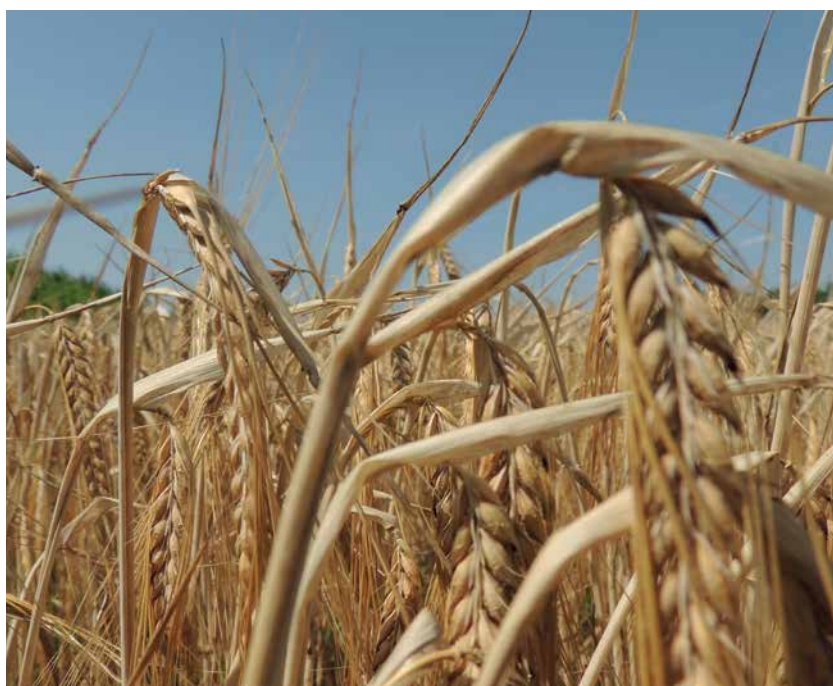




THREE YEARS OF EXPERIMENTATION IN ORGANIC FIELD CROP SYSTEMS

THE CRA-W SYCBIO EXPERIMENTAL PLATFORM IS UNVEILING THE FIRST RESULTS OBTAINED FROM THREE YEARS OF MONITORING ORGANIC FARMING.



30% of usable agricultural land to be cultivated organically by 2030; that is the ambition of the Development Plan for organic farming in Wallonia. To achieve this goal, there is much research to be done, and the CRA-W SYCBIO platform is there to help.

What does SYCBIO involve?

The SYCBIO platform (SYStèmes de Cultures Biologiques [Organic Cropping Systems]) was launched at the end of 2018 on a 6-hectare plot belonging to the CRA-W in Gembloux. It is an **experimental project** whose overall aim is to create cropping systems (SdC) that are agronomically and economically sustainable. How? By testing, assessing, and comparing 3 different SdCs developed on this plot:

- The **reference SdC**: with high-performance, varied mechanical weeding tools, access to commercial organic fertilisers, and substantial investment in inputs.
- The **autonomous SdC**: with reduced spending on inputs, no exogenous input of Nitrogen and Phosphorus via commercial organic fertilisers, and frequent use of legumes as the main crop, whether in combination or as plant cover crops.
- The **ABC SdC**: with reduced spending on inputs, no exogenous input of Nitrogen and Phosphorus via commercial organic fertilisers, a no-tillage policy, and the management of weeds by plant cover and/or intercropping.

Performance of the SdCs [Organic Cropping Systems] studied after 3 years

The **agronomic characteristics** monitored were the development of weeds and diseases, the yields, and the quality of the crops. The different SdCs have different crop rotations, therefore comparing the results for the gross yield is of little value.

The main features of the soil have changed little since the start of the trial. However the soil structural stability samples show a very clear, progressive difference between the SdCs from one year to the next, the ABC SdC proving to be the most stable. On the other hand, one major obstacle in the case of the latter is the development of weeds that are difficult to manage.

The **economic balance** is currently under study. A full report of these results will be available at the end of 2022.

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

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DIVERSIFY YOUR CROPPING SYSTEM TO INCREASE SUSTAINABILITY

The majority of European agricultural systems typically involve short rotations and single-culture crops. This can lead to problems with pests, erosion of biodiversity, loss of fertility, etc.

What are the impacts of spatial (intercropping) and temporal (successive cropping over one season) diversification strategies? Do they increase the efficiency and profitability of agricultural and agri-food systems and make inputs more economical, with a resulting lower impact on the environment and health? The objective of the European project **DiverIMPACTS** (2017-2022) was to assess the performance of these diversified systems.

The project involved 32 partners coordinated by INRAE (France). Twenty-five dynamic multi-stakeholders were mobilised throughout Europe as part of the «participatory research action», together with 10 long-term trials in an experimental station.

The results show that, whatever type of system was originally in place, it is possible to design more diversified cropping sequences, improving profitability and lessening environmental impacts. To achieve this objective, the rotation must include minor crops with high added value and/or those that benefit the major crops (Nitrogen restoration, pest control), along with combination crops and/or multiple crops that regulate the yield and make better use of resources. These strategies require adaptive management on the part of participants, who must consider the local biophysical and socio-economic conditions. Decision support tools (DST), including multi-criteria analyses, have been made available to interested parties. The tools made available to the participants make it possible to anticipate the effects of diversification on the scale of a field, sector, or territory¹.

Based on 46 identified barriers and obstacles to diversification, a catalogue of solutions has been proposed. Their implementation requires upstream changes (availability of seeds, machining) and downstream changes (storage, sorting and processing of new products), and changes at an institutional level: support for minor crops and risk management, and the adaptation of training and R&D in the agri-food sector.

The progress of the project has been widely publicised: There are 54 factsheets and 29 videos describing practical solutions and examples of co-construction of sectors for promoting diversity. There are five memos to politicians that contain recommendations for enabling the transition to diversified cropping systems and the co-construction of knowledge and actionable skills. The final conference is available on the internet².

For further information:

www.diverimpacts.net



THE TERRAÉ NETWORK, WORKING TOWARDS AGROECOLOGICAL SYSTEMS

The objective of the Terraé farm network is to promote agroecology in Wallonia and develop agricultural practices. The network is supported by the CRA-W in collaboration with Natagriwal, Fourrages Mieux, Greenotec and the Public Service of Wallonia.



How ?

By constructing and managing a network of farms that connects farmers who wish to begin or further their agroecological transition.

This network also enables the collection data in order to objectify the sustainability of agroecological practices and feed a communication platform which, along with the network, forms the two axes of the Terraé project.

After a call for applications and a meeting with all motivated farmers, 40 farms throughout Wallonia were selected, representing a wide variety of models. The platform was inaugurated on one of these farms on 6 October 2022. This congenial occasion made it possible to meet the participants of the project and create a group dynamic. Information was collected with regard to requirements, in order to set up a training programme and organise meetings to discuss various technical, economic and societal subjects.

As early as mid-October, the team launched the diagnostic phase and performed an initial audit of each farm. This diagnosis will serve as a basis for co-constructing an action plan with farmers, specific to each farm.

At the same time, participatory research on the sharing of knowledge, particularly between farms, is being carried out in collaboration with members of the network. This research will add a social dimension to the action carried out and the data shared through the platform.

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¹ <https://www.diverimpacts.net/toolbox.html>

² https://www.youtube.com/watch?v=cqCGz_9ZR5s&list=PLnxZlleQICZbSgXm-brn1oDj1lcEyk25q&index=2



ASSESSING THE RISK OF PLANT PROTECTION PRODUCTS TRANSFER TO THE WATER RESOURCES

INDIC'eau enables farmers to estimate their use of pesticides and to identify possible improvements, thus reducing the pressure exerted on water.

On a regional scale, Wallonia is committed to a major prevention policy, with a view to limiting the impact of plant protection products (PPPs) on the environment and human health. PPPs have played a large part in the intensification of agriculture and the increase in agricultural production, but the diffusion of active substance residues and/or their metabolites has also contaminated the environment.

Of the various environmental compartments, the water resource is receiving particular attention in Wallonia, notably the protection of catchments for the production of drinking water. Therefore the CRA-W has developed INDIC'eau, a risk indicator for the transfer of PPPs to water resources, working in partnership with PROTECT'eau, the regional non-profit organization for the preservation of water quality. This indicator is intended to be intrinsically specific, and applicable to the context of Walloon farms.

INDIC'eau is based on an analysis of the commercial products applied by farmers. Their sensitivity to infiltration and run-off is also taken into account via the physical and chemical properties of each active substance contained in all of applied PPPs. Concretely a dedicated treatment index gathering the PPPs that present a potential risk for the water resource (ISAC'eau) is combined with a colour code for surface waters and a weighting according to leaching parameters for groundwater. This ultimately enables us to determine a theoretical risk of the impact of PPPs used, for surface and ground waters respectively. The indicator has been developed and validated on the basis of the dataset collected by a network of farmers during the 2020-2021 crop year.

The tool enables us to raise awareness among farmers regarding the prevention of water resource contamination by PPPs.



It can also be used to assess progress, since it generates concrete information on the efforts made. Finally, from an objective analysis of the uses of problematic active substances on farms, it also facilitates the introduction of alternatives aimed at reducing the potential transfer of PPPs to water resources, for example by means of chemical substitutions and/or mechanical weeding.

Funding: Project subsidised by the SPW and the SPGE as part of the PROTECT'eau agreement

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RECONCILING THE RETURN OF LIVESTOCK FARMING TO ARABLE FARMING SYSTEMS AND THE QUALITY OF WATER RESOURCES

During 2019-2021, the SERVEAU project, a partnership between SPGE, UCLouvain, the Collège des Producteurs and the CRA-W, was challenged with the task of quantifying the impact of intercrop grazing by sheep on the quality of the water resource.

To meet this objective, trials were carried out on 11 sites. Each site was subjected to three treatments, each repeated three times, and compared. The treatments involved three methods of grazing intercrop covers (ungrazed, partial grazing, and total grazing). The sites were monitored by identifying the risks of Nitrogen leaching and the impact of grazing on the destruction of cover, weed and parasite pressures and the development of the subsequent crop.

The two years of trialling confirmed that the grazing of intercrops by sheep causes no significant increase in the risk of deterioration in the quality of water resources. Just after grazing, it is found to have resulted in a slight increase in the mineral-based Nitrogen in the soil (+11 kg N/ha). Although grazing accelerates conversion of the Nitrogen in the cover into the mineral-based Nitrogen found in soil, the risk of this Nitrogen leaching into groundwater was no greater for the grazed plots



than for the ungrazed plots under the conditions occurring in the winters of 2019-2020 and 2020-2021. However, a more detailed monitoring under climatic conditions that differ from these two winters would be required to support this analysis.

Consequently, the risk of leaching is more closely linked to the agricultural practices (bare soil for long periods, fertilisation before the planting of intercropping) than to the practice of grazing itself.

The yields of the crops studied (sugar beet, endives, peas, beans, maize, and potatoes) were not affected by the grazing.

In addition to this, it has been found that, depending on the bioclimatic conditions, intercrop cover may provide a biomass concentration that can be advantageous for sheep, with considerable nutritional quality.

Bringing sheep back to cropping systems therefore provides an opportunity for farmers to develop a rapidly expanding livestock industry combined with the benefits of mechanical destruction of winter cover, without increasing the risk to the water resource or compromising the performance of the next crop.

Funding: Project subsidised by the SPGE (call for projects 2018-2019 for the protection of water resources)

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WHAT ARE THE BENEFITS OF APPLE POMACE FOR NEWLY WEANED PIGLETS?

Apple pomace, an undervalued co-product in Wallonia, is known for its high fibre content and the antioxidant, anti-inflammatory substances it contains. Research has paid off and its benefits have been demonstrated.

The presence of components that are beneficial to health make apple pomace a good candidate for supporting piglets during the weaning stage. This is because weaning is a critical period in pig farming that can lead to post-weaning diarrhoea, affecting the performance and intestinal health of the piglet. Moreover, since the use of antibiotics or zinc oxide as a preventive treatment is no longer authorised in the European Union, alternative strategies are being widely investigated by Research.

In view of this observation, and in the spirit of recovering local resources (circular economy), apple pomace came to the attention of CRA-W researchers, who assessed its potential benefits. It was hoped that this new weaning strategy would help improve performance and boost the intestinal health of piglets.

The assessment was carried out in two stages: firstly using an in vitro gastrointestinal model – i.e. equipment that reconstructed the digestion process in a laboratory by means of bioreactors, and secondly, by conducting an in vivo experiment on piglets (see CRA-W info No. 64).

In the bioreactors, apple pomace stimulated the production of propionate – a metabolite produced by the intestinal fermentation involved in energy metabolism and the immune system – resulting from a relative enrichment of the ecosystem in the bacteria that produce it.

This observation was corroborated by the in vivo data: the piglets that received 4% apple pomace were found to have a different bacterial profile to the others, in relation to the propionate-producing bacteria at the onset of the post-weaning stage.

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This research therefore proved that apple pomace is a successful weaning strategy. Another concept also emerged, suggesting that, in addition to the compounds with «health» implications, it is also its simple sugar profile that makes apple pomace attractive for post-weaning use. This is because these simple sugars provide energy that is readily assimilated by the intestinal mucosa of the piglets at a stage in their lives where the digestive system is still relatively immature. More generally, the results show a complementarity

between the in vitro and in vivo approaches to assessing a co-product for feed purposes.

This research has led to the completion of a Doctor of Veterinary Sciences thesis defended by Sandrine Dufourny on 13 September 2022.

Funding: Moerman fund from the CRA-W, COPROPIG project; in collaboration with ULiège (FMV and Gb-ABT) and UCL

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As you know, the CRA-W celebrated its 150th anniversary this year. A wonderful anniversary shared with all of you, rich in exchanges, discoveries, and encounters. There was no shortage of activities:

- **Field demonstrations**
- **Conferences, training, workshops, and public debates** organised around various agricultural topics
- **Participation in events:** Libramont Fair, Hortifolies, Completion of European projects,...
- **Publication** of brochures and documents summarising our research work

And this anniversary year ended on a high note, with an academic session bringing all our partners together.

Whether you are organisers or visitors, thank you to all!

For information about this 150-year anniversary:
www.cra.wallonie.be/fr/tag/tag-150-ans?archive=true