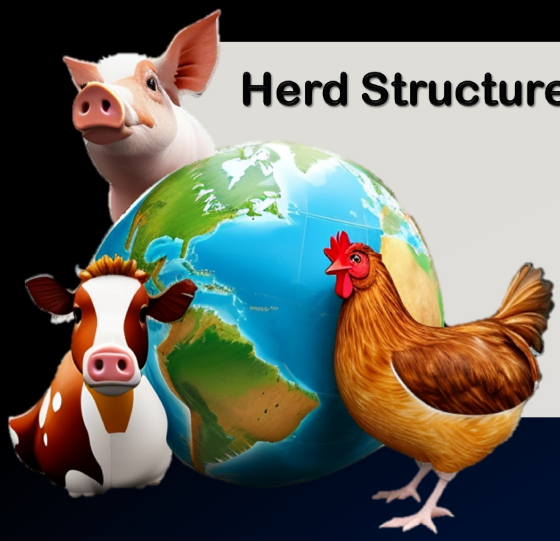

# Herd Structure and Nutrient Requirements in Livestock Across the World: A Modeling Approach


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## 1. Rationale

- Livestock are crucial in global food systems and sustainable development.
- A knowledge gap exists linking livestock nutrient requirements into the global food system supply.
- One key factor affecting nutrient requirements is herd dynamics.
- The study aims to model global livestock **herd structure** and **nutrient needs** by animal class and production system, for each major species.

## 2. Methodology

**Data Collection:**

- Gather data on diverse livestock demographics, production systems, biological limitations, and performance parameters from various sources.
- Sources include livestock census data, FAO, nutrition databases, and scholarly articles.

**Model Construction:**

- Construct a proprietary customized code using R Suite and MS Excel.
- Deploy various visualization tools using R Suite.
- Integrate the model into the PLANET global food system explorer platform @ goalsciences.org.

## 3. Herd Structure Aspects

- Diagram A and B visually compares pig herd demographics in backyard and industrial production systems.
- Backyard systems estimate 17 piglets born per sow per year, while industrial systems estimate 38, as one of the many input parameters.
- Backyard breeding stock is estimated at 25%, significantly higher than the industrial system's 8%.

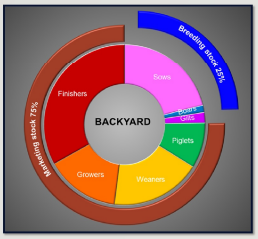



**Diagram A:** Pig herd demographics in backyard production system.

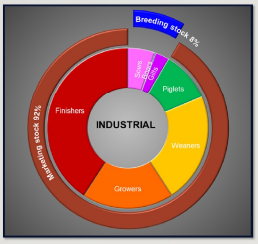



**Diagram B**: Pig herd demographics in industrial production system.

## Key Points

**Livestock's Global Significance:**

- Growing global demand for animal products underscores the importance of understanding nutrient needs of livestock.
- Herd dynamics and performance parameters have a substantial impact on livestock nutrient requirements and need to be understood.

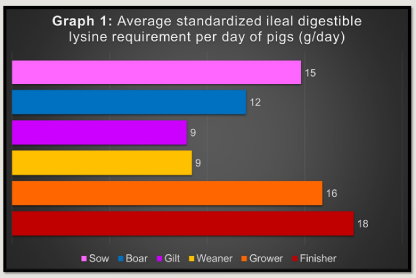
**Key Model Differentiators:**

- The model provides an extensive level of herd structure analysis, both on a per-country and globally aggregated basis.
- A comprehensive breakdown of nutrient requirements for livestock is explored —unlike energy-centric conventional models.
- This research envisions an interactive platform accessible to the broad public, enabling scenario creation and promoting transparency.

**Foundation for Future Research**:

- The model forms a foundational platform for future research, involving exploration of nutrient supply, demand, gap identification, scenario testing, and informed decision-making.

## 4. Nutrient Needs Aspects




- Graph 1 shows varied SID lysine needs in pig production stages, from sows to finishers.
- Each production stage, such as weaners or finishers, demands a unique level of SID lysine intake.
- This variability highlights the significance of herd structure in understanding and catering to the distinct nutrient requirements at each stage.
- Herd structure, including age and reproductive status, significantly influences nutrient needs, with growing pigs requiring more SID lysine due to increased weight.

## 5. Application

**Comparison of pig meat production:**

- Table 1 compares pig meat production in different systems with the same sow count.
- The industrial system yields 2249 ton more meat annually than the backyard system.

**Sankey illustration:**

- Diagram C depicts estimated global pig herd structure, flow, and production over a year period.

**Table 1**: Pig Meat Production Scenario

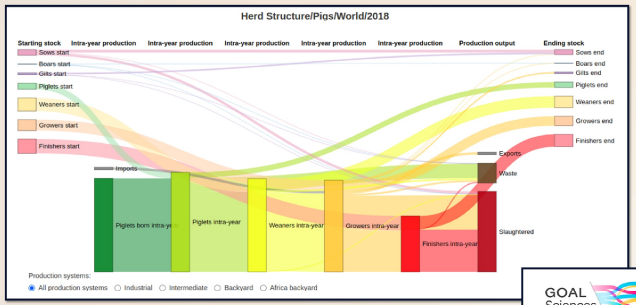
| Parameter/ System | Industrial | Backyard |
|---|---|---|
| Farrowing rate | 90% | 50% |
| Piglet born/ year/ sow | 38 | 17 |
| Mortality rate piglets | 13% | 17% |
| Live weight (kg)* | 115 | 70 |
| Dressing percentage | 75% | 65% |

*Approximately 6 months of age.

| Scenario | Industrial | Backyard |
|---|---|---|
| Sows in herd | 1 000 | 1 000 |
| Sows farrowing | 900 | 500 |
| Piglets born | 34 200 | 8 500 |
| Piglet production | 29 781 | 7 019 |
| Total live weight (ton)** | 3 425 | 491 |
| Total meat production (ton) | 2 569 | 319 |

** Assuming all piglets survive to slaughter.

**Diagram C**: Sankey illustration of World Pig Herd Structure

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