ANNUAL REPORT ILVO 2013

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ILVO

Institute for Agricultural and Fisheries Research

ANNUAL REPORT 2013

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This annual report describes the results of ILVO's two joined legal entities:

- ✓ The Internally Autonomous Agency (IAA) of the Flemish Government
- ✓ ILVO Own Capital (ILVO-OC)

ILVO's Mission

ILVO's mission is to perform and coordinate policy-supportive scientific research and related services. Our ultimate goal is to contribute to economically, ecologically and socially sustainable agriculture and fisheries.

ILVO therefore acquires the knowledge needed to improve products and production methods, to guarantee the quality and the safety of the end-products and to improve the policy instruments as the basis of development of the agriculture industry and rural policy.

Knowledge only becomes valuable once it is shared. Therefore ILVO strives to inform policymakers, the various industrial sectors and the general public about our projects, future plans, and results.

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2013

Vlaanderen
In Actie
Pact 2020

Dear reader,

The enthusiasm of ILVO's employees continues to grow the seed planted in 1932, the Federal Station for Plant Breeding. ILVO, founded in 2006, has since branched out far beyond plant breeding. ILVO now strives to contribute to the competitivity and sustainability of all aspects of agriculture and fisheries in Flanders.

In recent years, we have taken important steps to update our research infrastructure and expand our research capacity. The flexibility afforded by ILVO's Own Capital made these improvements possible.

Again in 2013, ILVO staff have translated ILVO's assignment and mission into research results that not only have intrinsic value but which can be valorised in the agricultural chain. The number and importance of Partnerss and partnerships with universities, university colleges, research institutions, advisory research centres, and the agriculture, fisheries and food industries continue to increase. The expertise available at ILVO, close Partners with our stakeholders and ILVO's role as a government research institute that bridges fundamental and applied research, all make ILVO the best partner for future agriculture and fisheries research.

The recently-submitted research programme for 2014-2016 guarantees that we will continue our efforts to support the sector using scientific research and provide valuable research-related services.

I thank all of the members of the ILVO-related bodies: the ILVO Board of Directors, the Advisory Committee, the Employee Welfare and Benefits Committee, the Ethics Commission and many others for their support and cooperation in the past year.

I thank the Minister-President, the Cabinet and our colleagues in the Agriculture and Fisheries Policy Area for helping to make our work possible. I gratefully acknowledge our funders, our research project partners, and all of our stakeholders for their positive and supportive Partners.

Last but not least I offer a word of thanks to all of the members of the ILVO staff. Your many positive qualities are what makes ILVO a success.

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From beef cattle to pulse fisheries

During an academic symposium with approximately 150 attendees, we honoured the work of our beef cattle researcher Dr Leo Fiems, who retired after a 37-year career. We thank Leo for his achievements at ILVO and in particular for his contributions to the beef cattle industry.

The surgical castration of male piglets is scheduled to be banned in 2018. In anticipation of this ban, we organised a meeting with the stakeholders this year. The sector's main concerns are to develop an objective method for detecting boar taint on the slaughter line and finding options to reduce the incidence of boar taint.

The use of soy meal in livestock husbandry has attracted major criticism. The nutritive potential of DDGS, a by-product of bio-energy production, appears to have great potential for replacing part of the soy meal currently used in animal rations. Research on dairy cattle showed that the protein value of soybean meal can be increased by protecting it from degradation in the rumen. This lowers the demand for soy in the ration.

The welfare of broilers needs to be improved, but in order to so, an objective and reliable method to assess their welfare is needed. In 2013 a doctoral study on this subject was completed. The existing protocols for monitoring (such as the Welfare Quality® broiler chicken welfare monitoring schemes) were improved and alternatives were developed. Main points of the research were assessment of the presence of (long-term) thirst and footpad dermatitis.

Broilers have a high incidence of cardiovascular diseases (this is the leading cause of death during the first week of life) and a high risk for infection. We tested whether feeding broiler breeder hens diets rich in omega-3 diet would produce chicks that are stronger at the start and also do better throughout their life cycle as broiler. Our research has shown that omega-3 fatty acids are indeed transferred from the mother to the yolk and the residual yolk and is found in the liver of the progeny. We will now investigate whether this gives a better response against infection.

Agriculture and horticulture are unfortunately still among the sectors with the highest accident rates. In 2013, PreventAgri brought attention to occupational health and risks by creating dossier with "facts and figures", organising a round table discussion with the industry, printing a brochure entitled "*Landbouw zonder kleerscheuren*", producing a promotional video and sensitising the industry during the machinery show *Werktuigendagen* in Oudenaarde and the *Agribex* agricultural trade show in Brussels.

The infrastructural renewal and expansion continues on our site: the shell of the dairy loose house for 150 cows is finished and the milking techniques and equipment are being installed. Our cows are waiting impatiently to move to their new winter housing system. The construction of the new pig house (a research facility with sows, piglets and fattening compartments) is scheduled to start on February 17, 2014. This project, a joint venture with Ghent University and Ghent University College, will hopefully be finished by the end of 2014. The existing piglet house has been renovated and expanded to 12 compartments. The new piglet compartments now conform to both commercial farm conditions as well as experimental requirements.

The Fisheries researchers participated in the European project called "MESMA" which focused on monitoring and evaluation of spatially managed marine areas. This included the full course of spatial planning in the Belgian part of the North Sea as compared with nine other areas throughout the European seas. The final results of this large-scale study were presented at a conference in Lisbon.

In the Interreg IVa "2 Seas" project called MEMO, ILVO studied the American comb jelly *Mnemiopsis leidyi* in our waters. The project ended with a three-day conference entitled "Non-indigenous species in the Northeast Atlantic".

Non-indigenous species and a changing climate have far-reaching effects on zooplankton in the North Sea. A doctoral research project focused on the dynamics of zooplankton in the Belgian part of the North Sea. Results showed that the zooplankton in the Belgian North Sea have large seasonal differences but belong to a single coastal community that is sporadically influenced by inflow of Atlantic water. The study updates the knowledge and understanding of the position of zooplankton in the marine food web. The role of zooplankton is an essential part of preserving our fish stocks.

Pulse fishing, a fishing method where fish and/or shrimp are caught after startling them with electrical pulses, is gaining increasing interest in the fisheries sector. Because little is known about the effects of the electrical fields on marine organisms, two PhD students of ILVO and Ghent University are studying any possible adverse effects.

The 83 researchers of the Animal Sciences Unit perform scientific research on sustainable livestock farming (cattle, pigs and small husbandry) and the exploitation of marine resources, the protection of the continental and marine environment, the promotion of animal welfare and the provision of high-quality, safe animal products. We also provide specific services for government and the agriculture and fisheries sectors. Services and advice provided by the Animal Sciences Unit happen in large part via ANIMALAB. This reference laboratory carries out research on animal feedstuffs and the nutritional value of animal products. In addition, we measure the quality of fish, crustaceans and molluscs, determine contaminants in environmental samples and the fat of fisheries products, and we perform biological environmental studies. The specialised technical advice and services such as *Varkensloket, PreventAgri* and TECHVIS, are all supported by research done in service of the agricultural and fisheries industries.

Can we predict methane emissions from cattle in a simple yet reliable way?

Predictions about methane emissions

Objectives

This project studied milk parameters to evaluate the success of methane mitigation strategies in dairy cattle. To do this well, such parameters should strongly reflect methane emissions from the animal. The main objective is to deliver a technique or methodology that can be applied in the dairy sector in order to decrease the methane emissions. One crucial condition of such techniques is that they have to be economically feasible and should be routinely applicable on farms with reliability. The specific goal includes finding parameters in milk (milk fatty acids (MFA)) that can be easily sampled and routinely analysed to monitor methane emissions.

Methods

To find these parameter(s), in vivo methane measurements were collected along with milk samples during the development of multiple feeding experiments and simultaneous methane measurements. Subsequently, the relationships between MFA and methane emissions were explored in an attempt to identify the MFA with the strongest links to methane emissions and their potential to reliably estimate daily amounts of methane produced. Additionally, the potential of MFA to differentiate high from low methane emitters was explored with the goal to contribute to the genetic selection of animals with a natural tendency to produce less methane.

Results

The implementation of diets and/or strategies to decrease methane emissions in cattle requires a careful plan. It is expected that farmers will require evidence that such strategies work effectively, and furthermore, farmers will need a financial stimulation to apply the strategies. The government and the dairy processing industry will only be prepared to provide those financial stimuli when they are sure that the strategies applied by the farmer effectively decrease methane emissions. The development of methodologies that objectively monitor methane emissions is therefore indispensable. This study contributed to the fundamental knowledge that lies at the basis of these measurements.

Title: Melkmet
Funding: ILVO
Term: 2010 - 2013
Partners: Ghent University Lanupro Prof. V. Fievez
Contact: sam.decampeneere@ilvo.vlaanderen.be

Networking for animal welfare

A coordinated European animal welfare network

Objectives

In this 1-year European pilot-project, 26 partners from 16 countries were involved to achieve four major goals regarding animal welfare. In particular, the project aimed to establish a network of experts regarding animal welfare. The goal was to solve difficulties in compliance with EU regulations concerning welfare, to test different kinds of knowledge transfer strategies that would lead to better compliance, and finally, to assess the feasibility and possible conditions under which a European animal welfare network could be set up.

Methods

ILVO participated mainly in achieving the third aim: the assessment of different knowledge transfer strategies aimed at improving compliance with animal welfare legislation. We focused on three recent EU rules: stocking density of broilers, group housing of sows, and tail docking and environmental enrichment for finishing pigs. The knowledge transfer was directed at official inspectors of the welfare regulations as well as the farmers. For every topic a different knowledge transfer strategy was used to assess and compare the effectiveness. We also participated in achieving part of the fourth aim, which concerned identifying the institutions that play a role in the field of animal welfare (our research took place in Belgium).

Results

For the broiler case, a website has been developed for the authorities where they can share which data they gather in relation to the Broiler Directive, and in what way they gather these data. For finishing pigs an e-learning tool was developed. This tool, which targets official inspectors of finishing pig farms, educated them about environmental enrichment and tail biting. For the case of the group housed sows, a PowerPoint presentation and fact sheets were developed for both farmers and the government agencies involved. In general, the knowledge strategies were well received, and had a positive effect on the knowledge of the audience, although this could only be tested during the short term. EUWelNet also demonstrated the value of developing different types of knowledge strategy resources and the benefit of producing them in different languages. It was also shown that the knowledge providers showed great interest in participating in a future network. Collectively, these results clearly suggest that such a network would be helpful to Member States and could contribute to improving farm animal welfare in Europe.

Title: EUWelNet (Coordinated European Animal Welfare Network)
Funding: DG SANCO (EU)
Term: 2012 - 2013
Partners: various partners
Contact: lisanne.stadig@ilvo.vlaanderen.be, frank.tuyttens@ilvo.vlaanderen.be

DDGS, a by-product from bio-ethanol, is good feed!

To what extent can DDGS (dried distillers grains and solubles), a by-product of the production of bio-ethanol from grains, be valorised in animal nutrition?

Objectives

Each year, Alco Bio Fuel (Ghent) produces about 150,000 m³ bio-ethanol from grains (wheat, maize or other grains either mixed or used separately). Nearly 130,000 tonnes of dried distillers grains and solubles (DDGS) flow from this production process and become available as animal feedstuffs. Other European countries also produce and market large quantities of DDGS.

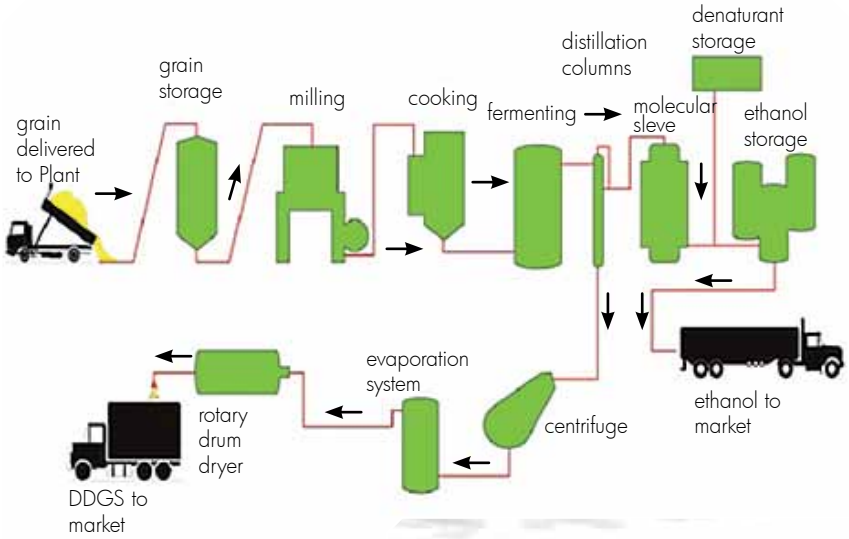
Methods

In the bio-ethanol production process, yeasts almost completely convert the starch of the grain into bio-ethanol and CO_2. This enriches the other nutrients in the by-product DDGS by a factor of 2.9. Roughly speaking, DDGS consists of one-third protein, one-third cell walls and one-third fat, sugars and minerals. Because the quality of DDGS may vary considerably with the nature of the grain(s) used and also with the production process, the composition and nutritive value for cattle, pigs and poultry of 13 diverse batches of DDGS was determined.

Results

Maize DDGS contains more fat and better digestible cell walls than wheat DDGS, thus its energy value is higher. Maize DDGS has also a higher protein value for cattle, because its protein is less degraded in the rumen than that of wheat DDGS and the by-pass protein is somewhat better digested in the small intestine. On the other hand, during production the fermentation and the heat by drying negatively affect the availability of certain amino acids, particularly lysine. Lack of this amino acid is particularly detrimental for pigs and poultry. DDGS is a rich source of minerals, mainly phosphorus, and trace elements. To enable a better estimation of the nutritive value of a batch of DDGS, we developed regression equations based on convenient chemical analyses (fat, NDF, ADF…) and in vitro tests (protein solubility).

For dairy cattle, up to 4 kg DDGS can be incorporated in the ration with positive effects on milk and protein production. This saves on concentrates as well as soybean meal. For fattening pigs, up to 22.5% DDGS may be included in the feed without negative effects on growth, feed conversion, or carcass quality. For broilers, up to 15% DDGS may be used in the feed with some better growth results and lower feed conversion for maize and mixed DDGS than for wheat DDGS. Layers can also tolerate up to 15% DDGS in the feed without negatively affecting the zootechnical performances nor the egg quality, regardless of the grain type.



The production process of bio-ethanol from grains with DDGS as by-product for animal nutrition

Title: Feed evaluation of DDGS as by-product of bio-ethanol production for cattle, pigs and poultry
Funding: IWT
Term: 2009 - 2013
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Target enzyme supplementation in poultry improves the digestibility and gut health and lowers the environmental excretion

Efficiency of different dietary exogenous enzyme supplementations for poultry

Objectives

The dietary digestibility of nutrients is limited by factors such as the shortage or absence of specific enzymes. An optimal target enzyme supply has the goal of not only improving nutrient digestibility but also reducing excretion of excess nutrients (N, P) into the environment.

Methods

In Partners with the agro-feed industry, we have tested target enzymes, dosages and age effects to improve the utilisation of non-starch polysaccharides, the protein fraction and the vegetable phosphorus sources. To do so, we performed a range of performance and digestibility trials in poultry.

Depending on the concentration and the composition of the non-starch polysaccharides, we tested xylanases, β-glucanases or mixtures of these on broilers, layers and turkeys. Specific proteases were added with the aim of splitting the complex protein molecules into simpler peptides or amino acids. The desired result is a protein-sparing effect which ultimately lowers excretion of nitrogen to the environment.

Phosphorus is an essential ingredient of bones. It is delivered either by the feed ingredients or by supplementing mineral phosphorus sources to the diets. However, mineral sources are becoming more and more scarce and their use in animal nutrition is being questioned. Vegetable phosphorus has a very low availability for poultry because it is present as a phytate complex and the necessary intestinal enzymes for degradation are only weakly available. The addition of exogenous phytase improves the utilisation of the phosphorus in grains by 50 to 70% with a significantly reduced excretion to the environment. Our trials clearly demonstrated the interactions with dietary calcium and the vitamin D_3 concentrations and with the calcium/phosphorus ratio. However, the methodology to judge the availability of phosphorus and the efficiency of the phytase supplementation differs greatly among European countries.

Therefore, collaborative studies were performed to achieve a standardised European methodology.

Results

The digestibility and performance trials demonstrated positive effects in most cases as well as the preservation of a good litter consistency. However, in many cases the response was dosage dependent but also varied according to the dietary composition, age and species of the birds.

Title: Efficiency of feed enzymes
Funding: ILVO and partners in the agro-feed industry
Term: continuous
Partners: partners in the agro-feed industry
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Healthy seafood

What is the impact of processing on marine biotoxins in bivalves and crustaceans?

Objectives

Marine biotoxins may be present in various shellfish species. These toxins are produced by microalgae during specific environmental conditions and may accumulate in shellfish tissue by filtration of contaminated water or by feeding on the contaminated species.

Methods

Usually, the Food Control Programme can register occurrences of algal bloom and/or toxin increase above amounts higher than the prescribed norms. Based on these levels, toxic doses have been suggested. However, there is evidence that concentration of some of the toxins can be changed during processing of shellfish. Moreover, nontoxic derivatives can be converted to the toxic ones. The existing Belgian food monitoring programmes for marine biotoxins in shellfish are based on reference methods described in European regulations. The shellfish species included in these regulations are species feeding directly on the toxin-producing algae. Moreover, the literature and data in other seafood species that may be feeding on these shellfish is scarce. The objectives of the study were to evaluate the accumulation and distribution of marine biotoxins in brown crab and to the effect of food processing on marine biotoxins in bivalves and crustaceans.

Results

The study led to several conclusions:

- The highest concentration of both lipophilic (azaspiracids) and hydrophilic (domoic acid) marine toxins may be found in the hepatopancreas, which is the least eaten or inedible part of crabs and some shellfish.

- Processing does not eliminate toxins which may pose a risk to public health; crabs may be the vector of marine toxins to humans. However, the toxin accumulation rate may highly vary between individual animals.

- According to the current knowledge and presented data, we presume there to be only a negligible risk of intoxication by either amnesic shellfish poisoning (ASP) or azaspiracids (AZAs) toxins for the Belgian seafood consumers.

Title: Marbitox
Funding: Federal Service for Public Health and Safety of the Food Chain and Environment
Term: 2012 - 2013
Partners: WIV
Contact: karen.bekaert@ilvo.vlaanderen.be

Invasive glutton in the North Sea

Observation, modelling and impact of the American comb jelly *Mnemiopsis leidyi*

Goal

The American comb jelly (*Mnemiopsis leidyi*) has been observed in the North Sea since 2006. This glutton, originating from the Atlantic, came through ship ballast water into our region. In the Black Sea the species has led to the collapse of the commercial anchovy fishery, with enormous economic and ecological consequences. To avoid such scenarios in our region, the distribution, behavior and the risk of this invasive comb jelly in the North Sea was estimated in the MEMO project (" *Mnemiopsis E*cology and Modelling: Observation of an invasive comb jelly in the North Sea").

Approach

MEMO had three research parts. First, the spatial and temporal distribution of *Mnemiopsis leidyi* was mapped based on data gathered during sea campaigns. SOPs (Standard Operating Protocols) were prepared for uniform sampling, preservation and morphological and genetic identification. A habitat model was drawn up to predict the occurrence of the American comb jelly in different circumstances and areas.

Second, data on the biology, physiology and feeding behavior of the species was obtained through chemical analysis (stable isotopes and fatty acid analysis) and breeding experiments in the lab. In this way, the location and potential impact of *Mnemiopsis* in the local food web became clear.

Last, we performed modelling and socio-economic analyses to provide a good estimate of the effect of this species on humans' daily lives.

Result

The presence of the American comb jelly could be confirmed in the coastal areas, estuaries and harbors of France, the Netherlands and Belgium. The highest numbers were seen in late summer and fall in semi-enclosed basins such as the "Spuikom" at Ostend and the Eastern Scheldt in the Netherlands. The species can efficiently reproduce and overwinter here, although their numbers do drop during the winter. The habitat model allows for close monitoring of areas where the species has not yet been seen (such as the coasts of Britain). This allows for a rapid response in the event of a sudden jellyfish bloom.

Temporal and spatial variation was shown in the diet of the jellyfish. The species feeds at a great pace on different types of zooplankton, fish eggs and fish larvae. It stores little reserves, instead converting the energy immediately into either growth or reproduction. This can provide a plausible explanation for its success. Furthermore, *Mnemiopsis* has a high tolerance for environmental variables. At very low salinities adult jellyfish could still produce eggs, which again furthers their rapid spread.

The models showed the importance of temperature for the presence of the comb jelly. Further global warming could stimulate the success of *M. leidyi* in the North Sea. The importance of the estuaries could also be clearly inferred. These can been as nurseries from which further spread due to existing currents is possible.

Socio-economic analyses indicate that the impact of the comb jellies would be small because of their limited size and fragility once out of the water. In the event that large numbers of these comb jellies would wash ashore, they may cause a nuisance by release of odour which could negatively impact tourism. Furthermore, as tourists generally know little about jellyfish, more information about the differences among jellyfish and the possible causes and consequences of jellyfish blooms is desired.

We can conclude that the American comb jelly thrives in our coastal areas, especially in sheltered harbors and basins. As yet, the species does not pose a problem, but caution is required. A rise in water temperature, the exchange of ballast water between our shores and the British coast, and an increased pressure on our marine ecosystem can lead to substantial blooms and their expansion into new territories, with potentially important implications for fisheries, tourism and other commercial activities.

Title: *Mnemiopsis* ecology and modelling: Observation of an invasive comb jelly in the North Sea
Funding: Interreg Iva 2 Seas
Term: 2011 - 2013
Partners: Institut Français de Recherche pour l'exploitation de la mer (IFREMER), Université du Littoral Côte d'Opale (ULCO-LOG), Centre for Environment, Fisheries and Aquaculture Science (CEFAS), Deltares
Contact: johan.robbens@ilvo.vlaanderen.be

Spatial planning at sea

Belgium as a model for Europe?

Objectives

Driven by the important European directives concerning nature conservation (e.g. the Water and Marine Strategy Framework Directives) and economic conservation (Maritime Planning Directive), more and more countries recognise the need for a sound marine management across the sectors with a good balance between ecological and (socio)economic interests. Using 14 case studies, we investigated how marine spatial (sectoral) planning differs among European countries and whether the management plans are appropriate for all users of the sea and meet everyone's needs.

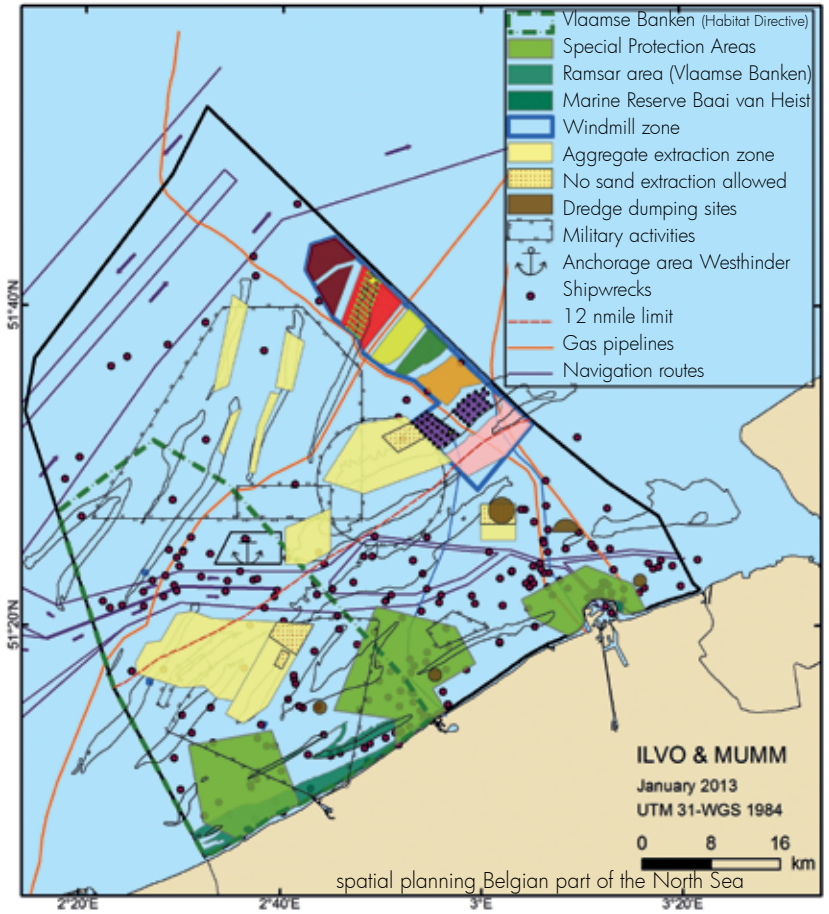
Methods

An extensive review was done to determine the state of art of marine spatial (and temporal) planning and the tools and data needed to accomplish such planning. In addition, we developed an integrated management tool within the MESMA project to evaluate, monitor and adapt marine spatial planning and management measures on an ecological, economic and political scale. The usefulness of this tool was then tested through 14 case studies.

Results

The first loop of the MESMA management tool consists of several steps: (1) synthesising existing plans and sectoral objectives; (2) gathering data on the ecosystem, human activities and economic value, (cumulative) pressures, indicators and thresholds; (3) performing an analysis of the risk of not reaching the goals; (4) giving advice to maintain or improve the management and (5) monitoring plans. Parallel with this 'ecological' loop, a 'governance' analysis needs to be performed. Various people and rules (e.g. different institutions, stakeholders, laws and decrees, and the implementation of EU directives) have contributed to the realisation of the marine spatial plan or the achievement of the preconceived goals in every case study. The purpose of the governance analysis is to investigate the role of each of the abovementioned actors. The online MESMA tool can be found on www.mesmacentralexchange.eu.

ILVO and Ghent University performed a case study about the monitoring and evaluation of the marine spatial management in Belgium. We began with a thorough literature review, participation in stakeholder meetings and several interviews with representatives of different interested parties. Based on that information we gave an overview of 14 years marine spatial planning in Belgium. We listed the background processes, failures and success factors that contributed to the transformation of the Marine Environmental Protection Act (1999) and the subsequent spatial zoning plan (2003-2005) into an integral spatial management plan for Belgian waters by the end of 2013.



spatial planning Belgian part of the North Sea

The comparative analyses of the 14 case studies will surely contribute to a better insight in the differences within Europe. We hope that they will urge the political leaders to increase the uniformity of the marine spatial planning and marine management approaches within Europe's member states.

Project: Monitoring and Evaluation of Spatially Managed Areas (MESMA)
Financing: EU FP7
Term: 2009 - 2013
Partnership: 21 European scientific institutes, 13 countries
Contact: kris.hostens@ilvo.vlaanderen.be,
ellen.pecceu@ilvo.vlaanderen.be

New projects and a selection of ongoing research at the Animal Sciences Unit

Tipping the scales. What is the ideal slaughter weight for a meat pig?

Title: Determination of the farm's most profitable slaughter weight for meat pigs
Funding: IWT
Term: 2013 - 2017
sam.millet@ilvo.vlaanderen.be

Boar meat with or without boar taint?

Title: Farm-specific strategies to reduce boar taint
Funding: IWT
Term: 2013 - 2017
Partners: K.U.Leuven, Ghent University
marijke.aluwe@ilvo.vlaanderen.be

How does one measure the welfare of dairy cattle using animal-based and routinely gathered data?

Title: The use of animal-based measures to determine the welfare of dairy cattle
Funding: EFSA
Term: 2013 - 2014
Partners: Istituto Zooprofalittico Sperimentale della Lombardia e dell'Emilia Romagna "Bruno Ubertini", Kobenhavns Universitet, Swedish Institute of Agricultural and Environmental Engineering National Institute for Agronomic Research
frank.tuyttens@ilvo.vlaanderen.be

You've got male: Practical experience and support about husbandry of entire boars and immunocastrates?

Title: Optimising husbandry of entire boars and immunocastrates
Funding: ADLO (Government of Flanders)
Term: 2013 - 2015
Partners: VIVES, HoGent, VLTI St-Rembert, BB Projecten vzw, Biotechnische Instituut Sint-Isidorus, Thomas More, PVL
marijke.aluwe@ilvo.vlaanderen.be

Splitting hairs: can we determine long-term stress in pigs based on just a few bristles?

Title: Applicability of cortisol in pig bristles as a long-term indicator of stress
Funding: FOD Volksgezondheid
Term: 2013 - 2014
Partners: Ghent University
johan.aerts@ilvo.vlaanderen.be

Feed for thought. How can enzyme supplements guide the digestion and intestinal microbiota of broilers?

Title: Digestion of NSP-rich raw materials in broilers: effects of enzyme supplements and technological therapies on the intenstinal microbiota
Funding: Irani Government
Term: 2013 - 2017
Partners: Ghent University
luc.maertens@ilvo.vlaanderen.be

Chicken scratch: Determining the welfare of broilers in Belgium in a practical and cost-efficient way

Title: Study of the possibilities for implementing welfare monitoring using animal-based parameters
Funding: FOD Volksgezondheid
Term: 2013 - 2015
stephanie.buijs@ilvo.vlaanderen.be

Was it a good road trip? Investigating poultry welfare during transport.

Title: Research on poultry welfare during transport
Funding: FOD Volksgezondheid
Term: 2013 - 2016
Partners: Ghent University
frank.tuyttens@ilvo.vlaanderen.be

A game of cobs and robbers. To what degree do the starch and protein in maize degrade during longer ensilage?

Title: Development of a model to estimate the degradability of starch and protein in maize in function of the silage period
Funding: PWO Ghent University College
Term: 2013 - 2015
Partners: Ghent University College
johan.deboever@ilvo.vlaanderen.be

International scientific research and advice, what's it good for?

Title: Scientific contribution to several ICES working groups and international advice through early reporting
Working groups: ICES: BEWG, WGECO, WGZE, WGVMS, WGITMO,..., jaarlijkse rapporten, A1-publ (ECSS)
Funding: ILVO Own Capital
Term: continuous
Partners: international Partners
kris.hostens@ilvo.vlaanderen.be

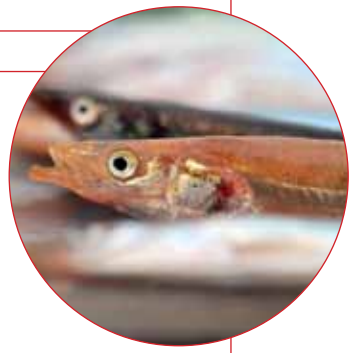
New projects and a selection of ongoing research at the Animal Sciences Unit

Old hens, good eggs: How can production and egg(shell) quality be maintained during a longer lay cycle?

Title: Determining the nutritional needs of layers in late lay and determining the effects of feed composition and management on production and egg(shell) quality.
Funding: Shared grant (ILVO and Poultry Experimental Farm)
Term: 2013 - 2017
Partners: Research Centre for Poultry, K.U.Leuven
evelyne.delezie@ilvo.vlaanderen.be

Shoring things up: What is the ecological impact of underwater and foreshore sand suppletions?

Title: Ecological study underwater suppletions on the Flemish coast (4Shore)
Funding: Agentschap voor Maritieme Dienstverlening en Kust, Afdeling Kust (MD&K)
Term: 2013 - 2016
Partners: Ghent University-Sectie Marine Biology Section, Deltares, Waterbouwkundig Laboratorium
gert.vanhoey@ilvo.vlaanderen.be



(Sea) birdfeed: Investigating the role of sandeels in the Belgian part of the North Sea

Title: Sandeels and other pelagic fish species as food source for seabirds
Funding: ILVO
Term: 2013 - 2014
Partners: INBO, Ghent University
kris.hostens@ilvo.vlaanderen.be

Safe seafood...? Is it still safe to eat seafood?

Title: ECsafeSEAFOOD: Priority environmental contaminants in seafood: safety assessment, impact and public perception
Funding: 7th framework
Term: 2013 - 2017
Partners: 19 European partners
griet.vandermeersch@ilvo.vlaanderen.be

Forty years of Belgian marine monitoring data

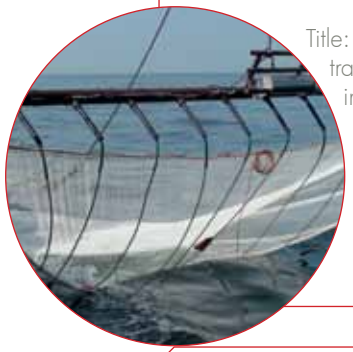
Title: 4Demon. Collection and intercalibration of historical data on pollution, eutrophication and acidification on the Belgian part of the North Sea.
Funding: BELSPO
Term: 2013 - 2017
Partners: VLIZ, Ghent University, OD Natural Environment, Université de Liège
johanna.gauquie@ilvo.vlaanderen.be
bavo.dewitte@ilvo.vlaanderen.be

Fish, freight and fridges: How can we optimise refrigerated transport of fish?

Title: Optimavis – Optimisation of the transports of fishery products
Funding: EVF- As3
Term: 2013 - 2014
Partners: Flemish fish auction
karen.bekaert@ilvo.vlaanderen.be

New projects and a selection of ongoing research at the Animal Sciences Unit

How can technical innovations contribute to the transition to a sustainable fisheries industry?



Title: TECHVIS (technical innovations for the transition to a sustainable sea fisheries industry sector)
Funding: IWT, SDVO, visserijsector
Term: 2013 - 2017
Partners: Fisheries industry
els.vanderperren@ilvo.vlaanderen.be

Are there alternative materials for using dolly rope?

Title: SPEKVIS (Alternative materials for the use of dolly rope in the fisheries industry: a feasibility study)
Funding: EVF AS 4, Flemish Government, Province of West-Flanders
Term: 2013 - 2014
Partners: Fisheries industry
karen.bekaert@ilvo.vlaanderen.be

Fisheries measures in Natura2000 areas: description of fisheries activities in the Belgian part of the North Sea

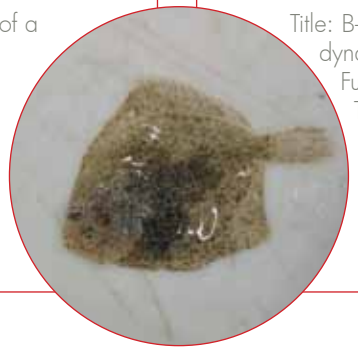
Title: Fishing measures in the NATURA2000 'Vlaamse Banken' area (VISNAT)
Funding: FOD Leefmilieu
Term: 2013 - 2014
ellen.pecceu@ilvo.vlaanderen.be

The Irish Sea – "sole"ly a Belgian problem?

Title: Action Plan for the Irish Sea. The fishing industry has asked for an action plan with an ecosystem approach to the Irish Sea. For the Belgian fisheries, the Irish Sea is economically important and Belgium is one of the few countries fishing specifically for sole in the Irish Sea.
Funding: EVF
Term: 2013 - 2014
Partners: NWWWRAC, UK, Ireland, RC
sara.vandamme@ilvo.vlaanderen.be

Is it possible to develop a scientific support tool to help develop a management plan in the Celtic Sea?

Title: Scientific Support for the development of a mangement plan in the Celtic Sea.
Funding: EU
Term: 2013 - 2014
Partners: MI, CEFAS, GMIT, ILVO, IFREMER, Imares, IEO, AZTI, MSS, BIM
els.torreele@ilvo.vlaanderen.be



Tracking the travels of flatfish in the southern part of the North Sea?

Title: B-FishConnect. Larval dispersal and juvenile dynamics of flatfish in the Southern North Sea.
Funding: FWO
Term: 2013 - 2017
Partners: K.U. Leuven, IMARES, IFREMER
andreas.vandenbaviere@ilvo.vlaanderen.be

The sea-dwellers tell us if we're on track. How can we use biological indicators to judge whether several European objectives and targets will be reached?

Title: Evaluating the benthos of soft substrates in function of WFD, MSFD, Natura2000 (BEQI-MFSD)
Funding: FOD Leefmilieu
Term: 2013 - 2014
Partners: Ghent University, BMM, VLIZ
gert.vanhoey@ilvo.vlaanderen.be

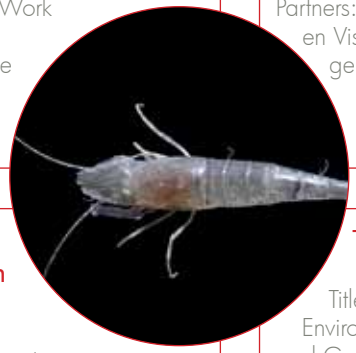
Putting our heads together: How can collating and integrating biological data within Europe influence the growing economy at sea?

Title: European Marine Observation & Data Network – Knowledge Base for Growth and Innovation in an Ocean Economy: Assembly and Dissemination of Marine Data for Seabed Mapping – Lot 5 Biology (EMODNET-2)
Funding: EU - DG MARE
Term: 2013 - 2017
Partners: 22 partners
gert.vanhoey@ilvo.vlaanderen.be

New projects and a selection of ongoing research at the Animal Sciences Unit

Shoring up the coast of the Wadden Sea: is coastal defence disastrous for marine life?

Title: Epibenthos and fish sampling Ameland 2013 (Ameland 3)
Funding: Deltares (NL)
Term: 2013 - 2014
Partners: Deltares, E-Coast, The Field Work Company
annelies.debacker@ilvo.vlaanderen.be



Is this shrimp fishery down in the dumps? How does dredge disposal affect the shrimp fisheries?

Title: Study on a dredge disposal test site in function of the shrimp fishery (Baggarnaal)
Funding: Europees Visserijfonds (EVF)
Term: 2013 - 2014
Partners: Versluys NV, Dienst Zeevisserij, Kabinet Landbouw en Visserij
gert.vanhoey@ilvo.vlaanderen.be

Towards integrated management of human activities in the North Sea

Title: New Knowledge for an integrated management of human activities in the sea: Towards a Joint Monitoring Programme for the North Sea (NS-JMP)
Funding: EC
Term: 2013 - 2014
Partners: ILVO, BMM, RWS, IMARES, CEFAS, JNCC, vTI, MSS, DTU-Aqua, DMU/AU, IFREMER, MI, SLU-Aqua, SWAM, SMHI
gert.vanhoey@ilvo.vlaanderen.be

Fish overboard! How much fish is being discarded by the Belgian fishing fleet?

Title: Creation of a national and regional discard atlas for the Belgian fisheries industry
Funding: EVF
Term: 2013 - 2014
Partners: RC, Visserijtechniek
bart.vanelslander@ilvo.vlaanderen.be

Towards a litter-free marine environment!

Title: Towards a Clean, Litter-Free European Marine Environment through Scientific Evidence, Innovative Tools and Good Governance (CLEANSEA)
Funding: EU KP7 Collaborative project under Theme ENV 'The Ocean for Tomorrow'
Term: 2013 - 2016
Partners: 17 partners from 11 countries representing the four European regional seas
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KRISTIAAN VAN LAECKE,
Plant Sciences Unit Head
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Expansion, collaboration, and challenges

In 2013, The Plant Sciences Unit increased its expertise via various partnerships and booked progress in a diversity of research areas.

Genomics, a relatively new discipline that is increasingly finding applications in agricultural research, has been a point of focus in Plant Sciences. To encourage genomics research, we have performed several investments and recruited new staff. The ILVO2020 "Coordinated Action" project entitled "Genomics" encourages interdisciplinary cooperation within ILVO. The development of a genomics platform contributes to the disciplinary approach of current and future projects, which improves the quality and international character of our research.

The breeding work was put under the microscope. Because agriculture and horticulture continue to evolve, we made strategic decisions to prune certain programmes and grow others. For example, we have started a soybean breeding programme in response to the increasing demand for domestic soybean cultivation from policymakers and farmers alike. If Belgium is to become less dependent on imported protein, we need to have soybean cultivars that grow well under Belgian cultivation conditions.

The SIETINET project (2004-2012) has gave birth in March to a large new partnership of 19 Flemish ornamental businesses. No less than 19 leading Flemish ornamental companies have signed the SIETINET community charter. The aim of the partnership is to promote innovation in the ornamental sector through knowledge in the field of plant breeding, tissue culture, plant biotechnology and physiology. ILVO is the coordinator of this partnership and also provides scientific support.

A major problem in horticulture concerning *Cylindrocladium buxicola*, a fungal disease on boxwood, was addressed via an IWT project that joined ILVO, the advisory research centre for ornamentals (PCS) and the growers. This infection threatens the cultivation and use of this plant in gardens. Fortunately, this research revealed that the combination of less susceptible cultivars and proper management should control the pathogen.

Food safety requirements for horticulture are growing stricter every year. This is partly due to the increase in reports of food related infections through consumption of food contaminated with zoonoses such as *Salmonella* and *E. coli*. Lettuce cultivation in greenhouses was studied during an interdepartmental research project (Plant Sciences and Technology and Food Science). A better understanding of the survival and virulence of the zoonoses should contribute to avoiding food crises.

A workshop related to the project 'Biochar: Climate saving soils' and the related doctoral study provided a complete overview of biochar. The workshop topics included current developments as well as information relevant for research, production and practical applications of biochar. Applying biochar to soil could improve soil quality and therefore result in higher crop yield. Biochar also stores carbon long-term, which may decrease the emission of greenhouse gases from soil.

The benchmark project and international Nutrihort conference held in Ghent addressed the need for horticulturists to meet the European water quality objectives. The conference drew 150 scientists, policymakers and other experts to discuss the challenges to sustainable nutrient management. Nutrihort successfully identifed the combination of different cultivation and fertilization techniques to lower nitrogen and phosphorus losses. The biggest challenge that remains is to ensure that this knowledge reaches the growers.

The 82 researchers in the Plant Sciences Unit work in four areas: crop protection, applied genetics and breeding, fundamental growth processes, and crop husbandry. of the Crop Protection researchers study bacteria, fungi, viruses, insects, mites and nematodes that can negatively affect plants. They also identify sustainable ways to combat these diseases and pests. The Applied Genetics and Breeding research area works toward genetic improvement of disease resistance, optimal nutrient and water utilisation, among others. The Growth and Development researchers unravel the fundamental growth processes of a crop, and the Crop Husbandry and Environment research area compares farming systems and their impact on the crop, soil quality and the environment. The Plant Sciences Business Unit, a separate group, is responsible for the development and marketing of high-quality starting plant material (seeds, cuttings), for the diagnosis of plant diseases and pests, for the detection and management of quarantine organisms and for chemical analyses of forage, soil and substrates.

Beefing up the grasses

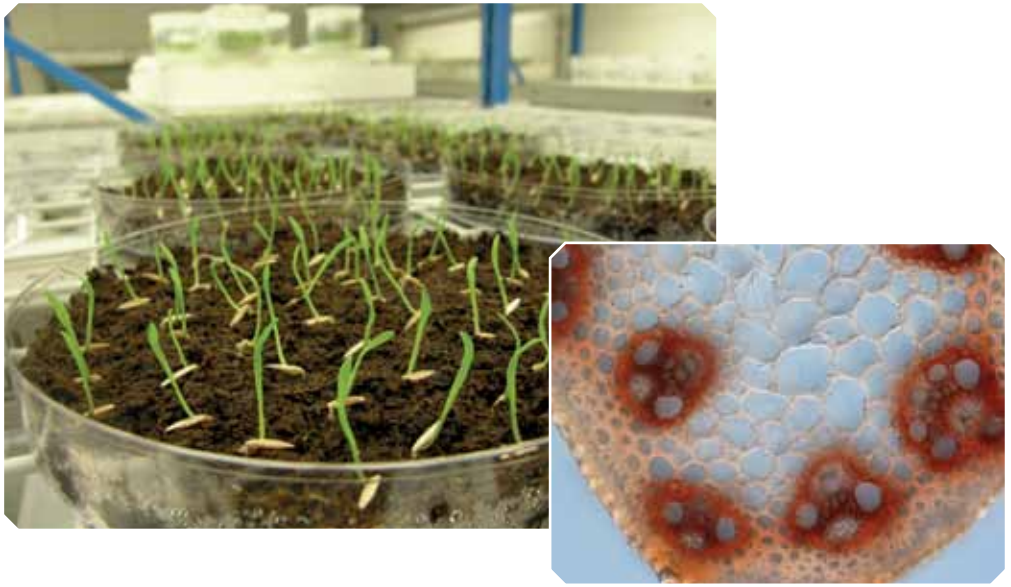
Enhancement of biomass production and cell wall accessibility for fermentation in *Brachypodium distachyon* and *Zea mays*

Goal

Grasses have major agronomic value, as feed as well as renewable feedstock for bio-energy and bio-materials. The aim of breeding of these crops is to obtain higher yield and improved quality. Part of the quality criteria include the ease of releasing the sugars from the cell wall. The aim of this research project is to develop an innovative concept for breeding purposes. The knowledge will come from a biotechnological approach to improve digestibility and enhance biomass production in grasses. The main focus was to translate expertise obtained in the dicot model plant *Arabidopsis thaliana* to the monocot species *Brachypodium distachyon* and *Zea mays*. *Brachypodium distachyon* is a relatively new model system for temperate grasses such as wheat and barley but is also used for bioenergy crops such as *Miscanthus* and switchgrass. The knowhow stems from the combined effort of two Flemish research institutes: ILVO's Plant Sciences Unit and VIB-PSB (The Flemish Institute for Biotechnology's department of Plant Systems Biology). ILVO has years of expertise in the field of biomass yield, digestibility and sugar content in animal feed and bioenergy crops. The VIB-PSB is a leading institute with top quality fundamental research in the field of intrinsic yield genes and cell wall biology in Arabidopsis and Poplar.

Appoach

Cell wall digestibility is a well-studied topic due to its agricultural importance in animal feed production. However, this research field has recently expanded with the potential of lignocellulosic crops as an alternative for fossil fuel. Cell wall digestibility and saccharification potential in grasses is known to be highly influenced by the presence of phenolic compounds such as ferulates and lignin. Improved cell wall digestibility is often correlated with a reduction in lignin content resulting in an elevated amount of sugars that can be released from the cell wall. The genes responsible for lignin biosynthesis are characterized and are a target for breeding for improved digestibility. However, targeted suppression or disruption of these genes can result in a yield penalty (cfr. Brown-midrib mutants in maize and *Sorghum*). A way to compensate for the decrease in growth potential is the application of genes that when overexpressed or mutated lead to bigger plant structures. We have identified and implemented a series of these intrinsic yield genes(IYGs) and lignin genes in monocots, and studied the impact on cell wall digestibility and yield in mutant and transgenic lines.



Results

The transgenic *AtGA20ox* overexpression line in maize revealed a increased leaf elongation rate, a modified biomass yield partitioning, and an enhanced cell wall biogenesis with effects on saccharification. Overexpression of GA20 ox resulted in longer leaves with a higher stem fraction and an earlier deposition of cellulose and lower glucose release upon enzymatic saccharification. However, studying a CAD mutant that has known improved cell wall digestibility in the model organism *Brachypodium* did not reveal detrimental effects on leaf growth. Disruption of the *CAD* gene or the *C4H* gene in maize resulted in a modified lignin biosynthesis and improved saccharification. In this doctoral study we have proven that modification in the lignin biosynthesis can result in improved cell wall quality and improved saccharification. Furthermore, we have seen that improved yield can impact biomass quality.

Title: Enhancement of biomass production and cell wall accessibility for fermentation in *Brachypodium distachyon* as a model and *Zea mays* as a crop
Funding: IWT
Term: 2009 - 2013
Partners: VIB – Flemisch institute for biotechnology – Plant Systems Biology (Prof. D. Inzé)
Contact: hilde.muylle@ilvo.vlaanderen.be

Zucchini viruses in Flanders

Towards a sustainable integrated control strategy

Goal

The rapidly increasing zucchini industry in Flanders is not only threatened by the well-known mildew problem, but also by a striking increase in losses due to viral diseases. The most important viruses are *Cucumber mosaic virus* (CMV), *Watermelon mosaic virus* (WMV) and *Zucchini yellow mosaic virus* (ZYMV), but occasionally *Papaya ringspot virus* (PRSV) is also found. In general, these viral diseases cause an important reduction in yield and quality due to mosaic and malformation of the plants. In case of severe infections, fruits are also affected, which makes the fruits unsellable. The rapid spread of these viral diseases throughout the field represents an important risk for severe economic impact. The aim of the project is to develop and implement a sustainable integrated control strategy for viral diseases in zucchini.

Approach

Because of difficulties in identifying viral diseases based on symptom development, a molecular detection technique (multiplex RT-PCR) is used for this purpose. We study virus epidemiology (status, symptomatology, spread) of the different viruses based on an extensive survey at approximately 30 production facilities in the regions around Roeselare and Sint-Katelijne-Waver. We also study vector epidemiology (population dynamics, virus introduction). During the survey, regular visits to the growers ensure detailed information gathering on disease development during the season. Virus identification and association with their respective vectors is important for developing an effective control strategy including cultivar choice, management of natural virus host plants (i.e. weeds) and vector control. Variety trials and transmission experiments also yield important knowledge. Growers and extension workers are closely involved in the project and in close consultation with them, a practical management strategy consisting of several control measures was compiled.

Results

Seven years of survey results show a clear shift in importance of the different viruses. The occurrence of ZYMV has gradually decreased over the years, while the importance of CMV has increased. WMV remained present in Flemish zucchini fields at a relatively high incidence level during the entire survey period, while PRSV was only found in some isolated observations. Vector monitoring at the outbreak sites confirms *Aphis gossypii* to be the most prominent aphid vector in zucchini fields. This can not only be explained by the high affinity for the crop, but also for its capability to develop resistance to the commonly used insecticides. Infection trials also confirmed that symptom development depends both on the virus type and zucchini cultivar. A well-considered cultivar choice is therefore an important step in the management of viral diseases in zucchini. In addition to the cultivar trials, seed transmission, weed control, and virus survival will be studied. In addition, we will set up disinfection trials to help develop a future control strategy.

Title: Ecology of zucchini viruses in Flanders – towards a sustainable integrated control strategy
Funding: IWT
Term: 2011 - 2015
Partners: Inagro (Roeselare), Research station for vegetables (Sint-Katelijne-Waver)
Contact: mathias.debacker@ilvo.vlaanderen.be, kris.dejonghe@ilvo.vlaanderen.be

Rotten luck? Not if we can help it...
More efficient resistance breeding against clover rot in red clover

Research on new bio-assays and sources of resistance

Goal

Clover rot, which can severely damage red clover crops, is caused by the necrotrophic fungi *Sclerotinia trifoliorum* and *S. sclerotiorum*. Control of clover rot is difficult and none of the available varieties are completely resistant. Resistance breeding is slowed by the annual variation in disease pressure and by the lack of reliable artificial infection methods or bio-assays. In this project we aimed to improve resistance breeding by studying the genetic diversity and aggressiveness of the pathogen on a European scale. We also optimised new bio-assays, we investigated sources of resistance and we studied the inheritance of the resistance.

Approach

Using an AFLP analysis, the genetic diversity was studied among 192 isolates from 25 locations in 12 European countries. Subsequently, two bio-assays were developed: a high-throughput bio-assay that inoculates young plants and an *in vitro* bio-assay on detached leaves. These bio-assays were used to study the aggressiveness of the pathogen in a sub-collection of 30 isolates. From these isolates we also measured the mycelial growth speed, their sclerotia production and the amount of oxalate they secreted. Plants from 121 red clover accessions with diverse genetic backgrounds were screened with the most aggressive isolates to identify resistant populations. Finally, the inheritance of clover rot resistance was studied through pair crossings between resistant and susceptible plants. The segregation of susceptibility among the progeny indicated the number of resistance genes involved.

Results

Among the 192 isolates, both *S. sclerotiorum* and *S. trifoliorum* isolates were recorded. Within each location, no sub-populations were observed. In *S. trifoliorum* there was a low degree of population differentiation: 79.2% of the genetic variation was found between locations while only 20.8% was found within locations. The aggressiveness study on 30 isolates indicated clear differences in aggressiveness. Isolates that grew rapidly and isolates that were aggressive on detached leaves were more aggressive on young plants, while isolates that produced many sclerotia were less aggressive. The 121 red clover accessions that were evaluated differed in susceptibility to clover rot, although no population was completely resistant. Two tetraploid cultivars and one diploid land race were significantly more resistant and can be used as sources of resistance. Tetraploid cultivars were on average 11.7% less susceptible than diploid cultivars. Cultivars, land races and wild populations did not differ significantly in susceptibility. Finally, our heritability study suggested that clover rot resistance is conferred by three major effect genes, supplemented by multiple genes with minor effects.

Title: Breeding for resistance to clover rot (*Sclerotinia* spp.) in red clover (*Trifolium pratense*)
Funding: ILVO doctoral grant
Term: 2008 - 2013
Contact: tim.vleugels@ilvo.vlaanderen.be

DNA barcodes at work

DNA polymorphisms, primers and probes used to identify plant-parasitic nematodes

Goal

During recent years, small DNA sequences called "DNA barcodes" have been generated to identify a number of plant-parasitic nematode species (especially *Heterodera* and *Pratylenchus*). The aim is to use these DNA barcodes, which are based on LSU rDNA, ITS-rDNA, COI mtDNA or the actin gene, to develop species-specific primers and probes. This would make it possible to identify nematode species without needing to sequence DNA.

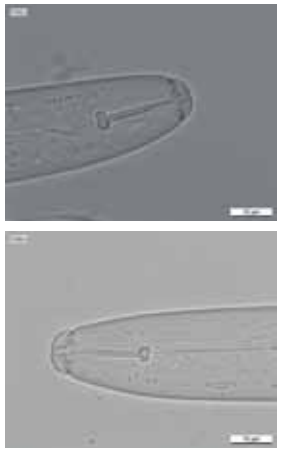
We also intend to investigate sequence variability within the ribosomal DNA and other DNA parts of two *Globodera* species in order to map polymorphisms (e.g. SNPs and INDELs). The potato cyst nematode species *Globodera pallida* and *G. rostochiensis* cause an economic loss of €220 million in Europe each year. Because they are so widespread, their quarantine status may be lifted in the future. It is therefore important to gain knowledge about the spread and detection of subspecies, or pathotypes. The different pathotypes cause more or less damage to certain potato varieties. Identification and detection of the pathotypes present in Europe are currently done via time-consuming biological tests. Using DNA barcodes would speed up this process greatly. The obtained DNA sequence data can lead to useful information about the geographical spread of each pathotype and increase their traceability.

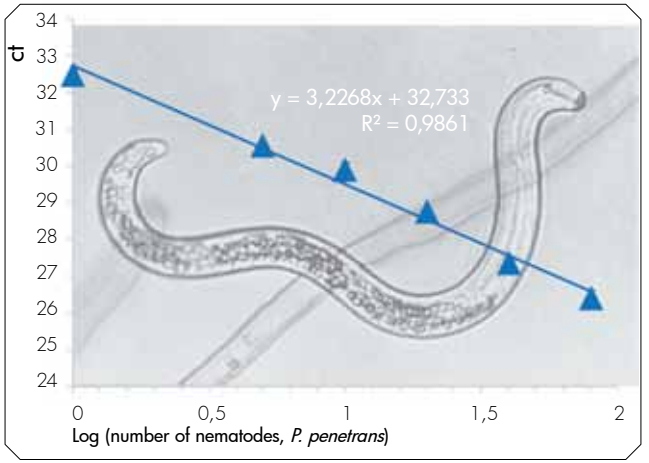
Approach

DNA barcodes are screened using software (AlleleID 7) to develop species-specific primers and probes. The specificity and sensitivity of the primers and probes is tested during an optimised (q)PCR assay.
Additional DNA barcodes are generated using a proofreading DNA Polymerase. Several populations and individuals are investigated.

Results

Two species-specific primer sets derived from the COI (cytochrome c oxidase subunit I) gene of mitochondrial DNA were developed to detect *Heterodera filipjevi* and *H. avenae*. The PCR reaction can detect one juvenile amongst 200 juveniles of another species. Sequences of the actin gene were successfully used to develop a species-specific PCR assay to identify *H. latipons*. But the sensitivity is lower because the actin gene has fewer copies than the COI gene. Nevertheless, DNA from 5 *H. latipons* juveniles mixed with 100 juveniles of another species can be detected.





Detail photos of the head of a *Globodera rostochiensis* and a *G. pallida* nematode. Correct identification of both species is possible using DNA analysis.

DNA barcodes from LSU rDNA, ITS-rDNA, COI mtDNA or the actin gene turned out to be unsuitable to develop species-specific primer and probe sets for *Pratylenchus penetrans*. This was possible, however, when applying DNA sequences of the beta-1,4-endoglucanase gene, a gene which plays a role in the breakdown of plant cell membranes during penetration and migration of the nematode in the plant. The specificity of the designed qPCR assay was determined using 19 different *Pratylenchus* species. The assay can detect one *P. penetrans* individual mixed with 80 other nematodes.

Title: WEB_HETERODERA, WEB_GLOBO, Detection and control of diseases and pests
Funding: ILVO
Term: 2012 - 2016
Partners: Ghent University (Faculty of Bioscience Engineering), CIMMYT (International Maize and Wheat Improvement Centre), ICARDA (International Centre for Agricultural Research in Dryland Agriculture)
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Taming an aggressive fungus on an ornamental crop

Integrated control of *Cylindrocladium buxicola* on boxwood

Goal

Cylindrocladium buxicola is a relatively recent and aggressive fungal disease of *Buxus* (boxwood). This pathogen threatens commercial boxwood production as well as the boxwood in public and private gardens. In this project we have expanded the limited knowledge of *C. buxicola* and of the available disease resistance in *Buxus* in order to improve disease management. The objective was to find answers to questions such as "how and how far does the fungus spread in the field? Is the pathogen also latently present and how can we track it, even in latent form? Is it transferred via clothing or pruning scissors? Are there variants of *C. buxicola* that are more virulent or less susceptible to fungicides? Which *Buxus* species and cultivars are less susceptible to the disease under practical conditions? Are there prospects for breeding?

Approach

Together with our research partner PCS, we established an international collection of *C. buxicola* isolates and determined differences in growth, sporulation, virulence and fungicide sensitivity. Using molecular markers such as AFLP and SSR we determined the genotypic diversity. We tested the effect of temperature and leaf-wetness period on disease development and sporulation. We developed real-time PCR detection technology and applied it in our study towards the spread of *C. buxicola* in commercial nurseries. We collected and screened *Buxus* cultivars and species for their susceptibility and determined at what level resistance occurred. Finally, we determined the inheritance characteristics of the resistance trait.

Results

We identified two genetic groups of quasi clonal isolates within *C. buxicola*. Under Western-European weather conditions, there are no differences in aggressiveness between these groups but one of them is considerably less susceptible to certain fungicides. We linked the recent intercontinental spread of the pathogen to certain genotypes.

The potential for infection and development of the fungus is strongly dependent on the interaction between temperature, leaf wetness period, cultivar and cultural characteristics such as pruning shape and planting density.

We determined the relative susceptibility of the *Buxus* species and cultivars and found that in general, *B. microphylla* cultivars are less prone to infection. Breeding these with the evergreen *B. sempervirens* cultivars has long term potential. Plant-to-plant spread is mainly dependent on intense rain events. Transfer via clothing or pruning equipment is limited but not impossible. Although *C. buxicola* is a very aggressive pathogen on *Buxus*, the combination of choosing less susceptible cultivars and using appropriate control measures now affords excellent control of this pathogen.

Title: Integrated control of *Cylindrocladium buxicola* on *Buxus*
Funding: IWT
Term: 2009 - 2013
Partners: Research Centre for Ornamentals (PCS) – Filip Rys
Contact: kurt.heungens@ilvo.vlaanderen.be,
johan.vanhuylenbroeck@ilvo.vlaanderen.be

Less is more: how can we transfer as few chromosomes as possible in plant breeding?

Genome fragmentation techniques and cytogenetic screening methods as new tools for asymmetric protoplast fusion in Araceae

Goal

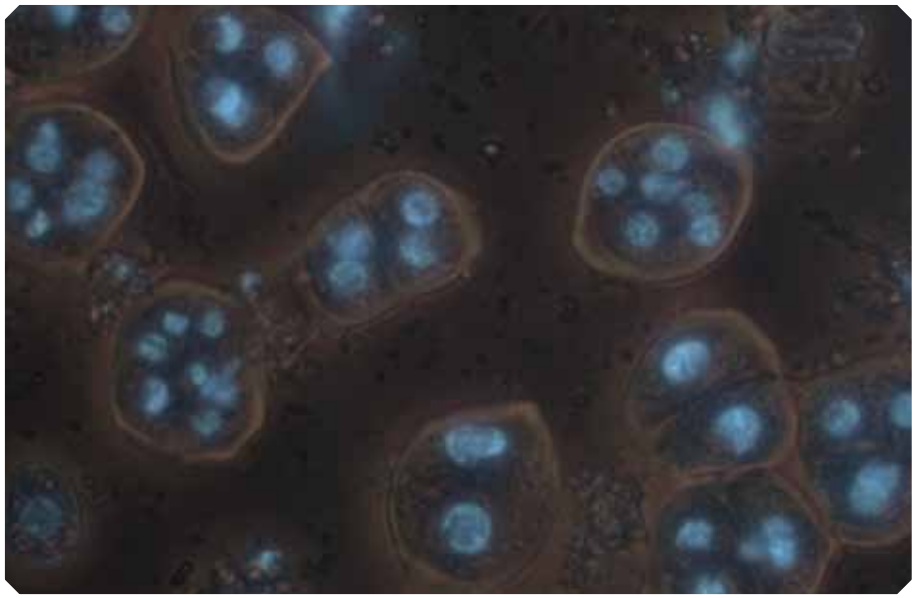
When crossing plants, genes of interest are transmitted into the seedling along with undesired DNA. Using cell fusion, is it possible to achieve somatic hybrids that contain only a fraction of the genetic material of one of both contributing species? How should we fragment the genetic material of this 'donor' parent? Can we fuse those fragments with the complete 'acceptor' parent? The aim of this project is to evaluate and integrate the different steps in the development of these so-called 'asymmetric somatic hybrids' and to monitor the whole process through chromosome staining techniques. Members of the Araceae plant family, which have high regeneration capacity and a limited number of chromosomes, are used as model crops.

Approach

We use different *Spathiphyllum*, *Anthurium* and *Zantedeschia* genotypes as protoplast source. We define the chromosomal constitution of the test plants through karyotyping as a control, prior to somatic hybrid development. For fragmentation, we will focus on isolation of microprotoplasts that do not contain all chromosomes of the original cell. To do so, we treat developing microspores with meiosis interfering chemicals. We quantify the subsequent development of micronucleated cells and the number of micronuclei per cell as a measure for the chromosome number in a micronucleus.

Results

We have generated a substantial amount of cytogenetic data with regard to genome size, chromosome number, chromosome formula, asymmetry index, degree of compactness, etc. for 6 Araceae genera. We used these data to draw up their karyotype. Also, we microscopically visualised 45S and 5S rDNA sites through classical and tyramid FISH (a more sensitive technique). These data have the potential to significantly improve possible somatic Araceae hybrid screening in the future. Two cell division inhibitors very efficiently induced micronuclei formation in developing microspores of *Spathiphyllum wallisii*, our test species. The effects of a number of parameters (concentration, exposure time, developmental stage of the microspores) was quantified. Micronuclei formation was confirmed for all cultivars tested. The large number of micronuclei per cell after particular treatments indicates a small chromosome number per micronucleus. This technique has a substantial genome fragmenting ability and offers perspectives for successful asymmetric fusions in the future.



Title: Use of fluorescent in situ hybridization techniques for cytogenetic characterization of Araceae somatic hybridization products
Funding: ILVO, Ghent University (joint PhD)
Term: 2009 - 2013
Partners: Ghent University, Fac. Bioscience Engineering, Prof. Erik Van Bockstaele; Russian State Agrarian University, Moscow Timiryazev Agricultural Academy, Prof. Ludmila Khrustaleva
Contact: tom.eeckhaut@ilvo.vlaanderen.be

A longer-lasting field of clover

Influence of branching characteristics on the regrowth of red clover

Goal

The goal of this research was to gain insights into the morphological and genetic variation of plant architecture in red clover. We anticipate that selecting for shoot branching characteristics in red clover can potentially result in further progress in breeding for traits of agronomic relevance such as biomass yield, seed yield and persistence. Part of this research was to analyse the regrowth after cutting of a representative set of genotypes. The aim here was to determine the influence of branching characteristics on regrowth.

Approach

To begin, the branching of red clover plants with contrasting branching characteristics was thoroughly characterised. Subsequently, the regrowth was analysed by counting the number of nodes remaining on the plant after cutting and determining the biomass yield at the time of the next cut. For the analysis of regrowth capacity, the red clover genotypes were tested both under controlled and field conditions. In the field, the influence of competition with perennial ryegrass was also tested. The plants were cut 3-4 times per growing season during two growing seasons.

Results

Red clover is used in Flanders because of its relatively fast growth, ability to fixate nitrogen and its high nutritional value. One problem with the current red clover cultivars is their low persistence (tendency to die off after a few years). The capacity for regrowth after mowing or grazing possibly also influences the persistence of red clover plants. Following the analysis of regrowth on plants in the growth chamber and in the field, with and without competition with perennial ryegrass, we concluded that branching characteristics are indeed important for regrowth. The most important characteristics are the number of nodes that remain after cutting and the capacity of these nodes to grow out into a new branch. The number of remaining nodes is related to the internode length and to the number of first-order branches. This indicates that selecting plants with a high number of first-order branches, short internodes and the ability to resume growth from the nodes that remain in the uncut zone should allow us to breed cultivars with a good regrowth capacity.

Title: Morphological and genetic variation of plant architecture in *Trifolium pratense* (red clover)
Funding: ILVO
Term: 2010 - 2013
Contact: gerda.cnops@ilvo.vlaanderen.be

Quality assessment / quality control of soil sampling procedures and soil analysis

Monitoring the reduction of soil carbon and nutrient losses in Croatia

Goal

This research focuses on assessing and improving the quality of agricultural soils in Croatia, a new EU member state. The expertise of ILVO on soil quality monitoring was shared with Zagreb University in a cooperation program between Flanders and Croatia. The intention was to help Croatia meet requirements in the European Directive on nitrate leaching to surface and ground waters. A manual for soil sampling and analysis of organic carbon and residual nitrate in Croatian agricultural soils has been developed and tested in practice for Croatian circumstances. Monitoring and, as necessary, supplying sources of additional organic carbon to the soil are important steps toward maintenance and amelioration of soil fertility of agricultural soils.

Approach

Croatian researchers were trained at ILVO on soil sampling and soil analyses on agricultural land. The Croatian partner has three case studies in three agricultural regions in Croatia. The data were analysed in Partners with ILVO to assess soil organic carbon levels and residual nitrate concentrations on agricultural land in Croatia. ILVO and Zagreb University both organised proficiency tests and developed a manual on sampling, analysis and quality control in labs and between labs. Based on the proficiency test results we assessed the quality of the analyses in different Croatian labs.

Results

Croatia should develop its own monitoring system of soil fertility in the framework of its EU membership, describe the system and test it for local applicability. By organising proficiency tests for labs, the quality of chemical analyses on agricultural soils can be assessed and improved. This project will help the Croatian Government to comply with EU Guidelines on soil quality of agricultural land.

Title: Monitoring the reduction of soil carbon and nutrient losses in Croatia: quality assessment/quality control of soil sampling procedures and soil analysis
Funding: Vlaanderen Internationaal
Term: 2010 - 2013
Partners: Faculty of Agriculture, University of Zagreb (Prof M. Romic)
Contact: alex.devliegher@ilvo.vlaanderen.be,
bart.vandecasteele@ilvo.vlaanderen.be

Biochar as soil improver?

Effects of biochar on soil functions, soil processes and crop growth

Goal

Biochar is a carbon-rich, charcoal-like product made during thermal breakdown of biomass under conditions of little or no oxygen (pyrolysis). Can biochar lead to long-term carbon sequestration in soil while improving soil quality and crop growth in temperate regions such as Flanders? We investigated this question in the Interreg project 'Biochar: climate saving soils' and a doctoral study.

Approach

With a field trial established in seven countries including Belgium and diverse lab and pot experiments, we investigated the influence of different biochar types on the nitrogen cycle (incubation and isotope experiments), water content, soil biology, soil greenhouse gas emissions and crop production. The tested biochars are made from wood species, maize or reed, and are produced at several pyrolysis temperatures.

Results

The biochars tested accelerated the nitrogen cycle in the short term. But biochar can also reduce mineral nitrogen availability which retards crop growth. An increase in soil pH after biochar addition might affect soil processes such as nitrification and denitrification. Soil greenhouse gas emissions (N_2O en NO) decreased after biochar amendment.

In contrast to the short-term effects (a term of several weeks), biochar did not have major effects on soil and crop growth in the longer term. This was concluded from a 2-year field trial during which a wood-based biochar was applied. There was no effect on plant available nutrients and despite accelerated nitrogen cycling just after biochar addition, no effect was observed after one year. In general the soil moisture content was higher in the biochar-amended plots, but differences could only be proven at a few measurement times. For now, it seems that biochar cannot retain more water during drought periods. There were some shifts among bacterial communities, but no effects were observed on soil fungi. Due to the limited effects of pure biochar additions (without co-amendment of organic materials), there was also no effect on crop yield. Biochar does have the potential for long-term carbon sequestration, which is positive for climate change mitigation. The field trial will be continued by the EU FP7 project Fertiplus.

Title: Biochar: climate saving soils, PhD research
Funding: Interreg IVB North Sea Region Programme, ILVO, Ghent University Multidisciplinary partnership 'Ghent Bio-economy'
Term: 2009 - 2013
Partners: Ghent University (Department of Applied Analytical and Physical Chemistry – prof. Pascal Boeckx, Department of Soil Management – prof. Wim Cornelis), multiple European partners
Contact: greet.ruysschaert@ilvo.vlaanderen.be, victoria.nelissen@ilvo.vlaanderen.be

Green vegetables, clean waters

Improved water quality through reduced N and P losses in horticulture

Goal

The Nutrihort project started with a benchmark study and ended with a conference involving 150 scientists, policy makers and other experts from 17 countries. The conference provided a forum to discuss the challenges of sustainable nutrient management in horticulture.

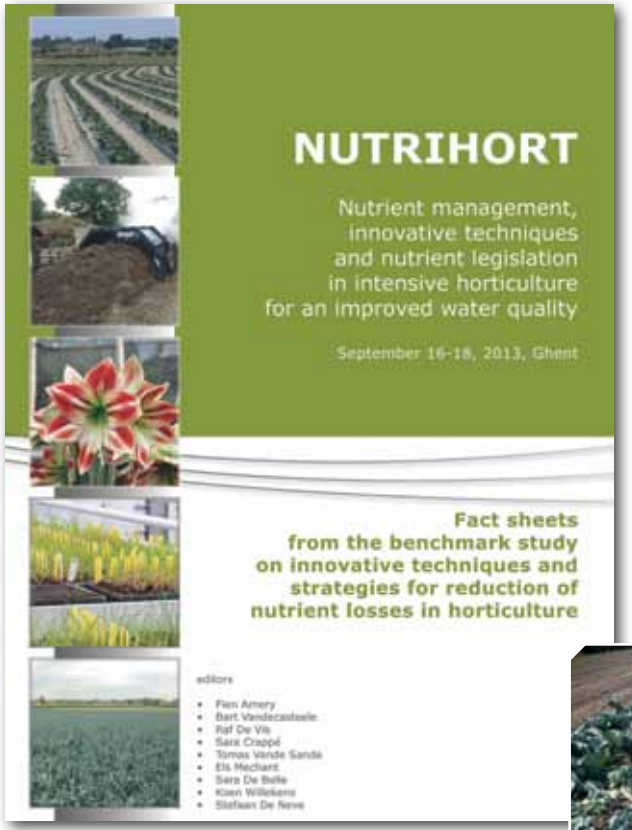
Approach

The benchmark study assembled 55 examples of innovative techniques in Flanders and the regions visited. Those examples of innovative techniques were clustered and divided into two categories: 1) 19 cluster techniques already effectively implemented in one or more regions, and 2) 11 cluster techniques still in development or just ready for use in practice. The implementation degree in Flanders was assessed for all these techniques and compared with the other regions. We assessed the applicability for Flanders and the need for additional research on the innovative techniques not yet applied. This benchmark study was conducted by ILVO, Ghent University, PSKW, PCG, PCS and Inagro, and was financed by the Flemish Land Agency (VLM).

Results

The benchmark study and the conference allowed us to define the most important future research needs. The next step is an action plan for horticulture in Flanders related to the application of innovative cultivation and fertilisation techniques for vegetable and ornamental plant production, including a list of research and extension needs and planning, and policy recommendations on nutrient legislation.

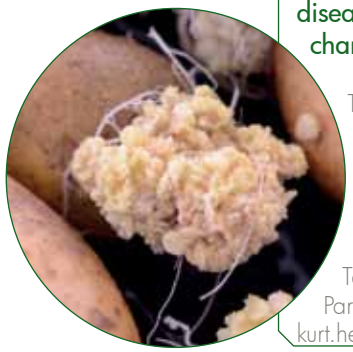
In the second part of the benchmark study, we compared the legislation on nutrient management in horticulture in different European regions. It was a difficult task because the legislations are rather complicated. The N fertilisation standards of several vegetables and ornamental crops show large differences between regions. Phosphorus fertilisation limits are only introduced in a limited number of countries although the phosphorus concentration in surface waters in many regions is too high to prevent eutrophication. Although in all countries or regions horticultural crops are responsible for potentially high N losses through leaching, only a few countries or regions take specific actions for these crops.



The benchmark study resulted in a book with the technical sheets for the 55 selected techniques.

Testing the mechanical collection of field residue of head cabbage (Flanders)

Title: Benchmark study and European conference on innovative techniques and strategies for reduction of nutrient losses in horticulture
Funding: VLM (TWOL)
Term: 2012 - 2013
Partners: Ghent University - Department of Soil Management (Stefaan De Neve and Georges Hofman), PSKW (Raf De Vis), PCG (Sara Crappé), PCS (Els Mechant) and Inagro (Danny Callens and Tomas Van de Sande)
Contact: bart.vandecasteele@ilvo.vlaanderen.be, fien.amery@ilvo.vlaanderen.be, karoline.dhaene@ilvo.vlaanderen.be



Is there a risk for the introduction of potato wart disease in Belgium? How can we quickly detect, characterise and control the potato wart pathogen?

Title: Assessment of the risks for introduction and spread of potato wart disease (*Synchytrium endobioticum*) in Belgium and recommendations for control measures (POWADIS)
Funding: FOD Health, Safety of the Food Chain and Environment
Term: 2013 - 2016
Partners: PCA, INAGRO
kurt.heungens@ilvo.vlaanderen.be

New projects and a selection of ongoing research at the Plant Sciences Unit

Healthy soil, bacteria, and plants. By manipulating the soil and calling on the help of bacteria around the plants, can we keep plants healthier?

Title: Diving deep into the genomic diversity of (meta) populations: CA-GENOMICS PhD3
Funding: ILVO - Coordinated Actions
Term: 2013 - 2017
Partners: Ghent University
caroline.detender@ilvo.vlaanderen.be
jane.debode@ilvo.vlaanderen.be
annelies.haegeman@ilvo.vlaanderen.be
martine.maes@ilvo.vlaanderen.be

A library. How can we improve the identification of reference organisms and the collection infrastructure for diagnostics and research in Europe?

Title: Q-collect: Coordination and collaboration between reference collections of plant pests and diseases for EU Plant Health Policy
Funding: EU-FP7
Term: 2013 - 2015
Partners: consortium with 16 EU partners
martine.maes@ilvo.vlaanderen.be

Staying on our toes in the orchard. How can we stay aware of the phytoplasmas now threatening apple and pear crops ?

Title: REPEDAP - Research of the spread and epidemiology of quarantine phytoplasmas with symptoms in pear (Pear decline, *Candidatus* Phytoplasma pyri) and apple (Apple proliferation, *Candidatus* Phytoplasma mali)
Funding: FOD contractueel onderzoek
Term: 2013 - 2015
Partners: CRA-W, PCFruit, PCS
kris.dejonghe@ilvo.vlaanderen.be

Are *Monochamus* longhorns present in Belgium? If so, do they pose a threat to Belgian pine forests by transmitting the invasive Pine Wilt Nematode?

Title: A study of the *Monochamus* spp. populations present in Belgium in order to assess their capacity to propagate the pine wood nematode, and to develop preventive control methods
Funding: FOD Volksgezondheid
Term: 2013 - 2015
Parners: ULB
nick.berkvens@ilvo.vlaanderen.be
hans.casteels@ilvo.vlaanderen.be
nicole.viaene@ilvo.vlaanderen.be

An alternative for field sampling of potato cysts?

Title: Detection of low infection proximities, knowledge of virulence groups and length of generation of potato cyst nematodes (*Globodera* spp.) as tools for containing potato exhaustion (DIVIRGENCY).
Funding: ILVO, FOD Volksgezondheid
Term: 2013 - 2015
Partners: PCA, INAGRO, Carah, CRA-W
nicole.viaene @ilvo.vlaanderen.be

New projects and
a selection
of ongoing
research at the
Plant Sciences Unit

Better chicory on the horizon?

Title: Targeted development of hybrid races of industrial chicory
Funding: ILVO
Term: 2013 - 2017
Partners: Cosucra – Groupe Warcoing
tom.eeckhaut@ilvo.vlaanderen.be

How efficient are the current plant production systems? What can an analysis based on exergy and resource efficiency teach us? An important question in the transition to a bio-economy.

Title: Exergy balances and economic evaluation of plant production systems with a valorisation in the bio-economy
Funding: ILVO
Term: 2013 - 2017
Partners: Ghent University
hilde.muylle@ilvo.vlaanderen.be

Is the red clover yield influenced by flower characteristics, pollenation efficiency, and their interactions?

Title: Plant-pollinator interactions and seed yield in red clover (*Trifolium pratense* L.)
Funding: ILVO, Ghent University
Term: 2013 - 2017
Partners: Ghent University
gerda.cnops@ilvo.vlaanderen.be

Can we make grass that cows can digest more easily?

Title: Better quality for feed grass
Funding: ILVO
Term: ongoing
joost.baert@ilvo.vlaanderen.be

Can farmers in Flanders produce their own soybeans?

Title: Introduction of soybean cultivation in Flanders
Funding: IWT-LA-traject
Term: 2013 - 2017
Partners: Inagro, K.U.Leuven: Campus Geel
sofie.goormachtigh@ilvo.vlaanderen.be
joke.pannecoucque@ilvo.vlaanderen.be

How can azalea stop the advance of the broad mite?

Title: Plant resistance to *Polyphagotarsonemus latus* (Acari:Tarsonemidae) in ornamentals
Funding: IWT
Term: 2011 - 2015
Partners: PCS
gil.luypaert@ilvo.vlaanderen.be

Is composting an applicable and feasible way to valorise agricultural byproducts in cases where optimisation is possible?

Title: System innovation for the valorisation of agrofood and fisheries byproducts (GeNeSys)
Funding: ILVO doctoral grant
Term: 2012 - 2016
Partners: Ghent University
jarinda.viaene@ilvo.vlaanderen.be
www.ilvogenesys.be

How can we build a functional-structural model of the growth of a soybean plant to support breeding and crop husbandry research?

Title: A functional-structural plant model for the growth and development of soybean
Funding: ILVO
Term: continuous
Partners: Ghent University
tom.deswaef@ilvo.vlaanderen.be

New projects and a selection of ongoing research at the Plant Sciences Unit

Stressed-out plants - Can that stress be measured?

Title: Analysis of stress-related hormones in plants
Funding: ILVO
Term: 2013 – continuous
leen.leus@ilvo.vlaanderen.be

What is the impact of genetic variation on the molecular functioning of candidate genes and on the physiological processes that control them? How can this knowledge be translated into more efficient breeding strategies?

Title: GA-Genomics
Funding: ILVO, EU, IWT
Term: continuous
Partners: K.U.Leuven, PSB-VIB, Ghent University
tom.ruttink@ilvo.vlaanderen.be

"Nematode-killers": Can green manures be bred that control nematodes?

Title: Mechanisms of nematode resistance in green manures
Funding: ILVO
Term: 2013 - continuous
tim.vleugels@ilvo.vlaanderen.be

Warning: high N levels. How can nitrogen advisory systems in horticulture be improved in order to meet the objectives for reducing nitrates in ground and surface waters?

Title: The documentation and environmental adjustment of KNS and other fertilisation advisory systems for horticultural crops for a broader application in horticulture as set out in the Fertiliser Action Programme (MAP4)
Funding: VLM
Term: 2013 - 2014
Partners: Inagro, PCG, PSKW, BDB, Ghent University, PCS, PC fruit, PC Hoogstraten
koen.willekens@ilvo.vlaanderen.be

How are microorganisms organised to associate with plants? Which features determine a pathogenic lifestyle or a potential to be biological control organism?

Title: GENSEARCH: Gene and genome analysis of plant associated microorganisms
Funding: ILVO and several external projects
Term: continuous
Partners: Ghent University, K.U.Leuven
martine.maes@ilvo.vlaanderen.be

LIEVE HERMAN,
Technology and Food Science Unit Head
lieve.herman@ilvo.vlaanderen.be

Powerfull labs, sustainable food products, and industry-oriented thinking

The Food Pilot is starting to gel

Close to food processing companies, service-oriented, innovative and highly technical, the Food Pilot occupies an essential place on the market. The investment phase (IWT funding) seamlessly flowed into a phase of field expansion. For and with 65 companies, of which 46% were SMEs, processes and products were optimised. A quarter of the clients came from the dairy industry, along with companies from the meat and fish industry, ingredient providers, and the bakery and fruit sectors. The fruit growing sector voted our Vaculiq fruit press the "Idea of the Year". The collaboration agreement between ILVO and FlandersFOOD is now in effect; this will ensure the continuation of the Food Pilot after 2013. The possibilities continue to grow: the research demand for shelf-life extension and cleaning/disinfection are key aspects of the Food Pilot. ILVO's new taste laboratory will become a true centre of expertise for food products with European norms. This was made possible in part due to an agreement with SensNet, a not-for-profit organisation, who brought the chemical smell and taste analyses to ILVO labs. Not coincidentally, the Accreditation Commission for wines produced in Flanders (part of the Department of Agriculture and Fisheries and the FPS Economy) also moved the wine tastings to ILVO's Melle site.

Reference working

Another new start in as of January 1, 2013 was that ILVO and the Centre d'Economie Rurale (CER) both became the national reference laboratories for veterinary drug residues. Our reference work in various laboratories was successfully audited, including the Spray Tech Lab, by both BELAC and the Federal Agency for the Safety of the Food Chain (FASFC). The pre-audit required to obtain the ISO 14001 certificate for sustainable laboratory operations was also passed with flying colors.

Six doctorates, new research avenues and high-tech tools

Four researchers from Agricultural Engineering and two in the Food Safety research area received their doctoral degree in 2013 – with the appropriate attention from the press and the stakeholders! The two-year field trial with GM Phytophtora-resistant potatoes also received a great deal of attention. The final report was presented in several places including the Commission of Agriculture of the Flemish Parlement.
The Technology and Food Science Unit is significantly expanding its research expertise into the chemical composition of agricultural and food products. Advanced chemical equipment has come to ILVO in 2013: an extra UHPLC-tandem mass spectrometer (Xevo TQ-S), a GC-mass spectrometer (Agilent 7890A GC and Agilent 5975 C inert XL EI/CI mass spectrometer detector equipped with a Gerstel thermal desorption unit, SPME and olfactometer) and a UHPLC coupled to a QTOF-based high resolution mass spectrometer (Synapt G2-S). The first results look promising.

New interesting research projects include investigating the sanitary aspects of manure treatment, the life cycle assessment of agricultural products, and the processing of by-products of the agri-food sector. Preparations for the application of next generation sequencing in microbiological and GMO research were done to make this technique operational in 2014, as required for the interdisciplinary Genomics project. Sixteen new (contract) projects were either approved or started in 2013. Three of these have an international character. The first is a SUSFOOD project to innovate the vegetable production and processing in cooperation with 10 European knowledge institutes and 7 companies. The European project 'Drive4EU' will demonstrate the technical and economic feasibility and the potential for extracting natural rubber from the Russian dandelion. 'ICT-AGRI 2' is a follow-up to the successful ICT-Agri project. This new four-year project will improve the use of ICT, robotics and automation for a sustainable European agriculture in a consortium of 23 partners from 16 countries.
We wish to thank our research partners and stakeholders for a fruitful collaboration and for their valuable input into our research and service activities. The input we obtained during the two contact days (themed 'meat' and 'fruit and vegetables') was particularly valuable.

The Technology and Food Science Unit performs research and provides services in three areas: agricultural mechanization, food safety, and food products. The Agricultural Engineering research group comprises 64 researchers who primarily focus on mechanization. Their research combines technical competence with modern mathematical and IT-based methods. The Food Safety research group studies the microbial and chemical safety of plant- and animal-based food products. Product Quality and Innovation examines the authenticity of vegetable and animal products, including GMO's and allergens, and works to improve the functional quality and valorization of food. This unit's service package consists of accredited laboratory analyses on food authenticity and food safety (including GMO analyses). We serve as the national reference lab for Milk and Dairy Products, for determination of water content in poultry meat, for allergens, and for GMOs. We also fulfill a reference task for the Milk Control Centre of Flanders (MCC). An accredited laboratory for spray application technique and the accredited inspection of sprayer equipment and certified milk and cooling tank technicians (CONTROL) are also part of our service package. Clients from either industry or research institutions can test new food and feed processing techniques in the renovated and expanded Food Pilot food processing plant. We also offer a certified service for the measurement of air emissions of animal houses and a service for tuning sprayer equipment. Finally, we also provide advice on new technologies and new practices in dairy farms, for (farm) dairy producers (TAD Dairy) and SMEs.

MRSA in the pork production chain

Goal

This project's main goals were to study MRSA contamination routes on pig farms and to evaluate eradication measures to remediate MRSA contaminated farms. In 2005, a new methicillin-resistant *Staphlylococcus aureus* (MRSA) type was reported. It was genetically different than the previously-reported MRSA types. The new type occurred particularly in humans who worked closely with pigs. This research was conducted by ILVO (coordinator), KATHO and CODA-CERVA, where ILVO focused on the molecular epidemiology of MRSA in the Belgian pork production chain.

Approach

After development of a suitable methodology, 30 pig farms and multispecies (pig-poultry, pig-cattle) farms were screened for the presence of MRSA. Horizontal and longitudinal studies were conducted on some of these farms to study the MRSA prevalence over the whole farm and to study the MRSA carriage of the animals from birth to slaughter. Samples were also taken in the slaughterhouse and from meat purchased in retail outlets. All obtained isolates were genetically characterised.

Results

MRSA was isolated more often from pigs than from dairy cattle and broilers. The number of MRSA colonised pigs within MRSA-positive farms was high, with a mean of 63%. This was highly variable, however, and depended on the farm and the age of the sampled animals. On some farms, the sows and piglets were only occasionally colonised, whereas the number of MRSA-colonised animals sharply increased during their stay in the battery. On other farms, the sows and their piglets were already highly MRSA positive in the nursery. The MRSA status of the sow at farrowing had a significant influence on the MRSA status of her piglets: negative sows more often had negative piglets and *vice versa*. The infection age of the piglets was also very variable: from less than one day to more than one month. In the slaughterhouse, carcasses were often found to be MRSA-contaminated, with the forelimb being the most often contaminated part. Samples of various pork samples were often contaminated with MRSA (72%) but in most cases the number of MRSA were low enough so as not to pose a direct hazard for public health.

Title: Study of contamination routes on pig farms and bacteria-host interactions to reduce the MRSA
Funding: IWT-Landbouwproject
Term: 2009 - 2012
Partners: Catholic University College Vives - K.U.Leuven, Veterinary and Agrochemical Research Centre (CODA-CERVA) with Ghent University, Faculty of Veterinary Medicine, Department of Pathology, Bacteriology and Avian Diseases
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Chickens that sicken: Controlling *Campylobacter* in broilers

Can we reduce the amount of *Campylobacter* in broiler chickens, and thus reduce the number of human campylobacteriosis cases?

Goal

The objective of this research was to identify promising *in vitro* anti-*Campylobacter* measures and to ascertain whether they could be used in broilers, to successfully decrease Campylobacter numbers in the ceca or at excretion level.
Thermo-tolerant *Campylobacter* species are the major cause of human bacterial gastrointestinal infections in the Western world. Due to the high intestinal *Campylobacter* counts in broilers, broiler carcasses can easily become externally contaminated during the slaughter process. This contaminated chicken meat can lead to human *Campylobacter* infections. Restraining *Campylobacter* colonisation and/or secretion in/by broiler chickens will lead to a decrease in the number of human campylobacteriosis cases.

Approach

We have screened 1251 bacterial strains (mainly lactic acid bacteria) and a number of organic and animal components for their *in vitro* anti-*Campylobacter* activity. Selected strains and plant components were thoroughly examined in a cecal simulation model.

Finally, the most efficient bacterial strain and organic component were tested in three *in vivo* experiments with live broilers. The aim was to determine whether they were capable of inhibiting in vivo cecal *Campylobacter* colonisation in broilers and/or preventing *Campylobacter* transmission of colonised to non-colonised chicks.

Results

In vitro, an *Enterococcus faecalis* strain was capable of reducing *Campylobacter* numbers tenfold in a preventive gastrointestinal simulation model. However, at high *Campylobacter* infective pressure in broiler chickens (*in vivo*), this strain was unable to prevent cecal *Campylobacter* colonisation and transmission. At a low *Campylobacter* infection pressure, there were indications that the *E. faecalis* strain could cause a delay in cecal *Campylobacter* colonisation.

Of the organic components tested a garlic extract (allicin) possessed the best *in vitro* anti-*Campylobacter* activity. In a gastrointestinal simulation model both cecal background flora and cecal mucus affected this antibacterial activity.
At a low *Campylobacter* infective pressure there are indications that allicin has potential to delay in vivo cecal *Campylobacter* colonisation in broilers.

Title: Control of *Campylobacter* in broilers (Campoul)
Funding: FOD Volksgezondheid, Veiligheid van de voedselketen en Leefmilieu
Term: 2009 - 2012
Partners: Ghent University – Department of Pathology, Bacteriology and Poultry deseases), Prof. Frank Pasmans
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Cleaning up their act (even more)

Efficient practices for cleaning and disinfection in food processing businesses

Goal

The final goal of this project was to design scientifically supported protocols to guarantee efficient cleaning and disinfection in the food processing industry. The research was done in collaboration with the food industry and suppliers of cleaning and disinfection products and techniques. We investigated open plant cleaning and CIP (cleaning in place).

Cleaning and disinfection are extremely important aspects of overall sanitation in the food processing industry. Improper cleaning and disinfection can lead to potential food contamination by microorganisms that cause spoilage, food contamination with food pathogens, and biofilm formation in the production environment.

Approach

Pain points and opportunities for optimisation of so-called 'open plant cleaning' in the participating food companies were studied. Subsequently the suggested adjustments in cleaning and disinfection were tested in the companies and their effectiveness was evaluated.

We took the applicability of currently available and innovative cleaning and disinfection techniques into account while optimising the cleaning and disinfection protocol. Innovative techniques such as enzymatic cleaning, use of products during the pre-rinse cleaning, ultrasonic cleaning, cleaning with tectobiotics, dry ice blasting, use of mobile CIP, etc. were tested either in practice, on a pilot scale or during demonstrations. Systems for automatic cleaning and disinfection of conveyor belts were installed and tested.

Additionally, we assessed the monitoring of the cleaning and disinfection because accurate monitoring is necessary to verify the effectiveness of the procedures. The sampling method, sampling points, type of analysis, evaluation of the results, trend analyses, etc. were studied.

Results

In addition to individual recommendations, we also wrote a general set of guidelines that contains points of interest for cleaning and disinfection that lead to better cleaning and disinfection in food industry. The project resulted in an optimised and more efficient cleaning and disinfection procedure tailored to the participating partners of the food processing businesses. It was coupled with a system to measure its efficiency. The findings are also appropriate for the wider context of the food industry. The participating food companies were made aware of contamination sources and routes as well as corrective measures. This communication was based on thorough sampling and took place during individual discussions and group debates.

Title: Efficient practice for cleaning and disinfection in food processing businesses (CleanGuideFood)
Funding: Flanders' FOOD
Term: 2011 - 2013
Partners: VITO: S. Kreps, S. Van Ermen, J. Ceulemans
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False alarm?! Interference of microbiological antibiotic milk tests

False positive results caused by bacteriocins and free fatty acids

Goal

ILVO has sought the precise source of the interference that can happen when milk is tested with a microbiological test to detect antibiotic residues in milk.
The most widely-used tests for this purpose are microbiological, but these are known to produce false-positive results because of natural substances in the milk that can also inhibit bacterial growth. These naturally-occurring inhibitors are often present in colostrum or mastitic milk.

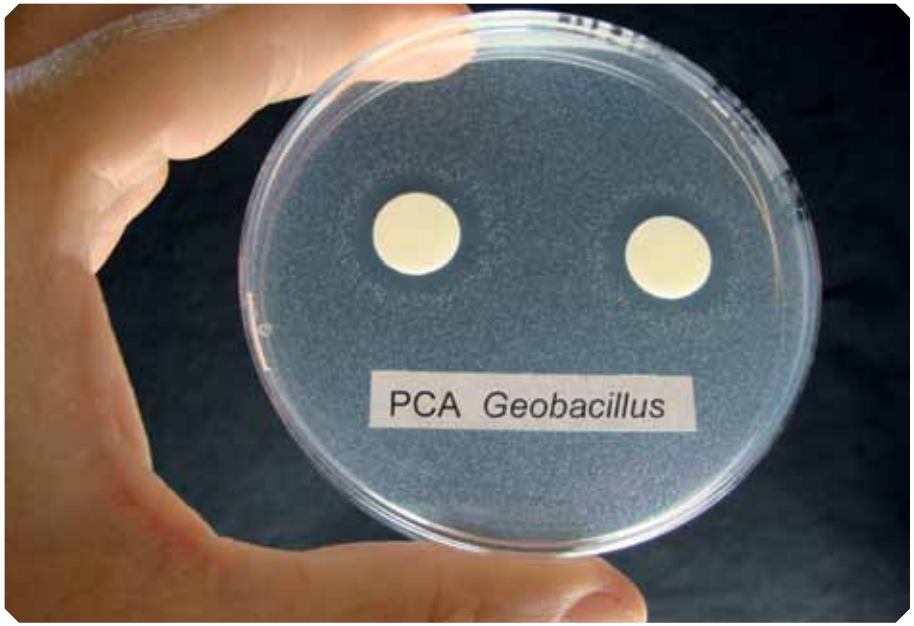
Approach

The milk from farms with frequent problems with inhibitory substances in the milk was carefully researched. We have also thoroughly studied the effects of increased concentration of fatty acids in the milk.

Results

Lactoferrin and lysozyme, two naturally-occurring antibacterial substances in milk, have an inhibitory effect on *Geobacillus stearothermophilus* var. *calidolactis*, the most commonly used test organism in microbiological inhibitor test. It is also know that the lactoperoxidase/SCN^-/H_2O_2 system and immunoglobulins both have an antibacterial effect. In addition, a high pH or a high number of somatic cells in the milk as well as lipolysis with the formation of free fatty acids can also lead to false positive results. Finally, the test bacterium can also be destroyed by traces of disinfectants in the milk.

ILVO stated that certain *Pseudomonas* strains can produce bacteriocins during their growth in milk in the farm milk cooling tank. Ghent University's Department of Organic Chemistry identified the bacteriocins as cyclic lipodepsipeptides of the viscosin group. To our knowledge, these results are the first time that interference of microbial inhibitor tests for antibiotic residues in milk has been shown to be caused by the bacterial inhibitors produced by *Pseudomonas* bacteria present in the milk. ILVO's findings show that extended refrigerated storage of raw milk can result not only in possible spoilage of milk but also in false-positive microbial inhibitor test results.



When a false positive Delvotest SP result is caused by an increased concentration of free fatty acids, interference by caprylic and capric acid was observed. Adding concentrations of 0.15% (w/v) to high quality milk led to positive Delvotest SP tests. In addition to the interference caused by these free fatty acids, the Delvotest SP-NT can be disturbed by similar concentrations of caproic, lauric, palmitic and a-linolenic acid.

Title: Development and validation of new methods for the detection of residues
Funding: ILVO
Term: 2008 - 2013
Partners: Ghent University - Department of Organic Chemistry, NMR & Structural Analysis Unit (Prof. J. Martins)
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From a great idea to a tasty food product

Food processing pilot tests at the Food Pilot

Goal

The Food Pilot aims to support food companies seeking to create innovative food products based on dairy, meat, fish, vegetables, fruits, baked goods and chocolate. Food Pilot (www.foodpilot.be), the test center for the agro-food business, was established in 2011 by ILVO and Flanders' FOOD. Through its integrated approach, the Food Pilot is able to guide a company's innovation project from idea to product. Additionally, the Food Pilot strives to be a platform for technology exploration and offers technical trainings.

Approach

The Food Pilot has expanded from a formerly dairy-oriented test centre to include a wide range of foods. The Food Pilot now includes more than 50 pilot appliances to simulate production lines for the small-scale, semi-industrial testing of new ingredients, recipes or processes. In addition, the Food Pilot offers analyses on chemical, physical and microbiological quality of products, as well as sensory tests, aroma profiling, packaging tests, shelf life tests, and advice in cleaning and disinfection of the production site. The aim is to a full service approach tailored to the company. This year, the Food Pilot strengthened its expertise in flavour and aroma research through a partnership with the non-profit SensNet, which has many years of experience in research and interpretation of aroma profiles and in providing advice on product composition and processing. Generally, the Food Pilot builds expertise through doctoral research and participation in research projects such as Flanders' FOOD projects. Active networking by Food Pilot staff help to spread the word about the possibilities offered by this unique pilot plant. These efforts include company visits, a website, exposition at trade fairs, organisation of workshops and seminars. FOODINOFRA, an NIB-funded project together with Fevia Vlaanderen and Flanders' FOOD, support this work. Two technical trainings have been organised: emulsifying through magnetism (M4E) and pressing of vegetables and fruits under a vacuum (Vaculiq). Both trainings had a good turnout. Through joint initiatives and projects, several cooperations with the sector federations FENAVIAN, FVPhouse and Bioforum were set up. The ERA-Net project called "SUSFOOD" joined the Food Pilot with a European network on sustainable food production and consumption.

Results

During 2013 220 pilot tests were conducted for a total of 65 companies. Some companies came back up to 5 times in order to perform additional tests. About half of the companies were SMEs; the others were joint ventures. The Food Pilot's history of dairy processing as the former Dairy Research Institute has now given way to representation of all food sectors: dairy (26%), meat (8%), bakery ingredients (9%), suppliers of ingredients (25%), fish (5%), fruit juices (6%) and others. According to a customer satisfaction survey, the Food Pilot is on the right track: the rating was good to very good.

Title: Food Pilot
Funding: IWT, Agentschap Ondernemen en de Europese Commissie (FP7)
Term: 2009 - 2013
Partners: Flanders' FOOD and Fevia Vlaanderen
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No mould on these potatoes...

A field trial with genetically modified potatoes

Goal

The objective of this project was threefold: 1) to test the effectiveness of different resistance genes under actual field conditions in Flanders. 2) to contribute to the development of durable resistant potatoes for potato and 3) to contribute to nuanced judgments about GM crops.
Potato late blight is the main problem in potato cultivation. The disease, caused by the fungus-like organism *Phytophthora*, causes an estimated annual loss of about €55 million in Belgium alone. In this project ILVO worked within a Flemish research consortium together with the DuRPh project of the University of Wageningen.

Approach

During the growing seasons in 2011 and 2012, 27 transgenic potato lines with 1 to 3 different built-in resistance genes were planted in a field trial. In addition to the GM lines also a number of more or less sensitive and resistant non-GM lines were planted as a reference. During two seasons observations were carried out to identify the extent to which each of the lines respond to the pathogen present.

In parallel experiments, an evaluation of the cultivation measures imposed by the Flemish Government in the framework of the co-existence legislation was done.

Results

During the first season, a very severe *Phytophthora* infestation could be observed in the non-resistant reference varieties The reference varieties Bionics and Sarpo Mira, which were assumed to be resistant, and a wild potato species were hardly affected. The multi-resistant genetically modified lines showed no infection. At the end of the season, the single resistant lines (Bionica and two single cisgenic lines) showed negligible to a very slight degree of infestation. The results of the trial in 2012 are similar to those in 2011 but this time Bionica and Toluca, which were supposed to be resistant, were strongly affected. The genetically modified lines showed results comparable to those of the 2011 trial.

The coexistence trial demonstrated that the main risk to spreading GM or other varieties of potatoes consists of possible mixing of races through volunteers in the field. However, phytosanitary protocols in good agricultural practices already include strict control of volunteers. Moreover, the experiment showed clearly that the isolation

distance of 5 metres provides enough space for potato planters and harvesters without creating a risk for mixing of potato material. We therefore concluded that the current legally-prescribed measures are adequate and realistic.

Title: Durable resistance against potato late blight
Funding: IWT
Term: 2011 - 2012
Partners: Ghent University - Faculty of Bioscience Engineering, Gheysen Godelieve VIB, René Custers - HoGent - Dept. BIOT , Geert Haesaert, Wageningen UR - PRI-Plant Research, Anton Haverkort
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Beauty isn't everything...

Tasty and healthy juice from downgraded Conference pears

Goal

The objective of this research project was to produce a delicious and healthy juice using downgraded Conference pears. The Belgian pear acreage is 8,579 ha, 90% of which is Conference. With a strong focus on fruit for the fresh market, if pears do not meet strict quality standards, they are simply downgraded (called "rebut pears" in technical terms). Consequently, at least 8,000 tonnes of Belgian Conference pears either end up as compost or, at best, they are valorised as animal feed or bio-energy.

Approach

Pear juice was made using the spiral filter press present in the Food Pilot (http://www.foodpilot.be). This extremely versatile press is useful for the oxygen-free pressing of various biomass food and feedstocks, and can be used to make juices, smoothies and purees of all kinds of fruits and vegetables. The Food Pilot, a joint effort of ILVO and Flanders' FOOD, has one of these presses in-house. This innovative press and all of the other food processing equipment is available for all companies wishing to develop innovative foods and beverages.

Results

In this doctoral research, the production process of a tasty and healthy juice was optimised, starting from the downgraded Conference pears. The result was a high added-value for these otherwise low-value fruits. The resulting juice keeps all of the health-promoting substances initially present in the pears thanks to the special oxygen-free pressing process. The first part of the project was to identify the polyphenols in 55 apple and pear varieties. This knowledge was then used to study the impact of the processing on these compounds. The study showed that juicing using the spiral filter press maximally preserves the healthy compounds. The polyphenols are preserved, either in the juice or in the press cake. This healthy and innovative pear juice won first prize for "Idea of the year" in a competition organised by a fruit grower's magazine. Future research will investigate the potential for high-added-value use of the press cake.

Title: Study of improved processing and valorisation possibilities for apple and pear
Funding: ILVO, VITO
Term: 2009 - 2013
Partners: VITO
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Sweet nothings: Steviol glycosides are promising natural sugar replacers

Research on the use of steviol glycosides in a variety of foods

Goal

The aim of this project is to investigate to what extent sugar can be replaced by steviol glycosides in several food products, which auxiliary agents have to be used, and which modifications to processing conditions would be necessary.
Consumers in Western societies eat too much sugar, are concerned about their health, and reject synthetic sugar replacers in favour of natural sugar replacers. The stevia plant and its derived steviol glycosides are being increasingly used by food processing companies as a natural alternative to sugar in food.

Approach

With the support of Flanders' FOOD and IWT, ILVO tested the substitution of sugar by steviol glycosides in several foods such as dairy products (ice cream, chocolate milk, yoghurt and desserts), fruit preparations (marmalade) and chocolate. These tests verified whether sugar could be replaced partially or completely by steviol glycosides. In addition, the research indicated the choice of the most suitable additives and how taste and texture would alter upon storage.

The most common sweet tasting components in the plant *Stevia rebaudiana* Bertoni are stevioside en rebaudioside A (both belonging to 'steviol glycosides'). These are intense sweeteners which are 200 to 300 times sweeter than sucrose and have almost no calories. Since November 2011, these sweeteners have been EU approved as a food additive.

Results

Sugar is not only sweet, but it also serves as a bulking agent. Therefore, when replacing sugar with other sweeteners such as steviol glycosides, other additives such as polyols and oligosaccharides are necessary to create a similar food product. In the case of ice cream, sugar plays an important role in depressing the freezing point. For heated products, the intensity of the Maillard reaction and caramelisation must also be taken into account. The taste characteristics of steviol glycosides must also be considered. As it is usually the case with intense sweeteners, the sweet taste of steviol glycosides is not the same as the sweet taste of sugar. The taste comes slowly and is lingering. Off-flavours such as a bitter and liquorice taste are frequently detected.

The composition of the available commercial mixtures of steviol glycosides often varies, which leads to variability in taste quality, sweetness and off-flavours. The optimal choice of additives and optimal combination with other sweeteners could lead to products in which sugar could be replaced either partially or completely. This research proved also that steviol glycosides are resistant to high temperatures and acid conditions, also during storage.

This research indicates that stevia and steviol glycosides have a great potential as sugar replacers in several food products.

Title: The use of stevia and steviol glycosides in the preparation of food products" and "Avoiding off tastes using steviol glycosides in the preparation of food products
Funding: IWT and Flanders' FOOD
Term: 2009 - 2013
Partners: K.U.Leuven, Laboratory of Functional Biology (prof. Dr. J. Geuns); K.U.Leuven Faculty of Industrial Engineering, research cluster Food & Biotechnology @ KHBO (Prof. B. Meesschaert)
Contact: jan.deblock@ilvo.vlaanderen.be, barbara.duquenne@ilvo.vlaanderen.be

Insects vs. mini-worms: investigating the application of EPN in field vegetable cultivations

Goal

Entomopathogenic nematodes (microscopically small worms that parasitise on various insects) are a safe alternative for chemical insecticides. They are used in the biological control of an increasing number of insect pests. Tailored application technology would improve their efficiency in field vegetables.

Approach

This project concentrated on the application of EPN in outdoor vegetables. Three difficult-to-reach pests were targeted: the leaf-bound cabbage moth in cauliflower, the soil-bound cabbage root fly in cauliflower, and the onion thrips in leek.

To improve the biocontrol potential of spray applications with EPN against cabbage moth larvae, we sought adjuvants that slow down sedimentation of EPN in the tank and thus increase the deposition of EPN on leaves. We also tested the effect of adding yeast extract, an insect attractant, to the spray suspension on the biocontrol of this pest. The selected adjuvants, when combined with an adapted spray application technique, did improve the control of the cabbage moth. But the results were not on par with the control results obtained with Bt, another biological insecticide, when this insecticide was sprayed with the same adapted spray boom as the EPN. The main limiting factor for EPN effectiveness was a low temperature.

Results

Field experiments against the cabbage root fly have shown that spraying the plant trays containing the cauliflower plantlets is the best application method for controlling the cabbage root fly with EPN. But here again an alternative biological control agent, spinosad, showed better control results.

The field experiments against onion thrips showed that *Steinernema feltiae* (a cold tolerant EPN species) is not effective against onion thrips in leek.

In summary, EPN are not yet the best solution for large-scale control of these insects in outdoor vegetables. More cold-tolerant EPN species, strains or breeds that more actively search for a host are urgently needed to improve outdoor control results. In the short term in temperate climates such as Belgium, the most promising research avenue is to study EPN applications against greenhouse pests.

Title: Development of an efficient application of entomopathogenic nematodes in vegetables
Funding: IWT
Term: 2009 - 2014
Partners: Ghent University (Prof. P. Spanoghe), Inagro
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Sow research with a leg to stand on

Towards prevention of lameness in group-housed sows

Goal

Sow lameness has negative impacts on sow health and welfare and represents considerable economic loss for pig producers.
The main goal of this research was to improve prevention of lameness in group-housed sows using better lameness detection, clarification of the reproductive implications and identification of risk factors.

Approach

We have developed a system to improve the detection of lame sows based on stance variables: the SowSIS - Sow Stance Information System. We elucidated the economic implications of lameness by by investigating the effect of lameness on reproductive performance of 491 sows throughout one reproductive cycle.
Finally, a longitudinal study on 15 commercial herds was performed to identify the risk factors for lameness development, with an emphasis on the period shortly after introduction into group-housing when lameness incidence is highest.

Results

SowSIS proved to be highly accurate and precise in measuring stance variables. These variables proved to be able to distinguish when a sow was lame despite appearances of soundness. Weight was removed from the lame leg by standing more asymmetrically, shifting weight to the other legs, and lifting the lame leg more frequently.

Claw lesions did have a clear effect on farrowing performance. The effect of lameness was less clear and was restricted to a 2.4 time higher risk of carrying mummified fetuses. Lameness was the second most important reason for culling. The culled sows were significantly younger compared to sows culled for other reasons, thus lameness mainly affects reproduction indirectly via the increased culling rate of young sows.

Neither the degree of aggression as indicated by skin lesions nor the floor characteristics (i.e. wetness, slipperiness and quality) influenced lameness development. This study demonstrated that lameness development in sows within the first days of group housing may not be increased by hierarchical aggressive encounters but rather that sows may benefit from more floor space per sow.

Title: Detection, implications and risk factors for lameness in group-housed gestating sows.
Fundng: IWT-specialisation grant (SB-091420)
Term: 2009 - 2013
Partners: Ghent University – Faculty of Veterinary Sciences (prof. Dominiek Maes)
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Dusty pigs, dusty people, dirty air? Particulate matter in the Flemish pig industry

Impact assessment with respect to emissions, animal health and occupational safety

Goal

The goal of this project was to characterise and evaluate the problem of particulate matter in Flemish pig husbandry. The project approached this question from three perspectives. First, to assess the particulate matter emissions in some conventional and low emission housing systems during periods of one year. The second research topic was to evaluate the indoor particulate matter concentrations and their effect on animal health and production. Finally, indoor particulate matter concentrations were measured in relation to occupational safety for the farmer and the veterinarian.

Approach

This project started by developing a measuring technique for the performance of representative particulate matter measurements in existing stables (intermittent measurement method). This method was then applied in existing stables to obtain typical indoor particulate matter concentrations and to quantify emission factors for pig fattening facilities. Last, based on the indoor particulate matter concentrations, an assessment was made of the impact on human (occupational safety) and animal health.

Results

A feasible measurement strategy was developed (an adapted and shortened version of the research method). This measurement strategy has been tested in practice in two types of stables, both conventional and low-emission. This data can be used for analysing the impact of particulate matter in relation to the effects on humans, animals and the environment.

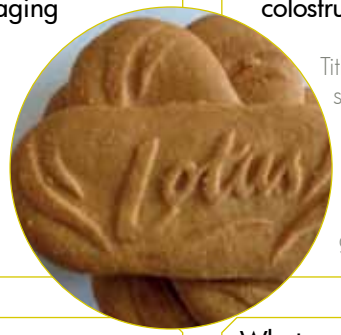
The ILVO measurements put both the international and Flemish emission data into an international perspective. Compared with the data from the emission inventory of the Flemish Environmental Authority (VMM, 2011), the ILVO measurements indicate 3 times lower emissions for PM10 and even 10 times lower for PM2.5. Still, the generated PM10 and PM2.5 data were similar to those found in the Netherlands. These findings imply that possible nuances need to be made in assessing the contribution of the pig industry in the current estimates of the VMM.

In this study, and in contrast to the sometimes high values for dust and gas concentrations in Flemish pig stables, we observed no negative impact on the weight gain of the pigs from dust and gases. The dust concentrations did have an effect on the extent of pneumonia lesions and the occurrence of fissures.
Concerning occupational safety, the measured concentrations remained below Belgian legal limits, but the values recommended in literature were exceeded. The researchers therefore advise farmers to protect themselves from the indoor particulate matter and ammonia concentrations in the stable.

Title: Particulate matter in the Flemish pig industry: impact on emissions, animal health and occupational safety
Funding: IWT
Term: 2008 - 2013
Partners: Ghent University, Departement of Obstetrics, reproduction and herd health, Dominiek Maes; Ghent University, Department of Sustainable Organic Chemistry and Technology, Herman Van Langenhove
Contact: peter.demeyer@ilvo.vlaanderen.be

Keeping carmelised cookies longer and better. By studying the ageing process of caramelised biscuits and caramelised biscuit paste, can we optimise the biscuit recipe and packaging to obtain a longer shelf life?

Title: Sensorial ageing of dry bakery products (SENSOBAK)
Funding: IWT
Term: 2013 - 2015
Partners: SensNet, Lotus Bakeries NV
jan.deblock@ilvo.vlaanderen.be



Clean colostrum. To what degree can physical separation techniques reduce the *Mycobacterium avium* subsp. *paratuberculosis* infection in colostrum?

Title: Reduction of *Mycobacterium avium* subsp. *paratuberculosis* infection via colostrum decontamination
Funding: IWT
Term: 2013 - 2015
Partners: Dierengezondheidszorg Vlaanderen
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New projects and a selection of ongoing research at the Technology & Food Science Unit

Are there risks for antibiotic residues, antibiotic resistance genes, and pathogens when using pig manure in agriculture?

Title: Mapping the risks of antibiotic residues, antibiotic resistance genes, and pathogens when using pig manure in agriculture (VARMEST)
Funding: ILVO
Term: 2013 - 2016
Partners: Ghent University
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What we resist persists. Antimicrobial resistance – impact of low concentrations of antibiotics present in animal feed

Title: Antimicrobial resistance – impact of cross contamination of animal feed with antimicrobial substances on the development of resistance (CROSSCONTAM)
Funding: FPS Health, Food Chain Safety and Environment
Term: 2013 - 2015
Partners: CODA-CERVA, Ghent University
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How can we develop a more fruity praline?

Title: Development of a new praline concept
Funding: IWT
Term: 2013 - 2014
Partners: Pralibel NV
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How can we manipulate and process live brown shrimp on board the fishing vessel?

Title: Development of innovative techniques on the vessel for manipulation and processing of live brown shrimp (Innolife)
Funding: Europees Visserijfonds
Term: 2013 - 2014
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How can we better evaluate food (micro)structure?

Title: Novel techniques for inspection and engineering of food (micro)structure based on X-ray computed tomography (TOMFOOD)
Funding: IWT
Term: 2013 - 2015
Partners: K.U.Leuven (BIOSYST-MeBioS), UAntwerpen (Vision Lab), Ghent University, UGCT en K.U.Leuven (Campus Geel, Lab4Food)
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New projects and
a selection
of ongoing
research at the
Technology & Food Science Unit

Not UFOs but FFOs (flying fertiliser objects). Can we determine the spread pattern of a fertiliser spreader using image processing?

Title: Developing an optical sensor to predict the spread pattern of centrifugal type fertiliser spreaders
Funding: ILVO – BOF (Ghent University)
Term: 2013 - 2017
Partners: Ghent University
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Waste not, want not: Can agri-food residues and wastes be used in feed production?

Title: Sustainable Production of Functional and Safe Feed from Food Waste (NOSHAN)
Funding: EU FP7
Term: 2012 - 2016
Partners: IGV (Germany); EKODENGE (Turkey); UCKERKAAS (Germany); VERTECH (France); PROVALOR (The Netherlands); AQON (Germany); KIM (Spain); Nutrition Sciences (Belgium); LEITAT (Spain); VITO (Belgium); University Parma (Italy)
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How can horticultural by-products be valorised?

Title: GeNeSys: Use of by-products as system innovation - stabilise in order to valorise: horticultural by-products as a case-study
Funding: ILVO
Term: 2012 - 2016
Partners: Ghent University
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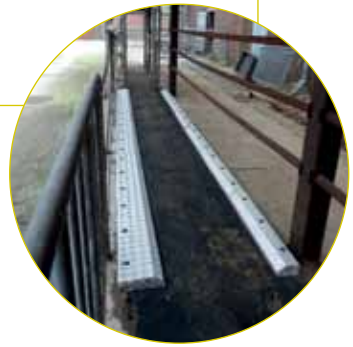
Can lameness in dairy cattle be detected by individual monitoring using the GaitWISE walkway?

Title: SILF: Smart integrated Livestock farming: integrating user-centric & ICT-based decision support platforms
Funding: ILVO, K.U.Leuven
Term: 2013 - 2017
Partners: K.U.Leuven
annelies.vannuffel@ilvo.vlaanderen.be



How can we efficiently and cost-effectively measure the potential toxicological effects of GMOs?

Title: Development of a test method for transgenerational effects of genetically modified crops in food using the zebra fish model - TRANSGGO
Funding: Federale Overheidsdienst Volksgezondheid, Veiligheid van de Voedselketen en Leefmilieu, Contractueel Onderzoek RF 13/6277 TRANSGGO
Term: 2013 - 2017
Partners: Antwerp University (Zebrafishla, Departement Diergeneeskundige Wetenschappen), Ghent University (Laboratorium voor levensmiddelenanalyse, Vakgroep levensmiddelenwetenschappen en –technologie en Laboratorium voor Bromatologie, Vakgroep Bioanalyse)
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Can yeasts applied to fruit in cool storage rooms prevent disease formation during storage?

Title: Post-harvest application of biological control organisms (BCOs) against fruit storage diseases
Funding: IWT
Term: 2013 - 2017
Partners: PCFruit, K.U.Leuven
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LUDWIG LAUWERS,
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A call to action: agricultural research in a changing society

Society is changing rapidly and agricultural research must keep up with those changes. It is no longer possible to unambiguously provide solutions for complex problems such as food provision, space requirements, social inclusion and sustainable development. To realise its mission to "interpret and clarify social choices in agricultural and rural societal issues" the Social Sciences Unit employs innovative research approaches that help to understand this complexity. Insight into the function, role and practices of actors in society and policies is very important in this respect. Several research frameworks, such as discourse analysis, cognitive mapping, modelling and research by design can help to shed light on such complex social issues.

In other pages of this report, you will find examples of research investigating the functions of agriculture and rural areas in relation to policy or society at large. International comparative research on Green Care shows that other valuable discourses coexist with the dominant discourse of multifunctional agriculture, and that they are able to lead to innovative development paths. This critical scientific insight not only leads to publications; the researchers were also invited for further reflection on the future of Green Care in Flanders. Sociological research on organic farming shows that aligning diverse interests of stakeholders from different domains within a common discourse is one of the driving forces for renewed growth in this sector. This activity report also reports research on the attitude of companies in the food and feed chains vis-a-vis the stalemated GMO policy in Europe.

In 2013, the unit began nine research lines in order to structure the research planned for 2014 to 2016 with a view to provide solutions to the challenge of complex problems in a changing society: farm management, agricultural economics, supply chain networks, agro-ecology, learning, spatial transformations, regional development, governance and agricultural philosophy. Emerging phenomena such as urban agriculture and food networks are addressed. In projects such as agro-ecology and transformation of the Flemish agricultural and food system, our unit cooperates with the stakeholders to provide socially relevant research. Real changes occurring in a complex social context cannot be pre-tested in a controlled environment. By involving all stakeholders and cooperating with them, our research unit is ideally placed to understand and produce scientific evidence about complex phenomena and to facilitate social learning trajectories. Action research is an essential approach to such challenges.

The 40 researchers of the Social Sciences Unit are responsible for the socio-economic research at ILVO. Our research is based on both quantitative and qualitative research principles and tools, action research and participatory methods. We strive to act as a driving force for transdisciplinary, prospective and systemic research. In this way, we anticipate and fulfill our stakeholders' needs (i.e. government, agriculture and research).

Our research takes place in the field of farm management, collaboration in the agro-food chain, resilience, learning processes, sustainability assessments, spatial transformations, regional development, governance and multi-stakeholder processes. Our research is grouped into two research domains: (i) Agricultural and Farm Development and (ii) Rural Development. In the first, we study the dynamic change processes terms of competitiveness and sustainability of the agricultural sector. The latter studies change processes and the governance of these processes on the countryside.

How sustainable is my crop protection?

The dual indicator set DISCUSS helps farmers achieve more sustainable crop protection

Goal

Farmers are confronted with statements about crop protection like: "use less harmful pesticides", "avoid point pollution", "make the cloud disappear", "wear gloves", "don't expose children to pesticides", etc. These are all aspects of sustainable crop protection. The challenge was to capture these aspects into one instrument, DISCUSS. Moreover, the instrument should be suitable for communication, monitoring and decision support, and help farmers achieve more sustainable crop protection.

Approach

While designing and testing DISCUSS we made ample use of stakeholder input. In iterative steps, the results of each stakeholder consultation fed back to desktop research and vice versa. This kind of participatory approach should reveal what is really at stake, create a broad base in the sector, and enhance the use and usefulness of the instrument.
In the design phase we mainly consulted experts. In the test phase also farmers and farm advisors were involved.

Results

DISCUSS is based on a conceptual framework encompassing seven requirements: (1) avoid chemical crop protection; (2) choose the least harmful pesticides; (3) comply with regulations; (4) avoid resistance; (5) take precautions for operator and third party safety; (6) avoid point pollution; (7) avoid diffuse pollution.

To assess this framework, DISCUSS pairs a risk indicator with a response indicator. POCER, the Pesticide Occupational and Environmental Risk Indicator, assesses the second requirement. Risk indices are calculated for operators, workers, bystanders, residents, consumers, soil persistence, groundwater, aquatic organisms, earthworms, birds, bees and beneficial arthropods. A questionnaire assesses all other requirements. One part covers management actions related to integrated pest management, human safety and environmental protection; the other covers knowledge, awareness and attitude.
Using cognitive interviews, tests on fruit farms, statistical analysis and focus groups with experts and advisors, we moulded DISCUSS into an operational instrument.

DISCUSS was designed as a social learning instrument for use in farmers' discussion groups. The results can serve as a starting point for discussion about the different aspects of sustainable crop protection. Such peer interaction not only fosters learning about more sustainable alternatives; also changes in attitudes, norms, perceptions and behaviours occur, providing leverage for increasing crop protection sustainability.

Title: DISCUSS – a dual indicator set for crop protection sustainability surveys
Funding: Flemish government
Term: 2010 - 2013
Partners: Research and development together with Ghent University, Department of Crop Protection (prof.dr.ir. Pieter Spanoghe)
Testing together with PCFruit, Research Station for Fruit Growing, Services to growers (ir. Tessa De Baets en ir. Charles de Schaetzen)
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Green Care and rural development

A comparative study

Goal

In this research, Care Farming is used as a case study to investigate if and how the dominance of the multifunctionality discourse is steering rural development in specific directions. The research is based on various databases, including focus groups in several European countries, stakeholder meetings in Flanders and the Netherlands, reports and qualitative interviews.

Approach

This research has distinguished three European Care Farming discourses. The Multifunctionality (MF) discourse sees Care Farming as an activity that contributes to the economic performance and/or the social acceptance of agriculture. The Public Health (PH) discourse stresses the therapeutic effect of being in an natural environment, such as a farm, whereas the Social Inclusion (SI) discourse focuses on reintegration into society through labour. The balance of these three discourses leads to a variety of Care Farming practices in Europe.

During the second part of the research, we took the similarities between Flemish and Dutch care farming practices as a starting point: "care farmers" are come to work on regular farms that depend on primary production for their income, possibly with other on-farm income-producing activities. A different evolution in the balance of the relevant discourses has resulted in a different institutionalisation of care farming in both countries. This is evidenced by the legislative and financial institutionalisation of Green Care.

Results

The multifunctionality discourse has remained dominant in Flanders, and care farming is mainly a social activity. Although care farming is strongly institutionalised, it stresses time and again that care farming is a informal activity. In the Netherlands, however, the integration of the multifunctionality discourse and the public health discourse instigated the liberalisation, institutionalisation and specialisation of care farming (farms offering care at market prices) and new care arrangements, such care farms in the urban areas or urban fringe.

The evolution of care farming in the Netherlands has made the sector vulnerable. The economic crisis is an point in case, as it has reduced the healthcare budgets, and thus decreased the purchasing power. The dominance of the multifunctionality discourse in Flanders has led to a very limited number of innovative pathways. The present preconditions for care farming do not allow, for instance, to start a new care farm in the urban areas, which might create new urban-rural linkages. On the other hand, the independence of economic evolutions makes the care farms more resilient, as long as the farming sector remains interested in care farming.

Title: Care Farming
Funding: IWT, Flemish government
Term: 2011 - 2013
Partners: Ghent University, Sociology group, Michiel de Krom
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A toolbox for policy processes

Effective policy-making in rural areas

Goal

Rural Flanders has undergone significant changes in the past few decades. Before, agriculture was the only player in rural areas and was also the backbone of the local enconomy. Now a wide range of players has entered the rural arena. Policy has also undergone visible changes: a farmer-focused policy has now given way to a rural development policy approach. This translates into space and financial support for environmental projects, quality of life in the countryside, and a diversification of the rural economy. This shift in the policymakers' attention suggests a different way of policy-making. The ability to meet policy goals now often relies on various players working together and forming partnerships. Policy visions and decisions are also increasingly discussed with the players involved. When taken together with increasing decentralisation, policy-making is becoming more complex. The policymakers often lack the skills, instruments, and background knowledge to successfully navigate this new approach.

Approach

In this research project, we have zoomed in on the proces of policy-making within the urbanised Flemish rural areas. To do so, we have used three characteristics from the theoretical framework of "social interface" developed by sociologist Norman Long: the presence of a number of players, the combination of various types of knowledge, and working with different levels of policy. Three projects from Flanders (the policy working group on agrarian architecture, the landscape vision Thought4Food and the policy strategy for development of castles and castle grounds) were analysed.

Results

This research resulted in a number of handles for the way that policymakers can address the complex problem of rural policy in a strongly urbanised context. This toolbox for participation in policy-making processes has five components:

1) determine common goals; 2) identify the various players; 3) integrate various forms of knowledge; 4) give the process an active form by visualising it; and 5) ensure fairness and transparency. Instead of one general blueprint for policy processes, these five components can be mixed and matched for a custom-made trajectory for every specific policy-making process.

Title: Governance of rural development processes
Funding: ILVO
Term: 2011 - 2013
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DAIRYMAN

Improving regional prosperity through better resource use on dairy farms and stakeholder cooperation

Goal

Climatic and soil conditions in northwestern Europe are well-suited for dairy farming. An extensive market for dairy products can be found nearby. But dairy farmers experience difficulties in implementing European legislation in an effective and socially acceptable way. The sustainability of the sector is under pressure due to low efficiencies in the use of fertilisers, feed, energy and water. In addition to these environmental pressures, dairy farmers are also facing milk price volatility, high investment costs, and narrow profit margins. How can the dairy farm resource management be improved in a profitable way to strengthen rural communities and regional economies?

Approach

A multilayered network of researchers, advisors, 130 commercial dairy farmers and 10 knowledge transfer centres spread over 10 regions in northwestern Europe has been established. This network supported the stakeholders to exchange experiences and innovations within and between participating regions. During the DAIRYMAN project, numerous activities were organised on both the regional and interregional levels to maximise knowledge exchange between the stakeholders.

Results

The DAIRYMAN network has been instrumental in assessing and comparing dairy sector sustainability in the main dairying regions, accompanied by evaluating the principles behind the regional implementation of EU environmental legislation. Strengths and weaknesses of each region were assessed and compared.
The network has also facilitated the exchange and testing of innovative sustainable practices in the field. Researchers, advisors and pilot farmers have worked together to improve the sustainability on pilot farms by making more efficient use of fertilisers, feed and energy sources. This cooperation should finally improve both farm economics at farm level and key environmental services at the regional level. Exchange of

experiences and knowledge between pilot farmers within a region as well as between regions, stimulated pilot farmers' learning toward more sustainability. The network of 130 pilot farmers has been established as an example to other dairy farmers within the region. Additional events and meetings have been organised to facilitate knowledge dissemination for external stakeholders such as local farmers, educational institutions and policy makers.

Title: DAIRYMAN
Funding: EU
Term: 2009 - 2013
Partners: Boerenbond, Inagro, Province of Antwerp – Hooibeekhoeve, Wageningen UR - PRI-Plant Research International
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Mapping the businesses between the farms

Spatial-economic analysis of commercial activity in the agrarian area of the province of Antwerp

Goal

This research project is part of the creation of agricultural and rural maps as commissioned by the Agricultural and Rural Policy Area of the province of Antwerp. In the last few decades, agriculture and rural areas have been confronted with an accelerating number of changes that not only affect the look of the countryside, but also its functions, position and the experience of those living there. Before the policymakers can best address these rapid changes, they need to first get a good idea of what is currently changing and the extent of the changes, their impact and what has caused them. The goal of this research was to get more insight into one of these changes, namely prevention of non-agrarian economic activities in the countryside.

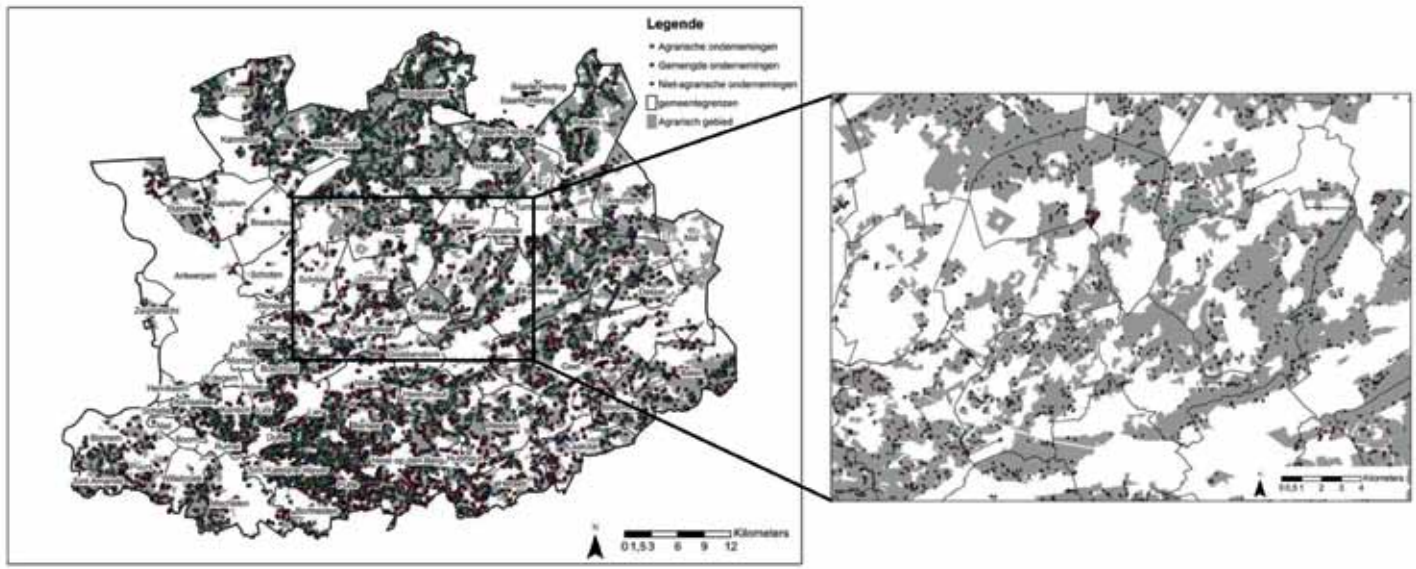
Approach

In this project ILVO made a spatial-economic analysis of the industrial activities within the agrarian area of the province of Antwerp. The primary goal was to inventory and visualise the existing businesses, including the non-agrarian activities, that are active within the agrarian areas of the province. This inventory of rural business activity illustrated the diversity of economic activity in the area. The methodology used (Verhoeve en De Roo, 2008) is based on a GIS-matic coupling of several existing data sets. We then analysed the spatial distribution of these rural commercial activities. To do so, we first confronted the inventory of rural commerce with other data layers to see whether clarifying links could be discovered between the appearance of specific commercial activity and some rural characteristics, such as proximity to cities or towns.

Results

The spatial-economic analysis resulted in several maps. The base map gives an overview of where the various commercial activities are found. Derived maps provide insight into the various types of commercial activity and relations with other rural characteristics.

Title: Spatial-economic analysis of commercial activities within the agrarian area of the province of Antwerp
Funding: province of Antwerp
Term: 2013
Contact: eva.kerselaers@ilvo.vlaanderen.be



Who are the stars of the regional show?

An analysis of the role of actors and policy in processes of region-specific rural development in Flanders

Goal

This doctoral research project investigated the role of actors and policy in region-specific rural development in Flanders. Such development processes focus on the endogenous potential of a region and build on territorial regional capital. The involvement and participation of local actors are central; the assumption is that this can better adapt development processes to specific regional opportunities and problems.

Approach

Four rural regions in Flanders were studied: Meetjesland, Pajottenland, Vlaamse Ardennen en Westhoek. Region-specific rural development processes were analysed using qualitative interviews, focus groups and document analysis.

Results

The research showed that all regions have followed different trajectories of region formation and rural development. This has led to very different regions, each in a different developmental phase. Individual actors have had an important role in the development processes of the studied regions. These actors and their initiatives have strongly influenced the differences among the regions. It seems that the potential for region-specific rural development is related more to actors than to the regions with their variety of assets. All regions have the same kind of regional assets in the form of beautiful landscapes, open space, authentic rural villages and heritage, etc. But divergent initiatives by regional actors and their way of developing the regional assets is what creates differences between the case study regions.

We have also analysed several rural development policies that affect regional actors in the formulation and implementation of region-specific rural development strategies. Our comparison has revealed that the case study regions are all affected in the same way by the European and Flemish rural development policy. Flanders has fixed a limited number of objectives and measures that are eligible for rural development funding. In this way, Flanders strongly influences and limits

the possible development strategies in the case study regions. The intention to enable region-specific rural development is not fully achieved. Also the respective provincial governments have an influence on the region-specific rural development trajectories; this influence is mainly organisational. The provinces influence regional stakeholders through the degree of decentralisation of provincial authorities as well as by interfering in decisions on the regional level.

Title: On regions and their actors. An analysis of the role of actors and policy in processes of region-specific rural development in Flanders.
Funding: ILVO
Term: 2008 - 2013
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An "organic" growth process

The impact of discourse dynamics on the development of organic agriculture in Flanders

Goal

Organic production in Flanders is growing slower than the demand for organic products in the region. In 2012, Flanders had 299 organic farmers, with approximately 0.8% of the area of agricultural land under organic production. This is less than the European average of 5.6% (2011). The research aims to develop insights in the development of the organic agricultural sector in Flanders and related challenges. To do so, we analysed the impact of different discourses on organic farming on the development of institutes and practices related to organic production in Flanders. We studied which discourses exist within the organic market, the policy and the agricultural sector in Flanders, how these different discourses influence each other and what impact changing dominance has on organic development in Flanders.

Approach

Interviews, selected documents and participatory observations provided plenty of qualitative data. Based on critical discourse analyses we gained insights in differences among discourses within the (organic) market, the (organic) agricultural sector, and the (Flemish) agricultural policy. We analysed how the discourses changed within these domains, how the relative dominance of discourses evolved and what impact this had on the development of the organic production and consumption in Flanders in the past decades.

Results

The research reveals that differences in discourses have hindered the coordination and collaboration between the conventional and organic agricultural communities, agricultural policy makers, and food market actors. Such coordination and collaboration is necessary to stimulate growth of organic production. Our results suggest that facilitating the creation of a common discourse across various food and agricultural fields is important to support the development of organic agriculture. Although we focused in our research on interrelations between the organic and conventional farmers' unions, policy makers, and supermarkets, other actors such as feed suppliers, banks, extension officers, veterinarians, and research institutions also play important roles in determining the developments in agricultural sectors.

Understanding these actors' involvement in discursive dynamics is therefore worthy of further investigation.

Title: The role of actors and networks in the development of organic agriculture
Funding: Flemish government
Term: 2010 - 2013
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Scanning for entrepreneurs in agriculture…

Participatory development and validation of an entrepreneur scan for agricultural and horticultural companies

Goal

Craftsmanship in farming and horticulture is not enough anymore. The challenges of sustainable agricultural development require farmers and growers to be entrepreneurs with good management skills. They are thus forced to learn and further professionalise in entrepreneurship. The project aims to develop and validate an entrepreneur scan for supporting entrepreneurship in Flemish agriculture and horticulture. After validation, the ultimate goal is to make the scan available to extension workers and study clubs in agriculture and horticulture, where it can be used to guide companies toward sustainable entrepreneurship. In addition to the use as a stand-alone instrument, the scan can be integrated in tools for integrated sustainability assessment.

Approach

Given that the entrepreneur scan must be both scientifically sound and useful in practice, a participatory approach was used. Both scientific experts and stakeholders from the Flemish agriculture and horticulture were involved such as advisors, representatives of banks, agricultural and horticultural organisations, certification organisations, government agencies, training managers, researchers, and of course the farmers and growers themselves.

The entrepreneur scan is hierarchically structured according to 8 themes, which are further subdivided into 15 indicators. The 8 themes are: Vision-Strategy, Planning-Organisation-Control, Networking-Collaboration, Risk Management, Opportunity Recognition and Exploitation, Searching and Learning Behavior, Innovation and Craftsmanship. These themes and indicators are visually presented in a radar plot (see figure). The radar plot gives a clear overview of the position of a company on the level of the entrepreneurial themes and indicators. All scores are shown on a scale of 0 to 100. The width of a segment reflects the relative importance of a theme or indicator. A bold black line indicates the mean of a reference group of companies.

Results

After an initial test and validation phase on 50 dairy farms, use of the scan as a tool for setting up a learning trajectory was evaluated in study clubs ('Dairy Cafés'), organized by the Division of Monitoring and Study (AMS) of the Flemish Government Department of Agriculture and Fisheries. Further testing and use of the scan in other agricultural and horticultural sectors is recommended.

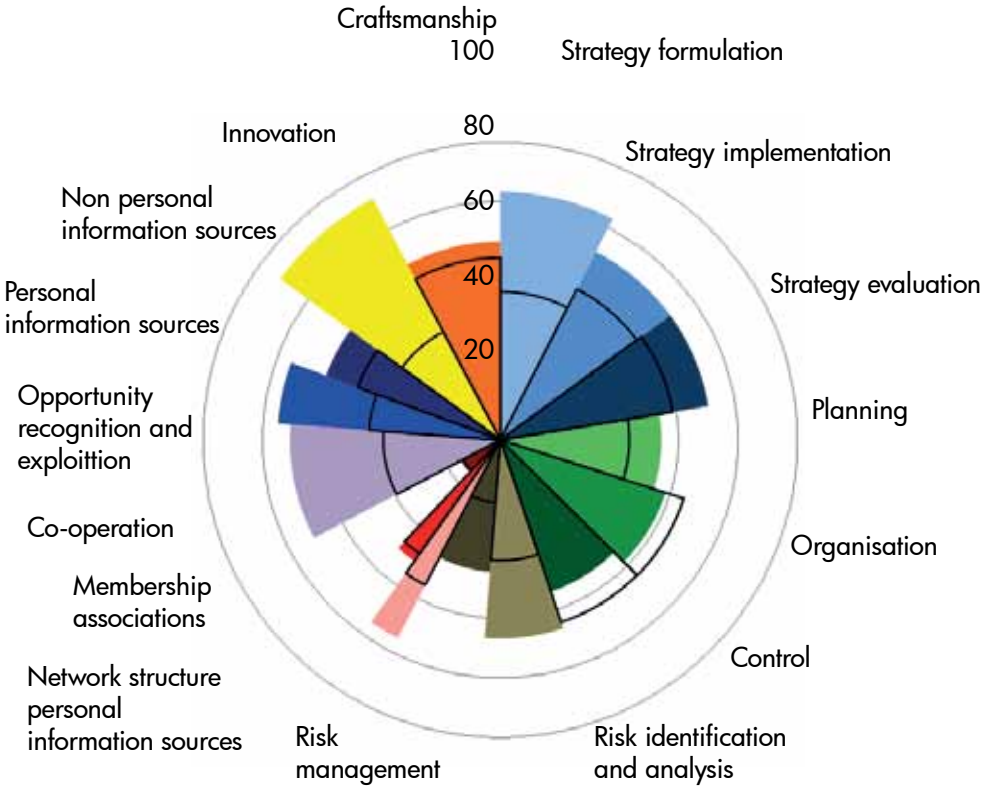

Figure: Entrepreneur scan for agricultural and horticultural companies (indicator level)

Title: Study clubs on entrepreneurship in dairy farming ('Dairy Cafés') (subproject)
Funding: Flemish government
Term: 2011 - 2013
Partners: Hasselt University, Centre for Environmental Sciences (prof.dr.ir. Steven Van Passel); University College Ghent, Department of Life Sciences and Landscape Architecture, Animal Production Unit (dr.ir. Marijke Meul); Department of Agriculture and Fisheries, Administration Monitoring and Study (ing. Joost D'Hooghe)
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Risky business…How do farmers manage economic and financial risk?

Survey on risk perception, attitude and management in Flemish agriculture

Goal

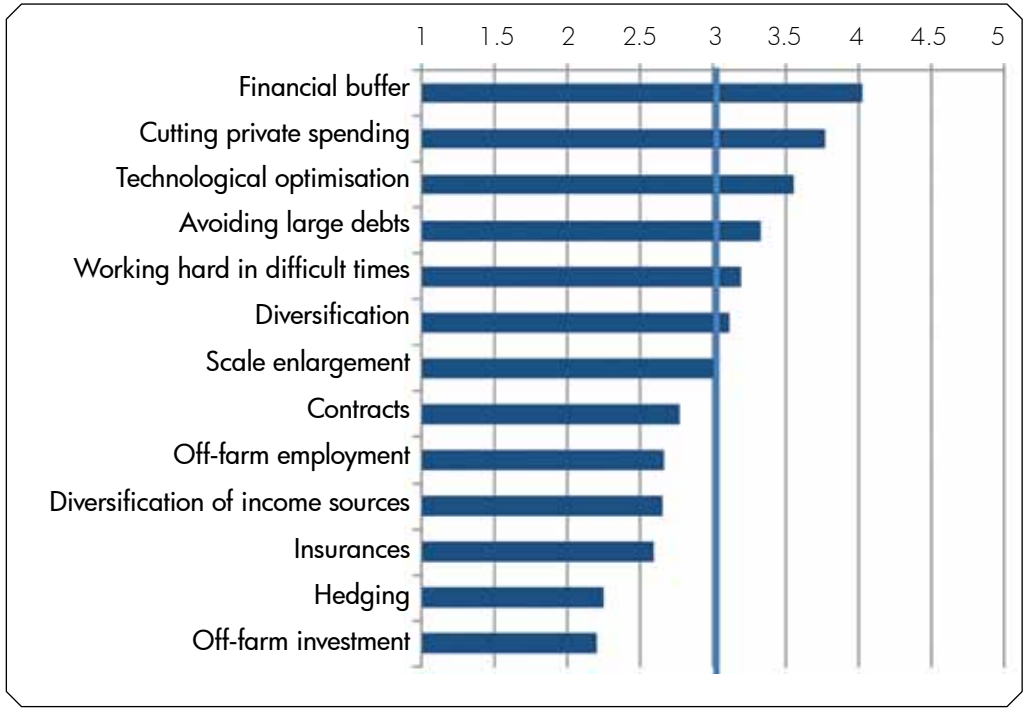
Risk and uncertainty in agriculture are increasing and will remain important in the future. Researchers, extension agents and policy makers play an important role in offering choices to the agricultural sector about how to manage risk and uncertainty. They need sound knowledge about what is at stake, which risks are perceived by farmers and how farmers judge the relevance of several risk management strategies. Therefore, a survey of 759 Flemish farmers was performed to assess farmers' risk perception, risk attitude and risk management strategies.

Approach

Risk perception was assessed by asking farmers to rate the frequency and the impact of several shocks. Risk attitude was measured by presenting the farmers a series of statements to which they had to indicate their degree of agreement. To assess risk management, farmers were asked to indicate the suitability of a number of risk management strategies. Finally, using a series of statements, we assessed to which degree risk management was performed at the household level.

Results

Landbouwers zijn vooral bezorgd over marktrisico's, door hen gedefinieerd als Farmers are mostly concerned about market risks, which they define as uncertainty about the longer term co-evolution of increasing expenses and decreasing income. This differs substantially from the more common definition in scientific literature, where market risk is conceptualised as the volatility in input and output prices. Other important risk sources identified through the survey are land availability and policy changes. Risk management strategies such as contracts, insurances and hedging were regarded among the least relevant strategies. This is paradoxical because these attract the most attention nowadays, both in research and among policy makers. Farmers put more faith in internal strategies such as liquidity management by maintaining a financial buffer and cutting private spending, debt management, diversifying and by working hard in difficult times. Finally, our results indicate that a substantial part of the risks from farming are buffered at the household level by strategies such as off-farm employment and cutting private expenses.



Relevance of risk management strategies

Title: Farm-level risk analysis and management in Flemish agriculture
Funding: IWT
Term: 2009 - 2014
Partners: University of Hasselt
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New projects and
a selection
of ongoing
research at
the Social Sciences Unit

Networking for sustainable food.
How can self-governance of food networks contribute to the development of a more sustainable food system?

Title: A sociological analysis of self-governance in agriculture
Funding: ILVO
Term: 2013 - 2017
Partners: UA
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Sustainability in chains?
What is the impact of supply chain relationships on the transformation towards a more sustainable agri-food chain?

Title: Institutional organisation of sustainable transformation of the agri-food chain
Funding: ILVO
Term: 2013 - 2017
Partners: Ghent University
marianne.hubeau@ilvo.vlaanderen

How can we underpin the transformation to a more sustainable agri-food chain in a conceptual and methodological way?

Title: Transformation to sustainable agriculture and nutrition
Funding: Consortium ILVO – Platform duurzame ontwikkeling landbouw en voeding. Ondersteund met middelen van Vlaanderen in Actie
Term: 2013 - 2015
Partners: Platform duurzame ontwikkeling landbouw en voeding: BEMEFA, ABS, Boerenbond, FEVIA, Comeos and UNIZO and in cooperation with werkgroep landbouw-voeding van transitie middenveld
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Learning and measuring, linked in the chain
How can learning and measurement tools be interlinked at company, sector and chain level and how can they reinforce each other?

Title: Effectiveness of measurement and learning tools in sustainability processes at corporate and chain level
Funding: ILVO
Term: 2013 - 2017
Partners: Ghent University, Boerenbond
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Which innovative combinations of multiple plant biomass valorisation pathways offer the most sustainable outlook for agricultural and processing companies?

Title: Construction of a integral assessment tool for sustainable multiple valorisation trajectories of plant biomass
Funding: IWT
Term: 2013 - 2017
Partners: Ghent University
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New projects and
a selection
of ongoing
research at
the Social Sciences Unit

Look before you leap.
What determines risk in agriculture and how do farmers perceive and manage risks?

Title: Resilience and risk management of agricultural systems
Funding: ILVO
Term: 2013 - 2016
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Decisions, decisions…
How can a farmer use a science-based decision support tool to improve his management?

Title: Participatory interpretation and evaluation of farm-specific strategy design in dairy farming
Funding: ILVO
Term: 2013 - 2015
Partners: Ghent University, LIBA
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One farmer, one vote.
How can participatory democracy and integrated rural development go together?

Title: Democracy and integrated rural development: the case of LEADER
Funding: Grant - External (Ghent University)
Term: 2013 - 2015
Partners: Ghent University
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Power gardening.
How can we mobilise the strategic potential of domestic gardens via their private owners?

Title: The garden complex in strategic perspective: the case of Flanders
Funding: ILVO
Term: 2013 - 2014
Partners: K.U.Leuven
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Stars of the city.
Which actors and institutions in the urban region govern and shape the development process of urban agriculture?

Title: Governance of urban agriculture in a comparative perspective: a sociological analysis
Funding: ILVO
Term: 2013 - 2017
Partners: Ghent University
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The peri-urban "greenhouse" effect.
How should land use and landscape in Flemish peri-urban areas be organised to adapt to climate change and secure local food production?

Title: Research by design on climate adaptive spatial concepts for the peri-urban areas in Flanders
Funding: ILVO
Term: 2013 - 2017
Partners: Antwerp University
jeroen.dewaegemaeker@ilvo.vlaanderen.be

SERVICES & PRODUCTS

The fundamental and practical scientific research performed at ILVO forms the foundation of the services we provide. All of the agricultural and fisheries-related industries can choose from an ever-expanding list of highly specialised services. These service activities deliver a win-win situation for all involved: the clients know that they are receiving only the most up-to-date scientific knowledge and advice, and by performing these services, ILVO stays in touch with the daily complexities of the agribusiness and fisheries sectors.

This annual report gives a well-structured overview of the services and products available from ILVO. For more information, contact the person(s) noted below. Businesses, individuals and organizations requesting a service from ILVO always receive a fair and unchanging price quote, and that confidentiality can be guaranteed whenever possible within the applicable legislation.

- ✓ LABORATORY ANALYSES
- ✓ REFERENCE LABORATORIES
- ✓ INSPECTION AND CERTIFICATION
- ✓ TECHNOLOGICAL SERVICES
- ✓ ADVICE
- ✓ PRODUCTS

LABORATORY ANALYSES

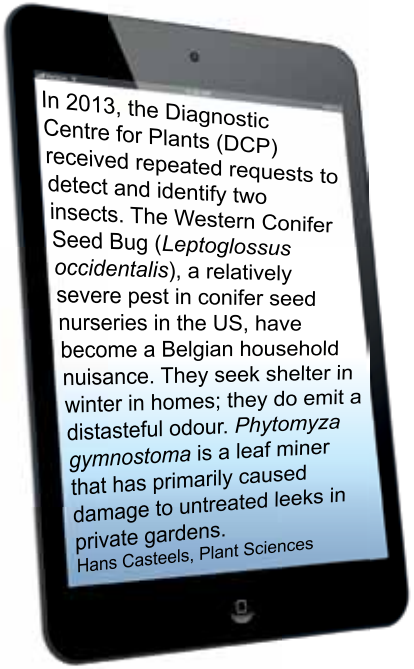
ILVO has dozens of specialized and mostly accredited labs for scientific research. These labs can also be visited by the public. All tests are performed by experienced and well-trained staff under supervision by a scientist. As needed, the researchers examine whether such tests would be appropriate for use under practical and industrial conditions.

Food Science

Chemical food safety	els.daeseleire@ilvo.vlaanderen.be wim.reybroeck@ilvo.vlaanderen.be sigrid.ooghe@ilvo.vlaanderen.be
Microbiological food safety	koen.dereu@ilvo.vlaanderen.be marc.heyndrickx@ilvo.vlaanderen.be
Ingredients, authenticity and quality	jan.deblock@ilvo.vlaanderen.be els.daeseleire@ilvo.vlaanderen.be hadewig.werbrouck@ilvo.vlaanderen.be hendrik.deruyck@ilvo.vlaanderen.be wim.reybroeck@ilvo.vlaanderen.be sigrid.ooghe@ilvo.vlaanderen.be isabel.taverniers@ilvo.vlaanderen.be
Organoleptic research	jan.deblock@ilvo.vlaanderen.be hendrik.deruyck@ilvo.vlaanderen.be
Houdbaarheid	els.vancoillie@ilvo.vlaanderen.be
GMO detection	isabel.taverniers@ilvo.vlaanderen.be bart.vandroogenbroeck@ilvo.vlaanderen.be marc.deloose@ilvo.vlaanderen.be
Allergens	isabel.taverniers@ilvo.vlaanderen.be
In vitro screening and gastro-intestinal simulations	marc.heyndrickx@ilvo.vlaanderen.be geertrui.rasschaert@ilvo.vlaanderen.be

Plants ans soil

Plants, soil and substrates	chris.vanwaes@ilvo.vlaanderen.be
Diagnostic Centre for Plant Diseases (DCP)	lutgart.dewael@ilvo.vlaanderen.be
Ploidy analysis	leen.leus@ilvo.vlaanderen.be
Molecular markers	jan.deriek@ilvo.vlaanderen.be



Animal/Marine Sciences

Animal feed	johan.deboever@ilvo.vlaanderen.be
Blood analysis - animal	johan.aerts@ilvo.vlaanderen.be
Intermediate products (rumen fluid and intestinal content)	johan.deboever@ilvo.vlaanderen.be
Excretion products (excreta, faeces and urine)	johan.deboever@ilvo.vlaanderen.be
Animal end products (milk, meat, eggs)	johan.deboever@ilvo.vlaanderen.be
Marine environment (fishing boat, sea water)	bart.verschueren@ilvo.vlaanderen.be
Marine sediment	bavo.dewitte@ilvo.vlaanderen.be
Epibenthos	sofie.vandendriessche@ilvo.vlaanderen.be
Macrobenthos	jan.wittoeck@ilvo.vlaanderen.be
Plankton	lies.vansteenbrugge@ilvo.vlaanderen.be
Fish	karen.bekaert@ilvo.vlaanderen.be

REFERENCE LABORATORIES

Who analyses the lab analyses for their reliability? Who is the independent referee? The answer, in a growing number of cases, is "ILVO". This year, the federal government of Belgium added GMO detection in food matrices and detection of allergens in food, to the list of reference analyses performed at ILVO's Technology and Food Science Unit. We are also officially mandated to perform independent and reliable tests and monitoring of labs and instruments to ensure that industrial, private or public labs exactly measure what they say they measure. Customers with questions or doubts about the exactness of a lab analysis perfomed elsewhere can also go to ILVO for help.
Of course, being chosen as a reference lab illustrates the excellence of ILVO's labs. But even more importantly, this reference work contributes to correct analyses throughout the nation, which guarantee that the correct assessments will be made and lead to better public health.

Certified national reference labs (NRL)

NRL Plant diseases	martine.maes@ilvo.vlaanderen.be annemie.hoedekie@ilvo.vlaanderen.be
NRL Milk and dairy products	koen.dereu@ilvo.vlaanderen.be
NRL Residues of Veterinary Drugs	sigrid.ooghe@ilvo.vlaanderen.be wim.reybroeck@ilvo.vlaanderen.be els.daeseleire@ilvo.vlaanderen.be
NRL Water content in poultry	hadewig.werbrouck@ilvo.vlaanderen.be
NRL GMOs	isabel.taverniers@ilvo.vlaanderen.be
NRL Allergens	isabel.taverniers@ilvo.vlaanderen.be

Mandated reference work

Coordination of the Milk Control Centre of Flanders	hadewig.werbrouck@ilvo.vlaanderen.be
VCU and DUS research – variety lists	joke.pannecoucque@ilvo.vlaanderen.be johan.vanwaes@ilvo.vlaanderen.be
Air emissions and sustainable production techniques (LNE)	peter.demeyer@ilvo.vlaanderen.be eva.brusselman@ilvo.vlaanderen.be
Coordination of fisheries management	els.torreele@ilvo.vlaanderen.be

Other reference work

Ring tests for the dairy industry	wim.reybroeck@ilvo.vlaanderen.be sigrid.ooghe@ilvo.vlaanderen.be hadewig.werbrouck@ilvo.vlaanderen.be
Animal marine laboratory (ANIMALAB)	johan.aerts@ilvo.vlaanderen.be

INSPECTION AND CERTIFICATION

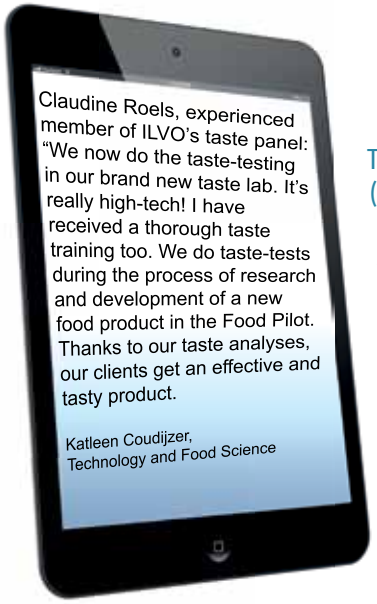
The safe production of primary agricultural products requires machines in perfect working order. Milk machines, spray installations or any other agricultural equipment must both work well and be well-maintained. The government has selected ILVO to inspect certain installations. To do so, one must have technical and chemical-biological knowledge. In addition to periodic inspections and certifications, ILVO is also actively involved in the training of maintenance technicians.

Milk technique

Inspection/certification of milking machines (Control)	stephanie.vanweyenbergh@ilvo.vlaanderen.be sarah.delaeter@ilvo.vlaanderen.be
Quality inspection of maintenance of milking machines (Control)	stephanie.vanweyenbergh@ilvo.vlaanderen.be sarah.delaeter@ilvo.vlaanderen.be

Spray application technology

Certified inspection of sprayers in Flanders	johan.declercq@ilvo.vlaanderen.be david.nuyttens@ilvo.vlaanderen.be
Testing of agricultural equipment	jurgen.vangeyte@ilvo.vlaanderen.be
Kits for antibiotic determination	wim.reybroeck@ilvo.vlaanderen.be



TECHNICAL / TECHNOLOGICAL SERVICES (TO SMEs, BUSINESS AND GOVERNMENT)

Businesses and organisations wishing to progress through innovation can call on ILVO's scientific expertise. The key to our service provision and advice is flexibility. Experience has taught us that the process of sharing scientific expertise with diverse industrial sectors requires custom-made services that address the customers' specific needs and requests. Some examples of this can be found in the knowledge network for ornamental plants (Sierteelt Sietinet), the Welfare Quality Protocol, which ILVO developed to measure animal welfare in agribusiness, and the possibility to pilot-test new food products in the renewed and expanded Food Pilot.

Plant Sciences and Crop Husbandry

Experimental field tests	kristiaan.vanlaecke@ilvo.vlaanderen.be
Disease resistance screening	kurt.heungens@ilvo.vlaanderen.be
Image-based analysis of shape and color	peter.lootens@ilvo.vlaanderen.be
Monitoring growth	peter.lootens@ilvo.vlaanderen.be
Genetic analyses	kristiaan.vanlaecke@ilvo.vlaanderen.be
Development of crossing schemes	johan.vanhuylenbroeck@ilvo.vlaanderen.be
Pre- en post-control of seeds and propagation material	johan.vanwaes@ilvo.vlaanderen.be

Animal husbandry

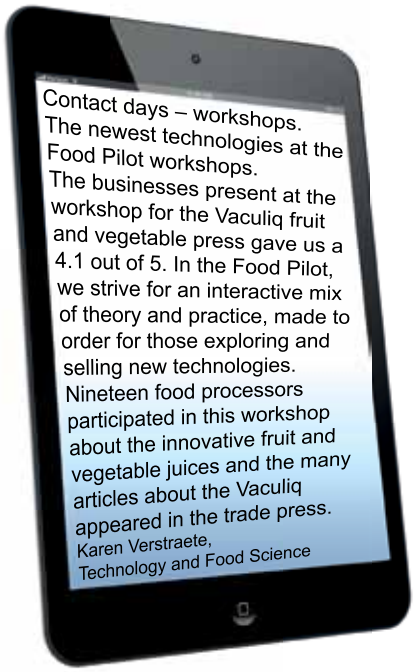
Feed evaluation and feed preservation	johan.deboever@ilvo.vlaanderen.be
Zootechnical tests with dairy cows	leen.vandaele@ilvo.vlaanderen.be stephanie.vanweyenbergh@ilvo.vlaanderen.be
Zootechnical tests with meat cattle	sam.decampeneere@ilvo.vlaanderen.be stephanie.vanweyenbergh@ilvo.vlaanderen.be
Zootechnical tests with pigs	sam.millet@ilvo.vlaanderen.be annelies.vanuffel@ilvo.vlaanderen.be
Zootechnical tests with small farm animals	luc.maertens@ilvo.vlaanderen.be evelyne.delezie@ilvo.vlaanderen.be
Behaviour and welfare of farm animals	frank.tuyttens@ilvo.vlaanderen.be annelies.vannuffel@ilvo.vlaanderen.be
Emissions from cattle	sam.decampeneere@ilvo.vlaanderen.be nico.peiren@ilvo.vlaanderen.be peter.demeyer@ilvo.vlaanderen.be
Excretion experiments - poultry	evelyne.delezie@ilvo.vlaanderen.be els.daeseleire@ilvo.vlaanderen.be
PreventAgri: safety on the farm	robin.desutter@ilvo.vlaanderen.be

Fisheries, aquaculture and aquatic environment

Design and testing of fishing boats	bart.verschueren@ilvo.vlaanderen.be
Evaluation of sustainability	kim.sys@ilvo.vlaanderen.be kelle.moreau@ilvo.vlaanderen.be arne.kinds@ilvo.vlaanderen.be
CIVIS (fishing gear and guidance)	els.vanderperren@ilvo.vlaanderen.be
Test setups for marine experiments (including acquaculture)	daan.delbare@ilvo.vlaanderen.be johan.robbens@ilvo.vlaanderen.be kris.hostens@ilvo.vlaanderen.be hans.polet@ilvo.vlaanderen.be
Scientific diving	stefan.hoffman@ilvo.vlaanderen.be
Aquaculture	daan.delbare@ilvo.vlaanderen.be
Fisheries biology	hans.polet@ilvo.vlaanderen.be els.torreele@ilvo.vlaanderen.be

Food and feed technology

Food Pilot	geert.vanroyen@ilvo.vlaanderen.be katleen.coudijzer@ilvo.vlaanderen.be karen.verstraete@ilvo.vlaanderen.be nathalie.bernaert@ilvo.vlaanderen.be
Advice for dairy (TAD Zuivel)	katleen.coudijzer@ilvo.vlaanderen.be
Fish quality	karen.bekaert@ilvo.vlaanderen.be sabrine.derveaux@ilvo.vlaanderen.be daphne.deloof@ilvo.vlaanderen.be johan.robbens@ilvo.vlaanderen.be geertrui.vlaemynck@ilvo.vlaanderen.be

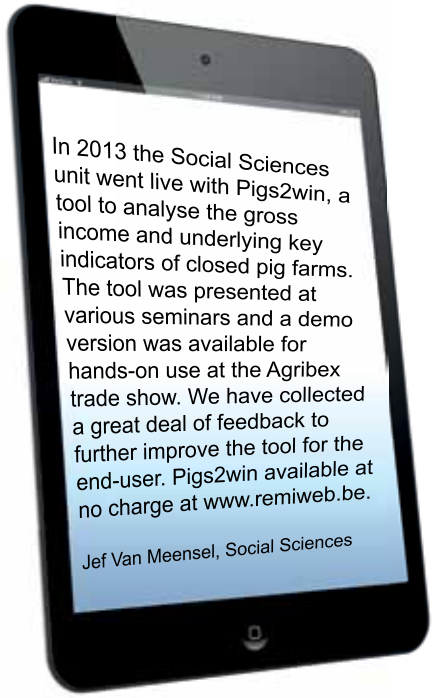


Agricultural Engineering

ICT/automation	koen.mertens@ilvo.vlaanderen.be jurgen.vangeyte@ilvo.vlaanderen.be
Machine design	jurgen.vangeyte@ilvo.vlaanderen.be
Low-emission stalls (indoor climate and emissions)	peter.demeyer@ilvo.vlaanderen.be eva.brusselman@ilvo.vlaanderen.be
Cattle emissions	sam.decampeneere@ilvo.vlaanderen.be nico.peiren@ilvo.vlaanderen.be peter.demeyer@ilvo.vlaanderen.be
Spray tech lab	david.nuyttens@ilvo.vlaanderen.be
Sustainability of stall materials	veerle.vanlinden@ilvo.vlaanderen.be
Analysis of mechanical impact during potato harvest	bart.eloot@ilvo.vlaanderen.be
Zootechnical tests with dairy cows	leen.vandaele@ilvo.vlaanderen.be stephanie.vanweyenberg@ilvo.vlaanderen.be
Zootechnical tests with pigs	sam.millet@ilvo.vlaanderen.be annelies.vanuffel@ilvo.vlaanderen.be
Underwater weighing of fruit and vegetables	bart.eloot@ilvo.vlaanderen.be

Social Sciences

(Participatory) process facilitation	fleur.marchand@ilvo.vlaanderen.be lies.debruyne@ilvo.vlaanderen.be elke.rogge@ilvo.vlaanderen.be joost.dessein@ilvo.vlaanderen.be
Quantitative and model-driven support of decision-making processes	jef.vanmeensel@ilvo.vlaanderen.be dakerlia.claeys@ilvo.vlaanderen.be



ADVICE

IVO offers advice on the following subjects to the government. This list also contains the expertise offered via participation in numerous national and international networks.

Advice to government

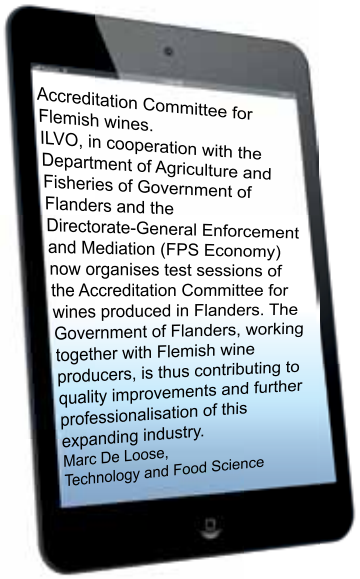
Advice about the legal decision regarding damage from wild animals	bert.vangils@ilvo.vlaanderen.be
Advice on agrarian nature management and agrobiodiversity	bert.reubens@ilvo.vlaanderen.be
Certification of the PDPO (Flemish Program Document for Rural Development)	jef.vanmeensel@ilvo.vlaanderen.be
Low-emission animal housing systems (VLM)	peter.demeyer@ilvo.vlaanderen.be
Scientific advice for FASFC	lieve.herman@ilvo.vlaanderen.be
Scientific advice for the Superior Health Council (SHC)	marc.heyndrickx@ilvo.vlaanderen.be
Scientific advice for the European Food Safety Authority (EFSA)	lieve.herman@ilvo.vlaanderen.be

Advice to organizations and networks

Pilot farm Kosovo	alex.devliegher@ilvo.vlaanderen.be
Network for Research on Organic Farming and Food (NOBL)	lieve.decock@ilvo.vlaanderen.be
ERA net (ICT-Agri, SUSFOOD, marinera)	jurgen.vangeyte@ilvo.vlaanderen.be hendrik.deruyck@ilvo.vlaanderen.be
JPI HDHL EC Joint Programming Initiative 'Healthy Diet for a Healthy Life'	hendrik.deruyck@ilvo.vlaanderen.be
Consortium for Knowledge-Building about Air Emissions in Animal Husbandry (VEMIS)	peter.demeyer@ilvo.vlaanderen.be

Advice to SMEs and businesses

Sustainability Monitoring	fleur.marchand@ilvo.vlaanderen.be
Consortium for Knowledge-Building about Air Emissions in Animal Husbandry (VEMIS)	peter.demeyer@ilvo.vlaanderen.be
Consortium Agroforestry (forest agriculture systems)	bert.reubens@ilvo.vlaanderen.be
Cost/benefit analysis and technological advice for aquaculture activities	daan.delbare@ilvo.vlaanderen.be
Technology Pool for Ornamentals (knowledge centre for ornamental growers)	johan.vanhuylenbroeck@ilvo.vlaanderen.be
The Pig Window ('Varkensloket')	sarah.desmet@ilvo.vlaanderen.be



PRODUCTS

Breeding of ornamentals and agricultural varieties (mainly grasses) at ILVO is always done to increase both sustainability and profitability of the plants. New ornamental cultivars bred at ILVO are commercialized via two cooperatives. New agricultural varieties are sold to multiplication companies worldwide.

ILVO Fisheries has witnessed a growing demand for sea water. ILVO owns a direct pipeline that brings water from deep in the North Sea onto land and can thus sell sea water on demand.

Ornamental Plants

Azalea - AZANOVA	johan.vanhuylenbroeck@ilvo.vlaanderen.be
Woody Ornamentals - BEST-select	johan.vanhuylenbroeck@ilvo.vlaanderen.be

Field and Greenhouse Plants

RVP varieties	marianne.malengier@ilvo.vlaanderen.be
Seawater	daan.delbare@ilvo.vlaanderen.be
Marine Organisms	hans.polet@ilvo.vlaanderen.be

management

Research Coordination 2013

Record breakers

The number of A1 (peer-reviewed) publications where ILVO authors were either first author or co-author continues to rise. In the selective list at the end of this 2013 report you can find no less than 151 of A1 articles. This means that in in 6 years' time we have a 50% growth rate in our high-level scientific output. In 2007 there were 98 A1s; in 2008, 106; in 2009, 117; in 2010, 126; in 2011, 151 and in 2012, 182.

As of the end of 2013, 110 doctoral projects were underway at ILVO. That is a record too – one that illustrates how many new, inspired researchers we have in our ranks. We had 27 PhD grants looking for students in the summer of 2013 alone. ILVO ended the year with the highest number of employees ever: 614 to be precise, 291 of which are employees who have a Master's or PhD diploma.

Focus via the Research Programme

At the time of this writing, the new Research Programme 2014-2016 has just begun. In the last three months of 2013, the scientific directors worked hard to write this new programme, once again based on the 9 programmes of ILVO2020. The new Research Programme was delivered in December to the Department of Agriculture and Fisheries. Evaluation of the policy-supportive projects is done by the Department's administrators whereas the fundamental research projects are evaluated by ILVO's Advisory Board (spring 2014).

Ambitious, innovative and future-oriented through ILVO Own Capital funds

In 2011, ILVO launched the ambitious system of "Coordinated Actions" (GA in Dutch). These Coordinated Actions are made possible by a generous set-aside to fund research projects that symbolise a "big challenge" as defined by ILVO2020. Among the most important selection criteria are interdepartmental working and multidisciplinarity. In 2012 we announced the very first GA: "GeNeSys: Use of Waste Streams as System Innovation". That multidisciplinary team of ag economists, food technologists, fisheries researchers and soil scientists was fully up to speed by 2013. That GA explores ways to meet societal demands for more efficient use of production resources, waste reduction, and to close cycles of resource use. These GAs emphasise the close involvement of many external stakeholders (farmers and growers, ship owners, consumers, distributors, technologists, researchers, policymakers, etc.). In the meanwhile, the Board of Directors has approved a second GA: the Genomics project entitled "Diving deep into the genetic diversity of (meta)populations". This project was selected from a wide number of candidates. Central to this GA is the implementation of generic genomics tools that are custom-designed for ILVO research needs. The ILVO researchers will generate the critical know-how in terms of next generation sequencing. The Genomics platform ensures that ILVO will remain an attractive partner in areas where sequencing technologies are already in use, or will be soon.

The ink on the first signed Genomics doctoral grant was not even dry when the third GA call went out the door. A successor to GeNeSys and Genomics may be named as soon as mid-2014.

Bottom up: ILVO2020

ILVO2020 was the organisation-wide exercise to identify the "big challenges" in agriculture and fisheries research in Flanders. The intellectual harvest of ILVO2020 – multidisciplinary Partners and discussion across all four research units – remains one of ILVO's greatest treasures. The discussion model has now achieved its main goal, so in 2013 we pushed the "pause button" on the ILVO2020 working groups. We are now reworking the discussion model to generate fresh ideas around research themes. The foundations laid by the ILVO2020 working groups will give rise to a totally new structure starting in 2014. That structure will create a space to stimulate a critical, inventive dialogue in ILVO. Time to push "start" again!

Twin supports make for a healthy balance (sheet)

A report from the Financial and Internal Control departments

Finances

ILVO has two sources of income: the Government of Flanders (ILVO is an internal independent agency (IAA)) and ILVO's Own Capital fund. As an IAA, ILVO receives a yearly allowance for the operations, investments and personnel costs for the Government of Flanders. The separate corporate personality called ILVO Own Capital (EV ILVO in Dutch) has always generated a healthy income stream above the yearly allowance. The Own Capital income sources mainly come from project funding, with additional sources being royalties on seeds and plants bred at ILVO and services provided.

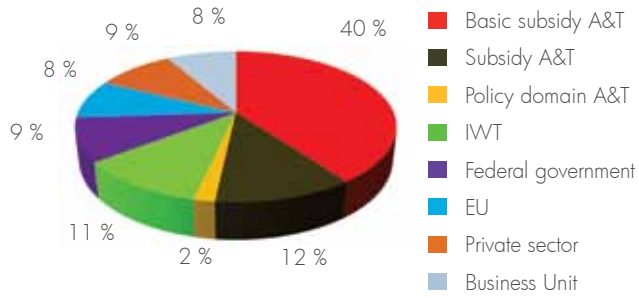
The bookkeeping for both the IAA and Own Capital is audited separately. The annual bookkeeping of the Own Capital fund is presented to the Own Capital Management Commission which also has a Financial Inspector. In addition, an external audit is performed. Both sets of bookkeeping are audited by the Government of Flanders' Central Accounting office and the "Rekenhof". ILVO's management team examines both income streams together to analyse the total cost of operations of the entire institute.

Internal Control

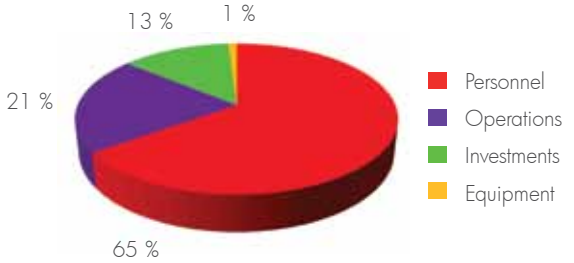
In 2013, as a follow-up to the positive audit that ILVO received from the Internal Audit of the Flemish Administraion (IAVA) in 2011, we received additional recommendations and addressed these accordingly. In the future, ILVO will optimise and maximise control of these processes to realise all of the strategic and assigned goals.

The ILVO quality handbook is updated continually. This handbook describes the work processes in detail, together with their risk analysis. In autumn 2013 during an annual strategy seminar, the committee of scientific directors (COWEDI) set the new operational goals for 2014. This determines the short-term actions needed to meet ILVO's long-term strategic goals.

In the beginning of 2014, the COWEDI will also make its annual evaluation of the internal control. This happens by assigning a maturity score to each of the operational measures per theme. The system is then set out in a performance indicator (PI). To follow the actual accomplishment of these goals, we created new "critical success factors" (KSF) and the related critical performance indicators (KPI). The research units as well as the ILVO's central management follow these up. During the COWEDI's strategy seminary, the KPIs were evaluated. The consolidated Balanced Score Card (BSC) offers a global image of ILVO.



Income sources 2013



Expenses 2013

Setting the right course, electronic "ploughing" of employees, and an in-house coach

Personnel and Human Resources management

"KOMPAS" - ILVO on the right course

ILVO now has a leadership instrument specifically developed for ILVO. The ILVO personnel services, together with a dozen managers at ILVO, developed the instrument called "KOMPAS" (the Dutch word for "compass" – with nods to the word "compassion").

The letters stand for "Knowledge, Openness, Courage, Passion, Appreciation, and Support".

To introduce KOMPAS, we organised an HR symposium for all managers on December 12, 2013. Three external speakers (Dirk Buyens, Herman Van de Velde and Brunhilde Borms) all spoke from their own context with the goal of inspiring the ILVO managers.

E-PLOEG

ILVO's system of personnel evaluation and guidance is called "PLOEG" (the word for "plough" in Dutch). Together with the ICT department, this system went virtual this year with the new name E-PLOEG. This simplifies the follow-up of each employee's planning, tracking and evaluation. In addition, E-PLOEG makes it possible for managers and employees to manage the current and needed competencies on an individual level as well as for the organisation as a whole.

Coaching

In 2013, the internal coaching process grew roots after starting out last year. An increasing number of employees (particularly managers) have found their way to the coaching service and see the advantages of having a listening ear within the organisation. In mid-2013, a coaching network was created within the Government of Flanders; ILVO is also part of that network.

Total staff composition as of 31/12/13, number of staff expressed in full-time equivalents (FTEs)

	male/VTE	female/FTE	total/FTE	share of OC (%) of the total FTE
A-level	130/127,6	158/147,7	288/275,3	61,8/63,2
B-level	62/60,2	73/63,5	135/123,7	58,5/60,2
C/D-level	112/106,4	79/60,9	191/167,3	41,4/43,5
Total	304/294,2	310/272,1	614/566,3	54,7/56,7

ILVO Communication: accessible, interactive and educational

Accessible

According to ILVO, scientific communication should be accessible, easy-to-find and relevant. All those involved with agriculture, horticulture, fisheries and food production – whether they are intimately involved or observing from a distance - should be able to find information about our research results and our services in a fast and efficient manner.

With this in mind, in 2013 the ILVO website (www.ilvo.vlaanderen.be) got a more centralised sending and archiving function. Since the end of 2012, the structure of that website has been thoroughly reorganised. The entire site is now completely bilingual in Dutch and English. The top-level service and current news items are connected with a deeper level called the "research portal" (www.pure.ilvo.vlaanderen.be). A user-friendly interface easily leads to researchers' biographies, research units, research projects and publications. This improved website is earning increasing interest: 26,000 visitors in the last year, which translates to about 55 unique visitors per day.

ILVO has continued to work actively with the mass media and the trade press. In 2013 we sent about 50 press releases. Journalists were informed of every newly-finished doctoral project. The highly technical information was presented in a popularised fashion that responded to current issues in Flemish agriculture and fisheries. Our findings about nematodes against pests, clover rot, precision agriculture, boar taint, farm animal health and welfare, campylobacter, zooplankton, valorisation of waste, and many other items were picked up by newspapers, magazines and trade journals.

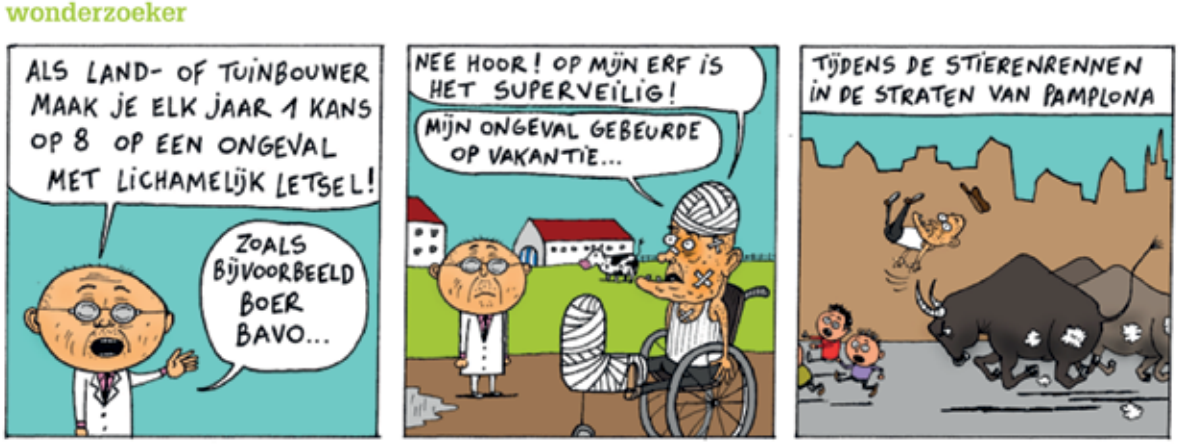
By delivering ready-to-use material to editors and target groups, we garnered attention for important ILVO messages: in the agricultural and rural magazine "*Landgenoten*", ILVO filled a double-page format with seven research topics up to the end of 2013. Four ILVO "*Nieuwsgolf*" newsletters, which are sent electronically and are now bilingual in Dutch and English, found their way to the in-box of over 3000 stakeholders. We have received unanimously positive reactions to the modern layout and relevant content.

Interactive

Communication is speaking and listening. In 2013, ILVO consciously sought to create more interactive formules during B2B meetings with the ag and fisheries industries. We always carefully craft our study-days, demonstrations, workshops, press conferences, symposiums and trade shows…in short, any occasion where we can thematically and thoroughly explain what is known in science and how that knowledge can be applied in practice. Panel discussions, question-and-answer sessions, focus groups, testimonials from those in practice, brainstorming sessions, dialogue days, interviews…the audiences consistently and enthusiastically engaged with ILVO representatives.
Sharing our knowledge, even with individual citizens and society at large, is a part of ILVO's mission. This was evidenced by our willing participation in debates (about GMOs), receiving domestic and international visitors and giving them tours of our facilities, and helping with *www.ikhebeenvraag.be*, which is an initative of 14 Flemish and federal scientific institutions wishing to spread scientific information and innovation. ILVO answered 67 questions from citizens; this was triple the number of questions answered by ILVO researchers 5 years ago.

Educational

In our role of supporting and advising policy makers, ILVO sometimes gets the assignment to (re)act to phenomena that our research has uncovered. One notable example is "*PreventAgri*". This ILVO service studies the occupational safety on farms. The upsetting statistics uncovered in that research led to the urgent need for an action plan and a consciousness-raising campaign. "*Landbouw zonder kleerscheuren*" (or "Farming in One Piece" in English) became a gripping short film and a brochure with dramatic pictures. Both were produced in-house at ILVO. The Flemish Minister-President took this campaign on the road during the "*Werktuigendagen*" ("Machinery Days") in Oudenaarde, together with an ILVO team, and also to Agribex, an ag trade show. Meanwhile, after two round-table sessions, those involved have taken important steps toward an action plan for improved occupational safety.



Environment, Employee Health and Facilities Management

Investment: a perennial necessity

All of ILVO's research questions improve sustainability in some form. 2013 illustrated the advantages of a close-knit integration of environment, health and facilities management. A deepening of the interaction between these three elements is one of ILVO's challenges for the near future. In spite of the budgetary constraints of the Government of Flanders, ILVO continues to invest in environment and employee health/wellness issues. We strive to serve as an example for the agricultural and fisheries industries. ILVO's attention to health and safety is reflected in the limited number of work-related injuries and most importantly, the lack of serious injuries.

We continue to systematically improve the environmental sustainability of our facilities. The ILVO management team decided this year that all of the BELAC-accredited labs (those who do analyses for the FAVV) will now conform to the environmental norm ISO 14001. The certification audit for this accreditation will normally take place in mid-2014.

In 2013 we continued to invest in our patrimonium. Now that the important improvements to the Plant Sciences Unit and the Food Pilot are complete, investments are being made in the Animal Sciences Unit and Technology and Food Science Unit (Agricultural Engineering department).

The structure of the new experimental dairy cow house was completed in 2013; the technical equiment will follow in 2014.
The architectural/engineering firm DLV has completed its work for the new sow house and the design is now in progress. We intend to gather bids and complete the building process in 2014. The exploratory work for a new experimental poultry house and the new aquaculture building have also been completed. The new aquatic breeding lab in Ostend is now in the testing phase; once operational it will play an important role in high-quality research.

Other building and environmental projects included the completion of the water-separation works at the Animal Sciences site in Melle. The Agricultural Engineering workshops are now being renovated to completely renew and insulate the roofs and outside walls to meet modern norms. This will greatly increase the comfort of the employees as well as reducing ILVO's energy use. That project is scheduled for completion in mid-July 2014.

ICT on "Cloud" 9

Virtualising our information and communication technology

The seven ICT employees are responsible for the ICT needs of all 600 ILVO employees over seven sites, from software to the computer infrastructure and networks. The ICT department also creates custom-made applications are made to support the various research and management tasks at ILVO. Together with the Communication department, the ICT team is also responsible for the technical development of the ILVO website and Intranet. ICT also manages the (mobile) telephone infrastructure.

ICT's main projects in 2013 were:

- Virtualising the server park. All physical servers were gradually virtualised in a VMWare cluster. This offers important benefits in terms of manageability, much more efficient use of the existing resources, and expanded and more reliable back-ups.
- Installing a video-conferencing system in Merelbeke and Ostend. This reduces the need for travel.
- The survey services were started (survey.ilvo.vlaanderen.be)

publications

http://pure.ilvo.vlaanderen.be

PUBLICATIONS

Animal Sciences

Scientific publications (A1)

Aluwé M., Langendries K. C. M., Bekaert K., Tuyttens F. A. M., De Brabander D., De Smet S. & Millet S. (2013) Effect of surgical castration, immunocastration and chicory-diet on the meat quality and palatability of boars. Meat Science, 94 (3): 402-407

Bekaert K. M., Aluwé M., Vanhaecke L., Heres L., Duchateau L., Vandendriessche F. & Tuyttens F. (2013) Evaluation of different heating methods for the detection of boar taint by means of the human nose. Meat Science, 94 (1): 125-132

De Boever J., Dupon E., Wambacq E. & Latré J. (2013) The effect of a mixture of Lactobacillus strains on silage quality and nutritive value of grass harvested at four growth stages and ensiled for two periods. Agricultural and Food Science, 22: 115-126

De Wilde R., Swevers L., Soin T., Christiaens O., Rougé P., Cooreman K., Janssen C. R. & Smagghe G. (2013) Cloning and functional analysis of the ecdysteroid receptor complex in the opossum shrimp Neomysis integer (Leach, 1814). Aquatic Toxicology, 130-131C: 31-40

Fiems L., De Boever J. & Vanacker J. (2013) Effect of supplementation on performance of grazing Belgian Blue double-muscled heifers. Animal, 7 (11): 1806-1815

Fiems L., De Boever J. & Vanacker J. (2013) Effect of milk replacer feeding program on performance of Belgian Blue double-muscled rearing calves. Archiv Tierzucht-Archives of Animal Breeding, 56

Fiems L., De Boever J., Vanacker J. & De Brabander D. (2013) Effect of cull potatoes in the diet for finishing Belgian Blue doublemuscled cows. Animal, 7 (1): 93-100

Fiems L., De Boever J., Vanacker J. & Renaville R. (2013) Effect of an energy restriction followed by a re-alimentation period on efficiency, blood metabolites and hormones in Belgian Blue double-muscled cows. Animal Feed Science and Technology, 186: 148-157

Kokokiris L., Stamoulis A., Monokrousos N. & Doulgeraki S. (2013) Oocytes development, maturity classification, maturity size and spawning season of the red mullet (Mullus barbatus barbatus Linnaeus, 1758). Journal of Applied Ichthyology, 2013: 1-7

Maertens L., Buijs S. & Davoust C. (2013) Gnawing blocks as cage enrichment and dietary supplement for does and fatteners: intake, performance and behaviour. World Rabbit Science, 21: 185-192

Mehta S., Verstraelen H., Vandaele L., Mehuys E., Remon J.P. & Vervaet C. (2013) Vaginal distribution and retention of tablets comprising starch-based multiparticulates: evaluation by colposcopy. Drug Development and Industrial Pharmacy, 39 (12):1944-1950

Millet S. & Delezie, E. (2013) Should n-3 polyunsaturated fatty acids be included in the feed of reproducing animals? The Veterinary Journal

Mot D., Timbermont L., Delezie E., Haesebrouck F., Ducatelle R. & Van Immerseel F. (2013) Day-of-hatch vaccination is not protective against necrotic enteritis in broiler chickens. Avian Pathology, 42 (2): 179-184

Nalon E., Conte S., Maes D., Tuyttens F. A. M. & Devillers N. (2013) Assessment of lameness and claw lesions in sows. Livestock Science, 156 (1-3, SI): 10-23

Nalon E., Maes D., Piepers S., van Riet M. M. J., Janssens G. P. J., Millet S. & Tuyttens F. A. M. (2013) Mechanical nociception thresholds in lame sows. The Veterinary Journal, 198 (2): 386-390

Pluym L., Maes D., Vangeyte J., Mertens K., Baert J., Van Weyenberg S., Millet S. & Van Nuffel A. (2013) Developments of a system for automatic measurements of force and visual stance variables for objective lameness detection in sows: SowSIS. Biosystems Engineering,116 (1): 64-74

Queiros A. M., Birchenough S. N. R., Bremner J., Godbold J. A., Parker R. E., Romero-Ramirez A., Reiss H., Solan M., Somerfield P. J., Van colen C., Van Hoey G. & Widdicombe S. (2013) A bioturbation classification of european marine infaunal invertebrates. Ecology and Evolution, 3 (10): 1-27

Rahman M. B., Vandaele L., Rijsselaere T., El-Deen M. S., Maes D., Shamsuddin M. & Van Soom A. (2013) Bovine spermatozoa react to in vitro heat stress by activating the mitogen-activated protein kinase 14 signalling pathway. Reproduction, Fertility, and Development, 26 (2): 245-257

Rasschaert G., Piessens V., Scheldeman P., Leleu S., Stals A., Herman L., Heyndrickx M. & Messens W. (2013) Efficacy of electrolyzed oxidizing water and lactic acid on the reduction of *Campylobacter* on naturally contaminated broiler carcasses during processing. Poultry Science, 92 (4): 1077-1084

Reubens J., Vandendriessche S., Zenner A., Degraer S. & Vincx M. (2013) Offshore wind farms as productive sites or ecological traps for gadoid fishes? Impact on growth, condition index and diet composition. Marine Environmental Research, 90: 66-74

Scheurer W., Spring P. & Maertens L. (2013) Effect of three dietary phytogenic products on the production performance and coccidiosis in challenged broiler chickens. The Journal of Applied Poultry Science, 22 (3): 591-599

Tanghe S. & De Smet S. (2013) Does sow reproduction and piglet performance benefit from the addition of n-3 polyunsaturated fatty acids to the maternal diet? The Veterinary Journal, 197 (3): 560-569

Tanghe S., Millet S. & De Smet S. (2013) Echium oil and linseed oil as alternatives for fish oil in the maternal diet: Blood fatty acid profiles and oxidative status of sows and piglets. Journal of Animal Science, 91 (7): 3253-3264

Tuyttens F., Struelens E. & Ampe B. (2013) Remedies for a high incidence of broken eggs in furnished cages: effectiveness of increasing nest attractiveness and lowering perch height. Poultry Science, 92: 19-25

Vanderhasselt R. F., Buijs S., Sprenger M., Goethals K., Willemsen H., Duchateau L. & Tuyttens F. (2013) Dehydration indicators for broiler chickens at slaughter. Poultry Science, 92 (3): 612-619

Vanderhasselt R., Sprenger M., Duchateau L. & Tuyttens F. (2013) Automated assessment of footpad dermatitis in broiler chickens at the slaughter-line: evaluation and correspondence with human expert scores. Poultry Science, 92: 12-18

Van Herck S. L. J., Geysens S., Bald E., Chwatko G., Delezie E., Dianati E., Ahmed R. G. & Darras V. M. (2013) Maternal transfer of methimazole and effects on thyroid hormone availability in embryonic tissues. Journal of Endocrinology, 218 (1): 105-115

Van Hoey G., Cabana Permuy D., Vandendriessche S., Vincx M. & Hostens K. (2013) An ecological quality status assessment procedure for soft-sediment benthic habitats: Weighing alternative approaches. Ecological Indicators, 25: 266-278

Van Nuffel A., Vangeyte J., Mertens K. C., Pluym L., De Campeneere S., Saeys W. & Van Weyenberg S. (2013) Exploration of measurement variation of gait variables for early lameness detection in cattle using the GAITWISE. Livestock Science, 156: 88-95

Van Riet M.M.J., Millet S., Aluwé M. & Janssens G.P.J. (2013) Impact of nutrition on lameness and claw health in sows. Livestock Science, 156: 24-35

Virdi V., Coddens A., De Buck S., Millet S., Goddeeris B. M., Cox E., De Greve H. & Depicker A. (2013) Orally fed seeds producing designer IgAs protect weaned piglets against enterotoxigenic *Escherichia coli* infection. Proceedings of the National Academy of Sciences of the United States of America, 110 (29): 11809-11814

Willems E., Wang Y., Willemsen H., Lesuisse J., Franssens L., Guo X., Koppenol A., Buyse J., Decuypere E. & Everaert N. (2013) Partial albumen removal early during embryonic development of layer-type chickens has negative consequences on laying performance in adult life. Poultry Science, 92 (7): 1905-1915

Zettler M. L., Proffitt C. E., Darr A., Degraer S., Devriese L., Greathead C., Kotta J., Magni P., Martin G., Reiss H., Speybroeck J., Tagliapietra D., Van Hoey G. & Ysebaert T. (2013) On the Myths of Indicator Species: Issues and Further Consideration in the Use of Static Concepts for Ecological Applications. PloS One, 8 (10): 1-15

Conference Proceedings

Castro Montoya J., Peiren N., De Campeneere S. & Fievez V. (2013) Potential of milk fatty acids as biomarkers for effectiveness of methane mitigating additives in dairy cattle under similar conditions. Advances in Animal Biosciences. Cambridge University Press, 4

De Boever J., Fiems L., Vanacker J. & De Campeneere S. (2013) An *in vitro* approach to estimate the DVE- and OEB-content of condensed distillers solubles. Proceedings of 38th Animal Nutrition Research Forum. Roeselare: 9-10

Delezie E., Maertens L., Teirlynck E. & De Campeneere S. (2013) Effect of inclusion rate and source of distillers dried grains with solubles on digestibility coefficients and zootechnical results of laying hens. Proceedings of 38th Animal Nutrition Research Forum. Roeselare: 13-14

Delezie E., Maertens L., Teirlynck E. & De Campeneere S. (2013) Comparing different DDGS sources as protein alternative for laying hens. Proceedings of 19th European Symposium on Poultry Nutrition, Potsdam, Germany. August 26–29, 2013, 5 p

Delezie E., Maertens L., Fiems L., & De Campeneere S. (2013) Are broiler performances affected if different DDGS sources are fed? Proceedings of 19th European Symposium on Poultry Nutrition, Potsdam, Germany. August 26–29, 5 p

Delezie E., Segers L., Van der AA A., Wittocx S. & Maertens L. (2013) Efficacy of Se influenced by source and inclusion level and effect on Se egg's concentration. Proceedings of XV European Symposium on the quality of eggs and egg products. XXI European Symposium on the quality of poultry meat. Bergamo, Italy 15-19 september 2013, 5 p

Fiems L., De Boever J. & Vanacker J. (2013) Effect of milk replacer feeding regimes in Belgian Blue double-muscled rearing calves. Proceedings of 38th Animal Nutrition Research Forum. Roeselare: 18-19

Fiems L., De Boever J., Vanacker J. & De Campeneere S. (2013) Effect of management after a period with feed restriction in Belgian Blue double-muscled cows. Proceedings of 38th Animal Nutrition Research Forum. Roeselare: 15-17

Gantois I., Van Meenen E. & Maertens L. (2013) L'effet d'un mélange spécifique d'acides gras à chaîne moyenne sur les performances zootechniques des poulets de chair. Dixièmes Journées de la Recherche Avicole et Palmipèdes à Foie Gras. La Rochelle: 805-809

Huysveld S., Van linden V., Peiren N., Muylle H., Lauwers L. & Dewulf J. (2013) Development of an exergetic life cycle assessment (ELCA) tool to evaluate environmental impact of dairy farms in Flanders (Belgium). Advances in Animal Biosciences. Cambridge University Press

Isaac D., Deschepper K., Van Meenen E. & Maertens L. (2013) The effect of a balanced mixture of medium chain fatty acids on zootechnical performances in broilers. Australian Poultry Science Symposium 2013. The University of Sydney. Sydney: 196-199

Jacquet M., Bauwens V., Teller C., Deswasmes V., Maertens L. & Marlier D. (2013) Contribution à la recherche des conditions optimales pour la garde des lapins en parcs hors sol: Résultats d'un centre de référence et d'expérimentation en Belgique en conditions de production. In: G. Bolet & G. Bolet (Eds.) 15e Journées de la Recherche Cunicole, 19 et 20 novembre 2013. ITAVI, 28 rue du Rocher PARIS. Paris: 39-42

Kashiha M., Bahr C., Ott S., Moons C., Niewold T., Tuyttens F. & Berckmans D. (2013) Automatic monitoring of pig activity using image analysis. Precision Livestock Farming 13. Leuven: 351-359

Kashiha M. A., Bahr C., Ott S., Moons C., Niewold T., Tuyttens F. & Berckmans D. (2013) Automatic Monitoring of Pig Activity Using Image Analysis. In: P. Scheunders & P. Scheunders (Eds.) Advanced Concepts for Intelligent Vision Systems. Springer. 555-563

Koppenol A., Delezie E., Everaert N., Franssens L., Willems E., Wang Y., Buyse J. 2013. Dietary n-3 fatty acid transfer from broiler breeder to yolk, residual yolk and liver of offspring. Proceedings of 38th Animal Nutrition Research Forum. Roeselare: 30

Leleu S., Segers L., Rovers M., van der Aa A. & Maertens L. (2013) The effect of a nutritional emulsifier on broiler performances in an energy diluted diet. 19th European Symposium on Poultry Nutrition. Potsdam: 3 p

Maertens L. (2013) Housing regulation of rabbits in Belgium: The step by step plan. 18. Internationale Tagung über Haltung und Krankheiten der Kaninchen, Pelztiere und Heimtiere. WB Laufersweiler Verlag. Giessen: 12-19

Maertens L. (2013) Management and feeding strategies to improve fattening rabbit intestinal health. 25th Hungarian Conference on Rabbit Production. Kaposvar: 13-24

Maertens L. & Buijs S. (2013) Performances des femelles logées temporairement en groupe dans des parcs polyvalents en système tout plein tout vide. In: G. Bolet & G. Bolet (Eds.) 15e Journées de la Recherche Cunicole. ITAVI, 28 rue du Rocher PARIS. Paris: 35-38

Maertens L. & Guermah H. (2013) The feeding value of corn silage and brewer's yeast for fattening rabbits. 18. Internationale Tagung über Haltung und Krankheiten der Kaninchen, Pelztiere und Heimtiere. WB Laufersweiler Verlag. Giessen: 85-91

Maertens L., Segers L., Rovers M., Leleu S. & van der Aa A. (2013) The effect of different emulsifiers on fat and energy digestibility in broilers. 19th European Symposium on Poultry Nutrition. Potsdam: 4 p

Maselyne J., Van Nuffel A., De Ketelaere B., Mertens K., Hessel E., Sonck B. & Saeys W. (2013) Range measurements of a Radio Frequency Identification System for registering growing-finishing pigs near a feed trough. Papers presented at the 6th European Conference on Precision Livestock Farming. Leuven: 433-439

Maselyne J., Van Nuffel A., De Ketelaere B., Mertens K., Sonck B., Hessel E. & Saeys W. (2013) Individual pig health monitoring based on automated registration of feeding pigs and synergistic control. Proceedings of the 11th Conference on Construction, Engineering and Environment in Livestock Farming

Maselyne J., Saeys W., Van Nuffel A., De Ketelaere B., Mertens K., Millet S., Gregersen T., Brizzi P. & Hessel E. (2013) A health monitoring system for growing-finishing pigs based on the individual feeding pattern using Radio Frequency Identification and Synergistic Control. Papers presented at the 6th European Conference on Precision Livestock Farming. Leuven: 825-833

Nalon E., Conte S., Maes D., Tuyttens F. & Devillers N. (2013) Assessment of lameness and claw lesions in sows. Proceedings of the 9th International Veterinary Behaviour Meeting. Lisbon, Portugal: 102-103

Peiren N., Castro Montoya J., Vandaele L. & De Campeneere S. (2013) Mitigation potential of plant additives to reduce methane emission in cattle. Proceedings of 38th Animal Nutrition Research Forum. Roeselare: 36-37

Peiren N., Castro Montoya J., Vandaele L. & De Campeneere S. (2013) Variation in methane emission from dairy cows and beef heifers measured in open-circuit chambers with an infrared laser spectrometer. Advances in Animal Biosciences, 4

Peiren N., Sonck B. & De Campeneere S. (2013) Monitoring Gas Emissions in Open-circuit Chambers with a Measuring Device that can be used for Measuring of Emissions from Manure. Proceedings of the International Symposium on missions of Gas and Dust from Livestock. Hassouna, M. & Guingand, N. (eds.). Edition IFIP-Institut du Porc, France, 1: 333-336.

Vandaele L., Van Eys J., D'Heer B., Ampe B. & De Campeneere S. (2013) The effect of prolonged butyrate supplementation to high producing peri-parturient dairy cows. Proceedings of 38th Animal Nutrition Forum. Roeselare: 41-42

Van den Broeke A., Aluwé,M., Tuyttens,F., Janssens S., Coussé,A., Vanhaecke L., Buys N. & Millet S. (2013) Are meat and carcass quality in commercial growing finishing gilts and entire males affected by a polymorphism of the MC4R gene? Proceedings of BAMST Symposium, Kortrijk, 2 p

Van Hamme V., Collet P., Hautekiet V., Delezie E. & Goethals L. (2013) Effect d'un additive a base de butyrate de calcium encapsulé sur la performance et la qualité des oeufs en pondeuses. Dixièmes Journées de la Recherche Avicole et Palmipèdes à Foie Gras, La Rochelle, du 26 au 28 mars 2013, 6 p

Vandermeulen J., Kashiha M., Ott S., Bahr C., Moons C., Tuyttens F., Niewold T. & Berckmans D. (2013) Combination of image and sound analysis for behaviour monitoring in pigs. Precision Livestock Farming 13. Leuven: 262-268

Books and reports

Bekaert, K., Deloof, D., Devriese, L., Maes, S., Vanhalst, K., Verhaeghe, D. & Robbens, J. (2013) ILVO-mededeling 146: Invloed van de opslagmethode op de kwaliteit van Noorse kreeft (*Nephrops norvegicus*), 23 p

Coates D., Van Hoey G., Reubens J., Vanden Eede S., De Maersschalck V., Vincx M. & Vanaverbeke J. (2013) The macrobenthic community around an offshore wind farm. In: Degraer S., Brabant R. & B. Rumes (Eds.) Environmental impacts of offshore wind farms in the Belgian Part of the North Sea. Royal Belgian Institute of Natural Sciences (RBINS): 86-97

De Backer, A.& Hostens, K. (2013) ILVO-mededeling 131: T_2 situatie – ecologische analyse 2012: epibenthos en (juveniele) visbemonstering Ameland en Schiermonnikoog, 35 p

De Backer, A. & Hostens, K. (2013) ILVO-mededeling 149: T_3-situatie – ecologische analyse 2013: juveniele visbemonstering Ameland en Schiermonnikoog, 24 p

De Backer, A. & Van Hoey, G. (2013) ILVO-mededeling 140: Veldverslag Ameland en Schiermonnikoog 2013. Bemonstering (juveniele) demersale vis, 25 p

Delbare D., Nevejan N., Sorgeloos P. & Pirlet H. (2013) Aquacultuur. In: Lescrauwaert A-K., Pirlet H., Verleye T., Mees J. & Herman R. (eds.). Compendium voor Kust en Zee 2013: Een geïntegreerd kennisdocument over de socio-economische, ecologische en institutionele aspecten van de kust en zee in Vlaanderen en België. Vlaams Instituut voor de Zee, Oostende: 167-176

Delbare D. (2013) Resources in Antarctica. In: Casey, J., Vanhee, W., Doerner, H. & Druon, J-N. (eds.). Scientific, Technical and Economic Committee for Fisheries (STECF) Review of Scientific Advice for 2014: Part 3 (STECF-13-26). Publications Office of the European Union, Luxembourg, Luxemburg: 276-291

Delbare, D. (2013) ILVO-mededeling 150: Zero output recirculating aquaculture system, 85 p

Degraer S., Kerckhof F., Reubens J., Vanermen N., Demesel I., Rumes B., Stienen E., Vandendriessche S. & Vincx M. (2013) Not necessarily all gold that shines: appropriate context setting needed! In: Degraer S., Brabant R. & B. Rumes (Eds.) Environmental impacts of offshore wind farms in the Belgian part of the North Sea. Royal Belgian Institute of Natural Sciences. 174-181

Degraer S., De Mesel I., Baeye M., Botteldooren D., Brabant R., Coates D., Courtens W., Debusschere E., Dekoninck L., De Maersschalck V., Deschutter Y., Derweduwen J., Di Marcantonio M., Dulière V., Fettweis M., Francken F., Haelters J., Haerens P., Hostens K., Houtaeve R., Houziaux J. S., Kerckhof F., Mathys M., Norro A., Onkelinx T., Reubens J., Rumes B., Sas M., Stienen E. W. M., Vanaverbeke J., Vandendriessche S., Vanden Eede S., Van den Eynde D., Van de walle M., Vanermen N., Van Hoey G., Vanhulle A., Van Lancker V., Van Renterghem T., Verstraete H., Vigin L. & Vincx M. (2013) Optimising the future Belgian offshore wind farm monitoring programme. In: Degraer S., Brabant R. & B. Rumes (Eds.) Environmental impact of offshore wind farms in the Belgian part of the North Sea. Royal Belgian Institute of Natural Sciences (RBINS). 192-197

Degraer S., Baeye M., Botteldooren D., Brabant R., Coates D., Courtens W., Debusschere E., Dekoninck L., De Maersschalck V., De Mesel I., Deschutter Y., Derweduwen J., Di Marcantonio M., Dulière V., Fettweis M., Francken F., Haelters J., Haerens P., Hostens K., Houthaeve R., Houziaux J. S., Kerckhof F., Mathys M., Norro A., Reubens J., Rumes B., Sas M., Stienen E., Vanaverbeke J., Vandendriessche S., Vanden Eede S., Van den Eynde D., Van de walle M., Vanermen N., Van Hoey G., Vanhulle A., Van Lancker V., Van Renterghem T., Verstraete H., Vigin L. & Vincx M. (2013) Executive summary. In: Degraer S., Brabant R. & B. Rumes (Eds.) Environmental impacts of offshore wind farms in the Belgian part of the North Sea, 8-13

Derweduwen, J., De Backer, A., Van Hoey, G., Hillewaert, H., Wittoeck, J. & Hostens, K. (2013) ILVO-mededeling 132: Statistische analyse van de eerste twee monitoringscampagnes (TO) binnen het onderzoek naar de invloed van lozing van gechloreerd zeewater op het macrobenthos (zacht substraat) en de epifauna (hard substraat), 22 p

Devriese L. (2013) Kunnen vissen zeeziek worden? In Zeeziek: Hoe kolkt de waanzinnige zee in lichaam en geest. Visserijmuseum. Oostduinkerke: 35-43

De Witte, B., Van Hoey, G., Devriese, L., Hostens, K. & Robbens, J. (2013) ILVO-mededeling 136: Voortgangsrapport effecten baggerlossingen periode 1 januari 2013 – 30 juni 2013, 12 p

De Witte, B., Van Hoey, G., Devriese, L., Hostens, K. & Robbens, J. (2013) ILVO-mededeling 127: Voortgangsrapport effecten baggerlossingen periode 1 juli 2012 – 31 december 2012, 10 p

Haelters J., Debusschere E., Botteldooren D., Dulière V., Hostens K., Norro A., Vandendriessche S., Vigin L., Vincx M. & Degraer S. (2013) The effects of pile driving on marine mammals and fish in Belgian waters. In: Degraer S., Brabant R. & B. Rumes (Eds.) Environmental impacts of offshore wind farms in the Belgian part of the North Sea. Royal Belgian Institute of Natural Sciences (RBINS). 70-77

Heerkens J. (2013) Healthy Hens: bevorderen van gezondheid en welzijn bij bio-leghennen in Europa. In: J. Van Waes & J. Van Waes (Eds.) De Biologische landbouw in Vlaanderen: Onderzoek 2011-2012

ICES (2013) Report of the Working Group on the effects of extraction of marine sediments on the marine ecosystem (WGEXT) (Bijdrage De Backer A.). 22-25 April, Faial-Azoren (Portugal). ICES CM 2013/SSGHIE:14, 60 p

ICES (2013) Report of the Working Group on Elasmobranch Fishes (WGEF) (Bijdrage van Moreau K.). ICES CM 2013/ACOM:19

ICES (2013) Report of the Working Group on Beam Trawl Surveys (WGBEAM 2013) (Bijdrage van Moreau K.). ICES CM 2013/SSGESST:12

ICES (2013) Report of the Working Group on Assessment of New MoU Species (WGnew) (Bijdrage van Moreau K.). ICES CM 2013/ACOM:21: 1-183

ICES (2013) Annual Meeting of Advisory Working Group Chairs Committee (WGCHAIRS) (Bijdrage van Moreau K.). ICES WGCHAIRS

ICES (2013) Report of the Planning Group on Commercial Catches, Discards and Biological Sampling (PGCCDBS 2013) (bijdrage van Torreele E., Zenner A. & Moreau K.). ICES CM 2013/ACOM: 49

ICES (2013) Report of the Benthos Ecology Working Group (BEWG) (bijdrage van Van Hoey G. & Hillewaert H.), 22-25 April 2013, A Coruña, Spain. ICES CM 2013/SSGEF:09, 39 p

ICES (2013) Report on the Second Workshop of National age readings coordinators (WKNARC2) (bijdrage van Zenner A.). ICES CM 2013/ACOM: 52

Lapage, D. & de Graaf, S. (2013) ILVO-mededeling 135: MELKWEL: diervriendelijkheid vermarkten als productattribuut van melk, 29 p

Pecceu, E., Hostens, K., Vanaverbeke, J. & Rabaut, M. (2013) ILVO-mededeling 138: Application of the mesma framework. Case study: Belgian part of the North Sea, 86 p

Pecceu E. & Hostens K. (2013) Deliverable 3.5. Comparison paper on the comparison of case studies, building on the overlap of human pressures and/or priority habitats. Monitoring and Evaluation of Spatially Managed Areas (MESMA). 19 p

Pecceu E. & Hostens K. (2013) Deliverable 3.4. Position paper on lessons' learned for the improvement of the generic concept and the necessary tools. Monitoring and Evaluation of Spatially Managed Areas (MESMA), 24 p

Pecceu E., Hostens K. & Maes F. (2013) The evolution of marine protected areas in the Belgian part of the North Sea. A case study report for Work Package 6 of the MESMA project (www.mesma.org), MESMA report, 49 p

Polet, H., Pede, A. & Verhaeghe, D. (2013) ILVO-mededelling 130: Eindrapport netinnovatie langoustinevisserij, 58 p

Rumes B., Coates D., Demesel I., Derweduwen J., Kerckhof F., Reubens J. & Vandendriessche S. (2013) Does it really matter? Changes in species richness and biomass at different spatial scales. In: Degraer S., Brabant R. & B. Rumes (Eds.) Environmental impacts of offshore wind farms in the Belgian part of the North Sea. Royal Belgian Institute of Natural Sciences. 182-189

Van Craeynest, K., Polet, H., Depestele, J., Stouten, H. & Verschueren, B. (2013) ILVO-mededeling 134: Alternatieven voor de boomkorvisserij,

Vandendriessche S., Reubens J., Derweduwen J., Degraer S. & Vincx M. (2013) Offshore wind farms as productive sites for fishes? In: Degraer S., Brabant R. & B. Rumes (Eds.) Environmental impacts of offshore wind farms in the Belgian part of the North Sea. Royal Belgian Institute of Natural Sciences. 152-161

Vandendriessche S., Derweduwen J. & Hostens K. (2013) Between the turbines: soft substrate epibenthos and fish. In: Degraer S., Brabant R. & B. Rumes (Eds.) Environmental impacts of offshore wind farms in the Belgian part of the North Sea. Royal Belgian Institute of Natural Sciences. 98-113

Vandendriessche S., Hostens K., Courtens W. & Stienen E. (2013) Fisheries activities change in the vicinity of offshore wind farms. In: Degraer S., Brabant R. & B. Rumes (Eds.) Environmental impacts of offshore wind farms in the Belgian part of the North Sea. Royal Belgian Institute of Natural Sciences. 80-85

Vandendriessche, S., Vansteenbrugge, L., Hostens, K. & Maelfait, H. (2013) ILVO-mededeling 142: Jellyfish, jellypress and jellyperception, 48 p

Van Hoey, G., Birchenough, S. & Hostens, K. (2013) ILVO-mededeling 126: The determination of the biological value of the wandelaar area based on sediment profile imaging (SPI) and grab sampling, 34 p

Van Hoey, G., Colson, L., Hillewaert, H., Hostens, K., Vanaverbeke, J. & Vincx, M. (2013) ILVO-mededeling 143: Staalname rapportage 4shore campagne T0 (najaar 2013), 32 p

Van Hoey, G., Colson, L., De Backer, A., Hillewaert, H., Holzhauer, H., Hostens, K., Vanaverbeke, J., Vincx, M., Van Dalfsen, J. & Wittoeck, J. (2013) ILVO-mededeling 144: Meetplan ecologische studie onderwatersuppleties aan de Vlaamse kust (4shore), 35 p

Van Lancker V., Lauwaert B., De Mol L., Vandereyken H., De Backer A. & Pirlet H. (2013) Zand- en grindwinning. In Lescrauwaet, A. K., Pirlet, H., Verleye, T., Mees, J. & Herman, R. (Eds.) Compendium voor Kust en Zee 2013. Oostende, Belgium: 128-139

Willems, T., Depestele, J., De Backer, A. & Hostens, K. (2013) ILVO-mededeling 139: By-catch of rays in the trawl fishery for atlantic seabob shrimp *Xiphopenaeus kroyeri* in Suriname: how effective are TEDs and BRDs?, 22 p

PhDs

Tanghe S. (2013) Physiological and zootechnical effects of n-3 fatty acids in the diet of sows. 276 p. UGent, Faculteit Bio-ingenieurswetenschappen. Promotor: De Smet S.

Vanderhasselt R. (2013) Improving the assessment of thirst and footpad dermatitis in broiler chicken welfare monitoring schemes. 135 p. UGent, Faculteit Diergeneeskunde. Promotoren: Duchateau L. & Tuyttens F.

Van Ginderdeuren K. (2013) Zooplankton and its role in North Sea food webs: community structure and selective feeding by pelagic fish in Belgian marine waters. 194 p. UGent, Faculteit Wetenschappen, Vakgroep Biologie. Promotoren: Vincx M. & Hostens K.

Plant Sciences

Scientific publications (A1)

Aper J., De Cauwer B., De Roo S., Lourenço M., Fievez V., Bulcke R. & Reheul D. (2013) Seed germination and viability of herbicide resistant and susceptible *Chenopodium album* populations after ensiling, digestion by cattle and manure storage. Weed Research, DOI 10.1111/wre.12063

Aerts R., Berecha G., Gijbels P., Hundera K., Van Glabeke S., Vandepitte K., Muys B., Roldan-Ruiz I. & Honnay O. (2013) Genetic variation and risks of introgression in the wild *Coffea arabica* gene pool in south-western Ethiopian montane rainforests. Evolutionary Applications, 6 (2): 243-252

Bernaert N., Wouters D., De Vuyst L., De Paepe D., De Clercq H., Van Bockstaele E., De Loose M. & Van Droogenbroeck B. (2013) Antioxidant changes of leek (*Allium ampeloprasum* var. *porrum*) during spontaneous fermentation of the white shaft and green leaves. Journal of the Science of Food and Agriculture, 93 (9): 2146-2153

Bernaert N., De Clercq H., Van Bockstaele E., De Loose M. & Van Droogenbroeck B. (2013) Antioxidant changes during postharvest processing and storage of leek (*Allium ampeloprasum* var. *porrum*). Postharvest Biology and Technology, 86: 8-16

Bertier L., Leus L., D'hondt L., De Cock A. W. A. M. & Höfte M. (2013) Host adaptation and speciation through hybridization and polyploidy in *Phytophthora*. PloS One, 1-15

Boshoff M., Jordaens K., Backeljau T., Lettens S., Tack F., Vandecasteele B., De Jonge M. & Bervoets L. (2013) Organ- and species-specific accumulation of metals in two land snail species (Gastropoda, Pulmonata). Science of the Total Environment, 449: 470-481

Cornille A., Giraud T., Bellard C., Tellier A., Le Cam B., Smulders M. J. M., Kleinschmit J., Roldan-Ruiz I. & Gladieux P. (2013) Postglacial recolonization history of the European crabapple (*Malus sylvestris* Mill.), a wild contributor to the domesticated apple. Molecular Ecology 22 (8): 2249-2263

Cougnon M., Baert J., Van Waes C. & Dirk R. (2013) Performance and quality of tall fescue (*Festuca arundinacea* Schreb.) and perennial ryegrass (*Lolium perenne* L.) and mixtures of both species grown with or without white clover (*Trifolium repens* L.) under cutting management. Grass and Forage Science. DOI 10.1111/gfs.12102

Cougnon M., Van Waes C., Dardenne P., Baert J. & Reheul D. (2013) Comparison of near infrared reflectance spectroscopy calibration strategies for the botanical composition of grass-clover mixtures. Grass and Forage Science. DOI 10.1111/gfs.12031

Damme N., Waeyenberge L., Viaene N., van Hoenselaar T. & Karssen G. (2013) First report of the root-knot nematode *Meloidogyne* artiellia in Belgium. Plant Disease, 97 (1): 152

De Backer M., Bonants P., Pedley K., Maes M., Roldan-Ruiz I., Van Bockstaele E., Heungens K. & van der Lee T. (2013) Genetic relationships in an international collection of *Puccinia horiana* isolates based on newly identified molecular markers and demonstration of recombination. Phytopathology, 103: 1169-1179

Debode, J., Van Hemelrijck, W., Creemers, P., & Maes, M. (2013) Effect of fungicides on epiphytic yeasts associated with strawberry. Microbiology Open, 3(2): 482-491

De Jonghe K., Maes M. & Bobev S. (2013) First report of *Candidatus Phytoplasma solani* on Blackberry (*Rubus fruticosus*) in Bulgaria. Plant Disease, 97 (2): 282

De Jonghe, K., Morio, S., & Maes, M. (2013) First outbreak of Chrysanthemum stem necrosis virus (CSNV) on potted Chrysanthemum in Belgium. New Disease Reports, 28, 14
http://dx.doi.org/10.5197/j.2044-0588.2013.028.014

De Keyser E., Desmet L., Van Bockstaele E. & De Riek J. (2013) How to perform RT-qPCR accurately in plant species? A case study on flower colour gene expression in an azalea (*Rhododendron simsii* hybrids) mapping population. BMC Molecular Biology, 14:13

De Keyser E., Lootens P., Van Bockstaele E. & De Riek J. (2013) Image analysis for QTL mapping of flower colour and leaf characteristics in pot azalea (*Rhododendron simsii* hybrids). Euphytica, 189 (3): 445-460

De Laethauwer S., De Riek J., Stals I., Reheul D. & Haesaert G. (2013) Amylase gene expression during kernel development in relation to pre-harvest sprouting in wheat and triticale. Acta Physiologiae Plantarum, 35 (10): 2927-2938

De Riek J., De Cock K., Smulders M. & Nybom H. (2013) AFLP-based population structure analysis as a means to validate the complex taxonomy of dogroses (*Rosa* section *Caninae*). Molecular Phylogenetics and Evolution, 67 (3): 547-559

Deryckere D., De Keyser E., Eeckhaut T., Van Huylenbroeck J. & Van Bockstaele E. (2013) High resolution melting analysis as a rapid and highly sensitive method for *Cichorium* plasmotype characterization. Plant Molecular Biology Reporter, 31 (3): 731-740

De Schepper V., De Swaef T., Bauweraerts I. & Steppe K. (2013) Phloem transport: a review of mechanisms and controls. Journal of Experimental Botany, 64 (16): 4839-4850

d'Yvoire M. B., Bouchabke-Coussa O., Voorend W., Antelme S., Cézard L., Legée F., Lebris P., Legay S., Whitehead C., McQueen-Mason S. J., Gomez L. D., Jouanin L., Lapierre C. & Sibout R. (2013) Disrupting the cinnamyl alcohol dehydrogenase 1 gene (BdCAD1) leads to altered lignification and improved saccharification in B*rachypodium distachyon*. The Plant Journal, 73 (3): 496-508

Eeckhaut T., Lakshmanan P. S., Deryckere D., Van Bockstaele E. & Van Huylenbroeck J. (2013) Progress in plant protoplast research. Planta, 238 (6): 991-1003

França S. C., Spiessens K., Pollet S., Debode J., De Rooster L., Callens D. & Höfte M. (2013) Population dynamics of *Verticillium* species in cauliflower fields: Influence of crop rotation, debris removal and ryegrass incorporation. Crop Protection, 54: 134-141

Gehesquière B., D'Haeyer S., Pham K., van Kuik A. J., Maes M., Höfte M. & Heungens K. (2013) qPCR assays for the detection of *Cylindrocladium buxicola* in plant, water and air samples. Plant Disease, 97 (8): 1082-1090

Finn, J. A., Kirwan, L., Connolly, J., Sebastià, M. T., Helgadottir, A., Baadshaug, O. H., Bélanger, G., Black, A., Brophy, C., Collins, R. P., Čop, J., Dalmannsdóttir, S., Delgado, I., Elgersma, A., Fothergill, M., Frankow-Lindberg, B. E., Ghesquiere, A., Golinska, B., Golinski, P., Grieu, P., Gustavsson, A.-M., Höglind, M., Huguenin-Elie, O., Jørgensen, M., Kadziuliene, Z., Kurki, P., Llurba, R., Lunnan, T., Porqueddu, C., Suter, M., Thumm, U., Lüscher, A. (2013) Ecosystem function enhanced by combining four functional types of plant species in intensively managed grassland mixtures: a 3-year continental-scale field experiment. Journal of Applied Ecology, 50 (2): 365-375

Haegeman A., Bauters L., Kyndt T., Rahman M. M. & Gheysen G. (2013) Identification of candidate effector genes in the transcriptome of the rice root knot nematode *Meloidogyne graminicola*. Molecular Plant Pathology, 14 (4): 379-390

Ji H., Gheysen G., Denil S., Lindsey K., Topping J. F., Nahar K., Haegeman A., De Vos W. H., Trooskens G., Van Criekinge W., De Meyer T. & Kyndt T. (2013) Transcriptional analysis through RNA sequencing of giant cells induced by *Meloidogyne graminicola* in rice roots. Journal of Experimental Botany, 64 (12): 3885-3898

Jones J., Haegeman A., Danchin E., Gaur H., Helder J., Jones M., Kikuchi T., Manzanilla-Lopez R., Palomares-Rius J., Wesemael W. & Perry R. (2013) Top 10 plant-parasitic nematodes in molecular plant pathology. Molecular Plant Pathology, 14: 946-961

Lakshmanan P. S., Eeckhaut T., Van Huylenbroeck J. & Van Bockstaele E. (2013) Micronucleation by mitosis inhibitors in developing microspores of *Spathiphyllum wallisii* Regel. Plant Cell Reports, 32 (3): 369-377

Lakshmanan P. S., Eeckhaut T., Deryckere D., Van Bockstaele E. & Van Huylenbroeck J. (2013) Asymmetric somatic plant hybridization: status and applications. American Journal of Plant Sciences, 4 (8A): 1-10

Lootens P., Chaves Daguilar B., Baert J., Pannecoucque J., Van Waes J. & Roldan-Ruiz I. (2013) Comparison of image analysis and direct measurement of UPOV taxonomic characteristics for variety discrimination as determined over five growing seasons, using industrial chicory as a model crop. Euphytica, 189 (3): 329-341

Mokrini F., Waeyenberge L., Viaene N., Andaloussi A. & Moens M. (2013) Quantitative detection of the root-lesion nematode, *Pratylenchus penetrans*, using qPCR. European Journal of Plant Pathology, 137: 403-413

Pipino L., Leus L., Scariot V. & Van Labeke M. C. (2013) Embryo and hip development in hybrid roses. Plant Growth Regulation, 69 (2): 107-116

Pritchard, L., Humphris, S., Baeyen, S., Maes, M., Van Vaerenbergh, J., Elphinstone, J., Saddler, G., & Toth, I. (2013). Draft genome sequences of four *Dickeya dianthicola* and four *Dickeya solani* strains. Genome Announcements. doi:10.1128/genomeA.00087-12

Prospero S., Vercauteren A., Heungens K., Belbahri L. & Rigling D. (2013) *Phytophthora* diversity and the population structure of *Phytophthora ramorum* in Swiss ornamental nurseries. Plant Pathology, 62 (5): 1063-1071

Ruttink T., Sterck L., Rohde A., Bendixen C., Rouzé P., Asp T., Van de Peer Y. & Roldan-Ruiz I. (2013) Orthology Guided Assembly in highly heterozygous crops: creating a reference transcriptome to uncover genetic diversity in *Lolium perenne*. Plant Biotechnology Journal, 11(5): 605-617

Toumi F., Waeyenberge L., Viaene N., Dababat A., Nicol J. M., Ogbonnaya F. & Moens M. (2013) Development of two species-specific primer sets to detect the cereal cyst nematodes *Heterodera avenae* and *Heterodera filipjevi*. European Journal of Plant Pathology, 136: 613-624

Toumi F., Waeyenberge L., Viaene N., Dababat A., Nicol J. M., Ogbonnaya F. & Moens M. (2013) Development of a species-specific PCR to detect the cereal cyst nematode, *Heterodera latipons*. Nematology, 15: 709-717

Vandecasteele B., Willekens K., Zwertvaegher A., Degrande L., Tack F. M. G. & Du Laing G. (2013) Effect of composting on the Cd, Zn and Mn content and fractionation in feedstock mixtures with wood chips from a short-rotation coppice and bark. Waste Management, 33: 2195-2203

Vandepitte K., Honnay O., Mergeay J., Breyne P., Roldan-Ruiz I. & De Meyer T. (2013) SNP discovery using Paired-End RAD-tag sequencing on pooled genomic DNA of *Sisymbrium austriacum* (Brassicaceae). Molecular Ecology Resources

Vandepitte K., Gristina A. S., De Raedt R., Roldan-Ruiz I., Marceno C., Sciandrello S. & Honnay O. (2013) Conservation genetics of an endemic from the Mediterranean Basin: high genetic differentiation but no genetic diversity loss from the last populations of the Sicilian Grape Hyacinth *Leopoldia gussonei*. Conservation Genetics, 14 (5): 963-972

Van der Linden I., Cottyn B., Uyttendaele M., Vlaemynck G., Maes M. & Heyndrickx M. (2013) Long-term survival of *Escherichia coli* O157:H7 and *Salmonella enterica* on butterhead lettuce seeds, and their subsequent survival and growth on the seedlings. International Journal of Food Microbiology, 161 (3): 214-219

Van der Linden I., Cottyn B., Uyttendaele M., Vlaemynck G., Heyndrickx M. & Maes M. (2013) Survival of enteric pathogens during butterhead lettuce growth: crop stage, leaf age, and irrigation. Foodborne Pathogens and Disease, 10 (6): 485-491

Vandroemme J., Cottyn B., Baeyen S., De Vos P. & Maes M. (2013) Draft genome sequence of *Xanthomonas fragariae* reveals reductive evolution and distinct virulence-related gene content. BMC Genomics, 14 (1): 829

Vandroemme J., Cottyn B., Pothier J. F., Pflüger V., Duffy B. & Maes M. (2013) *Xanthomonas arboricola* pv. *fragariae*: what's in a name? Plant Pathology, 62: 1123-1131

Vleugels T., Cnops G. & Van Bockstaele E. (2013) Screening for resistance to clover rot (*Sclerotinia* spp.) among a diverse collection of red clover populations (*Trifolium pratense* L.). Euphytica, 194 (3): 371-382

Vleugels T. & Van Bockstaele E. (2013) Number of involved genes and heritability of clover rot (*Sclerotinia trifoliorum*) resistance in red clover (*Trifolium pratense*). Euphytica, 194: 137-148

Vleugels T., Baert J. & Van Bockstaele E. (2013) Morphological and pathogenic characterization of genetically diverse *Sclerotinia* isolates from European red clover crops (*Trifolium Pratense* L.). Journal of Phytopathology, 161 (4): 254-262

Vercauteren A., Riedel M., Maes M., Werres S. & Heungens K. (2013) Survival of *Phytophthora ramorum* in *Rhododendron* root balls and in rootless substrates. Plant Pathology, 62 (1): 166-176

Zadji L., Baimey H., Afouda L., Houssou F., Waeyenberge L., De Sutter N., Moens M. & Decraemer W. (2013) First record on the distribution of entomopathogenic nematodes (*Rhabditida: Steinernematidae* and *Heterorhabditidae*) in Southern Benin. Russian Journal of Nematology, 21 (2): 117-130

Zaluga J., Stragier P., Van Vaerenbergh J., Maes M. & De Vos P. (2013) Multilocus Variable-Number-Tandem-Repeats Analysis (MLVA) distinguishes a clonal complex of *Clavibacter michiganensis* subsp. *michiganensis* strains isolated from recent outbreaks of bacterial wilt and canker in Belgium. BMC Microbiology, 13(1):126

Zaluga J., Van Vaerenbergh J., Stragier P., Maes M. & De Vos P. (2013) Genetic diversity of non-pathogenic *Clavibacter* strains isolated from tomato seeds. Systematic and Applied Microbiology, 36 (6): 426-435

Conference proceedings

Agneessens L., Vandecasteele B., Van de Sande T., Crappé S., De Nies J., Elsen A. & De Neve S. (2013) Management of vegetable crop residues for reducing nitrate leaching losses in intensive vegetable rotations. NUTRIHORT: Proceedings. 145-148

Amery F. & Vandecasteele B. (2013) The phosphorus cycle in North-West European agricultural soils. Nutrihort: Proceedings. 124-129

Berruti A., Boriello R., Christiaens A., Della Beffa M. T., De Keyser E., Biancotto V., Van Labeke M. C. & Scariot V. (2013) Rationalization of *Camellia japonica* L. pot cultivation: a multidisciplinary approach. In: K. Van Laere & K. Van Laere (Eds.) Proceedings of the Second International Symposium on Woody Ornamentals of the Temperate Zone. International Society for Horticultural Science (ISHS). 159-166

Christiaens A., De Keyser E., Pauwels E., De Riek J., Gobin B. & Van Labeke M. C. (2013) Flowering response of an early and late flowering azalea cultivar (*Rhododendron simsii*) according to cold treatment. In: K. Van Laere & K. Van Laere (Eds.) Proceedings of the Second International Symposium on Woody Ornamentals of the Temperate Zone. International Society for Horticultural Science (ISHS). 83-89

De Dauw K., Van Labeke M. C., Leus L. & Van Huylenbroeck J. (2013) Drought tolerance screening of a *Rosa* population. In: K. Van Laere & K. Van Laere (Eds.) Proceedings of the Second International Symposium on Woody Ornamentals of the Temperate Zone. International Society for Horticultural Science (ISHS). Gent: 121-127

De Keyser E., De Riek J., Christiaens A., Van Labeke M. C., Pauwels E. & Gobin B. (2013) Gene expression profiling of candidate genes for flowering initiation and dormancy breaking in *Rhododendron simsii* hybrids. In: K. Van Laere & K. Van Laere (Eds.) Proceedings of the Second International Symposium on Woody Ornamentals of the Temperate Zone. International Society for Horticultural Science (ISHS): 187-192

Debode J., Van Hemelrijck W., Creemers P. & Maes M. (2013) Dynamics of yeasts in the phylloplane of strawberry. Biological control of fungal and bacterial plant pathogens. IOBC-WPRS Bulletin, 86, 31-32

De Vliegher A. & Van Waes C. (2013) Nitrate-N residue in the soil under a perennial ryegrass sward with and without white clover under cutting conditions. Grassland Science in Europe. Reykjavik: 159-161

D'Hose T., Ruysschaert G., Heungens K., Viaene N., De Vliegher A. & Willekens K. (2013) Soil organic matter management within the legal constraints of the fertilization laws. BOPACT field trial. NUTRIHORT: Proceedings. 314-321

Eeckhaut T., Calsyn E. & Van Huylenbroeck J. (2013) Intersubgeneric hybridization of belgian pot azaleas (*Rhododendron simsii*) with tropical V *ireya* genotypes. In: K. Van Laere & K. Van Laere (Eds.) Proceedings of the Second International Symposium on Woody Ornamentals of the Temperate Zone. International Society for Horticultural Science (ISHS). Gent: 259-263

Hofman G., De Vis R., Crappé S., Van de Sande T., Mechant E., D'Haene K., Amery F., Vandecasteele B., Willekens K. & De Neve S. (2013) Benchmark study on nutrient legislation for horticultural crops in some European countries. NUTRIHORT : Proceedings. 211-227

Huysveld S., Van linden V., Peiren N., Muylle H., Lauwers L. & Dewulf J. (2013) Development of an exergetic life cycle assessment (ELCA) tool to evaluate environmental impact of dairy farms in Flanders (Belgium). Advances in Animal Biosciences. Cambridge University Press

Luypaert G., De Keyser E., Van Huylenbroeck J., Witters J., Maes M., De Riek J. & De Clercq P. (2013) Is there a role for jasmonic acid in induced resistance against broad mites in pot azalea? In: A. Schmitt & A. Schmitt (Eds.) Induced resistance in plants against insects and diseases. 63-66

Pipino L., Scariot V., Van Labeke M. C. & Leus L. (2013) Hybrid rose breeding: improving seed production efficiency. In: K. Van Laere & K. Van Laere (Eds.) Proceedings of the Second International Symposium on Woody Ornamentals of the Temperate Zone. International Society for Horticultural Science (ISHS). Gent: 281-291

Reubens, B., Van Gils, B., Baeyens, D., Vandevelde, C. & Wauters, E. (2013) Agroforestry, anyone? Opportunities, barriers and attitude towards agroforestry systems in Flemish agriculture. 13th North American Agroforestry Conference: Conference proceedings

Ruysschaert G., Coorevits L., Vandecasteele B., De Vliegher A. & Deckers J. (2013) Spatial and temporal variability of rooting characteristics and catch crop effectiveness. NUTRIHORT: Proceedings 94-102

Vandecasteele B., Mondini C., D'Hose T., Stefano R., Sinicco T. & Quero Alba A. (2013) Effect of biochar amendment during composting and compost storage on greenhouse gas emissions, N losses and P availability. RAMIRAN 2013. Recycling of Organic Residues in Agriculture: From Waste Management to Ecosystem Services. Proceedings

Vandecasteele, B., Muylle, H., Schrama, M., De Vliegher, A. & Baert, J. (2013) Fluxes of organic matter in harvested biomass and crop residues of energy crops: effects on soil organic matter. RAMIRAN 2013. Recycling of Organic Residues in Agriculture: From Waste Management to Ecosystem Services. Proceedings

Vandecasteele B., Amery F., De Vis R., Crappé S., Van de Sande T., Callens D., Mechant E., Hofman G. & De Neve S. (2013) Benchmark study on innovative techniques and strategies for reduction of nutrient losses in horticulture. NUTRIHORT: Proceedings. 196-210

Vanden Nest T., Vandecasteele B., Ruysschaert G., Cougnon M., Merckx R. & Reheul D. (2013) The effect of different fertilizer types on soil P conditions, crop yield and P leaching potential. NUTRIHORT: Proceedings. 130-135

Willekens K., Vandecasteele B. & De Neve S. (2013) Strong effect of compost and reduced tillage on C dynamics but not on N dynamics in a vegetable cropping system. NUTRIHORT: Proceedings. 162-169

Books and reports

Amery, F., Vandecasteele, B., Van Waes, C. & Van Waes, J. (2013) ILVO-mededeling 137: Vlarisub-ringtest mei 2013, 28 p

Amery F., Vandecasteele B., De Vis R., Crappé S., Van De Sande T., Mechant E., De Bolle S., Willekens K. & De Neve S. (2013) NUTRIHORT: Nutrient management, innovative techniques and nutrient legislation in intensive horticulture for an improved water quality. Fact sheets from the benchmark study on innovative techniques and strategies for reduction of nutrient losses in horticulture

D'Haene, K., Vandecasteele, B., De Vis, R., Crappé, S., Callens, D., Mechant, E., Hofman, G. & De Neve, S. (2013) NUTRIHORT : Nutrient management, innovative techniques and nutrient legislation in intensive horticulture for an improved water quality. Proceedings. September 16-18, 2013, Ghent, 391 p

D'Haene, K., Vandecasteele, B., De Vis, R., Crappé, S., Callens, D., Mechant, E., Hofman, G. & De Neve, S. (2013) NUTRIHORT : Nutrient management, innovative techniques and nutrient legislation in intensive horticulture for an improved water quality. Book of Abstracts. September 16-18, 2013, Ghent, 74 p

Gobin, A., Joris, I., Vos, J., Vandecasteele, B., Muylle, H. & Kros, H. (2013) Begroten van de gevaren en opportuniteiten van verschillende bio-energieproductiesystemen voor de organische koolstofvoorraden in de Vlaamse landbouwbodems. Studie uitgevoerd in opdracht van LNE-ALBON (2013/RMA/R/99), 199 p

Gybels, R., Viaene, J., Vandervelden, J., Reubens, B. & Vandecasteele, B. (2013) Biomassa als bodemverbeteraar - Onderzoek naar de toepassing van beheerresten als bodemverbeteraar. Agentschap voor Natuur en Bos, Inverde & ILVO. 73 p

Karssen G., Wesemael W. & Moens M. (2013) Root-knot nematodes. In: Perry R. & Moens M. Plant nematology. CABI Publishing. Wallingford, UK: 73-108

Organic Food and Farming in Flanders: Research 2011-2012 (2013) Instituut voor Landbouw- en Visserijonderzoek - ILVO. Merelbeke

Pannecoucque, J., Jacquemin, G., Van Waes, C. & Van Waes, J. (2013) ILVO-mededeling 128: Belgische beschrijvende en aanbevelende rassenlijst voor industriële cichorei, 8 p

Pannecoucque, J., Jacquemin, G., Van Waes, C. & Van Waes, J. (2013) ILVO-mededeling 129: Catalogue Belge description et recommandation chicorée industrielle, 8 p

Pannecoucque, J., Van Waes, J. & De Vliegher, A. (2013) ILVO-mededeling 147: Belgische beschrijvende en aanbevelende rassenlijst voor voedergewassen en groenbedekkers 2014, 74 p

Pannecoucque, J., Van Waes, J., De Vliegher, A. & Jacquemin, G. (2013) ILVO-mededeling 148: Catalogue Belge - description et recommandation plantes fourragères et engrais verts 2014, 75 p

Reubens B., Willekens K., Beeckman A., De Neve S., Vandecasteele B. & Delanote L. (2013) ILVO-mededeling 114: Optimale aanwending van biologische mest voor een gezond biologisch gewas, 120 p

Rijckaert, G., Vanden Nest, T. & Van Waes, C. (2013) ILVO-mededeling 141: Optimalisatie van de zaadoogsttechniek van Italiaans raaigras. Hoe praktijkzaadverliezen bij de oogst reduceren? Oogst 2013, 16 p

Subbotin S., Waeyenberge L. & Moens M. (2013) Molecular Systematics. In: Perry R. & Moens M. Plant Nematology. CABI Publishing, Wallingford, UK: 40-72

Vandecasteele, B., Van Waes, C. & Van Waes, J. (2013) ILVO-mededeling 133: Vlarisub-ringtest november 2012, 26 p

Viaene N., Coyne D. L. & Davies K. G. (2013) Biological and cultural management. In: Perry R. & Moens M. Plant Nematology. CABI Publishing. Wallingford: 383-410

Viaene N. (2013) Vijanden van Gewassen en hun Beheersing. In: L. Vandewalle & L. Vandewalle (Eds.). Inagro vzw. Rumbeke

PhDs

Deryckere D. (2013) Development of asymmetric somatic hybridization technology in industrial chicory (*Cichorium intybus* L.). 203 p. UGent, Faculteit Bio-ingenieurswetenschappen. Promotoren: Van Bockstaele E. & Van Huylenbroeck

Lakshmanan P. S. (2013) Molecular cytogenetic studies and technology development for creating aroid (Araceae) asymmetric somatic hybrids. 137 p. UGent, Faculteit Bio-ingenieurswetenschappen. Promotoren: Van Bockstaele E. & Khrustaleva L.

Mehdi Khanlou K. (2013) Use of RNAi to evaluate the role of isoflavones in resistance of red clover to *sclerotinia trifoliorum* and *sclerotium rolfsii*. 203 p. UGent, Faculteit Bio-ingenieurswetenschappen. Promotor: Van Bockstaele E.

Nelissen V. (2013) Effects of biochar on soil processes, soil functions and crop growth. 222 p. UGent, Faculteit Bio-ingenieurswetenschappen. Promotoren Boeckx P. & Ruysschaert G.

Vandroemme J. (2013) Detection of *Xanthomonas fragariae* and polyphasic characterization of its relationship with strawberry. 274 p. UGent, Faculteit Bio-ingenieurswetenschappen. Promotor: De Vos P.

Vleugels T. (2013) Breeding for resistance to clover rot (*Sclerotinia* spp.) in red clover (*Trifolium pratense*). 204 p. UGent, Faculteit Bio-ingenieurswetenschappen. Promotor: Van Bockstaele E.

Technology & Food Science

Scientific publications (A1)

Alfoldy B, Lööv, J. B., Lagler F., Mellqvist J., Berg N., Beecken J., Weststrate H., Duyzer J, Bencs L., Horemans B., Cavalli F., Putaud J.P., Janssens-Maenhout G., Csordas A.P., Van Grieken R., Borowiak A. & Hjorth J. (2013) Measurements of air pollution emission factors for marine transportation in SECA. Atmospheric Measurement Techniques, 6: 1777-1791

Anaf W., Horemans B., Madeira T. I., Carvalho M. L., De Wael K. & Van Grieken R. (2013) Effects of a constructional intervention on airborne and deposited particulate matter in the Portuguese National Tile Museum, Lisbon. Environmental Science and Pollution Research, 20 (3): 1849-1857

Beck B., Brusselman E., Nuyttens D., Moens M., Pollet S., Temmerman F. & Spanoghe P. (2013) Improving foliar applications of entomopathogenic nematodes by selecting adjuvants and spray nozzles. Biocontrol Science and Technology, 23 (5): 507-520

Beck B., Spanoghe P., Moens M., Brusselman E., Temmerman F., Pollet S. & Nuyttens D. (2013) Improving the biocontrol potential of Steinernema feltiae against Delia radicum through dosage, application technique and timing. Pest Management Science.

Bernaert N., Wouters D., De Vuyst L., De Paepe D., De Clercq H., Van Bockstaele E., De Loose M. & Van Droogenbroeck B. (2013) Antioxidant changes of leek (*Allium ampeloprasum* var. *porrum*) during spontaneous fermentation of the white shaft and green leaves. Journal of the Science of Food and Agriculture, 93 (9): 2146-2153

Bernaert N., De Clercq H., Van Bockstaele E., De Loose M. & Van Droogenbroeck B. (2013) Antioxidant changes during postharvest processing and storage of leek (*Allium ampeloprasum* var. *porrum*). Postharvest Biology and Technology, 86: 8-16

Block A., Debode F., Grohmann L., Hulin J., Taverniers I., Kluga L., Barbau-Piednoir E., Broeders S., Huber I., Van den Bulcke M., Heinze P., Berben G., Busch U., Roosens N., Janssen E., Zel J., Gruden K. & Morisset D. (2013) The GMOseek matrix: a decision support tool for optimizing the detection of genetically modified plants. BMC Bioinformatics, 14 (1): 256

Braem G., De Vliegher S., Verbist B., Piessens V., Van Coillie E., De Vuyst L. & Leroy F. (2013) Unraveling the microbiota of teat apices of clinically healthy lactating dairy cows, with special emphasis on coagulase-negative staphylococci. Journal of Dairy Science, 96 (3): 1499-1510

Broekaert K., Heyndrickx M., Herman L., Devlieghere F. & Vlaemynck G. (2013) Molecular identification of the microbiota of peeled and unpeeled brown shrimp (*Crangon crangon*) during storage on ice and at 7.5°C. Food Microbiology, 36 (2): 123-134

Broekaert K., Noseda B., Heyndrickx M., Vlaemynck G. & Devlieghere F. (2013) Volatile compounds associated with *Psychrobacter* spp. and *Pseudoalteromonas* spp., the dominant microbiota of brown shrimp (*Crangon crangon*) during aerobic storage. International Journal of Food Microbiology, 166 (3): 487-493

Bronchart F., De Paepe M., Dewulf J., Schrevens E. & Demeyer P. (2013) Thermodynamics of greenhouse systems for the northern latitudes: Analysis evaluation and prospects for primary energy saving. Journal of Environmental Management, 119: 121-133

Cucu T., Platteau C., Taverniers I., Devreese B., De Loose M. & De Meulenaer B. (2013) Effect of partial hydrolysis on the hazelnut and soybean protein detectability by ELISA. Food Control, 30 (2): 497-503

De Buck S., Nolf J., De Meyer T., Virdi V., De Wilde K., Van Lerberge E., Van Droogenbroeck B. & Depicker A. (2013) Fusion of an Fc chain to a VHH boosts the accumulation levels in Arabidopsis seeds. Plant Biotechnology Journal, 11 (8): 1006-1016

Dekeyser D., Duga A. T., Verboven P., Endalew A. M., Hendrickx N. & Nuyttens D. (2013) Assessment of orchard sprayers using laboratory experiments and computational fluid dynamics modelling. Biosystems Engineering, 114 (2): 157-169

De Paepe M., Pieters J., Cornelis W., Gabriels D., Merci B. & Demeyer P. (2013) Airflow measurements in and around scale-model cattle barns in a wind tunnel: Effect of wind incidence angle. Biosystems Engineering, 115 (2): 211-219

De Visscher A., Haesebrouck F., Piepers S., Vanderhaeghen W., Supré K., Leroy F., Van Coillie E. & De Vliegher S. (2013) Assessment of the suitability of mannitol salt agar for growing bovine-associated coagulase-negative staphylococci and its use under field conditions. Research in Veterinary Science, 95 (2): 347-351

Farrokh C., Jordan K., Auvray f., Glass K., Oppegaard H., Raynaud S., Thevenot D., Condron R., De Reu K., Govaris A., Heggum K., Heyndrickx M., Hummerjohann J., Lindsay D., Miszczycha S., Moussiegt S., Verstraete K. & Cerf O. (2013) Review of Shiga-toxin-producing Escherichia coli (STEC) and their significance in dairy production. International Journal of Food Microbiology, 162: 190-212

Foqué D., Nuyttens D. & Pieters J. G. (2013) Effect of spray angle and spray volume on deposition of a medium droplet spray with air support in ivy pot plants. Pest Management Science

Huysveld S., Schaubroeck T., De Meester S., Sorgeloos P., Van Langenhove H., Van linden V. & Dewulf J. (2013) Resource use analysis of Pangasius aquaculture in the Mekong Delta in Vietnam using Exergetic Life Cycle Assessment. Journal of Cleaner Production, 51: 225-233

Jensen P. K., Lund I. & Nuyttens D. (2013) Spray liquid distribution and biological efficacy of commercially available nozzles used for precision weed control. Biosystems Engineering, 116: 316-325

Joris M. A., Vanrompay D., Verstraete K., De Reu K., Dezutter L. & Cox E. (2013) Use of antibody responses against locus of enterocyte effacement (LEE)-encoded antigens to monitor enterohemorrhagic *Eschericia coli* infections on cattle farms. Applied and Environmental Microbiology, 79: 3677-3683

Joris M. A., Verstraete K., De Reu K. & De Zutter L. (2013) Longitudinal follow-up of the persistence and dissemination of EHEC on cattle farms in Belgium. Foodborne Pathogens and Disease, 10: 295-301

Lofstrom P., Bruus M., Andersen H. V., Kjaer C., Nuyttens D. & Astrup P. (2013) The OML-SprayDrift model for predicting pesticide drift and deposition from ground boom sprayers. Journal of Pesticide Science, 38 (3): 129-138

Ngoc Tong Thi A., Noseda B., Samapundo S., Ly Nguyen B., Broekaert K., Rasschaert G., Heyndrickx M. & Devlieghere F. (2013) Microbial ecology of Vietnamese Tra fish (*Pangasius hypophthalmus*) fillets during processing. International Journal of Food Microbiology, 167: 144-152

Nuyttens D., Devarrewaere W., Verboven P. & Foqué D. (2013) Pesticide-laden dust emission and drift from treated seeds during seed drilling: a review. Pest Management Science, 69: 564-575

Platteau C., Cucu T., Taverniers I., Devreese B., De Loose M. & De Meulenaer B. (2013) Effect of oxidation in the presence or absence of lipids on hazelnut and soybean protein detectability by commercial ELISA. Food and Agricultural Immunology, 24 (2): 179-192

Pletinckx L.J., Dewulf J., De Bleecker Y., Rasschaert G. , Goddeeris I.M & De man I. (2013) Effect of a disinfection strategy on the methicillin-resistant *Staphylococcus aureus* CC398 prevalence of sows, their piglets and the barn environment. Journal of Applied Microbiology, 114 (6): 1634-1641

Pluym L., Maes D., Vangeyte, J., Mertens K., Baert J., Van Weyenberg S., Millet S. & Van Nuffel A. (2013) Development of a system for automatic measurements of force and visual stance variables for objective lameness detection in sows: SowSIS. Biosystems Engineering, 116 (1): 64-74

Pluym L., Van Nuffel A., Van Weyenberg S. & Maes D. (2013) Prevalence of lameness and claw lesions during different stages in the reproductive cycle of sows and the impact on reproduction results : economic impact of lameness in group-housed sows. Animal, 7 (7): 1174-1181

Pluym L., Van Nuffel A. & Maes D. (2013) Treatment and prevention of lameness with special emphasis on claw disorders in group-housed sows. Livestock Science, 156 (1-3): 36-43

Ransbeeck N. V., Langenhove H. V. & Demeyer P. (2013) Indoor concentrations and emissions factors of particulate matter, ammonia and greenhouse gases for pig fattening facilities. Biosystems Engineering, 116 (4): 518-528

Rasschaert G. (2013) Effect of a disinfection strategy on the methicillin-resistant *Staphylococcus aureus* CC398 prevalence of sows, their piglets and the barn environment. Journal of Applied Microbiology, 114 (6): 1634-1641

Rasschaert G., Piessens V., Scheldeman P., Leleu S., Stals A., Herman L., Heyndrickx M. & Messens W. (2013) Efficacy of electrolyzed oxidizing water and lactic acid on the reduction of *Campylobacter* on naturally contaminated broiler carcasses during processing. Poultry Science, 92 (4): 1077-1084

Robyn J., Rasschaert G., Hermans D., Pasmans F. & Heyndrickx M. (2013) Is allicin able to reduce *Campylobacter jejuni* colonization in broilers when added to drinking water? Poultry Science, 92 (5): 1408-1418

Robyn J., Rasschaert G., Hermans D., Pasmans F. & Heyndrickx M. (2013) In vivo broiler experiments to assess anti *Campylobacter jejuni* activity of a live *Enterococcus faecalis* strain. Poultry Science, 92 (1): 265-271

Rossi M., Nys Y., Anton M., Bain M., De Ketelaere B., De Reu K., Dunn I., Gautron J., Mammershoj M., Hidalgo A., Meluzzi A., Mertens K., Nau F. & Sirri F. (2013) Developments in understanding and assessment of egg and egg product quality over the last century. Worlds Poultry Science Journal, 69: 414-429

Sedlar A. D., Bugarin R. M., Nuyttens D., Turan J. J., Zoranovic M. S., Ponjican O. O. & Janic T. V. (2013) Quality and efficiency of apple orchard protection affected by sprayer type and application rate. Spanish Journal of Agricultural Research, 11 (4): 935-944

Stals A., Uyttendaele M. & Van Coillie E. (2013) The need for harmonization in detection of human noroviruses in food. Journal of AOAC International, 96 (5): 998-1005

Stals A., Uyttendaele M., Baert L. & Van Coillie E. (2013) Norovirus transfer between foods and food contact materials. Journal of Food Protection, 76 (7): 1202-1209

Stals A., Van Coillie E. & Uyttendaele M. (2013) Viral genes everywhere: public health implications of PCR-based testing of foods. Current Opinion in Virology, 3 (1): 69-73

Van Nuffel A., Vangeyte J., Mertens K. C., Pluym L., De Campeneere S., Saeys W. & Van Weyenberg S. (2013) Exploration of measurement variation of gait variables for early lameness detection in cattle using the GAITWISE. Livestock Science, 156: 88-95

Van Ransbeeck N., Van Weyenberg S., Van Langenhove H. & Demeyer P. (2013) Indoor concentration measurements of particulate matter at a pig fattening facility: Comparison and equivalence tests with different sampling instruments and measuring techniques. Biosystems Engineering, 115 (4): 453-462

Van Weyenberg S., Buyse J., Kalmar I., Swennen Q. & Janssens G. (2013) Voluntary feed intake and leptin sensitivity in ad libitum fed obese ponies following a period of restricted feeding: a pilot study. Journal of Animal Physiology and Animal Nutrition

Van der Linden I., Cottyn B., Uyttendaele M., Vlaemynck G., Heyndrickx M. & Maes M. (2013) Survival of enteric pathogens during butterhead lettuce growth: crop stage, leaf age, and irrigation. Foodborne Pathogens and Disease, 10 (6): 485-491

Van der Linden I., Cottyn B., Uyttendaele M., Vlaemynck G., Maes M. & Heyndrickx M. (2013) Long-term survival of *Escherichia coli* O157:H7 and *Salmonella enterica* on butterhead lettuce seeds, and their subsequent survival and growth on the seedlings. International Journal of Food Microbiology, 161 (3): 214-219

Van Immerseel F., Studholme D. J., Eeckhaut V., Heyndrickx M., Dewulf J., Dewaele I., Van Hoorebeke S., Haesebrouck F., Van Meirhaeghe H., Ducatelle R., Paszkiewicz K. & Titball R. W. (2013) *Salmonella* Gallinarum field isolates from laying hens are related to the vaccine strain SG9R. Vaccine, 31 (43): 4940-4945

Van Meervenne E., Boon N., Verstraete K., Devlieghere F., De Reu K., Herman L., Buvens G., Piérard D. & Van Coillie E. (2013) Integron characterization and typing of Shiga toxin-producing *Escherichia coli* isolates in Belgium. Journal of Medical Microbiology, 62 (Pt 5): 712-719

Verhegghe M., Pletinckx L. J., Crombé F., Vandersmissen T., Haesebrouck F., Butaye P., Heyndrickx M. & Rasschaert G. (2013) Methicillin-resistant *Staphylococcus aureus* (MRSA) ST398 in pig farms and multispecies Farms. Zoonoses and Public Health, 60 (5): 366-374

Verhegghe M., Pletinckx L. J., Crombé F., Van Weyenberg S., Haesebrouck F., Butaye P., Heyndrickx M. & Rasschaert G. (2013) Cohort study for the presence of livestock-associated MRSA in piglets. Veterinary Microbiology, 162 (2-4): 679-686

Verraes C., Van Boxstael S., Van Meervenne E., Van Coillie E., Butaye P., Catry B., de Schaetzen M. A., Van Huffel X., Imberechts H., Dierick K., Daube G., Saegerman C., De Block J., Dewulf J. & Herman L. (2013) Antimicrobial resistance in the food chain: a review. International Journal of Environmental Research and Public Health, 10: 2643-2669

Verstraete K., De Reu K., Robyn J., Piérard D., De Zutter L., Herman L. & Heyndrickx M. (2013) Genetic characteristics of Shiga toxin producing *E. coli* O157, O26, O103, O111, and O145 isolates from humans, food, and cattle in Belgium. Epidemiology and Infections, 141: 2503-2515

Wouters D., Bernaert N., Anno N., Van Droogenbroeck B., De Loose M., Van Bockstaele E. & De Vuyst L. (2013) Application' and validation of autochthonous lactic acid bacteria starter cultures for controlled leek fermentations and their influence on the antioxidant properties of leek. International Journal of Food Microbiology, 165 (2): 121-133

Wouters D., Bernaert N., Conjaerts W., Van Droogenbroeck B., De Loose M. & De Vuyst L. (2013) Species diversity, community dynamics, and metabolite kinetics of spontaneous leek fermentations. Food Microbiology, 33 (2): 185-196

Zwertvaegher I., De Vliegher S., Baert J. & Van Weyenberg S. (2013) Short communication: Intraoperator repeatability and interoperator reproducibility of devices measuring teat dimensions in dairy cows. Journal of Dairy Science, 96: 366-371

Zwertvaegher I., De Vliegher S., Verbist B., Van Nuffel A., Baert J. & Van Weyenberg S. (2013) Short communication: Associations between teat dimensions and milking-induced changes in teat dimensions, and quarter milk somatic cell counts in dairy cows. Journal of Dairy Science, 96: 1075-1080

Conference Proceedings

Calliauw F., Broekaert K., Vlaemynck G. & Heyndrickx M. (2013) Identification of the microbiota during shelf-life of brown shrimp (*Crangon crangon*) under different storage conditions. Proceedings of the Eighteenth Conference on Food Microbiology, Brussel (BE): 104

Cross J., Balsari P., Doruchowski G., Douzals J. P., Herbst A., Marucco P., Nuyttens D. & Walklate P. (2013) Orchard spray application in Europe? State of the art and research challenges. IOBC-WPRS Bulletin: 465-475

De Clercq N., Van Coillie E., Van Pamel E., De Meulenaer B., Devlieghere F. & Vlaemynck G. (2013) Occurence of xerophilic fungi in chocolate factories. Proceedings of the Eighteenth Conference on Food Microbiology, Brussel (BE): 108

De Paepe M., Pieters J., Cornelis W., Gabriels D., Merci B. & Demeyer P. (2013) Computational modelling and scale model validation of airflow patterns in naturally ventilated barns. In: R. Suay & R. Suay (Eds.) ISHS Acta Horticulturae.

De Paepe M., Pieters J., Merci B. & Demeyer P. (2013) A real-scale test facility for the study of ammonia emissions from a slurry pit - Effect of airflow rate and airflow direction at the slatted floor level. Bau, Technik und Umwelt in der landwirtschaftlichen Nutztierhaltung: 235-239

De Reu K., Heyndrickx M., Rasschaert G., Bertrand S., Wildemauwe C., Wattiau P., Imberechts H., Herman L., Ducatelle R., Van Weyenberg S. & Dewaele I. (2013) Phage and MLVA typing of *Salmonella* Enteritidis isolated from layers and humans in Belgium from 2000 - 2010, a period in which vaccination of laying hens was introduced. Proceeding book of International Symposium Salmonella and Salmonellosis, Saint-Malo (FR): 448-449

De Reu K., Rasschaert G., Wildemauwe C., Van Meirhaeghe H., Vanrobaeys M., De Graef E., Herman L., Ducatelle R., Heyndrickx M. & Dewaele I. (2013) Polyphasic characterization of *Salmonella* Enteritidis isolates on persistently contaminated layer farms during the implementation of a national control program with obligatory vaccination: a longitudinal study. Proceeding book of International Symposium Salmonella and Salmonellosis, Saint-Malo (FR): 258-260

De Vogeleer G., Pieters J., Van Overbeke P. & Demeyer P. (2013) Field test facility for the development of a reference method for ventilation rate and emission measurements in naturally ventilated pig houses. 11th Conference "construction, engineering and environment in livestock farming".

Gregersen T., Jensen T., Andersen M., Mortensen L., Maselyne J. & Hessel E. (2013) Computer vision based monitoring of performance of an RFID based eating registration system. Proceedings of the 11th Conference on Construction, Engineering and Environment in Livestock Farming.

Gregersen T., Jensen T., Andersen M., Mortensen L., Maselyne J., Hessel E. & Ahrendt P. (2013) Consumer grade range cameras for monitoring pig feeding behaviour. Papers presented at the 6th European Conference on Precision Livestock Farming.

Heyndrickx M. (2013) Diarrhoea caused by Bacillus cereus present in foodstuffs: which conditions are necessary for enterotoxin production? Proceedings of the Eighteenth Conference on Food Microbiology. Brussel (BE): 87-92

Huysveld S., Van linden V., Peiren N., Muylle H., Lauwers L. & Dewulf J. (2013) Development of an exergetic life cycle assessment (ELCA) tool to evaluate environmental impact of dairy farms in Flanders (Belgium). Advances in Animal Biosciences. Cambridge University Press.

Luyckx K., Van Weyenberg S., Dewulf J., Herman L., Zoons J., Vervaet E., Heyndrickx M & De Reu K. (2013) Proceedings of the Eighteenth Conference on Food Microbiology, Brussel (BE): 124

Maselyne J. & De Keyser R. (2013) Control of the relative movement of hydraulically driven linear moving parts. Proceedings of the Asian Control Conference (ASCC)

Maselyne J., Van Nuffel A., De Ketelaere B., Mertens K., Hessel E., Sonck B. & Saeys W. (2013) Range measurements of a Radio Frequency Identification System for registering growing-finishing pigs near a feed trough. Papers presented at the 6th European Conference on Precision Livestock Farming. Leuven: 433-439

Maselyne J., Van Nuffel A., De Ketelaere B., Mertens K., Sonck B., Hessel E. & Saeys W. (2013) Individual pig health monitoring based on automated registration of feeding pigs and synergistic control. Proceedings of the 11th Conference on Construction, Engineering and Environment in Livestock Farming.

Maselyne J., Saeys W., Van Nuffel A., De Ketelaere B., Mertens K., Millet S., Gregersen T., Brizzi P. & Hessel E. (2013) A health monitoring system for growing-finishing pigs based on the individual feeding pattern using Radio Frequency Identification and Synergistic Control. Papers presented at the 6th European Conference on Precision Livestock Farming. Leuven: 825-833

Nuyttens D., De Baerdemaeker J., Dekeyser D. & Verboven P. (2013) Spray drift from field crop sprayers. Proceedings 12° Curso Internacional de Agricultura de Precisión.

Pluym L., Maes D., Vangeyte J., Mertens K., Millet S. & Van Nuffel A. (2013) Repeatability of, and correlation between, force and visual stance variables measured by a system for automatic lameness detection in sows, SowSIS. In: Papers presented at the 6th European Conference on Precision Livestock Farming. Leuven

Scalera A., Brizzi P., Tomasi R., Gregersen T., Mertens K., Maselyne J., Van Nuffel A. & Hessel E. (2013) The PigWise project: a novel approach in livestock farming through synergistic performances monitoring at individual level. Proceedings of the EFITA 2013 conference.

Van linden V., Demeyer P. & Herman L. (2013) Fuel consumption as a source of greenhouse gas emissions: off-road fuel consumption indicators for agricultural production in Belgium. Advances in Animal Biosciences. Cambridge University Press: 482

Van Meervenne E. (2013) Transfer van antibioticumresistentie tijdens voedselproductie en –bewaring. Proceedings of the Eighteenth Conference on Food Microbiology, Brussel (BE): 49-55

Van Nuffel A., Briene P., Vangeyte J., Mertens K., Saeys W. & Van Weyenberg S. (2013) Farmers opinions concerning lameness detection systems compared to oestrus detection systems. In : 17th International Symposium and 9th International Conference on Lameness in Ruminants. Bristol (UK)

Van Nuffel A., Vangeyte J., Mertens K., De Campeneere S., Pluym L., Saeys W., Opsomer G. & Van Weyenberg S. (2013) Is the within measurement variation of gait variables useful for early detection of cattle using the GAITWISE? In : 17th International Symposium and 9th International Conference on Lameness in Ruminants. Bristol (UK)

Van Overbeke P., Pieters J., De Vogeleer G. & Demeyer P. (2013) Development of a reference method for the measurement of the ventilation rate through rectangular ventilation openings using ultrasonic anemometers. 11th Conference "Construction, Engineering and Environment in Livestock Farming"

Vulgarakis Minov S., Cointault F., Vangeyte J., Pieters J. & Nuyttens D. (2013) Measurement of single droplet characteristics using high speed imaging techniques. Proceedings of the IASTED Conference on Signal Processing, Pattern recognition and Applications (SPRA). ACTA Press. 321-326

Vulgarakis Minov S., Cointault F., Vangeyte J., Pieters J. & Nuyttens D. (2013) Spray nozzle characterization using high speed imaging techniques. Precision Agriculture 13. Wageningen Academic Publishers. 569-576

Books and reports

Bahr C., Van Nuffel A., Van Weyenberg S. & Berckmans D. (2013) The ease of movement – how automatic gait and posture analysis can contribute to early lameness detection in dairy cattle. Chapter 22: Livestock housing: Modern management to ensure optimal health and welfare of farm animals. ed. Andres Aland; Thomas Banhazi. Wageningen Academic Publishers: 419-430

Broekaert, K., De Ruyck, H., Gotke, N., Thysen, I., Darcy-Vrillon, B., Esnouf, C. & Russel, M. (2013) SUSFOOD Country Report Book: Reports on the organisations of research programmes, funding bodies and research institutes in 16 European Countries. Merelbeke: 339 p.

De Loose M. & Depicker A. (2013) Fundamentals of Plant Biotechnology. In: G. Flachowsky & G. Flachowsky (Eds.) Animal Nutrition with Transgenic Plants. Oxfordshhire, UK: 14-29

Ooghe S., Reybroeck W. (2013) Rapport ringonderzoek antibiotica. 29 p.

Ooghe S., Reybroeck W. (2013) Report ring test "Screening for antibiotics and sulfonamides in raw goats' milk". 19 p.

Reybroeck W. & Ooghe S. (2013) Validation of the Charm Aflatoxin M1 15 minute test (MRLAFMQ) for detection of aflatoxin M1 at 50 ng/l in raw commingled and pasteurized whole milk. 16 p.

Reybroeck W. & Ooghe S. (2013) Validation of the quinosensor milk for the testing of raw bovine milk. 18 p.

Reybroeck W. & Ooghe S. (2013) Validation of the Charm Beta-Lactam 1 Minute test (MRL1) for raw commingled milk, final report. 16 p.

Werbrouck, H., Dehareng, F. (2013) Wetenschappelijke begeleiding van de Belgische Interprofessionele Organismen belast met de officiële bepaling van de kwaliteit en de samenstelling van rauwe melk geleverd aan kopers. 21 p.

PhDs

Beck B. (2013) Sustainable insect control in vegetables through optimized applications of entomopathogenic nematodes. 178 p. UGent, Faculteit Bio-ingenieurswetenschappen. Promotoren: Spanoghe P., Moens M. & Nuyttens D.

Bernaert N. (2013) Bioactive compounds in leek (*Allium ampeloprasum* var. *porrum*): analysis as a function of the genetic diversity, harvest time and processing techniques. 277 p. UGent, Faculteit Bio-ingenieurswetenschappen. Promotoren: Van Bockstaele E. & Van Droogenbroeck B.

Pluym L. (2013) Detection, implications and risk factors for lameness in group-housed gestating sows. 184 p. UGent, Faculteit Diergeneeskunde. Promotoren: Maes D., Van Nuffel A. & Van Weyenbergh S.

Robyn J. (2013) *In vitro* and *in vivo* evaluation of measures to control *Campylobacter jejuni* in broilers. 193 p. UGent, Faculteit Diergeneeskunde. Promotoren: Pasmans F., Heyndrickx M. & Rasschaert G.

Vangeyte J. (2013) Development and validation of a low cost technique to predict spread patterns of centrifugal fertiliser spreaders. 146 p. K.U.Leuven Faculteit Bio-ingenieurswetenschappen. Promotoren: Ramon H. & Sonck B.

Van Ransbeeck N. (2013) Particulate matter, ammonia and greenhouse gases in pig fattening facilities: measuring strategies, indoor concentrations and emissions. 165 p. UGent, Faculteit Bio-ingenieurswetenschappen. Promotor: Van Langenhove H. & Demeyer P.

Verhegghe M. (2013) Molecular epidemiology of livestock-associated methicillin-resistant *Staphylococcus aureus* in the Belgian pork production chain. 237 p. UGent, Faculteit Diergeneeskunde. Promotoren: Butaye P., Haesebrouck F., Heyndrickx M. & Rasschaert G.

Social Sciences

Scientific publications (A1)

Crivits M. & Paredis E. (2013) Designing an explanatory practice framework: local food systems as a case. Journal of Consumer Culture, 13 (3): 306-336

De Krom M., Oosterveer P. & Mol A. P. J. (2013) Public interests and values in multi-level food risk governance: European responses to avian influenza. Journal of Eenvironmental Policy & Planning, 15 (2): 161-177

De Krom M. P. M. M. & Dessein J. (2013) Multifunctionality and care farming: Contested discourses and practices in Flanders. Netherlands Journal of Agricultural Science, (64-65): 17-24

Dessein J., Bock B. B. & de Krom M. P. M. M. (2013) Investigating the limits of multifunctional agriculture as the dominant frame for Green Care in agriculture in Flanders and the Netherlands. Journal of Rural Studies, 32: 50-59

Dewaelheyns V., Elsen A., Vandendriessche H. & Gulinck H. (2013) Garden management and soil fertility in Flemish domestic gardens. Landscape and Urban Planning, 116: 25-35

Kerselaers E., Rogge E., Vanempten E., Lauwers L. & Van Huylenbroeck G. (2013) Changing land use in the countryside: Stakeholders? perception of the ongoing rural planning processes in Flanders. Land Use Policy, 32: 197-206

Messely L., Rogge E. & Dessein J. (2013) Using the rural web in dialogue with regional stakeholders. Journal of Rural Studies, 32: 400-410

Rogge E., Dessein J. & Verhoeve A. (2013) The organisation of complexity: A set of five components to organise the social interface of rural policy making. Land Use Policy, 35: 329-340

Van der Voort M., Charlier J., Lauwers L., Vercruysse J., Van Huylenbroeck G. & Van Meensel J. (2013) Conceptual framework for analysing farm-specific economic effects of helminth infections in ruminants and control strategies. Preventive Veterinary Medicine, 109: 228-235

Van Winsen F., de Mey Y., Lauwers L., Van Passel S., Vancauteren M. & Wauters E. (2013) Cognitive mapping: A method to elucidate and present farmers ? risk perception. Agricultural Systems, 122: 42-52

Wauters E. & Mathijs E. (2013) An Investigation into the Socio-psychological Determinants of Farmers' Conservation Decisions: Method and Implications for Policy, Extension and Research. Journal of Agricultural Education and Extension, 19 (1): 53-72

Conference Proceedings

Crivits M. (2013) Reconstructing innovation by letting the 'subject' speak: farmer's discourses and its relevance for democratic theory 17 p In: Proceedings of the RUC Sunrise Conference - Transforming Governance, Enhancing Innovation Roskilde University October 29-31, 2012, Proceedings RUC Sunrise Conference

De Cock L., Dessein J. & De Krom M. (2013) Impact of the dynamics of discourses on the development of organic farming in Flanders. NJF Seminar Report. 149-150

Gulinck H., Marcheggiani E., Lerouge F. & Dewaelheyns V. (2013) The Landscape of Interfaces: Painting Outside the Lines. In: B. Pedroli & B. Pedroli (Eds.) Landscape & Imagination. Bandecchi & Vivaldi. Florence: 71-76

Huysveld S., Van linden V., Peiren N., Muylle H., Lauwers L. & Dewulf J. (2013) Development of an exergetic life cycle assessment (ELCA) tool to evaluate environmental impact of dairy farms in Flanders (Belgium). Advances in Animal Biosciences. Cambridge University Press

Lambrecht E., Taragola N., Kühne B., Crivits M. & Gellynck X. (2013) Investigation of bottlenecks and success factors for networking as a tool for innovation in the ornamental plant sector. In: Majewski E., Czekaj S., Malak-Rawlikowska A., Ros M., Malazewska S. (Eds.) Proceedings of the IFMA 19 Congress, Transforming agriculture - between policy, science and the consumer. Warsaw University of Life Sciences - SGGW. Warsaw, Poland: 232-240

Wustenberghs H., Delcour I., De Baets T., de Schaetzen C., D'Haene K., Lauwers L., Marchand F., Steurbaut W. & Spanoghe P. (2013) Dual indicator set for crop protection sustainability surveys DISCUSS: preconditions for implementation on fruit farms. Proceedings of the 8th International Conference on Integrated Fruit Production, Kusadasi (Turkey), 07 12/10/2012, IOBC-WPRS Bulletin 91: 523-529, http://www.iobc-wprs.org/pub/bulletins/index.html

Wustenberghs H., Delcour I., D'Haene K., Lauwers L., Marchand F., Steurbaut W. & Spanoghe P. (2012) Dual indicator set for sustainable crop protection: do's and don'ts. Proceedings of the 64th International Symposium on Crop Protection, Ghent (Belgium), 22/5/2012, Communications in Agricultural and Applied Biological Sciences 77 (4): 401-405

Books and reports

De Cock L. & Van Waes J. (2013) Organic Food and Farming in Flanders: Research 2011-2012, NOBL Network for Organic Food and Farming Research. Merelbeke

de Krom, M., Dessein, J. & Erbout, N. (2013) ILVO-mededeling 151: Op zoek naar de wortels van een gepolariseerd publiek debat: de case van een gecontesteerde GGO-veldproef, 42 p

Demeyer R., De Baets T., de Schaetzen C., D'hooghe J., Keulemans W., Marchand F. & Wustenberghs H. (2013) Duurzame fruitbedrijven. Instituut voor Landbouw- en Visserijonderzoek – ILVO. Merelbeke Instituut voor Landbouw- en Visserijonderzoek, Proefcentrum Fruitteelt en Fruitteeltcentrum K.U.Leuven, i.o.v. Vlaamse overheid, Departement Landbouw- en Visserij, afdeling Monitoring en Studie, Brussel, 171 p http://lv.vlaanderen.be/nlapps/docs/default.asp?id=3292

De Waegemaeker J., Foré P., Verhoestraete D. & Lierman S. (2013) Wisselland als raamwerk. In: K. Vandermarliere & K. Vandermarliere (Eds.) Wisselland

Triste, L., Debruyne, L. & Marchand, F. (2013) ILVO-mededeling 124: Duurzame landbouw: een proces van leren, 55 p

Wauters, E., van Winsen, F., de Mey, Y., Van Passel, S., Vancauteren, M., Lauwers, L. & Deuninck, J. (2013) ILVO-mededeling 145: Risicoperceptie, attitude ten opzichte van risico en risicomanagement in de Vlaamse landbouw. Resultaten op basis van het landbouwmonitoringsnetwerk

SIETINET COMM

Half maart werd op het bedrijf Pelargonium D
SIETINET community. Hierbij tekenden 19 too
charterdocument. Het nieuwe samenwerking
plantenveredeling, weefselteelt, plantenbiote
sierteeltsector met het oog op het stimuleren
ondersteuning.

Emmy Dhooghe en Johan Van Huylenbroeck
ILVO Eenheid Plant

De eerste samenkomst van Sietinet Community vond plaats op het b
Komen (foto Sietinet)

Een community of netwerk brengt bedrijven bij elkaar rond gezamenlijke thema's of interesses. In geval van SIETINET zijn de thema's plant- edeling, weefselteel- logie en

Tevens is voor e noodza

onderzoek

"Technopool sierteelt" in

Guy Van Rysseghem

Eind mei ondertekenden de partners van "Technopool sierteelt" een samenwerkingsovereenkomst tussen onderzoeksinstellingen en het hoger onderwijs gericht op sierteeltgewassen.

In dit samenwerkingsverband vonden zich het Proefcentrum voor Sierteelt (PCS) Destelbergen, het Instituut voor Landbouw en Visserijonderzoek (ILVO), de Universi Gent en de Hogeschool Gent (HoG onderteker – Onderzo overeenk partners expertis timaal w len van

Alexander Vercamer schetste het l t in Oost-Vlaanderen.

Innov
Geder
voorz
de si
ren.
"Tec

MAP4
Nutrihort 2013
Tuinbouw en bemesting in internationaal kader

De internationale conferentie Nutrihort, die plaatsvond in Gent, was specifiek gericht op bemesting in de tuinbouw. ILVO, Universiteit Gent en de tuinbouwpraktijkcentra (PCG, PCS, PSKW en Inagro) stonden in voor de vlekkeloze organisatie. Gedurende drie dagen werd internationale kennis rond duurzame en innovatieve technieken van bemesting in de groente- en sierteelt gepresenteerd aan de 150 deelnemers uit zeventien landen. Niet minder dan 39 sprekers brachten een bijdrage. Daarnaast waren er nog een 50-tal posters die de resultaten van uitgevoerd onderzoek weergaven. Een impressie van deze internationale driedaagse.

Tuinbouw in het vlier

management

Rondworm die zich verplaatst via boktorren bedreigt naald- en loofbomen

Focus: België

(Belga) Het Instituut voor Landbouw- en Visserijonderzoek (ILVO) en de Université Libre de Bruxelles (ULB) onderzoeken of de "dennenhoutnematode" ook in ons land parasiteert op bepaalde soorten boktorren. De kans is reëel dat de schadelijke rondworm in de nabije toekomst ons land binnendringt via de handel in hout en houtproduc waarschuwt Natuurpunt.

OOSTENDE
Internationale conferentie over invasie van exoten in onze Noordzee

Exotische' Noordzee in de problemen

Wetenschappelijke onderzoekers van het ILVO met een paar labo-exoten: Lies Vanderperkt met een Amerikaanse zwaardschede en Kris Hostens met een Chinese wolhandkrab. (Foto Bij)

seminarie kregen de aanwezigen de kans om via een panelgesprek te stellen, onder meer aan de mensen van ILVO, Fenavian en Munters

ILVO ziet in rauwe garnaal meer dan lucratieve niche

Alle Belgische garnalenvissers samen visten de voorbije jaren gemiddeld 1.500 ton per jaar. Dat is amper vijf procent van het nationale verbruik. Toch is de prijs die zij voor de garnaal krijgen te laag. De mariene onderzoekers en voedingsexperts van ILVO willen daar wat aan doen. Ze besturen alle rendvoorwaarden om van addisel-vrije rauwe garnalen een commercieel succes te maken

De Belgen zijn van oudsher grote liefhebbers van gamaal. Aan geen enkel ander visserijproduct geven wij meer geld uit. De Belgische visserij kan de binnenlandse consumptie niet dekken. Maar liefst de helft van de EU-vangsten van grijze garnaal wat door de Belgen geconsumeerd. De garnaalvangsten onder Belgische vlag zijn slechts goed voor vijf procent van het nationale verbruik.

Volgens het instituut voor Landbouw- en Visserijonderzoek (ILVO) staat de Belgische garnaalsector voor uitdagingen. De prijs die de visser krijgt is (te) laag en het productgamma (te) klein. Er zijn ook bedenkingen te maken over duurzaamheid: de kwaliteit door transport om de garnalen in het binnenland te laten pellen lang en het gebruik van bewaarmiddelen en additieven is courant en aanzienlijk.

24 Belgische vaartuigen zijn actief in de garnalenvisserij. Zes ervan staan in voor de helft van de Belgische vangst. Er zijn ook maar 6 à 10 professionele garnaalvissers die een ander Belgische vlag varen. Én ook aantallen (gamaal aan land brengen) op Belgisch grondgebied. Alle Belgische garnaalvissers samen visten de vorige jaren gemiddeld 1.500 ton per jaar. Dat is zeer bescheiden in vergelijking met het totale Europese vangcijfer: 33.000 ton per jaar. In de Belgische havens/vismijnen kwam slechts 35 à 4 procent terecht: circa 400 ton

De vangst, aanlanding en co tijnds jaren voor een groot d door de noorderburen ooge worden. Wanneer ze in Mar bewaarmiddelen voedzame verzeilieren. Het vaarst pe De gamaal tan daardoor

Spekvis (ILVO)

Het project SPEKVIS gaat op zoek naar alternatieve materialen voor de spekking, het losse bouwwerk dat een boomkornet moet beschermen tegen slijtage. "Tijdens het slepen wordt de spekking uitgerafeld en gefragmenteerd. Uiteindelijk gaat bijna 100% van dit synthetische materiaal polyethyleen verloren op zee", verteld Sofie Vandendriessche van ILVO (Instituut voor Landbouw- en Visserijonderzoek). "We willen een alternatief biologisch afbreekbaar materiaal vinden met dezelfde essentiële eigenschappen (duurzaam, waterafstotend, licht, goedkoop) en bekijken of het gebruik ervan in de visserij haalbaar is. Met dit project wordt de brug geslagen naar de textielsector die al heel wat expertise heeft op vlak van alternatieve materialen."

Ruimtelijke planning op zee

Wetenschappelijke adviezen aan de basis van een verbeterd marien ruimtelijk plan voor Belgisch deel Noordzee

10/06/2013

België was in vergelijking met andere Europese kuststaten tot enkele jaren geleden voorloper in het opstellen van een zoneringsplan voor ons deeltje van de Noordzee. Naast zones voor natuurbescherming zijn er gebieden afgebakend voor de meeste menselijke activiteiten op zee, zoals zandontginning, terugstorten van baggerspecie, windenergie en scheepvaart. Momenteel ligt de focus van het beleid van de federale minister van de Noordzee op de vertaling van dat zoneringsplan in een echt ruimtelijk beheersplan om bepaalde zones beter te beschermen en eventueel nieuwe activiteiten beter in te kunnen plannen. De mariene wetenschappers van het Instituut voor Landbouw- en Visserijonderzoek ondersteunen dit planologisch proces met cijfergegevens en adviezen. | meer »

HLN BE BINNENLAND BUITENLAND
NIEUWS & SPORT BINNENLAND LANDBOUW

"Recht op meningsuiting vernielen"

"Het is de harde kern die terechtstaat in aardappelproces"

De elf beklaagden op het aardappelproces voor de correctionele rechtbank van Dendermonde voelen zich onaantastbaar en hebben volledig gebrek aan schuldinzicht. Dat stelden de advocaten van de burgerlijke partijen ILVO (Instituut voor Landbouw- en Visserijonderzoek), VIB (Vlaamse Instituut voor de Biotechnologie), Universiteit Gent en de Hogeschool Gent. "Het recht op meningsuiting is niet hetzelfde als het recht om vernielingen te plegen", zei advocaat Kristiaan Vandenbussche.

De elf beklaagden verlieten vanmorgen de rechtszaal omdat ze vonden dat de rechten van de verdediging geschonden werden. De burgerlijke partijen hebben toch gepleit en anticipeerden op de vervolgde argumenten van de verdediging.

TEKST ELS JONCKHEERE - FOTO'S ARCHIEF ILVO

OP ZOEK NAAR CALORIEARM ROOMIJ

Combinatie van vet- en suikervangers is e

In het streven naar een gebalanceerde voeding staat roomij product met een hoge concentratie aan vetten en suikers pas beuzuste consument. Vandaar dat verschillende producenten veelal met zoetstoffen uit stevia geëxperimenteerd. Maar bl met vetvervangers nodig. Dat is alvast de conclusie van zoek dat een flink stuk van het onderzoek terzake voor zijn

In het kader van de Flanders' FOOD projecten 'Suikerreductie', 'Vetreductie' en 'CaloRed' onderzocht het ILVO de laatste jaren hoe het suiker- en vetgehalte in roomijs naar beneden kon worden gehaald. Aangezien het om heikele studies gaat, kunnen er geen details worden vrijgegeven. Maar Dr. Jan De Block en Ir. Barbara Duquenne, respectievelijk Wetenschappelijk Expert-Groepsleider en Wetenschappelijk Onderzoeker van het ILVO wilden wel over enkele algemeenheden van het onderzoek spreken. De allerbelangrijkste conclusie? Lekker roomijs met een calorieredutie van 30 % is mogelijk. Maar om het beoogde resultaat te bekomen, moet er een combinatie van suiker- en vetvervangers worden gemaakt. Dr. Jan De Block: "Wanneer de sleutel van 30 % wordt aangetoond, is het smaakverschil is verwaarloosbaar. Het

Duurzame landbouw heeft nood

n eigen land daa
och kan men niet

gen en ons aan een haak gracht om er in een schuimende, kolkende p van bloed een paar rekeningen te vereffen Tot het zover is, echter, kijken we gezellig m onze goudvis **Pepijn** naar 'Hugh's Fish Fight de documentairereeks op Acht waarin de Britse tv-kok **Hugh Fearnley-Whittingstall** (foto) ten strijde trekt tegen de verspilling in de visserij. **Kelle Moreau** van het Oostendse Instituut voor Landbouw- en Visserijonderzoek (ILVO) volgt het probleem al jaren op de voet. Hij hing in zijn geelste jekker over de reling van comm ciële trawlers en zag met eigen ogen de ave die de logge visnetten veroorzaken.

Kelle Moreau «Afhankelijk van het vangstge bied en de periode van het jaar werd een kwart tot zelfs drie kwart van de vangst weer over boord gegooid.»

HUMO Waarom?

Moreau «De Europese regelgeving bepaalt per verkoopbare soort een minimumgrootte. Het idee hierachter – onvolwassen en dus kleine vissen laten ontsnappen – is good. Maar de mazen van een net kunnen maar worden afgestemd op de minimumgrootte van één soort, zodat onvolwassen vissen van andere soorten toch mee worden gevangen. Die te kleine exemplaren belanden dan terug in zee. Helaas, veelal dood.

»Ook vangstmethodes zoals sleepnetten, die de oceaanbodem afschrapen, zijn dem lectief dat zowat alles

sers mogen

Bioactief en creatief met prei

Wie prei zegt, denkt meteen aan de witte stengel of schacht. Als de groene bladeren al niet achtergelaten zijn op het veld, dan belanden ze vaak in de soep. Nochtans bevatten ze heel wat nuttige, gezondheidsbevorderende componenten, zo blijkt uit de doctoraatsstudie van Nathalie Bernaert. En wat gebeurt er met die componenten bij het koken, stomen of blancheren?

In haar doctoraatsstudie getiteld 'Bioactieve componenten in prei: analyse in functie van de genetische diversiteit, oogsttijdstip en verwerkingstechnieken' gaat ILVO-medewerkster Nathalie Bernaert op zoek naar de kenmerkende eigenschappen van prei. Daarbij brengt ze niet alleen de aanwezigheid van gezonde voedingsstoffen in kaart, maar ook hoe verschillende manier teelttechnieken en bereidingswijzen de impact van

ILVO onderzoekt mogelijkheden voor productieketen levende garnalen

woensdag 29 mei 2013 om 10u40

De onderzoekers en voedingsexperts bekijken welke bewarings- en verwerkingstechnieken mogelijk zijn voor levende garnaal, of ook wel niet-op-het-schip-gekookte niet-machinaal gesorteerde rauwe garnaal die in een onderkoelde 'slapende' toestand tot bij de eindverwerker en consument komt.

In het buitenland bestaat de traditie om garnaal levend te verhandelen al langer, zoals de 'gamberi rossi crudi' in Zuid-Italië of de 'drunken shrimps' in Shanghai. Ook het vermaarde Deense restaurant NOMA heeft levende garnaal op het menu staan. Een interessante piste, want de jongste jaren zijn de uitdagingen voor de Belgische garnalensector steeds duidelijker geworden : de prijs die de visser krijgt is (te) laag, het productgamma (te) klein.

oornaamste vollegrondsgroenten
enfamilie, waartoe ook ajuin en
ndheidsbevorderende stoffen

Resistentieveredeling

Slimmer, sneller en eindeloos op zoek naar tolerante rassen

04/03/2013

Het is een nooit eindigend proces, een strijd met erg flexibele vijanden en het vergt veel strategisch-financiële, technologische en praktische stappen in het plantenonderzoek: we hebben het over ziekteresistentieveredeling. Op 7 maart vindt bij ILVO een internationaal symposium van de Benelux Society for Horticultural Science plaats, waar ze binnen het thema geïntegreerde gewasbescherming ook aandacht hebben voor technieken die kunnen helpen om robuuster, lees: ziektebestendiger, plantmateriaal te ontwikkelen. VILT ging praten met ILVO-doctorandu Luypaert en met Johan Van Huylenbroeck, wetenschappelijk directeur van de groep Toegepaste plantengenetica en veredeling. | meer ››

Nieuwsblad.be

Omheining ILVO-proefvelden in Wetteren vernield

Aan de proefvelden va voor Landbouw- en Vis (ILVO) in Wetteren hebb eind vorige week de omt doorgeknipt. Volgens ILV duidelijke sporen van binn maar werden geen zichtba vernielingen aan de gewas aangebracht. Op de velden meer een kleine ggo-maisp

De omheining, het draadhekwerk en de stroomdraden werden op twee plaatsen d zowel aan de kant van de voetgangersbrug als aan de weg. De site is 20 hectare g vindt momenteel een kleinschalige ggo-maisveldproef van het Vlaams Instituut voo Biotechnologie (VIB) plaats. De rest van de gronden bestaat nog uit maisakkers en

Koeien stoten minder methaan uit door tijm of look - 30/10/20

Sommige componenten uit tijm en look kunnen ervoor zorgen dat runderen 10 tot 15 procent minder methaangas uitstoten. Dat zegt onderzoeker Sam De Campeneere van het Instituut voor Landbouw- en Visserijonderzoek (ILVO) in Volt (Eén), anderhalf jaar na de start van

FoodGate

STW Nieuwsbrief

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atie van prei nevenstromen, veelbelovende stabilisatie door fermentatie

06/2013 - 06:00 — Karen Verstraete
FOOD partner: Food Pilot

e oogst en verwerking van prei ontstaan heel wat nevenstromen, voornamelijk groene Onderzoek wees uit dat de groene bladeren een bron zijn van antioxidanten, welke de d positief beïnvloeden. Het zijn dus eigenlijk zeer voedzame preiresten, maar momente te voornamelijk op het land.

n in voeding, veevoeder of voor bio energie van deze preiresten zijn beperkt. Dus gingen onder VUB op zoek naar manieren om deze resten een kans te geven in de voedselketen. Hiervoor n stabiliseerd worden. Zo krijgen ze immers een verlengde houdbaarheid en kunnen ze verder worden. Melkzuurfermentatie bleek e antioxidantwaarde van het product

Thema

NUTRIHORT, conferentie ro innovatieve technieken voc in de tuinbouw

Van 16 tot 18 september in Gent

Bemesten in de groente- en sierteelt is geen sinecure de nitraatstikstofresidunorm in de sperperiode gec een weloverwogen beheer van oogstresten en een lijk om de

Veerle Heeren, burgemeester van Sint-Truiden overhandigde de trofee 'Idee van 't jaar' aan Bart Van Droogenbroeck, projectleider ILVO. Ferdy Hasmakers van KBC en Marc Tilkin van Omnia Travel overhandigden de cheques.

idee van 't jaar

De interesse vanuit de toeleveringsbedrijven en het onderzoek was groot. Als minpuntje aan de inzendingen was het gebrek aan inzendingen van de fruittelers zelf. Moge deze een inspiratiebron zijn om volgend jaar deel te nemen. De 7 genomineerden werden reeds in het feestnummer van Fruitteeltnieuws voorgesteld. Namens de Raad van Bestuur van Fruitteeltnieuws willen we hen bedanken en feliciteren voor hun deelname en positieve inbreng. De aanwezigen bepaalden via een elektronisch stemsysteem de winnaar. Naast de trofee ontving de winnaar ook een cheque ter waarde van €500 van KBC en een reischeque, met dezelfde waarde, van Omnia Travel.

De stemresultaten voor de

nen, werden de resultaten niet getoond maar kunnen deze wel door de deelnemende firma's opgevraagd worden.

Polyfenolen

"Het winnende idee vindt zijn oorsprong in het ILVO-VITO doctoraatsonderzoek van Domien De Paepe. Gedurende de eerste twee jaar van het onderzoek werd een methode ontwikkeld om de polyfenolen in appel en peer te kunnen gaan identificeren. De methode werd gebruikt om de polyfenol samenstelling van een set van meer dan 50 Vlaamse appel- en perenrassen in kaart te brengen (meten om te weten!). In deze set zitten de huidige belangrijke commerciële rassen, maar

Spiraalfilte

Intussen was ILVO en Flan zie www.food tieve spiraalfilt nieuwe perstec van een vacuü om het sap te on fruit. Dankzij he

Pers voor gezonder perensap valt in de prijzen

gopress @work

Het Nieuwsblad,
Di. 24 Dec. 2013, Pagina 27

Sint-Truiden De prijs 'Idee van 't jaar' van Studiekring Guvelingen ging naar een pers die gezonder perensap maakt. De techniek bewaart de kwaliteiten van peren beter en maakt het sap lekker, gezond en duurzaam.

'Perensap maken met behoud van kwaliteit is niet eenvoudig', zegt Bart Van Droogenbroeck, wetenschappelijk attaché bij het Instituut voor Landbouw- en Visserijonderzoek (*ILVO*). Het instituut is betrokken bij het Instituut voor Landbouw- en Pilot, een 'pilootfabriek' die nieuwe concepten voorbereidt. De uitvinding

Domien
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Bart Van
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De uitvindi
fruitmotval,
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de Rockit-a

08.01.2013 - ILVO persbericht

Veldproef bevestigt potentie van genetisch gewijzigde aardappelen voor duurzame aardappelteelt

Wetteren, 8 januari 2013 - Na een wetenschappelijke veldproef van twee jaar met genetisch gewijzigde aardappelen concluderen de onderzoekers dat aardappelen met een meervoudige resistentie tegen de aardappelziekte onze aardappelteelt veel duurzamer kunnen maken. Zowel in 2011 als in 2012 vertoonden de genetisch gewijzigde aardappelen een bijzonder sterk verlaagde vatbaarheid voor de aardappelziekte, Phytophthora infestans.

Onze aardappelteelt wordt al decennialang bedreigd door de aardappelziekte, veroorzaakt door de schimmelachtige plaag *Phytophthora infestans*. In de natte zomer van 2012 moesten

Is biochar een tovermiddel voor een vruchtbare bodem?

Kan biochar koolstof langdu… bodem opslaan en tegelijk d… bodemkwaliteit verbeteren in gematigde streken zoals Vlaanderen? Dit was de vraag … Victoria Nelissens doctoraatsonderzoek bij ILVO en UGent. Biochar is ook het onderwerp van een studievoormiddag op 17 december.

De term biochar slaat op het stabiele, koolstofrijke product dat ontstaat bij pyrolyse

Dairyman-project inspireert Europese melkveehouderij

Dr. ir. Koen De Reu, Groepsleider Mic… logische Voedselveiligheid … voor Landbouw- en Visse…

resulteert. Slechts in … rende bedrijven werd… van de reiniging vi…

oedselveiligheid Verbe…

Campylobacter plaats… uitdagingen

De cijfers liegen er niet om: elk ja… Europeanen ernstig ziek door m… voedsel te eten. Het werkelijke … campylobacteriose oploopt, li… hoger. Het Instituut voor Lar… (ILVO) heeft de bacterie al… voorlopig blijven allesomv… uit. "Oplossingen die we… werken, doen dat niet r…

…wetenschappelijk directeur Voedselv…

Van schimmel naar leveraandoening… moeten we weten over aflatoxine?

Begin maart werd in Duitsland veevoeder… waarin de kankerverwekkende stof aflatox… Het ging meer bepaald om besmette mais … Servië. Een klein deel ervan was ook in ons… terechtgekomen. De nodige maatregelen we… het veevoeder werd getraceerd en geblokkee… geproduceerde melk van de betrokken bedrij… getest. Alle melkstallen die op het Instituut voo… en Visserijonderzoek (ILVO) werden binnengeb…

veilig. Dat Europa strenge regels heeft inzake aflatoxines, is niet toevallig: als de … voedselketen geraken, kunnen ze wel degelijk gezondheidsschade veroorzaken. … we over aflatoxines? Els Daeseleire, Els Van Pamel en Wim Reybroeck, fulltime IL… onderzoekers rond ongewenste chemische stoffen in ons voedsel, geven antwoord …

Onderzoek | **Rassenproeven bij ILVO**

35.000 beoordelingen vormen toegangsexamen voor gewassen (25/11/2013)

Jaarlijks worden op het Insti… Landbouw- en Visserijonder… (ILVO) rassenproeven aang… van verschillende landbouwgewassen, en dit i… opdracht van het Agentscha… Landbouw en Visserij. Gem… tien procent van de geteste … wordt op de rassencatalogu… toegelaten en ingeschreven … steeds hogere eisen te stell… de standaardrassen en criteria te hanteren die inspelen op duurzaamheid (kwali… ziekteresistentie, oogstzekerheid) worden enkel de … opgenomen. ILVO toont in …

Idee van 't jaar

…nderzoekers identificeren 'beste' landbo…

ILVO ambieert nog meer onderzoek op maat van AGF-sector

Het Instituut voor Landbouw- en Visserijonderzoek brengt verslag uit van een door haar georganiseerde contactdag met de AGF-sector (aardappelen, groenten en fruit). Met dit initiatief beoogt de onderzoeksinstelling een intensievere interactie met de AGF-bedrijven om het praktijkgericht onderzoek nog beter af te stemmen op …

Onderzoek | **Aflatoxine**

Van schimmel naar leveraandoeningen. Wat moeten we weten over aflatoxine? (29/04/2013)

Begin maart werd in Duitsland veevoeder teruggevonden waarin de kankerverwekkende stof aflatoxine aanwezig was. Het ging meer bepaald om besmette mais afkomstig uit Servië. Een klein deel ervan was ook in ons land terechtgekomen. De nodige maatregelen werden getroffen: het veevoeder werd getraceerd en geblokkeerd, de geproduceerde melk van de betrokken bedrijven werd getest. Alle melkstallen die op het Instituut voor Landbouw- en Visserijonderzoek (ILVO) werden binnengebracht, bleken veilig. Dat Europa strenge regels heeft inzake aflatoxines, is niet toevallig: als de toxines in de voedselketen geraken, kunnen ze wel degelijk gezondheidsschade veroorzaken. Wat weten we over aflatoxines? Els Daeseleire, Els Van Pamel en Wim Reybroeck, fulltime ILVO-onderzoekers rond ongewenste chemische stoffen in ons voedsel, geven antwoord.

Wat was er precies aan de hand bij de aflatoxinezaak in Duitsland?

Els Daeseleire: Begin maart zagen wij alarmerende berichten over giftige aflatoxines in veevoeder in Duitsland. Men traceerde mais uit Servië waarin te hoge hoeveelheden aflatoxine zaten. Via het Europese waarschuwingssysteem RASFF werd België op de hoogte gebracht van de vastgestelde problematiek in Duitsland. Ons Voedselagentschap startte onmiddellijk verder onderzoek. Toen bleek dat een klein deel ook in België terechtgekomen was, heeft het FAVV het grootste deel van deze gecontamineerde zending kunnen blokkeren. Het andere deel was helaas al verwerkt in voeder voor varkens, pluimvee en in mindere mate ook in voeder voor rundvee.

De experts maakten een risico-evaluatie en die toonde aan dat, op basis van de gehaltes in de grondstoffen en de inmengingsgraad van de mais in het voeder, de norm in het samengestelde voeder over het algemeen niet overschreden werd. En wanneer dat wel het geval was, werden deze mengvoeders die nog aanwezig waren op de landbouwbedrijven onmiddellijk geblokkeerd. Op basis van deze gegevens werd dat de zeer strenge norm van 0,05 ppb voor aflatoxine … den kon zijn. Er werden door de Belgische Confederatie van de … en het FAVV melkmonsters genomen en geanalyseerd op …

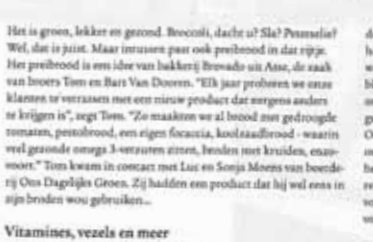
Lekker, gezond én duurzaam sap uit rebut Conference peer

Een lekker én gezond sap maken uit peren die normaal op de comp… belanden, kan dat? Ja, dat kan! De ontwikkeling van dit duurzam… sap is onze inzending voor de wedstrijd "Ide…

België én peren…

Het Belgisch… tar…

14 BINNENLAND



PREIBROOD:
GROEN, LEKKER, GE…

Bakkerij Brovado in Asse verrast haar klanten ja… pakte ze al uit met koolzaadbrood en brood met … de Brabantse bakkerij het preibrood. Daarvo… Dagelijks Groen' en enkele wetenschappers. Het…

Het is groen, lekker en gezond. Broccoli, dacht u? Sla? Peterselie? Wel, dat is juist. Maar intussen paart ook preibrood in dat rijtje. Het preibrood is een idee van bakkerij Brovado uit Asse, de zaak van broers Tom en Bart Van Dooren. "Elk jaar proberen we onze klanten te verrassen met een nieuw product dat nergens anders te krijgen is", zegt Tom. "Zo maakten we al brood met gedroogde tomaten, pestobrood, een eigen focaccia, koolzaadbrood - waarin veel gezonde omega 3-vetzuren zitten, broden met kruiden, enzovoort." Tom kwam in contact met Luc en Sonja Moens van boerderij Ons Dagelijks Groen. Zij hadden een product dat bij wel eens in zijn broden wou gebruiken…

Vitamines, vezels en meer

Nathalie Bertaert en haar collega's van ILVO (Instituut voor Landbouw- en Visserijonderzoek) speelden een belangrijke rol bij het tot stand komen van het preibrood. "In Vlaanderen staat jaarlijks zo'n 4.800 hectare prei. Daarmee is het één van onze belangrijkste volleegrondgroenten," legt Nathalie uit. "Maar de consumenten gebruiken in hun keuken vaak alleen de witte schacht van de prei. Ze verkiezen dan ook prei waarvan een deel van de groene bladeren … is verwijderd. Op die manier past de groene makkelijker in de … koelkast en heeft de consument minder afval." Daardoor snijden …

Food P…

Een deel… in de Fo… ILVO en… van uit… duurzi… met o… fiël, e… voer…

…nten hebben een … interesse voor … levensmiddelen. … uit perfect in dat …

De s… gebru… deren… geschi… fruit of …

NEDERLANDSE INVOERDERS BOOS OP VLAAMSE FETITIE TEGEN PANGASIUS

'Smaakloze' vis ligt onder vuur

10 www.landbouwleven.be AKKERBOUW LANDBOUWLEVEN 19/07/2013

Agroforestry in Vlaanderen: wie past het schoentje (en trekt het aan)?

Een thema dat op de beurs van Libramont uitvoerig aan bod komt, is dit van de agroforestry. Ook in Vlaanderen leeft dit. Celine Vandevelde voerde, onder begeleiding van ILVO, onderzoek uit op agroforestry in Vlaanderen. Dat gebeurde met het oog op het behalen van haar diploma Bach…

Onderzoek | **Sterke omega-3 vleeskip**

Kunnen omega-3 vetzuren bij de moederdieren de weerstand van de kuikens verhogen? (28/10/2013)

Vlaanderen telt zo'n 500 vleeskippenbedrijven, die gemiddeld 38.000 dieren hebben. Jaarlijks produceert de sector bijna 200 miljoen braadkippen. Om de vleeskuikens beter te vrijwaren van hart- en vaatziekten (de belangrijkste doodsoorzaak tijdens de eerste weken) en om het risico op ontstekingen bij de vleeskippen te reduceren, voert ILVO een

Visserijrapport

VIRA brengt duurzaamheid van de Vlaamse visserij in kaart 22/04/2013

Met het eerste Visserijrapport (VIRA) krijgt de Vlaamse visserijsector een nastaiwerk naar het voorbeeld van het tweejaarlijkse Landbouwrapport (LARA) over land- en tuinbouw. Het werkstuk van het Departement Landbouw en Visserij leert ons dat de Vlaamse vloot begin vorig jaar 86 vissersvaartuigen telde, waarvan er 41 behoren tot het grote vlootsegment. De 429 erkende zeevissers brachten 20.138 ton vis aan wal in 2011. Ongeveer 84 procent ging naar de havens van Zeebrugge, Oostende en Nieuwpoort. De belangrijkste aangevoerde soorten waren schol, tong en rog. "VIRA toont duidelijk aan dat de Vlaamse visserij de voorbije jaren heel wat veranderingen heeft ondergaan. Duurzaamheid is de rode draad in die evolutie", aldus minister-president Kris Peeters. Vlaanderen en Europa investeren ook steeds meer in de ontwikkeling van een duurzame aquacultuur, die de groeiende vraag naar visproducten deels moet opvangen. | meer ››

ILVO & VOEDING
WIE DOET WAT BIJ ILVO-TECHNOLOGIE EN VOEDING?

>> WAT WORDT DOOR WIE ONDERZOCHT BIJ ILVO?

1. VOEDSELVEILIGHEID

2. PRODUCTINNOVATIE

3. PRODUCTINNOVATIE

"Kunnen we tegenwoordig zonder GGO's?"

dinsdag 26 november vond er in het Vlaams Huis van de Voeding Miummm rijkend debat plaats over genetisch gemodificeerde organismen. De avond samenwerking met Vormingplus en had als bedoeling om het bewustzij de aanwezigen te verscherpen met enkele interessante weetjes.

Prei: een soep van antioxidan

Prei is een belangrijke vollegrondsgroente in Vlaanderen gezondheidseigenschappen van deze groente is er echter n veel geweten. Daarom onderzochten onderzoekers van het van Landbouw- en Visserijonderzoek (ILVO) de antioxidar voorkomen in deze groente. Daarnaast werd gekeken of de oxidanten behouden bleven na een bewaarperiode en wat de was van een keukenbereiding, zoals stomen en koken.

Meer antioxidanten in de groene bladeren

Prei is met een areaal van 4.800 ha één van de voornaamste vollegrondsgroenten in België. Van een aantal gewassen uit hetzelfde zogenaamde Allium-geslacht, waartoe ook ajuin en look behoren, is bekend dat ze een rijke waaier aan gezondheidsbevorderende stoffen, zoals antioxidanten, bevatten. Tot zover ontbrak echter uitgebreide fundamentele kennis omtrent antioxidanten in prei.

Antioxidanten spelen een belangrijke rol het menselijk lichaam dankzij hun neutralisatie van vrije radicalen. Deze radicalen kunnen in hun reactieve vorm eiwitstructuren, DNA-materiaal en lipiden beschadigen, met hart- en vaatziekten, kanker, DNA-beschadiging en

Vruchtbaarheid van melkkoeien

Verminderde vruchtbaarheid bij koeien, en hoe wetenschap en voorlichting daaraan verhelpen

Dat de melkveehouderij in Vlaanderen de jongste 15 jaar een stille revolutie heeft doorgemaakt op vlak va schaalvergroting, professionaliteit, productiviteit, autocontrole, verduurzaming en veiligheid is geen ge De genetische selectie en het dagelijks management (voeder, huisvesting, melkinstallaties) beogen niet m dan topprestaties. Maar dat tegenwoordig de vruchtb van de koeien het laat afweten, is een onverwachte tegenvaller. Waar de tussenkalftijd in 1991 nog zo'n dagen bedroeg, is deze vandaag de dag gestegen naar 420 dagen en meer. ILVO, he Instituut voor Landbouw- en Visserijonderzoek, is samen met KU Leuven en de Hooibeekhoeve te Geel op zoek naar oorzaken en oplossingen. Een nie rond sensoren' zal ervoor zorgen dat de informatie bijna realtim | meer ››

Het debat over GGO's werd gevoerd door Geert Gommers (VELT) en Marc De Loose (ILVO). "Bij een GGO gaan we een efficiënte eigenschap inplanten bij een bepaald product. Dat zorgt voor ee hogere duurzaamheid. De potentie hiervan is enorm. De techniek word wereldwijd uitgebreid toegepast, Europa blijft echter een stuk achter, aldus Marc. "Wij zijn overtuigd dat een volledig biologisch product

Multifunctionele landbouw en plattelandsontwikkeling

Worden alle mogelijkheden benut? Een case-studie over zorglandbouw 24/06/2013

Zorglandbouw biedt zorg op maat voor verschillende types zorgvragers, zoals jongeren uit de jeugdzorg of mensen met een verstandelijke beperking. De zorgvragers kunnen een tijdje meedraaien op een boerderij. Zorglandbouw in Vlaanderen ziet er anders uit dan in Nederland, Duitsland, Oostenrijk of Noorwegen. De formules verschillen, de financieringsbronnen ook. De veelvormigheid van het systeem in tijden van crisis of verandering evenaart. Sociologen legden verschillende systemen onder de loep. Naargelang het denkkader dat dominant is, krijg je mogelijkerwijze een andere invulling van het begrip 'zorglandbouw'. In hun onderzoek hebben Joost Dessein van de ILVO-eenheid Landbouw en maatschappij, Michiel de Krom (UGent/ILVO) en Bettina Bock (WUR, Nederland) drie discoursen rond zorglandbouw ontrafeld en geanalyseerd. Wie goed leest, haalt er ideeën uit over innovatieve, creatieve plattelandsontwikkeling en verbreding die ons tot op heden in Vlaanderen onbekend zijn. De nogal eenzijdige benadering van zorglandbouw vanuit het zogenaamde multifunctionele landbouw-discours lijkt in Vlaanderen immers de toekomstmogelijkheden te beperken. | meer ››

dS De Standaard NIEUWS KRANT AVOND

Home Krant Het verhaal

Ikea's van de natuur veroveren Noordzee

20/11/2013 | Yves Delepeleire

U heeft misschien nog niet van de Amerikaanse ribkwal o Nieuw-Zeelandse zeepok gehoord, maar veel kans dat u ze op onze stranden en golfbrekers heeft gezien. De Noordze lijdt onder een invasie van exotische algen, weekdieren en geleedpotigen en verschraalt in zo'n snel tempo dat de internationale wetenschap en politiek vanaf vandaa dagen lang, de koppen bij elkaar steken.

Spiraalfilterpers

innovatief proces voor gezond sap

Spiraalfilterpers is een innovatief perssysteem dat door ijk van vacuüm zorgt voor behoud van de gezondheidsbevorde componenten in het sap. Het systeem is dan ook kt voor de bereiding van functionele dranken groenten. De Food Pilot in Me

press

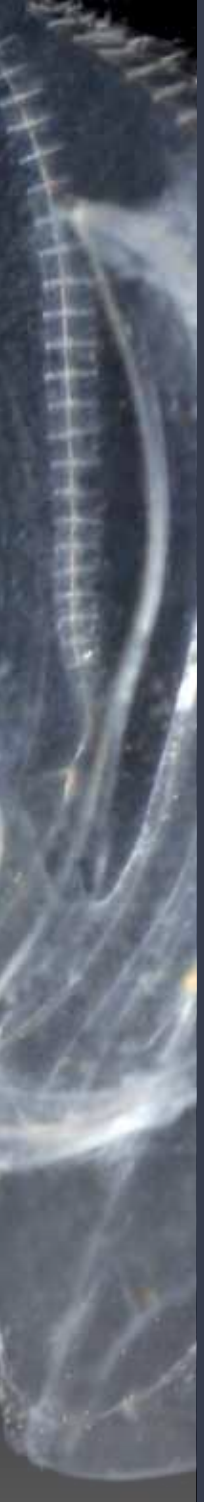
Exotische soorten bedreigen Noordzee

De Morgen, Do. 21 Nov. 2013, Pagina 11

Het Instituut van Landbouw- en Visserijonderzoek (ILVO) bindt de strijd aan tegen de invasie van exotische algen en weekdieren in de Noordzee. Of hoe de Amerikaanse ribkwal en Chinese wolhandkrab ons ecosysteem dreigen te

ILVO zoekt in één klap 25 nieuwe onderzoekers

Het Instituut v Visserijonder nieuwe ond doctorandi tijd om zi welbepa onderz kenni fund uit



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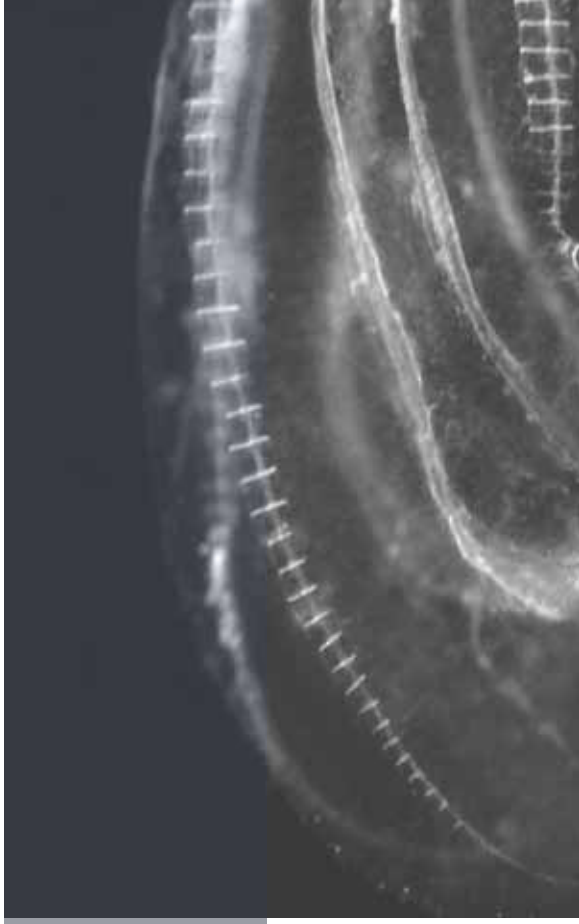

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Landbouw en Visserij

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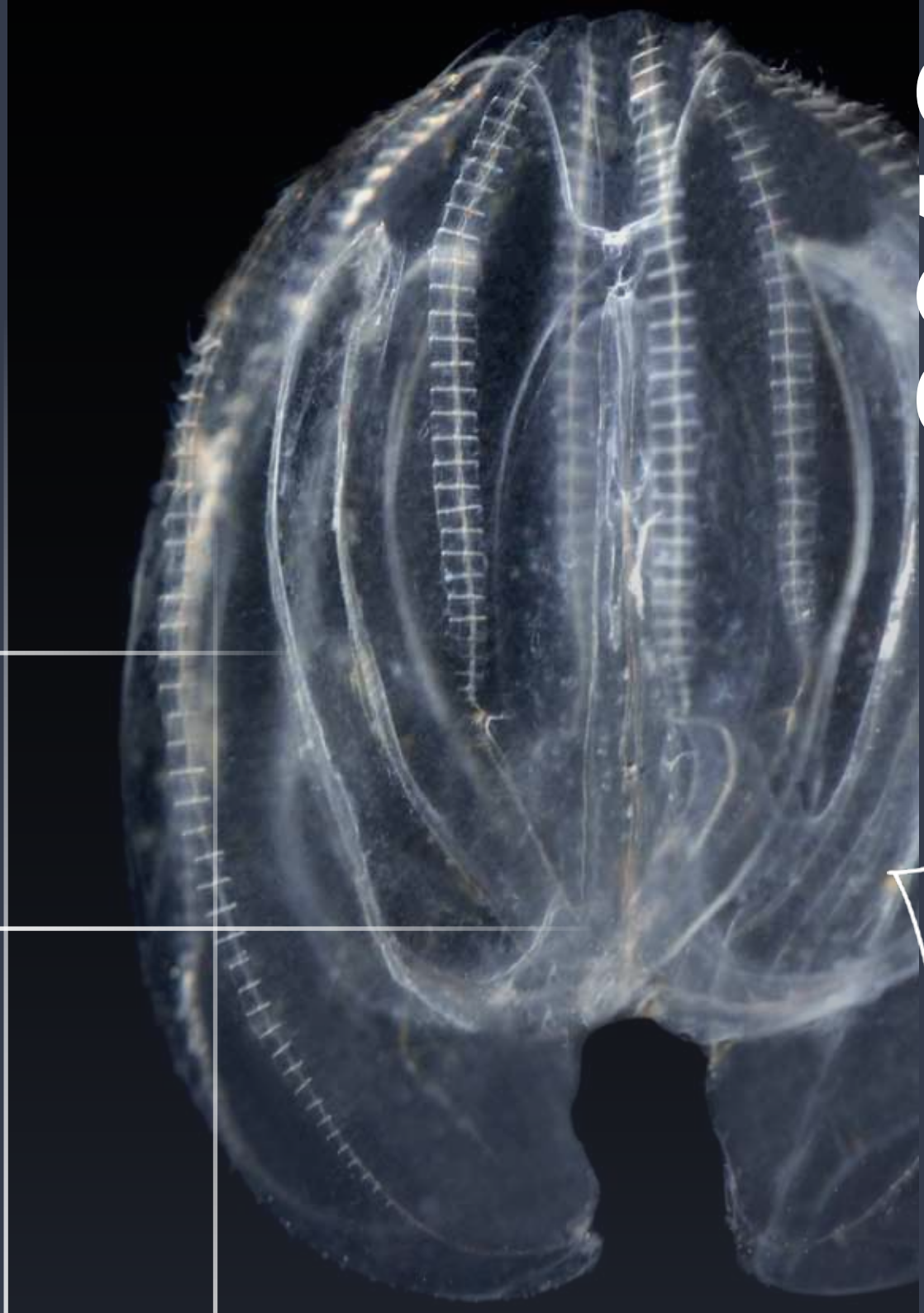

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