Assessing the commercial potential of Insect Proteins

Antoine Hubert, President of the International Platform of Insects for Food & Feed (IPIFF) – 27 April 2016
1. Introducing IPIFF

2. Global challenges

3. Insect industry

4. Commercial potential of Insects as feed
1. INTRODUCING IPIFF

What is IPIFF? ‘International Platform of Insects for Food & Feed’

- International alliance of key players in the insect industry across Europe & abroad
- Represents the interests of the insect value chain at European level
- Originally founded in 2012 and formally established in 2015

IPIFF objectives - ‘building up a responsible sector’

- Promoting insects as top-tier source of animal proteins for food & feed
- Developing shared standards & best practices
- Encouraging cooperation and effective risk management procedures along the insect value chain
- Consolidating dialogue with EU public authorities & advocating for appropriate legislative frameworks
1. INTRODUCING IPIFF

IPIFF MEMBERS 2016
1. INTRODUCING IPIFF

IPIFF MEMBERS PROFILE

- Mainly European members, but also non-EU companies targeting at the EU market.

- Insect producing companies (farming & processing), other firms in the insect value chain (e.g. equipment, distribution) & ‘knowledge sharing’ members.

- All producing for feed & food consumption, some of them producing also for other markets e.g. biological control, green chemistry and plant nutrition.
1. Introducing IPIFF

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2. GLOBAL CHALLENGES

ECONOMIC FORECASTS

Global growth in population - **9 billion people in 2050** – and increased welfare levels lead to fast increasing demand for high quality foods

- 72% increase in global meat demand (2000 vs 2030)
- 50% in aquaculture (2010 vs 2030)
- 60 MT proteins forecasted to be missing by 2030 in order to meet the expected demand (FAO)

**Increased dependency on proteins imports** for animal feed use puts the economic viability of the EU feedstock & livestock sector at risk

- soybean meal (of which 70% of EU consumption is imported) prices increased over 100% over the 5 past years
- fishmeal (of which 65% of EU consumption is imported) increased 4-fold.
ECONOMIC FORECASTS

Increased of demand leads to protein meal constant price rising, in particular fish meal.

Fishmeal Monthly Price - Euro per Metric Ton

Range: 6m 1y 5y 10y 15y 20y

Description: Fishmeal, Peru Fish meal/pellets 65% protein, CIF, Euro per Metric Ton

Unit: Euro per Metric Ton
2. GLOBAL CHALLENGES

GLOBAL SOLUTION – INSECTS

- Insects are part of the **staple diet of around 2.5 billion people** in large areas of the world.

- Insects are an important part of the **natural diet of widely consumed animals** (e.g. trouts, poultry).
AGENDA

1. Introducing IPIFF
2. Global challenges
3. Insect industry
4. Commercial potential of Insects as feed
3. INSECT INDUSTRY

PROFESSIONALIZING THE INDUSTRY

From “hobby” style to industrial scale & process control
3. INSECT INDUSTRY

HYGENE, HACCP AND CONTROL PRINCIPLES IN PRODUCTION PROCESS

Feedstock
Intake, mixing and storing of insect feed

Breed
Adult colony and egg production

Production
Insect growth management

Separation
Separating larvae from residue

Processing
Making proteins and fats from larvae

Incubation
Production of pupae for new adults

Store and Sell
Outlet to customer

Reject and Residue management

Tracking & Tracing principles apply to whole process and sub-processes.

S1 Feedstock control & traceability
S2 Fly escape control
S3 Life larvae quality control
S4 Larvae cleanliness control
S5 Processing conditions control
S6 Product norm value control & traceability
GENERAL OVERVIEW OF THE INSECT FARMING & PRODUCTION SECTOR (1)

- Sector exclusively composed of SMEs & Start-up companies with limited production capacities so far.

- Most companies are ‘exclusively’ dedicated to insect production and fully ‘integrate’ all production steps: from farming up to delivery of insect meal or oil.

- Potential for up scaling & significant production volumes increase (accessible worldwide fish feed market equivalent to 2 million tons of insect meals).
3. INSECT INDUSTRY

GENERAL OVERVIEW OF THE INSECT FARMING & PRODUCTION SECTOR (2)

Size of IPIFF Members*

- Large medium-sized company (between 250 and 5000 employees)
- Small medium-sized company (between 10 and 250 employees)
- Small company (10 or less employees)

* Source: IPIFF questionnaire: Overview of the insect professional sector & production practices
3. INSECT INDUSTRY

GENERAL OVERVIEW OF THE INSECT FARMING & PRODUCTION SECTOR (3)

IPIFF Members’ core business*

- Beekeeping
- Human Food
- Pet Food
- Feed**
- Biological control
- Health app.
- Pollination
- Industrial app.
- Other

*Source: IPIFF questionnaire: Overview of the insect professional sector & production practices
** Includes data on commercial activities (e.g. insects fats) or R&D activities
Operators engaged in ‘commercial activities’ (e.g. PIPs for pet food & fats for pigs & poultry markets) but also producing for R&D purposes (lab- and pilot-scale).

BSF, Mealworm or lesser mealworm are among the most promising insect species for commercialization as feed.

Operators using exclusively vegetal substrates for commercial production of animal feed.

First sales have started in Europe this year (i.e. proteins in pet food, fat in poultry)
3. INSECT INDUSTRY

GENERAL OVERVIEW OF THE INSECT FARMING & PRODUCTION SECTOR (5)

Growing substrate used by IPIFF Members*

- Vegetal substrate
- Commercial feed
- Former food stuff**

*Source: IPIFF questionnaire: Overview of the insect professional sector & production practices
** Containing food originating from vegetal, plus dairy and eggs
AGENDA

1. Global challenges
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3. Insect Industry
4. Commercial potential of Insect products
CURRENT MAIN PRODUCTS INCLUDE PROTEIN MEAL AND INSECT OIL
4. COMMERCIAL POTENTIAL OF INSECT PRODUCTS FOR ANIMAL FEED

GENERAL FIGURES

- Insects represent **up to 70%** of natural trout diet

- On average, insects can convert **2 kg of feed into 1 kg of insect mass**, whereas cattle requires 8 kg of feed to produce 1 kg of body weight gain

- **Protein** levels in insect meals vary **between 55% & 75%** (levels comparable to animal proteins - i.e. meat and bone meal - and fish meal sources)

- Feed incorporation rates range **betw. 5 % and 40% for aqua & broilers feed**
### 4. COMMERCIAL POTENTIAL OF INSECT PRODUCTS FOR ANIMAL FEED

**DATA SHEET INSECT MEAL – AVERAGE VALUES FOR SEVERAL SPECIES (1)**

**Hermetia Illucens meal**

<table>
<thead>
<tr>
<th>Properties</th>
<th>Total %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Protein</td>
<td>50-65</td>
</tr>
<tr>
<td>Fat</td>
<td>10-20</td>
</tr>
<tr>
<td>Fiber</td>
<td>8-15</td>
</tr>
<tr>
<td>Ash</td>
<td>0-10</td>
</tr>
<tr>
<td>Moisture</td>
<td>5-15</td>
</tr>
<tr>
<td>Caloric value</td>
<td>400-500 kcal/100g</td>
</tr>
<tr>
<td>Energy value</td>
<td>1750 - 2000 KJ/100g</td>
</tr>
</tbody>
</table>

**Amino acid**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lysine</td>
<td>1,5 – 2</td>
</tr>
<tr>
<td>Methionine</td>
<td>0,75-1</td>
</tr>
<tr>
<td>Cystine</td>
<td>0,25- 0,5</td>
</tr>
</tbody>
</table>

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[Image: 7x10 to 67x43, Image: 605x480 to 706x536]
### Data Sheet Insect Meal – Average Values for Several Species (2)

#### Tenebrio Molitor Meal

<table>
<thead>
<tr>
<th>Properties</th>
<th>Total %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Protein</td>
<td>65-75</td>
</tr>
<tr>
<td>Fat</td>
<td>10-15</td>
</tr>
<tr>
<td>Fiber</td>
<td>5-10</td>
</tr>
<tr>
<td>Ash</td>
<td>0-5</td>
</tr>
<tr>
<td>Moisture</td>
<td>10-15</td>
</tr>
<tr>
<td>Caloric value</td>
<td>2250 - 2500 KJ/kg</td>
</tr>
</tbody>
</table>

#### Amino acid

<table>
<thead>
<tr>
<th>Amino acid</th>
<th>Total %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lysine</td>
<td>3– 3,5</td>
</tr>
<tr>
<td>Methionine</td>
<td>0,75-1</td>
</tr>
<tr>
<td>Cysteine</td>
<td>0,5 -1</td>
</tr>
</tbody>
</table>
EXAMPLES OF TEST RESULTS

Fishmeal can be replaced in Atlantic salmon diets between 50-100% without negative impact on end-weight or taste, texture and odor of the meat. FCR improved at every insect meal inclusion level.

<table>
<thead>
<tr>
<th>Diet</th>
<th>Weight</th>
<th>Length</th>
<th>Gain fish (g)</th>
<th>Feed eaten (g)</th>
<th>FCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>563</td>
<td>35</td>
<td>23934</td>
<td>29079</td>
<td>1.24</td>
</tr>
<tr>
<td>5% A</td>
<td>575</td>
<td>36</td>
<td>26667</td>
<td>32973</td>
<td>1.24</td>
</tr>
<tr>
<td>10% A</td>
<td>549</td>
<td>35</td>
<td>25912</td>
<td>29948</td>
<td>1.16</td>
</tr>
<tr>
<td>25% A</td>
<td>498</td>
<td>34</td>
<td>21355</td>
<td>24361</td>
<td>1.14</td>
</tr>
<tr>
<td>5% B</td>
<td>525</td>
<td>35</td>
<td>16630</td>
<td>16290</td>
<td>0.98</td>
</tr>
</tbody>
</table>

Feed Conversion Rate (compared to control):

- Better: -6.5%, -8.1%, -20.9%
- Worse: 5% A, 10% A, 25% A, 5% B
4. COMMERCIAL POTENTIAL OF INSECT PRODUCTS FOR ANIMAL FEED

**FEED FORMULATION**

<table>
<thead>
<tr>
<th>Ingredients, %</th>
<th>CTRL</th>
<th>Y5</th>
<th>Y7.5</th>
<th>Y15</th>
<th>Y25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fishmeal LT70</td>
<td>25.00</td>
<td>20.00</td>
<td>17.50</td>
<td>10.00</td>
<td></td>
</tr>
<tr>
<td>Krill meal</td>
<td>3.00</td>
<td>3.00</td>
<td>3.00</td>
<td>3.00</td>
<td>3.00</td>
</tr>
<tr>
<td>Squid meal</td>
<td>5.00</td>
<td>5.00</td>
<td>5.00</td>
<td>5.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Ynsect meal: TMP-Y465</td>
<td></td>
<td>5.00</td>
<td>7.50</td>
<td>15.00</td>
<td>25.00</td>
</tr>
<tr>
<td>Soy protein concentrate</td>
<td>14.00</td>
<td>14.00</td>
<td>14.00</td>
<td>14.00</td>
<td>14.00</td>
</tr>
<tr>
<td>Wheat gluten</td>
<td>9.05</td>
<td>9.25</td>
<td>9.40</td>
<td>9.65</td>
<td>10.10</td>
</tr>
<tr>
<td>Corn gluten</td>
<td>8.20</td>
<td>8.20</td>
<td>8.20</td>
<td>8.20</td>
<td>8.20</td>
</tr>
<tr>
<td>Soybean meal 48</td>
<td>7.50</td>
<td>7.50</td>
<td>7.50</td>
<td>7.50</td>
<td>7.50</td>
</tr>
<tr>
<td>Whole peas</td>
<td>6.15</td>
<td>5.75</td>
<td>5.40</td>
<td>4.75</td>
<td>3.70</td>
</tr>
<tr>
<td>Fish oil</td>
<td>11.50</td>
<td>11.50</td>
<td>11.50</td>
<td>11.50</td>
<td>11.50</td>
</tr>
<tr>
<td>Rapeseed oil</td>
<td>6.00</td>
<td>5.80</td>
<td>5.70</td>
<td>5.40</td>
<td>5.00</td>
</tr>
<tr>
<td>Vitamin &amp; Mineral premix</td>
<td>1.50</td>
<td>1.50</td>
<td>1.50</td>
<td>1.50</td>
<td>1.50</td>
</tr>
<tr>
<td>Soy lecithin</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Guar gum</td>
<td>0.20</td>
<td>0.20</td>
<td>0.20</td>
<td>0.20</td>
<td>0.20</td>
</tr>
<tr>
<td>Antioxidant</td>
<td>0.20</td>
<td>0.20</td>
<td>0.20</td>
<td>0.20</td>
<td>0.20</td>
</tr>
<tr>
<td>Sodium propionate</td>
<td>0.10</td>
<td>0.10</td>
<td>0.10</td>
<td>0.10</td>
<td>0.10</td>
</tr>
<tr>
<td>DL-Methionine</td>
<td>0.30</td>
<td>0.30</td>
<td>0.30</td>
<td>0.40</td>
<td>0.50</td>
</tr>
</tbody>
</table>

**Proximate composition**

<table>
<thead>
<tr>
<th></th>
<th>CTRL</th>
<th>Y5</th>
<th>Y7.5</th>
<th>Y15</th>
<th>Y25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry matter (DM), %</td>
<td>93.4 ± 0.0</td>
<td>93.1 ± 0.0</td>
<td>93.2 ± 0.1</td>
<td>95.0 ± 0.0</td>
<td>93.2 ± 0.0</td>
</tr>
<tr>
<td>Crude protein, %DM</td>
<td>48.5 ± 0.0</td>
<td>48.5 ± 0.1</td>
<td>48.5 ± 0.0</td>
<td>48.5 ± 0.0</td>
<td>48.5 ± 0.1</td>
</tr>
<tr>
<td>Crude fat, %DM</td>
<td>22.7 ± 0.2</td>
<td>22.7 ± 0.1</td>
<td>22.6 ± 0.2</td>
<td>22.7 ± 0.2</td>
<td>22.7 ± 0.2</td>
</tr>
<tr>
<td>Ash, %DM</td>
<td>9.4 ± 0.0</td>
<td>8.8 ± 0.0</td>
<td>8.7 ± 0.1</td>
<td>8.1 ± 0.0</td>
<td>7.4 ± 0.0</td>
</tr>
<tr>
<td>Total phosphorus, %DM</td>
<td>1.4 ± 0.0</td>
<td>1.4 ± 0.0</td>
<td>1.4 ± 0.0</td>
<td>1.4 ± 0.0</td>
<td>1.4 ± 0.0</td>
</tr>
<tr>
<td>Gross energy, MJ/kg DM</td>
<td>23.2 ± 0.2</td>
<td>23.2 ± 0.0</td>
<td>23.2 ± 0.0</td>
<td>23.2 ± 0.1</td>
<td>23.2 ± 0.1</td>
</tr>
</tbody>
</table>
4. COMMERCIAL POTENTIAL OF INSECT PRODUCTS FOR ANIMAL FEED

RESULTS: GROWTH PERFORMANCE

Strong influence of TMP-Y465 on growth performance
30 % of weight gain in comparison of Fish meal

Bars are means ± standard deviation (n = 3)
Bars different superscripts differ significantly (P<0.05)
4. COMMERCIAL POTENTIAL OF INSECT PRODUCTS FOR ANIMAL FEED – REGULATORY ASPECTS

Feed stocks

- Vegetal origin
- Former Foodstuffs incl. dairy and eggs
- Former Foodstuffs incl. meat and fish
- Slaughterhouse products
- Catering waste
- Animal faeces
- ...Others

Insect production

- “Farmed Animals”

Target species

- Protein* ✔
- Fat ✔

- Fish: Not yet allowed to be fed to fish (whereas poultry & pig protein meal are) “slaughterhouse requirement” for insects

* Non-hydrolysed protein (if classified “hydrolysed”, all markets would be allowed)
2,5 BILLION PEOPLE ALREADY EATING INSECTS

- Traditionally in SE Asia, Africa and Central America
- Huge growth in demand in Europe and USA
- Insects as healthy food (high quality protein, unsaturated fats, vitamins and minerals)
- Natural food source (paleo)
- Commercial large scale farms in Europe (with huge investments)
- High demand high protein food (elderly, children, sick people)
- Applications: protein bars, pasta, special meals
5. NEXT STEPS - IPIFF RECOMMENDATIONS

IMPLEMENTATION OF REGULATION 2015/2283 ON NOVEL FOOD

**Simplification**

- Support the establishment of a simplified & shorter EU procedure for authorisation
- Reduce administrative burden for the preparation of applications

**Cooperation**

- Ensure a smooth transition between the ‘new’ and the ‘old’ Regulation
- Implementation of the transitional period for ‘products lawfully placed on the market’.
- Facilitate possibilities for ‘joined applications’

**Guidance**

- Requirements for applications should take account of ‘sectors specificities’
- Clarity as to implementation of the data protection rules & the scope of applications.
THANK YOU!
CONTACT DETAILS

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