Wallonie recherche CRA-W

CRA-W info

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Photo: UAV Soil Project

CAN UAV'S HELP TO IMPROVE NITROGEN RECOMMENDATION?

UAV IMAGES CAN BE USED TO INVESTIGATE SOIL ORGANIC CONTENT! THIS IS ONE OF THE UAVSOIL PROJECT OBJECTIVES.

Today, UAV-mounted sensors can provide a very precise image of a plot, with a resolution of a few centimetre. They measure the intensity of reflected light over a range of visible and near-infrared wavelengths, which is very useful to asses soil and vegetation parameters. Using, for example, the model developed in the UAVSoil project, it is possible to create a map of the soil organic content (SOC) after one single flight over a bare ground. This model is currently being validated, and the results are promising.

SOC contributes to nitrogen uptake through the mineralisation process. It is therefore an essential element to be considered when establishing a provisionnal balance sheet at the beginning of the season. Investigating the intra-field variability of SOC thus makes it possible to optimise nitrogen supply , by creating a nitrogen recommendation map that takes the heterogeneity of the SOC into account.

UAV flights have also been carried out at different times of the growing season in order to investigate the vegetation development. Maps produced in this way make it possible to study the relationship between the spatial variability of the crop development and the one of the soil parameters. First results for winter wheat show that this relationship does exist, and that it is stronger at the beginning of the season. Research is underway to determine the extent to which the heterogeneity of organic material can be defined on the basis of vegetation.

UAVSoil is a 2-year project undertaken in collaboration with UCL and funded by the Politique scientifique fédérale belge [Belgian Federal Science Policy] (BELSPO) as part of the STEREO III programme.

For further info, please go to: www.cra.wallonie.be/fr/les-projets/uavsoil

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CRA-W PRESENCE AT THE BATTICE TRADE FAIR UNDER THE THEME OF ZERO WASTE

THE BATTICE AGRICULTURAL FAIR TOOK UP RESIDENCE IN THE MIDDLE OF A GRASSLAND AREA ON SATURDAY 31 AUGUST AND SUNDAY 1 SEPTEMBER.

One of this year's themes was zero waste, an opportunity for the CRA-W to showcase the results of 7 projects detailing how livestock farming can be an ally in reducing waste.

Farming is often singled out as being a net user of food: the amount of food produced by animals is always less than the amount consumed. This is because some of the food is lost through respiration and excretion: in other words, a source of waste. If the foodstuff used in making animal feed can be used directly by humans, this phenomenon leads to a problematic competition between food for humans and feed for animals, which is bound to raise certain ethical issues...

However, as illustrated by an initial estimate of the feed-food competition in dairy farming carried out as part of the AUTOPROT project, this competition is not inevitable: livestock farming can be a net producer of food for humans. On average, dairy farms in grassland areas produce 1.7 times more protein and energy that could be used by humans than they consume. In order to achieve this, several approaches must be optimised. Here are two of them: the use of grass in the diet of ruminants; the upgrading of the co-products of agro-food industries in all types of animal production.

If we consider the first approach, the EFFORT and PROTECOW projects show how better use of grazed and preserved grass helps reduce the intake of concentrates while maintaining farm performance. The potential offered by the use of a portable infrared spectrometer on farms, to improve the prediction of the nutritional value of fodder and its place in the diet, are being explored.

As for the MIXENABLE project, this highlights the value of mixed grazing in the upgrading of grass.

Once the upgrading of fodder has been optimised in relation to the farmer's production objectives, the upgrading of co-products for the production of concentrated feed to be included in the ration also makes it possible to limit competition with human nutrition. What is more, this reduces the environmental impact associated with animal production, as underlined by the MonoDECIDE project. The SUSTAINBEEF project has made it possible to work with farmers and stakeholders in the sector to explore the constraints and strategies involved in the use of co-products. The MIXENABLE project is also concerned with the exploitation of co-products directly available on farms, by developing possible exchanges between different breeding and/or crop facilities within the same farm. Monogastric animals are not excluded, since the COPROPIG project optimises the use of apple pomace in the diet of post-weaning piglets.

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CRA-W EXPERTISE PROMOTED THROUGH THE IAEA

THROUGH VARIOUS EUROPEAN PROJECTS, THE CRA-W HAS FORGED LINKS WITH THE INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA).

he Agency is particularly focussed on helping to achieve development objectives concerned with energy, human health, food production, water management and protecting the environment.

Photo of the spectroscopy and imaging training held from 15 to 19 July 2019 (CRA-W, Belgium).

The CRA-W is helping to implement two collaborative research projects. The first project concerns ruminant nutrition. To be precise, a method based on the use of stable isotopes of specific compounds is being developed, with the aim of quantifying ingestion and food selection in ruminants. The work of the CRA-W involves the chemical analysis and near-infrared spectroscopy of food and faeces obtained from experiments conducted in different countries. The analytical results are essential for improving ruminant nutrition in partner countries participating in the project (Argentina, Australia, Belgium, Brazil, Chile, China, Ethiopia, Madagascar, Uganda, United Kingdom and United States).

The purpose of the second project is to develop analytical methods that can be applied in the field to check the authenticity, safety and quality of food. More specifically, the CRA-W is responsible for the implementation of portable spectrometers for defining and detecting contaminants and uncovering fraud. The project includes the implementation of protocols for the analysis of oils, fats and milk powders. In addition to this, a training course in vibrational spectroscopy and chemometrics was organised in July 2019 for various project partners (Austria, Belgium, China, India, Malaysia, Morocco, Russian Federation, Sri Lanka, Uganda and Sweden).

The skills that the CRA-W are bringing to the development of analytical solutions in vibrational spectroscopy are therefore being promoted as a means of improving the use of agricultural and agri-food productions throughout the world.

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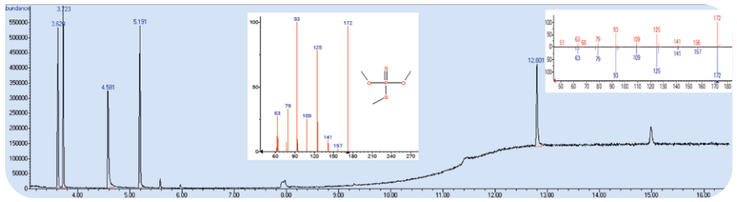
HOW DO YOU FIGHT AGAINST COUNTERFEIT PESTICIDES?

COUNTERFEIT PESTICIDES ARE A MAJOR SCOURGE WORLDWIDE, THREATENING THE HEALTH OF USERS AND CONSUMERS, BIODIVERSITY AND THE ENVIRONMENT.



The European Police Office (Europol) and the Directorate-General for Health and Consumers of the European Commission (DG SANSO) estimate that over 10% of the plant protection products (PPP) used in Europe are counterfeit. The Organisation for Economic Cooperation and Development (OECD) estimates that 5-7% of PPPs are illegal products. The main points of entry into Europe are the ports of Hamburg, Rotterdam and Antwerp. This percentage is even higher in the case of the global PPP market.

Counterfeit PPPs can take various forms: lack of active ingredient or incorrect active ingredient, out-of-specification content of active ingredient, incorrect, missing or prohibited co-formulants, presence of highly toxic impurities, unknown composition... These unauthorised products have not been tested or assessed in accordance with the stringent PPP licensing legislation. As well as creating serious economic problems, they represent a high risk to users, to the consumers of the food on which the products are found, to the plants treated (risk of phytotoxicity), and to biodiversity and the environment.

Liquid or gas chromatography (HPLC, GC) is commonly used to identify and quantify the content of active ingredients and their associated impurities in technical and formulated PPP products. When this is supplemented with standardised methods for the analysis of physical, chemical and technical properties, features of products can be distinguished for the purpose of approval or quality control with respect to specifications. The search for counterfeit products requires the use of screening or profiling techniques that make it possible to identify all constituents of a product or obtain its "fingerprint", and compare this with spectral libraries of compounds or with a reference product.

In the field of counterfeit PPP research, the CRA-W has at its disposal state-of-the-art techniques such as gas chromatography coupled to mass spectrometry (GC-MS, GC-MS/MS), high or ultra-high performance liquid chromatography coupled to mass spectrometry (LC-MS, LC-MS/MS) or coupled to high-resolution mass spectrometry (LC-HRMS), and non-destructive techniques such as Fourier transform infrared spectroscopy (FTIR) and Raman spectroscopy. The CRA-W is developing its skills in this area to provide an effective response to the problem of counterfeit pesticides.

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WHAT ABOUT SOIL FERTILITY IN ORGANIC FARMING?

CONVERSION TO ORGANIC FARMING LEADS TO CHANGES IN FARMING PRACTICES THAT CAN AFFECT THE ORGANIC MATERIAL CONTENT AND BIOLOGICAL FUNCTIONING OF SOILS. THE CRA-W HAS BEEN TRYING TO FIND OUT MORE...

Over the course of 2014 and 2015, the total organic carbon (TOC) content, the overall biological activity and the nitrogen supply potential were determined for soils in approximately 40 organic farming plots. Analysis of the figures suggests that, in about 60% of cases, the organic material content of organic farming plots is higher than the median values for agricultural regions, and that high levels of TOC are more commonly observed in plots with the longest history of organic farming. Grassland and integrated crop-livestock farming plots tend to have better organic status than field crop plots not practising animal husbandry, which may reflect better access to manure or the positive influence of grassland on the organic status of soils.

Other practices known to enhance the organic status of soils, such as lengthening of rotations, crop diversification or increase in restitution (restitution of straw, intermediate crops) are frequently observed among organic farmers.

Generally, the levels of soil carbon and nitrogen (N) mineralisation increase with TOC content, which highlights the importance of soil organic status in maintaining good biological activity and facilitating the natural supply of nitrogen to the soil. Nevertheless, the study found no difference in N supply potential compared with the soils of the CARBIOSOL regional reference system subject to conventional farming. If we consider the effects of previous crops, an N supply of the order of 18% lower was measured for spring cereals compared with winter cereals. On the other hand, the supply of N is increased by approximately 15% after a cereal-legume mixture and approximately 22% after a pure leguminous crop, compared with a pure winter cereal.

As a further study, it would be interesting to assess the performance of organic farming network plots on the basis of other indicators of abundance and (micro-)biological diversity that may correlate with the efficiency of use of nutritive resources and the resilience of the system to certain crop pathogens.

If you would like further information, the complete study can be found on the CRA-W site: www.cra.wallonie.be/fr/dossier-statut-organique-et-mineral-des-sols-en-agriculture-biologique

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CONTROLLING THE POTATO VIRUS Y: AN ABSOLUTE NECESSITY FOR OUR CROPS

OF THE FORTY OR SO VIRUSES THAT CAN AFFECT THE POTATO, VIRUS Y (PVY, POTATO VIRUS Y) IS THE MOST FREQUENTLY OBSERVED IN OUR POTATO PRODUCTIONS.

Potato virus Y is transmitted by winged aphids. When visiting the crops, they carry out so-called «test» probes to find out whether or not the potato is suitable for their diet. Whilst taking a test probe, the aphid absorbs a very small quantity of cell sap, along with viral particles if these are present in the cells probed. Absorbed viral particles can immediately be transmitted to another plant by the same process. These processes of acquisition and transmission of viral particles take place rapidly and repeatedly, making it difficult to control the spread of virus Y in the field. The virus takes advantage of processes occurring within the plant cell to multiply and circulate inside the plant, thus causing dysfunctions that can significantly affect the yield and quality of the tubers. When contaminated tubers are replanted, they will produce plants with weakened potential, which can in turn serve as a source of contamination. Depending on the strain of virus Y, the extent of the infection in the plot, the sensitivity of the plant, or even the climatic conditions in which it is growing, losses in yield can be as high as several dozen percent. Moreover, there is one specific virus Y strain that causes necrosis on the tubers, making marketing impossible.

The CRA-W potato unit has been monitoring this problem for many years, and various investigations into the matter have led to a full understanding of its significance and the development of potential solutions for seed potato producers.

The CRA-W participates in the official programme for the testing and certification of seed potatoes, which includes laboratory analysis of all seed potatoes produced in Belgium, and therefore has a global perspective of the situation. Depending on the year, 30 to 80% of the seed lots tested have the virus Y infection, which is responsible for 95 to 98% of the downgrading or rejection of batches after analysis. It therefore presents a genuine problem in potato growing and, under these conditions, it can be said that it would be virtually impossible to produce potatoes for consumption without this programme of control and certification, which maintains the effects of the virus at an acceptable level.

There is a proven relationship between winged aphid activity during the growing season and plant quality. To help plant producers, we have therefore developed a system for tracking this activity that involves the trapping of aphids in suction traps, of which there are only two functioning in Belgium (at Libramont and Gembloux). The data obtained are sent to the seed growers every day during the season.

Epidemiological studies have clearly shown that the sources of contamination that are inside the production plots are the main source of virus spreading. In practice, this means that seed growers must exercise caution when selecting the seed lots they intend to propagate.

Various crop protection strategies have been studied. These studies show that, paradoxically, insecticides are not very useful in limiting the spread of virus Y in propagation plots, unlike paraffinic mineral oils.

Other products have been trialled unsuccessfully, or found to be less effective: notably vegetable oils and plant macerates. Some agronomic practices have proved valid, such as foliage dessication of the propagation crops as early as possible or ground straw mulching to disorientate the aphids when they are searching for their plant substrate.

The use of appropriate genetic resources in breeding programmes, i.e. those derived from varieties with resistance genes, is an effective solution.

For example, use of the Gasore variety endowed with a virus Y resistance gene (Rysto) in our breeding programme has led to the development of a variety, Louisa, which is totally resistant to the virus.

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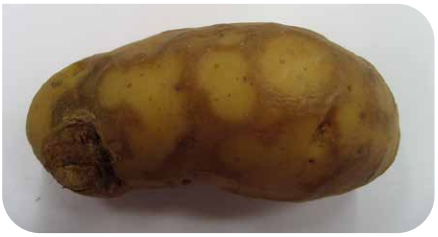

BOOKLET PROMOTION INSERT

NEW BOOKLET

Pig husbandry in organic farming - WELL-BEING

Animal well-being represents one of the cornerstones of organic farming. This priority is upheld by the application of specifications that incorporate it into all practices involving the breeding and handling of animals.

Today, animal welfare goes well beyond the sphere of organic farming. Farmers and consumers have seized upon this and are seeking advice and guarantees as to how it can be included in all stages of the production, transport and slaughter chain. The concept of the animal as a machine has given way to that of the animal as a living creature. This moral evolution can be seen in the light of scientific progress in the knowledge of the physiological basis of pain or awareness in animals.

This publication aims to take stock of the scientific monitoring of animal welfare in organic pig farming. It follows an earlier booklet on pig feeding; both arise from a broader of knowledge base about pig breeding in organic farming.

Order your hard copy of the booklet at celluleagribio@cra.wallonie.be or download it from www.cra.wallonie.be

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