Insect research in action: The GREEINSECT project

Nanna Roos

Department of Nutrition, Exercise and Sports (NEXS)
Section on Paediatric and International Nutrition

University of Copenhagen

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What do we do in nutrition? – and why insects?

Source: Adapted from HTF 2003.
Why insects?? – animal source foods is a key to improve childrens diets

• Characteristics of animal source foods compared to plant foods
  – Higher content of micronutrients important for growth and cognitive development (e.g. Zn, iron, B12)
  – Higher protein content and quality
  – No anti-nutrients
  – High energy density
  – High fat content
  – Higher content of n-3 PUFA
  – General: Diets with animal source foods appears to improve growth and development in children

BUT: Animal source food are generally expensive! Insects may be affordable/accessible alternatives to meat/milk/egg/fish
Why insects? - it started with the WinFood project..

Aim of the WinFood project in Cambodia and Kenya:

- To develop nutrient dense complementary food ('babyfoods') based on locally available/traditional food
- To test these ‘WinFoods’ in human intervention studies for impact on nutritional status
## Winfood composition – Cambodia

<table>
<thead>
<tr>
<th>Food item</th>
<th>Winfood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>77%</td>
</tr>
<tr>
<td>Fish (<em>Esomus longimanus</em>)</td>
<td>6,1%</td>
</tr>
<tr>
<td>Fish (<em>Paralaubuca typus</em>)</td>
<td>6,1%</td>
</tr>
<tr>
<td>Spider (<em>Hablopelma albostriatum</em>)</td>
<td>1,8%</td>
</tr>
<tr>
<td>Oil</td>
<td>4,8%</td>
</tr>
<tr>
<td>Sugar</td>
<td>4,8%</td>
</tr>
</tbody>
</table>
## Winfood composition - Kenya

<table>
<thead>
<tr>
<th>Food item</th>
<th>Winfood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amaranth grain</td>
<td>71%</td>
</tr>
<tr>
<td>Maize</td>
<td>10%</td>
</tr>
<tr>
<td>Fish (<em>Rastrineobola argentea</em>)</td>
<td>3%</td>
</tr>
<tr>
<td>Termite (<em>Macrotermes sunhylanus</em>)</td>
<td>10%</td>
</tr>
<tr>
<td>Oil</td>
<td>0.6%</td>
</tr>
<tr>
<td>Sugar</td>
<td>5%</td>
</tr>
</tbody>
</table>
GREEiNSECT objectives

Overall aim:
to investigate how an edible insects sector in Kenya can be developed to contribute to a transition towards a greener economy.

Specific objectives:
- To generate knowledge of edible insect production systems for small- to large-scale enterprises;
- To assess the risks and food safety threats of the mass-rearing of insects and to provide evidence for an institutional framework advising the development of national and international regulations for insects as food and feed;
- To investigate how edible insects can contribute to the development of green economy in Kenya (public-private partnerships, markets for insect-based food and feed products);
- To strengthen research collaboration and research capacity of Kenyan institutions;
- To strengthen the national and international outreach and communication of the knowledge generated from this research consortium.
The GREEiNSECT project at a glance

Aim: How can mass-rearing of edible insects contribute to a transition to green economy in Kenya?

Outcome: National knowledge base on edible insects for greening food and feed supply, established within a public-private partnership

Global demand for new protein sources for food and feed within a green economy

A model for Kenya for establishing mass-rearing of edible insects for feed and food, as an contribution to greening the economy

WP1: Mass-rearing insect production technology

WP2: Human and animal disease risks and food safety

WP3: ‘Green economy’: Environmental impact/consumer acceptance

WP4: Capacity building

WP5: Management
GREEiNSECT partners

Kenya

- **JOOUST - Jaramogi Oginga Odinga University of Science and Technology (Monica Ayieko).** Piloting cricket rearing and test trails on crickets for human consumption. Linking to the ‘Flying Food’ project implementing cricket farming in Kenya and Uganda.
- **TUK - Technical University of Kenya (Victor Owino).** Previous collaborated on development and human testing of baby food with termites (‘The WinFood project).
- **JKUAT - Jomo Kenyatta University of Agriculture & Technology (John Kinyuru).** Food scientist, previously involved in the WinFood project.
- **icipe - International Centre for Insect Physiology and Ecology, Nairobi (Sunday Ekesi).** An international research organization on harmful and useful arthropods in the tropics.

Private partners:

- **EnvironFlight- USA:** Private enterprise founded by Glenn Courtright. Black Solidier fly rearing.
- **AgriProtein- South Africa:** Bioconversion of human waste based on house fly larvae. Test plant established in slum-area in Nairobi.
EnviroFlight Participates in Global Consortium on Sustainability

By EnviroFlight Media, on July 12th, 2013

Yellow Springs, OH, July 12, 2013: EnviroFlight announces it has been selected to participate in a global team of public and private organizations to develop sustainable tools and techniques for the food and feed sector in Kenya. The GREENINSECT consortium is led by the University of Copenhagen with team members from Kenya, Thailand, Cambodia, UN FAO, and the private sector. The work on the GREENINSECT project will serve as the foundation for an international model. The GREENINSECT project is funded by the Danish International Development Agency (DANIDA), Danish Ministry of Foreign Affairs. The project will commence in early 2014 and will run for four years.

EnviroFlight will provide access to its facilities in Yellow Springs, Ohio USA. EnviroFlight researchers will supervise a Kenyan PhD student developing insect based aquaculture feeds specifically for the Kenyan aquaculture industry. Aquaculture production in Kenya has risen over 500% in the last four years according to the latest statistics by the Kenyan Ministry of Fisheries Development. In 2005 production was 4,220 metric tons; it is currently 22,000 metric tons. The Kenyan aquaculture industry employs over 150,000 farmers and provides short-term employment for over one million youth. Under the GREENINSECT project, EnviroFlight will also develop and propose to develop a black soldier fly bioconversion system to transform Kenyan agriculture and food production co-products into a value-added source of aquaculture feeds.
The world urgently needs new sustainable sources of protein. A growing population, scarce water and land resources as well as declining natural fish stocks, make this more critical than ever.

Industrial farming of chickens, pigs and fish relies on protein from two sources, land-based soya plantations and marine fishmeal. Agricultural protein requires vast amounts of land and water, while the sea caught alternative has material consequences for marine life. Increases in global food demand, and environmental issues have caused prices of both protein sources to soar in recent years.

AgniProtein is leading a new industry called nutrient recycling: using organic waste to create protein. This protein will supply the increasing demand for animal feed, as current sources are limited. It is a global project focused on fish and meat farming catering to the growing world population.

Using fly larvae fed on abundant waste nutrient sources, AgriProtein has developed and tested a new large scale and sustainable source of protein. The biocconversion process, takes 'free' waste materials, and generates a valuable commodity.

Larvae are a natural food of chickens in the wild and fish in streams. Their nutritional composition is as good as that of fishmeal and better than Soya. As a natural food it has excellent take on and digestibility properties.
GREEiNSECT partners

Denmark (KU)

International partners:
- DFPTQ - Department of Fisheries Post-Harvest Technologies and Quality Control, Cambodia. (Chhoun Chamnan). Share of experiences in regional standard for trading edible crickets across borders (in process in SE Asia as the first place).
Research capacity building

2 GREEiNSECT PhD students enrolled in Denmark

5 GREEiNSECT PhD students enrolled in Kenya

Possibility for attaching more Danish and Kenyan PhD students, Kenyan master students and Danish master students
The GREEiNSECT dream....

Insect sector in Kenya....
GREEiNSECT dream... spin-off projects

Extending research activities:
- 1 PhD stipend awarded through EU curriculum project
- Research proposal: OPTiNSECT - Insect protein in low-soy pig feed and human diets – predictive LP/cLCA-modelling for optimal impact on economic, environment and nutrition
- Partnership in EU Horizon 2020 research proposals

Student projects:
In human nutrition
- Nutritional qualities of insects
- Dietary contribution form insects
- Insect-based food products

Other disciplines and inter-disciplinary with
- Agriculture production and economy
- Entomology
- Consumer science/economy