



THE CRA-W IS HELPING IN THE FIGHT AGAINST COVID-19

IN THESE UNUSUAL TIMES, WE ARE NATURALLY ALL CONCERNED WITH THE FIGHT AGAINST THIS NEW VIRUS. FOR ITS PART, THE WALLOON AGRICULTURAL RESEARCH CENTRE IS TRYING TO PROVIDE WHATEVER HELP IT CAN.

The CRA-W has collected 759 masks for the emergency services

Thanks to a mass collection launched by the CRA-W when lockdown began, no fewer than 759 FFP2 and FFP3 masks were collected. This result exceeded all expectations; it represents a tremendous show of generosity and solidarity towards the emergency services and the shortages they are facing during the Coronavirus pandemic, a global health crisis.

The masks were donated to the staff of the Saint-Pierre clinic in Ottignies. For the record, one mask equates to one working day for an emergency doctor in contact with the virus.

The CRA-W comes also to the aid of the town of Gembloux

In a second stage, the CRA-W also supplied the services working in the town of Gembloux

(CPAS and other municipal services) with safety glasses, coveralls, protective headwear, etc. to protect the front-line staff in the town.

The CRA-W is lending laboratory instruments to detect the virus and thereby test the population

Instruments to help detect COVID-19 were also generously lent to the Federal Agency for Medicines and Health Products (FAMHP).

The instruments provide real-time polymerase chain reaction (PCR) testing. They can be used to detect, identify, and quantify the nucleic acids of any biological organism, including viruses such as Covid-19.

The CRA-W uses these devices in its research and development projects, for the analysis and detection of genetically modified organisms (GMOs) in human food and animal feed. Since the beginning of April, they have been made available for the detection of COVID-19.

Lending these items does not jeopardise the analytical capacity that the CRA-W must maintain as part of its work as an



approved laboratory of the Federal Agency for the Safety of the Food Chain (FASFC) and a European Union Reference Laboratory (EURL-AP).

With these initiatives, CRA-W is whole-heartedly supporting front-line services.



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CRA-W RESEARCHERS PLUNGE INTO THE HEART OF LIVING MATERIAL

AS PART OF ITS RESEARCH ACTIVITIES AND SERVICES, CRA-W HAS BEEN USING MASS SPECTROMETRY FOR SEVERAL YEARS FOR THE ACCURATE IDENTIFICATION AND QUANTIFICATION OF CHEMICAL COMPOUNDS FOUND IN TRACE AMOUNTS IN BIOLOGICAL SAMPLES (PLANTS, FOODSTUFFS, INSECTS,...) OR ENVIRONMENTAL SAMPLES (WATER, SOIL, AIR).

However, the main drawback of conventional techniques is that the molecule under study must be defined in advance. These analytical methods are thus targeted and are specific to what we want to measure. If the compound under investigation is in a different form, for example a metabolite, it then becomes undetectable for the instruments.

The use of high-resolution mass spectrometry, particularly using Q-TOF (Quadrupole Time of Flight) detection, which refers to the time of flight of particles, presents many advantages.

Firstly, this technique makes it possible to determine the mass of the target compound(s) more specifically, which broadens the range of compounds that can be analysed.

Secondly, Q-TOF technology measures most of the constituents present in a sample in a single run, without having to predefine them (non-targeted analysis). Thousands of measurements are obtained, enabling the chemical

nature of the sample to be determined. It is then possible to search this data for metabolite(s) in question. If the compound to be measured is metabolised, it can be checked ex post whether its chemical form has changed. This is called metabolomics. The retrospective nature of the analytical data processing makes it possible: i) to investigate different avenues without having to carry out further costly analysis; ii) to save time, to compare groups of samples in order to identify their similarities and differences.

Identifying resistance markers, identifying compounds responsible for specific biological or organoleptic properties, detecting the presence of undesirable compounds (pollutants or other abiotic compounds), etc., are all possibilities already offered by this advanced analytical technology.

CRA-W researchers face a number of future challenges: to clearly identify all these compounds and understand their exact roles,



and to set up databases to collate all this information and also cross-check the data with that of other scientific disciplines, so as to discover even more about the living matter that surrounds us.



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ENHANCING FODDER RESOURCES IN BENIN

IN THE FOOD SECTOR, THERE IS AN EVER-INCREASING DEMAND FOR THE IMPLEMENTATION OF ANALYTICAL METHODS THAT CAN BE USED IN THE FIELD TO CHECK FOOD QUALITY. DUE TO ITS EXPERTISE IN RAPID ANALYSIS BASED ON NEAR INFRARED SPECTROSCOPY, THE CRA-W TAKES A LEADING ROLE IN THE USE OF PORTABLE SPECTROMETERS FOR ON-SITE ANALYSIS.

Since 2017, the HEPH-Condorcet has collaborated with the Faculty of Agronomic Sciences (FSA) at the University of Abomey Calavi (UAC) in Benin, as part of a research and development project funded by the Research and Higher Education Academy (ARES). The project entitled "Improvements in traditional husbandry systems for small ruminants (sheep and goats) against a background of environmental and societal change in Benin" is part of the fight against poverty, and aims to boost the capacities of farmers in the management of small ruminant husbandry. The project, which is decidedly multidisciplinary and innovative, considers all stages of the production chain, providing recommendations on food, health, herd management and marketing. It will also mean that 10 masters students and 4 doctoral students can be trained, and new skills for assistants are so acquired.

In this way, Mr Paolo Lessé, assistant to Professor Marcel Houinato and doctor of ag-

ricultural sciences, came to do a 4-month internship at CRA-W, in order to improve his analysis of tropical fodder using near infrared spectrometry. The objectives of his internship were mainly to master the use of a VIAVI type field spectrometer and to master the basic tools of chemometrics.

For the purpose of this work, 415 fodder samples arrived directly from Benin and were analysed by VIAVI. The initial calibrations were generated by Dr Lessé. In the absence (at that time) of chemical reference values for these samples, the calibrations were based on NIR predictions from another laboratory spectrometer. The results obtained are of limited use, and the next step will involve analysing part of the samples using reference methods to refine the calibrations.

Once these have been validated, the portable spectrometer will be sent to Benin, where it can then be used to analyse and predict the composition of fodder supplied by local



producers. In view of Dr Lessé's interest and professionalism, there is no doubt that this internship is the start of a long collaboration between our two institutions.



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MEASURING METHANE EMISSIONS FROM CATTLE... QUITE A TECHNIQUE!

THE CRA-W HAS CARRIED OUT AN UNPRECEDENTED TRIAL, IN WHICH TECHNIQUES USED TO ASSESS METHANE EMISSIONS FROM CATTLE WERE COMPARED.



CRA-W is at the forefront in helping agriculture to reduce its environmental impact, in the interest of ecology and, indirectly, of socioeconomics. While cattle have the big advantage of optimising forage areas that cannot be cultivated by humans, they are often criticised for the methane (CH₄) emissions inherent to their digestive physiology. These emissions vary greatly from one animal to another. Several strategies, particularly relating to animal feed, genetic selection or herd management, make it possible to limit them.

However, testing the effectiveness of these strategies relies on the development of tools that can be applied both at the level of the individual animal and that of the herd; thus making it possible to measure individual methane emissions on a routine basis. These tools are either direct measuring instruments, which enable precise measurements, or mathematical models using routinely available data (proxies) which, once validated, will save time and money. The trial, conducted at the end of 2019, is the result of a collaboration between four CRA-W research units, which aimed to compare five methods for assessing the methane emissions of 10 dairy cows over two months, namely:

- a method taken as reference, using SF₆ as a tracer gas,
- Greenfeed®, marketed by C'Lock Inc,
- estimation of CH₄ based on milk fatty acids obtained by gas chromatography,
- estimation of CH₄ based on the medium infrared spectrum of milk,

- finally, estimation of CH₄ based on the near infrared spectra of faeces.

- et enfin, l'estimation du CH₄ à partir des spectres proche infrarouge des matières fécales.

To test the limits of these tools, the animals differed in terms of lactation stage, production capacity and diet.

The results will have implications for several projects, such as IndigGES (Improving the accuracy of life cycle analysis by incorporating the results of proxies, a Moerman project), and SmartCow (Standardisation of collection protocols on a European scale, a H2020 project).

This trial is innovative, in that the CRA-W has one of the only research teams in the world to have mastered all these techniques, which have therefore never been compared on the scale of a single trial.



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COMBINING CROPS TO MEET AGRICULTURAL CHALLENGES IN ORGANIC FARMING

THE SYMBIOSE PROJECT AIMS TO SEEK TECHNICAL INNOVATIONS TO ENHANCE THE CULTIVATION OF LEGUMINOUS PLANTS AND INCREASE THEIR PLACE IN CROP ROTATION, THUS IMPROVING THE NATURAL FERTILITY OF THE SOIL. CRA-W TEAMS HAVE BEEN CONDUCTING CROP COMBINATION TRIALS INCORPORATING LEGUMINOUS PLANTS.



Crop combination consists of cultivating several species mixed together on a plot. Although widespread until the 1950s, cereal/protein-based crop combinations fell into disuse with the development of modern agriculture.

Nowadays, this practice is used in organic farming because it is beneficial to crop rotation management and is also arousing interest among traditional farmers. Although it is more complicated to manage for farmers and downstream sectors, it provides a strategy for improving the resilience of crops, especially in low-input systems.

Firstly, crop combination generally leads to a stable yield over time, thanks to the complementarity between species with respect to growth factors such as light, water, and nutrients.

Secondly, in the special case of the cereal/protein-based crop combination, weed control is achieved using cover species sown with an appropriate density.

Thirdly, such combinations provide resistance to disease and pests, acquired through a physical barrier to airborne diseases, due to the lower density of each species and the choice of resistant varieties.

Fourthly, from an environmental point of view, a cereal/protein-based crop combination can have a direct beneficial effect as an additional nitrogen and pollen source. Finally, by reducing the phytosanitary pressure, it also has an indirectly positive effect on pollinators, for example.

As part of the SymbIOse project, the investigations are specifically targeted at three leguminous plants: protein peas, faba beans,

and lentils. This prioritisation is based on the scale of the challenges faced by the different sectors, a lack of knowledge, and the technical obstacles associated with these species. For research purposes, a "crop succession" trial designed to compare the effect of intensifying rotated leguminous plants on telluric diseases was carried out by planting successions of crops and pure intercrops (single species) or combined crops (several species mixed). Several varietal and seed density trials were set up to determine the impact of these cultivation parameters on flowering, yield or soil contamination on the plot. Finally, trials conducted on micro-plots will make it possible to test the response of innovative crop combinations to challenges specifically related to the synchronicity of ripening for harvesting, maintaining, or improving yields or even the feasibility of sorting.

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2020 ANNUAL MEETING OF THE CORE ORGANIC MIX-ENABLE PROJECT



ON APRIL 1, 2020, THE CORE ORGANIC MIX-ENABLE PROJECT CELEBRATED ITS SECOND ANNIVERSARY. THIS DATE ALSO MARKED THE OPENING OF THE THIRD ANNUAL MEETING, WHICH LASTED 3 DAYS. INITIALLY PLANNED IN NAMUR, IT TOOK THE FORM OF A VIRTUAL CONFERENCE IN RESPONSE TO THE CONSTRAINTS IMPOSED BY THE CORONAVIRUS PANDEMIC.

This annual meeting provided an opportunity for each partner (10 institutions from 7 countries) to present their achievements and take stock of the project's progress. For reminder, the purpose of Mix-Enable is to study organic farms with several breeding workshops. These farms represent a promising alternative to ensure the sustainability of livestock farming. This is because they can facilitate interaction between workshops and create opportunities for synergy. The project aims to determine the relationship between the

sustainability of these farms, their structure (utilised agricultural area (UAA), rotation, sizes and types of herd) and the management practices (work organisation, integration/interaction between the various workshops, choice of sectors...).

To achieve this objective, various operations have been carried out since 2018. A literature review was published in March 2020 in the «Agricultural systems» journal. This provides details of multi-livestock systems on the scale of a farm and identifies the limits and constraints of such systems, the conditions for success, and the putative obstacles. A comparison between mixed and specialised systems shows that mixed systems, especially those that combine ruminants and monogastric animals, tend to have higher, more stable incomes, but create a larger exceed of nitrogen. An investigation carried out between 2018 and 2019, involving 118 farms (including 16 in Wallonia), generated extensive data that will feed into sustainability indicators seeking to determine the relationship

between the type of species combination, the farm structure, the choices of distribution channels and the efficiency of use of the resources mobilised on the farm. Trials were also carried out at the facility, from which the following lessons could be learned:

- (1) in sequential grazing, beef cattle gain neither advantages nor disadvantages from grazing after sheep;
- (2) in co-grazing with bovines, the sheep are all finished on pasture (without bovines, only 10% are finished on pasture);
- (3) by farming cattle and chickens together, losses of chickens due to predation are reduced.

The coming months will be occupied by continued data processing and dissemination of the project results.

Project subsidised by Wallonia and Core Organic.



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ASSESSING THE VALUE OF ALTERNATIVE BEEF PRODUCTION SYSTEMS



AS PART OF THE SUSTAINBEEF PROJECT, VARIOUS SCENARIOS AIMED AT REDUCING THE COMPETITION BETWEEN HUMAN FOOD AND ANIMAL FEED IN BEEF FARMING WERE MODELLED. LET US EXAMINE THIS EXPERIMENT...



Today, one of the challenges faced by agriculture is to feed an increasing number of humans whose eating habits are changing, particularly regarding their consumption of meat. One possible solution to this challenge involves optimising the rations for farm animals (feed) to avoid competition with human food. The focus of this project is beef farming. This is because, although they are often criticised, ruminants have the advantage of being able to consume grass and by-products of the agro-industry.

They may therefore offer a potential solution for sustainable meat production.

In a previous issue of this quarterly publication (CRA-W Info No. 60 - spring 2019), we described the first stage of this project, namely the definition of typical farms and the identification of innovations in collaboration with the actors of the sector. The second stage consists of using the "FarmDyn" modelling tool to compare case studies farms before and after the introduction of these innovations – as regards technical and economic parameters, social and environmental aspects, and the issue of the "feed-food" competition.

In the case of Wallonia, two grass-based fattening scenarios were tested, using dynamic rotational grazing. The first scenario focusses on incorporating this technique into the breeder-fattener system, while the second scenario aims to change the system completely. This is based on the evolution of the Walloon

"intensive breeder" type approach towards a purely fattening system that favours males resulting from terminal cross breeding carried out on a dairy farm.

A meeting of experts, farmers and actors of the value chains was organised to discuss the results of these simulations and identify ways of encouraging implementation of these scenarios.

Further work will be aimed at improving these scenarios on the basis of comments made during this meeting, and comparing the Walloon scenarios with those of the project partners.

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