ReadMe text for Excel outputs

For each of the impact categories, land requirement, productivity, soil impacts, water impacts and GHG emissions, separate result sheets are provided. The text below provides guidance on results interpretation.

1. Land requirements

This sheet presents the amount of land required (in hectares per year) to meet the feed needs of the herd in the livestock enterprise. It's important to note that land is a valuable but finite resource, with many competing demands such as producing staple foods, animal production, preserving forests and natural habitats, building settlements and infrastructure, and more. The more efficient the feed production, the more land is available for other purposes. Converting non-agricultural land for feed production can have negative impacts on biodiversity. This is particularly problematic when forests, wetlands or other natural vegetation is converted into cropland or pastures.

1.1 Land requirement for feed production per associated crop (ha)

In this table, you will find the list of feed items used in the livestock enterprise. For each of these, it is indicated how many hectares of the associated crop need to be planted to fulfil the feed requirements of the animals per season and year-round. The total area used for feed production adds up to the annual area requirements per feed item. This is thus the total area of land that the livestock enterprise should "set aside" for feed production. The area for feed is further classified into four distinct categories depending on the production source:

- Area required on-farm (ha) – Area required to produce feeds within the livestock enterprise
- Area required roughages off-farm (ha) – Area for roughages produced outside the livestock enterprise
- Area required concentrates off-farm (ha) – Area linked to the production of concentrates outside the livestock enterprise
- Area required imported concentrates (ha) – Area linked to the production of imported concentrates

1.2 Area per milk unit (ha/kg FPCM)

In addition to the absolute values, the tool also calculates an efficiency indicator, i.e., how much land is required for the feed production for one kg of FPCM (Fat/protein-corrected milk). FPCM is calculated based on the milk fat and protein contents in percentage, which are livestock parameters.

1.3 Dry matter requirements (kg)

In the second table, the quantities in kg of dry matter (DM) per season per feed and in total are presented. The dry matter requirements per crop and per season do not consider the actual time at which the crop is cultivated, only what is required by the herd annually.

Total estimated annual quantities in kg of dry matter are also presented based on production source.

- DM required on-farm (kg) – requirement (expressed in kg DM) for feeds produced within the livestock enterprise

- DM required roughages off-farm (kg)– requirement (expressed in kg DM) for roughages produced outside the livestock enterprise
- DM required concentrates off-farm (kg) – requirement (expressed in kg DM) for concentrates produced outside the livestock enterprise
- DM required imported concentrates (kg) – requirement (expressed in kg DM) for imported concentrates

1.4 Feed per milk unit (kg/kg FPCM)

In addition to the absolute values, the tool also calculates an efficiency indicator, i.e., how much DM of feed is required to produce one kg of FPCM. FPCM is calculated based on the milk fat and protein contents in percentage, which are livestock parameters.

2. Productivity

2.1 Productivity indicators

Productivity is a potential supply indicator that calculates the total amount of calories embedded in the livestock products produced by the livestock enterprise. The table in this sheet lists productivity indicators for different livestock products, i.e.:

- Cattle meat
- Cattle Fat-Protein Corrected Milk (FPCM)
- Meat and Fat-Protein Corrected Milk (FPCM) from other ruminants e.g., goats, sheep, buffalo
- Meat from pigs

Besides the animal-sourced foods, annual manure production from cattle, buffalo, sheep, goats, and pigs is estimated.

The productivity indicators include:

- Production: the number of kilograms of this product that is produced in the year
- Energy: the number of kilocalories that this production represents (calculated by multiplying the quantity produced by the calorie content of the product)
- AME (adult male equivalent) days: assuming an adult male requires 2500 kcal/day, the value listed here represents the number of days that the livestock enterprise can fulfil the energy requirements of one adult male.

2.2 Tropical livestock units

The tool converts the total number of animals present in a livestock enterprise into a common unit. This is used as the reference point to factor livestock of different species by biomass. Generally, 1TLU = 250 kgs of liveweight. TLU/ha measures the intensity of animals managed in a hectare of (feed-producing) land.

3. Soil impacts

3.1 Overall soil impacts

The soil impacts are expressed in terms of Nitrogen balance and erosion. Both totals from the enterprise and disaggregation by production source are outlined in this table. We calculate (i) the percentage of the feed-producing fields with negative N balance as "% mining" and (ii) the percentage of feed-producing fields with positive N balance as "% leaching". The N balance is the difference between N added to the feed-producing areas of the livestock enterprise and the N removed in the form of feed or food. A positive N balance is desired; as otherwise nutrient mining might result in severe soil fertility depletion over time. However, the N balance of >150 kg N/ha is also undesirable as this could result in N leaching in groundwater and higher GHG emissions. The ideal is to have 0% leaching and mining.

Erosion: Erosion is expressed in annual t of soil loss. The total amount of soil lost from the enterprise (t soil/year), per area hectare (t soil/ha/year), and per unit product (kg soil/kg FPCM or kg soil/kg meat or kg soil/kg protein) are quantified.

3.2 Feed items specific N balance

For each feed item, the N inputs and N outputs as well as the resulting N balance are listed separately. The N balance considers the N for feed production used for animal production and also the N balance for food production. If the feed used to feed the animal is a food crop residue e.g., maize stover, N balance for the maize grain is calculated and used to assess the N balance of the livestock enterprise.

4. Water impacts

4.1 Overall water impacts

The model calculates from the annual rainfall the percentage of available water which is utilized for feed production. It also calculates an efficiency indicator, I.e., the percentage of water used to produce a kg of milk, meat, and protein. For this indicator, the lower the amount the livestock enterprise needs the more efficient the system.

5. GHG emissions

5.1 GHG balance

In this table, you will find the Tier 2 results (computed using context-specific data) for GHG emissions, differentiating footprints from different sources of carbon dioxide at farm and off-farm levels. These include:

- Methane emissions from enteric fermentation, manure production and storage, and rice production
- Direct and indirect nitrous oxide emissions from soil inputs and manure production and storage
- Carbon dioxide from production of synthetic fertilisers and burning of crop residues

When both methane (CH_4) and nitrous oxide (N_2O) are emitted from the same source, the emissions are detailed per gas, i.e., Manure-Methane and Manure-Direct N_2O etc. Carbon dioxide equivalent (CO2e) is obtained by multiplying the GHG emissions by their respective Global Warming Potential (GWP): 28 for methane and 265 for nitrous oxide.

The contribution of the different GHG emissions to the total GHG on-farm balance is given in percentage while the total GHG balance is given in t CO2e. Emissions are further expressed on per area basis (t co2/ha/year) and per kg product (kg CO2e/kg FPCM, kg CO2e/Kg meat, and kg CO2e/Kg protein). Per area basis emissions are further split into source types i.e., originating from the farm, off-farm roughages and concentrates or imported concentrates.