand with local production and landscape conservation, affects the nutritional value of the milk and limits the environmental impact of farms. With almost half of its agricultural area covered with grasslands, our region has the potential to achieve a high level of food autonomy in ruminant farming.

Through regular monitoring of six dairy farms for one year, **the GrassMilk project** (SPW, DGO3, 2012-2018) has shown that the fine composition of milk depends to a great extent on the proportion of grass and/or grass products in the cows' feed rations. Compared to rations with higher production potential, such as those based on maize silage, the levels of vitamin E, equol, polyunsaturated fatty acids and conjugated linoleic acid are significantly better in milk produced from a predominantly grass-based diet, which of course is good news for the consumer. Conversely, the levels of iodine and vitamin B12 in milk do not depend on the amount of grass ingested.

OPTIMISING FEED = ↓ CO₂ EMISSIONS

The project **GrassMilk** also illustrated the potential for progress in feeding dairy cows. Thus, compared to conventional feed rations commonly used in our farms, optimising feed for dairy cows has reduced the CO₂ impact by 25% (0.78 vs 1.02 g CO₂ eq/litre milk), without having a major impact on milk production, while improving the nutritional value of milk for the



consumer (fatty acid profile, equol, vitamin E).

These results are obtained on condition that:

1. accurately meet the animals' protein requirements (better nitrogen efficiency)
2. use fodder rich in legumes (lower inputs of nitrogen fertiliser and imported vegetable protein)
3. provide a starch base (optimising ruminal fermentation)
4. promote local raw materials (avoid the carbon cost of transport)

The environmental benefit mainly comes from reduced methane production (-8%, 18.4 vs 20.1 g/litre of milk), better nitrogen efficiency (+23%, 31.5 vs 25.7%) and the use of native crops.

These results are directly applicable on the farm once the nutritional value of the fodder and the needs of the animals have been correctly determined.

[HTTP://WWW.CRA.WALLONIE.BE/FR/GRASSMILK](http://www.cra.wallonie.be/fr/grassmilk)
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TresoGest, an application for better management of production costs in organic farming

Producers have expressed a need to regain control of their farms' economic performance in order to identify the management tools at their disposal more accurately. TresoGest has therefore been developed through participatory research between scientists and farmers to analyse the economic performance of organic farms.

Evaluation of production costs is an across-the-board concern in the organic farming sector. Monitoring your financial situation and being aware of your production costs are essential to effective farm management. In this context, a study of the economic performance of organic farms was set up with a network of farmers. What made this research distinctive was its participatory approach: farmers took part to the study alongside scientists.

TresoGest, which was developed in 2015, can be used for the day-to-day management of a farm and can also be used to organise exchange workshops on farmers' practices. In participatory research, the methodological approach is as important as the expected results. The method must meet the real needs of farmers.

A practical financial management tool

TresoGest comes in the form of an Excel spreadsheet into which farmers regularly enter their invoices and sales. Inputting these data allows the tool to present the farm's overall financial situation, to perform a monthly analysis of cash flow and to assess the income per department.

Applications

From 2015 to 2017, TresoGest was used for several usual applications for the farmers' organisation Collège des Producteurs (Prix Juste), the UNAB (association of organic pork producers in Wallonia), FINAGRI (AGRICALL), the GASAP network and others.

Outlook: The prospects for getting TresoGest online have now been enhanced by GroupOne's simplified online management tool EcoBox for very small enterprises (VSEs).

The objective of the new AgriCoGest (*) project is to create a decision support tool which will:

- help livestock farmers improve the financial management of their farms and prevent critical situations such as bankruptcies
- help mixed farmers to evaluate the profitability of their activities and set a fair and profitable price

(*) This project supported by the CRA-W is run in partnership with GroupeOne, Diversiferm and the GASAP network with the financial support of the SPW and the BIO2020 program.

[HTTP://WWW.CRA.WALLONIE.BE/FR/TRESOGEST](http://www.cra.wallonie.be/fr/tresogest)

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BL © : CNIEL/C. Helysly

The organisation of work on livestock farms in Wallonia: what's new?

Work pressure is high on livestock farms in Wallonia:
30% of farmers feel that they urgently need to improve the way they organise their work
45% would ideally like to change the way they work.

The problematic aspects of organising work on livestock farms relate to the complexity of regulations and of administrative management and lack of free time. Farmers who diversify by offering accommodation, processing their products or creating an educational farm face the same difficulties. For diversified farmers there is sometimes also competition between the various departments within the farm.

Once the problem of work pressure had been identified, a network of advisers specialising in work organisation was set up. This consisted of six specialists from a number of Walloon agricultural organisations. To acquire the necessary skills, training that alternated between theory and practice was provided by two French institutions (Institut de l'Elevage and Chambre d'Agriculture de Mayenne) in partnership with the CRA-W. At the end of 2017, some twenty Walloon livestock farmers were able to benefit from 'work advice'. Herd sizes unsuited to the size of the workforce, an inefficient daily route around the farm (e.g. poorly located silos), working on several sites or lack of communication between different workers are all factors that can have a negative influence on work organisation.

Tools to help farmers manage their work



© : P. Rondia

- a good practices sheet for administrative management
- a collection of tips and tricks, and a work diagnosis procedure for the work advisers
- a directory of resource persons to direct livestock farmers to the most competent contact organisation for each specific topic

Tools under development:

- working time benchmarks for agricultural diversification and beef cattle farming.


An OTeL project financed by Wallonia

[HTTP://WWW.CRA.WALLONIE.BE/FR/OTEL](http://www.cra.wallonie.be/fr/otel)
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Research Field

Risk management



Research into contaminants of agricultural origin in different components of the environment: Water, Air, Soil

Three projects have considered the concerns of the general public in Wallonia and helped develop CRA-W's expertise in the dissemination of pollutants in the environment.

The **BIODIEN** project helped to set up an initial screening programme to assess the presence of endocrine disruptors in Walloon waters. These compounds are classified on the European list of priority substances for monitoring, which is why this study aimed to be multidisciplinary and involved the participation not just of the CRA-W but of ISSeP (the Public Service Scientific Institute for Environmental Monitoring in Wallonia) and the water company SWDE (together forming GISREAU: the Walloon scientific interest group for water quality).

In the **EXPOPESTEN** project, an inventory was drawn up of contamination of ambient air during a year of sampling in Wallonia. The analytical methods developed, notably by the CRA-W, have helped to reveal the presence of numerous pesticides and to measure their concentrations at different locations in Wallonia. The results show a situation quite similar to that found in other countries in Europe (France, Spain, etc.), both in the city and the countryside.

Finally the **SOLINDIC** project focused on the soil. As a living material, a medium for agriculture and a guarantor of food production, soil is an environment that it is imperative to understand and protect properly.

During this project, analytical methods to monitor the level of residues of plant protection products reaching the soil were developed and validated.

Outlook : This work has led to the setting up of new projects and studies (Sol-Phy-Ly, PropulPPP, etc.) which in turn will contribute to a better understanding of potential contamination by agricultural contaminants in Wallonia and provide decision support tools to assist with the choice of future strategies needed for their management.

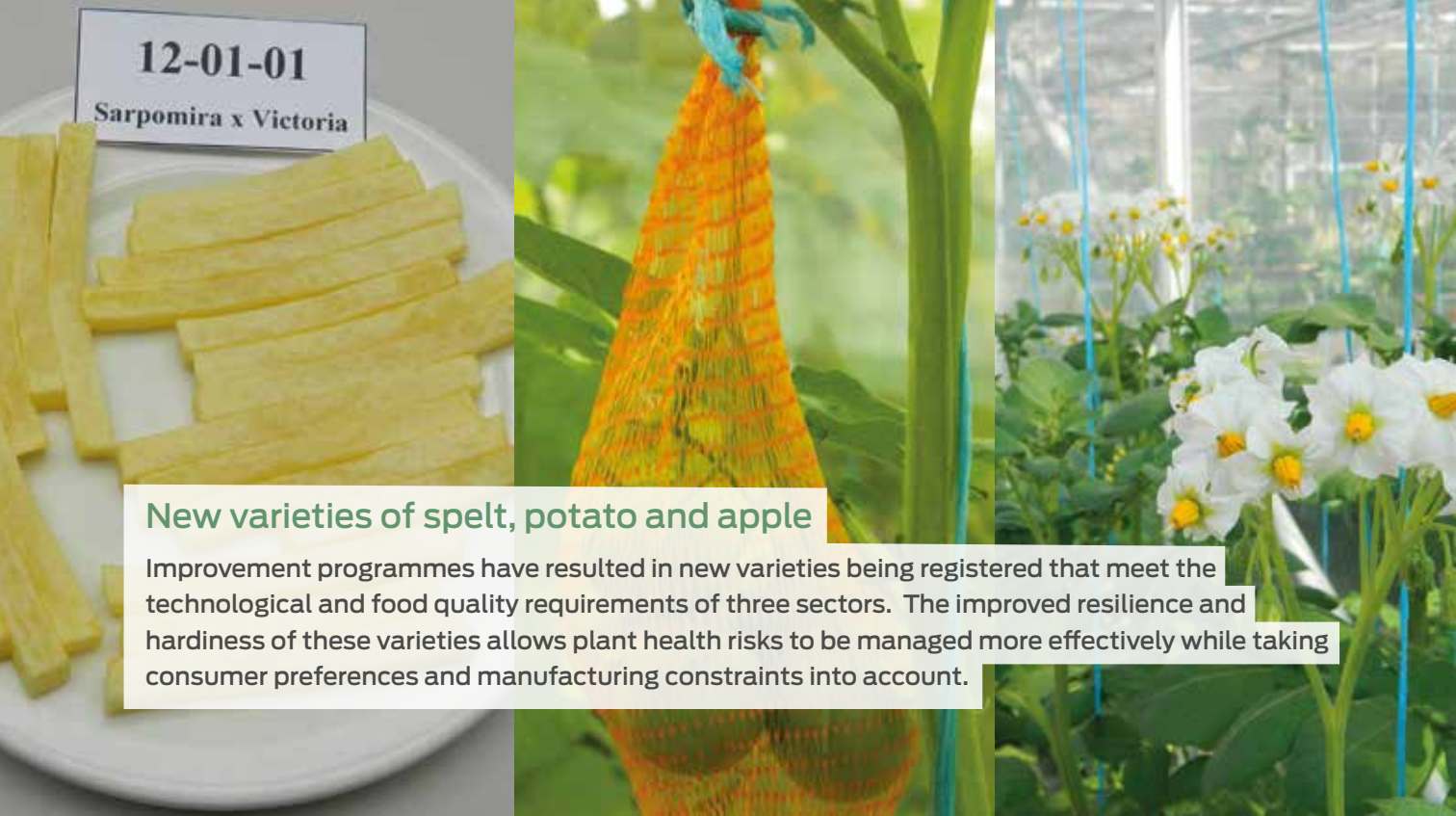


[HTTP://WWW.CRA.WALLONIE.BE/FR/BIODIEN](http://www.cra.wallonie.be/fr/biodien)

[HTTP://WWW.CRA.WALLONIE.BE/FR/EXPOPESTEN](http://www.cra.wallonie.be/fr/expopesten)

[HTTP://WWW.CRA.WALLONIE.BE/FR/SOLINDIC](http://www.cra.wallonie.be/fr/solindic)

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New varieties of spelt, potato and apple

Improvement programmes have resulted in new varieties being registered that meet the technological and food quality requirements of three sectors. The improved resilience and hardiness of these varieties allows plant health risks to be managed more effectively while taking consumer preferences and manufacturing constraints into account.

The CRA-W's work on plant breeding aims to provide farmers and market gardeners in Wallonia with varieties that are adapted to current challenges: (i) diversifying products and production methods, (ii) raising quality standards (iii) optimising input use in both organic and integrated production (hardiness and disease resistance) and (iv) reducing environmental and climate impact.

In 2015 the CRA-W registered the Sérénité variety

of spelt, does not present sensitivity to lodging, is of high quality for baking, and is well adapted agronomically to our region, is rising in popularity in Wallonia and France.

Another success for varietal improvement at the CRA-W has been the Louisa potato variety, which required ten years of classical breeding. Intended for the production of crisps, it is the first variety from the new CRA-W improvement programme launched

in 2005 to be listed in the Belgian variety catalogue. It has good late blight resistance, together with a higher yield than the varieties commonly used for making chips, a regular size, and excellent colour when fried.

Finally, again in the area of varietal improvement, and in the context of its work on using old fruit varieties to

create varieties that are more resistant to pests and diseases and better adapted to organic and integrated professional production, in 2015 the CRA-W filed a second variety of apple for plant variety certification,

On average it is estimated that it takes a good fifteen years of selection and experimentation to produce and register a new variety of genuine merit.

of spelt in the variety catalogue. It was the result of 11 years of selection. The Sérénité variety which has high resistance to foliage diseases, particularly yellow



following the Coxybelle variety submitted in 2013. At present, it is still only identified by a code number. This new variety is the result of a participatory breeding programme with regional producer groups (NOVAFRUITS and GAWI) and responds to a demand for varieties that are not so susceptible to diseases (particularly scab), have excellent storage properties, and offer exceptional flavour. On average it is estimated that it takes a good fifteen years of selection and experimentation to produce and register a new variety of genuine merit.

Outlook for current variety creation

Spelt : A new strain has completed its first-year trials following registration in the national variety catalogue.

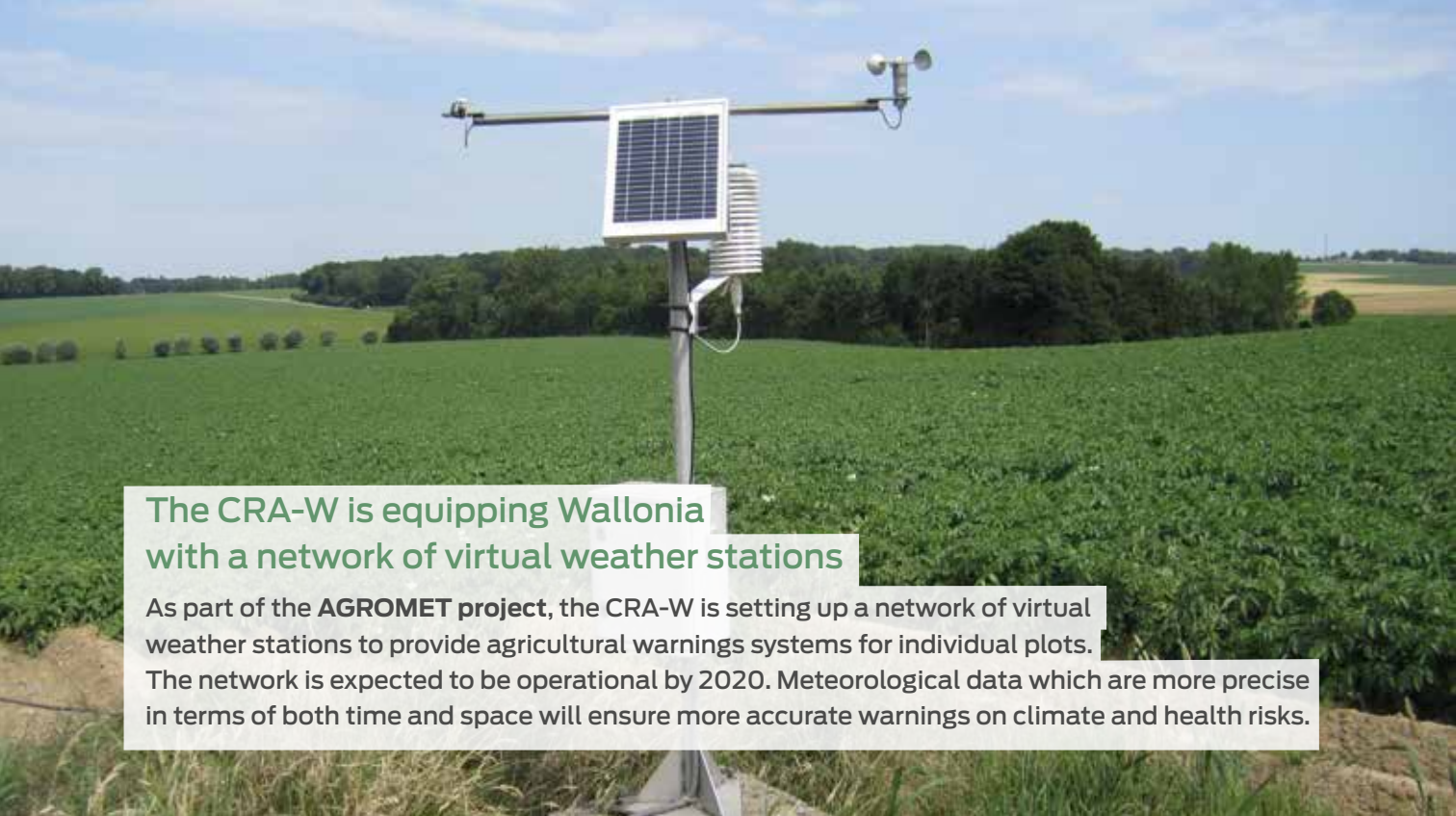
Potato : A second application for registration was submitted in 2017 for a clone resulting from a Sarpo Mira x Apolline cross. The variety is highly blight-resistant. It is an eating apple in the tender flesh category.

Apples and pears : Further new varieties are undergoing advanced trials on experimental plots and in partnership with groups of arboriculturists to better meet the sector's needs.

[HTTP://WWW.CRA.WALLONIE.BE/FR/GEREPHYTI](http://www.cra.wallonie.be/fr/gerephyti)

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Phylogenetic resources	Collection status	Newly registered / classified
Spelt	550 accessions	Sérénité in 2015
Potato	300 accessions	Louisa in 2017
Apple	1,535 accessions	Coxybelle in 2012 and CRA-W/Ma/AQ 84 in 2015



The CRA-W is equipping Wallonia with a network of virtual weather stations

As part of the **AGROMET** project, the CRA-W is setting up a network of virtual weather stations to provide agricultural warnings systems for individual plots.

The network is expected to be operational by 2020. Meteorological data which are more precise in terms of both time and space will ensure more accurate warnings on climate and health risks.

The Pameseb network, which links 23 weather stations in Wallonia, has been supplying meteorological data for many years to provide agricultural warnings (for potato blight and wheat leaf blotch). While these data are sufficient for warnings to be issued on a regional level, they do not allow recommendations to be made for individual plots since they do not take local weather conditions into account.

As partner of the development of integrated pest control in Wallonia, the CRA-W has been working with the Belgian Royal Meteorological Institute on the AGROMET project, with the aim of setting up a network of virtual weather stations that will provide real-time information for epidemiological agriculture monitoring models anywhere in Wallonia.

The AGROMET platform will use an API¹ to supply external decision support tools as well as its own tools. The meteorological parameters available will initially be temperature, humidity, precipitation and foliage wetting. Hourly weather forecasts will also be available, as these are essential for providing warnings.

¹ API: application programming interface

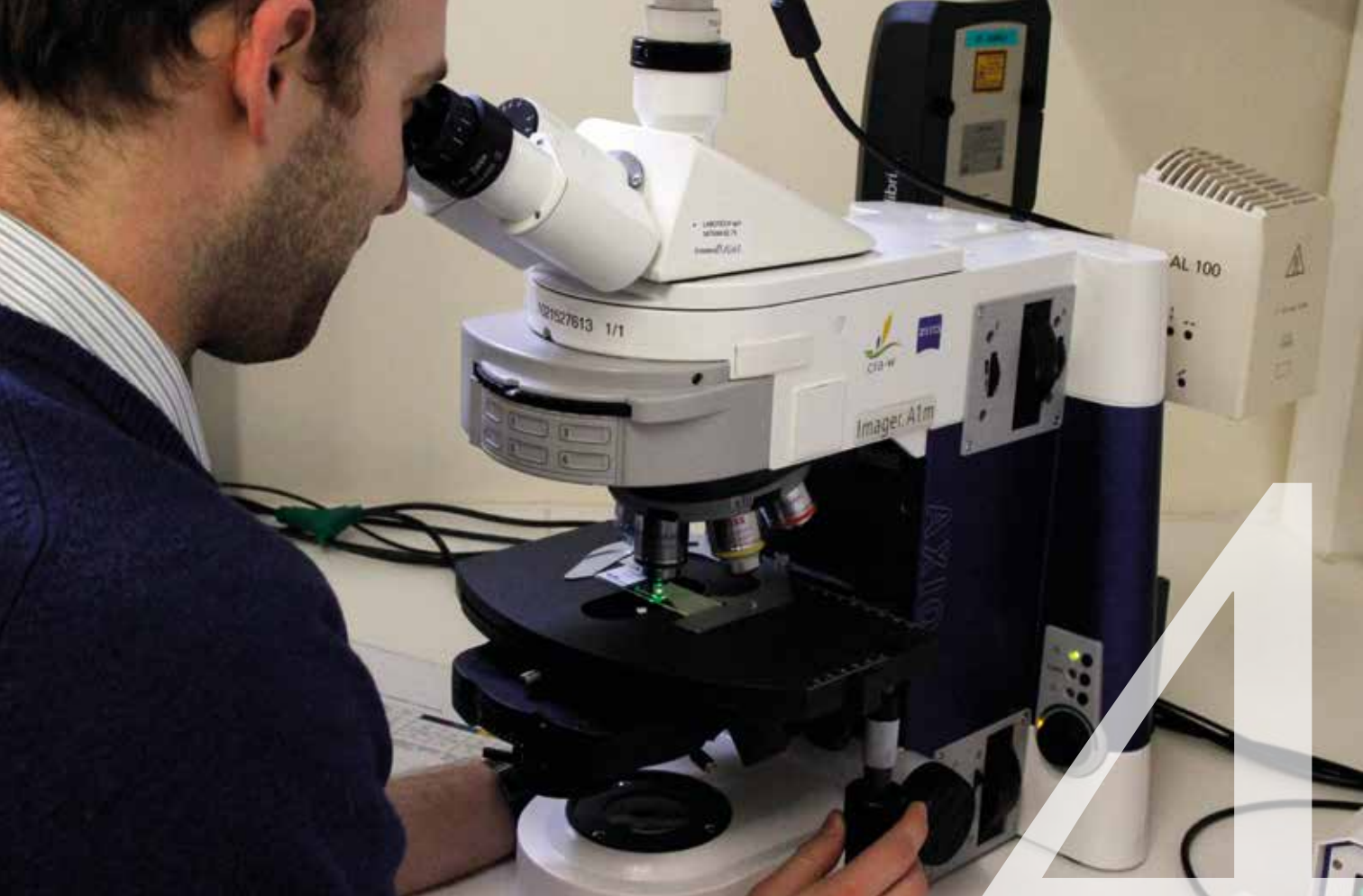
Outlook for 2020

By 2020, we will have a platform ready to provide data for future **warning systems**, **decision support tools**, and many other tools for sustainable agriculture that is good for farmers, consumers and the environment.



[HTTP://WWW.CRA.WALLONIE.BE/FR/AGROMET](http://www.cra.wallonie.be/fr/agromet)

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Research Field

Understanding products



Improving GMO detection

New genetically modified organisms (GMOs) are constantly being developed and the diversity of transgenic organisms in existence is increasing all the time. The challenge of continuing to detect GMOs raises the need for appropriate analytical methods.

Over the last three years, the CRA-W has been working to develop new tests for detecting genetically modified plants in real-time using the PCR method, which enables specific zones of the DNA to be highlighted. As part of the UGM Monitor project, funded by the Federal Public Service for Public Health, Food Chain Security and the Environment, new screening methods aimed at detecting a large number of GMOs (prior to identifying and quantifying them) have been developed. As the field of transgenesis is not limited to plants, tests have also been developed for detecting transgenic fish, and these methods have been disseminated on a Europe-wide level. On a more modest level, the CRA-W has also initiated work on the detection of transgenic bacteria (the FPS project Spencenzym).

New methods of detecting and identifying GMOs have also been investigated using the high-throughput sequencing technique, which can sequence hundreds of thousands of DNA fragments simultaneously (the FPS project UGM Monitor and the Moerman project NGS). We were able to show that bioinformatics analysis of the sequencing results could detect the structural elements (promoters, genes and terminators) frequently introduced in transgenic

constructs, and be used to partly or even totally reconstruct the integrated sequence in the genome of the plant – even one with a low GMO content.

Thanks to the CRA-W's expertise, Wallonia is increasing its ability to detect authorised and unauthorised GMOs in primary and processed agricultural products. In addition, the strategy made possible by high-throughput sequencing is a first step towards a more complete characterisation of agri-food products, as it will be possible to sequence other regions of interest in parallel. This means that the analysis can be extended to identifying plant and animal species that are present, and will no longer be confined to GMO detection.

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Improving food fraud prevention in Europe

One of the main expectations of consumers in Europe is that the food supply will be safe, authentic and produced according to well-defined quality standards. The entire food chain must therefore take on the challenge of detecting any adulteration and revealing any food fraud.

To meet these expectations, the CRA-W has in recent years contributed to two European projects, **Authent-Net** and **FoodIntegrity**, on the subject of food authentication.

The objective of Authent-Net, the first project, is to establish a platform for information exchange between member states. It should provide sectoral actors in each country with information about the organisational structure, legislation in force, research funded and priorities for authentication and detection of food fraud. The CRA-W's contribution has been to compile a Belgian national report in collaboration with the various Belgian institutions on ongoing initiatives and actions in Belgium relating to product authentication (<http://www.authent-net.eu/pdf/nsr-csr/nsr-belgium.pdf>). An open-access FARNHub web portal (<http://farnhub.authent.cra.wallonie.be/>) has been created. Users can gain an overview of the resources relating to food authenticity currently available: publications, projects, databases, funding agencies, fraud cases and regulations.

The second project, FoodIntegrity, focuses on the analytical methods used for product authentication and fraud detection. Connections between the world of research and industry are still patchy: methods presented in the literature are not applied – or even not known of – in industry and routine laboratory work. The CRA-W is helping to construct a database for the detection of fraud in foodstuffs. It includes information on analytical methods and access to the reference data needed for fraud detection. It will soon be freely available on the website of the JRC (the European Commission's internal scientific service). The CRA-W has also contributed to the development of analytical solutions based on Raman (a form of infrared spectrometry) for the authentication of olive oil. We are also involved in the use of near-infrared



imaging to detect the presence of soft wheat in durum wheat in the context of pasta production. Finally, specifications and recommendations for describing the results of a study on the development of an analytical method based on vibrational spectroscopy have also been established.

Outlook for product authentication

The CRA-W's expertise in database management and data fusion and its skill with the authentication of agricultural products enable us to make a valuable contribution to the development of analytical methods on mobile solutions and online sensor systems for monitoring different products. In this way, these advanced techniques will be brought from the laboratory to the economic operators.

[HTTP://WWW.CRA.WALLONIE.BE/FR/AUTHENT-NET;](http://www.cra.wallonie.be/fr/authent-net)

[HTTP://WWW.CRA.WALLONIE.BE/FR/FOODINTEGRITY](http://www.cra.wallonie.be/fr/foodintegrity)

PORTAIL WEB FARNHUB : [HTTP://FARNHUB.AUTHENT.CRA.WALLONIE.BE/](http://farnhub.authent.cra.wallonie.be/)

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Spelt as a model for studying the link between gluten content and coeliac disease

Coeliac disease is an autoimmune disease in which the small intestine becomes inflamed due to an abnormal immune response to gluten proteins. **The GLUTEN project** aims to evaluate spelt's toxicity with the goal of eventually obtaining non-toxic varieties that can be consumed by coeliac patients.

The CRA-W has tackled this issue by focusing mainly on spelt, a cereal that is closely related to wheat and has good breeding potential because of its genetic diversity.

A multidisciplinary approach

A range of methods from molecular biology, immunology and infrared spectroscopy were used for this project. They made it possible to study the immunological reactivity of a large number of spelt and wheat genotypes, evaluate their potential for

The tools developed have proved to be extremely useful for quantifying the toxicity of a large number of spelt genotypes.

industrial processing, and develop molecular markers to measure the toxicity of each genotype.

Application

The development of tools and knowledge to improve our understanding of coeliac disease, and ultimately provide solutions to patients with this condition. For example, it will be possible to select spelt varieties (and ultimately other cereal varieties) that meet these requirements.

The tools developed have proved to be extremely useful for quantifying the toxicity of a large number of spelt genotypes. Great diversity was revealed in the toxic content, immunological reactivity and technological potential of the spelt collection studied. The new tools are directly applicable in spelt breeding, allowing the toxic sequences derived from gluten to be monitored.

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How Life Cycle Assessments provide holistic answers for improving the sustainability of farming systems

In response to the many roles it is called up on to fulfil and the criticisms directed at it, Walloon agriculture is looking for answers that integrate all the components of its systems.

The challenges faced by agriculture

A growing demand for food and non-food products, along with the need to create jobs in rural areas, provide ecosystem services, fight against climate change, reduce water pollution, pesticide use, etc.

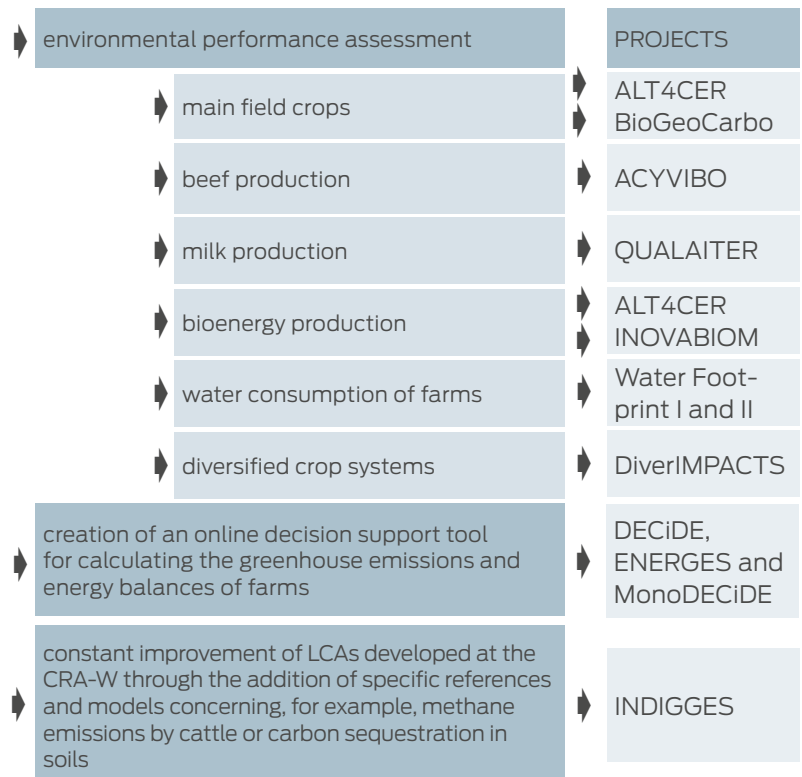
Life Cycle Assessment (LCA) is a holistic and comprehensive methodology for assessing the environmental impacts of agricultural systems, from the production of inputs (fertilisers, pesticides, machinery, fuel, etc.) to the outputs of farms and factories following processing, and the distribution circuit.

By considering the system as a whole, LCAs help to ensure that an opportunity for improvement identified at one stage in the system (e.g. a change in the food ration for a ruminant in order to reduce its methane emissions) is not cancelled out by an increase of impact at another stage (e.g. deforestation caused by the production of alternative foods used in the ration).

[HTTP://WWW.CRA.WALLONIE.BE/FR/AECV](http://www.cra.wallonie.be/fr/aecv) -

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LCA at the CRA-W = local references specific to the Walloon context



The LCAs developed at the CRA-W make it possible to provide specific and general responses to Walloon farmers interested by improving the sustainability of their systems. They enable misguided ideas to be exposed, and responses to be made to preconceived notions about production models and techniques.



Across all fields of research

Organic agriculture

Since 2013, organic agriculture (OA) research at the CRA-W has been supported by the Walloon government by means of the Strategic Plan for the Development of Organic Agriculture in Wallonia by 2020 (PSDAB).

The **Transversal Research Unit in Organic Agriculture** has been created to coordinate OA research activities in Wallonia. Its main mission is to set up and implement an OA research programme based on the sector's needs, taking account of existing work and competencies in the Walloon Region and elsewhere. The CRA-W's researchers are responsible for part of this OA scientific research programme.

The main areas of research in OA are cross-disciplinary and cover both crop and animal production.

Varietal characterisation has always been the subject of research at the CRA-W, whether in field crops, arboriculture or market gardening. The CRA-W has been working on OA since the 90s. It has long been regarded as an authority in the field of organic arboriculture, and also has one of Europe's largest varietal collections of spelt, potatoes and apples.

With the PSDAB, a platform for variety trials for cereals has been set up in varied agro-ecological conditions in Wallonia. Experiments are also being carried out on varieties of different vegetables on our test sites and directly in the fields of some Walloon producers.

In addition, the constraints and issues raised by OA require the development of suitable breeding practices and innovative technical plant production pathways. The CRA-W carries out trials at our own stations and directly documents potentially interesting practices and pathways used on producers' farms.

Soil is much more than a simple growing medium, and in OA plays a central role in the balance of systems. Fertility management is a vast field of study that is being investigated in the context of the BIO2020 programme by monitoring reference situations on various experimental and production sites in Wallonia, assessing specific practices, and comparing practices on a European level thanks to Wallonia's involvement in the ERA-NET Core Organic fund.

In a desire to engage in applied research, the CtrAb aims to answer practical questions raised by the

sector, regarding both specific practices (flower strips, vole control, etc.) and more cross-cutting issues.

Participatory research plays a vital role in the actions of the BIO2020 programme. The distinctive feature of this approach is that farmers take part in the research alongside scientists. This collective and participatory approach has been applied to improve economic performance by creating decision support tools to control production costs.



In July 2018, a new booklet was published on the research activities carried out under the BIO2020 Programme. This booklet divides the research work into

four thematic areas, which reflect the **specialised competencies** developed at the CRA-W concerning the production of **OA references**: (1) varietal and genetic characterisation, (2) technical practices and pathways, (3) fertility management, and (4) optimisation and performance. The state of progress in this research is varied across the different actions, and the information provided is deliberately succinct to give you an overview of all activities. If you are interested, you can download it for free on our website at www.cra.wallonie.be or contact celluleagribio@cra.wallonie.be to receive a paper version.

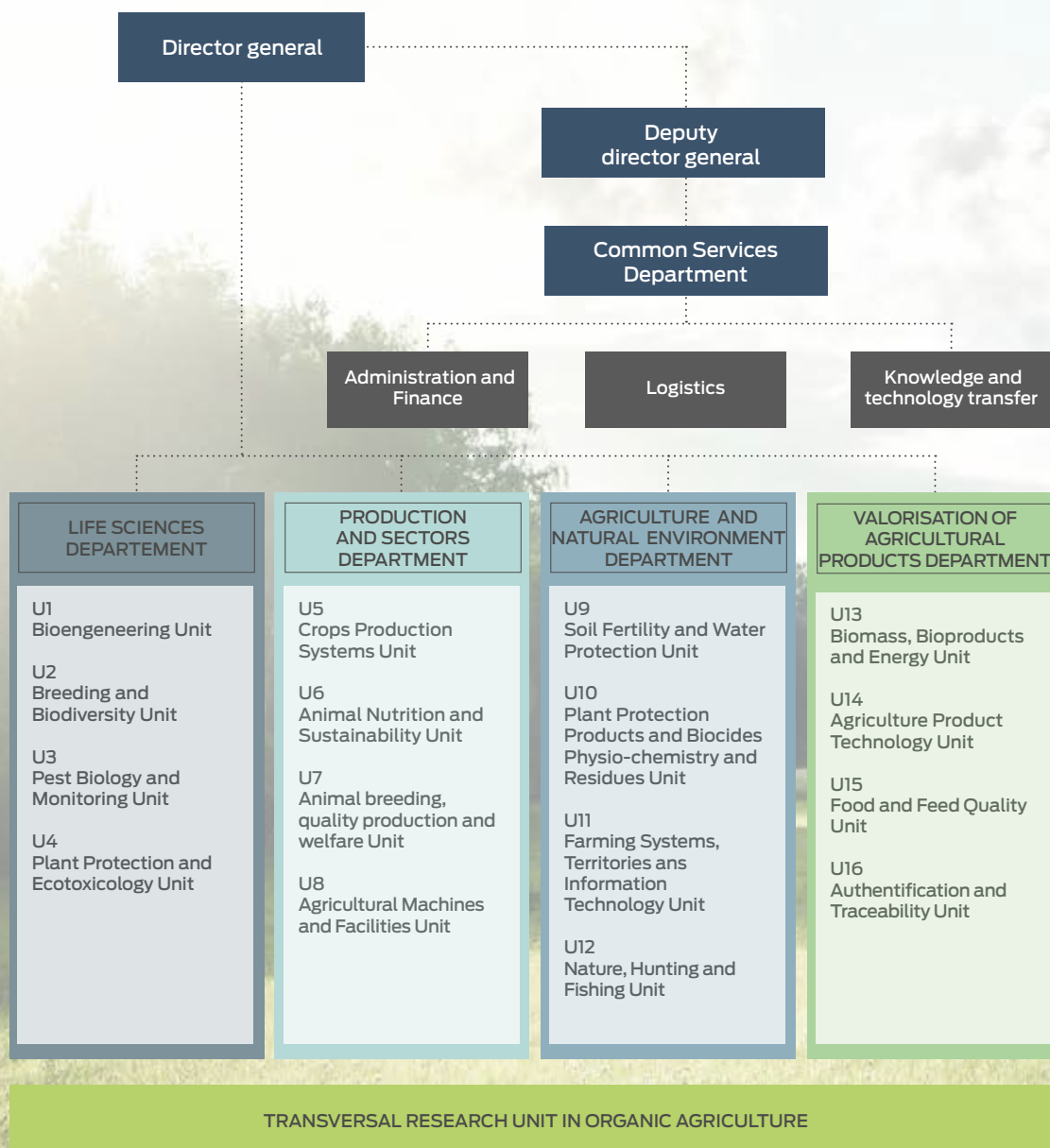
[HTTP://WWW.CRA.WALLONIE.BE/FR/NOUVELLES-DU-BIO](http://www.cra.wallonie.be/fr/nouvelles-du-bio)

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