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Dear Reader.

2022 was, for many reasons, a memorable year for ILVO. We celebrated the 90th anniversary of our research activities at the sites in Merelbeke/Melle and we moved our marine research activities to the brand new InnovOcean building in Ostend, an architectural gem that even made the architectural pages in the newspaper.

In September we held a big bash for our 90th birthday: the "Festival of Knowledge and Food" or FESTILVO. A four-day event! We started with various scientific seminars for an expert audience and then opened our doors to more than 8000 members of the general public. One day was dedicated to agricultural schools and the culture lovers enjoyed several performances of an open-air play about farming and farmer well-being. Once again, I would like to sincerely thank all ILVO staff members who made this wonderful four-day event possible. Our Festival of Knowledge and Food was something to be proud of and will remain engraved in our memory for a long time to come.

There were other milestones as well. The Pig Information Center celebrated its 10th anniversary and our Minister of Agriculture Jo Brouns cut the ribbon for our new protein processing line at the Food Pilot. We also put the finishing touches to our 'Strategic Real Estate Plan' which will guide us through all of our infrastructure investments in the coming decades.

The sharp rise in energy costs gave us a serious budgetary challenge, but provided an equally significant incentive to reduce our energy use. Over the past year, agriculture has been the subject of discussion among policy makers and in the media. Difficult subjects such as the nitrogen dossier, the Manure Action Plan (MAP) and the Strategic Plan for

the Common Agricultural Policy, were all on the table. In all these dossiers, ILVO takes part in the social debate in a thoughtful way, by supplying information and data and by shedding light on the subjects from various angles and fields of expertise. We always point out that farming is unique, both economically and ecologically.

We remain fully committed to using research to make agriculture more sustainable by embracing both the new technological possibilities of precision agriculture, as well as the fundamental insights generated by an agroecological view of agriculture, where soil quality takes center stage.

ILVO has an exemplary role. We therefore aim to demonstrate how agriculture can live in harmony with nature and the wider environment. For example, ILVO has drawn up a nature management plan, in which we will develop a number of hectares in order to realize the ambitions of the Rodeland project, which aims to inrease the biodiversity in the Gondbeek river valley.

Many new employees joined us in 2022: we now have more than 730 colleagues to carry out advanced research in the fields of agriculture, fisheries and food. The highlights of their research efforts follow in the coming pages.

Enjoy your reading.

Joris Relaes 01.03.2023



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Mission & Vision



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.

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 agrofood 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 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 socioeconomic 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.

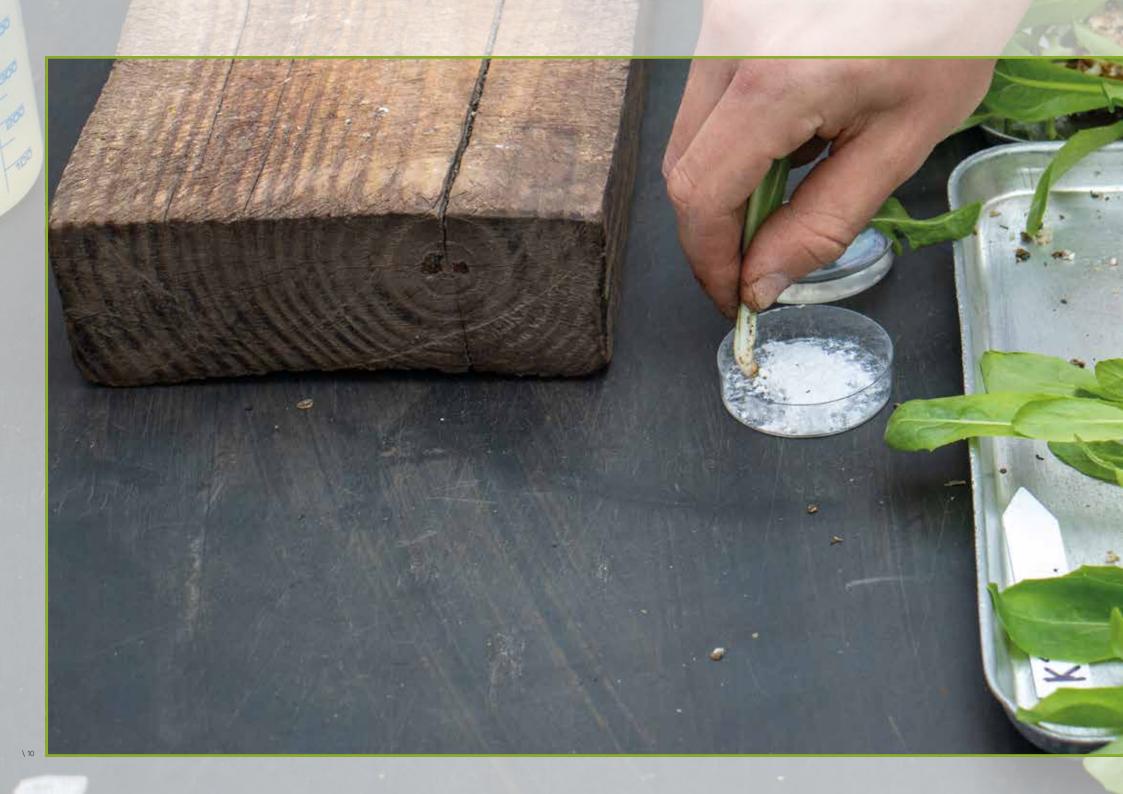
5. HEALTHY ENVIRONMENT

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.









Research 2022







Plant & Soil Living Lab

AZALEA BREEDING: NEW APPROACH, STRONGER INNOVATION

ILVO has been an azalea breeding partner since 2008 with the innovation network AZANOVA. Recently, the accession of FlorAmor and Hortibreed added international marketing and breeding to complement the historical azalea collection and the latest genetic breeding tools of ILVO's Plant and Soil Living Lab.

This expansion now allows AZANOVA to span the entire chain, from research to consumer-oriented marketing. This strengthens the consortium considerably. For the first time in azalea breeding, one can speak of a truly balanced private-public cooperation. This will accelerate the valorization of the fundamental knowledge developed at ILVO. Participating azalea growers are enthusiastic about the new approach. This marketing expertise will help them to know better how many plants of which cultivar to grow in order to collectively obtain a better producer price. They are starting to evolve from price taking to price setting, which gives the growers a rosier view of the future.

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ORNAMENTAL CIRCULAR CULTIVATION

Potting soil consists mainly of peat, but peat extraction is under pressure because peatlands provide a unique habitat for specific fauna and flora. The extraction and transport of this fossil based resource also creates significant greenhouse gas emissions. The chrysanthemum company JoluPlant NV in Staden was therefore looking for an alternative and found help at the Plant and Soil Living Lab.

Today, JoluPlant reuses substrates from local growers, contributing to circular horticulture and stimulating the short chain. Of course, used cultivation substrates cannot simply be reused in the greenhouse. Two things need to happen first: the substrate must be treated to avoid the risks of weeds, fungal spores and soil-borne pathogens. And fertilization must also be adapted to the substrate in question. ILVO's Plant and Soil Living Lab worked together with the Ornamental Plant Research Center (PCS) to adjust the cultivation for optimal valorization of the nutrients remaining in the used substrate.

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NO NEMATODES IN TARE SOIL FROM POTATOES

In recent years, concern has increased about the spread of potato cyst nematodes (*Globodera rostochiensis* and *G. pallida*). These quarantine species, which can decimate potato production, are spread passively, particularly via contaminated soil accompanying harvested potato tubers. This tare soil is removed at the processor or packer and must be disposed of properly to prevent infection of new fields. Decontamination of the tare soil is thus a crucial step. Belgapom, the federation of the potato trade and processing companies, called the ILVO experts for help. We investigated several ways to kill the nematodes present in tare soil. Ultimately, heating the soil was proven to be successful in eliminating the quarantine potato cyst nematodes.

The entire agri-food chain must work together to achieve circularity. Processing of tare soil was an important missing link in circularity. Belgapom is therefore pleased to see this step being taken toward a circular, sustainable and modern processing chain.

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RESULT.



DROUGHT TOLERANCE GENES IN SOYBEAN: A FASTER APPROACH TO BETTER SEEDS

In a doctoral study (ILVO/UGent), two sets of genes were shown to improve soybean drought resistance against short (3 to 4 weeks) or long dry periods (6 to 7 weeks). Some of the genes discovered have never before been identified as potentially active in the mechanisms of plant drought resistance. The genes were discovered through analysis of the whole genome of hundreds of soybean varieties and hybrids, combined with field experiments under the rain-out shelters, which simulate drought conditions. This knowledge is helping to accelerate the development of climate-adapted soybean varieties that will provide stable yields even under increasingly variable weather conditions.

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Regenkappen voor droogteonderzoek

0:25



RESULT



SOIL HEALTH IN THE SPOTLIGHT

Together with Wervel, VUB and Organic Forest Polska, ILVO's Living Lab Agroecology and Organic Farming (LLAEBIO) organized the 'Soil Health Conference' on December 5th, FAO's World Soil Day. A total of 178 participants came to Brussels, including 35 farmers. At the conference, American rangeland ecologist Richard Teague and Canadian microbiologist Kris Nichols presented their insights in Brussels for the first time. Kris Nichols clarified how labile carbon compounds and soil life can contribute to faster soil carbon accumulation than stable humus. Richard Teague explained his discovery that all U.S. farmers with the highest carbon levels in their soils applied holistic grazing management. Koen Willekens presented findings from ILVO's soil research, and Peter Vanhoof explained his innovative method to measure soil health. Farmer Emiel van de Vyver presented the soil practices he applies on his own organic farm. We concluded with a panel discussion where representatives of DG AGRI, the Belgian Soil Science Service and the Flemish Government all expressed the wish to integrate the speakers' research results into their organizational operations.

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RESULT



EXPERIMENTAL PLATFORM FOR AGROECOLOGY IN HANSBEKE DEMONSTRATES: SMART USE OF NITROGEN AND CARBON AND EXPERIENCES WITH CHICKPEA, BUCKWHEAT AND MIXED CROPPING

A demonstration day at the Experimental Platform for Agroecology in Hansbeke showed the partners' results from the second season of field experiments and measurements. How does the soil retain/multiply its carbon content and increase nitrogen availability without fertilizer application? How are crop rotations and mixed crops performing? And what do the other partners in the agroecological chain think of the results? During this demo day, farmers, contractors, consultants and researchers exchanged experiences and evaluated how to simultaneously achieve production and environmental goals.

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P , H , A , E , Project Hansbeke Agro - Ecologie

[RESULT]



HOW MITES MANIPULATE PLANTS

Spider mites can suppress plants' natural defenses by manipulating plant genes using a protein in their saliva. This allows them to reproduce faster. Joséphine Blaazer, during her doctoral studies with Professor Merijn Kant of the University of Amsterdam and under the guidance of Wannes Dermauw at ILVO, unraveled the underlying mechanism. This discovery offers prospects for a new form of pest control. Through mutations, breeders could make the vulnerable plant genes inaccessible to the mites. Good news for growers of greenhouse tomatoes, cucumbers and strawberries, because spider mites can cause great damage in those crops.

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RESULT



New BACTERIAL SPECIES IN HYDRANGEA

Leaf spot disease is a typical bacterial phenomenon that mainly affects *Hydrangea arborescens*. The most popular Hydrangea cultivars are 'Annabelle', 'Incrediball' and 'Invincibelle'. Based on a shared DNA code, the bacterium in these plants was first identified as *Xanthomonas hortorum*. After a more thorough analysis it was named as a new species: *Xanthomonas hydrangeae*. Even within this bacterial species there are genetic variants with different virulences. Bacterial blotch was also identified on *Hydrangea quercifolia*. *Hydrangea paniculata* and *Hydrangea macrophylla* showed no infestation in infection trials. This study revealed a risk for trade and export, as we found that *Xanthomonas hydrangeae* can survive not only on the leaves, but also in resting buds of *Hydrangea arborescens*.

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RESULT



VIRUS-BASED CROP PROTECTION

Within the VIROPLANT project, ILVO investigated how viruses can be used as biocontrol agents against diseases and pests in grapevine, tomatoes and roses. This study yielded insights about the interaction between viruses and the harmful fungi, bacteria and pests and their microbiomes. The crop protection market was mapped and the obstacles and drivers of virus-based crop protection and the expectations of end users were also identified. ILVO learned that consumers need to be informed, that growers not only care about efficacy but also health risks and ease of use, and that pome fruit is a promising market. These results will be an important contribution for the further development of virus-based crop protection products and their market introduction.

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An International Research Project H2020







NEW.

${f N}$ arrow-leafed plantain for nutritious biodiversity in pastures

ILVO this year began breeding what most know as a "weed," narrow-leafed plantain. Part of the reason is the growing demand for biodiversity in our grasslands. Narrow-leafed plantain offers additional benefits, however. According to New Zealand research, the plant contains substances that alter nitrogen metabolism, reducing the amount of nitrogen in the urine of grazing animals. This therefore reduces the risk of nitrogen leaching into the soil and to the environment.

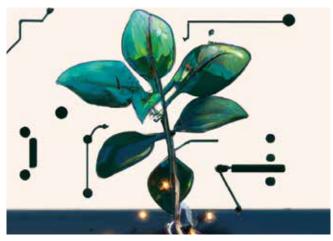
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NEW

FAST AND CHEAP ASSESSMENT OF CROP PERFORMANCE? ILVO IS FIGURING IT OUT!

During crop breeding, is it possible to predict the yield and quality of new crosses cheaper, faster and better? In this project, researchers are developing improved methods for phenotyping. The focus is on models based on data from 'high throughput phenotyping tools' and from laboratory analyses. The models should be able to accurately predict what crop yield and quality traits a particular plant can achieve. With this development, the adaptations required due to the rapidly changing growing conditions caused by the climate can be accelerated and promoted.

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NEW

See a diseased beech tree? Report it and help prevent the spread of beech leaf blight!

Beech leaf blight is a new, rapidly emerging disease in the U.S. and Canada that is doing a lot of damage there. The culprit is a leaf nematode. In North America, the disease is mainly detected on American beech, but has also been spotted on European beech, the dominant beech species in Belgium. So far, the disease has not been found in Europe. It is therefore vitally important to avoid introduction and to keep an eye on our trees to detect signs of disease. Researchers are monitoring the situation closely, but we are also appealing to citizens to report any symptoms.

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NEW

DEVELOPMENT OF A STATISTICALLY BASED MONITORING PLAN BASED ON RISK ANALYSIS FOR THE DETECTION OF XYLELLA FASTIDIOSA IN BELGIUM

Xylella fastidiosa (Xfas) is one of the most dangerous bacterial plant pathogens, as it is associated with serious diseases in a wide range of plant species. In 2013, a strain of the bacterium in Italian olive groves caused a dramatic outbreak for the first time on European soil. To better monitor and control the spread of the disease, EFSA published guidelines for conducting surveys to detect Xfas. In addition, they also prepared a tool, RiBESS+. Testing the applicability of this tool at the national level is the focus of RIBSURX. This project is a collaboration with ULB and UCL.

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NEW

RISK ANALYSIS OF WHITEFLY-BORNE VIRUSES FOR BELGIAN CROPS

Whiteflies such as *Trialeurodes vaporarorium* and *Bemisia tabaci* are devastating greenhouse crops like tomato and cucumber, causing yield losses of more than €1 billion per year worldwide. This project, in collaboration with the Research Station for Vegetable Production (PSKW), is investigating the status of Belgian *B. tabaci* populations in greenhouse and open crops, what viruses they might transmit and what measures, if any, should be taken against Belgian *B. tabaci* populations.

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NEW

INVENTORY AND VALIDATION OF QUALITY PROCEDURES FOR NUCLEIC ACID EXTRACTIONS USED IN DIAGNOSIS

Each plant health laboratory uses different DNA and RNA extraction methods for its diagnostic tests, depending on the organism, the purpose of the test, and other factors such as the matrix. The aim of this project is to establish guidelines for use of controls and other quality parameters for RNA/DNA extraction methods to support diagnostics and research in plant health.

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[NEW]

MUCOR IN STRAWBERRY

Mucor, a harmful plant fungus that lives on strawberry, has been appearing with increasing frequency in the last several years. In its worst form, it leads to loss of firmness of the pulp during ripening so the fruit becomes loose and splits open when it falls to the ground. Fruit rot symptoms often do not become visible until the fruit is being auctioned or even later once it reaches the store. The aim of this research, performed with Research Centre Hoogstraten, is to clarify the problem in practice and to map which Mucor species occur in Flanders.

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$oldsymbol{\bot}$ IN THE SPOTLIGHT $oldsymbol{\bot}$

100 VIPs named 'Rose' celebrated bee-friendly roses at Meise Botanical Garden

On the eve of the Week of the Bee in May, 100 men, women, girls and boys with 'rose' in their name were invited to attend an exclusive rose party at Meise Botanical Garden. They were encouraged to include more biodiversity in our gardens and received a bee-friendly rose to take home. This rose festival was an initiative of the rose breeders and researchers in Flanders. 'Mel Bee', one of ILVO's 4 new bee-friendly roses, won the top prize at the International Rose Competition in Bagatelle - Paris in 2022.

ILVO's bee-friendly roses

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A day full of roses, 'Roses' and bees. The aftermovie of our rose festiva

1:07





[NEW]

Sustainable control of viral yellowing disease in Sugar Beets

Since the European ban on neonicotinoids, sugar beet is experiencing yellowing diseases caused by different viruses, an infestation spread by aphids. The LA project Virbicon, a collaboration with KBIVB and KU Leuven, aims to develop a sustainable and integrated control strategy for viral yellowing disease in sugar beet, based on the pillars of Integrated Pest Management: prevention, monitoring, biological aphid control, biological virus control and use of chemical control only when truly necessary.

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[NEW]

RISK ANALYSIS OF HARMFUL BARK AND AMBROSIA BEETLES

The bark and ambrosia beetles *Scolytinae* and *Platypodinae* have been known to wreak havoc in forests, parks and nurseries. The beetles can hitchhike on timber shipments by hiding under the bark, thus spreading from country to country. The question is exactly which species pose the greatest risk to tree species present in Belgium and what their pest status is today. ILVO is evaluating the best method of monitoring these beetles to be able to respond adequately in case of detection.

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10 YEARS OF THE PIG INFORMATION CENTER

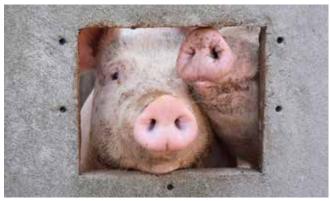
On April 11, 2022, the Pig Information Center celebrated its 10th birthday. Back in 2011, several 'dialogue days' showed that the pig sector strongly desired objective and understandable information. In response, the Pig Information Center was established to act as a point of contact for questions from pig farmers and extension agents.

The core task remains the same: to integrate, translate and disseminate research and practice knowledge based on scientific literature studies and practical experience. Questions from practice are captured and, where necessary and possible, converted into new (research) projects or experiments. Since poultry and cattle farming experienced similar needs, a Poultry Information Center and a Cattle Information Center were also established at the beginning of 2019, following the example of the Pig Information Center.

The site www.varkensloket.be has decision-support calculation tools, videos, brochures, practical knowledge, presentations, research results, reports including (anonymized) questions and the corresponding answers, and more.

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CATTLE NUTRITION COURSE

Another Cattle Nutrition Course was organized in the fall. Nearly 50 dairy and beef cattle farmers were presented with the theoretical basics of cattle nutrition and practical applications in an intensive program. Understanding the cow's physiology and evaluating the feed value of feeds helps to better estimate the ration. The farmers also learned how to use production parameters as inputs to help adjust feed management. This gave the trainees applicable knowledge about feeding their own cattle correctly and efficiently to increase profitability.

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Living Lab Animal Husbandry _

STAKEHOLDERS EXPECT POLICY ADVICE, PROACTIVE COMMUNICATION AND PRACTICE-RELEVANT RESEARCH

In a stakeholder brainstorming session 'Innovation in and for livestock farming' on September 16, 2022, sector federations, commercial companies, livestock farmers, agricultural organizations, retailers, researchers and policy makers talked with ILVO about the future of Flemish livestock farming. Ahead of time, the participants were asked about the three main challenges they believe the livestock industry faces and what role they see for ILVO in this. The most important challenges were the uncertain legal framework, emission and environmental issues, and the profitability and viability of farms.

To tackle the above challenges, cooperation is needed more than ever. Three sector federations - BFA, Fedagrim and FEBEV - also took the floor. They indicated that ILVO could assume various roles, namely: the role of advising policy and paying attention to policy developments; the role of providing objective communication to the sector, government and society; and the role of performing practice-oriented research and an independent and easily accessible knowledge center. The managers and researchers at ILVO will take this valuable input to heart when updating its livestock research vision.

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RESULT



How to reduce nitrogen emissions in Broilers without affecting performances?

The best nitrogen-reducing measure focuses on the source. This premise was the basis for the PhD of Madri Brink (ILVO/UGent). Based on breeding experiments with broiler chickens, she was able to show that a feed with slightly less protein leads to a drop in N emissions. Favorable effects were also seen when providing specific age-adapted feed, and with attention to litter selection and management.

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[RESULT]



GRASSLAND HIGH IN NITROGEN EFFICIENCY

Clover is a legume that can fix nitrogen from air when inoculated with the right bacteria. In a field trial within the VLAIO project EKOPTI (ILVO/Inagro), the nitrogen efficiency of 34 grass plots in West Flanders was investigated. The plots where clover was sown had a higher nitrogen efficiency than plots where no clover was sown. Moreover, the average dry matter yield (11 tons/ha/year), on pure grass plots was achieved with 300 kg/ha of active nitrogen from fertilization. When clover was sown the same yield was achieved with 200 kg/ha less active nitrogen from fertilization.

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RESULT



BRINGING RESEARCH AND BEEF FARMERS CLOSER TOGETHER

In December 2022 the 3-year H2020 project BovINE ended. That project focused on knowledge transfer and learning among beef farmers from across Europe. At the event, good practices and innovations were shared around 4 thematic challenges: 1) animal health and welfare, 2) socioeconomic resilience, 3) production efficiency and meat quality, and 4) climate and environmental sustainability. The European beef farmers presented these topics themselves in a bottom-up format. Presentations were also made to EU policymakers to broaden their understanding of the sector and to better detect opportunities and challenges. More information: https://www.bovine-eu.net/

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RESULT.



NUTRITIONAL STANDARDS FOR HEIFERS GET AN UPDATE

The Dutch energy and protein requirements standards for young cattle currently used by dairy farmers are based on calculation rules from 1997. However, today's heifers are heavier and larger than they were 25 years ago. And eventually they will also give a lot more milk than cows did back then. Within the VLAIO project JongLeven (ILVO/Inagro/Hooibeekhoeve) the ideal growth trajectory was mapped on the basis of quarterly weight measurements on 14 reference farms. This eventually yielded new, more accurate energy and protein requirements standards for Holstein heifers.

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[RESULT]



ANIMAL-FRIENDLY URINE COLLECTION FOR SAMPLING

Urine sampling from cows is required to measure the nitrogen balance: total nitrogen input versus total nitrogen output in milk, urine and feces. In past trials, total urine was collected via catheters. In 2022, a new, more animal-friendly method was tested for the first time: massaging the cows' perineum. This manipulation stimulates a nerve that causes them to urinate spontaneously, allowing for easy sample collection. This significantly less invasive method proved to be very successful and was far more comfortable for the cows.

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RESULT.



Cows give more milk when hearing music

Music is an easy and inexpensive form of enrichment that can be offered simultaneously to all animals in a group. The aim of this study was to clarify whether music is actually a suitable form of enrichment for cattle. On six dairy farms during three consecutive three-week periods, music was played for 8 hours a day. Per 3-week period, either classical music, pop music or no music was played. When the cows heard the classical music, their daily milk yield increased by 3%, and when they heard pop music, they gave 1.5% more milk. However, there were no indications that cows actively sought cubicles where the music could be more clearly heard.

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IN THE SPOTLIGHT _

OLD SHED BECOMES NEW LIVESTOCK BARN

At the ILVO experimental farm, an old shed was transformed into a new barn for the young dairy cattle. In addition to the new calving square for the youngest animals (2021), this renovation addresses the heifers' housing needs. To the extent possible, ILVO reused materials already present on the site. Fencing from old stables was refurbished and fitted into the new barn. This sustainable approach resulted in recycling a lot of building materials and significant financial savings!

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RESULT



WELL-CONSIDERED INSEMINATION THANKS TO NEW SIMULATION TOOL

Farmers in the 'Melktools' Operational Group have challenged researchers and consultants to develop practical calculation tools. These calculation tools should support Flemish dairy farmers in operational decisions that have to be made frequently. A first calculation tool, 'Inseminate with the right semen' was launched in the spring of 2022. This tool calculates what the additional yield can be if a dairy farmer makes thoughtful use of sexed semen and use of crosses. With the tool, the dairy farmer can simultaneously simulate 3 scenarios to determine the optimal insemination strategy for the farm.

More information:

https://www.rundveeloket.be/jongveetool

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[RESULT]



PhD on Chestnut tannins in Poultry Nutrition

Chestnut tannins may support production and health of broiler chickens and laying hens, according to findings from this VLAIO project (R&D), which focused on the role of tannins in poultry production. The notion that tannins are an anti-nutritional factor appears to be outdated, as tannins in fact appear to play multiple positive roles in animal production. This study focused on performance, growth, egg and meat quality in both layers and broilers. The (antioxidant) metabolism and pharmacokinetics of gallic and ellagic acid, components of tannins, were also discussed.

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RESULT



Online platform for extending the life of laying Hens

The VLAIO-LA project *Leglanger* (lay longer) aims to responsibly extend the laying cycle on farms to achieve 100 weeks of hen age. During the project, several bottlenecks to this goal were investigated. For example, the feed requirements of senior laying hens were studied, both in terms of protein and energy content, as well as calcium and phosphorus content. A tool that allows poultry farmers to calculate the optimal productive age of their laying hens was also developed. All obtained project info is available through the online platform

www.pluimveeloket.be/leglanger

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[RESULT]



ECONOMIC IMPACT CALCULATION OF PHASING OUT ENRICHED CAGES (FINAL REPORT)

In late 2020, Flemish Minister of Animal Welfare Ben Weyts commissioned a study on the economic impact calculation of a possible phase-out of enriched cages. This study aimed to provide answers to questions such as "What is the economic impact on poultry farms with enriched cages?" and "What is the impact on the market for eggs and egg products?". Project partners ILVO and the Poultry Information Center worked closely with the poultry industry to answer these questions. Final report available at

www.pluimveeloket.be/uitfaseringsstudie.

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RESULT

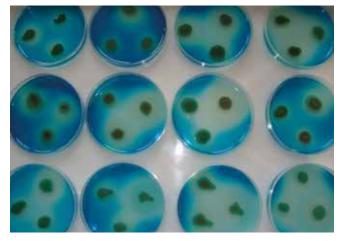


OPTIMAL TIMING FOR MIXING OF DOES IN PART-TIME GROUP HOUSING

Flemish meat rabbits have already been compulsorily housed in enriched group pens since 2016. Starting in 2025, does will also have to be housed part-time in groups. The Konsemi project began 3 years ago at the request of the Flemish Council for Animal Welfare. The aim: to work with the rabbit farmers to establish the ideal conditions for mixing the does. The ideal age of the kits was investigated, together with the occupancy rate and extra pen enrichment and/or escape possibilities.

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RESULT



CONTROLLING CAMPYLOBACTER AND SALMONELLA IN THE POULTRY INDUSTRY

On the monitored poultry farms, about one-third of the flocks were found to be infected with *Campylobacter* during rearing, most of them became colonized after thinning. We found an epidemiological link between the contaminated material and the chickens remaining after thinning. Efficient cleaning and disinfection of crates proved to be a problem in many slaughterhouses, where both an inefficient cleaning and disinfection process and contaminated wash water could cause problems. A similar study was initiated investigating why *Salmonella Infantis* persists on many poultry farms.

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[RESULT]



PREVENTION AND CONTROL OF WORM INFECTIONS IN ORGANIC LAYING HENS

Worm infections occur frequently in the laying hen industry. Usually, these infections are treated with flubendazole. However, this is not coherent with organic farming ideology, and, moreover, when used in the organic sector, a waiting period of 48 hours also applies. In two CCBT projects, alternative methods for prevention and control of worm infections in organic layers were sought. The aim was to provide the sector with tools to reduce flubendazole use without loss of technical performance and animal welfare.

More information:

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IN THE SPOTLIGHT

PROMISING AMMONIA SENSORS TESTED IN PIG BARN

And tested in a poultry house and a dairy barn too! ILVO, commissioned by the Flemish Environmental Policy Area, is looking for a reliable and affordable system for measuring the actual ammonia that is produced in an open or closed stable and is subsequently released into the ambient air. This is different from current practice based on models and general estimates.

Following a broad European call, several sensor manufacturers lent the researchers two copies of their measuring device. Application in a challenging agricultural environment is new for almost all sensor brands, so testing is a must.

In 2022, ILVO selected certain sensors based on a questionnaire and open dialogue with the companies on the potential of the sensor in a barn environment. The first test is to see whether the sensors correctly determine how much ammonia is in the air under ideal lab conditions. With the devices that pass, several field tests will follow in 2023. The question then is: How robust and correctly do they measure in a closed pig or poultry house, or in an open cattle barn?

Livestock farmers' nitrogen emissions are currently calculated with a fixed emission factor per animal species and barn type. Any efforts to reduce emissions on the farm through feed and farm management cannot currently be rewarded. If after this study it appears that continuous real-time measurement of an individual barn is technically possible and affordable, there is a chance that the government will also authorize multiple methods of emission determination.

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NEW

Do zeolites reduce barn ammonia?

Zeolites are volcanic minerals that can bind with various molecules. They are used for a variety of applications such as in water treatment, industrial processes and human 'detox' food products. They may also have potential as a measure to reduce ammonia emissions. A first experiment with 3 commercial zeolite products within the PAS (Programmatic Approach to Nitrogen) research project funded by Boerenbond already gave promising results. Currently, the composition of these products is being further investigated. Tests in cattle and pig barns should clarify their effect under practical conditions. We hope that zeolites can soon form a new solution for cattle farmers who want to reduce their nitrogen emissions!

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NEW

WEIDEWIJS: FUTURE-ORIENTED GRAZING IN FLANDERS

How can we combine robotic milking with pasturing under changing climate conditions and based on a profitable business model? The operational group WEIDEWIJS wants to increase support for grazing by making it (economically) more attractive. The aim is to organize the existing knowledge around the theme into good practices, thus supporting the knowledge exchange among dairy farmers and researching new business models.

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NEW

BODY CONDITION MEASUREMENT AND MANAGEMENT OF SOWS FOR OPTIMAL LIFE & LIFELONG PRODUCTION

On average, a sow weans between 50 and 90 piglets over successive litters during her stay on the pig farm. She naturally builds up energy reserves during periods of excess and uses these reserves during lactation. Fluctuations in body condition are therefore normal to some extent. The research question in this project is: To what extent do these fluctuations impact production results, longevity and welfare of sows, what is optimal sow condition and how can we control it? Among subjects under investigation are the ideal methods and timing of condition measurement, the evolution of sows' condition during their lifespan and adjustments to their condition through feed management.

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[NEW]

IMPROVED DRINKING WATER QUALITY FOR PIGS AND POULTRY BY ADDRESSING BIOFILM FORMATION IN PIPES

Persistent biofilms can form in livestock farm drinking water pipes, leading to reduced microbiological and chemical quality of drinking water. Reduced water quality can affect the health and production results of livestock. In the VLAIO-LA project BiofilmPrevent ILVO works together with Inagro and the Experimental Poultry Centre in Geel to guarantee higher drinking water quality for poultry and pigs. By gaining insight into the composition of biofilms and investigating drinking water treatments and cleaning protocols of the pipes, we hope to improve the drinking water quality.

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NEW.

WELFARE-ENHANCING MONITORING SOLUTIONS FOR CHICKENS

Innovative solutions are being developed to improve both the productivity and welfare of broiler chickens. Specifically, the researchers are building sensor technology that characterizes the behavior of broiler chickens, and machine learning solutions that automatically make health and productivity analyses based on this sensor input. In addition, barn enrichment solutions such as resting locations and adaptive lighting that can be controlled based on real-time measured chicken behavior are also being developed.

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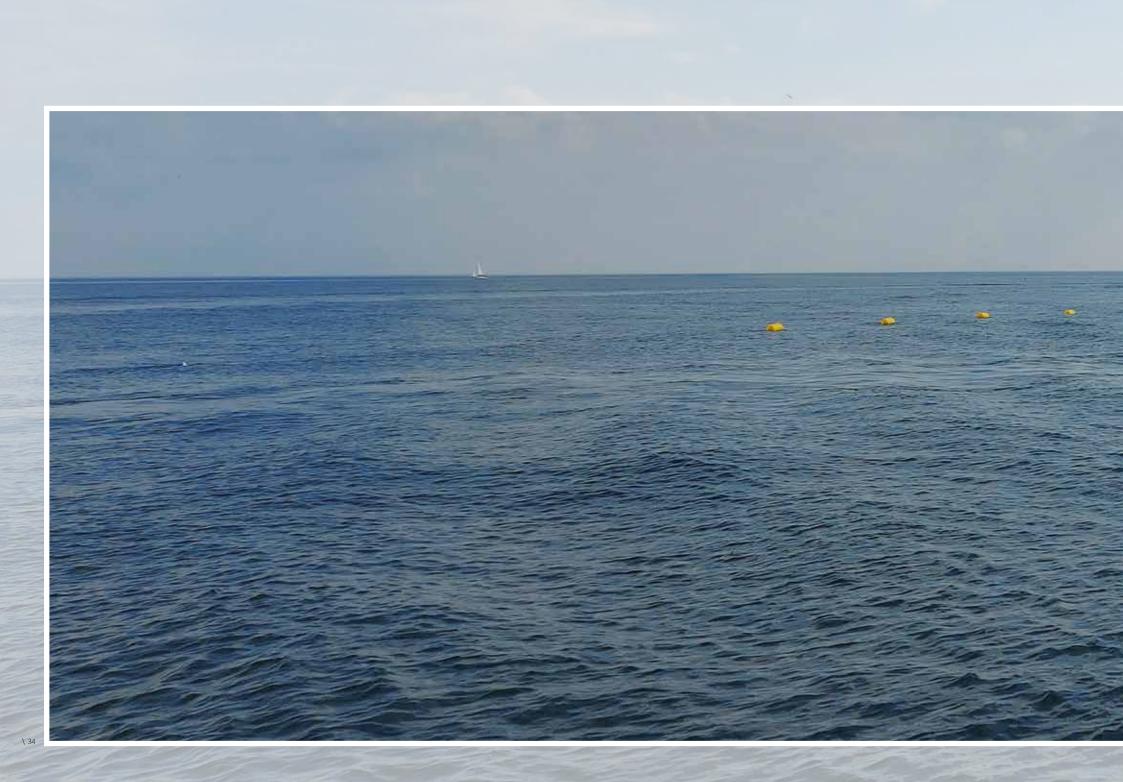
[NEW]

EFFECT OF EARLY NUTRITION ON HEALTH AND WELFARE IN BROILER CHICKENS

Giving a special feed to young broilers can potentially have a positive effect on intestinal health, immune status, help in the prevention of production diseases and animal welfare, among others. These findings from the field have only been confirmed by scientific research to a very limited extent. This VLAIO LA project with coordinator UGent aims to provide the broiler sector with protocols for good practices for the application of early feeding before and after hatch in the broiler and chick houses, for both regular and slower growing broilers.

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Marine production and marine environment

Development of innovative foods (including algae, microbial proteins, etc.), as well as the development of advanced methods for increased food quality and food security are priorities. Setting up offshore fishing fleets and aquaculture facilities as platforms for data collection is expanding. ILVO aims to combine the collected data with other data sources and make the generated personalized and aggregated information accessible to those who provide the data, whether this is a shipowner or an aquaculture company. In addition, these reliable and high-resolution data directly from the field also form the basis for the development of all kinds of scientific analyses and models that allow for new insights and predictions.

"Blue Growth" has become a widely used and a widely interpreted term in recent years and is strongly promoted by local, national and European governments alike. However the same authorities also strive to reduce the degree to which the marine environment is disrupted by human activities and to restore biodiversity. Within these seeming contradictions, ILVO gains insight into the functioning of the marine ecosystem and studies and monitors the impact of human activities at sea. These insights generate the advice that is needed to support the various marine sectors and policies and to steer "Blue Growth" in the right direction

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RESULT



Environmental impacts of offshore wind farms in the Belgian North Sea

Life in and around the wind farms keeps changing 13 years after construction. For example, the biodiversity of communities colonizing the wind turbines is increasing again, and seabird movements show more spatial and temporal variance than previously understood. The risk of songbird collisions is now better understood and measures are proposed for periods of intense bird migration. Artificial reefs continue to develop between the turbines. Some fish species, such as plaice, are attracted to the growing amount of food that they can find in these reefs. Echolocation data show that mitigation measures for underwater noise do effectively reduce the effect of piling on porpoises.

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IN THE SPOTLIGHT

KING FILIP SAILS WITH RESEARCH VESSEL BELGICA

On April 21, King Filip paid a visit to the new Belgica. During a voyage, he got a tour from the crew and several researchers from different research institutes, including some ILVO researchers and a seagoing observer. The new ship replaces the old Belgica and will sail about 300 days per year to facilitate study of various aspects of marine life, including climate change and fish stocks. In 2023, the ship will also sail to Greenland.

The new ship offers more space for scientists and research equipment than the old Belgica and is equipped with state-of-the-art scientific instruments. This Belgica will also spend more time at sea and cover a wider area than its predecessor, including the North Sea, the Atlantic Ocean, the Mediterranean and the Arctic during summer. Moreover, the ship was built to strict standards in terms of energy consumption, emissions and noise production.

ILVO uses the Belgica for several weeks each year. New fishing methods are tested on board. The Belgica is also used to monitor the state of the marine environment in the Belgian part of the North Sea and to conduct a fishery survey to determine the state of fish stocks.

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King visits Research Vesse BELGICA in Zeebrugge



RESULT



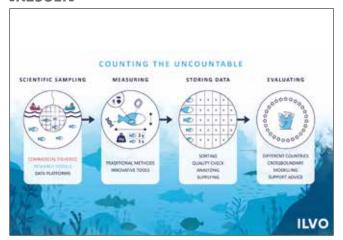
AVOIDING FRAUD TRHOUGH THE DEVELOPMENT AND APPLICATION OF IDENTIFICATION METHODS

In this doctoral study entitled 'Prevention of seafood substitution fraud through the development and application of identification methods' by Dumas Deconinck (ILVO/KU Leuven), methods for detecting fraud in the seafood value chain were developed. A case study was also conducted on the Belgian market for cod and sole. The doctorate was conducted within the framework of the EU-H2020 project Seafoodtomorrow. This research brings us another step closer to safe and healthy seafood.

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STATUS OF FISH POPULATIONS IN EUROPA

During the French Presidency of the Council of the European Union, Ifremer worked with Institut Agro of France, ILVO and the Irish Marine Institute to assess the state of fish populations in Europe in 2022. Overfishing is decreasing, but the improvement is uneven between regions and the European goal of 100% sustainable fishing has not been achieved. Moreover, climate change is affecting fish: their distribution has changed, food is more scarce and the fish's growth is being stunted. Scientists are committed to finding solutions.

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[RESULT]



ILVO CO-ORGANIZED THE 50TH EDITION OF WEFTA

ILVO and HZ-University of Applied Sciences (NL) organized the 50th edition of WEFTA (Western European Fish Technologists Association) in Rotterdam in October. With about 150 participants, this "Golden WEFTA" was a great success. ILVO was well represented in each of the themes: Micro- and macroalgae, Sustainable aquaculture techniques and its impact on product quality, Innovative seafood processing and quality, Seafood safety and authenticity, Blue biotechnology for food and nonfood and Seafood consumption and consumers. ILVO reseachers Bert Coleman and Kyriaki Tsirtsidou gave presentations, with posters presented by Valentina Casciaro and Liesbet Colson. Kaitlyn Vanhoutte provided technical support and Johan Robbens chaired and closed the conference. This Golden WEFTA put ILVO nicely in the spotlight.

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_IN THE SPOTLIGHT

THE FIRST ALGAE MONTH

Minister for Sea Fisheries Crevits launched May as Algae Month from the InnovOcean campus. As initiator and coorganizer, ILVO immediately provided the theme for the first day: 'Seaweed and algae on our plates - tasty and healthy?' Thomas More University College and UGent organized other thematic days on the following themes: 'Microalgae: lever to a more sustainable and circular economy' and 'Closing the food cycle with microalgae'

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ValgOrize -Algae-based food for Europe

3:51



[RESULT]



Evaluation of environmental impact of the fishing fleet in \dots Albania

Within this research collaboration with Italian marine experts, ILVO contributed ecosystem expertise and experience in marine impact assessments. Various environmental aspects of the Albanian fishing fleet were mapped, including the state of commercial fish stocks, local impact on the seabed, pollution and marine litter. The research area covered the southern Adriatic Sea and the eastern Ionian Sea, as these are the regions where Albanian fisheries are active. Despite the efforts made in recent years, data collection around Albanian marine fisheries still appears to be quite limited, specifically around a number of impact factors and around the status of fish stocks. This study takes another step towards development of scientific, management and enforcement capacity to ensure appropriate management of fish stocks and reduce the negative impacts of fishing. ILVO used the European Marine Strategy Framework Directive (MSFD) for this environmental risk analysis and identification of the main impacts of fishing.

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THE BROWN SHRIMP IS 'FISH OF THE YEAR'

Together with the fishing industry, VLAM has chosen a 'fish of the year' for the 34th time. The choice became brown shrimp, the most important commercial species for Belgian coastal fisheries. ILVO gave a positive opinion in this choice based on the status of the North Sea shrimp stock and the positive evolution in this fishery.

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_IN THE SPOTLIGHT.

Processing of Kelp

Interest in kelp breeding is increasing in Europe. This has led to the start of a short-term selection experiment with sugar kelp (*Saccharina latissima*) in Norway to establish the genetic basis for sugar kelp breeding. This is part of the Breed4Kelp2Feed project led by the Norwegian University of Life Sciences. Three generations of sugar kelp - a wild population and two generations of rope-reared offspring - are being analyzed to gain new genetic knowledge about this species. So far, the study of the wild population has revealed a wide genetic diversity and the genetic substructure on a finer scale than previously observed.

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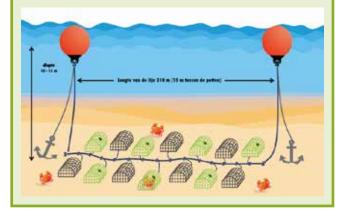


$oldsymbol{\bot}$ IN THE SPOTLIGHT $oldsymbol{\bot}$

COMBINATION OF PASSIVE FISHING AND MARINE AQUACULTURE ONE STEP CLOSER TO PROFITABLE PRACTICE

The combination of a sea farm with mussels, oysters and seaweed and passive fishing via baiting techniques has been extensively tested - and approved - over the past three years. This is good news because, unlike conventional (active) beam trawling, both activities are allowed in wind farm zones. Light, sound and smell proved to be successful techniques to attract more squid, shrimp and fish. Within this research, tools were also developed to better plan sea trips.

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FUEL OF THE FUTURE FOR FISHING VESSELS

The Flemish fisheries sector has already made many efforts to make its activities more sustainable and increase energy efficiency in the near future. As part of this effort, the partners of the Covenant 'On course to sustainability' joined various stakeholders at the InnovOcean Campus on November 23 for a seminar on energy transition in the fisheries sector. During this unique event, shipbuilders and engine manufacturers explained the possible alternatives for the present and the future.

The presentations were followed by an interesting and animated debate with the fishing industry stakeholders present. In the end, it became clear that no definite conclusion could be given about the "best option" for alternative fuels. Additional insights and knowledge need to be gathered in the coming years. Furthermore, the observation was made that the legislation as we know it today does not allow structural adjustments to be made to vessels in the context of energy transition, such as restrictions on length and volume. However, the fishing industry should continue to strive for the lowest possible energy consumption on existing fishing vessels. It is also of prime importance that the efforts already made over the past decades be adequately recognized by policymakers at the Flemish, federal and European levels.

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[NEW]

SHORT- AND LONG-TERM ASSESSMENT OF PAH, PCB AND METAL CONTAMINATION IN THE BELGIAN PART OF THE NORTH SEA

To prevent the silting of navigation channels and ports, excess silt is dredged up and dumped back into the sea. This often implies that silt from a contaminated port area is reallocated to the open sea. Here there is a correlation between the contamination measured at and around dredge spoil sites and port areas. Especially in industrial ports, there is a higher concentration of polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and metals. Although the measured concentrations of most PAHs and PCBs are below environmental quality standards, some metals that can exert negative pressure on the marine ecosystem are present in larger concentrations. This publication examines how the contamination of PAHs, PCBs and metals in dredge spoil heaps in the Belgian part of the North Sea can be related to industrial and recreational ports and how contaminant concentrations have evolved over the last 10 years.

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[NEW]

Too little data on sole: New Research Seeks fill the gaps via (e)DNA

The new EFMZV project called SoleDNA will use genetic techniques to help solve two key problems regarding the current management of the sole stock in the southern Celtic Sea and southwestern Ireland, namely the uncertainty about the genetic identity of the stock and a lack of data. This project aims to contribute to more efficient and sustainable management of data-poor fish stocks by providing a better rationale for quota negotiations - e.g., with the United Kingdom following Brexit - and in the day-to-day management of fisheries on these stocks.

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[NEW]

FISHERIES SUSTAINABILITY SUPPORT: TOWARDS A FAIRER AND MORE UP-TO-DATE MEASUREMENT SYSTEM

The Flemish fisheries sector is working collectively to make the fleet more sustainable, under the name *Visserij Verduurzaamt*. Sustainability is measured with a renewed set of indicators (VALDUVIS2.0) and every three years, target values are set to be achieved to stimulate continuous improvement. ILVO offers support in the form of an individual interview during which an improvement trajectory is drawn up together with the shipowner. Shipowners who participate in the trajectory and meet certain conditions are rewarded with market recognition on the auction clock.

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CLIMATE-CONSCIOUS FARMING WHILE MAKING SMART ECONOMIC CHOICES THANKS TO KLIMREK

Within the Klimrek project (ILVO, Boerenbond, Vito), climate trajectories are developed that offer farmers the tools to make their production more climate-smart and climate-robust. First a climate scan is done to get a picture of the climate impact of the farm, then the farmer is supported by a climate consultant to choose and implement the climate measures that best fit the farm. Since 2022, the climate trajectory for dairy farmers got a big start within the Klimrek Plus project. The development of climate pathways for arable farming and pig farming are now underway.

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IN THE SPOTLIGHT.

ILVO WINS **A**GORIA'S DIGITAL SOCIETY AWARD WITH ITS 'DIGITAL CLIMATE SCAN FOR FARMERS'

The digital tool called 'Klimrek', which runs on the data-sharing platform DjustConnect, was named 'best digital solution' in the sustainability category. This user-friendly digital tool puts farmers on the road to more sustainable production and helps them to communicate transparently with consumers. This award was possible because of the (Klimrek) farmers who are pioneers in the fight for a more sustainable world, the climate consultants who help them on their way, the companies with an 'onramp' to our data highway who help ease the administrative burden for farmers, and the ILVO Klimrek and DjustConnect researchers and developers.

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_IN THE SPOTLIGHT _

TALL FESCUE: POWERFUL GROWTH IN THE FIELD, POWERFUL MILK PRODUCTION? KLIMGRAS INVESTIGATES!

The VLAIO-LA project KLIMGRAS (ILVO - UGent) aims to investigate climate-adaptive strategies such as the incorporation of drought-tolerant grasses into Flemish dairy rations. Drought-tolerant grasses like tall fescue have higher yield potential but their nutritional value and digestibility lag behind conventional grasses like English ryegrass. Initial results from dairy trials show that intake and milk production is lower compared to English ryegrass but that this decrease is in line with what is expected based on forage value and digestibility. In young cattle, it was shown that growth and intake did not differ when the animals were fed tall fescue or English ryegrass, either ensiled or fresh.

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System analysis shows building blocks of Carbon agriculture

How can regions help develop robust and fair carbon farming systems? In the LIFE CarbonCounts project, ILVO used qualitative research methods to identify the building blocks for this goal. Among other things, the report addresses the policy context, different possible designs of carbon farming systems and the governance system. Key concerns such as additionality, sustainability, carbon leakage and systems for monitoring, reporting and verification (MRV) are identified as the pillars of carbon farming systems. In addition, ILVO evaluates the creation of a geodata platform and emerging technologies that can increase the cost-effectiveness of MRV systems. Furthermore, a description of the current state of the already established voluntary carbon market and the different aspects of carbon farming as a business model are described. The challenges and potential problems of carbon farming have also been identified. This report is the starting point for the various stakeholders to work together to create a roadmap by 2023. That roadmap formulates recommendations for a widely supported and scaledup practical implementation of carbon agriculture in Flanders.

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RESULT



IMPACT OF HIGHER WATER LEVELS AND RE-WETTING ON NEIGHBORING AGRICULTURAL LAND IN FLANDERS

To reduce the effects of climate change, the Flemish coalition agreement 2019-2024 places strong emphasis on increased resilience to drought, including actively deploying resilient open space with (additional) wetlands. Agricultural activities can experience positive effects when water is buffered in the landscape. However, re-wetting can also have negative effects: excessively high water levels can compromise the workability of the land, limit crop growth, affect the availability and leaching of nutrients to surface and groundwater, and increase disease pressure on crops. In this project, ILVO worked on a modeling framework that makes it possible to quantify the impact of groundwater levels on conventional crops, either regionally or for specific locations.

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_IN THE SPOTLIGHT _

Soil as a key buffer for climate extremes

European agriculture is vulnerable to weather extremes, but at the same time farming holds the key. By making good choices about how they manage their land, farmers can safeguard their crops against drought and heavy rainfall. More than a thousand observations across Europe show that keeping the soil covered with living plants, even in winter, is especially important. No-till farming was not proven to be a holy grail; in contrast, adding plant materials such as mulch, compost or biochar to the soil allows water both to pass through and to stay in the soil longer.

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_IN THE SPOTLIGHT _____

CLIMATE NEUTRAL FARMS THANKS TO CARBON SEQUESTRATION IN AGROFORESTRY

In a new East Flanders rural project, BOS+, Bioforum, ILVO and the East Flemish Regional Landscapes are working together to achieve carbon sequestration through agroforestry. This project wants to offer East Flemish farms and citizens the possibility to compensate for their CO₂ emissions through agroforestry projects at local farms. Five farmers receive active guidance starting from the design of the agroforestry plot through the marketing of the carbon storage achieved. The specific question is exactly how much carbon can be stored can be stored in agroforestry plots and how this can be optimized. In addition, the project examines how to organize the marketing on a practical level. Finally, potential drawbacks or pain points faced by farmers throughout the process are identified and attempts are made to resolve them.

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[RESULT]



DEMONSTRATION NETWORKS ARE GROWING, NOW WITH FOCUS ON CLIMATE SMART FARMING

NEFERTITI (January 2018 - September 2022) brought together 45 regional hubs of demonstration farmers across 10 thematic networks in 17 countries. The project raised awareness around the importance of agricultural demonstrations in spreading innovations and thus ensured the adoption of good practices for organizing farm demos. The many videos on the FarmDemo YouTube channel and the translation of the FarmDemo Training Kit into all European languages constitute an important and useful output that can be used in many other projects. The project legacy continues in the 7-year Climate Farm Demo project, within which farm demonstration networks are being set up to increase the adoption of climate-smart agricultural practices.

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RESULT



Sprinkling pigs with water during lairage greatly reduces heat stress

The increase in frequency and severity of heat episodes has led to increased heat stress in pigs that are transported to the slaughterhouse in summer, even in European regions with mild climates. The slim economic margins in the pig industry imply the need for cheap and easy heat stress measures. In the COOLPIGS project (VLAIO, ILVO - UGent), measures on the farm, during transport and in the slaughterhouse are being evaluated. During past summers we could clearly demonstrate that sprinkling slaughter pigs with water immediately after unloading the truck using a sprinkler system in the slaughterhouse resulted in a significant decrease in heat stress parameters.

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NEW

LESS METHANE IN DAIRY CATTLE VIA GRASS-RICH RATIONS?

The relationship between cattle farming and climate is twofold. Cattle farmers must both reduce their impact on the climate as well as arm themselves against current climate change and its consequences. The project MelkMethGras examines the effect of feed strategies for lower methane emissions in gras rich rations. Adaptation strategies such as drought-tolerant grasses and grassland herbs are also examined for their effect on methane production by dairy cattle. This ILVO/UGent (Lanupro) doctoral research is funded by FWO.

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[NEW]

Comparison of the environmental impact of different agricultural production systems based on a food basket

What are the strengths or weaknesses of life cycle analysis (LCA) used to determine the environmental sustainability of food products? The 'LCA food basket' project answered this research question, with a special focus on the variation of agricultural production systems and practices related to the origin of the food product. It shows that an objective and correct assessment of the environmental sustainability of food products requires an appropriate assessment method that not only identifies the environmental costs, but also reveals the environmental benefits. In this study, a method was developed and illustrated in which the ecosystem services provided are included in the assessment.

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[NEW]

WORKING TOGETHER ON CLIMATE-ADAPTIVE DRAINAGE

Climate Adaptive Drainage (CAD) is the modern, innovative variant of level-controlled drainage, a smart way to achieve drainage during rainfall and water retention in dry periods. With CAD, all the information about management and about its effects on hydrology becomes available and interpretable, and it is even possible to control the drainage system remotely. This is more expensive to set up but saves time and ensures better control. With this project, we are testing and demonstrating CAD for the first time in Flanders.

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LOOKING AHEAD WITH AND FOR THE BELGIAN FLAX SECTOR

Over the centuries, the cultivation and processing of flax has played played an important role in Belgium, the Netherlands and France. After hard times due to the advent of synthetic fibers, the last 10 to 15 years have seen a revival in the sector. The Belgian acreage even reached a record size of 18,500 ha in 2020 (Statbel). It is now time to work with the sector to see how we can fully exploit that potential, despite major challenges such as climate change, land and labor scarcity. Through a system analysis and identification of bottlenecks and opportunities, the sector can now get to work.

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[RESULT]



SEMINAR: AGROFORESTRY IN THE EVOLVING CARBON MARKET

On November 16, ILVO and South Pole co-organized a Seminar about the developing voluntary carbon market in Flanders as well as the opportunities for agroforestry within that market. In the morning, three presentations illustrated what the (inter)national voluntary carbon market looks like, how this can translate to our local context, and the potential of carbon sequestration in agroforestry systems. In the afternoon, moderated discussions with farmers, consultants, policymakers and researchers (through workshops and focus groups) explored the desirability, visions and opportunities related to the design of carbon farming systems with agroforestry.

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IN THE SPOTLIGHT.

WATCHITGROW REVEALS FIRST APPLICATION IN THE POTATO SECTOR FOR CORRECT AND TRANSPARENT DATA SHARING VIA DJUSTCONNECT

Potato growers can now monitor their crops with WatchITgrow. To achieve this, VITO Remote Sensing works together with ILVO and the data sharing platform DjustConnect. Just like other farmers who register on DjustConnect, growers get access to a personal dashboard where they can give or refuse permission to share their data. This marks a major step toward a more efficient and sustainable "data-driven" agriculture.

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RESULT



SHORT-CHAIN SUCCESS FACTORS

A study on success factors for short chain farms, commissioned by the Support Center for the Short Chain, was finalized in 2022. On the basis of 24 in-depth interviews at various short chain farms spread across sectors, it was possible to identify various farm and person-related success factors that contribute to a profitable and resilient short chain activity. The results were compiled in a research report used by the consultants during their first-line advice to short chain enterprises. Also, the final master class was conducted in which short chain entrepreneurs got to work with the success factors and identify areas for improvement regarding relation to their own short chain activities.

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[RESULT]



REDUCING ANTIBIOTIC USE

DISARM aimed to help the European livestock industry to reduce antibiotic use by emphasizing animal health and disease management. Key to this was the establishment of a thematic network. The project enabled more contact between livestock farmers, veterinarians, researchers and other stakeholders for exchange of important questions and insights. In 2022 we established the legacy of this project by writing a policy brief. The aim of that brief is to make recommendations that have an impact at the broader European level, particularly on how solutions can be applied in practice.

The recommendations can be found on our website: https://disarmproject.eu/what-we-do/policy/

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NEW

ENCOURAGING ACTORS IN THE FOOD SYSTEM TO ACHIEVE ZERO FOOD LOSSES

Preventing food loss and waste (FLW) is a major challenge but also represents a great potential for sustainability gains. The aim of the European project CHORIZO is to better understand how social norms influence the behavior that leads to losses in the food system. We start with an evaluation of previous actions and identify success factors and successful pathways for solving FLW. Through new case observations, we seek to link social norms with FLW behavior. As a test, CHORIZO also organizes a series of concrete activities and workshops that stimulate behavioral change in consumers and actors to reduce their FLW.

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NEW

DIGITAF: DIGITAL TOOLS LINK FIELD AND CLOUD TO BOOST AGROFORESTRY IN EUROPE

Agroforestry or forest agriculture can contribute to a climateresilient, resilient agriculture but only if the right trees end up in the right place and are then maintained in the right way. Because this is easier said than done, top European experts in 'DigitAF' have developed user-friendly, practical tools for policymakers, farmers and advisors. ILVO is responsible for the development instruments that measure and assess the impact of agroforestry systems in an objective way. This can help farmers to make the best possible choices in design and management.

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NEW

DIGI-SMART FARMING

Agriculture and horticulture are evolving towards other business models, such as demand-driven production or alternative marketing. Digitalization and data-sharing platforms such as DjustConnect can support this, but many of these digital solutions are not reaching the farmer. With this project, we join farmers, computer specialists and the available data to design and test new, data-driven solutions.

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[NEW]

ENCOURAGING FARMERS TO ADOPT SUSTAINABLE FARMING SYSTEMS THROUGH POLICY AND BUSINESS STRATEGIES

The European project ENFASYS aims to stimulate the transition to sustainable and resilient farming systems by developing effective public and private strategies. The research focuses on a better understanding of lock-ins and levers in agricultural and food systems; a better understanding of behavioral factors of farmers, consumers and other actors; more and better evidence about the potential effectiveness of possible interventions; and a more structured approach to linking knowledge to action. This is being applied to 10 cases in 12 to 15 countries across Europe.

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[NEW]

FOODFORWARD TO A SUSTAINABLE BUSINESS MODEL FOR FOOD FOREST FARMERS

FoodForward is an Operational Group that studies and facilitates the economic feasibility of food forests as an alternative business model. The central research question is: how can we offer food forest farmers, and by extension the entire agricultural and horticulture sector, innovative tools to create a resilient and sustainable business model that enables the farmer to cope with all kinds of crises.

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Living Lab Agroecologie & Organic Farming (LLAEBIO)

How can you sell sustainability?

On 18 March, LLAEBIO and the Flemish Department of Agriculture and Fisheries organized a presentation titled 'How can you sell sustainability?' Koen Thewissen, founder of the Belgian Advertising School and WeAreDaniel, explained to researchers, policymakers, farmers and NGOs how individuals can be motivated to embrace sustainable behavior. This presentation was inspired by behavioral psychology theories of Nobel laureate Daniel Kahneman. In the afternoon, we reflected on how the learning material could be applied in the Flemish agricultural context.

More info:

www.llaebio.be/node/218

contact: dylan.feyaerts@ilvo.vlaanderen.be

FARMER AND POLICYMAKERS IN DIALOGUE

On June 2, 22 participants visited 3 farms: a conventional mixed farm, an organic fruit farm and a biodynamic mixed farm. In a highly farm-specific manner, all three of these farmers are engaging in the transition to more sustainable agricultural practices. During the visits, the farmers told how their operations are inspired by agroecological principles. As the main target audience for this day were policymakers, the emphasis was also placed on the role and impact of policy in applying agroecology. More info:

www.llaebio.be/node/226

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SOIL HEALTH CONFERENCE: SCIENTISTS AND REGENERATIVE PIONEERS IN DIALOGUE WITH POLICYMAKERS

The European Commission labels 60-70% of our soils as "unhealthy." Nevertheless, in times of climate change healthy agricultural soils are needed more than ever. On December 5th, World Soil Day, ILVO, VUB and Wervel organized a conference based on the question 'How can soils be *healed* so that they not only only produce healthy food, but can also withstand drought or extreme precipitation?' After all, healthy soils score well in many areas, such as yield, nutrient balance, carbon sequestration, biodiversity and water management.

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How to be a farmer? Many options for the future

By labeling 12 'farmers of the future' the increasingly diverse agricultural landscape becomes more recognizable to farmers, businesses, researchers, journalists and policymakers. This is done without any intention to put people, innovations or farms into boxes. During the 'Farmers of the Future' seminar, these 12 future farmer types were used to explore options for current and future farmers in Flanders.

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[RESULT]



LEARNING NETWORKS FOR AGROECOLOGICAL PRACTICES

How can farmers, researchers and advisors strengthen each other to support the transition to more agroecological practices? During the 4-year Interreg project TRANSAE, learning networks of farmers experimenting with agroecological practices were developed in northern France, Wallonia and Flanders. Advisors and researchers were responsible for monitoring the experiments and helped to facilitate knowledge exchange among farmers within and between these regions. The experiences of the farmers and the consultants who guided these farmers are summarized in two publications

(Publicaties | Transae | Transition vers l'agro-écologie).

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France - Wallonie - Vlaanderen









My GREEN PLACE TOOL

When a park or other green space is being (re)constructed, local residents are traditionally asked to get involved. At information evenings or workshops, only a select group of usually well-educated, middle-aged people who live very close by actually attend. In the context of the doctoral work of Nohemi Ramirez Aranda, ILVO, in collaboration with UGent, created an online PPGIS tool that can be used by (landscape) architects and city councils to digitally collect the use of and the appreciation for open space by all citizens.

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My Green Place -A PPGIS tool to map the social value of green spaces

5:26



[RESULT]



PROMOTING SUSTAINABLE DEVELOPMENT AND REGIONAL ATTRACTIVENESS

ILVO developed a toolkit to make interregional learning an efficient, instructive and fun process (part of the PROSPERA project). Almost all EU projects assume that international sharing of experiences 'facilitates and accelerates' the rollout of good practices in other contexts. Interreg EU projects specifically focus on the learning process between different cities and regions facing similar challenges. Often, however, the finesse of a consultation gets lost in translation, while a nuanced understanding is essential to evaluate and implement the transferability of a practice. The methodological support developed by ILVO is presented as a guide to organizing interregional learning in new EU projects.

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IN THE SPOTLIGHT.

POLICY DEVELOPMENTS REGARDING NITROGEN DEPOSITION

ILVO's social scientists closely monitor policy developments on nitrogen deposition. We also do policy-relevant study work on the Programmatic Approach to Nitrogen (PAS), including a system analysis and an analysis of the spatial impact of this policy. ILVO also answers questions from various actors about this theme - primarily from farmers, but also journalists, policymakers, etc. In 2022, we spoke on this theme in different forums for a diverse audience such as parliamentarians, representatives of the Dutch agricultural organization ZLTO, bioengineering Master's students, employees of the social organization Farmers at a Crossroads, and participants in an agricultural economic seminar on nitrogen. Finally the Social Sciences Unit also drew on its expertise to advise political cabinets and administrations, and contributed an expert response to the public inquiry into the nitrogen agreement.

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_IN THE SPOTLIGHT _

FOREIGN MISSION WITH C-LAN

Fourteen Flemish parliamentarians from the Agriculture Committee went on a five-day foreign study trip to Montpellier and Barcelona on the theme of 'agriculture in highly urbanized areas'. ILVO researchers Elke Rogge and Jeroen De Waegemaeker helped draw up the program, provided on site tours and translated the inspiring projects inspiring projects to a Flemish (policy) context. The Committee visited several peri-urban agricultural parks and met with policymakers that are crafting a local food policy.

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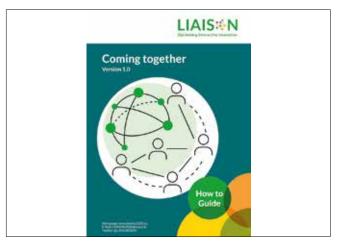
[NEW]

CALL FOR FARMERS: PROJECTS THAT ENABLE COLLABORATION BETWEEN FARMER AND CITIZEN

ILVO is participating in the operational group 'farmers and citizens', a call to farmers for projects that enable farmer-citizen collaboration. A budget of € 20,000 is divided among at least two projects. Examples are citizens volunteering to help on a farm, school children receiving lessons on a farm, and cooperative actions between farmers and citizens. In short, collaborations from which both farmer and citizen can benefit.

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[NEW]

How can you best organize innovation processes in agriculture and food?

Within the 4-year LIAISON project, more than than 200 interviews were conducted in as many multi-actor partnerships with the aim of exchanging knowledge and developing innovative solutions in the agroforestry and rural development sectors. A selection of 32 partnerships were chosen for in-depth investigation. The insights gathered from good practices have been compiled in five handy 'How to' guides: 1) Joining up, 2) Good planning, 3) Healthy partnerships, 4) Connected partnerships, 5) Achieving impact. These guides provide very practical tools to anyone who engages in and participates in multi-actor partnerships. Guides:

https://zenodo.org/record/7448303#.Y-yaBnbMKUk

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RESULT



IS SOY-FREE FEED FOR PIGS AND BROILERS POSSIBILE?

In this demonstration project, soy in the pork and broiler feed was replaced by several locally grown, alternative protein sources such as potato protein, peas and rapeseed meal. In finishing pigs, the slaughter yield and meat thickness was somewhat lower with the soy-free feed and in broilers a lower final weight and poorer feed conversion ratio was noted. On top of this the soy-free feed is more expensive. The researchers state that soy free production has potential if the extra feed costs would be covered. Additional knowledge acquisition regarding digestibility and cultivation techniques of these local crops is desirable.

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[RESULT]



QUINOA, SOY, CHICKPEA, ... AND PARCHED FIELDS

Quinoa, soybean, chickpea and dried beans destined for the human food chain are currently hardly being grown in our region. Nevertheless these are promising new crops and ILVO thus studies their crop husbandry and/or breeding. As proteinrich crops, Flanders wants to help promote them, both in the field and on our plate. The extremely dry summer of 2022 was a tough test for these new crops. Both quinoa and chickpea were the champions of the past year.

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IN THE SPOTLIGHT.

PROTEINS FROM MICROBIAL FERMENTATION GET A BOOST WITH THE PROTEINN CLUB

In Ghent, an innovation platform was born that will advance a fairly new (f)actor in the food landscape and the broader bioeconomy, namely proteins made via fermentation-based production processes. The name 'The ProteInn Club' refers to the 'inn' of innovation. The proud parents of the ProteInn Club are the knowledge centers UGent, CAPTURE, ILVO and the pilot facility Bio Base Europe Pilot Plant (BBEPP). Their ambition: to achieve significant sustainability gains in the protein world by accelerating new value chains at an industrial scale built on research and development. Already 27 companies are showing serious interest. The Flemish government, the province of East Flanders and the City of Ghent (through the *Hefboomfonds*) all support this initiative.

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IN THE SPOTLIGHT _

ALTERNATIVE PROTEIN SOURCES: FUNCTIONALITY, OXIDATION DURING PROCESSING AND DIGESTION, AND NUTRITIONAL QUALITY

The main goal of this project is to build up knowledge on the impact of processing and digestion on protein oxidation, and the nutritional and functional quality of alternative protein sources for meat and other products into which they are incorporated. Several alternative protein sources are investigated that vary in terms of origin (legume, insect, algae) and degree of processing (from raw material to more pure protein fractions). Pure meat, pure alternative protein sources and their fractions, and blended products are all included. The hybrid meat products will also vary in processing and composition.

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[NEW]

CHAIN-WIDE INITIATIVE FOR PLANT PROTEIN FROM FLEMISH COLD GREENHOUSES

Is there economic and technical potential for growing protein crops during the summer months in temporarily empty cold greenhouses? That is the central research question. We start from the observation that the cultivation of head lettuce in cold greenhouses in Flanders in some cases suffers to such an extent from the damaging fungus *Fusarium* during the summer months that several greenhouse growers just leave their greenhouse empty. The KIPei project is investigating whether it is both technically possible and economically profitable for these growers to plant edamame, chickpeas or kidney beans.

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NEW

INSECT MEAL AND MILK WHEY POWDER; NEW POTENTIAL PROTEIN SOURCES FOR 100% ORGANIC LAYING HEN FEED

Since 2022, stricter feed standards apply in organic farming, where 30% of the raw materials must be of regional origin. In addition, in 2026 the exception for inclusion of up to 5% high-protein feed in the young poultry ration will expire. Insect meal and milk whey powder are two interesting potential sources of protein for organic poultry feed but they are being currently insufficiently exploited. The LEGMEME project is working to optimize local feed based on these raw materials, keeping a close eye on methionine and vitamin B2 content.

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[NEW]

EXTRACTION OF PROTEIN FROM ALFALFA AND CLOVER TO FEED CHICKENS AND PIGS

Can we extract protein from alfalfa and red clover (both leguminous fodder crops with well-known cultivation techniques) to add to the rations of (organic) pigs and poultry? We are answering this question in order to better meet the demand for more, locally grown protein in the rations. Ruminants can digest the high-protein alfalfa and clover which contains up to 20% crude protein. Monogastrics such as pigs and chickens cannot digest it unless protein extraction is done first. This study will finalize an extraction protocol at the laboratory and pilot scales.

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[NEW]

ILVO STARTS BREEDING OF CHICKPEA

Soybean is the main protein crop for human consumption, but chickpea (Cicer arietinum) appears to be a promising second, especially for cultivation in northwestern Europe and for processing as a local product. Chickpeas are familiar to the Flemish consumer, and the processing industry loves them for their mild taste and neutral color. The first chickpea cultivation trials in Flanders have been positive. However, the currently available varieties are insufficiently adapted to the climate and soil in Flanders. ILVO has therefore started a chickpea breeding program to obtain adapted varieties that will guarantee a sufficiently stable yield even in more difficult years. In addition we are aiming for a sufficiently high protein content, better resistance to the fungal disease Ascochyta rabiei, and improved nodulation with nitrogen-fixing bacteria. This project was established with funding from the former Flemish Minister for Agriculture Hilde Crevits in the framework of the Flemish protein strategy.

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How are plants bred? Chickpea as an example

1:05







NEW

NEED FOR NUTS

The 'Need for nuts' project (*Nood aan noot*) aims to map the possibilities of Flemish walnut and hazelnut cultivation and processing and to facilitate both cultivation and profitability. A local nut cultivation can support the protein transition by increasing both the supply and the diversity of locally produced protein-rich food products. Moreover, (nut) trees in the landscape provide numerous ecosystem services such as biodiversity and carbon storage.

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NEW

Pulses (Legumes): Indispensable in Agroecological Cropping for Human Consumption

Demand for vegetable protein sources is rising. The economic opportunities and ecological advantages improve the attractiveness of local cultivation of protein crops. But stability in terms of yield and quality remains a major challenge. Recent research in the Netherlands shows that strip cultivation results in more stable yields and reduced incidence of disease and pests in cauliflower and potatoes, among others. A rotation of arable crops for human consumption in strip cropping is therefore the core idea of this project, which focuses on three dry-harvested legumes: field pea, field bean and kidney bean, complemented by three cereal crops: baking wheat, durum wheat and malting barley.

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_IN THE SPOTLIGHT.

PEUL-CHAIN HELPS PULSES TO GAIN GROUND

More legumes on our Flemish fields and on our plates: that is the goal of the new project 'PEUL-CHAIN'. With this project, ILVO and the Flemish Institute for Healthy Living vzw are joining forces to contribute to the transition to more healthy, environmentally responsible and affordable sources of protein in our food. The recent news about rising food prices and the importance of local production increase the relevance and urgency of this work.

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Living Lab Agri-food Technology _

SITE-SPECIFIC, NON-CHEMICAL WEED CONTROL IN POTATOES VIA DRONES, ARTIFICIAL INTELLIGENCE, **5G** AND THE **CIMAT** ROBOT

On a technology trial field, an unusual precision potato cultivation trial took place this year. Every three days, a drone equipped with a camera captured images of the plants (and any weeds present). A computer system powered by artificial intelligence learned to recognize where anomalies occurred in the images and what they meant. The weeds were controlled in a completely site-specific way using an innovative weed burner (in partnership with Vanhoucke) fixed to our CIMAT field robot: the images captured by the drone were processed and transmitted in semi-real-time to the robot. That was possible due to improved, superfast computing power and the 5G connectivity available via an antenna provided by Proximus.

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LIVING LAB FOR ALL PLAYERS IN THE AGRI-FOOD SECTOR

The ILVO Living Lab Agri-food Technology aims to stimulate technological innovation and make solutions accessible to all the players in the agri-food sector. Not only farmers, contractors and food processing companies, but also technology producers are welcome for advice, prototyping support and testing new innovative technologies in practice relevant conditions in a co-creative and confidential way. More info:

www.agrifoodtechnology.be

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RESULT.



MEASUREMENT METHOD FOR AMMONIA EMISSIONS FROM DAIRY BARN FACILITATES HANDS-ON NITROGEN POLICY

ILVO has developed a new measurement method to measure the ammonia emissions from dairy barns. The method may have useful applications in the context of the nitrogen (PAS) policy, where both current and newly proposed ammonia-reducing measures for open dairy barns may get more accurate measurement and assessment.

This measurement technique was developed in several steps. In 2022 we finalized the phase of optimizing the measurement and calculation method in ILVO's own pilot dairy barn. We also started the next phase where the measurement setup was relocated to a dairy barn used in practice. There, data will be collected in real time, during all seasons and with the wind coming from different directions, for at least one year.

The method is based, among others, on air velocity measurements that determine the amount of outgoing air. By combining those quantities with continuous measurements of ammonia concentrations, hourly emissions can be calculated. Commissioned by the Flemish Environment Policy Area, ILVO will start a measurement campaign in 2023 in the barns of 4 Flemish dairy farmers. The knowledge gained from this campaign can lead to a new ammonia emission factor for dairy cattle and guidelines for future measurement campaigns in all kinds of dairy farming systems.

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RESULT



SMART SPRAYERS APPLY CROP PROTECTION PRODUCTS ONLY WHERE AND WHEN NEEDED

In the H2020 Optima project, ILVO collaborated with several research partners and the manufacturers Caffini (Italy) and Fede (Spain) to develop smart sprayers for grapes (downy mildew), carrots (alternaria) as well as apples (scab). These sprayers apply biological and chemical pesticides only where and when needed, based on input from disease prediction models and the smart cameras and sensors that determine crop characteristics and disease pressure. Both Fede and Caffini have won several international awards.

Learn more:

https://spraytechlab.ilvo.vlaanderen.be/ https://optima-h2020.eu/nl

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OPTIMA

This project has received funding from the European Union's Horizon 2020 research and innovation programme: Grant agreement N° 773718







RESULT



DJUSTCONNECT DATA HIGHWAY ACCELERATES THE FLEMISH DATA ECONOMY

DjustConnect was presented to companies and organizations that are interested in data during the Agridagen in Ravels. On the Flemish data sharing platform DjustConnect, which can be imagined as a data highway, more than 30 on- and offramps are being used to transport data, all with the approval and full control of the farmer as data owner. In doing so, DjustConnect strongly accelerated data exchange and has taken a leadership position to ensure secure and efficient data sharing in the Flemish agri-food chain. Among the pioneer users you will find big names such as Milcobel, Boerenbond, AVR, Arvesta, KBC and the Department of Agriculture and Fisheries, but also names from less obvious places, such as from the viticulture sector. The list of special supporters includes Microsoft, which will be supporting DjustConnect for the next few years as a Microsoft startup.

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_IN THE SPOTLIGHT _

SMART WEED SPRAYER DRAMATICALLY REDUCES USE OF PELARGONIC ACID IN BLUEBERRIES

In the Smart Growers project, a smart robot sprayer was developed to apply the biological agent pelargonic acid only where weeds appeared in blueberry substrate. This results in significant cost savings for the grower. The robot is equipped with RTK GPS, autonomous navigation and camera technology for weed detection. Using 'edge computing', this is translated in real time into an action executed by a high resolution precision sprayer with individual nozzle control that is fitted onto the robot.

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Alternative weed control in blueberries via small-scale robot and precision sprayer









NEW

EUROPE IS PROMOTING A FAIR, SUSTAINABLE AND INCLUSIVE DATA ECONOMY SYSTEM IN ITS AGRI-FOOD CHAINS

The digital transformation of food systems is at a crossroads: data-driven innovation is looking promising but it is still unclear how to achieve the required scaling up and smooth acceptance in the field. The Data4Food2030 project aims to facilitate the Data Economy for food systems (DE4FS) by expanding its definition, monitoring its development, performance and impact, and creating new insights and opportunities. The researchers believe that successful data-driven systems will help the EU to achieve a more competitive and sustainable food system. This research project fits into policy ambitions at multiple levels: the Digital Single market, the Green Deal and the Common Agricultural Policy.

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NEW

TOWARDS A TRUE EUROPEAN DATA SPACE AND DATA-DRIVEN INNOVATIONS IN AGRI-FOOD: ILVO PARTICIPATES IN INTERNATIONAL PROJECT AGRIDATASPACE

In a number of sectors, data-driven innovations are changing society and the economy at lightning speed, and for the better. Within the agri-food sector as well, developers of data-driven apps can create useful applications with added value. But this digital transformation is not going as fast as expected. For the first time, a multi disciplinary consortium has therefore been tasked with taking steps toward a true AgriDataSpace, so that cross-sectoral data-driven innovations can break through faster.

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[NEW]

'COMPUTING' WITH PLANTS - NEW SENSOR PLATFORM AND TECHNOLOGY FROM COMPUTER SCIENCE USED SUCCESSFULLY TO 'CALCULATE' PLANT BEHAVIOR

If we can numerically map the response of plants to their environment in the same way as we can with robots and computers, we can accelerate our understanding of the underlying processes that determine that behavior and how to control them. In his ILVO-UGent doctoral research, Olivier Pieters succeeded in applying the 'Physical Reservoir Computing' framework from computer science to plants. This allowed him to calculate, simulate and predict their behavior and their environment. The method is still in its infancy, but thanks to the further development of a suitable sensor platform, new avenues of research are rapidly opening up, for example in the fields of breeding and precision agriculture.

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_IN THE SPOTLIGHT _

AUTOMATICALLY SHARING DATA FROM THE MILK INVOICE TO THE FARMER'S ACCOUNTING PACKAGE: ADMINISTRATIVE SIMPLIFICATION THROUGH DATA SHARING

Dairy farmers no longer need to manually enter the figures from their milk payment statement into their accounting package. By using the data-sharing platform DjustConnect, Milcobel and Boerenbond offer a solution that eliminates inefficient retyping and administrative work. Just like the data that farmers need for the IKM audit, they can now also automatically upload the data from their milk money statement into their accounting software. The data generated by Milcobel for the milk money statement - liters, price, protein and fat content immediately end up in the right place in Focus. As always with DjustConnect, The dairy farmer keeps the power to decide whether or not this data transfer takes place.

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[NEW]

DIGITAL TWIN OF THE OCEAN

The international project ILIAD will create a European Digital Twin of the Ocean (DTO) to accurately represent changes and processes in the ocean. This model combines high-resolution modeling with real-time sensing of ocean parameters, advanced algorithms for event prediction, and pattern recognition. The virtual representations will consist of various real-time to near real-time digital replicas of the ocean. ILIAD will also create a marketplace to provide apps, plug-ins, interfaces, raw data, citizen science data, synthesized information and value-added services to be distributed in conjunction with the ILIAD Digital Twin.

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NEW

OPTIMIZATION OF GRASSLAND EXPLOITATION THROUGH A DECISION SUPPORT TOOL

In this research project, a validated and applicable mathematical model was developed for grass growth that relies on satellite imagery under field conditions and that takes into account regional weather conditions and soil moisture supply. The model will then be integrated into an online platform where farmers can obtain information about the fertilization needs based on the demand of the crop, (potential) grass growth, yield estimation and an indication of grass quality, all while taking into account the soil type and regional weather conditions.

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$oldsymbol{\mathsf{L}}$ IN THE SPOTLIGHT $oldsymbol{\mathsf{L}}$

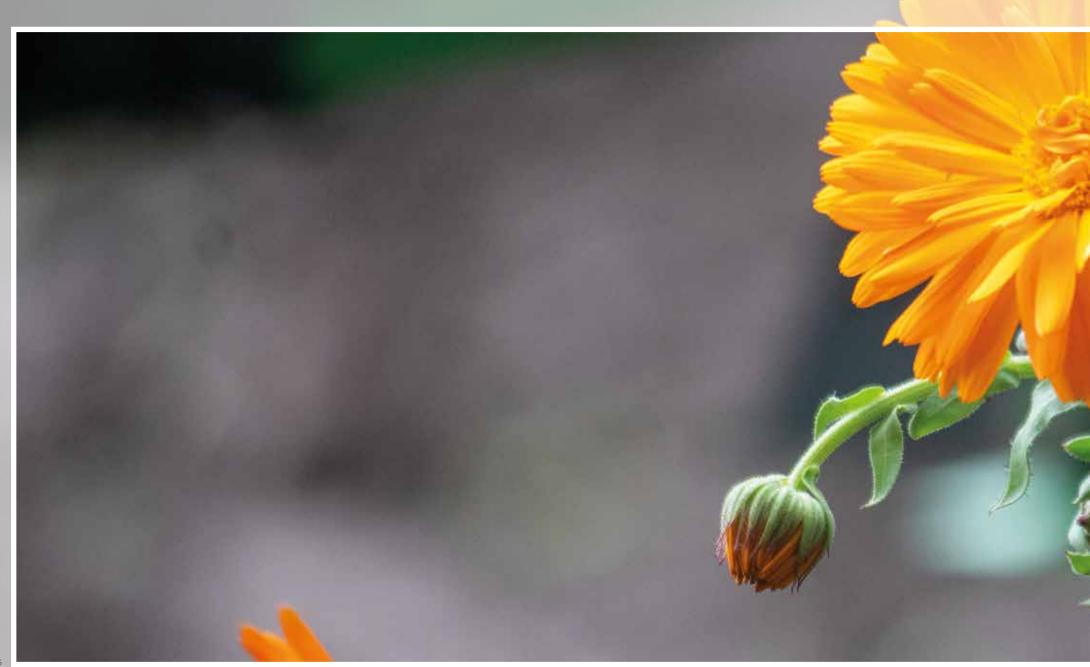
AUTOMATIC MONITORING OF ANIMAL WELFARE ON FARM, DURING TRANSPORT AND AT THE SLAUGHTERHOUSE

Every year, more than 130 million pigs and more than 5 billion chickens are slaughtered annually in the EU. This makes the broiler and pig sectors very important economic segments of European food production. Due to the industrial scale of animal production in Europe, the animals' welfare is increasingly being scrutinized. With the European aWISH project (Animal Welfare Indicators at the SlaughterHouse) ILVO is working together with technology companies, slaughterhouses and fellow researchers to address the challenge of monitoring and improving the welfare of all slaughter chickens and pigs.

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RESULT.



WHICH FARM ANIMALS DELIVER MORE HUMAN EDIBLE PROTEIN THAN THEY CONSUME? EDIBLE PROTEIN EFFICIENCY OF BELGIAN LIFESTOCK SYSTEMS CALCULATED FOR THE FIRST TIME

In a BFA-commissioned study, ILVO described the relationship between the vegetable proteins that are used as animal feed but which are also edible by humans, as well as the amount of edible animal protein that is produced in the form of meat, eggs and milk. The study shows that cattle, which eat a lot of grass, are net producers of human edible protein. In other words, they produce more edible protein in the form of milk or meat, than the edible protein that they consume. For pigs and laying hens, the figure is close to breaking even (they consume about as much human edible protein so they provide in the form of pork or eggs). Broiler chickens currently appear to consume more human edible protein than they return, mainly due to the large proportion of grain in their feed. This study confirms that choice of raw materials and the validation of the edible protein content are strong determinants of the edible protein efficiency of Belgian livestock. Currently, by-products already make up 43% of our feed ingredients.

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[RESULT]



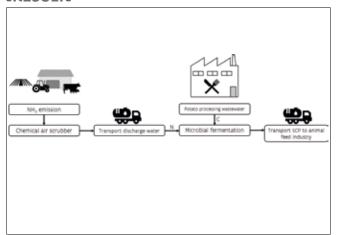
FIRST STRUCTURE OVERVIEW SHOWS PERFORMANCE OF FLEMISH BIOECONOMY

For the first time, the numerous flows of renewable raw materials and processes have been described and their economic value for Flanders has been estimated. The study was carried out by ILVO and VITO at the request of Flemish minister Jo Brouns and his predecessor, both competent for Work, Economy, Innovation & Agriculture. The annual repetition of this study makes it possible to implement a targeted, stimulating policy and to evaluate its impact. The B2BE Facilitator can also use the data from the comprehensive study to optimize operations.

contact: jasmineversyck@b2be-facilitator.be



[RESULT]



VALORIZATION OF MINERAL NITROGEN FROM BARNS AS A SLOW-RELEASE FERTILIZER OR ANIMAL FEED

Commissioned by the Flemish EWI department, ILVO investigated the feasibility of converting the ammonia captured from barn air via an air scrubber into microbial protein. That protein can then be valorized as organic fertilizer or as an ingredient in animal feed. From all the possible options: type of air scrubber, the location of the fermentation process, the carbon source, etc., two scenarios were drawn up for study. Only one scenario in the best possible world seems to have economic potential. The image above illustrates this scenario. Here the effluent from the chemical air scrubber is used as a nitrogen source in a microbial fermentation, together with wastewater from a potato processor as a carbon source. For this scenario, we assumed that the microbial protein would be incorporated as an animal feed component. From an environmental standpoint, there are always trade-offs between certain environmental themes. The environmental sustainability of a scenario is largely related to the nature of the carbon source, the nitrogen source in the different applications, and the transport distances and the energy aspects. In addition to the economic and environmental story, the legislative aspect of this type of process seems to be a great challenge.

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RESULT



FEEDING PIGS WITH FIBER-RICH BY-PRODUCTS

ILVO, UGent and KU Leuven organized a trial within the framework of the food-feed competition in the Flemish pig sector. The question was how well the lean pig genotypes typical of Flanders can cope with feeds consisting exclusively of byproducts. Fattening pigs derived from sire lines with very high versus very low feed intake were compared, where in the final feeding phase they were fed either a conventional or a very high fiber feed based on by-products. Both types of pigs handled the two feeds similarly, where the high-fiber feed resulted in lower feed intake, lower growth and lower carcass quality. Meat quality did not differ.

contact: eline.kowalski@ilvo.vlaanderen.be



[NEW]

BIO-BASED FERTILIZERS FROM ORGANIC FIELD CROP RESIDUES

ILVO is participating in the Horizon2020 project RUSTICA, together with project partners in Europe and South America. The project focus is making new bio-based fertilizers from organic plant by-products. The idea is to valorize crop residues, thus closing nutrient loops. In the technological part, a variety of conversion processes are being developed depending on the available crop residues, for a further combination of ingredients (e.g., biochar) to create bio-based fertilizers. ILVO is involved in the field trials with leeks and cauliflower for the Flemish region. In addition, ILVO is leading a work package on co-creation of knowledge and systemic feasibility assessment to gain insights into strong business models under different potential scenarios.

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NEW

INNCOCELLS PROPOSES: HIGH-QUALITY COSMETIC PRODUCTS FROM PLANTS AND PLANT CELLS

Cosmetic users are becoming increasingly aware of the importance of using healthy beauty products. This awareness is leading to an increasing demand for sustainable and safe cosmetics. The InnCoCells project, launched at the end of 2021, stems from the societal demand for products based on natural ingredients and investigates how scientifically validated and safe cosmetics based on plants can be developed.

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This project has received funding from the European Union's Horizon 2020 research and innovation programme: Grant agreement N° 101000373

[NEW]

EXPLOIT THE POTENTIAL OF 'GENE EDITING' IN THE CONTEXT OF A SUSTAINABLE BIOECONOMY

New Genomic Techniques (NGTs) are promising for those who want to work towards a more energy-efficient, low-input and non-polluting agriculture and/or more sustainable industrial processing of raw materials. This innovative potential is not being fully exploited in Europe due to uncertainties and challenges regarding legislation, traceability and social impact. The aim of the GeneBEcon project is to thoroughly describe this using systems thinking and questions related to risk assessment and socio-economic aspects of two practical cases. In the case of potato, CRISPR/Cas is being used in an attempt to improve disease resistance and to obtain a higher starch content for useful industrial applications. In microalgae, we plan CRISPR/Cas application to increase production of mycosporin amino acids (MAAs). After the extraction of those MAAs, the by-products of the algae production will be used in chicken feed. Here, we track the effects on humans and the environment along the entire production chain, from lab to field and its industrial processing into bio-based animal feed.

More information: https://genebecon.eu/

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_IN THE SPOTLIGHT _

B2BE FACILITATOR: FLAX BY-PRODUCTS CREATE BUSINESS OPPORTUNITIES

On Feb. 22, the B2BE Facilitator organized a first workshop with 69 participants. During the workshop we explored innovative applications of flax by-products in different sectors. After the workshop the industry showed great interest. Several companies from both the construction and agricultural sectors have requested samples of flax by-products. Flax has been included in the research proposal Bioloop. The B2BE Facilitator has commissioned a study to investigate the logistics of flax shives using VITO's MOOV model. A successful workshop with nice results and an active topic for the B2BE Facilitator!

contact: jasmineversyck@b2be-facilitator.be





NEW

B2BE FACILITATOR: THE BIOBASED PRIMARY SECTOR - BIOPESTICIDES AND BIOSTIMULANTS

The second working theme of the B2BE Facilitator focused on biopesticides and biostimulants. Biostimulants are products of plant or animal origin that may affect crops by making them more stress resistant, by helping them to absorb nutrients from the soil, or by making the plants generally stronger. From 14 stakeholder interviews, it became clear that there are several barriers that prevent these bio-based pesticides and fertilizers from reaching the majority of farmers. A study was outsourced to UGent that will detail the opportunities and bottlenecks in the biopesticide and biostimulant chain.

contact: jasmineversyck@b2be-facilitator.be











Living Lab Food Pilot

MINISTER BROUNS IN THE FOOD PILOT AS PART OF THE FLEMISH FOOD SUMMIT

On November 29, the very first Food Summit took place where Minister Brouns presented the Flemish Food Strategy. Spearheads are sustainability and innovation. There is no better setting than the Food Pilot to bring that message into focus. After all, for more than 10 years companies have been testing new recipes, ingredients or production processes at the Food Pilot. This pilot facility has more than 50 food processing machines, 10 labs and a team of 100 food experts. In 2022, 638 pilot tests conducted, >20,000 nutritional analyses and >200 recommendations were delivered to >400 companies. These numbers show the strong annual growth in the number of businesses receiving counseling.

During the Flemish Food Summit, Minister Brouns emphasized the crucial importance of this form of knowledge building with the sector: co-creation. This way of working has already resulted in many successful business accomplishments.

contact: karen.verstraete@ilvo.vlaanderen.be



UNIQUE PROTEIN LINE HELPS COMPANIES GET STARTED WITH INNOVATIVE PROTEINS

In addition to the 50 food processing machines already in place, the Food Pilot invested in no less than 20 new ones to cover the entire process from raw alternative protein source to pure ready-to-use protein ingredient. This pilot line consists of equipment that covers every step from harvested raw material, through protein concentrates and isolates, to textured proteins produced in a semi-industrial and controlled manner. This allows each of these processes to be optimized to obtain high quality proteins.

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Europees Fonds voor Regionale Ontwikkeling. Mede gefinancierd in het kader van de respons van de Unie op de COVID-19-pandemie.



CAPACITY OF FOOD PILOT IN MELLE STRENGTHENED: ADDITIONAL TEST HALL AND 7 NEW PILOT MACHINES TO HELP GUIDE COMPANIES

The Food Pilot now also meets the demand for smaller test equipment, with a capacity of 1 to 5 kg in addition to existing ones of 50 kg and above. Increasingly, the Food Pilot is experimenting with highly innovative raw materials or products, e.g. in protein extraction. Protein extractions do not always yield large quantities of protein, which means that subsequent processing steps are not always feasible at pilot scale. In addition, alternative raw materials that are still in the exploratory phase are often only available in limited amounts. Even at this stage, pilot tests are still very important. A series of smaller pilot devices are therefore being purchased, including the fluidized-bed dryer. In addition, startups are looking for equipment of small scale for starting their first commercial production. For this purpose, investments are being made in a cutting machinery, a separator and a bar maker. A new hall will be renovated to make room for this activity.

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[RESULT]



ISO 17020, ISO 17025 AND ISO 17043 ACCREDITED DEPARTMENTS AND REFERENCE WORK

A large number of services such as laboratory analyses, inspections and the organization of proficiency tests take place at ILVO in certified departments or laboratories. These ISO certifications guarantee high quality and correct service for policy and the various other links in the agri-food chain. The various departments are also continuously responding to new trends and needs from society by adapting and expanding of the accreditation domain. This accreditation also provides a basis for ILVO's reference working and ILVO's responsibilities as National Reference Laboratories.

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RESULT



FLAVOR PROFILES OF AUTHORIZED ALGAE WENT DOWN WELL WITH FOOD PROCESSORS

About a hundred stakeholders ranging from growers, food processors, producers, product developers and chefs discovered the numerous possibilities of algae in food. Within the framework of the ValgOrize project, they were given a tour of the Food Pilot in Melle with a focus on the equipment that can be used when processing algae. They also were treated to a variety of algae snacks. The participants did a taste test in a professional tasting lab, and followed an algae cooking workshop. In between, there were presentations were given on the nutritional, health and sustainability benefits of algae, and on the results of a real consumer panel. The food processors were very interested in the taste profiles of the algae that are already legally recognized for human consumption, which allow them to select the perfect algae for their product based on the exact taste scores.

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Seaweed and algae: surprising tasty and

0:39



LIN THE SPOTLIGHT.

TELEVISION-WATCHING FLANDERS DISCOVERS ILVO IN PROGRAM 'OVER ETEN'

ILVO was featured in no less than three episodes of the program Over Eten ('About Food') with Kobe Ilsen and Danira Boukhriss Terkessidis. In the first episode, food technologist Keshia Broucke explained the difference between proteins of animal and vegetable origin. In the episode about vegetables, we watched lab assistant Annique Staelens perform a DNA analysis on a carrot wrap: does it actually contain carrots as the packaging claims? Then we saw food technologist Bart Van Droogenbroeck in the Food Pilot processing several kilos of fresh carrots into a few grams of carrot powder. After all, how else do you get those carrots into a wrap? In the episode about the North Sea, expert Daan Delbare explained sustainable aquaculture on land and at sea. Will we eat flat oysters from our North Sea again? Daan Delbare thinks so.

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RESULT

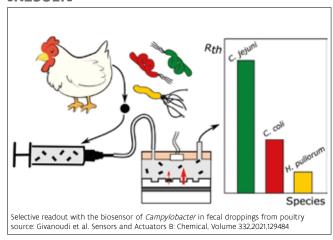


THE OCCURRENCE, SOURCES AND TRANSMISSION ROUTES OF MAJOR FOODBORNE PATHOGENS

This study investigated the sources and transmission routes of *Salmonella* during the slaughter of poultry and pigs. The occurrence of the parasite *Sarcocystis* in bovine carcasses was determined as well as the role of wastewater treatment plants in the spread of *Sarcocystis* and *Taenia* species in the environment. The results show that poultry and pig carcasses can be contaminated with *Salmonella* through (persistently) contaminated slaughter equipment or production water. In poultry, cross-contamination between slaughtered batches also plays an important role. It is also clear that cleaning and disinfection are very important in *Salmonella* control in the slaughterhouse.

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[RESULT]



BIOSENSORS RECOGNIZE AND COUNT SMALL MOLECULES AND MICROORGANISMS IN FOOD

In the doctoral research of Stella Givanoudi (ILVO-KU Leuven), a DNA-based aptamer was selected via a SELEX process as recognition element for incorporation in a biosensor for the detection of histamine. This is important because histamine can cause food poisoning from certain fish species and other food products. In addition, a biosensor based on surface imprinted polymers as a recognition element was developed for the detection and quantification of the pathogen *Campylobacter* in cecal droppings of poultry. The development of a biosensor coupled with nanopore sequence-based characterization of pathogens in the food industry continues in the new project SIPORE.

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RESULT



AGREUFOOD: RAPID TEST FOR BACTERIAL CONTAMINATION IN FOOD

In this Interreg (Flanders-Netherlands) project, a proof of concept surface imprinted polymer based biosensor has been further developed at the level of a demonstrator device, with the right size scale and connected to a software platform for the detection of *Escherichia coli* as an indicator organism in food. At ILVO, microbiological reference measurements were performed, including on a smoothie machine, to evaluate the applicability of and readouts with the biosensor. In collaboration with Brightlands Campus Greenport Venlo, intensive subject-oriented communication efforts were carried out, each from its triplehelix structure, including a number of demo events.

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RESULT.



Prevention and control of *Listeria monocytogenes* in the chain for fresh beef and pork meat

The bacterium *L. monocytogenes* was found on 47% and 20% of cattle and pig carcasses, respectively. Furthermore the skins of 93% of incoming cattle were found to be contaminated. Rather than contamination of the skin, persistent contamination of certain slaughter equipment proved to be the cause of contamination of cattle carcasses. In pork cutting plants, during production as well as after cleaning and disinfection, certain types of *L. monocytogenes* were regularly detected, which indicates persistence. The study provided insight into sources of contamination and pathways, critical points, persistence and growth of this pathogen in pork chops and minced pork.

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[RESULT]



HEALTHY, NEUTRAL-TASTING FIBER FROM BELGIAN ENDIVE ROOTS

In the PhD research done by Anna Twarogowska, an innovative biorefinery processing method of underutilized chicory roots was successfully developed. The developed products can be used in a wide range of applications: from food and beverages to cosmetics, pharmaceuticals and biostimulants. Starting from the forced roots of Belgian endive, a dietary fiber concentrate was made. This is a functional food ingredient with low sugar content, high dietary fiber content, and excellent functional properties such as water and oil retention capacity. These properties come in handy in various products, e.g. in veggie burgers with improved baking properties. The bitter components collected during processing were shown to have anti-microbial and plant growth stimulating properties. This PhD was funded through the ERA-NET FACCE Surplus and VLAIO in collaboration with the partners listed below.

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RESULT



'SMARTER EATING IN HEALTHCARE' EVENT

We were pleased to receive 150 participants on September 15th, with good representation from both food and healthcare companies, with a fascinating debate as a result! Three years ago, the 'Nutrition Health Care System' partnership, or NuHCaS for short, was launched. The aim: to work on chain-driven solutions for tasty, balanced and accessible food, with extra attention for people in care situations. On a regular basis, researchers and stakeholders come together to debate, provide feedback, and develop ideas for future collaborations. Projects on meal preparation, development of customized products, monitoring of food intake and malnutrition in residential care facilities, and the fight against sarcopenia were presented with a call for participation.

More info:

https://www.nuhcas.be/2022/10/05/nuhcas-bundelt-krachten-voor-meer-slimmer-eten-in-de-zorg/

contact: karen.verstraete@ilvo.vlaanderen.be

IN THE SPOTLIGHT .

RESEARCHERS SUCCEED IN TURNING OFF 'BITTER GENES' WITH CRISPR/Cas9 TECHNOLOGY

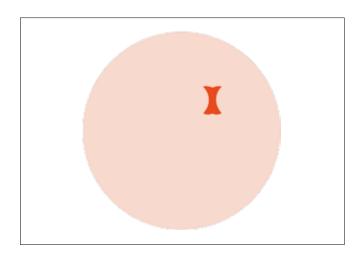
Researchers have succeeded in creating Belgian endive and chicory that contain hardly any bitter components. They did so by using the famous CRISPR/Cas9 technology to switch off only those genes that control the production of bitter components in the plants. This offers opportunities for Belgian endive cultivation, because less-bitter Belgian endive is appreciated more by (younger) consumers. This discovery also has applications for chicory cultivation, because less bitter roots are better suited for the production of healthy, high-fiber and gluten-free flours for the food industry. This research even offers perspectives for breeding of other well-known bitter vegetables such as Brussels sprouts and endive. The doctoral research of Charlotte De Bruyn was a collaboration between ILVO, VIB and UGent.

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NEW

FLEMISH PARTNERS JOIN FORCES IN THEIR FIGHT AGAINST FOOD LOSS UNDER NEW NAME: 'THE KOSTWINNERS'

September 29 is the international day against food loss. The Flemish government, together with organizations that fight against food loss, launched 'De Kostwinners' ('The Breadwinners'): an enhanced collaboration between all partners leading the action plan against food loss. 'De Kostwinners' are already taking many actions, including a new app that estimates how much food is thrown away every day, a survey of caterers on food waste, a mobile processing unit for fruit and vegetables, and a commitment to a local food policy. The entire chain aims to prevent 30% of food losses, reprocess the losses into food, or increase the value of their eventual valorization. ILVO also contributes in the role of leader of a living lab in the European ZEROW project, in which innovative, flexible and versatile solutions are being demonstrated as a service for optimizing the use of edible biomass.

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NEW

INSIGHT INTO MULTISPECIES BIOFILMS IN THE FOOD INDUSTRY

In the food industry, microbial contamination is a major risk to the safety and quality of food products. Even after cleaning and disinfection, food contact surfaces often remain laden with surface-attached microbial communities. These biofilms often contain several species that synergistically interact with each other, making them more resistant and more difficult to remove by routine cleaning and disinfection protocols. In this Marie Sklodowska Curie postdoc fellowship, ILVO is investigating the interspecies interactions between different bacteria, which combinations of species are important in the formation of biofilms, and how exactly these species exactly interact with each other.

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This project has received funding from the European Union's Horizon 2020 research and innovation programme: Grant agreement N° 101025683

IN THE SPOTLIGHT _

PLATE SCRAPS AND PREPARATION SURPLUSES IN HEALTHCARE

Food loss is present in all links of the food chain. The reported amounts of food loss in the healthcare sector vary widely. Under the motto 'to measure is to know' ILVO developed a measurement setup that was used to characterize the plate scraps in residential care centers. The measurements were carried out in 2 large care institutions in Flanders and yielded plenty of results. Besides the insight into quantities of leftovers per resident, it also generated knowledge about consumption levels. In addition to the plate scraps, food preparation leftovers were also included in the study. Given that this portion was the biggest, an additional project was started: AU BAINPERDU, also within the Circular Food Chain call.

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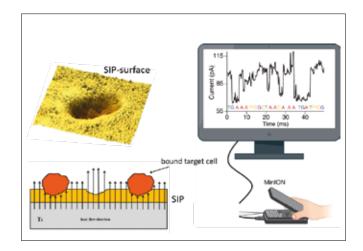


NEW

SURFACE IMPRINTED POLYMER TECHNOLOGY AND NANOPORE SEQUENCING FOR POINT OF CARE FOOD MICROBIOLOGICAL ANALYSIS

SIPORE aims to explore and test 'surface imprinted polymers' (SIP) biosensors in combination with a portable nanopore DNA sequencing system (MinION) for on-site detection of microbial presence in the agri-food industry. These two technologies, SIP and whole genome nanopore sequencing, are promising for 'on-site' detection and characterization of foodborne pathogens and for monitoring of starter culture strains. This may enable agri-food companies to perform more specific 'on-site' microbial analyses themselves and thus gain insight into sources and pathways of pathogens.

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NEW

APPROPRIATE AND TASTY FOOD IN CARE CENTERS AND HOSPITALS

The FoodCare project is a first 'fruit' of the NuHCaS partnership that aims to connect the food and health sectors with each other. The group of 3 knowledge institutions and 15 companies aim to improve meal quality in health care settings. In close collaboration with the companies, challenges and recipes are explored and experiments are done regarding taste, nutritional value, technical preparation, logistics and economic impact. A methodology is also being developed for process improvements. For example, "How can you prepare tasty and nutritionally rich broccoli in a decoupled kitchen?". Future issues include the crispness of breaded products after regeneration and the nutritional enrichment of mashed potatoes.

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Management 2022

AN ENERGETIC 90TH BIRTHDAY

ILVO celebrated its 90th anniversary with a four-day event that treated all key stakeholders to learning, demonstrations, storytelling, exhibitions, innovative foods and even emotional experiences (e.g. the open-air play ZWINS). There wasn't a trace of stagnation or metal fatigue to be seen, despite COVID-19 and the energy crisis.

Organogram. Living Lab Living Lab **Food Pilot Agri-food Protein Technology** diversification Precision Nutrition Marine Marine **TECHNOLOGY &** Living **Bioeconomy FOOD SCIENCE** Lab Marine **Environment** Plant & Soil cycles Living Lab **ILVO PLANT** ANIMAL **Living Lab** Supported **SCIENCES** Animal **SCIENCES Husbandry SOCIAL** limate-smart Crops **SCIENCES** production Centre of Living Lab **Development Expertise for Agroecology Production Agriculture** and Systems Added Value and Climate Organic Creation **Farming**





Research coordination 2022 _____ EU team ____

OPEN, TRANSPARENT AND DONE WITH INTEGRITY

This year we worked on 331 active research projects, 96 of which started up in 2022. Research results are meant to be shared with society as a whole. This can take the form of seminars as well as publication in scientific journals. The trend of making more publications available using the principles of Open Access is growing. In 2022, this resulted in 96 peer reviewed A1 publications and 93 other scientific publications.

Results of scientific research should be produced correctly: openly, transparently and with integrity. In the past year ILVO also continued its open dialogue on scientific integrity by taking questions for our 'dilemma training' and by developing internal guidelines. The scientific integrity committee received no formal complaints in 2022.

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BROAD EXPERTISE

After an intense year of preparation and information sessions, ILVO got off to a good start with the new European Horizon Europe 2021-2027 (Green Deal, including Farm to Fork). Under the 2022 call, 16 new projects were approved, for a total of 31 Horizon Europe projects. Among other things, we scored very well for the Missions, with 1 project under the Oceans Mission and no fewer than 5 projects under the Soil Mission. Our efforts in the Europe Digital program also rewarded us with a Test and Experiment Facility to accelerate the application of AI and robotics. Of the new Interreg programs that are gradually starting up, 1 has already been approved.

These results reflect the broad expertise present at ILVO. Meanwhile, our project coordination skills - which we deploy internally with additional support - are being appreciated. We are the lead institution on 7 new projects (with up to 56 partners).

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RECRUITMENT AND SELECTION

In 2022, more than 80 new employees joined ILVO. This large influx of mainly young people makes ILVO a very dynamic organization. In 2022, 53% of ILVO's Own Capital employees were under 35 years old. But age is certainly not a decisive criterion in recruitment. In recent years, several people over 50 have also joined ILVO. Personality, expertise and motivation are the main selection criteria. We also try to keep our employees working as long as possible; for example, we have a bacteriologist who will turn 67 in January 2023 and continues to work full-time.

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Number of ILVO employees in 2022

	Employees			FTE		
	FG	ос	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
dec 2022	214	524	738	195.5	494.1	689.6

BICYCLE LEASING

The bicycle leasing program was used in the fall of 2022 to meet the growing demand and to further promote bicycles as an alternative means of transport for commuting. This initiative, despite its limitations, creates more flexibility in working conditions. Biking is good for employee well-being: regular cycling contributes to one's general health, fitness and well-being at work. It is also sustainable: consciously choosing to bike reduces our environmental footprint. And it is fiscally advantageous.

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LEARNING & DEVELOPMENT

ILVO believes in the ongoing development of all its employees. In 2022, the learning platform GoodHabitz was rolled out for the first time and was met with success: 688 employees found their their way to GoodHabitz. Nearly 4,500 lessons were taken this year. Trainings around Microsoft 365, Time Management and how to best use one's personal power were the most popular offerings.

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ORGANIZATION DEVELOPMENT

As an important part of organizational development, since 2021 ILVO has been working with roles and making employee responsibilities more explicit at all levels of the organization. The objective is to offer our employees meaningful work based on talent orientation and encourage them to take on personal leadership. The possibility for them to explore new (substantive) career paths is considered a pleasant and useful side effect. This started in 2021 as an experiment and in 2022 became a concrete application in 2 research units: Animal Sciences and Plant Sciences. The plan is to broaden this in 2023 and offer it to all departments of ILVO.

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YOUTH COUNCIL

In March 2022, the ILVO Youth Council was established. This group consists of younger employees who are actively involved in ILVO management. The Youth Council handles topics presented by the Management Committee, as well as topics put forward by members themselves. This year, 26 motivated young people all put their shoulders under this project. One of their achievements was creating a place where all ILVO employees could go during the summer for after-work activities.

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A REAL ESTATE STRATEGY

ILVO has an extensive patrimony with some 90 buildings spread over 10 sites, a legacy of the federal research stations dating from the 1950s to the 1970s. This obsolete and fragmented patrimony is a cause for concern and requires an integrated real estate strategy.







In the framework of the European project SURE2050, ILVO has developed the 'ILVO Agri-food Research Landscape Strategic Property Plan.' An ambitious and realistic path towards a climate neutral patrimony in 2045 that answers our many and diverse challenges. ILVO was one of the first entities to complete this strategic real estate plan. Our dream is to evolve into a campus model with one beating heart: a centrally located, lab-related and administrative cluster with specialized satellites around it. A first step could be the so-called Horizon building. It would gather the now-scattered ILVO labs. We are working closely with the Facility Management Department on this project. A tender has been launched for an Urban Planning vision statement. Candidate design teams for this Urban Planning vision are exploring the spatial aspects of biking to the ILVO research campus.

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ENERGY SAVINGS AND RESEARCH-ORIENTED WORK

Using the strategic property plan as a guide, we again made annual investments in the area of energy savings. For example, several roofs were insulated and several boiler rooms were optimized. A new drying installation was also installed to replace a very outdated oil-fired installation with large, non-frequency-controlled fans. The new installation will be used to dry various grasses and seeds, with the temperature and air flow per individual box being controlled according to various parameters such as measured humidity, temperature and species. This investment makes it possible to conduct further research on innovative crops, such as chickpea and quinoa. It also substantially reduces our energy consumption by using demand-controlled fans and heating. Finally, this building, despite its larger volume, also saves on use of space.

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IN THE SPOTLIGHT

INNOVOCEAN CAMPUS IN FIGURES

- 8.000 m²
- ILVO: 90 employees
- VLIZ and partners: 190 employees
- 20 million euros
- 6 floors with labs and offices
- Fish lab, otolith lab, microscopy lab, genetics lab, chemical lab, etc.
- Breeding room with direct access to seawater
- Public library and sea archive
- Professionally equipped meeting rooms and auditorium



ILVO AND VLIZ MOVE INTO THE NEW INNOVOCEAN CAMPUS

The impressive building with its bright blue facade on the East Bank of Ostend is meant to become the hub for innovation and science for sustainable exploitation of the seas and oceans. For ILVO, the move represents a muchneeded upgrade of its lab and research infrastructure. InnovOcean has some 10 labs for microscopic, chemical and genetic analyses and a professionally equipped aquaculture room with a seawater tank and a reactor for research into aquaculture and micro-algae. Moving in together also means working more intensively together and therefore ILVO and VLIZ (Flemish Institute for the Sea) signed a new cooperation agreement in March. On December 5 the building was officially inaugurated by Vice Minister-President of the Flemish Government and Flemish Minister of Fisheries Hilde Crevits. West Flemish governor Carl Decaluwé, alderman for Space and Housing for Ostend Kurt Claeys, General Director of VLIZ Jan Mees, and Unit Head of Animal Sciences at ILVO Bart Sonck were there, as were TV presenter, playwright, song-singer and visual artist Wim Opbrouck and some 100 guests.

Take a look at the new building yourself!

contact: bart.sonck@ilvo.vlaanderen.be



Insight into the InnovOcea Campus

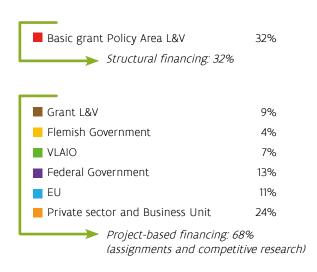
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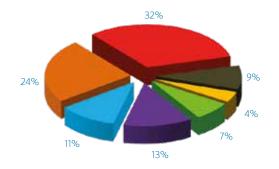
TWICE AS MUCH FUNDING FROM PROJECTS VS. ENDOWMENT

Administratively, ILVO consists of the two entities that reinforce each other in a remarkable way: the IVA 'VO ILVO' (the Internal Autonomous Agency of the Flemish government - without legal personality) and 'EV ILVO' (ILVO's Own Capital fund). These legally separate entities each have their own budget, staff and governing bodies. Whereas VO ILVO operates largely through the basic endowment, the Own Capital EV ILVO acquires resources in a flexible manner through competitive research at home and abroad, through companies and through paid services. At EV ILVO, since the fiscal year 2022, the accounting rules for processing receipts from new research projects have been adapted in accordance with the guidelines included in the Flemish Government Finance Codex (VCO). In the first years of ILVO, the ratio of VO to EV was was approximately equal. This year, the balance EV/VO is about 2/3 - 1/3. In 2022, the basic endowment to ILVO accounts for 32% of ILVO's total operating funds.

contact: katrien.debruyn@ilvo.vlaanderen.be



Distribution of operational resources ILVO 2022



ILVO CELEBRATES 90 YEARS WITH FESTILVO, THE FESTIVAL OF KNOWING AND EATING

From September 15th – 19th, everyone was welcome on our festival grounds situated between the research fields of ILVO in Melle and Merelbeke. No fewer than 1,000 professionals from the agricultural and horticulture, technology and food sector and the (international) research world attended one of the 15 seminars and contact opportunities on Thursday and Friday. On Sunday - the Flemish Farm Day - more than 8,000 daytrippers descended upon the festival zone. They enjoyed a packed program of animated walks, cooking, drone and robot demos, a plethora of tastings and food, a demo garden with innovative crops, interesting conversations in the bar tent, a straw-bale children's village and lots of sports and games. Some lucky families went home with a bag of self-harvested ILVO potatoes. At the very least, the visitors left the grounds with a head full of interesting, optimistic stories about the future of our food. On Monday the festival zone opened one last time for 800 students from as many as 20 agricultural and hotel schools across all over Flanders.

These were four unforgettable days. Thanks to everyone who helped and celebrated with us!





ILVO Festival or knowing and eating the aftermovie

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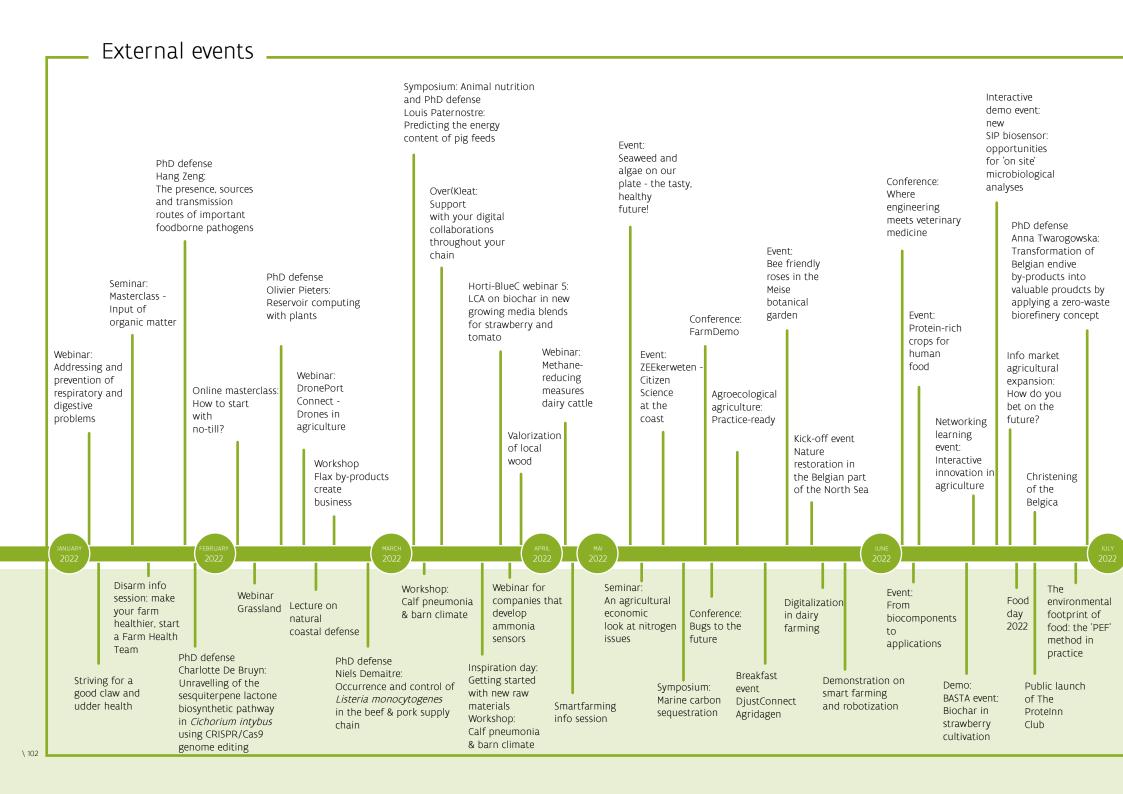


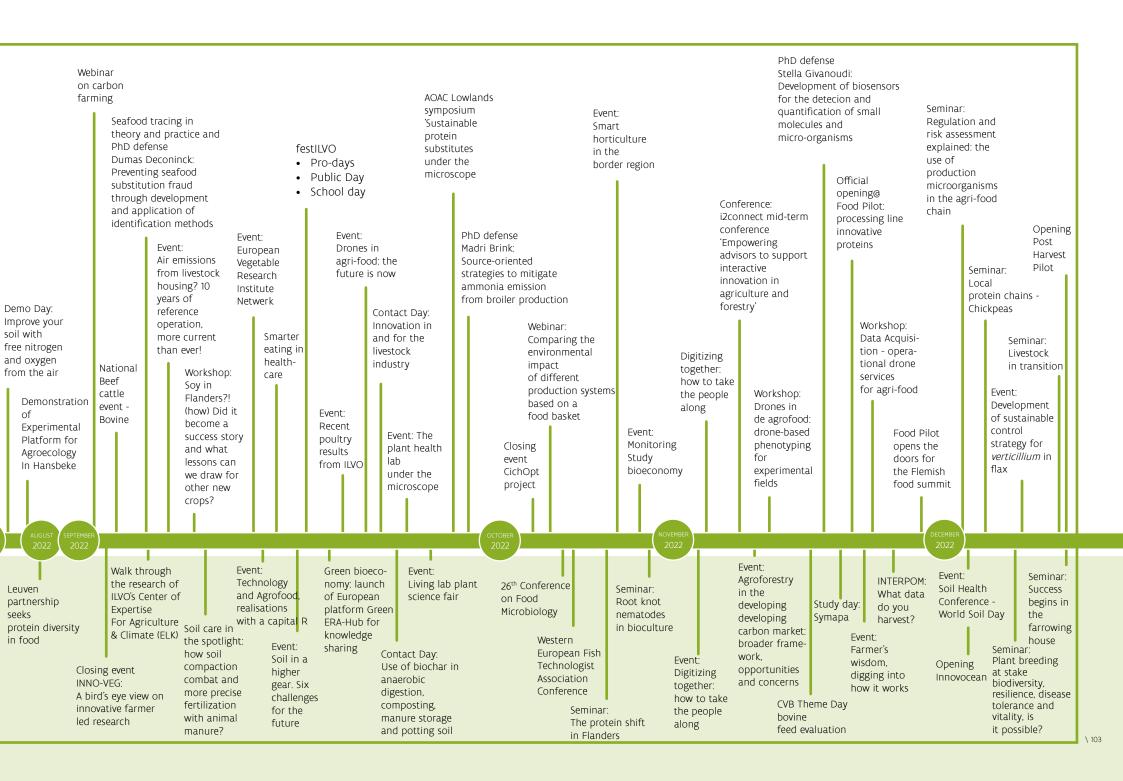
OFFICIAL OPENING IS DOUBLE BIRTHDAY CELEBRATION FOR ILVO AND BOEK

The non-profit organization Boeren op een Kruispunt (BoeK) also had a anniversary in 2022. The organization celebrated its 15th birthday and published a book to mark the occasion. ILVO and BoeK therefore jointly invited more than 300 stakeholders to the official opening of festILVO. Apart from an impressive meal prepared and served by students of Hotelschool Ghent the guests enjoyed the theater performance ZWINS by *Het Eenzame Westen* (The Lonely West).

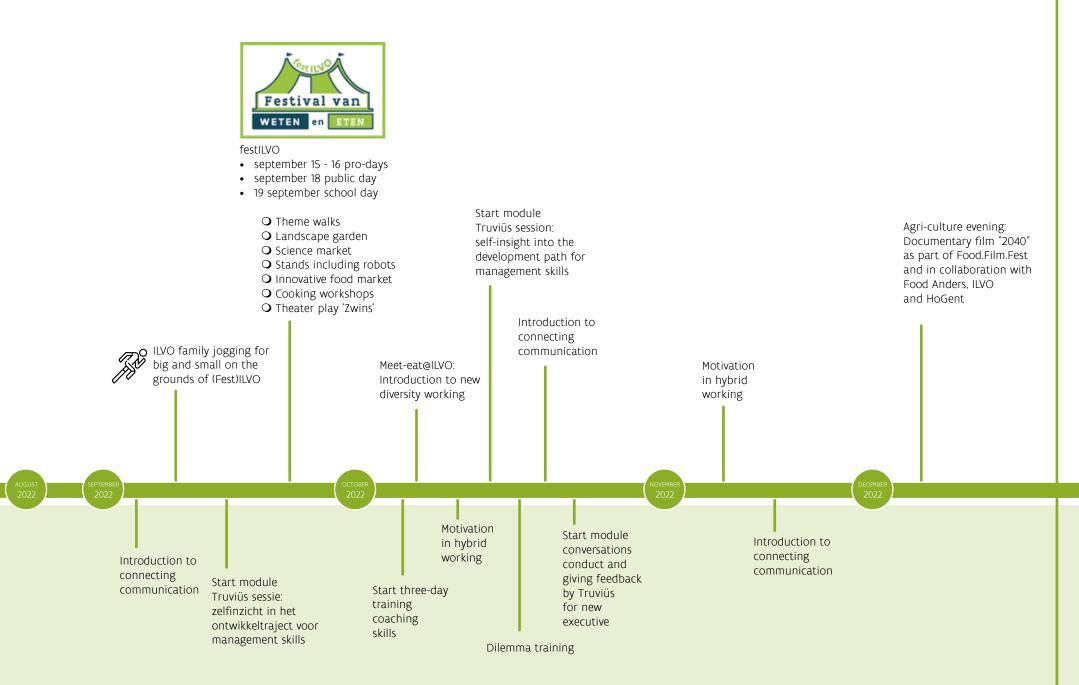








Internal events O-day: Research afternoon with bicycle tours Guided tours of the various sites • Living Lab Food Pilot. • Plant Sciences - varieties in labs, greenhouses, trial fields, soil, Meet-eat@ILVO: compost, Agroforestry Nitrogen Agreement: • Plant diseases - diagnoses concerns, questions, • Technology & Food Science - robots, drones, sprayers solutions... Living Lab Agri-food Technology • Animal Sciences - challenges in animal husbandry • Social Sciences - dialogue with society Kom op Tegen Kanker actions • sale of ILVO cycling clothes sale of honey Kanker • sale of wines walking challenges Return day breakfast Start module for new Webinar: Introduction to Truviüs session: · spaghetti lunch staff connecting Launch of Meet-eat@ILVO: self-insight communication learning Art at ILVO: for new platform the bridge between Leadership GoodHabitz art and science Yoga 1000 at your Kom op tegen Kanker Introduction to Introduction to desk New Year's ILVO cycles connecting connecting (weekly) wishes 1000 km Motivating communication communication along from trust Thick Sweater Day Motivating Motivating Opening ILVO from SciMingo trainings throughout the year: from pop-up cafe trust Creative & balanced trust The Greenhouse science communication Kom op ILVO team runs Open during Dilemma training Presentations Start three-day the 100 km RUN the summer • Infographic training for Kom op Tegen Kanker months • Pitch coaching in Genk Dilemma training · Video Pitch skills Podcast • Stage techniques \ 104



Dronetoepassingen

in de landbouw

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Makreel of haring eten

Sonck (aldelingshoold ILVO-Dier): "We bekijken welke richting we moeten uitgwan om deze uitdagingen aan te pak-ken. De input van onze stakeholders is hiertsi essentieel. Welke expertises

ILVO zet de boden in het midden

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Stakeholders verwachten doortastend beleidsadvies. proactieve communicatie en praktijkrelevant onderzoek over veehouderij van ILVO

> met zij beschouwen als de vool uitdigingen voor de Vlasmas derijsector, Allerserst word

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ram, klonik het. Milieu an i en de stakeholders ook gro

of aanwerven? Hoe kunnen we

Tijdens de contectnamiddeg 'in novatie in en voor de veehouderij' brainsformde ILVO-Dier met sector ederaties, commerciële bedriiven. veehouders, landbouworganisatie stallers, onderzoekers en beleide makers over de toekomst van de Vlasmes veehooderij. De participan-ten werden voorafgeand bevraagd over de drie voornaamste uitdegin-gen waar de veehouderij volgens hen voor staat en welke rol zij hierbij den het onzekere wettelijk kader, de emissie- en milieuproblematiek, en de rendabiliteit en leefbaarheid van de landbouwbedrijven als prioritale beschouwd. Om bovenstaande undegingen to tacketen, is samenwerking meer dan ooit nodig. Drie sectorfe-deraties - BFA, Fedagrim en FEBEV namen ook het woord. Zij gaven sen dat ILVO diverse rollen zou kunnen opnemen, nil een adviserende en attenderende rol naar het beleid toe; sen objectieve communicational ser zowel sector, everheld als mast chappij; een uitvoerder van praktijk ericht onderzoek en een onafhanke

verwege september used Festil VO. het festival van Weten en Ellen n.a.v. de 90th verjaardag van ILVO, plaats. Met erre professionele dagen die meer dan een publieksdag die meer dan 7000 beoekers lokte, en een scholendag met 800 middelbare schollaren, kan dit als heel successol worden geëvalueerd Op wijdag 16 september organiseerde ILVG-Dier en het ILVO Living Lab Vee-

Het management au onderzoekers van ILVO-DIER geen met dece waar

evolle input verder aan de slag bij

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Nieuwe inzichten in de kalveropfok

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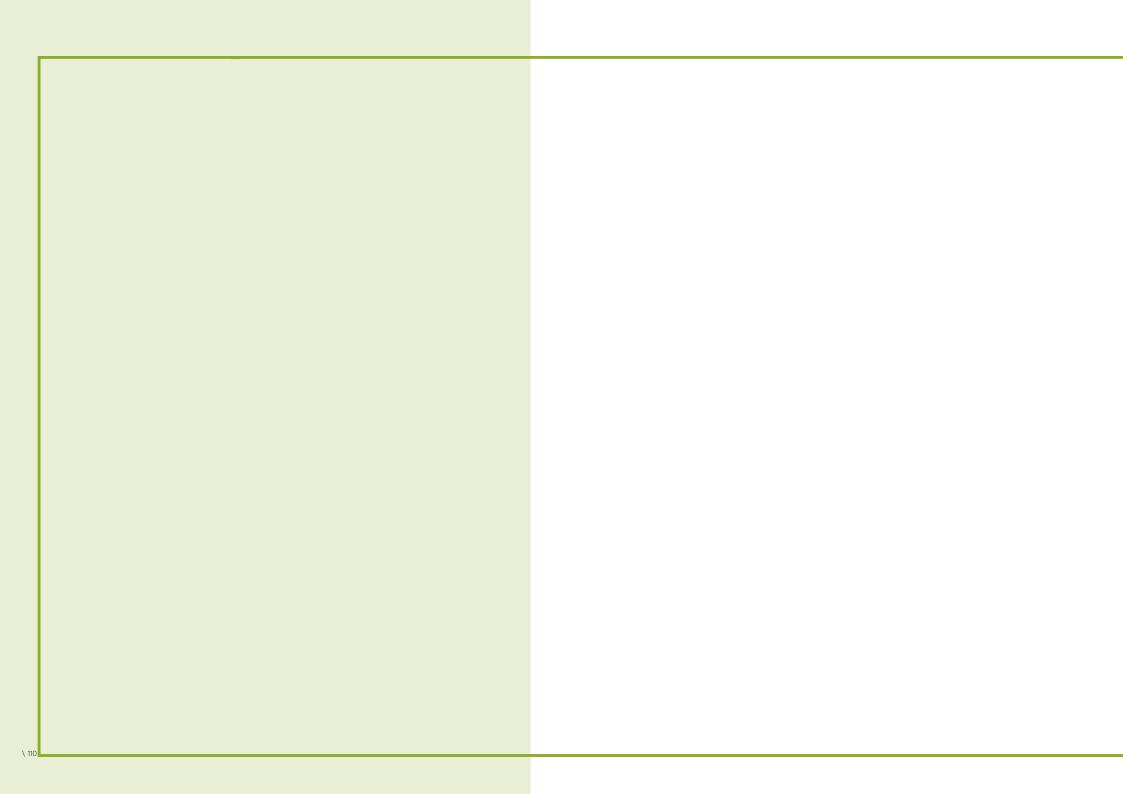
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