

GREENGROWING

GREENHOUSE ENERGY SAVING | *programme for the North Sea Region*



WORKSHOP GREENGROWING THE FUTURE LOW CARBON GREENHOUSE PRODUCTION: DEFINING RESEARCH NEEDS AND OPPORTUNITIES

21-23 OCTOBER 2013

LOKEREN, BELGIUM



The Interreg IVB
North Sea Region
Programme





TABLE OF CONTENTS

1. Participants	1
Aarhus University (Denmark)	1
Agrotech (Denmark)	1
Horticulture Development Council (UK)	1
Research Station for Horticulture Hannover-Ahlem (Germany)	2
Humboldt University (Germany)	2
Saxon State Ministry of the Environment and Agriculture (Germany)	2
Hochschule Osnabrück (Germany)	2
Astredhor (France)	3
Bioforsk (Norway)	3
Swedish University of Agricultural Sciences	3
TNO (The Netherlands)	4
Alliander (The Netherlands)	4
University of Southern Denmark	5
Research Centre for Ornamental Plants - PCS (Belgium)	5
Ghent University (Belgium)	6
Institute for Fisheries and Agriculture Research (Belgium)	6
Provincial Research Centre for Vegetables East-Flanders - PCG (Belgium)	7
Thomas More Kempen (Belgium)	7
2. Program at a glance	8
3. Detailed program	9
4. Location	12
Biznis hotel	12
Research Station for Ornamental Plants	12

1. PARTICIPANTS

AARHUS UNIVERSITY (DENMARK)

CARL-OTTO OTTOSEN

Expertise in photosynthesis studies of plants subjected to changes in abiotic factors including CO₂ and other environmental factors, using physiological responses on intact plants for building up a knowledge base in the control of climate in commercial greenhouses in order to save energy.

EVA ROSENKVIST

Working on the ecophysiology of photosynthesis for the last 25 years, focusing on light acclimation and the energy balance of the electron transport chain during various abiotic stresses, combining chlorophyll fluorescence and gas exchange.

HABTAMU GIDAY

Has a MSc in Plant Science (specialization Greenhouse Horticulture) from Wageningen University and is currently a PhD student at Aarhus University at the Department of Food Science. His main interest of research is Environmental Plant Physiology more specifically humidity and stomata response to it.

THEOHARIS OUZOUNIS

Theoharis Ouzounis holds a BSc in Agriculture (2005) from Aristotle University of Thessaloniki and a MSc in Horticulture (2008) from Michigan State University. Currently he is a PhD research fellow at University of Southern Denmark. The project is focused on the demonstration and integration of energy saving LED luminaires for greenhouses. The work involves research in the fields of plant physiology, chromatography, and natural product chemistry.

AGROTECH (DENMARK)

OLIVER KÖRNER

R&D Specialist in modeling greenhouse processes at AgroTech A/S in Denmark. Educated in Horticultural Sciences with major interest in biological and technical modeling at University of Hannover, Germany (MSc) and Wageningen University, The Netherlands (PhD).

HORTICULTURE DEVELOPMENT COUNCIL (UK)

PHILIP DAVIS

Studied for his degree in Biology as well as his PhD at Bristol University. For his PhD he studied the growth and photosynthetic rates of freshwater cyanobacteria. After his PhD he worked in Ireland (at University College Dublin) for three years examining the influence of different tillage systems on the carbon dioxide exchange of Barley crops with the aim of reducing agricultural carbon emissions. At Indiana University, USA, he spent 6 years studying plant responses to blue-light. His research background has provided the perfect starting point for his HDC fellowship (CP85 Securing skills and expertise in crop light responses for UK protected horticulture, with specific reference to exploitation of LED technology). He is based at Stockbridge Technology Centre where in addition to his fellowship role he manages the LED4CROPS facility.

RESEARCH STATION FOR HORTICULTURE HANNOVER-AHLEM (GERMANY)

DIRK LUDOLPH

Has been working more than 20 years with climate control strategies in greenhouses. Main topics have been dynamic heating strategies and the efficient use of supplementary lighting. His research is focused on plant physiology of ornamental pot plants. He is one partner of the German ZINEG project and his work at the LVG Ahlem is much impressed by grower's demands.

MELANIE HORST

Since 2009 working in the research project ZINEG. Main topics are the evaluation of climate conditions in a high insulated, (semi) closed greenhouse with solar heat storage, development and investigation of system-orientated, energy saving temperature strategies for using solar heat and their effects on development, growth and quality of potted ornamental plants.

HUMBOLDT UNIVERSITY (GERMANY)

UWE SCHMIDT

Graduated as agricultural engineer at Wartenberg University of applied Science Berlin. Since 1993 professor for Horticultural Engineering at the Humboldt University Berlin. Head of Steinbeis Transfer Centre "Energy-Environment-Information" in Berlin and president of the Federal Association for German Horticultural engineers and Landscape Architectures. Since 2010 he is the Vice Dean of Faculty for Agriculture and Horticulture, Humboldt-University Berlin.

SAXON STATE MINISTRY OF THE ENVIRONMENT AND AGRICULTURE (GERMANY)

STEPHAN WARTENBERG

Studied in plant production, seed production and plant breeding at Martin Luther University Halle, Germany. In 1983 Researcher and breeder in small fruits at the nursery VEG Baumschulen Dresden. In 1986 Breeder in pelargoniums and other ornamentals at VEG pac Zierpflanzen Dresden. In 1992 Researcher and teacher, head of the Division for Cultivation of Ornamental Plants in Dresden-Pillnitz, now at the Saxon State Office for Environment, Agriculture and Geology, Department of Horticulture Dresden-Pillnitz including School of Agricultural Engineering and Horticulture. Main work areas: Energy efficient climate control in the cultivation of ornamentals ensuring consistency in crop time and plant quality, practical methods for mass balanced nutrition of ornamentals, energy saving assortments in ornamentals, education, knowledge transfer and political advisory work.

HOCHSCHULE OSNABRÜCK (GERMANY)

ANDREAS BETTIN

Horticultural studies and PhD at Hannover University (topic: plant nutrition). 1988-1991 Chamber of Agriculture, Lower Saxony, Bad Zwischenahn. Since 1991 Professor for floriculture at the University of Applied Sciences, Osnabrück. Special interests: production systems, new ornamentals, dormancy.

ASTREDHOR (FRANCE)

BRUNO PARIS

Former director of experiment station in the south of France (CREAT : Centre for Economic Research and Technical Actions) agronomist of the Chamber of Agriculture of the Alpes- Maritimes given to INRA to drive and lead projects for the horticulture since January 2013. Based in Sophia- Antipolis Institute INRA UMR ISA SophiaAgrobiotech, coordination of projects around the decision support tools in ornamental horticulture and responsible with UMR ISA to develop a draft joint research unit between INRA and ASTREDHOR National Technical Institute for the construction of new production systems: a production system in semi-confined nature which should be optimized by innovative materials and equipment, energy efficiency; a system of horticultural production which should promote better management of inputs and new ways of recycling; a mixed system coupling horticultural production and renewable energy.

BIOFORSK (NORWAY)

MICHEL VERHEUL

Dr. ir. Michel Verheul is working as a senior research scientist on plant production in controlled environments at the Norwegian Institute for Agricultural and Environmental Research Bioforsk. He has developed new and effective methods for year-round production of greenhouse vegetables and berries resulting in high yields, and studied effects of greenhouse climate and plant nutrition on fruit quality. In addition, he is active in the development of sustainable greenhouse production methods, has performed life cycle assessment for Norwegian greenhouse products and developed a patented system for temperature regulation of root growth media in greenhouses.

HENK MAESSEN

Was born and raised in the Netherlands. Graduated in 1988 at the Higher Agriculture School and afterwards took over the family greenhouse (growing tomatoes) till 2003. Moved to Norway in 2003 and started working at Bioforsk where he worked in the research greenhouse. Currently he advises growers in Norway using the knowledge acquired in the research station to solve various problems that the growers face.

JENS RYSTEDT

Worked as advisor in Danish nurseries for many years. At the moment working for Bioforsk, Norway and Lillegaard-Teknik, Denmark. Subjects of interest: Greenhouse energy saving, climate control and quality management.

SWEDISH UNIVERSITY OF AGRICULTURAL SCIENCES

SAMAREH GHARAE

She is a PhD student in the Microbial Horticulture group at the Swedish University of Agricultural Sciences, department of Biosystem & Technology. She has a MSc. in horticultural sciences from the Jahrom Islamic Azad University, Iran. Her research as a PhD student deals with interactions between alternative technologies in greenhouse horticulture and the microbial biogeography of ornamental plants. New technologies are employed to mitigate the impact of greenhouse horticulture on the environment and to reduce its CO₂-foot prints. Her focus is on the main ornamental crops of importance for the Scandinavian market.

KARL-JOHAN BERGSTRAND

Has a bachelor degree in Horticulture and has been working at SLU Alnarp since 2004. Before his studies he worked in different greenhouse industries in southern Sweden. During 2004-2006 he worked as an assistant in a project on closed hydroponic systems. In 2006 he was enrolled as a PhD-student which resulted in the doctoral thesis "Approaches for mitigating the environmental impact of greenhouse horticulture" (2010). Since 2010 he has been working as project manager of two projects on advanced light management in greenhouses.

TNO (THE NETHERLANDS)

JACK VERHOOSSEL

Senior Scientist and Consultant at TNO and leading the group on Connected Business within TNO. He is specialized in interoperability, architecture and standardization. Research topics include information modeling and standardization, with a focus on standardization processes, semantics and structuring of information and quality of standards and standardization processes. He applies his knowledge in various industry sectors, among others energy, agriculture and in governmental areas such as central Dutch government, health care and education. He conducts applied research for national standardization institutes and coordinates and manages applied research projects for customers. Specifically, in the energy sector he is involved in European projects like Mirabel, Odysseus, GreenGrowing and the Dutch project Cerise in which specifications and standards are developed for the information exchange for matching of flexible demand and supply of energy.

MENTE KONSMAN

Artificial Intelligence studies in 1999 at the University of Groningen. After his studies he started working for KPN Research where his main focus was on Telecommunications Management and Enterprise Application Integration. In 2003 KPN Research became part of TNO and his focus changed towards sensor networks. He contributed to the design and implementation of a software platform (AnySense) to collect and distribute sensor data. This platform is used in various dike monitoring projects, such as IJkdijk. In the last couple of years he mainly works in the energy domain on Energy Management (matching of flexible demand and supply of energy) in Smart Grids. This work is carried out in European projects such as Mirabel, Hagrid and GreenGrowing and Dutch projects such as VIOS.

FEIJE DE ZWART

Dr. Ir. H.F. de Zwart did his PhD work on the development of an extensive greenhouse climate simulation model, published in 1996. This model was designed to enable scenario studies on all different ways of reducing the energy consumption of greenhouses. In the past couple of years, a lot of work has been carried out in the field of closed greenhouses. An overview of this work can be found in 'Lessons Learned from Experiments with Semi-closed Greenhouses' by H.F. de Zwart, Acta Hort. (ISHS) 952:583-588. Currently Feije de Zwart is studying the possibilities of what's called 'The next Generation Semi Closed Greenhouse'. Also Feije de Zwart is involved in experiments with a high insulated greenhouse (the VenLowEnergy greenhouse) which has shown for the third year in a row to yield high production levels at only 40% of the energy consumption of practical greenhouses.

ALLIANDER (THE NETHERLANDS)

JAN BOZELIE

Jan Bozelie is an electrical engineer in heart and kidneys, with wide range working experience in petrochemical, environmental installations, plant automation, and others. Designing electrical installations for 6 year of wind turbines and wind power plants (involved in both wind farms for the Dutch coast), worked for 3 year for the

national TSO TenneT in grid design for 400kV and 150kV grids. And already working more than 7 year in the group Technic and Innovations of Alliander (one of the 3 major Dutch DSO's). Focused on all smart grid items and giving input in the companies goals for facilitating the energy transition and putting new ideas to the test. Involved in a large number of smart grid and storage testing for Liander for our 3.5 million customer connections.

UNIVERSITY OF SOUTHERN DENMARK

JAN CORFIXEN SØRENSEN

Jan Sørensen (1980) obtained a PhD degree in software engineering from the University of Southern Denmark. He has experience in software engineering from different research projects related to reducing energy consumption in the horticulture domain. He has specifically worked on developing a dynamic supplemental lighting control system (DynaLight Nxt) that integrates electricity spot prices and weather forecasts to minimize energy consumption. His research interests include multi-objective optimization, component-based software engineering, feature interactions and intelligent extensible control systems.

RESEARCH CENTRE FOR ORNAMENTAL PLANTS - PCS (BELGIUM)

BRUNO GOBIN

Since 2009 director of the tree applied research centers: PCS Ornamental Plant Research, PCG Vegetable Research and PCA Potato Research. He has a M.Sc. in biology (1993) and a Ph.D. in Science (1997) from the Catholic University of Leuven, Belgium, held postdoc positions in Japan & Germany (EU-TMR FP5) and was head of the zoology department at the Royal Research station of Gorsem. He published more than 40 scientific papers (h=13), and over 60 technical papers. His main aim is to make research accessible to growers and to translate research results into practical solutions for innovation on the farm.

BERT SCHAMP

Received a M.Sc. degree in applied bio-engineering: agri- and horticulture (2009). Since four years he is leading an advisory service for climate control at PCS for greenhouses with high energy needs. His main expertise is application of sensor technology and greenhouse innovation, energy calculations and climate regulation.

HEIN VANSTEENKISTE

Has a M.Sc. degree in Industrial engineering: agri- and horticulture (1996). At PCS he worked on following energy-topics: Assessment of flowering quality of *Rhododendron simsii* influenced by temperature strategies using alternative cooling and heating techniques, energy use in horticulture and advisory service for climate control. As manager of PCS he is responsible for all energy-related topics (LEDs, climate control software, sensor technologies, greenhouse construction, innovation and investment). He is a member of GESKAS/SMARTKAS (semiclosed greenhouse research), the Energy Platform (Innovation for agri- en horticulture) and POI (Procurement of Innovation – IWT / Flemish Government).

ELS PAUWELS

Has a M. Sc. degree in Bioscience engineering (1995) and studied at the Catholic University of Leuven. She is since 2001 researcher at the Research Centre for Ornamental Plants at Destelbergen (PCS) where she is as study director responsible for the GEP (Good Experimental Practice) trials and as coordinator 'azalea and Rhododendron' responsible for all trials within this division. She has experience in optimization of culture methods, growth and flowering regulation, pest control, quality and post-harvest properties of ornamental plants. Main energy-topics of interest are: assimilation light (f.i. LED) during forcing azalea's, climate control during growing season, cooling azalea's in summer, determination of the daily light integral and others.

She is member of many grower organizations and her research for practical utility is always performed in dialogue with the growers.

LIESBET BLINDEMAN

Has a M.Sc. degree in Industrial engineering: agri- and horticulture (1997). She started working at the PCS in 1998 and she is there responsible for the research on "cut flowers, bedding plants and garden Chrysanthemums" where she manages different trials and gives advice to growers. Since 2008 she has been testing LEDs for different applications: as assimilation light on roses and steering supplemental light in several plants. From 2010 till 2012 she participated in the project "Energiebewust boeren".

VERONICA DIAS

Master degree in Agricultural Sciences from the University of Porto (2006). Professional experience as Crop Manager in several horticultural companies in Belgium and Portugal. At the moment working at PCS for the project "GreenGrowing", responsible for experiments of greenhouse climate conservation for several ornamental crops.

GHENT UNIVERSITY (BELGIUM)

KATHY STEPPE

Research (Laboratory of Plant Ecology, Ghent University) is focused on plant-environment interactions with a special emphasis on exploring factors that determine water and carbon fluxes. Projects include work on herbaceous and woody plants, as well as (tropical) forest ecosystems. Diverse approaches are applied to study the dynamic plant-environment interplay, ranging from detailed measurements with an array of plant sensors (sap flow, stem diameter changes, leaf temperature, chlorophyll fluorescence, photosynthesis, stem respiration,...) across tools from ecosystem science (thermal imaging, eddy covariance) to stable isotope biogeochemistry. Sophisticated models are developed as avenues for improving our understanding on how plants respond to changes in the environments they inhabit. Special attention goes to the development of new plant-based control and stress detection systems.

JAN PIETERS

Master degree in Agricultural Engineering and doctor degree in Applied Biological Sciences from the Ghent University. After his stay at the Civil and Environmental Engineering Department of the University of Tennessee – Knoxville, he was appointed professor at the Biosystems Engineering Department of the Ghent University, where he is also the head of department since 2007. His research interests are situated in the field of bioprocess engineering, with applications in the food industry, agriculture, and (renewable) energy.

INSTITUTE FOR FISHERIES AND AGRICULTURE RESEARCH (BELGIUM)

PETER LOOTENS

Master degree in applied biological sciences and is specialized in horticultural research. He is a senior scientist at the unit Growth and Development of the Institute for Agricultural and Fisheries Research (ILVO) in Melle, Belgium. He has long-standing experience in ecophysiology research (photosynthesis, chlorophyll fluorescence) and the development of medium-throughput phenotyping tools based on image analysis. He has authored and co-authored over 20 papers in peer-reviewed journals. His main research interests are the development of tools for the analysis of growth and plant morphogenesis in greenhouses, growth chambers and in the field, the analysis of plant responses in function of the environment and the optimization of greenhouse climate conditions. Current research topics include also the analysis of the response of agricultural crops to drought and chilling stress.

PROVINCIAL RESEARCH CENTRE FOR VEGETABLES EAST-FLANDERS - PCG (BELGIUM)

TOM BEYERS

After he graduated as an industrial engineer in horticulture, Tom Beyers started a career in research. He gained experience in the fields of crop protection and plant pathology through his position as a researcher at the Sustainable Food Production group of Thomas More college and as a PhD student in a collaborative research project on plant defenses between the University of Leuven, Ghent University and Thomas More. Currently, he coordinates the research on conventional greenhouse vegetables at the Provincial Research Center for Vegetables East-Flanders (PCG).

EVERT ERIKSSON

Evert Eriksson (1986) got a master degree as an industrial engineer in electronics and ICT at the KAHO Sint-Lieven college in Ghent. He also obtained a master degree in environmental sciences at the Antwerp University. He started working at the vegetable research center in Kruishoutem in December 2011 where he is responsible for the energy related research, climate control and ICT coordination. His interests of research are gas-absorption heat pumps, semi-closed greenhouses, borehole thermal energy storage and climate control.

AAIKE BOGAERT

Aaike Bogaert has been working at the PCG research center since august 2008. She graduated at the University College Ghent as an industrial engineer in agriculture and biotechnology (option horticulture). Her area of research at PCG is crop protection for both leafy and fruity vegetables.

SASKIA BUYSSENS

Saskia Buysens (Ph. D. in applied biological sciences - agronomy, agricultural ir. – applied botany-biotechnology) is research coordinator at PCG (Vegetable Research Centre, Kruishoutem, Belgium). She started her career in microbiology and plant pathology, in business as well as in academic world in Belgium and abroad. In 1999, she joined PCG as researcher integrated crop protection in outdoor crops and sensory analysis. From 2001 on, she is responsible for the unit 'sensory and consumer research' at PCG.

THOMAS MORE KEMPEN (BELGIUM)

HERMAN MARIËN

Experience with the cultivation of crops: tomatoes; pepper; strawberries. Energy specialist in different fuels and different crop-dependent heating requirements and technical solutions. Consultant in the field of dimensioning CHP and energy market strategy.

2. PROGRAM AT A GLANCE

	MONDAY 21TH OCTOBER (BIZNIS HOTEL, LOKEREN)	TUESDAY 22ND OCTOBER (BIZNIS HOTEL, LOKEREN)	WEDNESDAY 23TH OCTOBER (PCS, DESTELBERGEN)
8.30			
9.00			Transport to PCS
9.30			Talk F. de Zwart and H. Giday
10.00		Climate control (*)	
10.30	Arrival & Welcome	Coffee Break	
11.00			Interactive discussion & Future vision of greenhouse Horticulture
11.30	GreenGrowing internal administration (**)	Interactive discussion	
12.00			
12.30	Lunch		Lunch
13.00			
13.30	Supplemental Lighting (*)	Lunch & Visit local reserve	
14.00			
14.30	Interactive discussion	Heat storage & Smart Grids (*)	
15.00			Open meeting "Energy efficient horticulture in Europe" (*)
15.30	Coffee Break		
16.00	Greenhouse construction (*)	Interactive discussion	
16.30		Coffee Break	
17.00	Interactive discussion	Future greenhouse concepts (*)	
17.30			
18.00		Interactive discussion	
18.30	Social Event & dinner	Break	
19.00			
20.00		Dinner	

(*) For further information check the detailed program

(**) Only for GreenGrowing partners

3. DETAILED PROGRAM

MONDAY 21TH OCTOBER AT THE BIZNIS HOTEL, LOKEREN	
9.00	
9.30	
10.00	Arrival & Welcome (10.00 – 11.00)
10.30	
11.00	GreenGrowing internal administration (11.00 – 12.00)
11.30	
12.00	Lunch (12.00 – 13.00)
12.30	
13.00	Session 1: Supplemental Lighting (13.00 – 14.10) <ul style="list-style-type: none"> GreenGrowing: the way forward – B. Gobin Effects of LED on photosynthesis – E. Rosenkvist
13.30	
	<ul style="list-style-type: none"> LED and multi-tiered controlled environment growing systems – P. Davis Effects of LEDs on Photosynthesis and Secondary Metabolites on Roses, Chrysanthemums and Campanulas – T. Ouzounis New technologies for horticultural lighting - how much can we save? – K-J. Bergstrand
14.00	
14.30	Interactive discussion (14.10 – 15.10)
15.00	
	Coffee Break (15.10 – 15.30)
15.30	Session 2: Greenhouse construction (15.30 – 16.15) <ul style="list-style-type: none"> ZINEG The future has arrived in German horticulture. Research greenhouses and pioneers in horticulture praxis – D. Ludolph
16.00	
	<ul style="list-style-type: none"> Low E-glass, an alternative for horticultural production? – A. Bettin Passive climate control: the role of greenhouse design – J. Pieters
16.30	
	Interactive discussion (16.15 – 17.15)
17.00	
17.30	
18.00	Energetic excursion and dinner (departure 17.45)
18.30	

TUESDAY 22ND OCTOBER AT THE BIZNIS HOTEL, LOKEREN

9.00	Session 3: Climate control (9.00 – 10.40) <ul style="list-style-type: none"> • Effects of dynamic control in greenhouses – C.o. Ottosen • An online greenhouse simulator 'The Virtual Greenhouse' – O. Körner • Microclimate control in greenhouses based on phytomonitoring data – U. Schmidt • Saving heating energy through dynamic set points controlled by outside temperature, irradiation and wind speed – S. Wartenberg • Advanced Model-based Greenhouse Climate Control Using Multi-objective Optimization – J. C Sørensen • Energy savings in Danish nurseries, current situation and needs for future developments – J. Rystedt
9.30	
10.00	
	Coffee break (10.40 – 11.00)
10.30	
	Interactive discussion (11.00 – 12.00)
11.00	
	Lunch & visit local reserve (12.00 – 14.30)
11.30	
12.00	
12.30	
13.00	
	Session 4: Heat storage & smart grids (14.30 – 15.15) <ul style="list-style-type: none"> • Using the heat storage to support the grid-balance with CHP – H. Mariën • Greener than Green Greenhouses – J. Bozelie • Gas absorption heat pumps and borehole energy storage in semi closed greenhouses – E. Eriksson • Using Flexibility in Greenhouse Climate Parameters to Guide Smart Grid Markets – J.Verhoosel
13.30	
14.00	
	Interactive discussion (15.15 – 16.15)
14.30	
15.00	Coffee break (16.15 – 16.30)
	Session 5: Future greenhouse concepts (16.30 – 17.45) <ul style="list-style-type: none"> • Towards more efficient energy use in Norwegian greenhouse production – M. Verheul • Greenhouse production with less energy: a plants' perspective – P. Lootens • To be announced– B. Paris • A vision on the use of plant sensors and models in the greenhouse industry – K. Steppe • Production of ornamentals with minimal energy input – V. Dias
15.30	
16.00	
	Interactive discussion (17.45 – 18.45)
16.30	
17.00	
17.30	
18.00	
18.30	
	Dinner at hotel (19.00)
19.00	

WEDNESDAY 23TH OCTOBER AT THE RESEARCH STATION FOR ORNAMENTAL PLANTS, DESTELBERGEN

9.00	Transport to PCS, Destelbergen
9.30	<ul style="list-style-type: none"> • Latest figures of the energy conserving greenhouse designs on the Innovation and Demonstration Centre in Bleiswijk, The Netherlands – F. de Zwart • Cultivar difference in plant transpiration rate at high air humidity are not related to genotypic variation in stomatal responsiveness – H. Giday
10.00	Interactive discussion & Future vision of greenhouse horticulture (10.00 – 12.00)
10.30	
11.00	
11.30	Lunch (12.00 – 13.30)
12.00	
12.30	
13.00	<p>Open meeting “Energy efficient horticulture in Europe”</p> <p>Welcome & introduction GreenGrowing – depute Alexander Vercamer Saving energy in German greenhouses – D. Ludolph The future in Norwegian greenhouse horticulture – M. Verheul Future vision of energy management in the North Sea Region – C. Ottosen Coffee break Smart solutions for greenhouse ornamentals – B. Schamp Possible energy saving innovations in Flemish horticulture – E. Eriksson Decrease your energy bill – I. Goessens (Innovatiesteunpunt) Get funding for your energy project – KBC bank Reception with interactive discussion</p>
13.30	
14.00	
14.30	
15.00	
15.30	
16.00	

4. LOCATION

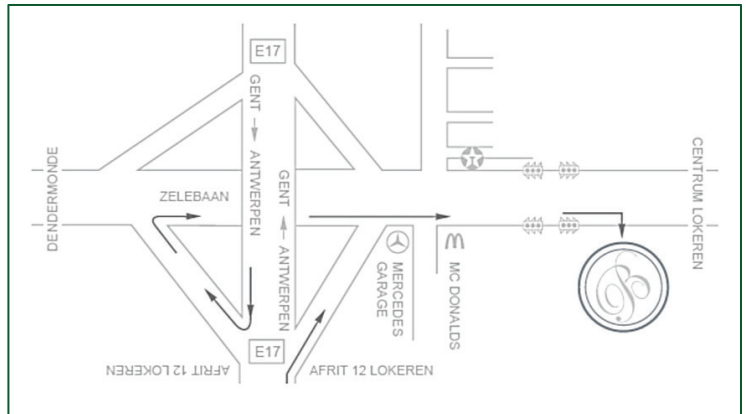
BIZNIS HOTEL

Zelebaan 100

B - 9160 Lokeren

Route description: from Ghent/Antwerp
or Antwerp/Ghent (E17):

- Exit 12, Lokeren.
- Turn right at the end of the exit and follow straight ahead until the traffic lights. Follow the road for about 200 m. You will find the Biznis hotel on your right side.

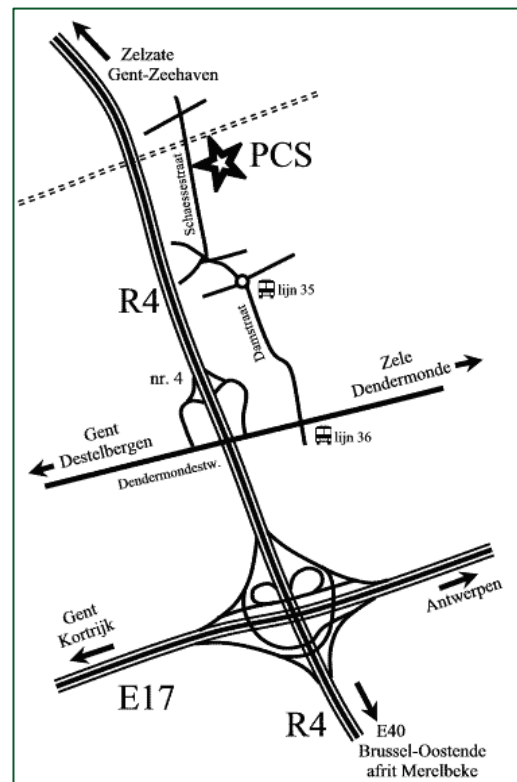


RESEARCH STATION FOR ORNAMENTAL PLANTS

Schaessestraat 18, B - 9070 Destelbergen

Route description:

- Coming from Oostende or Brugge: follow the E 40 until the E40-E17 interchanger, where you head for Antwerpen (E17). At the E17-R4 interchanger, take the R4 towards Zelzate – Gent-Zeehaven. Then take immediately the exit Zele-Destelbergen (n°4), which brings you on the Dendermondesteenweg (N445). Take left towards Dendermonde and at the roundabout, take left onto Beervelde. You are now in the Damstraat. At the roundabout, follow the Houtstraat and take a right turn in the second street, the Schaessestraat. You will see the PCS (Proefcentrum voor Sierteelt) on your right side.
- Coming from Brussel: take the E40 until the exit Merelbeke (n°16), where you take the R4 towards Zelzate – Gent-Zeehaven. Carry on straight until the exit Zele-Destelbergen (n°4), which brings you on the Dendermondesteenweg (N445). Take left towards Dendermonde and at the roundabout, take left onto Beervelde. You are now in the Damstraat. At the roundabout, follow the Houtstraat and take a right turn in the second street, the Schaessestraat. You will see the PCS (Proefcentrum voor Sierteelt) on your right side.
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- Coming from Kortrijk: take the E17 until the E17-R4 interchanger, where you head for Zelzate – Gent-Zeehaven (R4). Then take immediately the exit Zele-Destelbergen (n°4), which brings you on the Dendermondesteenweg (N445). Take left towards Dendermonde and at the roundabout, take left onto Beervelde. You are now in the Damstraat. At the roundabout, follow the Houtstraat and take a right turn in the second street, the Schaessestraat. You will see the PCS (Proefcentrum voor Sierteelt) on your right side.





For more information, please contact:



PCS | Proefcentrum voor Sierteelt

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**PCG | Provinciaal Proefcentrum
voor de Groenteteelt Oost-Vlaanderen**

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T: +32 (0)9 381 86 86
F: +32 (0)9 381 86 99
E: info@proefcentrum-kruishoutem.be
W: www.proefcentrum-kruishoutem.be

For practical information during the workshop you can contact:

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Hein Vansteenkiste (+32 (0)473 52 35 38).



GREENHOUSE | programme for
ENERGY SAVING | the North Sea Region

WORKSHOP GREENGROWING

21-23 OCTOBER 2013, LOKEREN (BELGIUM)

organization: PCS and PCG

Experts in greenhouse energy conservation inside and outside the Greengrowing partnership will present and exchange knowledge in a closed meeting in Lokeren (Belgium). This meeting will allow the participants to get an overview of the state of the art and the future technologies to reduce energy use in the NSR Horticulture.

THE GOALS OF THIS WORKSHOP ARE:

- Define a realistic vision on the future of energy reduction in greenhouse horticulture
- Define potential bottlenecks and respective solutions to move forward
- Produce a paper on first and second topic which will form a basis for future research. Forge future collaboration and partnerships beyond Greengrowing.

