Greenhouse gas emissions and fossil energy demand from poultry supply chains
Guidelines for quantification

DRAFT FOR PUBLIC REVIEW

Webinar: Introduction of Guidance for Poultry
4 June, 2014
Poultry Technical Advisory Group

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Process and Content

• Largely consensus driven
• Attempted pragmatic guidelines flexible enough to handle wide diversity of production, but as prescriptive as possible
• Based significantly on extant standards and refined based on practitioner experience
  – Review of extant studies and standards to identify commonalities and differences (in an Annex)
Guiding questions behind methodology development

- What level of complexity?
  - Streamlined versus detailed LCA
- Goal & Scope Definition
  - What the system boundary?
  - What functional unit(s)?
- What allocation method(s)?
- Limitations
  - Only GHG and fossil energy demand
Goal & Scope Definition

- **System boundary**
  - Cradle-to-farm-gate
  - Cradle-to-processing-gate

- **Animal types and systems**
  - Broilers, layers, breeders – chicken and turkey
  - Backyard through large-scale commercial

- **Products covered**
  - Meat (including edible offal) & egg products, other co-products (rendering)
What is the system boundary?

**Upstream boundary** = cradle (rations, fuel…) plus great grandparent breeding stock level.

**Downstream boundary** = manufacturer loading dock (retail, food service and final consumption are excluded). Data availability and absence of retail stakeholders led us to this boundary decision. Also products such as frozen meals are too complex.

This boundary also is a point through which virtually all production systems share – allowing a degree of comparability and consistency for different practices.
Foreground/Background systems or processes; Primary/secondary data (proxy & model)
What functional unit(s)?

FU should be specified \textbf{at} the system boundary: e.g. 1000 kg edible carcass (or eggs) at the processor gate or at the retail receiving dock.

In some cultures, bones (or feet) are consumed, so FU should include these products.

FU should be well characterized: specify moisture, fat and protein content for meat, and egg’s shell percent.

<table>
<thead>
<tr>
<th></th>
<th>Functional Unit (weight of product)</th>
<th>System Boundary</th>
<th>Qualifying characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Meat</strong></td>
<td>Live weight</td>
<td>Farmgate</td>
<td>Specified carcass yield</td>
</tr>
<tr>
<td></td>
<td>Carcass weight</td>
<td>Processor loading dock, or equivalent</td>
<td>Specified edible yield</td>
</tr>
<tr>
<td><strong>Egg</strong></td>
<td>Fresh, shelled weight</td>
<td>Farm gate or processor loading dock</td>
<td>Specify shell mass</td>
</tr>
<tr>
<td></td>
<td>Liquid weight</td>
<td>Processor loading dock</td>
<td>Yolk, whole, white</td>
</tr>
<tr>
<td></td>
<td>Dry (powder) weight</td>
<td>Processor loading dock</td>
<td>Yolk, whole, white</td>
</tr>
</tbody>
</table>
Multifunctional Processes / Allocation

- **On-farm:**
  - Multiple animal species: separate systems / biophysical growth requirements
  - Spent breeders / layers: system expansion (substitution) by relevant broiler production

- **Processing:**
  - Meat products (undifferentiated edible portion) and other co-products: economic allocation.
Advice to practitioners

- Diversity of production systems
  - Terminology issues: Conventional, commercial, free range, organic, colonial, and differences both within country and between regions; adopt terms in glossary for consistency

- May need adaptation for specialized systems

- Data availability for developing regions, small scale production – some default values available, seek region-specific information.
Webinar: Introduction of Guidance for Small Ruminants
4 June, 2014
Small Ruminants
Technical Advisory Group

Stewart Ledgard, Beverley Henry, C. Devendra, Marc Benoit, Armelle Gac, Chris Lloyd, Hans-Peter Zerfas, Jean-Baptiste Dolle
Outline

• Guidelines – Introduction
• System boundary
• Handling co-products/allocation
• Accounting for feed intake
• Lessons learnt
Small Ruminant Guidelines using LCA

- Sheep and goats only
- Products (Functional/Reference Units)
  - meat, milk, fibre
- Environmental performance (Impact categories)
  - GHGs, fossil energy demand
- System boundary (cradle to primary processor)
System boundary diagram

Land

External feed

On-farm feed

Cradle-to-farm-gate

Other animals (eg cattle)

Sheep or goats

Farm-to-primary-processor-gate

Wool/fibre scouring

Milk Processing

Meat processing

Product manufacturer (e.g. carpet, lasagne, flavoured yoghurt)

Retailer or Food service outlet

Consumer

greasy fibre

raw milk

live weight

clean fibre

milk products

meat products
Accounting for co-products

Recommended method of allocation

**On-farm:**

- **Animal species**
  - biophysical (based on relative feed intake)
- **Meat/milk/fibre**
  - biophysical (based on feed requirements)
Accounting for co-products

**Recommended method of allocation**

**On-farm:**

Animal species: biophysical (based on relative feed intake)

Meat/milk/fibre: biophysical (based on feed requirements)

**Processing:**

Milk: fat+protein (use relative fat+protein in products)

Fibre: economic (relatively unimportant; lanolin ~2%)

Meat: economic (cuts/CW/offal treated as equivalent; hide, blood, tallow, renderables)
Key sources/hot-spots:

Cradle-to-farm-gate ~80% life-cycle GHG

Rumen enteric methane 50-80% farm-gate GHG

Excreta/manure ~20% farm-gate GHG
Key sources/hot-spots:

Cradle-to-farm-gate ~80% life-cycle GHG

Rumen enteric methane 50-80% farm-gate GHG

Excreta/manure ~20% farm-gate GHG

Key determinant is feed intake
For most systems: Calculate feed intake using animal energy requirement model
  - needs animal population & productivity data
Defining animal populations

- **Rams**
  - 20
  - Deaths 1

- **Ram lambs**
  - 500
  - Deaths 10
  - 486

- **Breeding ewes**
  - 1000
  - Deaths 20
  - 225

- **Ewe lambs**
  - 500
  - Deaths 10
  - 240

- **Replacement lambs**
  - 250
  - Replacement rate
  - Lambing%

- **Replacement hoggets**
  - 4
  - Death rate

- **Replacement hoggets**
  - 20

- **Cull rams**
  - 3

- **Cull ewes**
  - 10

- **Cull lambs**
  - 20

**Cradle-to-farm-gate**
Model for feed requirements (Tier 2)

Basic animal productivity data:

- male and female adult live-weight,
- live-weight of animal classes & age at slaughter,
- fibre production, and
- milk production (where milk is a product that is sold)
Lessons learnt

• Importance of involving sector and wider groups to recognize the diversity of systems and ensure practicality of methodology
  - & the need for compromise!

• Recognizing possible data limitations
  - hierarchy; region-specific 2° data

• Importance of appropriate methodology when aim is to define benefits of GHG reduction options
Webinar: Introduction of Guidance for Feed
4 June, 2014
Feed Technical Advisory Group
Theun Vellinga, Hans Blonk, Carolyn Opio, Nicolas Martin, Salil Arora, Bruno Caputi, Hans Luttikholt, Ben Lukuyu, Harinda Makkar, Thumrongsakd Phonbumrung, Raghavendra Bhatta, Sophie Bertrand, Li Yue, Anna Flysjö, Paul Crosson, Heinz Meissner
Process and Content

- Building on existing methodologies and standards and on practitioner experience
- Application and extension of flexible and modular approach to handle wide diversity of production, but as prescriptive as possible
Stepwise analysis

- Goal and scope should be defined first.
- Irrespective goal and scope we defined:
  - System boundaries
  - Reference flow
  - Allocation preferences
  - Environmental impacts
System boundaries

- System boundary
  - Cradle-to-the-animal’s-mouth
  - Internal system boundaries to deal with variation

- Modular approach:
  - feed production,
  - processing,
  - feed compounding
  - feed preparation at the farm,
  - transport & trade linking the different stages
Reference flow

• One kg of feed material as is
• Attributional information
  o Dry matter content
  o Gross energy
  o List of predefined feed characteristics, suitable for ruminants, pigs and poultry
Allocation

• ISO rules:
  o Avoid it, system expansion/substitution
  o Physical properties
  o Other relationships

• Economic allocation preferred
  o Various physical properties
  o Cannot be captured in one physical model (yet)
  o Price reflects complex of physical properties

• Apply alternative allocation options for comparison and sensitivity assessment.
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**IS THE ANALYSIS OF THE FEED CHAIN PART OF A LIVESTOCK SYSTEM ANALYSIS?**

- **YES**
  - Goal, scope and methodological requirements are pre-defined by livestock system
  - Define feed components and fractions of feed materials in animal rations
  - Define relevant stages of the feed supply chain for each feed component
  - Repeat next step for all feed components

<table>
<thead>
<tr>
<th>Stage</th>
<th>Data Inventory</th>
<th>Calculation of Emissions and Resource Use</th>
<th>Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultivation stage</td>
<td>data inventory</td>
<td>calculation of emissions and resource use</td>
<td>and allocation</td>
</tr>
<tr>
<td>Processing stage</td>
<td>data inventory</td>
<td>calculation of emissions and resource use</td>
<td>and allocation</td>
</tr>
<tr>
<td>Compound feed production</td>
<td>data inventory</td>
<td>calculation of emissions and resource use</td>
<td>and allocation</td>
</tr>
<tr>
<td>Farm</td>
<td>data inventory</td>
<td>calculation of emissions and resource use</td>
<td>and allocation</td>
</tr>
</tbody>
</table>

**Transport and trade between relevant stages**

*Data inventory; calculation of emissions and resource use; and allocation*

- Calculate total emissions and resource use
- To livestock system
- Final results
**STEP 1**
Collect data on inputs and resource use, emission factors and parameters for emission models on farm/factory level

**STEP 2**
Calculate emissions and resource use

**STEP 3**
Allocate inputs, emissions and resource use to production units (if the farm/factory level have more than one)

**STEP 4**
Allocate inputs, emissions and resource use to co-products and divide emissions by the yield

Emissions per kg of (co-)product
Land Use and Land Use Change

- Not one consistent methodology
- Large variation between methodologies
- Methodology often combination of scientific and political/policy approach
- Not manageable at farm level

• LULUC shall be assessed, reported separately
  - Create insight in importance and in wide range
  - Compare at least two methods
    • Global average (top-down) method (Audsley/Vellinga)
    • Crop/country based method (PAS2050)

• It’s about understanding, no blame game
Lessons learned

• There is a large variation in systems
  – Guidelines can deal with that
  – Ask for the variation and show it!

• It’s teamwork; organise it,
  – Some members will not contribute automatically
  – You need input! Face to face meetings will help
  – You need co-authors and people for reflection

• It’s not (all) new
  – Copy and refer to previous work and standards
  – Most work is on structuring guidelines
Webinar Format

- Introduction to the LEAP Partnership
- Introduction to each guideline document by the TAG Leaders
- Comments from stakeholders on what the guidelines mean to them
- Review process and next steps
- Q&A session – please submit questions as we go
- Wrap-up
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Introduction to LEAP
Life Cycle Assessment Guidelines