GLOBAL AGENDA OF ACTION
IN SUPPORT OF SUSTAINABLE LIVESTOCK SECTOR DEVELOPMENT
Focus Area 1: Closing the efficiency gap

Efficiency matrix exercise

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1. **Background – FA1 doc.: closing the efficiency gap in NRU**

1. To establish practical livestock systems boundaries for the framing and measurement of NR efficiency.

2. Evaluation at the farm level?, food chain (LCA) ?, farm scale? agro-ecological system scale? each animal species or both?

3. Yield gap assessment?,

4. phytomass appropriation efficiency?, Total factor productivity (TFP), LCA?

5. Assess the potential NRU efficiency gains that can deliver both environ. and prod. benefits. These need to be complemented with cost benefit analyses.
Outcomes re. efficiency

• A set of definitions is required, as a reference FA1 notebook.
• The term efficiency can be qualified as *technical efficiency* and *economic efficiency*.
• A framework has to be set up with the preliminary list of variables, which will be used to measure the input, output and therefore the efficiency (*metrics*).
• The starting point of the FA1 is on NRU, but the *economic dimension* has to be added.
• There is a need to have a reference system in order to *compare status quo* and the new scenario.
2. Objectives and expected outcomes

- To provide a frame work for the analysis of the NRU efficiency
- To exchange different ways of measuring efficiency.
- To explore how livestock efficiency can be measured in terms of the goals of the FA1.
- To determine the main elements that can be included for measuring efficiency in the activities of the FA1.
- **To define a tentative list of criteria to assess NRU efficiency gaps.**
3. What we have? Feedback from the FA1

<table>
<thead>
<tr>
<th>Natural Resources</th>
<th>Based On</th>
<th>With a Given Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land</td>
<td>The quality of the land</td>
<td>For herds using land</td>
</tr>
<tr>
<td>Water</td>
<td>Availability of the water and minerals</td>
<td>Water use for consumpt. and grass production</td>
</tr>
<tr>
<td>Minerals (N,P,K)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Given Scenario of Outputs (Statu Quo-Baseline)

- Food: milk, meat, eggs
- By-products: Hides, skins, fibre, feathers
- “Waste”: (solid, liquid, gas)
3. What we have? Feedback from the FA1

**NATURAL RESOURCES**
- Land
- Water
- Minerals (N, P, K)

**VEGETATION**
- Natural
- Cultivated
  - Food
  - Feed
  - Fuels

**FEEDING SYSTEMS**
- Natural veg.
- Crop residues, unprocessed by-products, waste
- Cultivated feed crops and / or processed by-products

**LIVESTOCK**
- Ruminants (Equines)
- Pigs
- Poultry

**PRODUCTS AND BY-PRODUCTS**
- Food
  - Milk, meat, eggs
- By-products
  - Hides, skins, fibre, feathers
- "Waste"
  - (solid, liquid, gas)
3. What we have? Feedback from the FA1

PRODUCTION SYSTEMS APPROACH

LIVESTOCK PERFORMANCE
- Mortality
- Daily weight gain
- Yields/unit
- Weaning %
- Intercalving period
- Herd structure
- Replacement rate
- Live weight
- Slaughter weight
- Methane em./unit

FORAGE PRODUCTION
- Yields
- Dry matter
- Water use effic.
- Grass off take%
- Synthetic fertilizer per manure
- for N&P applied on feed pasture %
- Feed digestibility

ANIMAL FEEDING
- Feed conversion (herd level)
- kg feed/kg product
- Home grown prod.
- Purchase feed level
- By-products use
- Methane em./unit

ANIMAL HEALTH
- Mortality rate

MANURE MNGMT SYSTEM
- Like “Synthetic fertilizer per manure for N & P applied on feed/pasture (%)” + IPCC classification

When closing the efficiency gap

PRODUCTS AND BY-PRODUCTS
- Food milk, meat, eggs
- By-products Hides, skins, fibre, feathers
- “Waste” (solid, liquid, gas)

ENVIRONMENTAL EVALUATION

ECONOMIC EVALUATION

ANIMAL WELFARE EVALUATION

Page 8
19.09.2013

Efficiency matrix exercise
3. What we have? Feedback from the FA1

PRODUCTION SYSTEMS

LIVESTOCK PERFORMANCE
- Mortality
- Daily weight gain
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- Methane em/unit

ANIMAL HEALTH
- Mortality
- Loss of products
- Impact of disease
- medication
- Welfare systems
- Amount of anti/
unit

MANURE MNGMT SYSTEM
- Like „Synthetic fertilizer per manure for N & P
applied on feed/pasture (%)” + IPCC classification
- Nutrient use effectiveness whole production system
- (from field to fork)

HOUSING
- Energy use
- Manure storage
- eff.
- Manure treatment
- Bedding materials
- Water consump.
- Appli.P.F.T.

EMISSIONS CONTROL
- Abatement technologies

RESOURCE USE
- Water use
- (drinking, cleaning, irrigation, etc.)
- Energy use /type and quantity
- Nutrient use
- (Nitrogen and phosphorus) per area, animal, kg of feed

Application of prec.
feeding techniques

Application of prec.
practices

Irrigation

Protein
concentration

Soil carbon
sequestration

Diet components

Use of medication

Effect of composition

Bedding material intake

Legumes within forage

Appl. Prec. F.T

m2 land use per unit
of product, with
economic allocation
for by products

Dry matter ingest.
3. What we have? Feedback from the FA1

**PRODUCTION SYSTEMS**

**LIVESTOCK PERFORMANCE**
- Mortality
- Daily weight gain
- Yields/unit
- Weaning %
- Intercalving %
- Herd structure
- Replacement rate
- Livestock weight
- Slaughter weight
- Methane (ton/unit)

**FORAGE PRODUCTION**
- Yields
- Dry matter
- Water use effic.
- Grass off take %
- Synthetic fertilizer per manure
- Home grown prod.
- Purchase feed level
- By-products use Methane (ton/unit)

**ANIMAL FEEDING**
- Feed conversion (herd level)
- kg feed/kg product
- Home grown prod.
- Purchase feed level
- By-products use Methane (ton/unit)

**ANIMAL HEALTH**

**MANURE MNGMT SYSTEM**

- Like „Synthetic fertilizer per manure for N & P applied on feed/pasture (%)“ + IPCC classification

**PRODUCTS AND BY-PRODUCTS**
- Food
  - milk
  - meat
  - eggs
- By-products
  - Hides, skins, fibre, feathers
- „Waste“ (solid, liquid, gas)

**ENVIRONMENTAL EVALUATION**

**ECONOMIC EVALUATION**

**ANIMAL WELFARE EVALUATION**

**STANDARDIZED COMPARATIVE ANALYSIS OF SCENARIOS (BASELINE VS EFFICIENCY SCENARIOS)**

- Cost/benefit
- Gross margins
- Net margin
- Profit
- Whole farm level and enterprise level,
- Short term (Cash flow), Medium term (NFI/NCFI), Long term (Opp. Costs)
- Commercial and non-commercial farms, small holders, communal farms

Efficiency matrix exercise
3. What we have? Feedback from the FA1

Efficiency matrix exercise

- pasture access
  - transport distance and welfare quality
  - access to shade and shelter
  - welfare outcome measurements
    - humane slaughter
    - handling
    - housing quality

[Diagram showing PRODUCTION SYSTEMS with categories such as LIVESTOCK PERFORMANCE, FORAGE PRODUCTION, ANIMAL FEEDING, ANIMAL HEALTH, and MANURE MNGMT SYSTEM.]

ENVIRONMENTAL EVALUATION

ECONOMIC EVALUATION

ANIMAL WELFARE EVALUATION

OUTPUTS

PRODUCTS AND BY-PRODUCTS

Food
  - milk, meat, eggs
  - hides, skins, fibre, feathers
  - “Waste” (solid, liquid, gas)

By-products
  - eggs
  - leather, hair
  - manure

INPUTS

- Mortality
- Daily weight gain
- Yields/unit
- Weaning %
- Intercalving period
- Herd structure
- Replacement rate
- Live weight
- Slaughter weight
- Methane em./unit
- Yields
- Dry matter
- Water use effc.
- Grass off take%
- Syntethic fertilizer per manure for N & P applied on feed/pasture (%)
- Feed conversion (herd level)
- kg feed/kg product
- Home grown prod.
- Purchase feed level
- By-products use Methane em./unit
- Like „Syntethic fertilizer per manure for N & P applied on feed/pasture (%)” + IPCC classification

Efficiency matrix exercise
Agenda Consensus

“Integrating respect for socially desirable outcomes that are not the immediate focus of Agenda related activities including, but not limited to, public health, biodiversity and animal welfare”
### Principles underpinning animal welfare assessment

<table>
<thead>
<tr>
<th>Five freedoms</th>
<th>Welfare Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Pain Injury and Disease</td>
<td>Four main principles:</td>
</tr>
<tr>
<td>- Hunger and thirst</td>
<td>- Good feeding</td>
</tr>
<tr>
<td>- Shelter</td>
<td>- Good housing</td>
</tr>
<tr>
<td>- Fear and distress</td>
<td>- Good health</td>
</tr>
<tr>
<td>- Natural behaviour</td>
<td>- Appropriate behaviour</td>
</tr>
</tbody>
</table>

Broadly supported

(OIE etc.)

Scientific body of knowledge on behaviour and welfare
Relevance of animal welfare - examples

• Good animal welfare systems can provide good productivity and sufficient food for the planet (Erb et al., 2012)

• Greenhouse gas emissions are can be optimised by moderate dual purpose production (e.g. dairy/beef consequential LCA – Cederberg and Stadig, 2003, Flysjo et al., 2011)

• Blue water efficiency (thus lower opportunity cost of its use) can be greater in extensive systems (Hoekstra, 2011)
Animal welfare is relevant to all types of production (McInerney, 2004)
4. Discussion

- Selecting areas to work
- Re-order some indicators
- Re-define some indicators
- Selecting most important indicators (at this stage)
- Define elements of the assessment categories