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NEW TECHNOLOGIES SERVING THE IMPROVEMENT OF VARIETY

THE CRA-W AND ILVO ARE APPLYING THEIR EXPERTISE TO INNOVATIONS IN THE ASSESSMENT OF NEW VARIETIES IN EUROPE

Assessing a new plant line involves collecting extensive data before it can be registered as a variety. Some traits are easy to assess; others are more laborious or require advanced skills. This is where new technology could be of great help to assessors.

Among the data collected during the registration process, that which is obtained through DHS and VCU examinations can be distinguished. The purpose of the DHS examination is to ensure that the new line is Distinct from the varieties already registered, that individuals are Homogeneous and that it is Stable from generation to generation. This examination is based on essentially visual features such as the shape, length or colour of the plant organs. The VCU examination assesses the Cultural Value and the Use of the new line. Its purpose is to assess the performance of a line in terms of yield, resistance to various stress factors and technological quality in comparison with the varieties already registered. All these criteria are considered according to observation protocols and well-defined measuring procedures within the framework of examinations by official bodies, these being the CRA-W and ILVO in the case of Belgium.

In order to participate in the development of assessment methods, the CRA-W and ILVO became involved in the European INVITE project on 1 July 2019. The aim of this project is to promote the introduction of new varieties resistant to biotic and abiotic stresses, which are adapted to sustainable management practices and demonstrate efficient use of resources. One of the approaches chosen as part of the project is the development of new phenotyping instruments in both the visible and invisible regions, to provide indicators of adaptation to stress and to improve the speed, precision and efficiency of observation when assessing varieties. Another approach is to work with historical data in order to predict the performance of a variety according to the environmental growing conditions and the farming methods.

As part of this project, the CRA-W teams are working to determine the properties of different varieties of wheat and apple on-site using handheld and imaging instruments, visible and near infrared, for the ground measurements. Evaluation trials on cereal varieties and collections of genetic resources of apples are used to support this research. There is particular focus on investigating the use of hyperspectral sensors to study the susceptibility of winter wheat varieties to fusarium head blight disease and the quality of apples in orchards. On the ILVO side, the use of drone-mounted RGB cameras to study height and biomass in ryegrass and maize is being explored. The most promising phenotyping methods developed by the project partners can subsequently be assessed directly in trial networks. Historical data from 10 years of varietal assessment will also be shared with the project partners in order to calibrate predictive models.

The synergy between the different CRA-W and ILVO teams will undoubtedly make it possible to combine multiple skills and thus bring innovation to existing protocols for the assessment of varieties by examination authorities. This will also make it possible to propose new organisational patterns to improve variety testing networks, taking the socio-economic and environmental impact into consideration.

The INVITE project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 817970 For further informations: www.cra.wallonie.be/fr/invite and www.h2020-invite.eu

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PPILOW: A PARTICIPATORY PROJECT FOR THE IMPROVEMENT OF WELFARE IN PIGS

WALLOON FARMERS, STAKEHOLDERS IN THE SECTOR AND CITIZENS HAVE BEEN CONSULTED IN CONNECTION WITH VARIOUS COURSES OF ACTION AND SOLUTIONS CONCERNING THE WELFARE OF PIGS.

This discussion group on porcine welfare was set up under the auspices of the European project PPILOW. This project brings together 23 organisations from 9 European countries, and aims to offer innovative solutions to improve the welfare of pigs and poultry in organic farming systems and/or farms with outdoor access. Current topics such as the rearing of non-castrated pigs, genetic selection, management of parasitism, alternatives to debeaking in poultry, in ovo sexing and the exploitation of male chicks are discussed. A self-assessment tool, enabling pig and poultry farmers to monitor a wide range of indicators relating to the welfare of their animals, is also under creation. The CRA-W is involved at several levels of the project concerning pigs. Both the assessment tool and the ways of improving welfare proposed throughout the project will be discussed, considered and finally validated by farmers and stakeholders in the sectors.

Other discussion groups have been set up in several other European countries, with the aim of monitoring and assessing the activities of the project. The Walloon group, supervised by the CRA-W, started in February 2020. On this occasion, around ten people gathered for a first meeting to discuss and debate the subject of animal welfare in pig farming. The discussion group is made up of farmers, representatives of the sector, members of public administration in charge of animal welfare, and citizen representatives. The participants discussed their perception of farm animal welfare. The satisfaction of basic needs of animals (hunger, thirst, health, movement, etc.) was naturally mentioned, but also the consideration of their emotions. A link has been made between the welfare of the animals and the well-being of the farmer, in addition to the economic outcome and product quality. The participants were then faced with the challenge of establishing criteria by which to assess the welfare of their farm pigs, which was not easy!

The feedback from the discussion groups served as the basis for the PPILOW project science team in developing an initial version of the pig welfare self-assessment tool. This summer, two farmers from the Walloon group agreed to try out an initial version of the tool.

Their responses were collected, and these will help improve the tool before testing it on a larger scale. The Walloon group will continue to meet approximately twice a year throughout the project.

The PPILOW project is funded by the Horizon 2020 programme of the European Union under grant agreement No. 816172. www.ppilow.eu

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COMBINING RESEARCH AND SUPPORT IN THE DEVELOPMENT OF AGROECOLOGY

USING A NETWORK OF EXPERIMENTAL PLOTS, PARTICIPATORY RESEARCH INVOLVING A GROUP OF FARMERS WAS SET UP DURING THE 2019-2020 SEASON.

The overall aim of the Interreg TRANSAE project is to support farmers in their transition towards agroecology. This translates into a participatory approach whose purpose is to resolve the problems that professionals encounter in the field. For this reason, various groups of farmers already involved in agroecological practices have been set up in the project partner regions (Flanders, Hauts-de-France, Wallonia).

The Wallonia group is made up of 10 to 15 field crop farmers with a variety of profiles and backgrounds (conservation agriculture, organic farming, interaction with livestock, etc.) with whom the CRA-W and the non-profit association Greenotec are associated. Their main objectives are to reduce tillage and the use of plant protection products.

The farmers in the network quickly raised a major issue: the results of scientific studies and associated trials are difficult to apply in their production systems. It was therefore decided to develop a new approach involving a collective personalised experiment, co-designed with each farmer on the basis of rotation (at least 3 years), in order to meet his objectives and adapt to his production conditions.

This approach has been named "Network Plot System Experimentation" or ESR.

In the field, this means identifying 12 plots of 2 hectares (one per farmer), distributed around Wallonia and dedicated to experimentation. On one 1-hectare sub-plot, called a «control», the usual practices, well-mastered by the farmer, are carried out. On the adjacent sub-plot, called the «ABC» (Agriculture Biologique de Conservation), [Organic Conservation Agriculture], a series of innovative techniques associated with a reduction in tillage and the use of crop inputs is implemented. As a rule, the two sub-plots have the same crop.

Several innovations were tested during this first season, for example the use of permanent cover (in conservation agriculture and organic farming), simplified cultivation techniques or direct sowing of winter crops in organic farming, implementation of strip-till (tillage focused on the sowing line) for spring crops, etc.

The ESR approach is an iterative learning process punctuated by individual and group meetings. It enables farmers in the group to gain and share experience, and to accelerate and safeguard the

transition in their crop system. The ambition is to test this ESR approach, both as a support tool for the transition to agroecology and as a tool to enable scientific understanding of the agroecological and socio-technical processes involved.

The TRANSAE project is an Interreg V FWVl project partially subsidised by the CRA-W, the Feder and the SPW-DGO3, within the framework of the C3U08.HB1102 grant agreement. For further information: www.cra.wallonie.be/fr/transae

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WHAT POSSIBILITIES AND RESULTS CAN BE GAINED FROM THE ADJUSTMENT OF TOPKILLING ON POTATOES?

TOPKILLING IS AN OPERATION CARRIED OUT ON CROPS THAT IS INTENDED TO DESTROY THE FOLIAGE ON POTATOES BEFORE HARVEST. IMAGES PROVIDED BY SENSORS MAKE IT POSSIBLE TO LIMIT THE USE OF HERBICIDES FOR THIS OPERATION BY ADJUSTING THE SUPPLY OF PRODUCTS ACCORDING TO THE VEGETATION.

The DEFAPOT project, conducted in partnership with the Walloon potato industry, consists of studying the possibility of supplying an appropriate dose of desiccant at each point of the potato field, depending on the remaining vegetation to be destroyed. It is hoped that by restricting the doses of desiccant used, the environmental impact of the crop will be reduced, along with the cost of crop inputs for the farmer.

The amount of biomass remaining is assessed by means of multispectral cameras. The images are transformed into a vegetation index, making it possible to quantify the remaining vegetation and generate a biomass map that represents the heterogeneity of the field. The project has enabled us to compare several means of transport for these cameras (drone, satellite, on board a tractor or sprayer). A comparison of the various data obtained highlighted that there was no preferred vehicle, but each had its advantages and disadvantages depending on the location of the plots, the weather, the cost, the time required for implementation and the desired precision.

The required dose of desiccant could be predicted on the basis of vegetation indices according to algorithms developed by the University of Wageningen. This makes it possible, on the one hand, to objectify the actual dose of desiccant required according to the vegetation index and, on the other hand, to produce a recommendation chart based on the heterogeneity of the plots.

As part of the project, several trials were carried out on farmland in 2018 and 2019, using a CRA-W sprayer fitted with dose-adjustment technology along its entire width. Tracing equipment was developed and installed on the sprayer. This provided a means of recovering and geolocating all spraying parameters (spraying instruction, actual dose applied, pressure, speed, etc.).

The results have demonstrated the benefits of these new technologies, with observed reductions ranging from 8% to 61%, depending on the trials. There was no impact on the yields, quality or ease of uprooting. However, in spite of a sometimes significant decrease, the cost of these technologies is not compensated by a reduction in the cost of the crop inputs. It is therefore difficult for farmers to adopt this kind of technology at this time, Meanwhile the CRA-W is now monitoring one farmer per year in this step. In 2020, no fewer than 60 hectares were adjusted using this process.

The DEFAPOT project is funded by the CRA-W and the SPW-DGO3.

For further information:
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RESEARCH IN ORGANIC AGRICULTURE AT THE CRA-W

DISCOVER THE NEW EXPANDED EDITION OF OUR COLLECTION ON RESEARCH CARRIED OUT IN ORGANIC FARMING AT THE CRA-W

In 2018, we published our first collection of research carried out on the BIO2020 programme. This year, the new edition of this collection has been extended to other CRA-W research associated with organic farming.

CRA-W began conducting its research in organic farming in the 1990s.

In 2013, following the proposal of the Walloon Minister of Agriculture, the Government adopted an initial agricultural plan for Wallonia, the "Strategic Plan for the Development of Organic Farming in Wallonia by 2020». Several participants are responsible for implementing this plan through various courses of action. The CRA-W is responsible for the Research axis.

In 2015, the Cellule transversale de Recherches en Agriculture biologique [Transversal Unit for Research in Organic Farming] (CtRAb) was set up to coordinate research activities, including through the development of a comprehensive organic farming research plan. These research activities, carried out as part of the BIO2020 programme, cover the various sectors of organic farming for both animal and plant production.

In addition to the BIO2020 programme, other projects are being carried out in organic farming at the CRA-W. Every year, the CRA-W conducts around 120 research projects and offers more than 60 types of services. 20% of these projects are focused on specific issues in organic farming and interestingly, 50% are focused on subjects that could benefit both traditional and organic farming.

This collection offers a compilation of this research work, covering six themes (two more than the previous one), reflecting the specific skills developed at CRA-W in the production of organic farming references.

The progress of this research varies according to the steps taken, and the information provided is intentionally brief to enable you to gain an overview of the activities. This publication is intended to arouse (the desire to dig deeper)? in the discovery of our research work on themes that interest you. For this purpose, the reference persons are mentioned within each file. This collection is intended for all those who may be interested in research activities and sensitive to organic farming in Wallonia, Belgium and the European community.

If you would like a hard copy of this booklet, please send a request: celluleagribio@cra.wallonie.be

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ANALYSING FODDERS BY BRIGGING THE LABORATORY TO THE FARM

IN RECENT YEARS, INSTEAD OF MOVING SAMPLES TO THE LABORATORY, THERE IS A TENDENCY TO TAKE MEASURING DEVICES DIRECTLY TO THE PRODUCTION SITE.

Traditionally, a sample of fodder is taken to the laboratory. Once it is dried out and ground up, it is measured using near infrared spectrometers in order to predict some variables relating to the quality. Due to the miniaturisation of analytical instruments in the past few years, moving from the laboratory to the farm is increasingly within the reach of farmers and consultants. The importance of this approach is that it drastically reduces the time of analysis (by saving the time taken to dry out and grind up the samples), thus enabling farmers to adapt breeding rations more effectively by carrying out the analysis on a more regular basis and take into account the variability of fodder quality in space and time. As part of the EFFORT project, the performance of four portable devices was compared: the FieldSpec 4 (ASD), the Micronir 1700 (Viavi), the Flame-NIR (OceanOptics) and the AuroraNIR (GrainIT).

The approach involves establishing models for all types of fresh fodder (hay grass, corn silage, grass silage and haylage) and for all variables needing to be estimated (dry matter, ash, protein, fibre, starch, sugars and digestibility). To achieve this, samples were collected and analysed on site using four portable spectrometers on approximately fifty farms throughout Wallonia between 2018 and 2020. Firstly, a spectral database was created for the various products, and reference values were obtained for each variable. On the basis of these data, calibration models were then developed for each portable device.

Encouraging results were obtained in relation to the determination of dry matter. With regard to the other variables, the precision errors of the models are still quite high compared with the reference methods. Two major difficulties were encountered: a very high degree of heterogeneity and a high level of humidity for this type of product. A protocol was introduced to address this heterogeneity, whereby the measurement that was most representative of the sample was taken. The effect of the high humidity was to cause a fairly high prediction error for all variables other than the dry matter; since water strongly absorbs near infrared radiation, it masks the other chemical constituents of the fodder.

In the current state of research, these portable devices enable dairy farmers to obtain a relatively precise quantitative prediction of the dry matter and qualitative information (good, satisfactory, poor) about the other variables of the fodder analysed, making it possible to adapt the diet of their animals.

The EFFORT project is funded by the Moerman Act.

For further information: www.cra.wallonie.be/fr/effort

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INNOVATIVE PRODUCTION SYSTEMS AND THE IMPACT ON GROUNDWATER

THE DEVELOPMENT OF INNOVATIVE PRODUCTION SYSTEMS AND A BETTER UNDERSTANDING OF THE FATE OF PESTICIDES IN THE ENVIRONMENT WOULD ENABLE US TO REDUCE THE IMPACT OF AGRICULTURAL PRACTICES ON WATER QUALITY.

The Agriculture Is Life For Water Quality (AIL4WaterQuality) project is based on two observations: on the one hand, adjusting conventional production systems has a limited reduction in the effect on water quality, so it is now essential to develop innovative production systems and, on the other hand, the knowledge of pesticides behaviour within a soil profile is extremely limited.

The trials set up on the Agriculture Is Life platform (ULiège Agro-Bio-Tech) are innovative agricultural production systems that meet the demands of society while also preserving natural resources. The three systems tested are geared towards agriculture without pesticides, based on long, 8-year rotations. The first system is typically based on Animal-Plant flows via «above-ground» interactions involving conventional crops, chemical fertilisers and animal-derived organic matter. The second system, Animal-Plant flows within agroecological interactions, entails periods of grazing and limited use of chemical fertilisers. The third system is a vegan approach that makes use of organic material from non-animal sources.

The project has four main objectives:

- Instrumentation of the three production systems for hydrological monitoring. Water content and potential probes have been set up in the first three horizons for this purpose. Soil solution sampling plates have been installed below the root zone in order to analyse pesticides and nitrates percolating in the soil.
- The creation of a database for the three production systems: the data will be accessible and downloadable to any interested user.
- The quantification of the impact of agricultural transition on water quality and the modelling of water and molecule flows in the root zone and groundwater.
- The enrichment of knowledge on the mobility of pesticides in soils by monitoring the transfer of pesticides on soil columns.

The practical exploitation of the results, along with their promotion and dissemination within the agricultural sector, is an important aspect of the project aimed at helping those who work in the agricultural sector to adopt more environmentally friendly practices.

The AIL4WaterQuality project is subsidised by the SPGE and backed by the TERRA (Gembloux Agro-Bio-Tech) research and training centre.

For further information: www.cra.wallonie.be/fr/ail4waterquality

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