

Flanders

is agriculture and fisheries

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2021

ILVO

Flanders Research Institute for Agriculture, Fisheries and Food

www.ilvo.vlaanderen.be

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Dear Reader,

We are living in turbulent times where many certainties are being turned upside down. Where, in addition to real wars, virtual media wars are being fought and where many truths and falsehoods about food and farming are being broadcast. It is then a matter of keeping our heads cool and working steadily and with integrity towards the future. At ILVO, that means preparing the future of a sustainable, quality agro-food sector in harmony with its environment. We do this through research from the soil to the consumer's plate or to the cattle's feed trough. From 'Farm to Fork' – and also from 'Fork to Farm'.

Although 2021 was another year of dealing with Covid-19, it did not prevent us from performing our activities to the fullest, including starting up many new projects. The European Union is an increasingly important funder of our research. As part of the Flemish economic recovery plan, a number of other exciting projects were also started, such as studying drought resistance and protein diversification. With regard to the latter, in close partnership with Bio Base Plant Europe, ILVO has started down the road of studying the processing of food from microbial fermentation.

The 2021 annual report presents a fascinating palette of research completed and started in the past year, too much to mention here. I do want to draw your attention to the launch of ILVO's first spin-off, fruit of a collaboration with VIB. Protealis is driven in the short term to bring soy varieties to the market that are adapted to our climate conditions, with the aim of reducing Europe's dependence on imported soy.

In addition, the Flemish Government has entrusted ILVO with the task of developing the Business to Bioeconomy Facilitator (B2BE Facilitator) within the framework of the Flemish Policy Plan on Bioeconomy. And I would be remiss not to mention the the *VerdienWijzer*, a tool developed at the explicit request of Minister Crevits to help farmers search for new business models.

Dear reader, you can see that despite everything, 2021 was once again a fruitful research year. I would therefore like to thank all ILVO employees, and there are a lot of them, because there are now more than 700! I hereby extend my appreciation for all the hard work of the past year.

We are also looking forward to 2022, when ILVO will turn 90 years old. We will celebrate ILVO's birthday together with the general public on Agriculture Day on 18 September. We also look forward to the commissioning of the beautiful new 'InnovOcean' building by our colleagues in Ostend, an important milestone in ILVO history.

Joris Relaes
3 March 2022



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Unit Head
- Lieve Herman,
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
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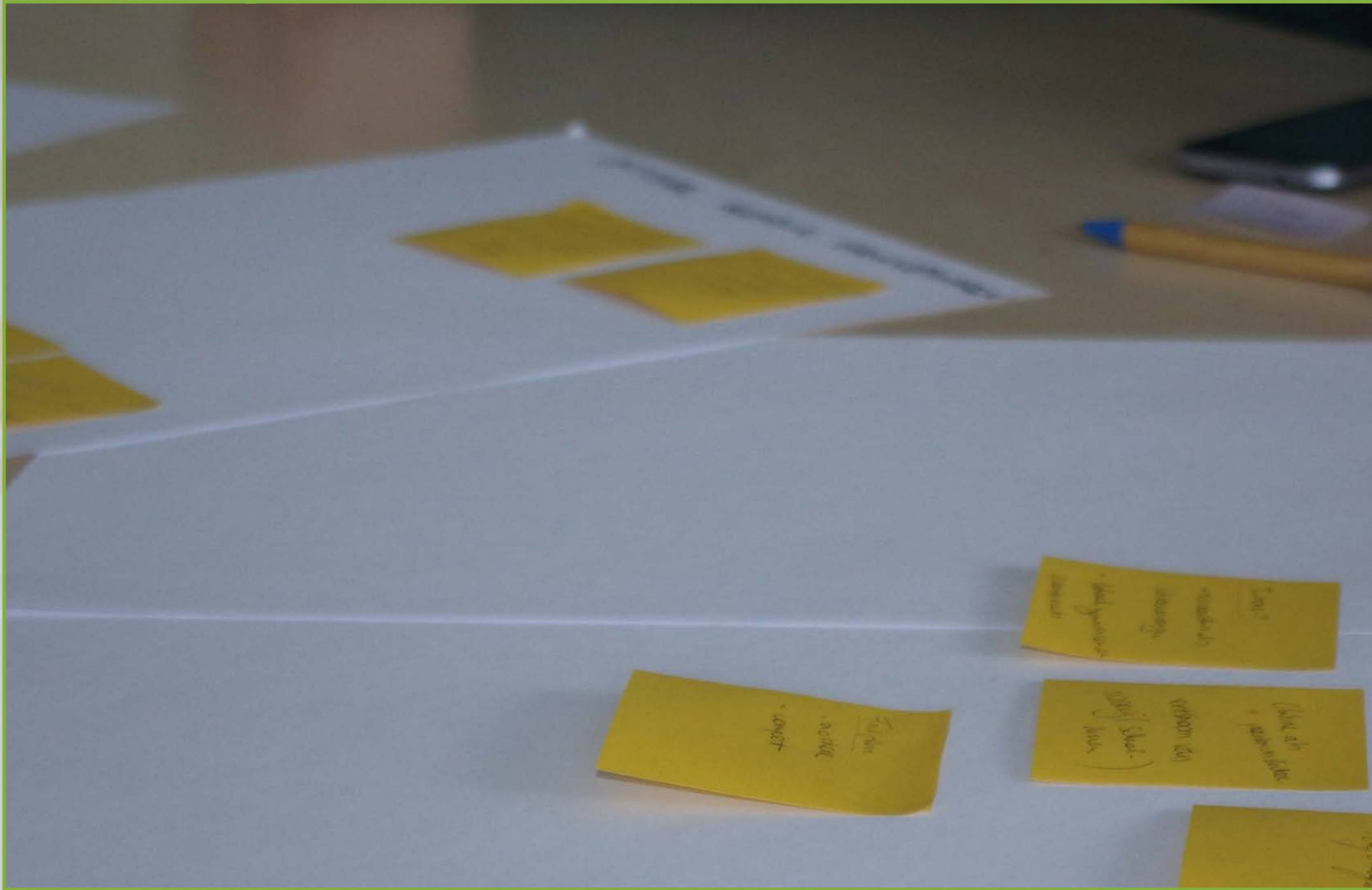
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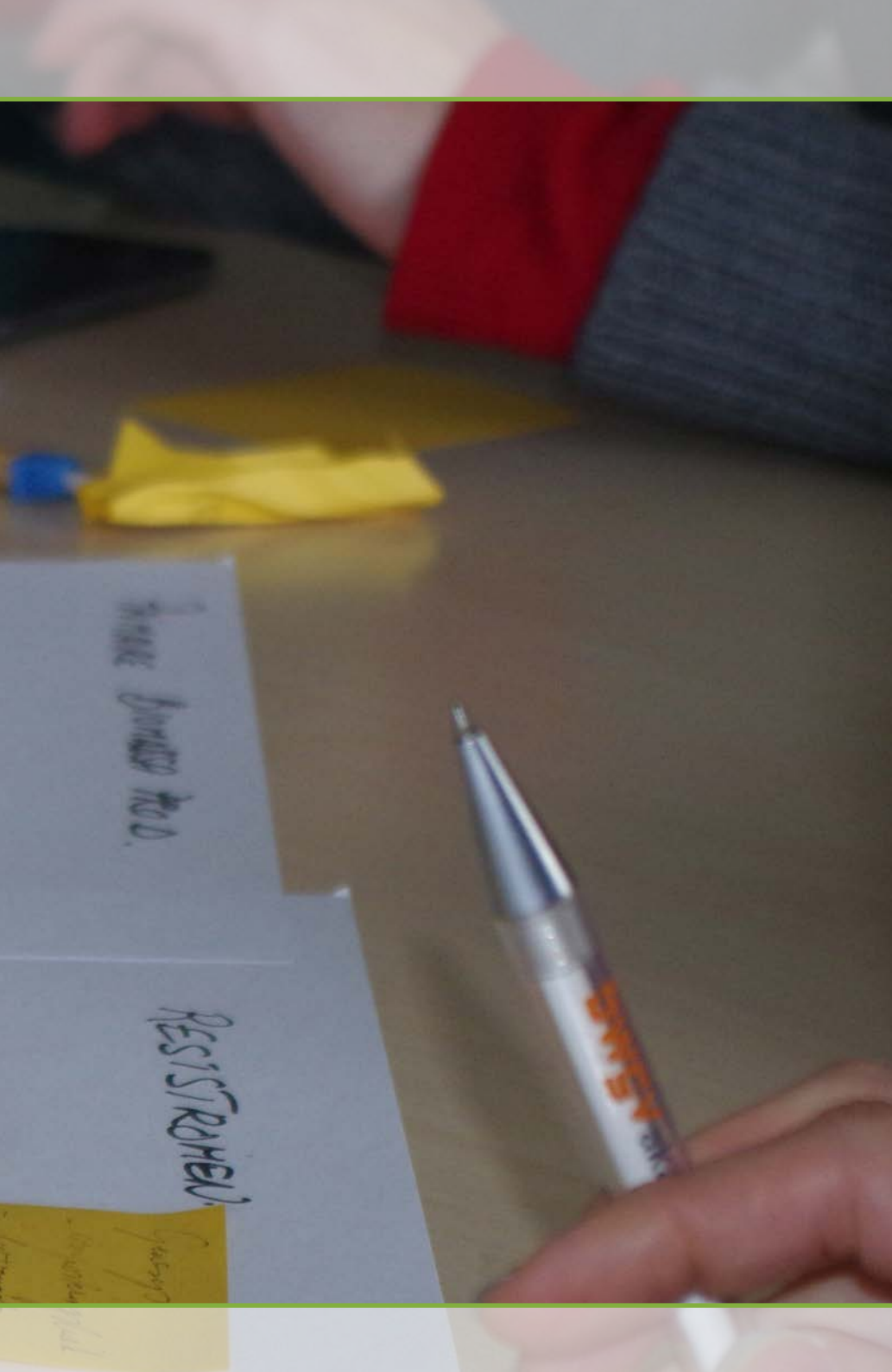
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Mission & Vision

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RESEARCH FOR A CHANGING WORLD

ILVO situates its research as a useful underpinning for a changing world.

Our society is in a full-on transition. Worldwide, challenges put our planet, our health and the global food supply under pressure. In the coming years, we will focus our research even more on these fundamental shifts.

The structure of the vision document reveals the concern of the ILVO community for the essential needs and values of society.

RENEWED MISSION AND VISION AND 10 RESEARCH LINES

In 2021, the scientific teams updated the overarching research vision of ILVO and laid down a new set of tracks. That process took place via structured thinking exercises and workshops. The title reads: 'A resilient food system for Flanders. Research vision 2030'

WHAT DRIVES US?

How do we ensure that people have access to balanced and affordable meals that are produced and prepared in an environmentally, economically, animal-friendly and socially responsible manner? Past solutions are not always appropriate because of their impact on climate, the environment, animal welfare and human health. Using independent scientific research, ILVO wants to offer sustainable solutions for a changing world.

A NEW POLICY CONTEXT

A sustainable and resilient food system is high on the Flemish, European and international policy agenda. Now that the effects of climate change are becoming increasingly noticeable, there is also a growing need for more sustainability in farming and the agri-food sector. This transition has already started in many ways. Thorough scientific research is needed to promote and accelerate this process.

THE HORIZON: 5 G(s)

In the coming years, ILVO will organize its research efforts under a fivefold approach to the health of the agri-food system: healthy primary production, healthy food processing, healthy socioeconomic relations, healthy consumption patterns and a healthy environment.

With this so-called “5G” approach (where “G” stands for *gezondheid* or “health” in Dutch), we want to contribute to a healthy agro-food system in all its aspects, on one line with the sustainability ambitions of Flanders, Europe and the world.

1. HEALTHY PRIMARY PRODUCTION (AND CATCH)

The denominator ‘healthy production’ comprises a number of innovative research lines that represent a number of significant recent ILVO investments:

- Protein diversification: more variation in protein sources (plant-based, animal, microbial)
- Reduced crop protection through better knowledge of plant pathogens and their interaction with the plant and its environment
- Climate-smart food production
- Reduced use of antibiotics in livestock farming together with improved animal health and welfare
- The transition to a circular, bio-based economy
- Attention to valorization of by-products and residual flows

2. HEALTHY FOOD PROCESSING

When we talk about ‘healthy processing’, food processors and home processors immediately think of ILVO’s expertise in the field of food safety: pathogens, spoilage, decontamination, etc. But research is also needed into which processed foods will be produced in the future. In this way, our society can expect a great deal of innovation and knowledge in the field of protein diversification. New technologies and open or shared data systems play a crucial role in this.

ILVO also wants to conduct research into allergenicity, health-promoting properties, nutritional values and anti-nutritional factors of various ingredients at different stages of processing.

3. HEALTHY CONSUMPTION

With ‘healthy consumption’ ILVO aims for a holistic approach to knowledge: we strive for diets that are healthy for the person and for the planet. For example, a new research line will focus on the relationship between nutrition and intestinal flora. We are working on malnutrition as well as the reduction of sugar, fat and salt in in foods. More targeted problems also capture our attention, such as nutrition for specific target groups (e.g. Parkinson’s patients or people who stay in a residential care facility).

4. HEALTHY SOCIO-ECONOMIC RELATIONSHIPS

ILVO has a multi-faceted approach to the study of healthy socio-economic relationships. Striking highlights are research into alternative business models and the short chain. As a ‘living lab’, we have set up a structural collaboration with six short-chain farms, where we make scientific observations and perform tests. We are also conducting extensive research into the well-being of farmers and their families.

5. HEALTHY ENVIRONMENT

Soil health is a top concern for ILVO. Healthy soils are good for agriculture, for the climate and for biodiversity. That is why we recently started a new field experiment. Through a structural partnership with an agroecological farm in Hansbeke, we study new cultivation approaches and evaluate their value and feasibility.

Emissions reduction is a second area where we have built up a great deal of expertise. This issue is difficult to investigate, with its many uncertainties and subjective aspects. By using methodological, technological and biostatistical approaches, we are nevertheless making great strides forward.

OUR 10 LINES OF SCIENTIFIC RESEARCH

ILVO supports the entire agri-food sector and all of society with relevant and practice-oriented knowledge. This annual report puts our 10 main lines of research in the spotlight. For each theme, you can read the abridged version of the new ILVO research vision for 2030.

The full text can be found at www.ilvo.vlaanderen.be.



hier eng versie





Research 2021





Healthy soil and crops



ILVO RESEARCH VISION 2030

ILVO consciously places soil at the center of our research into plant production. After all, sustainable agriculture and horticulture strive for high-quality production with as few inputs as possible and recognize the importance of the soil as the most important strategic production resource.

In all our studies we start from a system vision on soil and crops. As a result, we know that methods to improve the quality and ecosystem functions of agricultural soils go hand in hand with efforts to keep crops healthy and cropping systems robust. We aim to minimize risks of nutrient losses, greenhouse gas emissions and soil compaction, and we maximize our efforts to close cycles and sequester carbon.

On the basis of our experimentally substantiated improvement processes we formulate clear advice to farmers, growers and policymakers. We act in the role of expert within numerous soil partnerships in Flanders, Europe and the world.

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RESULT



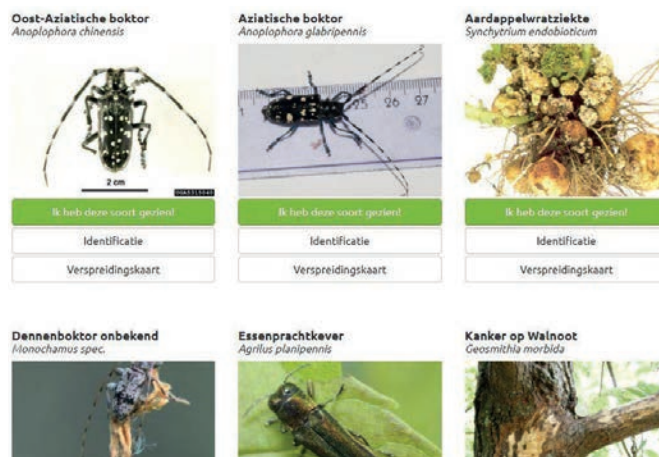
GROWING CHRYSANTHEMUMS WITHOUT PEAT? IT CAN BE DONE

Pot chrysanthemums grown on a substrate low in peat and fertilized in the field with local management residues grow just as well or even better than pot chrysanthemums grown on a peat-rich substrate and fertilized with farmyard manure. In the Flemish research project Bi-optimal@work, in partnership with PCS and KU Leuven, soil experts have developed high-performance, environmentally-friendly cultivation techniques. When growing ornamental plants it is very challenging to maintain a sustainable and balanced soil chemistry, because in the potting phase as well as in the longer (perennial) field phases, choices need to be made for materials and fertilizers that are good for the crop, the soil and the environment.

Fien Amery (ILVO): 'Management residues add hardly any extra phosphorus. At the same time they contain, in comparison with farmyard manure and per unit of phosphorus, much more carbon - up to 10 times as much! That is interesting for perennial crops and especially important for Flemish soils that already contain high levels of phosphorus. Ornamental growers have less risk of phosphate and nitrate leaching, but they also enrich their soil with soil organic carbon, increasing its ability to release water to plants in times of drought.'

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RESULT



TOOL LAUNCHED TO REPORT 'STRANGE PLANT DISEASES'

Anyone who spots an unknown plant disease or pest in a private garden or neighborhood can now identify and report it in the new Beware&Note application on the existing website waarnemingen.be. ILVO, PCS Ornamental Plant Research and Natuurpunt Study hope in this way to also involve citizens in the protection of our public citizens in the protection of our public and private green spaces against alien diseases and pests.

These so-called Q-organisms (where Q stands for quarantine) are increasingly crossing the borders of the European Union, damaging our environment and food production. This preventive approach, characterized by intensive monitoring, rapid detection and control, should help to prevent high control costs and crop losses.

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RESULT



CROP PROTECTION BASED ON VIRUSES

In the European VIROPLANT project, 17 partners from 7 European countries worked together to find new viruses to protect agricultural crops against pests, bacterial and fungal diseases. ILVO researchers were specifically looking for new bacteriophages (these are viruses that target and infect bacteria) to combat the bacterium *Rhizobium radiobacter*. This pathogen disrupts the housekeeping within the roots of tomato and cucumber plants. At the same time, the economic feasibility and social acceptance of virus-based crop protection was explored. The knowledge from the technical study was incorporated into a market analysis and a study of possible business models. The research was based on the concept of co-creation and involved stakeholders from the entire crop protection chain.

Numerous potential biocontrol viruses against diseases and pests were found for grape, tomato and roses. In addition, important insights were gained about the interaction between viruses, harmful fungi, bacteria and pests and their microbiomes. The crop protection market, crop protection chain, major obstacles and driving factors of virus-based crop protection and the expectations of the end users were all mapped out. This revealed, among other things, that it is necessary to inform consumers. For growers, in addition to efficacy, they also attach great importance to health risks and ease of use, and that pome fruits, among others, are an important market for new virus-based crop protection products. These results will make an important contribution to the further development of virus-based crop protection products and their subsequent market introduction.

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[RESULT]



EUROPEAN AGRICULTURAL SOILS ON THE ROAD TO CLIMATE-SMART AND SUSTAINABLE MANAGEMENT. FINDINGS AFTER ONE YEAR EJP SOIL IN FLANDERS

Our soils provide us not only with food, but also with a wide range of ecosystem services such as storage of carbon and water. Due in part to the changing climate and intensive soil management, several of these services have been under pressure for years. Europe wants to change that with EJP SOIL, a European 'Joint Programme' with research and policy actors from 24 European countries.

In Flanders, EJP SOIL researchers are searching far and wide for solutions to make our agricultural soils more resilient to climate change and for ways to use soils for more sustainable agricultural production. Ecosystem services, land and soil degradation and biodiversity are important aspects. Flanders is represented within this program by ILVO, the Department of Environment and INBO. The Department of Agriculture and Fisheries chairs that Flemish Hub.

www.ejpsoilvlaanderen.be

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EJP SOIL has received funding from the European Union's Horizon 2020 research and innovation programme. Grant agreement N° 862695



[RESULT]



DETECTION OF 2 VIROIDS IS NOW 100X MORE EFFECTIVE

Detection of two viroids - the Columnea latent viroid (CLVd) and the Pepper chat fruit viroid (PCFVd) - which have a strong presence in the Thai crops of tomato, eggplant, sweet bell pepper, chili peppers and bolo maka, is now up to 100 times easier and more effective. This is the result of a special exchange between Ghent University, ILVO and the Thai government. Researcher Parichate Tangkanchanapas came to Belgium with this PhD grant. He succeeded in mapping the viroids in detail on a molecular mapping of the viroids, to predict their harmfulness and to develop a simple method that authorities can use at border controls. These viroids are not allowed in vegetables and seeds being exported from Thailand.

Over the last 10 years, UGent and ILVO have gained a lot of fame for their scientific knowledge on viroids. Tangkanchanapas continues his work as a researcher in plant health at the Department of Agriculture of Thailand.

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[RESULT]



NUTRIENT RECOVERY THROUGH A CONVENIENT PLATFORM

The NUTRIMAN platform for farmers offers information about nutrient recovery techniques and about bio-based fertilizers already available on the market. The platform contains practical, user-friendly information and instructions in the form of info sheets, videos and contact details of vendors.

Nutrیمان is a nitrogen- and phosphorus-oriented thematic network that brings together practical knowledge on nutrient recovery, related practices and technologies. In doing so, we build the bridge between applied research and industry for the benefit of the agricultural sector. The fourteen European partners in the Nutrیمان consortium are showing ready-to-use cases for nutrient recovery that are still insufficiently known to potential users. The project can mean a great added value for farmers!

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Wij kunnen jouw bedrijf helpen!

Sluiten van nutriëntenkringlopen

Duurzaam gebruik van stikstof en fosfor

Teruggewonnen meststof oplossingen

NUTRIënt MANagement en Nutriëntrecuperatie thematisch netwerk

2:28





[NEW]

PHENOTYPING OF FUTURE CROPS

ILVO and VIB are developing a national node of EMPHASIS, the plant phenotyping infrastructure in Europe. EMPHASIS focuses on four pillars for plant phenotyping: plant phenotyping in a controlled environment, intensive field phenotyping, a network of field trials for phenotyping to benefit breeding and modeling for simulation and/or prediction of crop or plant performance.

The regional platform focuses on cases from controlled conditions and field phenotyping, with a research focus on drought/salt adaptation of crops in the context of climate change. In this way, Flanders will maintain its leading role in the rapidly evolving international plant phenotyping community and stimulate interactive encouraging interactive collaborations between disciplines within Flanders, Belgium, Europe (through EMPHASIS) and the rest of the world. Plant phenotyping is the characterization of complex traits by non-destructive applications, such as image analysis, in crop and plant research. This is essential in the breeding of agricultural crops with a view to increasing production and dealing with climate change.

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[NEW]

JAPANESE HOLLY COLLECTION OF THE ARBORETUM IN BOKRIJK IS IMPORTANT ASSET FOR NEW CO-CREATIVE BREEDING PROJECT

During covid, Bokrijk has become a particularly popular place for walking where visitors enjoy the open space, the historic setting of the Open Air Museum and lovely greenery. That greenery is now receiving extra attention from scientists. The Bokrijk Arboretum houses an exceptional collection of *Ilex crenata* or Japanese holly, a species often used as a substitute for boxwood. The plants in Bokrijk, together with plants from the Leen forest in Eeklo, are screened for useful characteristics, such as resistance to disease and tolerance to less acidic soils. The aim is to arrive at new cultivars that can be applied more widely in all kinds of gardens, and are thus less dependent on the right type of soil (acid - non-acid, heavy clay - sand, dry - wet).

The scientific project with ILVO and KU Leuven is taking place at the request of the ornamental plant breeding company Plant Select and thus has a co-creative setup with a view to accelerated innovation and creation of added value. 'This acceleration is necessary in order to be able to respond to an opportunity in the market. Breeding is generally a long process', clarifies ILVO researcher Esther Geukens.

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[NEW]

WATERRADAR CONNECTS WATER SUPPLY AND DEMAND FOR AGRICULTURE

Water availability and the well-considered use of available water are becoming an ever greater priority for farmers and growers. In times of drought and water scarcity, irrigating crops with rainwater and groundwater is no longer self-evident. That is why the partners (Inagro, ILVO, VITO and VLAKWA) in the VLAIO project Irrigation 2.0 are developing the online viewer WaterRadar. This tool integrates water supply and demand and promotes sustainable and circular water use.

With this tool, farmers and growers can easily look for suitable alternative suitable alternative water sources in the vicinity of their plots. Specifically, the focus is on both treated household wastewater from Aquafin plants as well as treated wastewater from food processing companies. In addition, interested companies and local governments can use this tool to gain insight into the theoretical demand for irrigation on a regional scale.

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[NEW]

RESTORING BIODIVERSE GRASSLANDS: ECOSYSTEM SERVICES UNDER THE MICROSCOPE

There are several techniques for grassland restoration, such as standard (2 x mowing) vs. frequent mowing, stripping or "mining". But what are the effects of these techniques on the grassland itself and on ecosystem services?

Project HERBIOGRAS investigates the forage quality of the grassland (and for which animals it is suitable), how much carbon is stored in the soil, and how attractive the grassland is for pollinators and recreational visitors. The experiment is conducted in Melle, Gentbrugge and Makkegem.

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[NEW]

TARE SOIL CLEANED AND RETURNED TO THE FIELD?

To clear the tare soil from potatoes and root vegetables of nematodes and yellow nutsedge, and to set up a pilot installation in a processing company; that is the aim of the follow-up project to the Circular Tare Soil project.

The intention is to rid tare soil of these pathogens so that the risk of contamination between fields is reduced to nil. The spread of nematodes and yellow nutsedge happens passively, mainly through contaminated soil that accompanies harvested potato tubers and root vegetables. The soil is removed at the processor or packer and then disposed of. Especially for potatoes imported from other countries, this is problematic because European legislation strictly regulates the transport of soil.

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[NEW]

NON-EUROPEAN FRUIT FLIES IN BELGIUM?

Non-European fruit flies (family Tephritidae) include a large number of important pests that could cause a lot of damage in Belgium. Early intervention is very important to prevent them from getting established and spreading in Europe. In the FPS-TEPHRISURV project, ILVO, in collaboration with the Royal Museum for Central Africa, is working on an effective monitoring program that complies with international phytosanitary guidelines.

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© Joseph Berger, Bugwood.org



Eikenprachtkever © Tamás Németh

[NEW]

NATIVE AND EXOTIC JEWEL BEETLES ON FRUIT TREES: DEVELOPMENT OF A MONITORING STRATEGY

The larvae of Agrilus jewel beetles can inflict lethal damage to (fruit) trees, by making tunnels in the bark and the sapwood. The Euphresco project AGRITRAP should therefore consolidate the European studies carried out to date and, in collaboration with North American researchers, develop an optimal trapping method.

In addition, the project will provide practical tools for the future monitoring of (fruit) trees that can be infected by *Agrilus* spp. This will be done by, among others, FAVV inspectors, researchers, foresters and fruit tree growers.

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[NEW]

BEECH LEAF DISEASE IN BELGIUM?

Beech Leaf Disease (BLD) is a new disease spreading rapidly in forests and landscapes in the United States and Canada. It is linked to the leaf nematode *Litylenchus*. The disease has been identified primarily on American beech, but also on European beech.

Since it is not known whether beech leaf disease or *Litylenchus* species occur in Europe, the NEMAFAGUS and FAGUSTAT projects were created. These projects want to raise public awareness of this beech disease, to investigate the presence of the nematode in the six partner countries and to study the risks for this disease in our regions.

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[NEW]

WATER BALANCE STUDY OF THE OUDLAND POLDER

The 'Watbal-Oudland' project studies the polder area between Ostend and Newport. The aim is to reduce drought, salinization and flooding risks through research-based management. We aim at an adapted water and land management, taking into account the various land users within the polder. Agricultural and nature-oriented plots are often found close to each other in the area. Each has its own water needs.

Data collection is crucial within this project, with an inventory of water regime, meteorological data, surface waters, effluents, discharges and captures, groundwater, water quality, nature, and agriculture. This collection should provide better insight into the integrated system operation, i.e., the greater water system (including interactions with including interactions with waters outside the Oudlandpolder itself) and the ecosystem. Within this Inagro-led project, ILVO gave expert advice at key junctures.

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© Heather Coste, BCA, NY

IN THE SPOTLIGHT

FIRST SCIENTIFIC SANDER VERCAMER PRIZE AWARDED

Siel Desmet of ILVO won the first Sander Vercamer prize with his doctoral research on creating compact ornamental plants without growth inhibitors at ILVO. Watch the video that ILVO made about this groundbreaking research.

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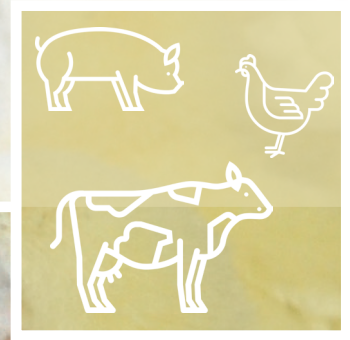


Duurzame compactheid bij sierplanten

2:12







Role of animal production in society



ILVO RESEARCH VISION 2030

ILVO commits to use scientific research to promote livestock farming that farmers and citizens can all feel good about.

We aim for an animal-friendly production that combines a low impact with a fair return and a healthy product with a delicious taste. In this way we help to guarantee international and local competitiveness.

Our scientific research also provides opportunities to integrate local livestock farming in a sustainable way into a circular food production system. With increasing societal concerns about (large-scale) animal production, the resilience of the sector will determine what the future holds.

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RESULT



BETTER PORK? CHOOSE THE SIRE CAREFULLY

The choice of breed and the stress sensitivity of the sire line not only determine to a large extent the technological (e.g., cooking yield of ham) and eating quality (e.g., succulence and tenderness) of pork, but also the economic picture, according to the doctoral study of Eline Kowalski. She investigated how the meat quality and processability of pork can be measured and improved. While taking the financial picture into account as well as the recent ban on surgical castration.

The most important findings:

- Within Belgian Piétrain, the use of homozygous stress negative sire lines results in a higher quality without sacrificing carcass quality or feed conversion.
- Eating quality is more influenced by breed choice. Progeny of Duroc sire lines score the highest for both technological and eating quality, but lowest for carcass quality and financial return.
- In male piglets, immunocastration can be applied as an alternative to non-anesthetized surgical castration. It prevents the chance of boar taint and results in a meat quality consistent with that of barrows.
- In order to properly assess the meat quality of the entire carcass, it is appropriate to perform quality measurements on different muscles. The meat quality of the carré is not a good predictor of ham quality.
- Instrumental methods (such as drip loss, intramuscular fat content, shear strength and color) can be used to assess the eating quality of the carré and the technological quality of the ham.

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RESULT



THE PROTEIN AND ENERGY CONTENT IN THE FEED OF SENIOR LAYING HENS CAN BE SIGNIFICANTLY REDUCED.

Do senior laying hens (older than 70 weeks) have different nutritional requirements than their younger counterparts? The VLAIO-LA project LEGLANGER tries to answer this question to help find sustainable ways to prolong the laying cycle. Feeding according to need can not only have benefits for the animal itself, but also for the environment and for the poultry farmer's bank account.

A feeding trial with senior laying hens showed that the energy and (crude) protein content in the feed could be reduced significantly: by 6% and 10%, respectively! Performance, egg quality, liver health and plumage scores of the hens remained unchanged. This trial was conducted on a small scale, but the concept of precision feeding will be further investigated on a semi-practical scale at a further stage.

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RESULT



LITTER TYPE CAN AFFECT PERFORMANCE AND AMMONIA FORMATION IN BROILER FARMS

The ongoing VLAIO-LA project KUIKEMIS aims to tackle the ammonia formation in broiler farms at the source. Different modifications with regard to feed, equipment and management are investigated in this project. Six types of litter (which are also frequently used in Flemish poultry houses) were compared with each other. Each litter type had a number of advantages and disadvantages in terms of performance, ammonia concentrations and animal welfare parameters.

For example, peat was found to result in good performance and litter quality, but also to the highest ammonia concentrations at litter level (because of its loose, grainy texture). In this trial, foot pad lesions were most common on chopped wheat straw and wood shavings. The ideal litter type for broilers could not be determined from this trial, but its influence on several parameters became clear.

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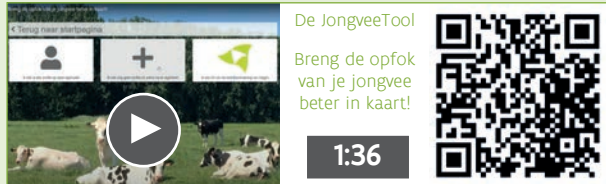
IN THE SPOTLIGHT

NEW TOOL CAN MAP THE GROWTH TRAJECTORY OF YOUNG CATTLE!

In the free *Jongvee* (Young Livestock) tool, developed in the VLAIO-LA project Jongleven, farmers can record the weight or chest circumference of their young cattle. The Jongvee tool then illustrates how well the farm scores in relation to the target trajectory. At a glance, the tool also evaluates growth trajectory of different age groups.


The Jongvee tool is available free of charge to all dairy farmers. By regularly recording weight or chest the farmer can detect and correct errors early in the rearing process and early in the breeding process in order to realize an optimal growth trajectory. This ultimately results in high-yielding heifers that calve at the right time.

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De JongveeTool
Breng de opfok van je jongvee beter in kaart!

1:36



RESULT



HEAT STRESS IN PIGS: SIGNALS AND EFFECTS

A first pilot study within the VLAIO-project COOLPIGS, in which a heat wave was artificially induced for fattening pigs, shows that heat stress induces physiological changes in the pigs. For example, the respiratory rate accelerated, feed consumption decreased, passive behavior increased and skin and rectal temperature rose. The simplest and clearest way to monitor heat stress in meat pigs is the respiratory rate. At more than 50 breaths per minute, one should look out for (other) signs of heat stress. A first list of measures to limit heat stress can be found at www.varkensloket.be/stalklimaat/hittestress

Climate change means that in the future we will have to be better prepared for more extreme weather conditions such as heat waves and dry periods. This research project responds to this by describing practical and economically feasible measures to reduce heat stress in the stable and during transport to the slaughterhouse. This project will also raise awareness about the visible and less visible impact of heat stress.

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RESULT



ANIMAL WELFARE SELF-SCAN FOR FREE-RANGE SYSTEMS

PPILOW - Poultry and Pig Low-input and Organic production systems' Welfare - aims to improve the welfare of both pigs and poultry kept in free-range or organic systems. By working together, the project partners want to provide innovative tools and solutions that are both practical and economically feasible and are supported by the whole sector (including consumers).

One of these applications is the mobile application PIGLOW, which allows pig farmers in organic and free-range systems to monitor the welfare of their animals themselves. The step-by-step self-scan takes about an hour to complete. An internet connection is not required. The results provide automated feedback in which the meaning and importance of the various welfare indicators, as well as certain risk factors that could explain a possible low (welfare) score. This also includes a (completely anonymous) comparison of the scores obtained for the different welfare indicators with the results of other farmers. By using the app several times over a longer period of time, the pig farmer can also evaluate how welfare on the farm changes over time and in relation to (management) adjustments. The PIGLOW app is available free of charge in nine languages (including Dutch, English and French) in the Google Play Store and the Apple Store. For extensive poultry farming, the free EBENE app was developed by project partner ITAVI in collaboration with ILVO.

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A promotional graphic for the PIGLOW app. It features a video player showing a farmer using the app, a QR code, and text describing the app's purpose. The text includes: 'Piglow - Pig Welfare Application PPILOW project', 'Smartphone app that enables farmers to self-assess the welfare of their pigs on-farm. The app can also be used by technician', and a duration of '4:10'.





[NEW]

INFRASTRUCTURE FOR EXPERIMENTAL RESEARCH ON SUSTAINABLE PIG PRODUCTION

The learning network PIGWEB aims to strengthen the community of pig research infrastructures. Hereby the project focuses on

- Offering and facilitating access to European top research infrastructures,
- strengthening a culture of collaboration between the research community and stakeholders from industry or society, and
- improving and integrating the services provided by these research infrastructures.

The project will play a key role in identifying the levers that can be used to achieve the objectives of the Green Deal. The ultimate goal is to produce safe, nutritious high-quality food with minimal impact on nature, while responding to citizen concerns about the welfare of farm animals.

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[NEW]

ALTERNATIVE DEWORMING STRATEGIES FOR ORGANIC LAYING HENS

Worm infections occur regularly in (organic) laying hen husbandry. These can be treated with the veterinary drugs flubendazole or fenbendazole. The basic principle of organic poultry farming is however to keep healthy, resilient chickens with a minimum use of veterinary drugs. In addition, as of January 1, 2022, a waiting period of 48 hours will be linked to the use of these veterinary drugs in the organic sector, which will lead to large economic losses.

The new project was started in addition to the already ongoing worm studies in which alternatives are being researched for the prevention and control of worm infections in organic laying hens. Together with partners CCBT, Bioforum and UGent we want to investigate in this parallel project exactly how a worm infection evolves on an organic poultry farm and what the relation is between a worm infection, production level and animal health. For this purpose several farms will be followed during a full laying period.

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IN THE SPOTLIGHT

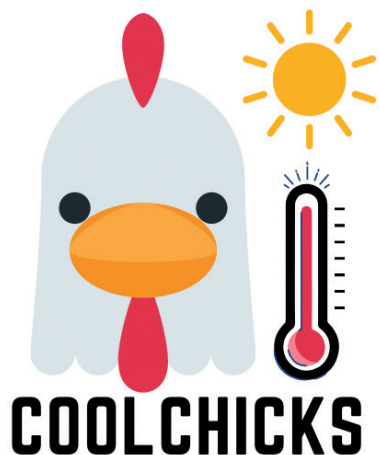
WOLF PRESENCE IN FLANDERS...AND IN PARLIAMENT

The presence of wolves in Flanders is being closely followed, among others by the Cabinet for the Environment. With regard to damage to agriculture, ILVO's advice has now also been requested via the Cabinet for Agriculture and Rural Development. ILVO has developed the following advice on the basis of a number of scientific sources (including INBO):

- A favorable combination of a number of factors ensures the advance of the wolf: speed of reproduction, the ability to travel far and to adapt to newly adapt to new urbanized areas
- The Flemish wolf pack is active in Limburg in a zone of approximately 400 km. Within this zone, the wolves will normally not allow any other conspecifics. The number of animals is therefore capped to those already present: one set of parents with their young. Packs have a constant size and there is never more than 1 pack in the same area. The danger to livestock does not continue to increase. Nevertheless, even one wolf or a pack can cause great damage to livestock. In order to reduce the risks, according to ILVO, it does not make sense to reduce the number of wolves. Shifting their territory is a better option.
- Studies indicate that human intervention in the number of wolves can exacerbate the problem. When this happens, the social ranking in the pack is disrupted and the packs fall apart, resulting in more lone wolves roaming the territory. As individuals they can cause more damage.

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[NEW]

FARM-SPECIFIC HEAT ACTION PLANS FOR POULTRY

To reduce heat stress in poultry, several measures are already being recommended, ranging from adapting feed and water management to the application of climatization and housing techniques. This advice is very valuable, but with climate change and the higher probability of heat waves, even more effort is needed to keep the animals safe from heat stress. In the LA trajectory 'COOLCHICKS', ILVO, Proefbedrijf Pluimveehouderij, Pehestat, Ghent University and Lanupro are looking for improvement strategies.

It is essential to predict in advance the tipping point at which poultry will experience heat stress, per specific poultry farm. Therefore the most predictive parameters (or possible combinations of parameters) will be determined. This will result in the development of a scientifically supported tool that indicates when to start the heat action plan at the farm. In addition, the aim is to develop a farm-specific heat action plan with recommendations around effective, economical and practically feasible measures.

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[NEW]

FREE-RANGE FARROWING PENS: HOW FEASIBLE ARE THEY?

What should pig farmers choose when doing short-term renovations or building of farrowing pens for their sows? Because traditional farrowing crates offer limited freedom of movement, they may want to consider free-range pens. These represent an innovative, welfare-friendly housing of the individual sow in the farrowing pen. However, objective practical knowledge and information about the economic feasibility of the systems are still scarce. The Triple F operational group is therefore collecting information about the challenges and bottlenecks that an initial group of users/pig farmers (the pioneers) of free-range farrowing pens are experiencing.

The aim of the initiative is to prevent possible problems for a second group of pig farmers (the innovators) and to help them make a more informed decision on the basis of the data obtained. The builders also learn from the 'wish list' of the innovators and the bottlenecks cited by the pioneers. Their systems thus become more practical and economically viable.

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Best Practice Hens



[NEW]

SUPPORTING THE TRANSITION TO CAGE-FREE HOUSING SYSTEMS FOR LAYING HENS IN EUROPE

On 21 May 2021, the project 'Best practices for alternative egg production systems' ('Best Practice Hens') was launched. This project aims to gather knowledge about the 'best practices' with regard to keeping pullets and laying hens in cage-free housing systems (barns, free range and organic) and to support the transition towards cage-free housing of laying hens in Europe.

Through these 'best practices', the aim is to provide European farmers with all kinds of practical information to support them in their transition from (enriched) cage to non-cage systems. Be sure to visit the project website www.bestpracticehens.eu

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[NEW]

FIRST AID FOR COWS WITH HEAT STRESS

After several hot summers, beef and dairy farmers are acutely aware of the consequences of heat stress on their animals. As a result, they are demanding information and support. The project 'EHB heat stress COW' was set up to support Flemish cattle farmers in their choice of appropriate preventive measures, both existing and new.

The project focuses on optimal silage and feed management, grazing strategies, ventilators, spraying and roof cooling. The researchers inform cattle farmers about the possibilities of the various techniques, and provide insight into the operating costs and possible investment costs. The cattle farmers will be guided in the choice of appropriate measures for their farm.

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[NEW]

LIMITING LOSSES THROUGH MORE UNIFORMITY WITHIN A FATTENING PIG ROUND

Individual finishing pigs in the same production round can sometimes show a high variation in body weight, resulting in economic and environmental costs. The UNIPIG project therefore investigates which are the most effective and cost-efficient farm-specific strategies to deal with variation in the fattening pig stable.

The main objective of the project is to develop and provide a web-based tool for pig farmers to assess the ecological and economic effects of heterogeneity within a fattening pig round and to reduce them. This will be achieved by implementation of management strategies and/or the use of precision livestock farming (PLF) technology. In this way the project contributes to a higher efficiency of the individual pig farm and more sustainable pig production in general.

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[NEW]

ALTERNATIVE METHODS FOR CATCHING AND LOADING BROILERS AND LAYING HENS

With the current, common catching method, chickens are often taken by the legs and carried upside down to the collection crates. In this project, an alternative catching method, in which the chickens remain upright, will be taught to catching teams. This method will be studied in both broiler and laying hen houses.

Labor efficiency and workload, animal-related welfare factors and possible production losses will be investigated for both the conventional and the alternative catching method. Also the opinion and attitude of those directly involved will also be taken into account. The research team will determine the costs and benefits for all partners in the chain. Additionally for broilers, the methods will also be compared to the mechanical catching method.

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Marine production and marine environment



ILVO RESEARCH VISION 2030

ILVO is working on sustainable exploitation of natural resources from the sea and innovative monitoring of the consequences of that exploitation on the marine ecosystem.

The increasing investments in 'blue growth' and 'blue biotechnology', are increasing the use of our sea. That growth has consequences for the natural resources, which ILVO will monitor in an efficient way using innovative techniques that it is helping to develop.

We're continuing to equip the Flemish fleet with sensors that provide valuable data that benefits both the fisheries and our research. We offer fishermen the tools they need to make their sustainability plans a success and work on the construction of one large ecosystem prediction model that enables the sustainable exploitation of our marine resources. We broaden our view to a systems vision and focus on valorization, international collaboration with various companies and close collaboration with policymakers.

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[RESULT]



KNOWLEDGE ABOUT MARINE CONNECTIVITY IS ESSENTIAL TO SUPPORT A SUSTAINABLE BLUE ECONOMY

Oceans and seas cover more than 70% of the Earth's surface and provide several important ecosystem services, such as food provision and climate regulation. At the same time, marine ecosystems are exposed to numerous (human) threats, such as habitat loss, overfishing and global warming. Sustainable management of these marine ecosystems is therefore essential, but there is still too little knowledge about the functioning and connectivity between habitats and various ecosystem components. Increasing that knowledge is the objective of the COST network initiative SEA-UNICORN.

This is a follow-up study to B-FishConnect, a study on connectivity in the North Sea. ILVO, KBIN and KU Leuven have now reported on the distribution of juvenile sole, a commercial fish species, specifically their migration and connectivity between their place of birth and the place where they continue to grow up as young fish. The research combined age measurements via diurnal rings in otoliths (the balance organ in fish) in 0-year-old sole to cross-reference a biophysical larval dispersal model.

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[RESULT]



FISHERIES LIGHT UP

In the sea, visual stimuli can be used to influence the response of fish during the catching process. ILVO tested different types of light sources to improve catch efficiency and selectivity in various fishing methods. Within the SYMAPA project - in which synergies between mariculture and passive fisheries are explored - the first tests were carried out in 2021. These first trials were carried out with innovative luminous pots for catching cuttlefish (*Sepia officinalis*). Those pots are an alternative to traditional active trawling, and consist of a trap-like network that is set up on the seabed on long ropes. Standard pots were compared to pots that were covered with luminous yarn. During the day, the yarn absorbs ultraviolet light, then at night it re-emits this as a green light. The catches of cuttlefish were as much as 10x greater, with no effect on bycatch. This promising innovation will be further tested and optimized during 2022.

The use of light has also proven to be useful in other fishing methods. For example, over the past 3 years extensive tests have been conducted with LED light in beam trawling to improve selectivity. The use of LED light in a 'Benthos release panel' (BRP) has resulted in up to 45% less undersized plaice being caught without any loss of commercial species. These results led to the new project 'LED there be light', which starts in 2022, and which will specifically look at optimization of the use of LED in different (active and passive) fishing methods.

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[RESULT]



MUSSELS AND OYSTERS SUFFER FROM UNWANTED GUESTS

The SYMAPA project, funded by De Blauwe Cluster/VLAIO, is investigating the feasibility of cultivating mussels, oysters and seaweed in the open sea. After two years, the longline systems for both mussels and flat oysters appear to withstanding the conditions of our North Sea. The horizontal cultivation system for seaweed, did not prove worthier, however, and researchers had to go back to the drawing board. The good news is that the mussels are showing strong growth with a high meat value. Optimization is still mainly needed to improve the sorting after harvest and keeping the systems clean. The lines of mussels and the baskets in which the oysters grow have a lot of trouble with unwanted guests, such as the annoying growth of crayfish, worms and other marine animals. These clog the meshes of the oyster baskets, thus restricting the supply of oxygen-rich water and food, and hindering the removal of excrement. Tests with coatings as well as mechanical and biological removal should reveal which technique is best for avoiding or removing the unwanted growth.

Further research is focusing first on capturing natural spat, i.e., baby oysters that will attach to hard structures. Off the west coast, several different substrates are being tested at different times. Secondly, we are examining how cuttlefish (*Sepia*), which are attracted to the culture installations, could be caught efficiently by passive fishing (see also 'Fisheries lights up').

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[RESULT]



PLASTIC POLLUTION IN THE BELGIAN NORTH SEA: NO ALARMING AMOUNTS OF MICROPLASTICS IN FISH AND SHELLFISH, PLASTIC FIBERS UBIQUITOUS WITH A HOT SPOT NEAR ZEEBRUGGE

More than three-quarters of all waste in the Belgian North Sea consists of macroplastics (larger plastic particles, plastic trash), which is a major source of pollution, particularly in the coastal zone

However, plastic fibers, largely derived from the decomposition of dolly ropes used in trawling, can be found everywhere, even further offshore. Also smaller plastic particles or microplastics of >50 µm (one-twentieth of a millimeter) also appear to be much more common along the coastal strip and in ports than further out to sea. All this is shown by a systematic monitoring study in the Belgian North Sea. Via the MarinePlastics research project, scientists now have the necessary input to draw up a macro and microplastics monitoring plan for the Belgian part of the North Sea, a European obligation.

On the fishing grounds where Belgian fishermen are active, ILVO and KBIN researchers have been studying commercial fish species and crustaceans for microplastics. There, the numbers are very low to absent. On the basis of this study, fish and crustaceans from Belgian fisheries can currently be considered as a safe source of food regarding microplastic contamination.

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[RESULT]



NEW REPORT ON RECREATIONAL MARINE FISHERIES SHOWS SHARP DECLINE IN COD IN THE BELGIAN NORTH SEA

The 2021 report of the national monitoring program on Belgian recreational marine fisheries showed higher seabass catches for 2019, but also reports a sharp decline in cod catches in the southern North Sea. The cod population in the southern North Sea has been experiencing a continuous decline for ten years. The accelerated and extremely sharp decline during 2019 (-90%) is therefore alarming and validates previous reports by recreational sea anglers about the decline of the stock. This negative evolution therefore raises questions about the effectiveness of the current recovery measures for the cod stocks in the southern North Sea.

The results are based on a tailored methodology that relies heavily on voluntary catch reports by a group of enthusiastic recreational sea anglers. This methodology for the monitoring of recreational catches was developed by ILVO and Flanders Marine Institute (VLIZ).

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[RESULT]



DIGITAL TWIN OF THE OCEAN: RESEARCH INFRASTRUCTURE BEING CREATED

An important research task at ILVO is to monitor the biological, ecological and chemical status of the sea and the seabed ecosystem. This extensive task is entering a new era with advanced DNA-based and data-driven techniques, building on the fishing fleet as a platform for data collection, image analysis of fisheries catches and a model-based approach to the functioning, exploitation, and management of the marine ecosystem. For optimal use of the collected data, ILVO is helping to build a 'digital Twin of the Ocean', we are further expanding the GEOVIS platform, and we are developing business intelligence tools for various users of the sea.

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IN THE SPOTLIGHT

NEW COVENANT FOR SUSTAINABLE FISHERIES: FROM BOAT TO PLATE AND LAUNCH OF 'VISSERIJ VERDUURZAAMT' ACCREDITATION

In June 2021, Flemish Minister for Fisheries Hilde Crevits, the Rederscentrale, Natuurpunt, ILVO, the Flemish Department of Agriculture and Fisheries and the Province of West Flanders ratified the new Flemish covenant for sustainable fisheries 2021-2025 'Visserij Verduurzaamt' (in English, 'On Course to Sustainability'). The six partners commit to working on sustainable quality and fresh local fish, thus contributing to the objectives of the European Green Deal. The ambitions of the new covenant are situated on three levels: protection of the natural and social environment, on-shore processing and production of the fish caught at sea, and consumer-centered communication and consumption.

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IN THE SPOTLIGHT

RAY, FISH OF THE YEAR 2021

Ray was named 'fish of the year 2021' in Flanders. VLAM launched a promotional campaign for this fish species, with a remarkable number of nuances and facts. Once again ILVO provided the photo of this sustainable 'fish of the year'. 'Ray actually represents a large family of species with large populations in the areas fished by the Flemish fleet, as well as species that need protection because of their vulnerable profile', says ILVO researcher Heleen Lenoir. The promotion was limited to 3 of the 12 rays present in the North Sea: thornback ray (*Raja clavata* (RJC), blonde ray (*Raja brachyura* (RJH)) and spotted ray (*Raja montagui* (RJM)). 'Since 2021, the Flemish fishermen have committed to land only these three species and to return the others alive to the sea.'

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IN THE SPOTLIGHT

MEMBERS OF PARLIAMENT INTERESTED IN 'VISSERIJ VERDUURZAAMT'

During their visit to ILVO-Marine in Ostend, on September 24 2021, the parliamentarians of the Agriculture, Fisheries and Rural Policy Area asked a lot of interested questions about the algae research, about aquaculture projects in aquaculture projects in general, and about the *Visserij Verduurzaamt* project.

ILVO got a chance to explain how the scientific monitoring data are collected, which ultimately provides a picture of the evolution and the state of health of marine ecosystems. As a first, they were shown the new breeding infrastructure at the InnovOcean Campus. The new building will be completed on schedule in early 2022.

Commission President Bart Dochy: 'Despite the enormous challenges facing the fisheries sector, I still see a lot of positivity and enthusiasm to move forward, both among people from the fishing industry and among the among the scientists.'

The delegation also visited the Rederscentrale, the Flemish Fish Auction and VLIZ.

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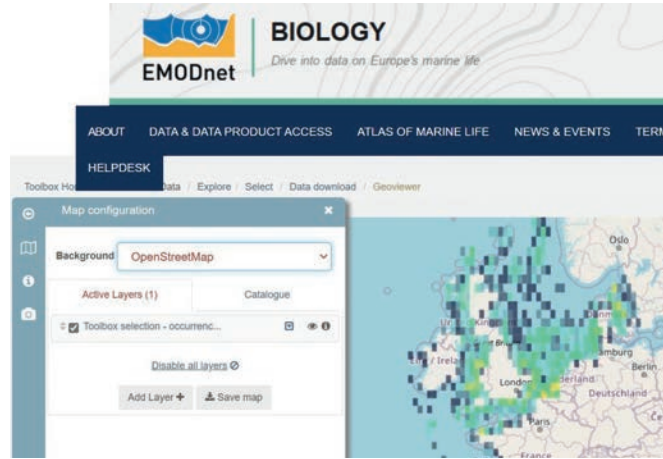
[NEW]

ANTIBIOTIC RESIDUES AND RESISTANCE TRANSFER IN AQUATIC ENVIRONMENTS

In a new international project, PARRTAE - from the joint action Aquatic Pollutants and financed by the JPIs on Water, Oceans and Antimicrobial Resistance with partners from Belgium, Norway, Sweden and Gran Canaria - will examine to what extent there are antibiotic resistant bacteria and antibiotic residues in both freshwater (groundwater, surface water, wastewater) and in the marine environment such as the North Sea, aquaculture and ports.

The question arises from the observation that science does not yet have complete answers concerning the spread of antibiotic resistance via the aquatic environment. At ILVO samples will be collected and analyzed for antibiotic residues and antibiotic resistant bacteria from sites with a high and low expected load of antibiotic residues, including an agricultural region with high antibiotic use. The actual transfer of resistance plasmids will be determined within the project consortium using the indicator bacteria *E. coli*, *Vibrio* and *Shewanella*.

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[NEW]

EUROPEAN MARINE OBSERVATION AND DATA NETWORK ENTERS FOURTH PHASE

EMODNET (European Marine Observation and Data Network) wants to open up marine data according to international standards for researchers, governments and private companies. In phase IV of the EMODNET process, continuity is ensured in the development and maintenance of the portal. ILVO provides access to ecological marine data on the Belgian part of the North Sea.

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[NEW]

TOO LITTLE DATA ON SOLE IN WESTERN WATERS: NEW RESEARCH SEEKS TO FILL THE GAPS VIA (e)DNA

Fishermen focusing on sole stocks in the southern Celtic Sea and southwest of Ireland (ICES areas 27.7hk) have been faced in recent years with little positive advice and declining allowable catches. The cause of this is a shortage of data and the resulting lack of clarity about the stock size (biomass) and the genetic identity of the stock. The new EFMZV project SoleDNA, carried out by ILVO, will use genetic techniques to address two important problems regarding the current management of this fish stock.

Specifically, SoleDNA will examine the extent to which 'free' DNA (eDNA) can be used to determine the presence and biomass of both sole and plaice. The results will contribute to a more efficient and sustainable management of data-poor stocks (such as sole in 7h-k) by providing better information for quota negotiations - e.g. with the United Kingdom after Brexit - and in the day-to-day management of fisheries on these stocks.

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Toward climate-smart food production



ILVO RESEARCH VISION 2030

ILVO's Center of Expertise for Agriculture & Climate works toward a food chain that is environmentally friendly, climate proof and profitable.

With our knowledge we try to reduce the impact of agriculture on the climate (mitigation) as well as better helping farming adapt (or the agricultural sector) to the consequences of climate change (adaptation). In doing so, we always keep in mind the broader sustainability of the agro-food chain.

Other important spearheads are the efficient use of natural resources, carbon storage, closing loops, limiting losses throughout the chain and sustainable consumption patterns.

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RESULT



GROWING SUBSTRATES WITH RENEWABLE RAW MATERIALS MATCH THE PERFORMANCE OF CLASSIC, LESS SUSTAINABLE ONES

Comparative greenhouse research on tomato and strawberry reveal no differences in yield after the mineral wool and a large part of the peat in the horticultural substrate are replaced with renewable or less energy-intensive products such as wood fiber, chitin, biochar or green compost. The Interreg 2 Seas research project Horti-BlueC shows with this result a way that greenhouse crops can become more climate-friendly.

The horticulture and growing media sectors know already longtime that peat and mineral wool - two important ingredients of their cultivation substrate - have a heavy environmental and climate burden. The scientific search for workable, competitive substrate recipes with more sustainable properties is now bearing fruit.

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aardbeien telen op innovatieve teelt-substraten

4:28



RESULT



PERSONALIZED CLIMATE APPROACH TO DAIRY FARMING (KLIMREK) ON THE FAST TRACK

Two times good news about the VLAIO-project KLIMREK and its results in the dairy farming sector. The scan methodology to map out the greenhouse gas emissions of an individual farm per source is finished and has already been applied nearly 15 times. The scan appears to be able to cope very well with the great diversity of operations. The automation via a handy online tool for the consultants has been completed. Via the pilot farms we also have a clear top three of emissions: On the first place are enteric emissions, followed by feed management and manure management. Klimrek immediately calculates a cost-benefit recommendation about climate-friendly interventions on the farm. Working on the calving age and the amount of fertilizer used are items that often come back as low-hanging fruit.

At the end of 2021, the Flemish government decided to set aside almost half a million euros extra for an accelerated rollout of KLIMREK in dairy farming. Approximately 200 dairy farms can immediately receive guidance from the researchers of ILVO and Boerenbond, now extended with colleagues from Inagro and Hooibeekhoeve. Together, these farms can achieve an estimated greenhouse gas reduction in the next 20 years of 174,000 tons of CO₂ equivalents.

The dairy processors are also committed to help support the KLIMREK rollout. In 4 years time, 3,000 dairy farms will have been screened. The consultants have all received the required training courses by now.

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IN THE SPOTLIGHT

RUMINANT METHANE AND CLIMATE IMPACT: A DIFFERENCE BETWEEN GWP AND GWP*-STAR CALCULATION

Ahead of the UN climate conference, in November 2021 in Glasgow, the agriculture sector and researchers looked forward to whether or not to adopt the new scientific insights regarding the impact of methane. In addition to the currently used GWP calculation a GWP* calculation ('GWP star') is also circulating. This can make a big difference to the impact of methane from ruminants. The ILVO Center of Expertise for Agriculture and Climate (ELK) closely followed the developments and made the knowledge available through the ILVO channels.

GWP is the abbreviation of 'global warming potential'. It is the measure of the degree to which a gas will cause warming over the next 100 years, compared to the same volume of CO₂. The GWP* approach is considered to be more accurate: GWP* takes more account of the lifetime of the greenhouse gas in the atmosphere. Unlike CO₂, methane is a short-lived gas with an average residence time of 10 – 12 years. A constant emission (e.g. same number of animals and same production level in cattle breeding) over time does not cause an additional concentration of methane in the atmosphere and consequently does not increase warming. The GWP* more accurately accounts for this. The positive effect of this calculation method is dependent on a stable level of methane emissions over time.

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[RESULT]



INCREASED CARBON STORAGE IN THE SEABED AS AN EFFECT OF MARINE WIND FARMS

Marine animals that grow on offshore wind turbines (such as mussels) affect the seabed. We already knew that, but thanks to recent Belgian-Dutch research results, we now know exactly how important this effect is.

The results were presented in two recently published papers. They describe in detail how organic material becomes concentrated in and around the wind farms and is deposited in lower quantities a distance away. This provides greater carbon storage in the seafloor within the wind farms, which is important in the context of climate compensation, but also for changes within the sometimes fragile bottom fauna. The results can contribute to decision-making on sensitive issues such as the spatial planning of offshore wind farms in marine protected areas and the future decommissioning of offshore wind turbines. In collaboration with the Royal Belgian Institute of Natural Sciences, the University of Ghent, the University of Liège and the Royal Dutch Institute for Sea Research.

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[RESULT]



HOPEFUL NEWS: COWS DIGEST CLIMATE-ADAPTIVE GRASS

The first year of field and stall experiments with the grass species tall fescue, an uncommon crop in Flanders, were performed within the framework of the VLAIO project KLIMGRAS. The results are hopeful: compared to the classic grass mixtures of perennial ryegrass it appears that a meadow planted with tall fescue is at least as productive as with perennial ryegrass in terms of both dry matter yield and crude protein content.

'With a well-considered mowing management, the nutritional value of ensiled grass can also stand up to comparison. Despite the lower digestibility, the animals still appear to be able to cope very well with the grass. The latter was uncertain before we started with tall fescue. These findings offer prospects for dairy farmers to incorporate this type of grass in their farm operations on a larger scale, now that more summer droughts are occurring,' says researcher Nico Peiren. KLIMGRAS is shooting for proven adaptive solutions against climate changes. Tall fescue, a grass species cultivated in southern Europe, is known to root deeper and thus to have more water available.

The approach in this project is remarkably integrated and multidisciplinary: plant researchers, emissions researchers, animal researchers and agricultural economists put their experimental results together to provide a more complete answer to climate issues in the agricultural sector.

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[NEW]

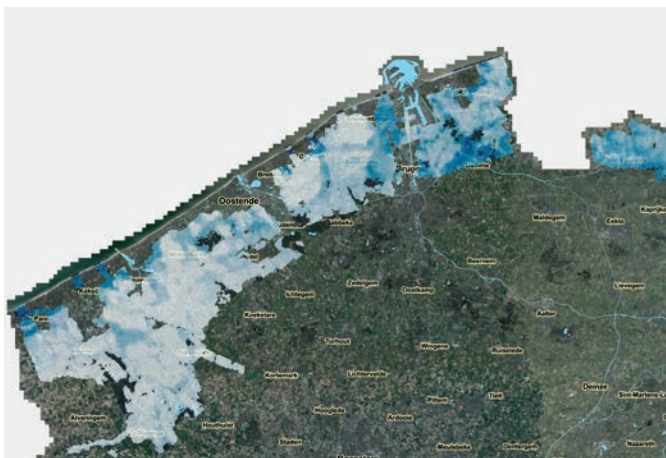
OPPORTUNITIES FOR LEVEL-CONTROLLED DRAINAGE IN FLANDERS

The VLAIO-project 'OP-PEIL' aims at nothing less than a breakthrough for level-controlled drainage (LCD) systems in Flemish agricultural soils. This form of drainage does not drain water continuously, as is the case with conventional drainage, but allows water to be drained at times when it is really needed, such as during the sowing period. This form of drainage can be both socially and agriculturally profitable, and effective in the short term.

OP-PEIL will specifically focus on:

- Offering decision support guidelines and practical recommendations to farms on the plot-specific application of LCD.
- Encouraging and guiding the target farms about the conversion from conventional drainage to LCD, with an emphasis on constructing a feasible and financially viable LCD system.
- Maximal sharing of the knowledge about LCD with farmers and governmental authorities. The project team as well as the farmers in the target group share their insights during demonstration activities and workshops.

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[NEW]

CURIEUZE NEUZEN PLACES 500 SENSORS IN POTATO FIELDS

'CurieuzeNeuzen in de Tuin' (CuriousNoses in the Garden) is the largest citizen science study in Flanders on heat and drought ever. In the spring of 2021, 500 smart sensors called 'field daggers' were installed in potato fields all over Flanders to gather information about the microclimate in our potato fields.

The sensors collect data from the emergence of the plants until harvest. The participating growers can view all measurements and data via a personal dashboard in WatchITgrow (VITO) dashboard, and closely follow all the measurements and the analyses of the soil samples.

The participating fields, spread across Flanders, were selected in consultation with ILVO, the interprovincial Experimental Center for Potato Production (PCA vzw), INAGRO, the Hooibeekhoeve, Agristo and Clarebout.

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www.Curieuzeneuzen.be/landbouw

[NEW]

SALINE AGRICULTURE FOR CLIMATE ADAPTATION

SALAD (Saline Agriculture for ADaptation) is a transcontinental, innovative research project on food systems and climate. The focus is on ensuring food security under climate change through saline agriculture, where vision, research and practice are being aligned between European and African countries that are focusing on scaling up saline agriculture.

According to FAO reports, advancing salinization is in fact one of the main causes of soil degradation in Europe, the Near East and North Africa. This is putting conventional agriculture, which is based on freshwater resources, under increasing pressure. SALAD therefore aims to improve the resilience of food production in saline and potentially saline agricultural areas in the Mediterranean Sea region and the North Sea region. This is done by supporting the development and sustainable use of innovative salt-tolerant crops, identification and further development of saline-adapted crop cultivation techniques, and researching and testing of innovative market development techniques and tools to scale up certain crops/food chains in the EU and Africa, to exchange knowledge, and to transfer practical and adaptive solutions.

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This project is part of the programme of the ERA-NET Cofund FOSC that has received funding from the European Union's Horizon 2020 research and innovation programme: Grant agreement N° 862555



[NEW]

WHAT IS THE CARBON STORAGE POTENTIAL OF AGRICULTURAL SOILS IN EUROPE?

Carbon storage in soils contributes to climate change mitigation. The aim of CarboSeq - an internal research project of EJP SOIL - is to assess the potential of different management practices for soil carbon storage, taking into account technical and economic constraints. This estimation is carried out in the different regions and countries of Europe.

ILVO is responsible for the collection of Flemish data on long-term field experiments, and leads a work package that gathers various data for crop management.

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[NEW]

MORE CARBON STORAGE, BUT WHAT ABOUT NITROUS OXIDE, METHANE AND NITRATE LOSSES?

Within the context of climate change there is an increasing focus on agricultural practices that contribute to carbon sequestration to mitigate rising atmospheric CO₂ levels. While it is known that these soil management strategies can also affect soil N₂O and CH₄ fluxes and N losses through leaching, data and knowledge are still fragmented.

SOMMIT, an internal research project of the European Joint Programme EJP SOIL, therefore aims to assess the nature (quality) and dosage of the organic material that is applied (quality), how it is applied to the soil (application method), when and where it is applied (pedo-climatological conditions) and the impact of carbon sequestration, on nitrous oxide and methane emissions and on nitrate leaching losses. The project finally aims to develop a set of indicators that accurately evaluate the performance of soil management practices in several pedo-climatological conditions in Europe.

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EJP SOIL has received funding from the European Union's Horizon 2020 research and innovation programme: Grant agreement N° 862695



EJP SOIL has received funding from the European Union's Horizon 2020 research and innovation programme: Grant agreement N° 862695



[NEW]

ILVO AND DEPARTMENT OF AGRICULTURE AND FISHERIES ARE CREATING A ROADMAP AND GEODATA PLATFORM FOR CARBON AGRICULTURE

The consequences of climate change are being felt more and more. Carbon farming can help to counteract climate change while increasing the resilience of soils. In Flanders, too, interest in carbon farming is growing noticeably. A variety of initiatives are being taken, among others from companies, who want to compensate farmers for the degree to which they store carbon in their (arable) soils.

In the recently started LIFE CarbonCounts project, ILVO and the Department of Agriculture and Fisheries will map out how Carbon Farming can be rolled out more broadly in a feasible, fair and efficient manner and be rolled out more broadly and they are working on a geodata platform for the further development of carbon farming in Flanders.

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NEW

NEW, LOW-COST SCREENING METHODS FOR ASSESSING CROP YIELD AND QUALITY UNDER CHANGING CLIMATE

CropYQualT-CEC is part of an effort to help the agricultural sector to cope with rapidly changing climate conditions. The concrete goal is to make progress in current breeding programs, with improved methodologies (traits and protocols) for phenotyping.

Models will be developed based on data derived from 'high throughput phenotyping tools' and laboratory analyses, which are aimed at predicting crop yield and quality traits. This study focuses on the crops wheat, soybean, quinoa, rice and corn.

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NEW

BEER DRAFF, RAPESEED MEAL AND SEAWEED FOR METHANE REDUCTION IN DAIRY CATTLE

The LA trajectory HappyCliMi is testing the application of rapeseed meal and beer draff in feed rations for dairy cattle in practice, and investigates the underlying mechanism. In addition, within this project other new raw materials and by-products available in Flanders will be screened in vitro for their potential to reduce methane production in dairy cattle. This concerns algae, insects, microbial protein and by-products from viticulture or leek cultivation.

The research results from HappyCliMi will give dairy farmers a clear manual on how to use rapeseed meal and fermented cereal by-products, for example, to reduce the methane emissions from their cattle. Further they will find out to what extent the by-products they are already using have the potential to be validated as a methane-reducing additive or component.

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IN THE SPOTLIGHT

DAIRY FARMER AND RESEARCHERS PLANT TREES FOR THE CLIMATE

In the winter of 2021, dairy farmer Kris Heirbaut from Temse just like 20 other Flemish farmers got started with 'agroforestry'. He planted several rows of poplar, sessile oak and sweet chestnut on one of his fields. In doing so, he opted for an extra income from wood production in the long term, more biodiversity on his farm and farm and maximum carbon storage under his soils and in the wood. The Agroforestry Vlaanderen Consortium, led by ILVO, assisted Kris in drawing up the planting plans and actually planting the trees.

Bert Reubens (ILVO researcher and coordinator of Agroforestry Flanders): 'Increasingly, agroforestry is seen as a robust and sustainable form of agriculture that can help tackle the climate challenges of today and tomorrow. Introducing trees on a farm has several advantages. They provide shelter for livestock and crops against extreme weather conditions. They store carbon in the soil and in their wood, they promote biodiversity and improve the general soil quality. This makes that soil is more resistant to drought, rainfall and wind.'

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[NEW]

CLIMATE ADAPTATION THROUGH SOIL AND CROP MANAGEMENT: SYNTHESIS AND WAY FORWARD

In CLIMASOMA we explore what the existing scientific literature can teach us about the role of soil management on the hydrological and biological soil functions, and on the resilience of crop production under climate change within specific pedo-climatological contexts.

Specifically, we seek frameworks and soil and crop models that consider soil structure as a dynamic key variable to consider. In doing so, the project identifies knowledge gaps around the relationship between soil management and the hydrological and biological functioning of the soil. The ultimate goal is the optimization of that relationship, which consequently leads to better climate adaptation.

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[NEW]

BLUE-GREEN STRATEGIES FOR CLIMATE ADAPTATION

Persistent droughts between 2017 and 2021 have made it clear that Flanders is insufficiently prepared for water scarcity. With the TURQUOISE project, the aim is to take a proactive approach based on the functioning of ecosystems, in order to increase the availability of water in dry periods.

Before blue-green solutions can be properly planned, implemented and scaled up, more empirical evidence needs to be obtained about 1) the effectiveness (or side effects) of measures at a larger scale and 2) how many such measures are needed to reduce drought risk to an acceptable level. In addition, levers and obstacles to the implementation of green and blue measures will also be mapped out via a community of practice.

This knowledge will help to overcome the current, rather fragmented visions and implementations from the various sectors into logical synergies and an integrated approach for a resilient water landscape. In concrete terms the TURQUOISE project is intended to develop a decision-supporting framework and test it in practice in order to facilitate planning and increase the implementation rate of green adaptation strategies.

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[NEW]

ARE 'HAIRY ROOTS' THE KEY TO MAKE PLANTS MORE CLIMATE-ROBUST?

Can you make plants more drought-resistant by exposing their tissue to specific soil bacteria in the lab? Plant scientists have known for some time that they can use this 'bacterial breeding' to alter the root characteristics of a plant. In ornamental plant cultivation, it has already led to varieties with a more beautiful and compact shape. Whether it is also successful to chrysanthemum, sunflower, apple and rose to make them more climate proof is the question that will be investigated in the new RootsPlus project over the next 3 years. This is a European collaboration between Germany (University of Hannover), Poland (Nicolaus Copernicus University), Romania (University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca) and ILVO (project coordinator). In Flanders the project is financed by VLAIO (Business Project). ILVO is working with 2 companies.

'The technique is difficult and plant-dependent, but you get a new cultivar ready for the market much faster than with other breeding techniques', says project coordinator Ellen De Keyser (ILVO).

More info: www.rootsplus.eu

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Profitable and resilient food systems



ILVO RESEARCH VISION 2030

ILVO wants to contribute to better profitability throughout the agri-food chain, with the important precondition that this does not interfere with environmental, climate, animal welfare or social objectives.

In the long term, food systems can only continue to exist if each link is viable and therefore profitable. Today, that profitability is under pressure. The changes we propose range from relatively minor adjustments within existing food systems to drastic changes of entire systems. They are situated at the levels of production, processing, distribution and consumption. We mainly focus on system innovations in a circular context, diversification and demand-driven production.

The creation of new markets and sales channels and more attention to channels and more focus on added value are crucial to achieve a profitable and resilient food system.

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[RESULT]



OBJECTIVE AND INSPIRING: ILVO LAUNCHES LANDBOUW - VERDIENWIJZER

'Where are the opportunities for MY farm, combined with MY interests, to get a better income at the end of the month?' That is the question that Flemish farmers can now ask the new, digital *landbouwverdienwijzer* (farmer's earning guide) of ILVO. This earning guide was officially launched on 7 December 2021. It is suitable for all types of farms, because all sectors and all possible sales channels and management choices are included in the tool.

Researcher Edward Belderbos, himself a former entrepreneur, worked on the tool with a number of ILVO colleagues and with the farmers' organizations. 'Many farmers wonder about where they want to take their farm, or where it needs to evolve. The earning indicator helps, through a thorough analysis, to arrive at an individual, suitable recommendation, without background interference from hidden interests.

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[RESULT]



GREAT INTEREST FOR FIRST FLEMISH WINE SYMPOSIUM

The very first Flemish wine symposium in 2021 brought together 350 winegrowers, agricultural and wine researchers, wine experts and policy makers. The symposium was an initiative of Flemish Minister of Agriculture and Food Hilde Crevits, together with several partners.

Flemish wine growers seem to have the wind in their sails: they are growing strongly, they show remarkable diversity and they show a clear ambition. In almost 10 years' time, wine production has increased sixfold. The research world is in speeding up to serve the wine sector: sustainable vineyard management, analytical techniques, control of plant diseases, controlled steering of the vinification, even locally-adapted grape varieties are research topics that are (or will be) put on the rails via various partnerships. ILVO and pcfuit are taking the lead.

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IN THE SPOTLIGHT

CRISES AND POSITION OF THE FARMER

2021 had a tremendous impact on the agricultural and food system, and on society as a result. Profitability in a number of sectors, including the pig farming, was under severe pressure. We also continue to be confronted with, among other things, climate challenges, the nitrogen issue and the covid pandemic. It is quite a challenge to maintain a profitable and resilient farm in this socio-economic context.

We especially want to strengthen the position of the farmer in the food system, in a wide variety of ways. We are looking for innovative partnerships that bring farmer and consumer back together, we are looking for the opportunities that options like agroecology or agroforestry can present for the farmer, but we also look for the potential of promising niches such as viticulture.

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RESULT



IN DIALOGUE WITH FLEMISH LIVESTOCK FARMERS ABOUT AGROECOLOGY

Both organic and conventional livestock farmers regularly apply agroecological principles on a regular basis. The stereotypical agroecological farmer does not exist. Economic laws that farmer-entrepreneurs themselves set in motion force them to make compromises in practice. This turns out to be the underexposed Achilles' heel for those striving for a full-scale roll out of agroecology as a model. That was one of the findings in the doctorate of ILVO/UCLouvain researcher Louis Tessier. 'Agroecology as an agricultural system ultimately functions in a free a free market, in which supply and demand, and thus competition plays. On the ecological level the model is well established, but on the economic and social level, it does not provide sufficient answers.'

Tessier interviewed some 40 Flemish beef farmers, each with a very different approach to farming, about the relevance of agroecology to their practice. The study revealed what exactly motivates or prevents the farmers exactly motivates or holds them back. Tessier also took important steps to make the concept of agroecology 'measurable' in practice. The doctorate provides new insights for the debate on food systems.

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IN THE SPOTLIGHT

WANTED: YOUNG 'CHANGEMAKERS' WITH A WIDE NETWORK AND A PASSION FOR AGRICULTURE AND FOOD

Farmers are under high pressure, not only because of the European Green Deal and climate ambitions, but also because of their weak negotiating position in the (world) market and growing distrust from society. The COCOREADO project wants to help them strengthen their position, by making use of three known success factors: relying on ambassadors, promoting good (local) practices and working with young people.

Therefore, in the autumn of 2021, Europe went in search of 40 young ambassadors who want to drive sustainable change in the agri-food chain. The selected young people will be offered training and networking opportunities on city trips throughout Europe over the next 3 years. In this way COCOREADO wants to give them the knowledge, skills and self-confidence to fully play their role as ambassadors and changemakers. Finally, the best ideas that emerge from the network of ambassadors have a chance of being funded by the project.

COCOREADO is a project funded by the European Commission and coordinated by KU Leuven. ILVO is the Flemish research partner.

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[NEW]

ROUTEPLANNER MELKVEE 2.0: SUCCESSFUL STRATEGIC DECISION TOOL DEMANDS SCALING UP

How can we help dairy farmers facing strategic business decisions (growth, rearing young stock, manure disposal, etc.) to substantiate their decisions in a way that is tailored to their farm within a changing market and social context? ILVO has already produced a first version of a scientifically based decision tool for this sector. The ambition of the Dairy Route Planner (*Routeplanner Melkvee*) 2.0 project is to make this tool even more user-friendly, more accurate and more widely applicable. We are therefore scaling up the existing Dairy Cattle Route Planner and also making it complementary to other existing tools.

By integrating economics, the social dimension and the environment in a planning tool, this makes it possible to start from the specific existing farm situation and weigh the choices that will lead to quality of life, a better life for the dairy farmer and the family, and substantial environmental and climate benefits.

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[NEW]

MIX OF ANIMALS, CROPS AND TREES

AGROMIX, which stands for 'AGROforestry and MIXed farming systems' focuses over the next four years on farming systems that combine animal production, plant production and/or trees. The research should shed light on economic and climatic resilience, the provision of ecosystem services and the carbon balance of mixed systems.

ILVO has an important coordinating role in twelve European co-design pilots. These can be existing farms, but can also be cooperative structures or stakeholder groups. The pilots always take place under real practical conditions, where all relevant stakeholders are involved in the participatory design process and the implementation of innovative forms of mixed farming and agroforestry. One of these pilots is situated in Flanders and is linked to PHAE, the Experimental Platform for Agroecology in Hansbeke.

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[NEW]

LEVERS FOR SCALING UP ORGANIC AND SUSTAINABLE FOOD SYSTEMS

FOODLEVERS aims to identify levers to further develop and scale up innovative organic food systems. This should promote resource efficiency, identify inefficiencies, uncover the motives in the decision-making processes that have led to the current configuration of food systems, identify configurations that 'work' and identify how they can be scaled up.

The project, with ILVO as 1 of the 8 partners, uses systems thinking to investigate the potential leverage in food systems. The focus here is on products, production technologies, marketing practices and actors. Instead of considering each link in a food system, FOODLEVERS takes their interdependence into account. Changes in the behavior of actors in the various links can, if brought together, bring about systemic change. In order to build such a holistic view of food systems, this project follows a multidisciplinary and multi-actor approach. In innovative case studies of organic and sustainable food systems, the different behaviors are tracked 'from cradle to grave', to identify potential levers for greater sustainability.

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[NEW]

DAIRY FARMERS WANT TO MAKE OPERATIONAL CHANGES SMARTER AND FASTER

An ever-increasing group of dairy farmers is struggling to make financial ends meet. The MELKTOOLS Operational Group wishes to improve the economic resilience of the member dairy farmers and to disseminate the findings to the entire dairy sector. They will do this by developing a number of calculation tools.

The newly developed, user-friendly and web-based calculation tools must enable individual dairy farmers to make interim calculations about the sector's most important key parameters. The tool must enable a farm to switch faster and more rationally when making operational choices. After all, it is precisely those operational choices that determine the ultimate profitability. This tool is the missing link between all the other tools or accounting packages that already exist.

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 Europees Landbouwfonds
voor Plattelandsontwikkeling:
Europa investeert
in zijn platteland







Agriculture and countryside in an urbanized society



ILVO RESEARCH VISION 2030

ILVO wants to work towards a liveable countryside where there is literally and figuratively room for agriculture, nature and forest.

In fact, our countryside, just as in other European regions, is urbanizing rapidly. This has an enormous impact on the countryside and its users: the result is an area with rural and urban characteristics. The wealth of functions that is present in such a peri-urban area offers opportunities, but also leads to conflicts. New urban desires such as rest and relaxation, recreation, tourism, private space and exclusive living put the more traditional functions of agriculture, nature and forests under pressure.

ILVO wants to feed the social discussion about the use of our open space by mapping gradual, subtle changes in land use, as well as their impact on ecosystem services such as food production, biodiversity, water buffering and cooling. ILVO is also looking for solutions for multiple land use and alliances between different rural actors

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RESULT



SOCIAL JUSTICE IN LOCAL FOOD STRATEGIES: THE BOARD GAME

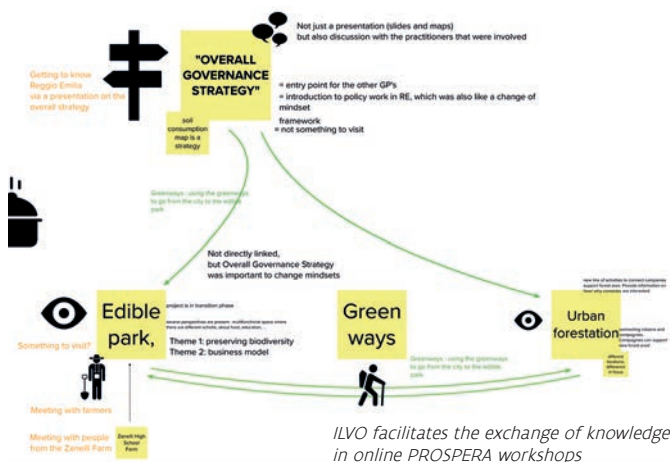
Cities and towns can add social value in a variety of ways within the food system of their city or region, provided that they work closely with citizens and local stakeholders in doing so. Based on her doctoral research, Sara Smaal developed a board game with which urban actors can enter into a dialogue with each other on the social impact of food policies and food initiatives. The game bears the name RE-ADJUSTool. This stands for **RE**flecting on & **AD**vancing Justice in **UR**ban food **ST**rategies.

With the help of an analytical framework, question cards and several figures to fill in, the players discover what is involved in a fairer, more humane and more and more inclusive food system. Municipalities, food initiatives and Food Partnerships can use the RE-ADJUSTool to review and refine their existing goals and measures in the area of social justice (evaluation), but also to discuss and operationalize what action steps are needed in the future in their city (brainstorming). The RE-ADJUSTool has three editions: DELUXE (a reusable box), DIY (PDFs to print and cut out yourself) and ONLINE (slides). Finally, there are game extensions available where the text of the cards is replaced by dotted lines on which one can fill in bonus questions or translations. All packages are available in Dutch and in English, and can be downloaded or requested at <https://recoms.eu/re-adjustool>

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RESULT



FIVE EUROPEAN CITIES LEARN FROM EACH OTHER

In the Interreg Europe project PROSPERA, five cities exchange knowledge about the sustainable development of peri-urban areas, including better protection of food production and biodiversity in the urban periphery. Levers for a better management of this natural capital are: (1) smart governance, (2) ecological (and local) value chains and (3) sustainable public-private partnerships. The participating regions are the municipality of Reggio Emilia (IT), city of Ghent (BE), municipality of Aristoteli Chalkidikis (GR), EDC Debrecen Center for Urban and Economic Development (HU), and municipality of Varberg (SE).

ILVO is responsible for the methodological underpinning of the interregional learning, which was extra challenging during the covid-19 pandemic. All the tips and tricks to successfully organize an interregional, interactive and online learning environment we collected in a set of guidelines. In this way ILVO, together with the regional project partners, mapped out the main challenges and at least 15 inspiring cases. Based on that, each region draws up an action plan with concrete policy instruments. In the second phase of the project the action plans are effectively implemented in the regions. ILVO's role in this phase is more limited.

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IN THE SPOTLIGHT

FABULOUS FARMERS AT WORK IN MERODE AND THE PAJOTTENLAND

In the FABulous Farmers project we are trying to establish collaborations and mutual understanding between the agricultural sector, research and society at large around the theme of functional agrobiodiversity.

Together with the non-profit organization RURANT vzw, we worked in the Merode area with citizen scientists, who enthusiastically monitored and cared for their square-meter gardens from May to October. The citizen scientists noted the yields of the crops in their gardens and together with the researchers monitored which insects came to visit their garden. In August, a bicycle tour was organized during which several gardens were visited and the differences between the performances of the gardens were discussed. The colleagues from *Boeren Natuur Vlaanderen* gave more about the construction of field borders and the associated benefits and challenges for farmers. We also made the link between the observations in the different gardens and the surrounding landscape.

In addition, a walk was organized in the Pajottenland along a number of fields belonging to farmers from the FABulous farmers network, who in collaboration with *Boeren Natuur Vlaanderen* have sown various flower mixtures on their field edges. An insect and flower bingo helped participants to get to know a number of species that can be used for natural pest control.

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RESULT



FARMERS LEARN FROM FARMERS – WHY FARM DEMOS ARE SO IMPORTANT FOR KNOWLEDGE BUILDING AMONG FARMERS

It was already suspected that learning from each other, whether or not through farm demos, was essential for knowledge development among farmers. Thanks to the research of ILVO and KU Leuven education specialist Hanne Cooreman, we can now confirm this and explain it: demonstrations for and with farmers ensure interactive knowledge creation, with opportunities to gain sensory experiences and above all to participate in facilitated discussions. In other words, a dialogue is better than a monologue, and questions and assignments for participants stimulate learning. Even better, have them do something, so that they get both head and hands involved in the topic of the demo.

That way, demos are triggers for connecting with and positioning in relation to others, adding new knowledge on top of existing knowledge, thinking critically about existing and new methods, and applying new insights. 'That pedagogical knowledge can now be used to make learning-from-each-other even more effective in the dissemination of knowledge with a view towards increasing sustainability in agriculture', says Hanne Cooreman. 'For example, we advocate for expanding the demos with other players within agriculture, a new concept called embedded on farm demonstrations. In addition, it is also important to stimulate engagement and trust, as these appear to be essential for a demo with impact.'

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RESULT



EU PROJECT RECOMS UNVEILS ATYPICAL SCIENCE COMMUNICATION: RESILIENCE IS THE SUBJECT OF RESEARCH ART IN THE BRUSSELS PARK

From June 7 to 11, 2021, 15 international PhD students in Brussels made an original presentation of their results on the themes of open space, water, climate change, equitable food strategies, environmental injustice and soft mobility. All of these were part of the RECOMS project, a prestigious European Marie Skłodowska Curie training network. Partners from six European countries - including ILVO - provided intensive training for 15 provided intensive training for 15 doctoral students from abroad on aspects of community strengthening and resilience. A so-called ConfEx (an interactive conference and an art exhibition in an appropriate outdoor setting) provide a festive conclusion to the project.

Two of the 15 doctoral students were hosted and supervised by ILVO. Two practically usable tools were also developed from the research, which met with the interest of Flemish policy organizations. Jeroen De Waegemaeker (ILVO): 'There is a lot of interest locally from cities and towns in both tools. The efficiency and impact of the RECOMS program will increase even more when the fellows also start valorizing their approach and knowledge in their own country.'

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RESULT



SHORT CHAIN MASTERCLASS

Commissioned by *Steunpunt Korte Keten*, ILVO conducted research to identify the success factors for an economically profitable and resilient management in the short chain. The results came about following a series of in-depth interviews with entrepreneurs from various sectors of agriculture.

Subsequently, the results were put to work by organizing a master class in each province where short-chain entrepreneurs could learn from each other and apply the success factors to their own business operations.

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NEW

SOCIAL INNOVATIONS TO WORK TOWARD BETTER WELL-BEING FOR FARMERS

Farmwell is a European thematic network that gathers and integrates relevant expertise on well-being in the agricultural sector. In cooperation with farmers they search for innovative solutions for the wellbeing problems in various partner countries. The ultimate goal of FARMWELL is to ensure that individual farmers and farmer families can fully benefit from research into social innovation and practices, which will in turn result in strengthening the welfare of farmers and the links between the agricultural sector and broader society.

In close consultation with farmers, the Flemish partners select a number of initiatives from the inventory of existing innovative solutions and match them to local problems. In Flanders the Innovation Support Centre and Ferm will set to work, together with farmers, to test one or more of these initiatives in practice.

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IN THE SPOTLIGHT

ILVO @ WORLD DAY OF URBAN PLANNING

On the World Day of Urban Planning, in November, the Flemish Association of Spatial Planners (VRP), traditionally organizes a major day of reflection. In 2021 ILVO helped take the helm because of its unique expertise in the field of in the field of agricultural space. The spatial planning congress put the agriculture theme central, under the title 'PLOEG. Agriculture and spatial planning: a new team?'

Six ILVO researchers had the opportunity to share their knowledge: Elke Vanempten who chaired the day, Lies Messely with a presentation on farmer well-being, Hans Vandermaelen as session leader about the role of public lands, Anna Verhoeve and David De Pue with their insights on area-oriented work in a differentiated agricultural (policy) space, and Jeroen De Waegemaeker with the story of the agricultural parks in Cologne and Reggio Emilia for the Food Landscape session.

Agriculture has always helped to shape the space in Flanders. The classic creators of space have mainly paid attention to the built environment, and/or they approach agricultural space as a purely legal destination, so that the social debate revolves - too narrowly - around accounting for space. Elke Vanempten: 'That way we miss opportunities. Because of the increasing pressure on open space and from the climate challenges, a coherent local and supralocal vision of the agricultural space is becoming increasingly local and supra-local vision of the agricultural space is becoming more pressing. All spatial actors will benefit if agriculture and space become a team in the near future.'

The spatial planning conference took place in Beveren-Waas and also provided inspiring examples for local authorities, the agricultural sector, designers and planners.

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[NEW]

SUSTAINABLE TECHNOLOGY AND FOOD SYSTEMS FOR YOUNG PEOPLE

STEM & VORK focuses on a more sustainable local food system through an extracurricular track for young people. The project wishes to use the open-source use of intelligent sensors, robotics, AI and big data to discover and set up new forms of digital and sustainable urban agro-production that will make a local, resilient and fair food system possible.

In concrete terms, the project will engage teenagers and (young) adults through an extracurricular STEAM activity to reconnect with producing and understanding their own food. In this regard, STEAM stands for Science, Technology, Engineering, Arts and Mathematics, an educational approach that uses science, technology, engineering, arts and mathematics as entry points for student inquiry, dialogue and critical thinking around major social issues.

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[NEW]

CITIZENS AND FARMERS

The enthusiastic response of citizens to the request for help from farmers during the full-on covid crisis unfortunately revealed a number of barriers. These hindered the great potential for support and collaboration to perpetuate a more sustainable relationship between agriculture and citizens at the local level.

In the operational group 'farmers and citizens', farmers and experts look at the policy, practical and legal aspects related to farmer-citizen collaborations. This should lead to more local cooperation in rural areas. After identifying bottlenecks and drawing up a breakthrough memorandum, a call will be issued that makes it possible for farmers to experiment with new forms of bringing citizens and agriculture closer together.

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IN THE SPOTLIGHT

TRANSFORMATION OF ILVO FIELDS IN THE GONDEBEEK VALLEY

With over 240 ha of experimental fields and research infrastructure in the open agricultural landscape south of Ghent, ILVO has an exceptional space at its disposal for high-quality scientific research into agri-food, agriculture and the agriculture and the countryside. Climate neutrality, energy efficiency, desealing, water buffering and biodiversity are the explicit ambitions for the development of a real co-creative, innovative food landscape with field trial research, called ILVO's agrifood research landscape.

Of the 240 hectares, 5 hectares are situated in an SPA-Special Protection Area for Natura 2000, more specifically 'SPA-H BE2300044 Forests of the south-east of the sandy loam region'. In the framework of this research landscape, ILVO has been actively working on the transformation pathway 'working on biodiversity in a productive landscape on the Gondebeek'. This took place in an interesting collaboration with the partners from the Rodeland landscape project, including ANB, the province of East Flanders, ANB, the province of East Flanders, ForNaLab, and Natuurpunt.

The result is a plan for a suitable landscape layout and management for the parcels concerned, maximally in line with the desired nature objective types. In concrete terms, the current intensive grasslands will be converted into extensive, flower-rich grasslands with groups of trees and afforested sections. Pools for amphibians and a footpath will also have their place in the grounds. In 2022 everything will be further concretized in a nature management plan, and the first changes will take place on the terrain.

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Protein diversification



ILVO RESEARCH VISION 2030

ILVO supports protein diversification – provided that it contributes to a balanced, tasty, healthy and safe diet for a growing world population, and if it stays within a sustainable and economically viable framework.

The term 'protein diversification' refers to an adapted dietary pattern in which animal proteins are partly replaced by plant-based and other protein sources. This is not only useful from a nutritional point of view, it also offers new opportunities at economic, ecological and social levels. Attention also goes to alternative protein sources for animal feed.

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RESULT



NEW COMPANY PROTEALIS IS ILVO'S VERY FIRST SPINOFF. FASTER WORK ON PROFITABLE LOCAL PROTEIN CROPS

In April 2021 VIB and ILVO, with the support of several public and private funders, launched a company that will make it possible to grow protein-rich protein crops such as legumes in our region. The two founders of Protealis are a plant biotechnologist (VIB - BASF) and an experienced soybean breeder (ILVO).

'To start with, Protealis is aiming for soybean varieties and their related seed coatings that are suitable for north- and west European farmers. The beans must have up to 46 grams of protein per 100 grams and be suitable for the dual application as food and feed. These soy varieties should promote the local production of vegetable proteins, as an answer to the rapidly growing demand for alternatives to animal protein sources and for sustainable animal feed.'

Joris Relaes, ILVO Administrator General: 'For 10 years ILVO has been paving the way to local soy within the entire agro-food chain. We are delighted that our highly specialized soy breeding now has a chance to accelerate significantly and actively search for valorization in the market. ILVO participates in Protealis. As a public research institute, we have made constructive, clear, and fair agreements with this spinoff.'

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 Protealis

RESULT



FIELD BEANS IN DAIRY FARMING: TOASTING FOR SUCCESS?

Field beans can be an interesting alternative to imported soy within dairy farming, provided that the beans are heated first, as discovered within the EKOPTI project conducted by ILVO and Inagro. Heating is necessary for proper digestion and ensures better storage of the beans.

Toasted field beans appear to be able to replace part of the soy in rations (up to 1.7 kg per cow per day), without a major impact on milk production. Besides the ecological benefits, feeding field beans can increase farm profitability, primarily due to lower feed costs. The extent to which field beans are cheaper and therefore more interesting than soybeans depends of course on the price of soy. Especially on organic dairy farms, roasted field beans can therefore be an interesting choice as a crop and protein-rich feed.

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IN THE SPOTLIGHT

FLEMISH GREEN DEAL PROTEIN SHIFT GOES FOR A SUSTAINABLE FOOD PATTERN

A total of 64 partners, including ILVO, have endorsed the Flemish Green Deal Protein Shift launched by Flemish Minister for the Environment Zuhair Demir on April 26, 2021. The goal is to change the ratio between animal and vegetable protein-rich products in our diet.

The protein shift strives for an environmentally responsible and healthy dietary pattern. 'A protein shift also involves economic opportunities that are there for the taking with the strong Flemish innovation potential', according to minister Demir. This Green Deal is being drawn up by the Department of Environment. The focus on the consumption of proteins is very important with a view to a sustainable and future-oriented food system.

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GREEN DEAL
010. EIWSHIFT OP ONS BORD

ILVO
Instituut voor Landbouw,
Visserij- en Voedingsonderzoek



Joris Relaes,
Administrateur-Generaal ILVO

"Onze eiwitconsumptie is aan het diversifiëren. We komen uit een tijd waar we het vooral invulden met de (erg volledige) eiwitten uit melk, eieren, vlees en vis. Dat is een goed in kaart gebracht kennisdomein. De nieuwere eiwitbronnen uit planten, algen, insecten en microbiële processen, vergen echt nog veel wetenschappelijk onderzoek en kunde. ILVO duwt hier enthousiast aan de kar, met Europees en Vlaams onderzoeksgeld, en samen met geïnteresseerde bedrijven."

RESULT



CITIZEN SCIENCE PROJECT 'SOY IN 1000 GARDENS' MOVES INTO THE LAB

In March 2021, Flemish Minister of Agriculture, Innovation and Nutrition Hilde Crevits launched an appeal to find about 1000 citizen scientists who, like herself, wanted to roll up their sleeves for science. In the meantime soybeans have been planted in no fewer than 1150 Flemish gardens. In many of the gardens the soybeans germinated, and many plants—including all the roots—were collected, examined and inventoried in the lab. The researchers hoped to find nodules on the roots, formed spontaneously by bacteria already present in the soil.

The research project 'Soy in 1000 gardens' is a collaboration between VIB, UGent, ILVO, KU Leuven and many volunteers to map locally present soil bacteria that can help soy to grow successfully in Flanders.

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IN THE SPOTLIGHT

INVESTMENTS: PILOT EQUIPMENT FOR VEGETABLE PROTEIN SOURCES

To support protein diversification, the Food Pilot (ILVO/ Flanders' FOOD) has invested in pilot equipment for processing vegetable protein sources, for the processing of small quantities of innovative products, and for the further processing of microbial fermentation products into food and feed applications. The latter trajectory is a complementary partnership with Bio Base Europe Pilot Plant.

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[NEW]

CHICKPEA: LOCAL FLEMISH PROTEIN

Chickpea is a crop that is currently not yet established in Flanders. With the Kik-Love research project, ILVO is starting an exploratory research project on the local cultivation and processing of chickpea. Together with pioneer farmers, the cultivation technique is being tested for the first time. The food sector is being screened for their willingness to process the locally grown chickpea. In addition to the farmer and the food industry, the search is also on for the necessary intermediate links in the chain.

Within Kik-Love, an operational group has been started up that comprises all the actors in the chickpea chain. This should stimulate the formation of new local partnerships and local, profitable production of vegetable protein via chickpea.

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[NEW]

COMMERCIALIZATION OF MICROBIAL PROTEIN

In addition to animal and plant proteins - the production of which is often associated with a high ecological footprint – microbial proteins have been making inroads in recent years as one answer to the demand for sustainable protein. The investments in this field are enormous, and various industrial players are already active in our region as well. The complementary research and pilot facilities ILVO and Bio Base Europe Pilot Plant have joined forces to assist companies on their path towards commercialization via the Microbial Protein Transition project.

The new investments will support companies in the agro-food sector to valorize microbial fermentation streams into high-quality food products or ingredients and animal feed. This co-creation process takes place within the ILVO/Flanders'FOOD Living Labs. Investments will be made in the necessary lab and pilot equipment at both pilot plants, mainly for the production, purification, characterization and further processing of the nutrient flows. After installation of the pilot equipment, two showcases will be carried out, i.e. one food and one feed application. In addition, the equipment will be installed with the necessary sensors to enable a sustainability analysis of the entire process, from fermentation to the final products.

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[NEW]

SOY-FREE CHICKEN AND PIG PRODUCTION

PVL, ILVO, ABS, Inagro and the Poultry Research Centre have started a demonstration project to show that alternative European protein sources can be used as raw ingredients to mix into pig and poultry feed, and that it is possible to build up a profitable production chain around them.

Intensive consultation with animal feed manufacturers will take place to work out the best strategy for creating a feed with only protein-rich raw materials available in Europe. In doing so the project partners will not lose sight of required practical results. This soy-free feed will be demonstrated in the production of pigs and broiler chickens. The impact of the costs and benefits in terms of farm profitability and the environment will also be calculated. Based on this information, pig and poultry farmers will be shown which added value they can create by using alternative protein sources. Arable farmers will also be informed about the price of the most promising protein crops and the related production costs.

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IN THE SPOTLIGHT

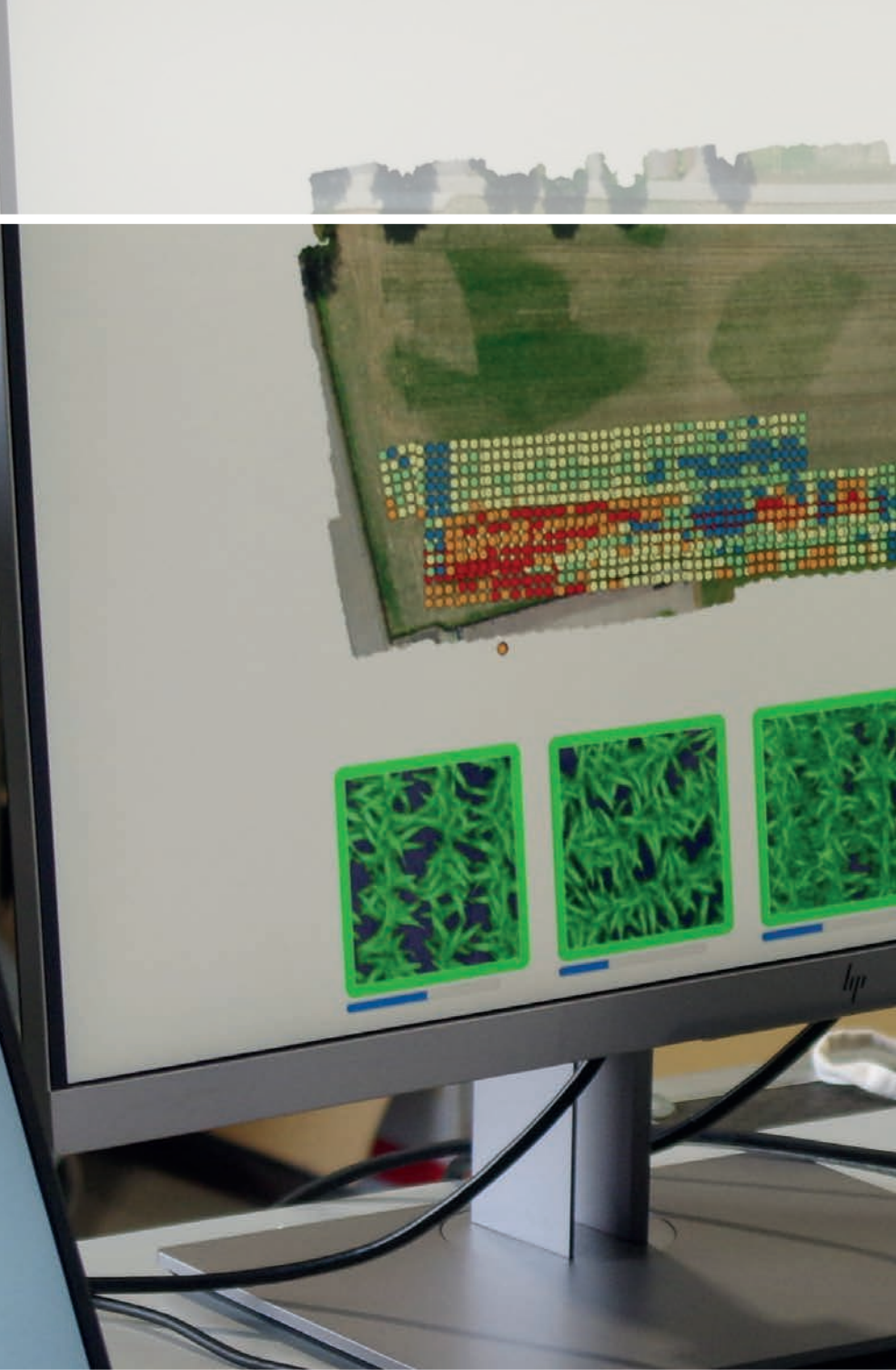
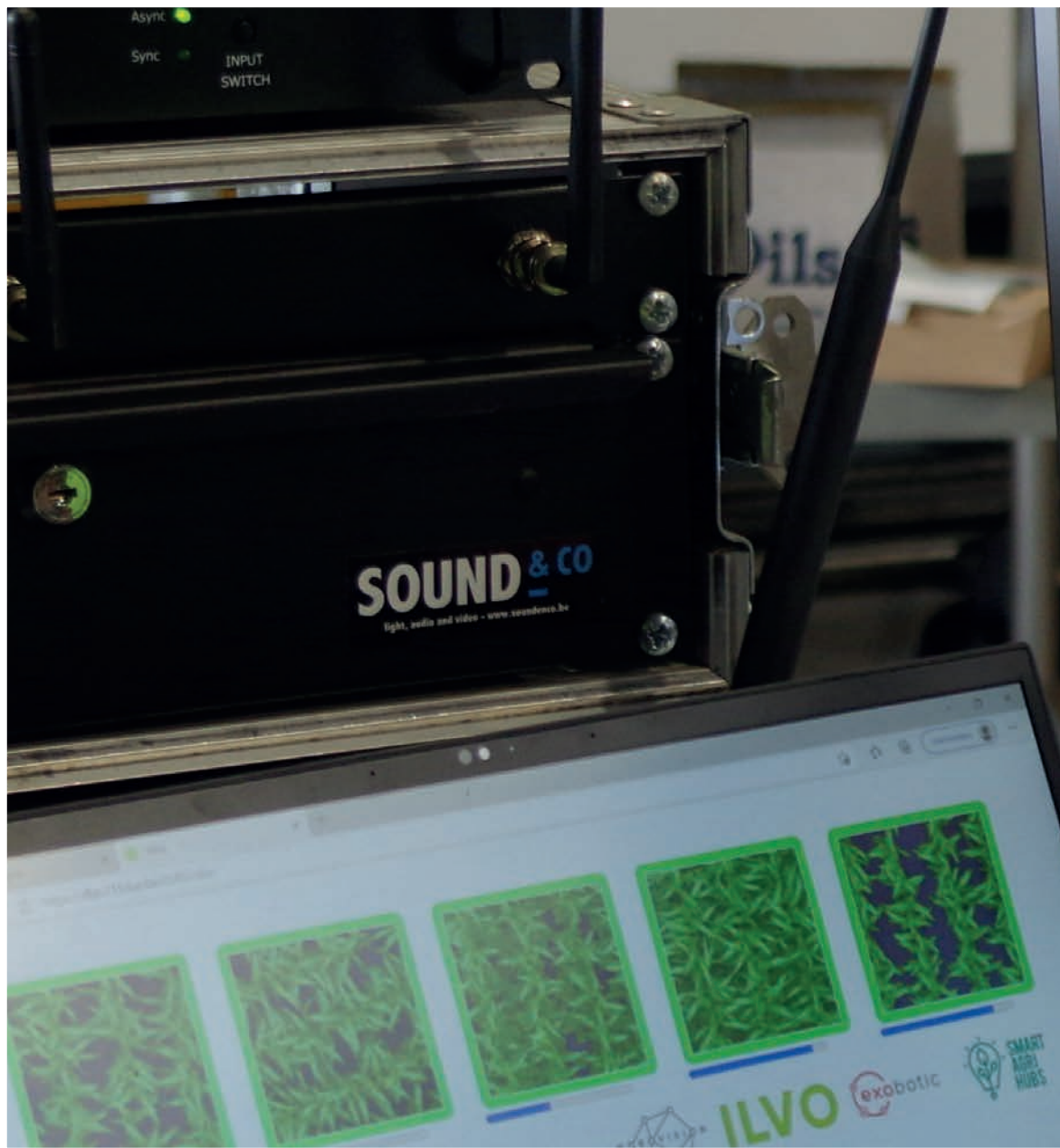
THE PROTEINN CLUB

'The Proteinn Club' initiative was founded last year within the Ghent region. This 'club', a successful collaboration between Bio Base Europe Pilot Plant, Capture (UGent) and ILVO, offers knowledge and answers to companies that want to seize opportunities and meet the challenges in the transition to more sustainable proteins, specifically in the context of fermentation-based proteins.

The Proteinn Club identifies, connects, supports and inspires the entire value chain. Its goals are to create and promote a unique ecosystem for the development, production and application of microbial proteins. Promotion of these proteins is part of the transition to more sustainable food systems and a circular bio-economy. In addition, it aims to bring together (regional) industrial, governmental and knowledge partners throughout the entire innovation and value chain and facilitate new innovation and demonstration activities related to proteins from fermentation.

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Precision agriculture and data technology



ILVO RESEARCH VISION 2030

ILVO combines promising new technologies with the so-called 'tacit knowledge' of its researchers and stakeholders, aiming not to maximize production but to optimize it.

Optimization by producing as much food and feed as possible with as little impact on the environment and thus by minimizing the use of (artificial) manure crop protection products, water and veterinary drugs. This will only be a real success when various data sources are integrated, and when the innovations are also effectively implemented in practice. That is why we focus our efforts on the further rollout of the data-sharing platform DjustConnect, and we involve farmers, fishermen, and food producers as early as possible in the development process, evaluation and demonstration of innovations.

Precision agriculture and data technology can effectively make a contribute to the systemic change that the European Green Deal and the Farm-to-Fork strategy aim to achieve.

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RESULT



SMARTER SPRAYERS AND SENSORS HOLD PROMISE FOR REDUCTION OF SYNTHETIC PLANT PROTECTION PRODUCTS

The market for smart spraying equipment that can apply plant protection products (PPP) in a far more targeted and accurate way is undergoing intense development. The European Horizon2020 project OPTIMA, in which ILVO is an important partner, is also focusing on this development. 'We are drawing the card of an ambitious holistic IPM approach in which not only precise spraying techniques, but also disease prediction models, disease detection systems, and the use of new biological PPP are central,' says Ingrid Zwertvaegher, ILVO researcher. OPTIMA has already made interesting progress in the following areas:

- a decision support system that integrates, models and determines the risk of disease outbreaks,
- a portable, advanced detection system that locates fungal infections based on camera and spectral images in open-field vegetables (carrot) or in perennial crops (apple and grape),
- smart sprayers that integrate these applications and translate them into a variable rate application and are equipped with communication systems that connect in real time with sensors for crop detection, automatically controlled air support, or have a system of variable nozzle spacing depending on the growth stage of the crop,
- the selection of new biological PPPs and resistance inducers for a number of plant diseases,
- a life cycle assessment (LCA) comparing the developed IPM systems with conventional applications.

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RESULT



USING 5G AND A.I. FOR REAL-TIME, SITE-SPECIFIC WEED CONTROL. UP TO 80% LESS HERBICIDES? SAME CROP YIELD!

For the first time, on 24 June 2021 in a maize field in Merelbeke, a special chain of innovative technologies was demonstrated that in time will enable a far more sustainable approach to weed control. An automatic drone flew a high-tech camera over the field and transmitted the images and the drone's positions in real time via 5G to the cloud. Trained algorithms (artificial intelligence) reading those images could immediately detect the location of weeds in the field, and convert that information into a digital spray map for a smart sprayer with individually controllable nozzles. That machine received the task map in real time via a mobile connection, and immediately after the flight started its (GPS-controlled) spray application.

The result: only the areas with weeds received a treatment, the rest of the field was left untouched. In other words, 80% less product was sprayed during the corrective treatment in maize, while the maize yield remained the same. This development was carried out by the Agrifood Technology living lab in collaboration with various technology companies, knowledge centers, farmers and contractors and was part of the SmartAgriHub Flagship Innovation Experiment 'AI4Agriculture'.

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A video thumbnail showing a field with a play button in the center. The text on the thumbnail reads: 'LOW SCORE' and 'HIGH SCORE' on either side of the play button, and 'VOOR ELKE ZONE WORDT EEN "ONKRUID-INDEX" BEREKEND' at the bottom. A QR code is located to the right of the video thumbnail.

Via 5G en A.I. naar een real time plaats-specifieke onkruidbestrijding

1:17

IN THE SPOTLIGHT

DJUSTCONNECT WINS HACKATHON FROM MICROSOFT AND DIGITAL FLANDERS WITH INTERACTIVE FARM MAP

The Flemish data-sharing platform DjustConnect has won the hackathon of Microsoft and Digital Flanders in November 2021 with an innovative idea to bring farmer and citizen closer together. In barely three days, the bright minds at ILVO, Cegeka and DXC Technology put together a demo version of an interactive map showing the farms with their basic farm and crop data, in the form of a digital business card. This idea will be further developed by DjustConnect with support from several pioneer farmers, the Department of Agriculture and Fisheries, and VLAM.

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[NEW]

INTERNET OF ANIMALS: DESIGN AND DEVELOPMENT OF AN INTEGRATED FOLLOW-UP SYSTEM FOR THE HEALTH AND WELFARE OF DAIRY COWS

MONICOW2 aims to develop innovative monitoring systems to collect data in a reliable and energy-efficient manner as well as new methods to analyze this large amount of data. This approach should make it possible to accurately determine and optimize the productivity, health and welfare state of dairy cows.

To manage the intensification of livestock farming in an economically efficient way, modern dairy farms increasingly rely on automated systems that collect and interpret animal behavioral parameters and interpret them. Current technologies and research focus on single applications that monitor a small number of specific parameters are monitored by one specific sensor (e.g., pH monitoring for disease, milk analysis for mastitis, activity monitoring for estrus). This approach requires the livestock farmer to purchase and integrate different sensor technologies depending on the applications. This is not user-friendly as it increases deployment, training and maintenance costs. The main objective of this project is therefore to integrate different sensors (localization, accelerometers). By using several parameters and their deviating values, important issues for the animal such as calving, oestrus, lameness, heat stress, etc. can be detected and monitored.

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[NEW]

CHECKING THE PRODUCT QUALITY OF FRUITS AND VEGETABLES THROUGHOUT THE CHAIN USING WITH HYPERSPECTRAL MEASUREMENTS

An objective hyperspectral measurement of the quality of leeks during cultivation, transport and storage, and linking it back to field data and storage parameters: That is the aim of the VLAIO project 'SpectroFood'.

The hyperspectral measurements give an objective picture of the quality during the entire production process. They contribute to transparency throughout the chain and ensure further optimization of the production process. This project should lead to an increase in knowledge and skills, and to better quality of the final product. In addition during the term of the project, a business model will be developed so that the use of the measuring devices can quickly find an application in practice.

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[NEW]

DigiHub BRINGS SMEs AND SCIENTISTS TOGETHER TO TEST DIGITAL APPLICATIONS

The DigiHub, with ILVO as one of the partners, is a place where SMEs can come with questions about digitization, bridging the business world and the research world.

A great many SMEs appear to have questions about the integration of digital applications in their company. They are specifically looking for advice, guidance and test infrastructure. VOKA has therefore taken the initiative, in collaboration with the ERDF, to establish a digital hub in each Flemish province. This support ensures that SMEs get easy guided access to the test infrastructure available at one of the 28 knowledge institutions. ILVO is the participating knowledge institution in both East and West Flanders, with expertise in digital applications in agriculture and fisheries/aquaculture, respectively. Via the DigiHub, SMEs can present their questions about the application of sensors, image analysis, data management and artificial intelligence.

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Closing loops and the bio-economy



ILVO RESEARCH VISION 2030

ILVO wants to accelerate the bio-economy and makes its broad expertise, network and infrastructure available.

In the bio-economy, fossil raw materials are replaced by renewable raw materials such as residual and by-product streams from agriculture, horticulture, fisheries, aquaculture and the food industry. Maximum value creation in all links of the of the chain and sustainability is paramount.

ILVO also focuses on the closing of cycles in the bio-economy and agri-food chain. At the technological, economic and social levels, we working to remove obstacles: we are conducting research into and processing of wet biomass flows, we characterize interesting molecules, we research and evaluate new profit models, we find partners and guide them towards effective system innovation.

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RESULT



GOOD NEWS FOR THE BIOECONOMY: EXTRACTING CHITIN FROM SHRIMP PEELS AND CRAB SHELLS CAN BE EXTRACTED VIA 'SOFT' BIOLOGICAL PROCESSES. AND THE BY-PRODUCTS ALSO SHOW POTENTIAL

'With enzymes and bacterial fermentation, it is just as possible to extract the useful substance chitin from shrimp shells and crab shells than with more aggressive chemical-based processes,' says ILVO-UGent researcher Yang Zou at the end of his PhD.

This is good news for the new bio-economy sector and producers of chitin, a substance that is used in the production of bio-plastics, additives for crop substrates, and other applications. In addition, the by-products of these more sustainable extraction processes also have interesting properties for the bioeconomy, such as the potential to neutralize free radicals, kill nematodes and inhibit the formation of biofilms. 'In any case, this research leaves us wanting more,' say promoters Johan Robbens (ILVO) and Katleen Raes (UGent).

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IN THE SPOTLIGHT

ILVO LAUNCHES THE B2BE FACILITATOR

In order to achieve the climate objectives of 2030, both the European and Flemish level took many initiatives in 2021 to accelerate the development of the bio-economy. Bio-economy is a very broad concept that refers to an economy in which fossil raw materials are replaced by bio-based or renewable raw materials.

The search is on for usable biomass streams, essential for making the bio-economy a reality. Different paths can be pursued, namely valorization of by-products and residual streams and the cultivation of new crops. Working with biomass is not easy and there are still many obstacles to be overcome. For example, many biomass flows are not available all year round because they are directly linked to a specific growth and harvest cycle. The composition and quality of biomass can also show great variation under the influence of weather conditions or the way the product is stored.

The B2BE Facilitator is a task carried out by ILVO on behalf of the Flemish government and is part of the Flemish Bio-Economy Policy Plan. In order to facilitate the collaboration between the different actors from the value chains, the B2BE or Business-to-Bioeconomy Facilitator was established. The B2BE facilitator tries to link entrepreneurs from the agricultural, horticultural, and marine sector, the food industry, industrial partners as well as knowledge institutes and governmental bodies with each other. Hence the name Matchmaker in Bio-economy. Not only matching, but also mapping out the bottlenecks, opportunities and opportunities and the financial and economic feasibility of projects is on the agenda. Every six months they work on a specific theme. Until the beginning of April 2022 we are focusing on the valorization of dry crop residues. Possible topics for the following months are: stabilization & valorization of green foliage, the use of biopesticides, a bio-based fishery sector: anti-fouling & nets, mycomaterials,



B2BE Facilitator - Business to Bioeconomy Facilitator
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[NEW]

EU PROJECT ON COSMETIC INGREDIENTS FROM PLANTS, WITH SCIENTIFICALLY PROVEN EFFECTS

Over the next four years, 17 partners from 11 European countries will work on scientifically validated, safe cosmetic ingredients based on plants. The Horizon2020 project is called InnCoCells (in full: Innovative high-performance cosmetic products from plants and plant cells). In Flanders, ILVO, VIB and AddEssens are the research partners.

'We are aiming for a systematic and innovative approach to discover active plant components and develop them into functional ingredients for cosmetic products, which have both proven qualities and an acceptable environmental impact. We are guided by our stakeholders (producers and consumers) to ensure that the new cosmetic ingredients are indeed suitable for the market.

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Dit project werd gefinancierd door het EU Horizon 2020 programma voor onderzoek en innovatie onder N° 101000373

[NEW]

FROM BARN AIR TO USEFUL MANURE OR NUTRITIOUS ANIMAL FEED: HOW FEASIBLE IS IT TO RECYCLE NITROGEN FROM LIVESTOCK BUILDINGS?

Can you turn nitrogen from barn air into a raw material suitable for the production of organic fertilizer and/or animal feed? Flemish Minister of Agriculture and Food Hilde Crevits has asked ILVO to investigate whether that process is feasible in practice. What are the possible risks involved and what are the attention points needed for a safe and environmentally friendly application? Does it effectively deliver environmental benefits? And which method or application is the best?

Until now the nitrogen collected in air scrubbers has been used directly as mineral fertilizer. This nitrogen, however, might also serve as a growth medium for beneficial bacteria in a controlled fermentation process. The result is a microbial biomass ('single cell protein') that can be considered for higher-value applications.

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Food and Health



ILVO RESEARCH VISION 2030

Through scientific research ILVO wants to join the fight against malnutrition. Research that enables a more diverse range of safe and sustainable produced food is therefore an important focus.

ILVO conducts research from an integrated view of the entire food chain and in close cooperation with a broad partner landscape. We work with the healthcare sector on feasible, nutritionally balanced meals for different target groups and for the primary sectors we are working on raw materials with even more interesting components.

We are applying our knowledge of the link between nutrition and health in animals to better understand how we can increase our resistance to infection and so-called 'diseases of civilization'. For people with food allergies, we are sharpening our knowledge of the action of allergens and how they are influenced by processing.

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RESULT



FOOD AS MEDICINE FOR PARKINSON'S PATIENTS?

There is some evidence that a modified diet has beneficial effects on the treatment of Parkinson's disease. *In vitro* tests on stool samples show that certain dietary fibers, such as inulin from vegetables and beta-glucans from mushrooms, can boost butyric acid production in the intestines of patients, which subsequently improves the composition of gut microbiota. There appears to be a link between that composition and an alleviation of the patient's motor symptoms, such as tremors.

Doctoral researcher Florence Baert further worked on the swallowing problems and loss of taste and smell in Parkinson's patients. 'With a thorough understanding of food composition and processing, these problems can also be mitigated. By adapting the texture of the patient's daily diet, and especially by providing alternative flavor enhancers, interesting effects can be observed.' Additional research and clinical trials should deepen the understanding within this research pathway.

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RESULT



FOOD SPOILAGE: DNA-BASED TECHNIQUES AS ADDITIONAL DETECTION TECHNIQUE

In order to better assess the shelf life of food products, thorough knowledge is needed regarding the bacteria present. Classically, this is done by culturing the bacteria, which is a proven technique, but additional DNA-based analyses offer valuable additional information, as demonstrated by the doctoral research of ILVO-VUB researcher Evelyne Duthoo. By diving into packages of cold cuts, she found DNA of both familiar and less familiar bacteria.

The research emphasizes the importance of analysis techniques that are not dependent on culturing bacteria, because not all bacteria are able to be cultured using standard techniques, even though they are still present in our food. 'The DNA-based technique called metabarcoding is such a technique, but it is still quite expensive and too complex for routine analyses. However, the technique does provide us with additional insights that will allow us to better understand the microbial community in food in order to better understand and manage shelf life or food spoilage.'

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IN THE SPOTLIGHT

THE ILVO TASTE LAB

Good taste that is acceptable to consumers is one of the priorities while developing new food products. ILVO has more than 10 years of experience in organizing all kinds of types of taste tests (descriptive tests, triangle tests, appreciation tests, and training expert panels). The taste lab is set up according to the ISO standards for the execution of taste tests. This includes, among other things, a separation of kitchen and panelists, separating the panelists from each other, appropriate lighting to mask color differences, and adequate exhaust ventilation. The experimental design and the statistical processing of the sensory data is done with the help of the computer program FIZZ.

Linked to the activities of the taste lab, ILVO established a Taste and Odor Ethics Committee (ECSG-ILVO), which ensures that taste and odor tests are carried out in a safe and ethical manner. Experts that are not involved in the research in question make a strict critical evaluation of the taste test. Only after approval of the test, participants are informed individually about the nature of the products and the context in which this evaluation is taking place.

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[NEW]

COMPARING ENVIRONMENTAL IMPACTS OF DIFFERENT AGRICULTURAL PRODUCTION SYSTEMS

Is there a difference in footprint between food products from different production systems and produced with different farming techniques? And if you look at the whole shopping cart, how big is the difference? In the LCA shopping cart project, researchers are using the methodology of life cycle analysis (LCA) to determine the environmental sustainability of food products. The strengths and shortcomings of the method are mapped out, and the ecological sustainability of a typical shopping cart is calculated. This is composed of a fixed assortment of Belgian products but with each from a different agricultural production system or with the use of specific agricultural techniques.

The ultimate goal is to examine whether it is possible to also take into account the positive contributions of specific production systems and techniques when assessing the environmental sustainability of food products, and to define how this should then be done.

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[NEW]

WHAT IF IRRIGATION WATER FOR LETTUCE, CARROTS AND STRAWBERRIES CONTAINS TOXIC MICROCYSTIN?

CYANTIR, an FPS-funded project with coordinator UGent and partners ILVO, Sciensano, Inagro, and ULG, performs experiments under controlled conditions to determine the potential accumulation of toxic microcystin in lettuce, carrot and strawberry. The motive of it is an increase in cyanobacterial (blue-green algae) blooms due to climate change and eutrophication. These occur in canals and open surface basins, and water sources that in drought periods are also used to irrigate agricultural crops. *Microcystis aeruginosa* is one of the main bloom-forming cyanobacteria in Belgium and produces microcystin (MC), a hepatotoxin that damages the liver and has a tumor-stimulating effect. It is known from the literature that microcystins can be transmitted to plants by the use of contaminated irrigation water. The CYANTIR project investigates whether irrigation water contaminated with microcystin (a cyanotoxin) poses a health risk in terms of residual concentrations of microcystin that accumulate on or in the crop.

The ultimate goal is to formulate a policy and to propose guideline values for what microcystin concentration in water sources is unsuitable for irrigation of fruits and vegetables that are (mainly) consumed raw.

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IN THE SPOTLIGHT

SHORT CHAIN: PROCESSING

In 2021, ILVO continued its work within the KRATOS advisory platform for farm processors.

Within this platform, farmers who have questions about the processing their primary products into food, can turn to the ILVO food technologists. They answer questions such as: 'what technology do I need to market freshly cut potato products?' or 'What is the nutritional value of my product?' or 'what is the shelf-life of my food product?' In 2021, advice was given to 7 Flemish farm processors. The free subsidy worth € 1500 is easy to apply for via www.landbouwwlaanderen.be

Help for this target group will be further expanded in the coming years be further expanded with additional small-scale vegetable processing equipment. This expansion is possible thanks to European support from the ERDF and co-financing from the Province of East Flanders.

www.vlaanderen.be/pdpo

European Agricultural Fund for Rural Development: Europe invests in its countryside

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Management 2021

109 NEW RESEARCH PROJECTS

While Covid-19 divided the year into peaks and troughs, ILVO grew as steadily in 2021 as it had in 2020. Covid and the telework that went along with it provided a lot of inspiration for the researchers because the call for Agricultural Trajectories 2020-2021, a record number of project proposals were submitted: 44 proposals to be exact, 34 of which involved ILVO. In total 15 projects were retained in 2021, with ILVO playing an active or coordinating role in 8 of them. These 8 newly started projects form part of the 109 new, externally financed projects that were started in 2021. You read it correctly: 109 new projects. They are part of the portfolio of 285 projects that were ongoing in 2021. The Agricultural Trajectory projects are still important to ILVO, but the figures also show that as an innovative, future-oriented player diversity is not only a personnel matter, but also that the palette of research resources is becoming more diverse and international.

EUROPEAN PROJECTS

ILVO remains strongly committed to European research programs such as Horizon Europe, INTERREG, LIFE and MARE. Horizon Europe is the new ambitious research and innovation program of the European Union that runs from 2021 to 2027, in which the Green Deal including the Farm To Fork strategy is situated. In the fall of 2021, a total of 34 Horizon Europe 'global challenges' project proposals were submitted, and 1 Horizon Europe 'Marie-Sclodowska Curie Actions' project proposal.

For the second call with deadline February 2022, already 17 project proposals are planned. In addition, the INTERREG program offers new opportunities for European cooperation in the program period 2021 - 2027, with a focus on climate and green transition. The preparation of the INTERREG programs is proceeding at different speeds, where the border programs are often the most advanced.

LIFE is the only program at EU level that is exclusively dedicated to environment and climate. The program for 2021-2027 is the most ambitious program to date with 3.5 billion euros for environmental activities and 1.9 billion euros for climate action. The program is part of the European Commission's Green Deal package proposed by the European Commission. Within the LIFE program ILVO already has 2 projects running: FARMLIFE and CarbonCounts. The LIFE calls for proposals 2022 are expected to be published on May 17, 2022.

142 A1 PUBLICATIONS

Research results should of course be made known to society. This can take the form of seminars and workshops. For this purpose, 2021 was an extended experiment to provide online alternatives as professionally as possible. An emergency situation often gives rise to innovative solutions that in turn contribute to more sustainable operations and wider dissemination of knowledge. Results are of course published by researchers in scientific journals, which are increasingly making the publications available through the principles of Open Access. In 2021 this resulted in 142 peer reviewed A1 publications and 71 other scientific publications.

SCIENTIFIC INTEGRITY CHANGED

Results of scientific research must be generated in a way: openly, transparently and with integrity. In the past year, ILVO also continued to focus on the open dialogue on scientific integrity by handling questions for advice, organizing dilemma training and developing guidelines. The Commission on Scientific Integrity also dealt with 2 formal complaints in 2021. The findings of these investigations allowed us to further professionalize internal operations.

OPEN ACCESS

ILVO also endorses the objectives of the Flemish Open Science Board (FOSB). These are aimed at making scientific data more available. An important condition for this is that the datasets need to be FAIR: Findable, Accessible, Interoperable, and Reusable.

Collaboration is also a core value of ILVO - researchers naturally call upon each other's expertise. But ILVO wants to go a step further in this, by facilitating the sharing and reuse of data sets, both on its own campus and for other organizations. This requires training, IT infrastructure, time and an elaborate policy framework. To realize this, the recruitment of a data manager was an important step taken in 2021.



SOCIETAL IMPACT

ILVO is a knowledge institution at the service of society. The results of our research projects are usually collectively available to the general public. In certain cases, however, more impact can be generated by economic valorization of certain research lines. Since this is not a specific task of ILVO, an evaluation framework has been developed for this purpose. Our strategic collaboration with VIB has been in place for a number of years and has already produced good results. In 2021 this became concretely visible through the establishment of Protealis: a new ambitious company focused on locally grown leguminous crops such as soy and based on knowledge and technology of VIB and ILVO.

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Living Lab

As a knowledge center for applied scientific research, ILVO has had years of experience with the social added value of collaboration with companies, sectors, civil society and policy. Via 7 specialized Living Labs, these actors can seize the opportunity to reinforce their professional knowledge with scientific and technical know-how, thus achieving quickly deployable innovations to solve pressing problems. A list of some exemplary achievements.

LIVING LAB AGRIFOOD TECHNOLOGY:

A MULTI-PURPOSE ROBOT AS A NEW WEAPON IN THE BATTLE AGAINST WEEDS

Within integrated pest management, mechanical and thermal treatment of weeds can offer a sustainable alternative to conventional chemical treatments. A major challenge is the limited capacity/working width. Use of an autonomous robot can automate this labor-intensive task, greatly increasing labor efficiency. Despite the potential added value, adoption into practice is still low, partly due to limited supply as well as low confidence in this relatively new technology.

CO-CREATION

For those reasons ILVO's Living Lab Agri-food Technology teamed up with technology companies, knowledge institutions and practical research centers within the CIMAT project to co-create and develop a multi-purpose electric robot platform. Farmers are also actively involved in the project. Central to Living Lab Agri-food Technology is the integration of technology and agriculture. The Living Lab team uses an iterative development process in which design, implementation and testing under practice-relevant conditions follow each other in an iterative cycle. Flemish and Dutch farmers are specifically included in this process so their knowledge and specific requirements can be taken into account. This strongly increases applicability in practice.



PROTOTYPE

After many months of work - on the computer, in the workshop and on the field - the prototype is now ready for the new growing season. The result: a robot with four-wheel drive, fully independent four-wheel steering and 20 kW of electrical power with a high traction torque even at low engine speeds. Flexibility is an important asset, with an adjustable track width and a design reminiscent of a tool carrier. Standard implements can be coupled via three hydraulic three-point linkages, which greatly increases the robot's deployability. In collaboration with the West-Flemish company Vanhoucke Engineering, a hoeing machine and weed burner were developed in parallel with the robot. Standard components such as those found on existing implements were used, giving an important advantage in terms of price and equipment maintenance.

The robot drives automatically on RTK GPS, which at the same time allows georeferencing of the data from numerous integrated sensors. The latter is of great importance as it concerns a

prototype, used specifically to explore new applications. In this way the researchers are trying to pave the way for constructors who can use the project results to build machinery that is ready for the market and that has a sustainable added value for the Flemish farmer.

PRACTICE TESTS

In the next growing season the project partners want to work together with farmers to further test and optimize the robot on their parcels of land in practice. Interested?

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More info www.agrifoodtechnology.be or www.cimat.be.
Recent updates via @LLAgrifoodTech or #cimat on Twitter.

Introducing new CIMAT prototype
3:31



Funded within the Interreg V program Flanders-Netherlands, the cross-border cooperation program with financial support from the European Regional Fund Development. More information: www.grensregio.eu



LIVING LAB ANIMAL HUSBANDRY:

PRECISION FEEDING FOR PIGS

METEX NØØVISTAGO (previously known as Ajinomoto Animal Nutrition Europe) is part of METEX, a European company specialized in the selection and production of amino acids through fermentation. By combining these amino acids, METEX NØØVISTAGO wants to create solutions for the specific needs of pig farming, poultry farming and aquaculture.

In recent years, they have frequently collaborated with ILVO to develop expertise on no fewer than 3 topics: (i) reducing the crude protein content of pig feed while maintaining animal performance (ii) determining the amino acid requirements in pigs and (iii) exploring how functional amino acids could improve performance and intestinal health in pigs. METEX NØØVISTAGO calls on ILVO because of ILVO's up-to-date infrastructure, the option of milling precision feeds at ILVO, and the quality of the tests carried out here.

'The collaboration with ILVO's Animal Science Unit has always been very fruitful. The quality of the institute and its researchers enables us to find clear answers to the scientific questions we have.' Tristan Chalvon-Demersay - Innovation and New Products Manager METEX NØØVISTAGO

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GENERAL AND GUT HEALTH IN CHICKENS

Sanluc International nv has been working since 1998 on feed solutions to promote gut health, resulting in better animal performance and a financial benefit for the customer. They are pioneers in the development of ingredients based on calcium butyrate and aqueous extract of sweet chestnut wood.

The exact effects are tested in collaboration with the poultry and cattle information centers, among other things. We explore issues such as gut health in general, phasing out the use of growth promoting antibiotics, growth and laying performance, egg quality, manure and litter quality, and gut problems including diarrhea, *Salmonella* infections and enteritis in poultry. These themes were addressed both in our own product research and in the context of various research projects (e.g. VLAIO-LA, VLAIO-O&O) together with ILVO. Recently we worked together on protein utilization (cattle), keeping laying hens longer, and heat stress.

'By joining forces and sharing knowledge, together we have arrived at insights and concepts that have enabled us to contribute to the sustainable and efficient development of animal production.' Luc Goethals - Managing Director Sanluc.

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DAIRY CATTLE AND ALTERNATIVES FOR FEEDING CONCENTRATES IN MILKING ROBOTS

Feeding of concentrates in automatic milking systems (milking robots) is standard in today's dairy farming. In high yielding dairy cows, this supports milk production and at the end of lactation, it stimulates cows to visit the milking robot. However, concentrate feed is expensive and high use of concentrate in milking robots puts pressure on profitability on farms using milking robots. Alternatives that have the same effect at a lower price would offer an appropriate answer.

In the LOKROB Operational Group, innovative livestock farmers, together with ILVO researchers, technical equipment builders, economic and technical advisors all join to look for alternatives to concentrates in the milking robot. The operational group is developing a way to automatically and continuously offer chopped fodder beets. This system is being tested and optimized at the farm of dairy farmer Johan Vanhecke. Due to the limited availability of beets, other alternatives such as potatoes and unmarketable apples and pears are being tested in the same system.

'In this operational group we have brought the right people and companies together. The expertise present and the constructive dynamic in the group provides new insights and surprising ideas. In this way, the ultimate goal is slowly coming within reach.' Johan Vanhecke – Dairy farmer and initiator of the Operational Group LOKROB

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Living Lab

MARINE LIVING LAB:

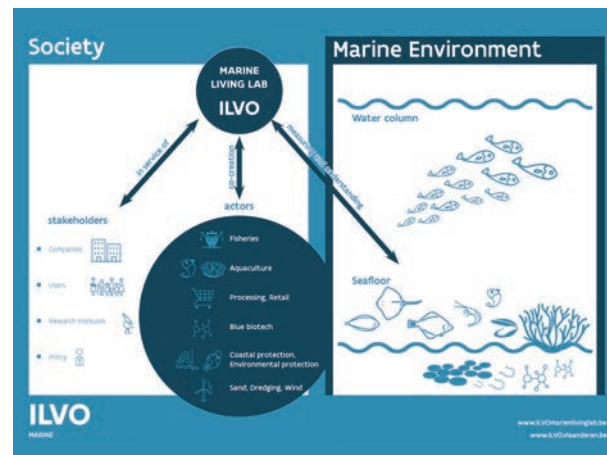
OUT OF THE STARTING BLOCKS

CO-CREATION AT SEA: ILVO LAUNCHES THE MARINE LIVING LAB

In the fisheries sector and in the broader marine research surrounding it, ILVO will now focus even more on the development of innovations and applications together with - and at the request of - ambitious companies and stakeholders. As of 2021, a real 'Marine Living Lab', operating from Ostend (ILVO-Marine), will facilitate the dialogue and co-creation process. International projects and intensive collaborations with other specialized knowledge centers and with multiple policy levels are also part of the mission. All of these tasks will aim to accelerate and facilitate new, relevant practice-oriented solutions to marine and fisheries challenges.

ILVO offers the marine entrepreneur an integrated package of services and infrastructure, with a focus on innovation and sustainability. The key word is co-creation, in both directions! In other words, the Marine Living Lab offers expertise, but is also looking for new expertise and technology that can stimulate accelerated and sustainable innovation in various blue sectors.

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LIVING LAB FOOD PILOT:

CHICOBITE: THE BEST FROM THE BELGIAN ENDIVE ROOT

Forced roots from Belgian endive are currently mainly used as animal feed. Chicory grower Versalof, located in the Flemish Brabant town of Steenhuffel, has managed to make this by-product usable for human consumption by extracting the bitter substances. Belgian endive root is very rich in fiber and has a good capacity to hold water. The company asserts that it is an ideal raw material for vegetarian food products, among others.

The Living Lab Food Pilot, as research partner, is exploring the application possibilities. Bart Van Droogenbroeck, ILVO researcher: 'Application in burgers ensures a good structure and avoids moisture loss during baking, thanks to the strong water binding properties of Belgian endive fiber'.

Versalof: 'Several of our customers are carrying out tests to see how they can make a tasty product using our product, Chicobite. We think there are still many possible applications out there, so new ideas are always welcome.'

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The [Food Pilot](#) is the oldest of the Living Labs within ILVO; it celebrated its 10th birthday in 2021.



LIVING LAB AGROECOLOGY & ORGANIC AGRICULTURE (LLAEBIO):

AGROECOLOGY INSPIRATION DAY FOR TEACHERS IN SECONDARY EDUCATION

During an agroecology inspiration day for teachers on 19 August 2021, three break-out rooms were organized where teachers could explore the application of agroecology in research and in practice.

In the Animal Production break-out room, ILVO researchers Marta Lourenço and Jolien Bracke presented their research related to agroecology and animal production. Marta investigates the possibility of protein-rich mixed cropping as an alternative to poultry feed based on soy, and Jolien investigates how trees and bushes can be used in animal production as pasture protection, feed trees or in combination with poultry. Elise Van Broeckhoven of the 'Grondig' pick-your-own farm also discussed the application of agroecological principles for keeping cattle, pigs and chickens on farms or in collaborative projects. The other breakout rooms presented plant production and gardening.

'The first seminar on agroecology for secondary agricultural and horticultural education was an incentive to get to know the principles of agroecology. Whether it was about animal production, vegetable production or gardening, everyone could immediately see the possible practical applications within their field of expertise.'

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WEBINAR 'LET THE SOIL WORK FOR YOU'

On Thursday evening June 10, 2021, LLAEBIO, in collaboration with Inagro, organized an online inspiration session for farmers who want to know more about sustainable soil management.

How can farmers be less dependent on fertilizers and more dependent on conservation tillage, and thus reduce your costs with respect for people and the environment?

During this inspiration event, we shined a light on the trajectory of a few pioneering farmers and entered into debate with the participants. What drives these farmers? How do they cope, what challenges do they face? Change is not something you do alone, and these pioneer farmers are also part of a learning network that is supported by the Interreg project TRANSAE. They get guidance from Inagro in collaboration with ILVO.

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PLANT LIVING LAB:

PLANT LIVING LAB IN A NUTSHELL

The Plant Living Lab responds to the needs and questions of the agri-food and ornamental plant sectors. The focus is on the use of sustainable, innovative approaches and technologies to optimize the efficiency of production systems while reducing environmental impacts.

Co-creation of knowledge and targeted transfer of this knowledge to the end user is one of our core tasks. In addition, we are research partners for individual companies and consortia and we offer a platform for open innovation to facilitate collaboration between the various actors in the sector. The knowledge present in all parties is then used for effective innovation.

To achieve these three core tasks, the Plant Living Lab relies on the extensive infrastructure and multidisciplinary expertise of ILVO.

Curious ?

Take a look at this video or go to www.livinglabplant.be



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DETECTION TECHNIQUES REQUESTED

'By developing sensitive and robust detection techniques, we support the sugar beet sector to quickly detect emerging bacterial and virus infestations,' explains ILVO researcher Kris De Jonghe. For several years now, the beet sector has been struggling with serious problems caused by various viral and bacterial pathogens. The correct identification of these pathogens is essential in order to intervene in a targeted manner and prevent further spread. SES VanderHave, producer of sugar beet seeds, called on the expertise of ILVO's Plant Living Lab.

ILVO developed tests for the rapid, sensitive and reliable detection of bacteria associated with the 'Syndrome of Basses Richesses' (SBR) and other viruses that frequently occur in the crop (beet mild yellowing virus (BMYV), beet chlorosis virus (BChV), beet yellows virus (BYV) and beet mosaic virus (BtMV). Infestation in all of these cases leads to decreased photosynthesis, resulting in reduced sugar content and yield losses.

The molecular techniques developed by ILVO make rapid and reliable detection of these pathogens possible. In addition, with the help of the LAMP (Loop Mediated Isothermal Amplification) technique bacterial contamination in beet samples can now be detected on-site with minimal pre-treatment.

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OPTIMIZING BREEDING TECHNIQUES

Plant Select NV is specialized in the production of bamboo and is market leader in multiplying bamboo through tissue culture. In vitro production results in a uniform product and makes it possible to propagate plants all year round. In order to meet the increasing production demand, the company continues to invest in research and development to further optimize the propagation protocols. In doing so, they are also looking at specific climate settings.

'We came to ILVO because they have the necessary infrastructure to test a number of scenarios on a pilot scale. The results are already very promising and allow us to allow us to optimize the breeding process even further,' explains Hilde Peeters (Head of in vitro cultivation production, Plant Select NV).

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SOIL IMPROVERS IN ROOF GARDENS

ROOF FOOD, a pioneer in urban agriculture from Ghent, called on ILVO to make their business operations even more sustainable.

The environment in which the vegetables are grown is very different from an ordinary field or greenhouse. The composition of a specific roof garden substrate is therefore crucial to obtain a good harvest. ROOF FOOD strives to close loops and therefore wishes to match the soil improvers used as closely as possible to the needs of the vegetables grown in the roof garden.

ILVO determined the chemical and microbiological characteristics of the substrate for the roof garden and studied how an optimal root environment for the vegetables can be obtained. Maintaining enough carbon in the topsoil of the roof garden appeared to be one of the greatest challenges, but it also was challenging to achieve a slight reduction in pH of the substrate and to add organic material that could supply sufficient mineral nitrogen. ILVO made recommendations on how to achieve this. This can be a source of inspiration for other roof agriculture projects.

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NEW CLIMATE INSIGHTS FOR AGRICULTURE: SEMINAR BY ILVO'S CENTER OF EXPERTISE FOR AGRICULTURE AND CLIMATE (ILVO-ELK)

On May 31, 2021, ILVO-ELK organized a successful seminar with 170 participants. A large number of researchers were present as well as policymakers and farmer representatives. Especially notable were the many agri-food companies in attendance. Farmers are clearly not the only ones looking for ways to deal with climate challenges: other links in the food chain are also expecting insights and answers from research.

The focus of the webinar was both on reducing greenhouse gas emissions as well as on increasing the resilience of our farms and systems to achieve effective climate action. ILVO-ELK highlighted, among other things, how dairy farmers can reduce greenhouse gas emissions while maintaining or increasing profit; and how greenhouse growers can use less energy without sacrificing production. The recurring dry periods, and how farmers can prepare for these, was also highlighted. Finally, attention was paid to agricultural soils as interesting climate buffers including how they can extract more CO₂ from the air. If you couldn't be there, the recording and presentations (in Dutch) are still on the ILVO-ELK website, together with additional information.

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Organizational management — Operating resources

BUSINESS PLAN 2021-2024

STRATEGIC AND OPERATIONAL OBJECTIVES

Within the new Policy Memorandum 2019-2024, the ILVO Business Plan 2021-2024, which comprises all of ILVO's strategic and operational objectives, was approved. These fall primarily within the framework of the structural element 'Agricultural and Fisheries Research' and also concern our internal operations.

The objectives are systematically implemented and monitored. If necessary, adjustments are made. The annual strategic and operational risk analysis was implemented.

During the annual Strategic Seminar and various strategic board meetings, the strategic challenges for the future were discussed and the strategic policy was further elaborated. Objectives of the past year include, among other things:

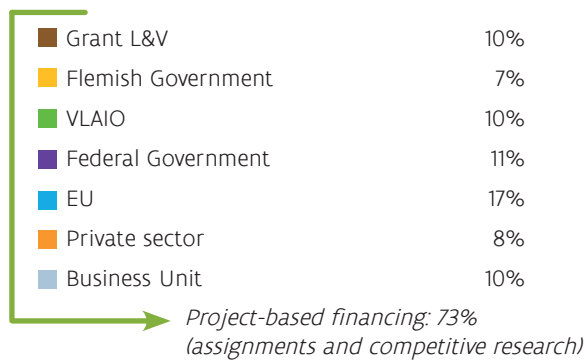
- the further elaboration of the long-term research agenda,
- inclusion in the new Horizon Europe program,
- the development of the ILVO Research Cycle,
- the further rollout of the SDG trajectory,
- strengthening our digital communication possibilities,
- the further rollout of the HR policy plan 2020-2024,
- the rollout of the data management policy,
- the further digitization of operational processes and the introduction of a new accounting system.

TWO ENTITIES

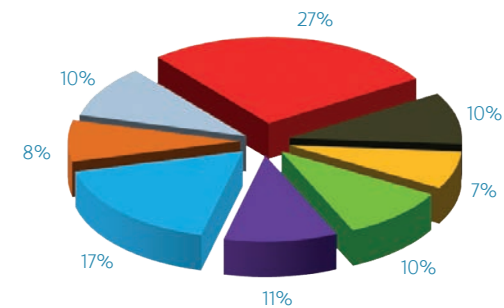
Administratively, ILVO consists of two entities that reinforce each other in a remarkable way: ILVO-VO' (the Internal Independent Agency of the Flemish Government - without corporate personality) and 'ILVO-EV' (ILVO's Own Capital). These legally separated entities each have a budget, a staff and governing bodies. Where ILVO-VO largely operates through the basic endowment from the Flemish Government, ILVO-EV gains flexible funding through competitive research at home and abroad, through companies, and paid services.

In the first years of ILVO, the EV/VO ratio was approximately equal. This year, the EV/VO ratio is approximately at 3/4 - 1/4. In 2021, the basic endowment to ILVO accounted for 27% of ILVO's total operating funds.

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Distribution of operational resources ILVO 2021



GROWING AS ILVO AND PERSONAL GROWTH

RECRUITMENT AND SELECTION

In recent years, ILVO has been very successful in bringing in new projects. It is equally crucial to find the right people to carry out these projects, which is not always evident in a very tight labor market. In 2021, 67 vacancies were publicized and 82 new staff members joined us. To continue this into the future, the processes for processes were optimized and we will focus even more on employer branding.

STAFF NUMBERS

ILVO staff numbers 2021

	Employees			FTE		
	FG	OC	total	FG	OC	total
dec 2017	249	342	591	221.7	324.1	545.8
dec 2018	239	370	609	211.8	346.6	558.4
dec 2019	231	415	646	207.1	388.0	595.1
dec 2020	223	454	677	201.3	427.5	629.8
dec 2021	212	487	699	194.0	460.0	654.0

LEARNING AND DEVELOPMENT

At ILVO, we find it important that all our employees continue to develop - technically, but also personally. We do everything we can to support them in this. That is why everyone is offered an account on GoodHabit, an online training platform with more than 120 training courses for personal development.

HYBRID WORK

ILVO wants to continue to evolve towards a culture of trust and collaboration, with a focus on the objectives and results to be achieved, and not on monitoring where and when someone is at work.

Under the impetus of Covid-19, in 2021 we took the definitive step to implement hybrid work. For this purpose, we set up a very flexible framework. In order to guarantee social cohesion and maintain a maximum team spirit, the aim is to be physically present at work at least 60% of the working days. The recurring series of covid measures meant that we obviously worked more at home in 2021 than envisaged in the framework of this agreement.

ORGANIZATIONAL AND LEADERSHIP DEVELOPMENT

Within the project 'Organization and leadership development: working with roles' we examine how to more clearly define the roles within an agile and rapidly changing organization. This is intended, among other things, to improve the career outlook of the employees and the requirements of ILVO as an organization. This project focuses on giving and supporting opportunities for more explicitly being able to take on responsibility (personal leadership).

DIVERSITY

Language Partners

ILVO started a project on 'language buddies', in which a native Dutch-speaking colleague is paired with a colleague who is learning/practicing Dutch. The language buddies agreed to meet up (online) for half an hour each week for ten weeks.

Gender Equality Plan

On 1 December 2020, the European Council approved new conclusions on the thorough revision of the European Research Area (ERA). In these conclusions, even more than in the past, priority is given to Gender Equality in research and innovation. The European Council therefore calls on knowledge institutions to put a Gender Equality Plan (GEP). ILVO has answered this call. This plan will contribute to ILVO being able to attract and keep the right talent.

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ENERGY SAVING INVESTMENTS

RELIGHTING

For years ILVO has been structurally investing in energy-saving measures, partly thanks to subsidies via the Climate Action Plan on energy efficiency as guided by VEB. One of the projects carried out via the VEB framework contracts was to carry out a lighting study and to effectively implement the modernization of our lighting. This gives us a total savings of € 9100 euros per year and saves 19 tons of CO₂. The result is impressive: not only are we saving energy, the light is also better distributed and the light intensity is more pleasant. We have opted for light sensors with motion detection. The light intensity is also adjusted to daylight. This ensures even more energy savings.



The video thumbnail features a woman, Gerlinde De Vogeleer, in a white tank top, standing in front of a building. The text on the left reads 'Zij kozen voor VEB' and 'ILVO GERLINDE DE VOGELEER'. The text on the right reads 'ILVO kiest voor relighting via het VEB' and '1:49'. A QR code is located on the right side of the thumbnail.

GAS ABSORPTION HEAT PUMPS FOR POULTRY HOUSES

Two ILVO poultry houses were due for a boiler room renovation. ILVO opted for gas absorption heat pumps for both houses. The traditional electric heat pump was not an option as these cannot cope with the high feed temperatures required for these stables (less recent, but well-insulated stables). A gas absorption heat pump is the ideal solution here as it also achieves much higher efficiencies and thus saves fossil fuel.

RENOVATED 'USA' BARN FOR RESEARCH INTO GUT HEALTH PROCESSES IN (MINI) PIGS

As part of a project for research into the digestion and intestinal health in pigs, the so-called USA barn was completely renovated. The existing infrastructure was thoroughly adapted so that multidisciplinary research is now possible through a combination of different functional areas, such as group and individual housing for mini-pigs, fattening pigs or piglets, experimental areas for carrying out animal trials, a laboratory for dissections and sample processing, and an operating room. Achieving a stable climate, even at extreme outside temperatures, is essential for the research. An environmentally friendly solution was chosen with heat pumps, buffer vessels and heat exchangers, controlled by high-performance climate computers. There is also additional insulation in the walls and well insulated windows.

'The alternative accommodation possibilities and the better methods for sample collection demonstrate the strong focus on animal welfare. This specialized stable infrastructure helps ILVO to develop new expertise for research and co-creation, together with individual companies, industries, universities and knowledge institutions.'

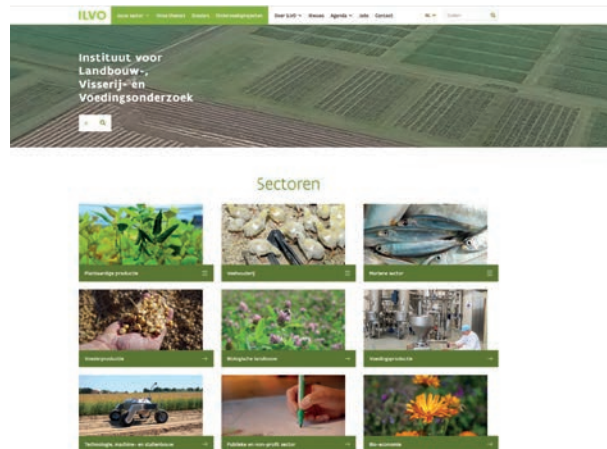
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Communication

WEBSITE

ILVO's new website was launched in early 2021, with a fresh layout and a user-friendly structure according to themes and sectors. Completely new on the website are the dossiers: each dossier contains sector-relevant information, with clear explanations about ILVO involvement and research. These dossiers are updated as new research results become available, and are eagerly consulted by website visitors.

Concurrent with the external website, ILVO also built a thoroughly restructured Intranet, so that (new) employees can quickly and efficiently find their way to ILVO news, procedures and sources of information about ILVO operations.



SOCIAL MEDIA

For years now, social media have been important communication channels for ILVO. A new leg of the social media strategy focuses on young people, namely via Instagram. To date, ILVO has been active on Instagram through the account ILVO_marien (launched in 2019 as ILVO_at_sea), an initiative of some young marine scientists. Meanwhile, the account has more than 500 followers, and ILVO decided to also start an umbrella ILVO account. After the preliminary study in 2021, the launch will follow in early 2022.

Facebook, Twitter and LinkedIn remain active, with the expansion of new groups (e.g. Agroforestry in Flanders), new hashtags (e.g. #ILVOatSociety) and new accounts (e.g. @ILVOPlantLL). Very popular in 2021 were posts about job opportunities, and about the themes of climate, protein diversification, digitalization and agroforestry.

WEBINARS, WEBINARS, WEBINARS

The covid measures in 2021 forced ILVO to host the bulk of its events, both external and internal, online as webinars. ILVO provided the necessary structural and technological adaptations and developed handbooks and training for employees. For example, the very first Flemish wine symposium brought together almost 350 wine growers, agricultural and wine researchers, wine connoisseurs and policymakers, in an interactive online space. The international GrowingMedia2021 congress was organized as a hybrid conference, where the physical and online audiences could interact. Recordings of the webinars are available on the ILVO website.

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Social media posts with most number of likes in 2021, on Facebook, Twitter and LinkedIn, respectively

SDG PIONEER GOES FOR SDG CHAMPION (SUSTAINABLE DEVELOPMENT GOALS)

ILVO has been working on more sustainable business for years. A few years ago, ILVO underlined its ambitions by entering into a partnership with CIFAL Flanders (UNITAR affiliated International Training Centre for Authorities & Leaders). CIFAL Flanders helps to sketch the broad outlines, includes ILVO in a larger learning network of organizations working on the same themes, and gives specific input on specific topics. This ensured that the path towards a more sustainable management and research focus could be implemented more quickly. The first steps of this trajectory were honored by awarding ILVO the title of SDG Pioneer. Since then, ILVO has been working towards becoming an SDG Champion. The goal is that ILVO will evolve into a research institute that can contribute even more to the realization of the sustainable development goals.



DRASTIC SUSTAINABILITY STEPS IN THE REAL ESTATE PATRIMONY

ILVO'S BUILDINGS

The variety of office buildings plus laboratories, greenhouses, farm buildings, barns and stables was thoroughly mapped out in 2021 with the aim of facilitating later decision making. This is done from an integrated vision in which synergies are sought between the buildings, the surrounding landscape and sustainable mobility. The 'Innocean' building, a state-of-the-art marine research complex of 8000 m² that ILVO and VLIZ are building on the East Shore in Ostend already demonstrates our great ambitions (SDG 9 & 11). See above for details about our energy efforts.

ILVO'S AGRI-FOOD RESEARCH LANDSCAPE

In 2021, work continued on the large transition project that already saw the light of day in 2020: the Agri-Food Research Landscape. With the appointment of a farm manager and a coordinator, ILVO

wants to make the connection between innovative research and the own farm. In this way, ILVO wants to set an example for making agriculture more sustainable. A good example of this is the commitment to reopen a number of "slow paths" and the efforts being made to increase biodiversity within a productive landscape near the Gonde creek. This involves 8 hectares of land, 5 of which fall within a SPA (Special Protection Area). For these plots, a Nature Management Plan will also be developed. Help is being sought from various partners from the Rodeland landscape project including ANB, the Province of East Flanders, ForNaLab, and Natuurpunt (SDG 6 & 15).

ILVO's Agri-Food Research Landscape also has room for relaxation and information sharing. (SDG 2, 4, 9 & 11). It also contributes to the stimulating work environment that ILVO strives for, with room for relaxation, its own childcare facilities and 'The Greenhouse' as a multipurpose meeting space (SDG 3).

FURTHER SDG INITIATIVES: RESEARCH, HR, ...

ILVO has set up many more actions inspired by the Research Vision 2030. For example, together with IDEACONSULT, a trajectory was started that should provide an estimate of the impact of ILVO research. In addition, further steps were taken with regard to the mobility policy, HR policy (including the introduction of a Gender Equality Plan) and the permanent employee training via the GoodHabitZ platform. The initiatives are too numerous to include them all in this brief report. They will, however, be included in a more comprehensive SDG publication that will follow at a later date.

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ILVO'S AGRI-FOOD RESEARCH LANDSCAPE:

TAKING THE LID OFF THE ILVO GROUNDS

In 2021 ILVO launched the innovative concept of the agri-food research landscape. It can best be described as an agriculturally strong incubator for top research within a high-quality landscape, as such an example of how best to use open space. The roll-out of this concept called for a sophisticated communication strategy and style, which was developed and applied by all those involved. This increased the visibility of achievements such as the new municipal child day care center 'Klaverveld', located at the former ILVO concierge's house, and the ILVO pop-up café that in the summer of 2021 allowed for covid-safe formal and informal meetings for the ILVO-colleagues in a pleasant setting (a well-ventilated conservatory, with indoor and outdoor seating).

WHAT IS ILVO'S AGRI-FOOD RESEARCH LANDSCAPE?

With more than 240 ha of experimental fields and research infrastructure in the open farming landscape south of Ghent, ILVO has an exceptional space for quality scientific research on agri-food, agriculture and rural areas. From social and policy concerns such as climate, energy climate, energy efficiency, descaling, water buffering and increasing biodiversity, ILVO chooses to develop its land and infrastructure as much as possible in a climate-neutral way for the benefit of research and society. This long-term sustainable development is based on the sustainability goals or SDGs of the United Nations. In addition, we also use the five health guidelines, the so-called '5G for agriculture and food' as our guiding principles: healthy production, healthy environment, healthy processing, healthy consumption and healthy socio-economic relationships and business models. To help this ambition take shape in a well-thought-out and concrete way, ILVO is working on the co-creative development of an innovative agricultural park within its fields: ILVO's Agri-Food Research Landscape.

AGRICULTURAL PARKS AS SOURCE OF INSPIRATION

The inspiration for the development of ILVO's food landscape was drawn from our own research into the concept of agricultural parks. In doing so, we link up with well-known examples of iconic European agricultural parks such as *the Parc Agrari del Baix Llobregat* near Barcelona or *Parco Agricolo Sud Milano* in Italy. ILVO's innovative Agri-Food Research Landscape aims to be a scenic landscape as well as a high-quality farming incubator

for top research that performs an exemplary function for the wider environment. Within ILVO's Agri-Food Research Landscape, trial fields for food production, greenhouses, labs and other types of research infrastructures are located between flowery field borders, hedges and pools, slow roads for cyclists and hikers, and historic relics. Visitor facilities and resting points are of course an integral part of it, with possibilities for refreshments and a bit of explanation about ILVO's work, contemporary practices and developments in agriculture. By developing this climate-proof open farming environment and the related climate-neutral patrimony, ILVO aims to set an inspiring example. *aatneutraal patrimonium wil ILVO een voorbeeldrol opnemen.*

HOW DO WE GO ABOUT THIS?

Making that innovative Agri-Food Research Landscape into a reality requires a number of interventions in both the built and undeveloped areas. The built landscape that is currently spread across various sites has come about in various phases of construction since 1932. The majority of the buildings date from the 1950s to the 1980s, and are thus dramatically outdated. In order to meet the (ILVO and European) energy ambitions of climate-neutral buildings, as well as to improve the welfare and well-being of the ILVO workers inside and outside, a thorough revision of the entire patrimony is required. By better matching thematic research lines with building clusters, efficiency gains will be achieved in terms of the building and the environment, resulting in a leap in quality. The 200 hectares of ILVO grounds also offer unique potential, both in terms of research as well as the realization of the ambitious European policy intentions such as the Green Deal and Farm to Fork Strategy. The location in the open agricultural landscape between two nature reserves, surrounded by the urban cores of Merelbeke and Melle and the rural villages of Gontrode and Lemberge, represents a challenging diversity of land uses and users. Because of the focus on research and policy, the ILVO environment offers the possibility to set up an exhaustive experimental space to test relevant social and policy-related issues, such as descaling and soil compaction, increasing biodiversity, developing water buffering capacity, working towards improved soil health, agroforestry, agricultural education, connecting modern agriculture with society, digitalization and increasing the appreciation for food production

in strongly urbanized Flanders. To do so, ILVO draws on its expertise in participative processes to shape the Agri-Food Research Landscape together with the researchers, farmers, citizens and municipalities.

AGRI-FOOD RESEARCH LANDSCAPE THEMES:

- Bioproductive landscape
- Well-being
- Climate-neutral infrastructure



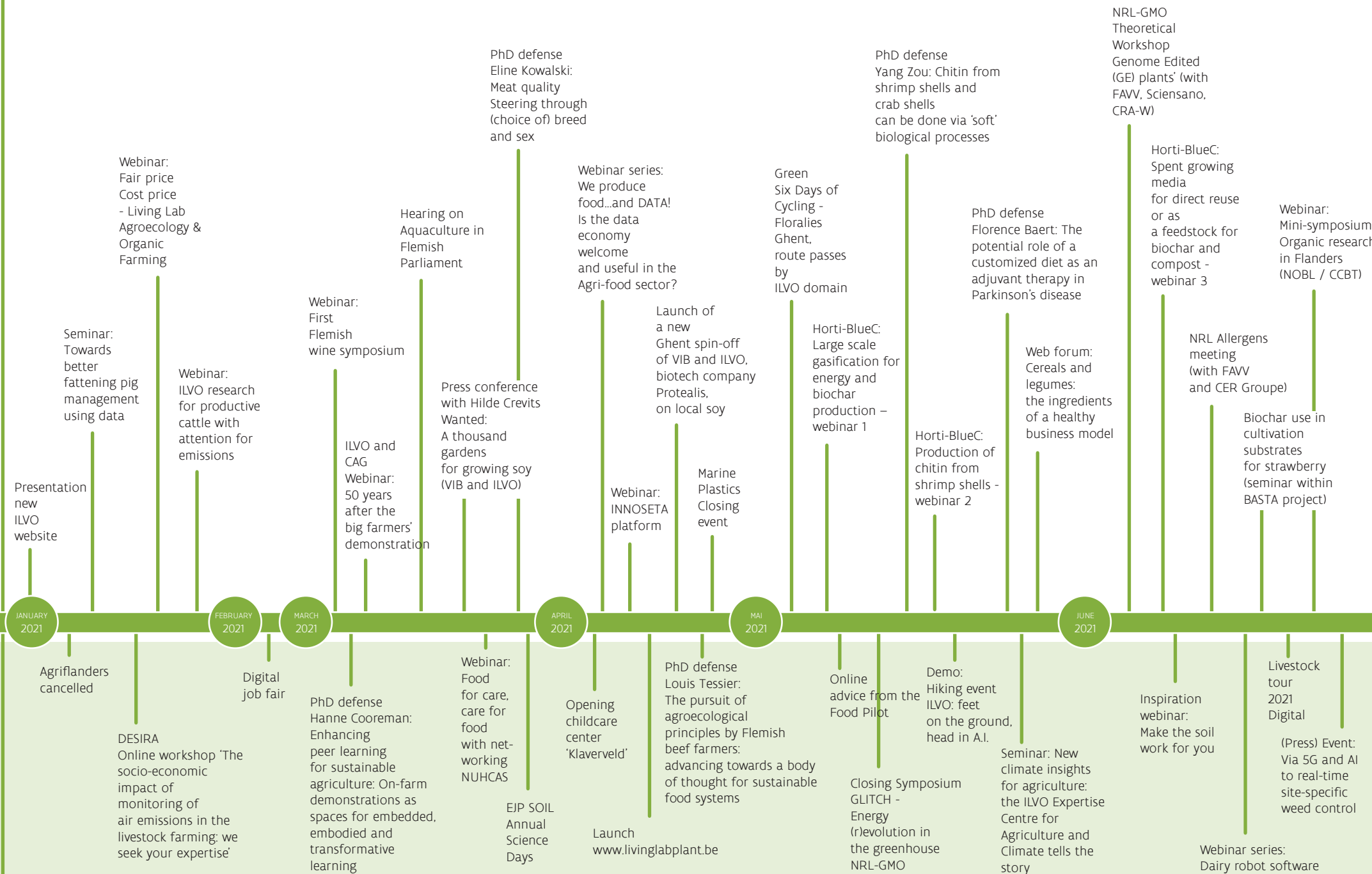
WALKING THROUGH THE AGRI-FOOD RESEARCH LANDSCAPE

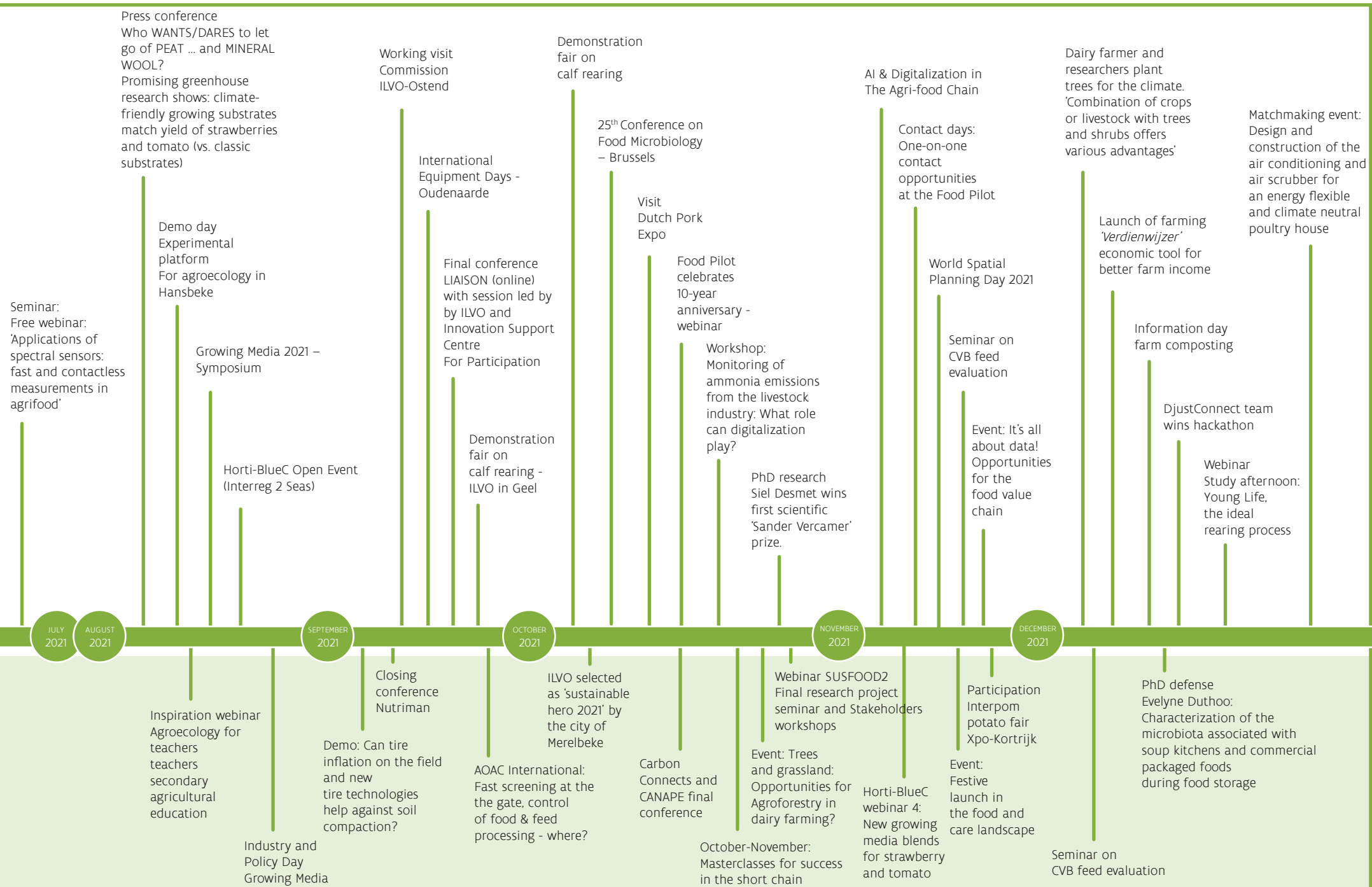
The icing on the cake of the Agri-Food Research Landscape was the design of a walk along and through ILVO research plots, with audio fragments that can be called up via QR codes. This walk can be followed in a covid-safe way and provides information about information about what is happening at ILVO and how ILVO strives for sustainability in its research, field operations and interaction with the environment.

www.ilvo.vlaanderen.be/nl/wandeling-op-de-ilvo-onderzoekskouter

contact: elke.vanempten@ilvo.vlaanderen.be

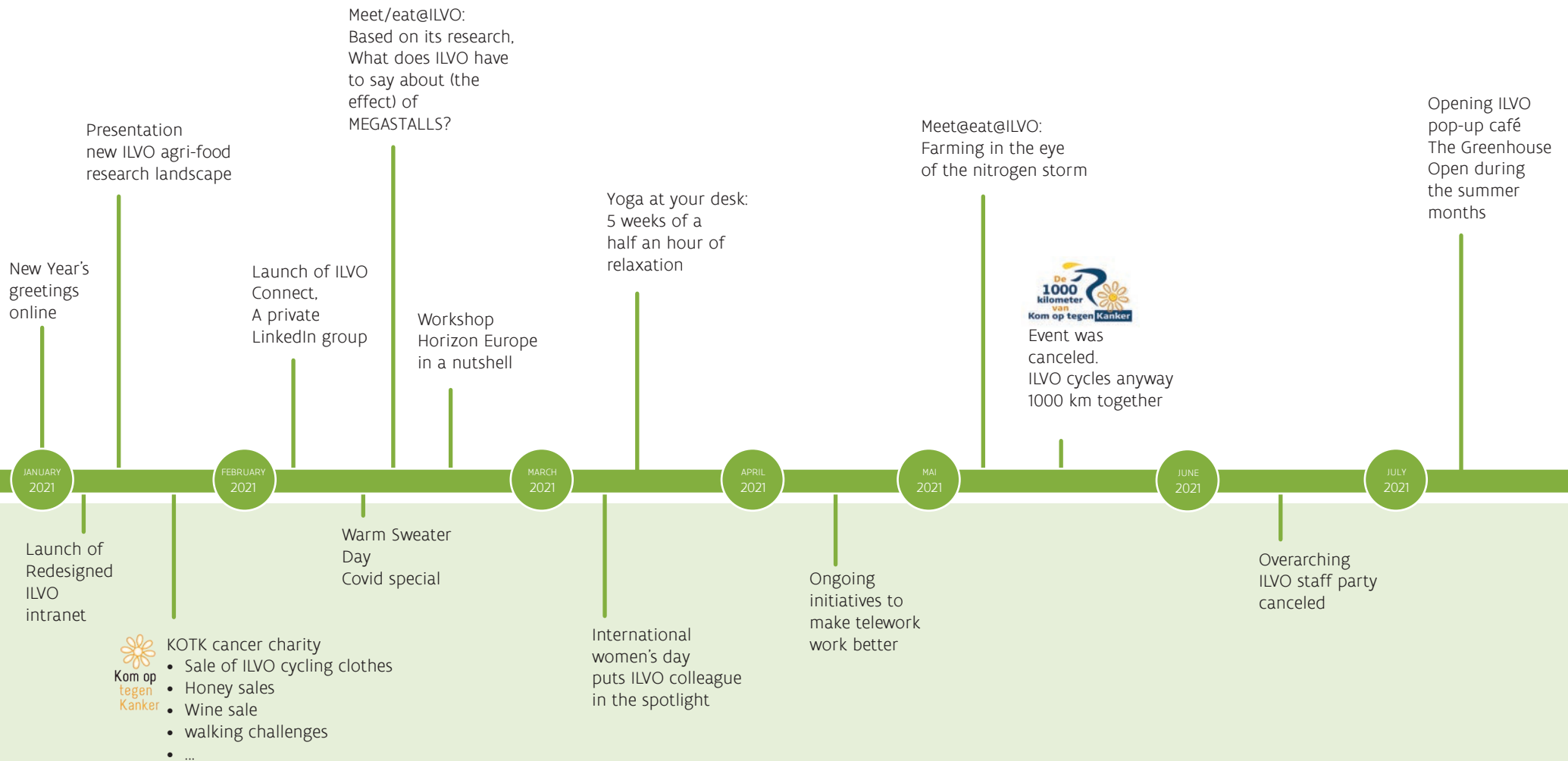
External events





Internal events

'Ventilation and CO₂ measurements'





AUGUST 2021

SEPTEMBER 2021

OCTOBER 2021

NOVEMBER 2021

DECEMBER 2021

200 colleagues together at Plant Sciences Day

Innocean family day Ostend

Return to work day: French fries at T&V 370

Return to work day: French fries at T&V 115



ILVO family jogging event For large and small on the fields of Plant Sciences

Expatriate outing, cultural contact day for ILVO expats

Agri-culture evening: Farmer's Psalm, A modern farmer drama

O-day: Research Day

- Investing = growing smart and working together
- Stacked labs
 - Shed 33 and the big ILVO-Marine move
 - Underground activity (and an incubator)
 - The store of Meet@All
 - Year-old Food Pilot with strong support pillars
- Flowers and plants in winter
- IQ of a plant
 - Shrinking geraniums
 - Lavender in the cold
 - The genus of roses
- Art and a walk as a gift - An art grant for ILVO

ILVO team runs 100 km KOTK cancer benefit run in Koksijde

Rodeland day, cycling route with stops at ILVO

10 weeks: 'apple chat.' To take time for colleagues

VLIZ@ILVO

Launch audio-walk Through Agri-Food Landscape

Meer kip en minder rund eten is beter voor het klimaat. Maar de kippen betalen een torenhoog prijs

Van kalkhenp tot fruitresteren en goudsbloem

ILVO in the press



DeMorgen.

oor het klimaat is het beter dat we meer kip en minder rund eten. Want de vleesdier zet voor erg efficiënt om in vlees. Daar betaalt ze wel zelf de rijk voor. De vleesdier

B2BE-Facilitator brengt alle actoren in bio-economie
Vlaanderen wil op hoger schakel en innovatie in bio-economie

Amelien passe
Vlaamse Bre
Heroverveging
Besparingen zetten rem op Vlaams onderzoek

De 56 van het ILVO
Onderzoek in de
Vlaamse Bre
Heroverveging
Besparingen zetten rem op Vlaams onderzoek

2018 medien
Vlaamse Bre
Heroverveging
Besparingen zetten rem op Vlaams onderzoek



Maatregel 3: Langleefbaarheid en veiligheid van vee
Een cyclisch voedingsplan houdt zo'n 80.000 kippen op het einde van een geboortecyclus van de kippen in plastic kisten

Thematische dieptevergadering
Werkevaluatie
Boer wordt pietje-precies, met dank aan gps en robots

Verder opschalen
Onderzoek in de
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Objectief en inspirerend: ILVO lanceert LANDBOUW-VERDRIENWIJZER
Lancering van de Vlaamse actiesamenwerking

2018 medien
Vlaamse Bre
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Mechanisch scheiden van mengmest
Voordeelen daarvan
Schaarste aan kippen

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Een cyclisch voedingsplan houdt zo'n 80.000 kippen op het einde van een geboortecyclus van de kippen in plastic kisten

„Hairy Roots“ – der Schlüssel zu mehr Trockentoleranz?
Wasserschiller als...
Hoe de Vlaamse melkveehouderij wapenen tegen de volgende crisis?

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Hyperspectrale sensoren en 5G maken hun intrede
De overname van...
Hyperspectrale sensoren en 5G maken hun intrede

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„Smart farming verhoogt efficiëntie, duurzaamheid en kwaliteit van de landbouw“

Smart farming kan een enorme bijdrage leveren aan het duurzamer maken van onze landbouw en veehouderij. Maar ook op vlak van efficiëntie en dierenwelzijn kan het heel wat winnen opleveren. Eva Brusselman, Simon Colt en Jarissa Maselyne, onderzoekers bij het Instituut voor Voedselonderzoek (ILVO)

Vermindering van emissies in veehouderij
Hoe de Vlaamse melkveehouderij wapenen tegen de volgende crisis?

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Kunnen we ons aanpassen aan schaarste én intense regen?
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