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OUR GRASSLANDS – AN ASSET FOR THE BIODIVERSITY OF AGROECOSYSTEMS

THE CRA-W HIGHLIGHTS THE IMPORTANCE OF GRASSLAND MANAGEMENTTO INCREASE FLORAL DIVERSITY, AND HENCE ECOSYSTEM SERVICES. IN SUSTAINABLE AND MULTIFUNCTIONAL AGRICULTURE, IT IS ESSENTIAL TO RECONCILE PROVISIONINGAND REGULATING SERVICES.

In our livestock systems, which occupy almost 50% of agricultural land in Wallonia, the challenge is to combine grass production with regulatingfunctions potentially providedby grasslands, such as carbon storage, water filtration, soil erosion regulation or pollination. Recent studies indicate a link between the grassland ecosystem functioning and the provision of a set of services which are essential to our societies and their development. The range of functions that an agroecosystem can support is closely linked to the biodiversity it contains. Thus, a species-rich environment ensures a greater diversity of functions (as each species can play a complementary role) but is also potentially more stable face to disturbances (since any role no longer performed by a missing species can be quickly filled by another species). We therefore felt it important to throw some light on the links between management and plant diversity in grasslands.

During BIOECOSYS project, the monitoring of flora in 49 grasslands across Ardenne, Famenne and Pays de Herve regionsconfirmed the existence of a link between floral diversity and management intensity: extensive grasslandswere found to have up to more than 30 species, compared with less than a dozen in the more intensively managed ones. It should be emphasised that floral diversity increases rapidly with a reduction ofmanagement intensity, whether by delaying the first mowing until after 15 June or by replacing mineral fertilisers with organic fertilisers. For instance, in Ardenne region, intensively managed grasslands under conventional regimes show lower levels of species-richness than intensive organic management (on average 9 vs 15 species observed in temporary fields and 11 vs 15 species observed in permanent fields). In organic farming, floral diversity is higher, with the presence of species such as *Anthoxanthum odoratum, Cynosurus cristatus* or *Achillea millefolium,* and more abundant in legumes, with, for example, 15 to 25% white clover coverage versus 5% in conventional intensive grasslands.

Moderate grassland management, with organic nutrient inputs, therefore seems to be a positive factor in strengthening regulating services while maintaining a satisfactory fodder provisioning service (of the order of 800 VEM on average for the first cut). This type of management allows greater floral diversity, including legumes which contribute positively to (1) the digestibility and nutritional value of forage, (2) the fertility of soil by stimulating the fixation of atmospheric nitrogen by root nodules, (3) carbon sequestration and (4) the provision of food resources for pollinators.

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Wallonie

EVALUATION OF THE SUSTAINABILITY OF WALLOON CEREAL RESOURCES USE

WALLOON CEREALS ARE CURRENTLY USED MAINLY FOR ANIMAL FEED (45%). FOR EXAMPLE, DUE TO SMALL FIELD SIZES, CLIMATE CONDITIONS AND INSUFFICIENT FINANCIAL REWARDS FOR MEETING FOOD QUALITY STANDARDS, VIRTUALLY ALL WALLOON WHEAT IS USED FOR FODDER PURPOSES.

Wallonia produces less than 10% of its cereal needs for human consumption; the remainder is covered by imports. If the current model continues, Wallonia will no longer produce any cereals for human consumption by 2030.

The four-year ALT-4-CER project began at CRA-W in March 2011. It consisted of several different parts, aiming to (i) survey current uses of Walloon cereals and describe original scenarios showing possible developments in those uses and (ii) use life-cycle analysis (LCA) to evaluate the environmental and socio-economic impacts of the production and processing of Walloon cereals on the basis of the production chains identified in the first part of the project.

Of the cereals grown in Wallonia, wheat alone accounts for more than a third of the cultivated area. The trend over the last 15 years has been for the area of land sown with wheat to continue growing to the detriment of other cereals such as six-row barley or spelt, indicating the occurrence of specialisation among Walloon cereal producers.

More than a quarter (27%) of Walloon wheat is processed by the bioethanol industry. The latter also produces distillers' grains and gluten for animal feed, which in part compensates for the use of this feed wheat for energy rather than nutrition. However, our study shows that it would be more appropriate for bioenergy production to favour the use of inputs that cannot be used directly in animal feed.

The environmental impacts of Walloon cereal production are lower than the European average. This is partly due to the very high yields obtained in Wallonia, indicating a high level of expertise in these crops. It has also been observed that the crops with the least impact per kg of product are also those with the least impact per hectare grown and per euro of gross margin. These crops are therefore the most eco-efficient, offering production at a competitive price while minimising environmental impact. In the case of Walloon cereals, this applies to – unsurprisingly – wheat, but also spelt.

The results of the socio-economic analysis showed that farmers with no specific agricultural training can generate as much added value as more highly qualified farmers.

In Wallonia, among the primary cereal processing sectors, the animal feed sector accounts for the largest number of jobs per 1,000 tonnes of cereal input, but its employees have the longest work commute distance.
The commodities trading sector trains its employees more extensively but also involves more part-time work.

The ALT-4-CER project has enabled the CRA-W to establish itself as Wallonia's centre of expertise for environmental and socio-economic LCAs of agricultural products. Links have been formed with the other LCA projects conducted at the CRA-W (BioGeoCarbo, QUALAITER, INOVABIOM, DECiDE, Empreinte Eau) in order to consolidate the experience gained. Activities planned for the future (via a Moerman post-doctorate) include extending LCA expertise to the other main Walloon crops, taking account of the impact in terms of crop rotation and drawing comparisons between different production systems (such as ecologically intensive and organic agriculture), in order to guide the actors (producers and decision-makers) in their choices towards more sustainable agricultural products.

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Funding: CRA-W Moerman Fund

AND THE WINNER IS... PIERRE DARDENNE

OVER THE PAST FORTY YEARS, THE WORLD OF ANALYSIS HAS UNDERGONE MANY CHANGES.

Vibrational spectroscopy techniques (including infrared spectroscopy) involving the use of photons to probe organic matter have grown in popularity year after year. These tools provide the agricultural and food sectors with first-class analytical solutions that can determine the major constituents of agri-food products in a matter of minutes.

In his forty years at CRA-W, Dr Pierre Dardenne has accompanied – and contributed significantly to – the development of infrared spectroscopy and chemometrics. His contributions in the field of developing spectroscopic methods include establishing spectrometer networks (such as the Walloon Requasud network which has been in operation for nearly three decades), measurements carried out in the field, forage analysis, the use of faecal analysis to determine digestibility, rapid soil analysis, the use of NIR to detect contaminants in animal feed, the use of NIR imaging to analyse agri-food products and the use of medium infrared spectroscopy to determine the composition of milk. In chemometrics (i.e. the application of statistical and mathematical tools to chemical data), Pierre Dardenne has developed widely recognised expertise in the rigorous validation of spectroscopic methods, variable selection (NAPLS), the development of data mining algorithms (Windows PCA), the construction of robust predictive models based on innovative approaches (LS-SVM) and the development of so-called local methods (LCCRS, LCPS). All these developments have of course been made possible by Pierre's talent for inspiring those who work with him and for establishing fruitful collaborations. He has formed partnerships with numerous Belgian and foreign universities, internationally recognised research centres, infrared-spectroscopy-based solution providers, and international companies. He has also been very active in European projects (STRATFEED, QUEST, STAFANIR, MEDEO, TYPIC, TRACE) and in the International Council of Near Infrared Spectroscopy (ICNIRS). In all these initiatives and in his daily work, Pierre has been a very active member who has known how to combine the sense of pride in producing quality work with the stimulation of scientific curiosity among young researchers. He has always attached importance to working in a friendly atmosphere, and has succeeded in turning professional relationships into friendships.

The research teams of the CRA-W and the Management Committee would like to wish Pierre a long and happy retirement. We are all convinced that his significant contributions to infrared spectroscopy and chemometrics will remain influential. In any case, the work continues at the CRA-W, which will take advantage of his scientific and international legacy to meet challenges in the development of analytical tools based on vibrational spectroscopy and chemometric methods for the benefit of the scientific community and of the agri-food sector. His energy and enthusiasm will be missed by those who have been fortunate enough to share their scientific journey with him. Retirement represents a new challenge which we are sure he will take on with characteristic vigour.

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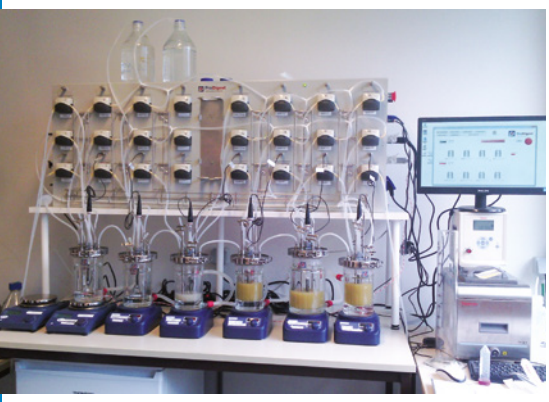
COLLABORATION ON THE DIGESTIVE HEALTH OF NEWLY WEANED PIGLETS

WITHIN THE FRAMEWORK OF THE COPROPIG PROJECT, THE CRA-W AND THE FACULTY OF VETERINARY MEDICINE OF THE UNIVERSITY OF LIÈGE (FMV – FARAH) ARE WORKING TOGETHER TO DEVELOP AN INNOVATIVE ARTIFICIAL DIGESTION MODEL THAT SIMULATES THE DYNAMIC PROCESSES OF DIGESTION IN THE PIGLET AT WEANING.

This model adapts FARAH's SHIME® (Simulator of Human Intestinal Microbial Ecosystem) equipment - located at Pr. V. Delcenserie's laboratory - to create a baby-SPIME (P for 'porcine') version. The applications of this model are numerous.



The SHIME, a piece of equipment made available to CRA-W by the FMV for a joint research project

In particular, they enable the effect of raw materials or food additives on the digestive health of the piglet to be studied by preferentially targeting its microbiota (all the bacteria present in the intestines).

The results so far have been encouraging. The two main bacterial groups present in piglets' digestive tract (Firmicutes and Bacteroidetes) can be found in the baby-SPIME reactors. However, certain types of bacteria, in particular those colonising the intestinal wall, are no longer detected after the inoculation of the reactor. To overcome this problem, the model used will be improved by the addition of mucin beads into the reactors. Thus, the in vitro model developed will make it possible to take into consideration both the bacteria colonising the intestinal lumen and those colonising the surface of the intestinal mucosa.

With these advances, CRA-W and its partners will be able to test the suitability of several raw materials, such as apple pomace (http://www.cra.wallonie.be/fr/les-projets/copropig), on the intestinal health of the piglet at weaning while limiting the number of experimental animals. This research is receiving scientific support from Gbx ABT.

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Funding: CRA-W Moerman Fund

PESTICIDES: MORE TECHNICAL INSPECTIONS EQUALS LOWER RISK?

TIME, WEAR AND TEAR, LACK OF MAINTENANCE... IT'S SO EASY FOR SOMETHING TO GO WRONG! AND WHEN IT COMES TO PESTICIDE APPLICATION EQUIPMENT (PAE), LEAKAGE OR IMPROPER DOSING POSES A THREAT TO HUMAN HEALTH AND TO THE ENVIRONMENT. SOON, THESE RISKS WILL BE EVALUATED FOR ALL EQUIPMENT. OPTIMISED PREVENTIVE MEASURES SUCH AS NEW TECHNICAL INSPECTIONS MAY THEN BE MADE MANDATORY IN BELGIUM.

Just like cars, a sprayer or any other PAE item must undergo technical inspections to detect any defects or malfunctions. In the absence of inspections, a car may break down or cause an accident. When it comes to PAE, the risk concerns operators' safety, their health and that of consumers and the environment, as pesticides application doses could be affected by any problem.

Risk depends on two main factors: the hazard impact severity for an exposed subject and the likelihood of occurrence of the impact. In this case, it is calculated on the basis of PAE technical defects, their probabilities of occurrence, and the severity of their impacts on human health and the environment. In order to assess this risk on a national scale, a study of the level of use of each PAE item is included in the risk study.

Decisions concerning the technical inspection of a piece of equipment must be based on a sound risk assessment (RA). For this reason, an RA protocol that applies to all PAE has been developed by a Walloon (CRA-W) and Flemish (ILVO) partnership in a federal dual project named SIRA-APESTICON. For each type of PAE, the risks are assessed – both before and after the technical inspection. An observed reduction in risk between the 'before' and 'after' situations could justify making such a technical inspection compulsory.

To our knowledge, the RA protocol developed in this project is the most comprehensive existing method in the context of technical inspection for PAE. It targets all types of PAE used in Belgium: a total of 23 types are listed. Of these, four are currently inspected: field crop sprayers, arboriculture sprayers, greenhouse sprayers and disinfection equipment. Some types may ultimately be exempted from mandatory inspection on the completion of the RA. For the others, new inspection protocols will be developed that reflect the predicted risks. In particular,

thanks to this project, Belgium will be among the first countries to comply with EU Directive 2009/128/EC on sustainable use of pesticides.

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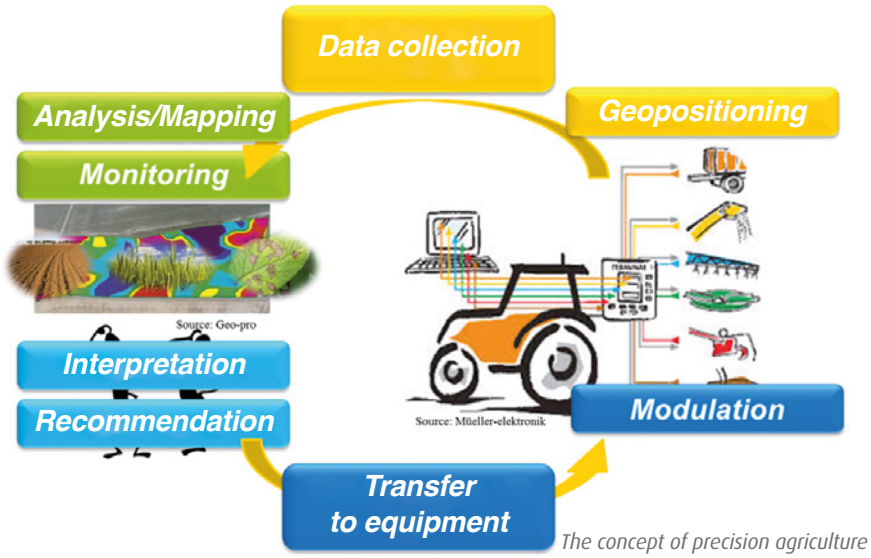
VISA: PASSPORT FOR PRECISION IN AGRICULTURE

A WIDE RANGE OF INNOVATIVE AND PROMISING APPLICATIONS OF PRECISION AGRICULTURE (PA) IS AVAILABLE TO FARMERS. HOWEVER, MANY OF THESE TECHNIQUES HAVE NOT BEEN VALIDATED REGIONALLY AND IT CAN BE DIFFICULT FOR THE USER TO MAKE THE RIGHT CHOICE. FOR THIS REASON, THE CRA-W HAS DEVELOPED SEVERAL PROJECTS UNDER THE THEME OF PRECISION AGRICULTURE, INCLUDING VISA: REAL-TIME UTILISATION OF GENERIC AND GEO-LOCALISED INFORMATION FOR THE DEVELOPMENT OF PRECISION AGRONOMIC STRATEGIES.



The concept of precision agriculture

In Belgium, the applications of precision agriculture are at present very narrow and limited mainly to guiding tractors, creating yield maps from combine harvesters and producing nitrogen recommendations by flying a drone over the field.

First and foremost, PA involves the use of sensors to take measurements and record a large amount of information about the crops, the field, the soil, etc. They can be carried directly by farming equipment or by a tractor, but also by a drone, aircraft or satellite. The primary objective of the VISA project is to test and compare the various sensors available on the market in order to determine their reliability and their added value from an agronomic point of view. More than ten sensors have already been studied and validated under real-world conditions on different crops, plots and soil types.

A second objective of the project is to make good use of the information provided by the various sensors. The idea is to map the data, but above all to convert them into agronomically relevant activity to be performed on the plot (e.g. a fertiliser modulation map). This stage of agronomic interpretation of data is one of the main obstacles to the development of PA and its adoption by farmers.

Through the VISA project, the CRA-W has highlighted the importance of contextualising the data collected. This means that taking just one piece of information into account is not enough. It needs to be compared with and weighed up against other agronomic parameters. For example, the modulation and management of nitrogen fertilisation based solely on information on the development of the plant (e.g. height, leaf area index, etc.) is not sufficient. Other soil and climatic information provided by other sensors must be integrated in order to manage fertiliser and/or soil conditioner input appropriately.

The project's third objective is to transfer computer-generated recommendation/ modulation maps to farming equipment. Although farming equipment and tractors are managed electronically using a standardised computer language (BusCAN and ISOBUS), managing such technology remains complex and the prerogative of specialists. It is still very difficult for uninitiated users to process the data, to digitise them and to transfer a modulation map to their equipment. As part of this project, the CRA-W is devising an online platform to process data from various sources online.

The project is intended as a showcase for farmers to demonstrate realistic and applicable solutions available in Wallonia, and to hint at future developments in precision agriculture. It has also made genuine consultation possible with the machinery sector in order to highlight the discrepancies between the technologies on offer and their actual application on the ground in Wallonia.

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AGENDA

24 - 25 JUNE 2017

Large educational exhibition on cereal crops «S'il suffisait qu'on sème» on the grounds of the Gembloux Agro-Bio Tech Experimental Farm and of CRA-W

www.silsuffisaitquonseme.be | Contact: communication@cra.wallonie.be

28 TO 31 JULY 2017

Meet the CRA-W at the heart of the Wallonia Village of Agriculture (Hall 3) and "En terre bio" at the Libramont Agricultural Fair.

A busy programme of activities at our stand in Hall 3.

SATURDAY 29 JULY 2017 TO 1.30 AT LEC3 HALL 3

ound table on the farm of the future: Agriculture and climate change.

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