

International Conference Insects to Feed the World

Ede
The Netherlands

14 -17 May 2014



PROGRAMME

Silver sponsor:



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Wednesday, 14 May 2014

PLENARY LECTURES (ROOM SCHOUWBURG)

Chair: Arnold van Huis

- 09:00-09:15 **Objectives of the conference** - *Arnold van Huis, Wageningen University, The Netherlands*
- 09:15-09:45 **Setting the table for a hotter, flatter, more crowded earth: insects on the menu?** - *Sonny Ramaswamy, Director National Institute of Food and Agriculture, U.S. Department of Agriculture, Washington*

HARVESTING FROM NATURE

- 09:45-10:15 **Anthropo-entomophagy in Latin America: An overview of the importance of edible insects to local communities** - *Eraldo M. Costa Neto, Brazil*
- 10:15-10:45 **Ethno-entomophagy in Asia and the Pacific: historical perspectives and future directions** - *Alan Yen, Australia*

10:45-11:15 **Coffee/tea break**

ORAL PRESENTATIONS IN PARALLEL SESSIONS

Harvesting from nature (room Schouwburg)

Chairs: Maurizio Paoletti and Joost van Itterbeeck

- 11:15-11:35 Everyday entomophagy in rural Laos: Understanding the heterogeneity of insect consumption in dairy life (Nonaka, K., Murayama, N., Natsuhara, K. and Ono, E.)
- 11:35-11:55 Semi-cultivating edible insects: A historical perspective and future prospects (Van Itterbeeck, J.)
- 11:55-12:15 Harvesting and nutrition value of edible wasps in southwest China (Zhao, M., Feng, Y. and Chen, X.M.)
- 12:15-12:35 The Amazonic strategy to utilize edible insects can be extended? (Paoletti, M.G. and Manno, N.)

Harvesting from nature (room Kernhem)

Chairs: Alan Yen and Charlotte Payne

- 11:15-11:35 Prospects and constraints for the use of insects as human food and animal feed in West Africa (Kenis, M. and Hien, K.)
- 11:35-11:55 Entomophagy in contemporary Japan: Imported insects compensate for a decline in wild harvesting (Payne, C.L.R.)
- 11:55-12:15 The other food: the status of entomophagy in Botswana (Obopile, M.)

Harvesting from nature (room Studio 2)

Chairs: Eraldo Costa Neto and Michael Rajam Basil Rose

- 11:15-11:35 Entomophagous insects of Kanyakumari District, India (Basil-Rose M.R., Padua, J.C. and Punitha, A.)
- 11:35-11:55 What innovations to convert locusts invasions into a protein pulsed resource accessible to local population? (Randrianasolo-Rakotobe, H. and Rakotonandraina, N.)
- 11:55-12:15 Exploiting pest insects species *Sphenarium purpurascens* for human consumption: ecological, social, and economic repercussions (Cerritos Flores, R., Ponce-Reyes, R. and Rojas-García, F.)

12:30-13:15 **Lunch**

13:15-14:00 **Poster session**

PRODUCTION OF INSECTS AS FOOD AND FEED

PLENARY LECTURES (ROOM SCHOUWBURG)

Chair: Sunday Ekesi

14:00-14:30 **Small-scale production of edible insects for enhanced food security and rural livelihoods: experience from Thailand and Laos** – Patrick B. Durst (FAO) and Yupa Hanboonsong, Thailand

14:30-15:00 **Insect diseases: what are they and how to avoid them?**
- Jørgen Eilenberg and Annette Bruun Jensen, Denmark

15:00-15:30 Coffee/Tea break

15:30-17:10 ORAL PRESENTATIONS IN PARALLEL SESSIONS

Projects (room Schouwburg)

Chairs: Nanna Roos and Elaine Fitches

15:30-15:50 GREEINSECT: a multidisciplinary research project on potentials and barriers for insect-farming for food and feed in Kenya (Roos, N., Owino, V., Kinyuru, J., Ekesi, S., Courtwright, G., Drew, D., Hanboonsong, Y., Vantomme, P., Chamnan, C., Olsen, S.B., Jensen, A.B. and Ayieko, M.)

15:50-16:10 PROteINSECT- do European citizens accept the use of insects for animal feed & human food? (Smith, R. and Pryor, R.E.)

16:10-16:30 WINFOOD PROJECT: development and evaluation of Amaranth grain based complementary foods enriched with termites and fish (Kinyuru, J.N., Konyole, S.O., Onyango-Omolo, S.A., Owino, V.O., Owuor, B.O., Estambale, B.B. and Roos, N.)

16:30-16:50 Perspectives of insect industry in South Korea: Government policies and R&D strategies (Jeong, J.)

Silkworms as food and feed (room Kernhem)

Chairs: Joop van Loon and Sivilai Sirimungkararat

15:30-15:50 Silkworms to resolve the world's food crisis - the most acceptable insect as food and feed (Prabhakar C.J., Akai, H., Sumida, M., Sohn, B.H., Wu Jenmai and Sirimungkararat, S.)

15:50-16:10 Ideal edible insect: High value, safety food and innovative products with complete value chain of eri silkworm (*Samia ricini* D.) in Thailand (Sirimungkararat, S., Saksirirat, W. and Wongson, D.)

16:10-16:30 Pury, a fine powder made from silkworm pupae as an alternate of nutritious food for human nutrition (Astuti, T., Kusharto, C.M. and Mas'ud, H.)

16:30-16:50 Insects: Potential of stable isotope tools for optimizing insect production management (Hood-Nowotny, R.)

Farming different species (room Studio 2)

Chairs: Karel Bolckmans and David Drew

15:30-15:50 High potential for mass rearing katydid (*Ruspolia differens*) and palm weevil (*Rhynchophorus phoenicis*) for food in the Lake Victoria basin (Nyeko, P., Okia, C.A., Nusula, N., Odongo, W., Nzabamwita, H.P., Ndimubandi, J., Jaronski, S. and Roininen, H.)

15:50-16:10 Edible mealworm species: the effect of diets composed of organic side stream material (Van Broekhoven, S., Oonincx, D.G.A.B., Van Huis, A. and Van Loon, J.J.A.)

16:10-16:30 The rearing and utilization of cockroach in Yunnan, China (Feng, Y., Chen, X.M. and Zhao, M.)

16:30-16:50 Two rearing substrates on *Tenebrio molitor* meal composition: issues on aquaculture and biodiesel production (Belforti M., Lussiana C., Malfatto V., Rotolo L., Zoccarato, I. and Gasco L.)

16:50-17:10 An aquatic worm production concept for the valorisation of food by-products
(Laarhoven, B., Elissen, H.J.H., Temmink, H., Buisman, C.J.N.)

OFFICIAL OPENING

PLENARY SESSION (ROOM SCHOUWBURG)

Chair: Arnold van Huis

17:15-17:45 **African edible-insects: inventory, diversity, commonalities and contribution to food and nutritional security-** *Segenet Kelemu, Director General icipe (African Insect Science for Food and Health), Nairobi, Kenya*

17:45-18:30 **Opening statements**
Ernst van den Ende, Managing Director, Plant Sciences Group, Wageningen University and Research Centre, The Netherlands
Hans Hoogeveen JD MPA, Director General Agro at the Ministry of Economic Affairs, The Netherlands
Eduardo Rojas-Briales, Assistant Director-General, FAO Forestry Department, FAO Headquarters, Rome

18:30 **Cocktail** (offered by Ynsect)

Thursday, 15 May

FOOD SAFETY, LEGISLATION AND POLICY

PLENARY LECTURE (ROOM SCHOUWBURG)

Chair: Marian Peters

09:00–09:30 **Safety and quality considerations of insects for food and feed** - Adrian Charlton, United Kingdom

ORAL PRESENTATIONS IN PARALLEL SESSIONS

Legislation and food safety (room Schouwburg)

Chairs: Rosie Pryor and Nils Grabowski

09:30-09:50 PROteINSECT- promoting legislation change to help feed the world (Pryor, R. E. and Smith, R.)

09:50-10:10 Use of insects as a protein source in feed and food: Safety and EU legislative aspects (Van der Spiegel, M. and Noordam, M.)

10:10-10:30 Risk assessment of novel proteins in food: Are insect proteins allergenic? (Broekman, H.C.H.P., Knulst, A.C., Den Hartog Jager, C.F., Gaspari, M., De Jong, G.A.H., Houben, G.F. and Verhoeckx, K.C.M.)

10:30-10:50 Microbiological status of edible insects sold as pet feed in Germany (Grabowski, N.Th., Jansen, W. and Klein, G.)

Food safety (room Kernhem)

Chairs: Stefan Diener and Steen Nordentoft

09:30-09:50 Inactivation of *Salmonella* spp. and *Ascaris suum* in batch and continuous black soldier fly treatments (Lalander, C.H., Diener, S. and Vinnerås, B.)

09:50-10:10 Evaluation of feed safety aspects in feeding organic layers with fresh house fly larvae (*Musca domestica*) reared in poultry manure (Nordentoft, S., Fischer, C., Hald, B., Enemark, H., Thapa, S. and Bjerrum, L.)

10:10-10:30 Nutrition and heavy metal levels in the mound termite, *Macrotermes bellicosus* (Smeathman) (Isoptera: Termitidae), at three sites under varying land use in Abeokuta, southwestern Nigeria (Idowu, A.B., Ademolu, K.O. and Bamidele, J.A.)

10:30-10:50 Multifaceted aspects of insect pathogenic and commensal bacteria in insect based food (Nielsen-LeRoux, C.)

Nutrition (room Studio 2)

Chairs: Marleen Vrij and Jharna Chakravorty

09:30-09:50 Towards an effective insect supply chain: meeting qualitative requirements and quantitative demands (Vrij, E.M.P. and Peters, M.)

09:50-10:10 Human chitinases' variability and implications for chitin digestion in populations eating insects (Paoletti, M.G., Mostacciuolo, M.L., Battisti, A., Mostacero Leon, J. and Manno, N.)

10:10-10:30 Nutritional and anti-nutritional composition of most preferred ant and termite species used as food by the tribes of Arunachal Pradesh, India (Chakravorty, J.)

10:30-10:50 Ethanol extract of *Bombys batryticatus* induces apoptosis in human hepatoma cell SMMC-7721 via the modulation of Bax/Bcl-2 and P21 expression pathway (Wu, W-P, Wu, J-Y, Zhang, R-F., Feng, J-N and Wang, D.)

10:50–11:20 **Coffee/tea break**

PLENARY LECTURES (ROOM SCHOUWBURG)

Chair: Paul Vantomme

11:20–11:35 The role of the FAO in assisting countries to develop regulatory frameworks to include insects in the food and feed sectors (Afton Halloran, Paul Vantomme and Christopher Münke) (15 min)

11:35-12:00	Legislation and regulation of insects as food and feed - the EU perspective (European Commission - Health & Consumers Directorate-General - DG SANCO) Sirrku Heinimaa and Wolfgang Trunk
12:00-12:30	Discussion
12:30-13:15	Lunch
13:15-14:00	Poster session

INSECTS AS FEED: SPECIFIC PRODUCTION SYSTEMS

PLENARY LECTURES (ROOM SCHOUWBURG)

Chair: Paul Jones

14:00-14:30	Black soldier fly farming: The entomology link in kiloton/month (and above) production chains – <i>John C. Schneider, USA</i>
14:30-15:00	AgriProtein: Building the worlds' largest insect rearing protein farm – a history and vision - <i>David Drew, South Africa</i>

15:00-15:30 **Coffee/tea break**

ORAL PRESENTATIONS IN PARALLEL SESSIONS

Insects as feed - general (room Schouwburg)

Chairs: Harinder Makkar and Takeshi Miura

15:30-15:50	Current status on use of insects as animal feed (Makkar, H.P.S.)
15:50-16:10	The Insect Biorefinery, an efficient tool for industrial production of insects and derivatives (Hubert, A.)
16:10-16:30	The benefits of using insects as fish and animal feed (Miura, T., Ido, A., Ohta, T., Iwai, T., Kusano, K., Kobayashi, S., Kishida, T. and Miura, C.)
16:30-16:50	Case study: Insects as feed (Pieterse, E., Hoffman, L.C. and Drew, D.W.)
16:50-17:10	Industrial fruit fly mass rearing for the application of the Sterile Insect Technique (Abd-Alla A. M. M., Caceres, C., Parker, A.G., and Vreysen, M.J.B.)
17:10-17:30	EnviroFlight, USA: Industrial cultivation of black soldier flies for animal feed (Courtright, G.)

Aquaculture (room Kernhem)

Chairs: Erik-Jan Lock and Tarique Arsiwalla

15:30-15:50	Insect meal: a promising source of nutrients in the diet of Atlantic salmon (<i>Salmo salar</i>) (Lock, E.J., Arsiwalla, T. and Waagbø, R.)
15:50-16:10	Use of <i>Tenebrio molitor</i> larvae meal in diets for gilthead sea bream <i>Sparus aurata</i> juveniles (Piccolo, G., Marono, S., Gasco, L., Iannaccone, F., Bovera, F. and Nizza, A.)
16:10-16:30	Mealworm (<i>Tenebrio molitor</i>) as a potential ingredient in practical diets for rainbow trout (<i>Oncorhynchus mykiss</i>) (Gasco, L., Belforti, M., Rotolo L., Lussiana, C., Parisi G., Terova G., Roncarati A. and Gai, F.)
16:30-16:50	Substitution of fish meal by <i>Tenebrio molitor</i> meal in the diet of <i>Dicentrarchus labrax</i> juveniles (Gasco, L., Gai, F., Piccolo, G., Rotolo, L., Lussiana, C., Molla, P. and Chatzifotis, S.)
16:50-17:10	Insects are a sustainable alternative to fishmeal in aquaculture feed. Past and future (Henry, M. and Fountoulaki, E.)
17:10-17:30	Mass production system of housefly (<i>Musca domestica</i>) for waste reutilization and as feed for chickens and shrimps (Chen, J., Zhao, G. and Han, R.)

Black soldier fly and Housefly as feed (room Studio 2)

Chairs: Birgit Rumpold and Heinrich Katz

15:30-15:50	Nutrient digestibility of <i>Hermetia illucens</i> and <i>Tenebrio molitor</i> meal in broiler chickens (Schiavone, A., De Marco, M., Rotolo, L., Belforti, M., Martinez Mirò, S., Madrid Sanchez, J., Hernandez Ruiperez, F., Bianchi, C., Sterpone, L., Malfatto, V., Katz, H., Zoccarato, I., Gai, F. and Gasco, L.)
15:50-16:10	Parameters affecting larval development in the mass rearing of <i>Musca domestica</i> (Diptera: Muscidae) (Pastor, B., Martínez-Sánchez, A. and Rojo, S.)

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16:10-16:30	Evaluation and improvement of a house fly larvae production system in Mali (Koné, N., Nacambo, S. and Kenis, M.)
16:30-16:50	Efficiency and scalability in producing feed from manure using the common housefly (Fischer, C.H., Heckmann, L.H.L., Nordentoft, S., Hald, B. and Bjerrum, L.)
16:50-17:10	Utilization of <i>Hermetia illucens</i> larvae for the production of food and feed (Katz, H., Rumpold, B., Katz, P., Fröhling, A. and Schlüter, O.)
17:10-17:30	Cactus as feedstock to produce protein from <i>Hermetia illucens</i> in South Africa (Tarrisse, A.)
17:30-17:50	Black soldier fly–Microbes Union: Efficient waste recycling agent and valuable renewable resource (Zheng, L.Y., Zhang, J.B., Li, Q. and Yu, Z.N.)
18:30	Conference dinner

Friday, 16 May

NUTRITION, PROCESSING, CONSUMER ATTITUDES AND GASTRONOMY

PLENARY LECTURE (ROOM SCHOUWBURG)

Chair: Sonny Ramaswamy

09:00 – 09:30 **The last and critical step in promoting insects as food: Getting people to eat them** - *Paul Rozin, USA*

ORAL PRESENTATIONS IN PARALLEL SESSIONS

Introducing insects as food (room Schouwburg)

Chairs: Florence Dunkel and Ben Reade

09:30-09:50 Welcoming the world to our table: Hospitality and edible insects (Looy, H. and Wood, J.R.)

09:50-10:10 Taste First: Deliciousness as an argument for entomophagy (Reade, B., Evans, J. and Bom Frøst, M.)

10:10-10:30 The role of design in introducing insects to the UK diet (Dasan, A.)

Coffee/tea break

11:00-11:20 Willingness to pay for new food products from insect protein: Initial evidence from a choice experiment study in Kenya (Alemu, M.H. and Olsen, S.B.)

11:20-11:40 Longitudinal changes in acceptance of edible insects by students at Montana State University (Dunkel, F.V. and Stokhof de Jong, S.)

11:40-12:00 Introducing Entomophagy to America through children's education and culinary events (Ceadel, M.)

12:00-12:20 Can mass-production of insects contribute to alleviating malnutrition in developing countries? (Roos, N.)

12:20-12:40 Sustainable critters or delicious fritters? Consumer perceptions of edible insects in The Netherlands and Thailand (Tan, H.S.G., Tinchan, P., Steenbekkers, L.P.A., Lakemond, C.M.M. and Fischer, A.R.H.)

12:40-13:00 Effect of edible termite-based complementary foods on growth and micronutrient status of 6-15 month old Kenyan infants – a randomised trial (Owino, V.O., Omollo, S.A., Konyole, S.O., Kinyuru, J.N., Owuor, B., Skau, J., Roos, N., Michaelsen, K.; Friis, H. and Estambale, B.B.)

Developing a sustainable business crickets for food in Africa; TNO's Flying Food project (room Kernhem)

Chair: Henk van Deventer

09:30-09:50 The Flying Food project on crickets in Africa, general introduction (Van Deventer, H., Gianotten, N., De Graaf, M., Kamukama, D., Mancheron, H. and Vrij, M.)

09:50-10:10 Rearing of crickets in Kenya and Uganda (Gianotten, N.)

10:10-10:30 Processing and new insect based products (Van Deventer, D. and Vrij, M.)

Coffee/tea break

11:00-11:20 Market development and business case (Kamukama, D. and Mancheron, H.)

11:20-11:40 Triple loop monitoring and learning approach of Flying Food (De Graaf, M.)

Farming and nutritional quality (room Kernhem)

Chairs: Kenichi Nonaka and Ying Feng

11:40-12:00 Cricket Farming, Reproduction and Economic Potential for Small Farmers (Fuah, A.M., Siregar, H.C.H. and Siregar R.S.)

12:00-12:20 Nutritional assessment of the rare edible monster crickets and soldier termites consumed in the South Eastern districts of Zimbabwe (Musundire, R.)

12:20-12:40 Chemical profiling in the edible stink bug, *Encosternum delegorguei* consumed in South-Eastern districts of Zimbabwe (Musundire R., Cheseto X. and Torto B.)

Edible insects and nutrition (room Studio 2)

Chair: Tiny van Boekel

09:30-09:50 Mealworms: Alternate source of lipids (Danthine, S., Blecker, C., Paul, A., Caparros Medigo, R., Haubruge, E., Taofic, A., Lognay, G., Fauconnier, M-L., Frédéricich, M. and Francis, F.)

09:50-10:10 Lipid extraction of four insect species: Effect of extraction method and potential use as food ingredient (Tzompa-Sosa, D.A., Yi, L., Van Valenberg, H.J.F., Van Boekel, M.A.J.S. and Lakemond, C.M.M.)

10:10-10:30 Proteomics mass spectrometry to discover changes in protein composition: analyzing gut protein content and protein digestibility (America, A.H.P., Cordewener, J.H.G. and Van der Meer, I.M.)

10:30-11:00 **Coffee/tea break**

11:00-11:20 Blood profile and nutrient status of *Macaca fascicularis* as animal model fed with pupa meal (Astuti, D.A., Sajuthi, D., Irma H.S. and T.B. Clarkson)

11:20-11:40 Insect biochemistry: The assessment of nutritional factors by metabolomics (Snart, C.J.P., Kapranas, A., Hardy, I.C.W. and Barrett, D.A.)

11:40-12:00 Preliminary chemical analysis of extracts from *Encosternum delegorguei* using Gas Chromatography Mass Spectroscopy (Zvidzai, C.J.)

12:00-12:20 Nutrient composition of four species of winged termites consumed in Western Kenya (Kinyuru, J.N.; Konyole, S.O., Roos, N., Onyango, C.A., Owino, V.O., Owuor, B., Estambale, B.B. and Kenji, G.M.)

12:20-12:40 Extraction and characterization of proteins from five insect species (Yi, L., Lakemond, C.M.M., Sagis, L.M.C., Van Huis, A. and Van Boekel, M.A.J.S.)

12:40-13:00 Traditional processing of selected edible insects of Zimbabwe (Manditsera, F. A. and Zvidzai C. J.)

12:40-13:15 **Lunch**

13:15-14:00 **Poster session**

ENVIRONMENTAL ISSUES

PLENARY LECTURES (ROOM SCHOUWBURG)

Chair: Adrian Charlton

14:00-14:30 **Conversion of organic wastes into insect biomass and added value products: an integrated approach towards sustainability** - Santos Rojo, Spain

14:30-15:00 **Generic Life Cycle Assessment of proteins from insects** - Bart Muys, Belgium

15:00-15:30 **Coffee/tea break**

ORAL PRESENTATIONS IN PARALLEL SESSIONS

Entomophagy (room Schouwburg)

Chairs: Paul Rozin and Teun Veldkamp

15:30-15:50 Consumers' associations with insects in the context of food consumption: comparisons from acceptors to disgusted (Cunha, L. M., Moura, A.P. and Costa-Lima, R.)

15:50-16:10 Moving beyond the Bizarre Foods concept and tapping the "foodie" culture to promote entomophagy (Why, A. and Ricci, J.)

16:10-16:30 Business models based on insect inclusiveness (Klewer, M. and Real, F.)

16:30-16:50 Roadmap towards a flowering global insect industry (Peters, M. and Veldkamp, T.)

Environment (room Kernhem)

Chairs: Bart Muys and Dennis Oonincx

- 15:30-15:50 Can greenhouse gas emissions be reduced by inclusion of waste-fed larvae in livestock feed? (Zanten, H.H.E. van, Van Holsteijn, F.H., Oonincx, D.G.A.B., Mollenhorst, H., Bikker, P., Meerburg, B.G. and De Boer, I.J.M.)
- 15:50-16:10 Third Millennium Farming: utilizing city bio-wastes in a strategy for high-yield urban farming (Dzamba, J.)
- 16:10-16:30 Conversion of food waste directly to sustainable feed ingredients for animals and plants (Marchant, P.B., Vickerson, A. and Radley, R.)
- 16:30-16:50 Environmental sustainability of insect production (Oonincx, D.G.A.B.)

Promoting entomophagy (room Studio 2)

Chairs: Marcel Dicke and Catriona Lakemond

- 15:30-15:50 Open Source: Why we need open knowledge sharing to help insects feed the world (Imrie-Situnayake, D.)
- 15:50-16:10 Global awareness starts locally: the "Buggy Buffet" model to enhance conversation and adoption (Grant, J.F. and Follum, R.A.)
- 16:10-16:30 The hockey stick pattern in the acceptance of edible insects in The Netherlands (Dicke, M., Van Huis, A., Peters, M. and Van Gurp, H.)
- 16:30-16:50 Consumer acceptance of insect-based meat substitutes (Caparros Megido, R., Gierts, C., Blecker, C., Brostaux, Y., Danthine, S., Paul, A., Haubruge, É., Alabi, T. and Francis, F.)

CLOSURE OF THE CONFERENCE

PLENARY LECTURES (ROOM SCHOUWBURG)

Chair: Arnold van Huis

- 17:00-17:30 **Way forward to bring insects in the human food chain** – *Paul Vantomme (FAO HQ), Italy*
- 17:30-18:00 **Conclusions and recommendations**

Saturday, 17 May

Excursion programme

Option 1: Wageningen (fully booked)

Three chairgroups of Wageningen University and one company will be visited:

1. The Laboratory of Entomology: the basics of insect rearing.
2. The Animal Nutrition group: from insects to nutritious feed ingredients.
3. The Food Quality and Design group: fractionation of insects, insect protein, and consumer acceptance.
4. New Generation Nutrition: insect processing.

During the program a lunch will be provided at the Rijn IJssel Vakschool, Wageningen.

Henk van Gurp, lecturer-cook at Rijn-IJssel made the recipes of the Insect Cookbook.

The participants will return to "de Reehorst" at approximately 15:00 PM.

Option 2: Excursion region North Brabant

1. Visit to meal worm farm of Vivara/CJ Wildlife in Vierlingsbeek

(65 km from Wageningen).

Vivara/CJ Wildlife is producing mealworms as bird food. CJ Wildlife offers a wide variety of high-quality products for wild birds and a broad selection of other garden wildlife. CJ Wildlife is now operating in 10 European countries and is the market leader in the research, design and development of wild bird and wildlife food, and accompanying feed products.

1. Tour in mealworm production location
2. Presentation of the mealworm products and the market/supply chain of Vivara (at the visitors centre and distribution centre)
3. Optional: visit the educational garden
 - <http://www.birdfood.co.uk>
 - <http://www.vivara.nl>
 - <http://www.wormspecialist.com>

2. Visit to Feed DesignLab, Wansum

Feed Design Lab, a research and education center for innovation and sustainability in the animal feed industry. Feed & technology companies from the Netherlands, Belgium and Germany are working together in an open innovation network.

1. Tour and explanation in Feed Design Lab – pilot batch of chicken feed including mealworms will be produced at that moment
2. Presentations
 - <http://www.feedsdesignlab.nl/nl/>

The participants will return to "de Reehorst" at approximately 16:00 PM.

POSTERS

1. Exploring entomophagy in northern Benin: Practices, perceptions and possibilities (Riggi, L.G., Verspoor, R.L. Veronesi, M., MacFarlane, C., S. and Tchiboza, S.)
2. How can museums contribute for food provision and security in Africa – a stakeholder's approach (De Prins, J., Mergen, P. and Vantomme, P.)
3. Study on proteolysis of *Palembus dermestoides* (Fairmaire) and antioxidant activity of the hydrolysates (Yan, S., Chu, Z. and Meng Z.)
4. Neither wild nor farmed: What can we learn from insect 'semi-domestication'? (Payne, C.L.R. and Nonaka, K.)
5. Influences of different light sources on the life history of the Black soldier fly (Zhang, J.B., Huang, L., Zheng, L.Y. and Yu, Z.N.)
6. Life cycle of three *Hermetia illucens* L. strains and their conversion effect on manure (Zhang, J.B., Zhou, F., Zheng, L.Y. and Yu, Z.N.)
7. Research of co-conversion of livestock and poultry manure by black soldier fly and micro-organisms (Zhang, J.B., Cao, L., Zheng L.Y. and Yu, Z.N.)
8. Kitchen waste converted by black soldier fly and partly substituting soymeal in chicken feed (Zhang, J.B., Zheng, L.Y., Liu, X.L. and Yu, Z.N.)
9. Fishmeal substituted by production of chicken manure conversion with microorganisms and black soldier fly (Zhang, J.B., Zheng, L.Y., Jin, P., Zhang, D.N. and Yu, Z.N.)
10. Discovery of new anti-microbial peptides in black soldier fly and their function (Elhag, O.A.O., Zheng, L.Y., Zhou, D.Z., Yu, Z.N. and Zhang J.B.)
11. Edible insects of Western and Central Africa online (Mergen, P., Tchiboza, S., Theeten, F., De Prins J., Van de Voorde, J.)
12. Positive effects of dietary housefly (*Musca domestica*) pupa for fish and mammal (Ido, A., Ohta, T., Iwai, T., Kishida, S.T., Miura, C. and Miura, T.)
13. Belgian grasshoppers: A nutritious food source (Paul, A., Frédéricich, M., Blecker, C., Haubruge, E., Francis, F., Caparros Medigo, R., Uyttenbroeck, R., Taofic, A., Heuskin, S., Lognay, G. and Danthine, S.)
14. Biowastes to Bioenergy (Li, W., Zheng, L.Y., Zhang, J.B., Yu, Z.N. and Li, Q.)
15. Effects of egg associated bacteria on the development of black soldier fly (Zheng, L.Y., Zhang, J.B., Li, Q. and Yu, Z.N.)
16. Optimization of cricket breeding production system for human food in Ratanakiri province (Cambodia) (Caparros Megido, R., Alabi, T.; Nieuw, C.; Blecker, C.; Danthine, S., Paul, A., Haubruge, É. and Francis, F.)
17. Situation and perspective of entomophagy in Kinshasa (Nsevolo, P., Caparros Megido, R., Blecker, C., Danthine, S., Paul, A., Haubruge, É., Alabi, T. and Francis, F.)
18. Wild edible Arthropods of tapia woodlands (*Uapaca bojeri*) in Madagascar (Barsics, F., Caparros Megido, R., Malaisse F., Razafimanantsoa, T.M., Minet, J., Lognay, G., Wathelet, B., Haubruge, E., Francis, F. and Verheggen, F.J.)
19. Impact of insect species and preparation ways on composition and digestibility for feed and food (Crahay, B., Beckers, Y., Danthine, S., Blecker, C., Paul, A., Caparros, R., Taofic, A., Haubruge, E. and Francis, F.)
20. Effect of sanitation treatment on the microbiological quality and nutritional value of edible insects (Alabi, T., Fievez, T., Jonas, M., Caparros, R., Blecker, C., Danthine, S., Paul, A., Haubruge, E. and Francis, F.)
21. The sustainability in agribusiness case research centre: opportunities at insects to feed the world conference (Braga, F.S., Omta, S.W.F. and Fortuin, F.)
22. Human consumption and nutrient composition of adult stage of *Zonocerus Variegatus* (Idowu, T. and K. Ademolu)
23. Purification and characterisation of soluble proteins based on expanded bed adsorption (EBA) chromatography for food application (Kristjansson, M., Eybye, K.L., Miquel Becker, E. and Hansen, M.B.)
24. Micro encapsulation as a means of protecting functional proteins and oils (Nielsen, A.L., Burnaes, K.L. and Isager, P.)
25. Entomophagy and capitalism (Müller, A.)
26. Comparison of honeybee pupae composition from healthy and parasitized brood by *Varroa* (Jonas, A., Benjamin, O., Martinez, J-JI.)
27. *Hermetia* as a transformer of organic waste streams for aquaculture feed (Smáráson, B.Ö., Knobloch, S., Björnsdóttir, R., Davíðsdóttir, B., Árnason, J.)

28. Cholesterol and edible insects (Adámková, A., Borkovcová, M., Kouřimská, L., Mlček, J. and Bednářová, M.)
29. Entomophagy in the Czech Republic (Borkovcová, M., Bednářová, M., Adámková, A., Mlček, J. and Kouřimská, L.)
30. Breeding flies in Ghana: Implications of scaling up from pilot trials to commercial production scale (Devic, E., Anankware, J.P., Murray, F. and Little D.C.)
31. Exploring insect wastes as a fertiliser: A preliminary study (Pelissetti, S., Belforti, M., Gaudino, S., Gasco, L., Katz, H. and Grignani C.)
32. Honey, pollen and propolis production of *Trigona laeviceps* (Siregar, H.G.H., Fuah, A.M. and Septiani, A.)
33. Growth performance of common catfish (*Ameiurus melas* Raf.) fingerlings fed insect meal diets (Roncarati, A., Gasco, L., Parisi, G. and Terova, G.)
34. Insects as feed and food: A comparison of domestication potential of some species (Pieterse, E., Hopley, D. and Drew, D.W.)
35. Insect rearing optimisation of *Hermetia illucens* on different organics waste streams (De Bakker, R., Staats, W. and Borghuis, A.)
36. Fatty acid profile and antioxidant content of pupae of a yellow strains of *Bombyx mori* (Chieco, C., Morrone, L., Bertazza, G., Di Virgilio, N., Cappellozza S. and Rossi, F.)
37. Conversion of nutrients from pig feces and food waste by the black soldier fly: preliminary results (De Boever, J.L., Van Linden, V., De Campeneere, S. and Jacobs, J.)
38. Edible Saturniids harvested around Arabuko sokoke forest in Kilifi County, Kenya (Musyoki, A.M., Kioko, E.N.2, Mbugi, J.P. and Bagine, R.K.)
39. Small scale experimental insect farming: Compliance of raw insects and processed flour with food hygiene requirements (Torcoli, E., Amoroso, I., Moretto, E., Caravello, G.U. and Giaccone, V.)
40. The potential of black soldier fly (*Hermetia illucens* L.) as animal feed: Biological view (Barragán, K.B., Oonincx, D.A.G.B., Dicke, M. and Van Loon, J.J.A.)
41. Development and marketing of new proteins; experienced impediments, solutions and tools (Janssens, S.R.M., Van Wagenberg, C.P.A., Kalk, C., Van der Sluis, A.A., Van der Spiegel, M. and Noordam, M.Y.)
42. Enabling the exploitation of insects as a sustainable source of protein for animal feed and human nutrition, PROteINSECT (Fitches, E.C., Charlton, A., Kenis, M., Smith, R., Melzer, G., Muys, B. and Bruggeman, G.)
43. Value added creation of eri silkworm (*Samia ricini* D.) pupa by cultivation of medicinal fungus (*Cordyceps militaris*) in Thailand (Saksirat, W. and Sirimungkararat S.)
44. Entomophagy at the New York Entomological Society 100th Anniversary celebration (Sorkin, L.N.)
45. Feasibility of mass rearing of black soldier fly in Iceland (Gísladóttir, S. and Ólafsson, G.)
46. Sustainable Insect Biorefinery (Broeze, J., Eisner-Schadler, V.R., Langelaan, H.C. and Togtema, K.A.)
47. Alternative protein production technology for animal feed in the UK (Wakefield, M., Fitches, E., Booth, A., Robinson, K., Charlton, A.J., Dickinson, M., Neal, N. and Sissins, J.)
48. Trends in USA edible insect businesses (Stokhof de Jong, S. and Dunkel, F.V.)
49. *Macrotermes gilvus* (Hagen) the mound building termite : A food supplement (Basil-Rose M.R., Punitha, A. and Padua, J.C)
50. Optimisation of the composition of *Hermetia* meal as a potential feedstuff for broiler and fish (Tschirner, M., Simon, A. and Ulrichs, Ch.)
51. A research framework for pro-poor commercial scale insect-based transformation of organic wastes in Ghana (Murray, F.J., Leschen, W., Devic, E., Newton, R. and Little, D.C.)
52. Superworm farming: stable supply as human and animal food, organic fertilizer and medical use materials (Chong, Y.Ch.)
53. Effect of replacing wheat bran feed with *Flammulina velutipes* cultivation media wastes on the growth of mealworm (*Tenebrio molitor*) (Tae-ho Chung, Ju-min Kim, Je-hyun Lee, Chul Park, Gi-wook Shin, Seong-Hyun Kim and Namjung Kim)
54. Developmental characteristic of *Tenebrio molitor* (Coleoptera: Tenebrionidae) at different temperatures and photoperiods (Kim, N., Kim, S., Kim, S., Choi, J., Lee, S. and Go, H.)