

## GBADs Core Analytics and Data

### Executive Summary

GBADs will develop and use analytical structures to describe the burden of animal diseases. These structures will determine the collection, collation and curation of data that will be inputs for analyses. Models will be generated that describe livestock production (e.g. growth rate, lactation, population structure), disease dynamics, farm level resource use (land, labour and capital), intra-household division of burden (e.g. by gender and age), and the impacts of change on the food system and wider economy (e.g. value chain analyses, social accounting matrixes, partial equilibrium models).

Data needs include animal populations (by age, sex and breed; a description of the production system), production parameters (e.g. mortality, growth curves, egg production), prices (e.g. live animals, animal source proteins, livestock fibres, draught power, manure, skins and byproducts), resource use (e.g. infrastructure, veterinary services and medicines, labour) and disease (levels and impacts on production parameters and market access).

A full description of the analytical structures and data needs can be found here:

[www.animalhealthmetrics.org/coreanalytics](http://www.animalhealthmetrics.org/coreanalytics)

### Collection, collation and curation of data

- Population
  - Numbers of animals by age, sex and breed
  - Description of the environment and production systems animals are found in with specific information detailed below
- Production parameters
  - Animal weights by sex, age and principal purpose
  - Rates defining mortality, fertility, sales (offtake)
  - Age at sexual maturity and first parturition
  - Lactation and egg laying rates and curves
  - Feed conversion ratios
  - Growth rates and curves
- Prices
  - Live animals with specifications based on age, sex, body condition, breeding status
  - Core animal source protein products
    - Milk
    - Eggs
    - Meat – beef, chicken, pork, mutton, lamb, goat meat, camelid meat (African and South American)
  - Other products
    - Livestock fibres – wool, mohair, cashmere etc
    - Draught power – daily rates and specification of the type work - ploughing, transport, weeding
    - Manure
- Resource use (preferably generated as use per animal or livestock unit, or per production cycle)
  - Veterinary medicines and services
  - Labour inputs by gender and age
  - Land – relating this to feed and forage needs
  - Infrastructure
- Disease data
  - Levels of diseases – communicable, and non-communicable, nutrition and injuries (accidents, predation) – prevalence or incidence
  - Impact of disease presence on the production parameters listed above
  - Impact of disease and health problems or risk on market value

### Development and use of analytical structures

- Development of models to represent livestock production and generate information on livestock output and resource use - actual and simulated to examine an “ideal” level of production
  - Animal growth rate models
  - Lactation and egg laying curve models
  - Population models to represent breeding populations
- Development of models to represent farm-level resource use that reflects the competition for resources with an emphasis on land, labour and capital
- Development of intra-household models that reflect the division of burden of work and cost from livestock and the sharing of food, income and social status by gender and age
- Development of economy models that reflect the flows of inputs to and outputs from farm level production - these provide information on the impacts of changes within food systems and wider economy
  - Value chain analyses
  - Benefit-Cost analysis
  - Social accounting matrixes, partial equilibrium models
  - Assessing impacts on firms vertically and horizontally along the supply chain, and consumer groups (who is burdened and by how much)

### Further information

Please refer to our website - <https://animalhealthmetrics.org>

For further information on the GBADs programme please refer to:

Overview of the programme and assessment of burden of livestock diseases:

- Huntington, B., Bernardo, T.M., Bruce, M., Devleeschauwer, B., Gilbert, W., Havelaar, A., Herrero, M., Marsh, T.L., Mesenhowski, S., Pendell, D., Pigott, D., Grace Randolph, D., Bondad-Reantaso, M., Shaw, APM, Stacey, D., Stone, M., Torgerson, P., Watkins, K., Wieland, B., & Rushton, J. (accepted) Global Burden of Animal Disease: a novel approach to understanding and managing disease in livestock and aquaculture. Why is it needed, what is its theoretical basis and what will it contribute? OIE Rev Tech Sci
- Rushton, J. (2009) Economics of livestock production and health. CABI, UK pp 193-197
- Rushton, J.; Thornton, P. and Otte, M.J. (1999) *Methods of Economic Impact Assessment*. In “The economics of animal disease control” OIE Revue Scientifique et Technique Vol 18 (2) pp 315-338
- J Rushton, B Huntington, W Gilbert, M Herrero, P R Torgerson, A P M Shaw, M Bruce, T L Marsh, D L Pendell, T M Bernardo, D Stacey, D Grace, K Watkins, M Bondad-Reantaso, B Devleeschauwer, D M Pigott, M Stone, S Mesenhowski (2021) Roll-out of the Global Burden of Animal Diseases programme The Lancet Published: February 04, 2021 [https://doi.org/10.1016/S0140-6736\(21\)00189-6](https://doi.org/10.1016/S0140-6736(21)00189-6)

Estimating biomass:

- Rothman-Ostrow P, Gilbert W and Rushton J (2020) Tropical Livestock Units: Re-evaluating a Methodology. Front. Vet. Sci. 7:556788. <https://doi.org/10.3389/fvets.2020.556788>

Disease levels:

- Afonso JS, Bruce M, Keating P, Raboisson D, Clough H, Oikonomou G and Rushton J (2020) Profiling Detection and Classification of Lameness Methods in British Dairy Cattle Research: A Systematic Review and Meta-Analysis. Front. Vet. Sci. 7:542. <https://doi.org/10.3389/fvets.2020.00542>

Comparing gaps in production

- Mayberry, D.; Ash, A.; Prestwidge, D.; Godde, C.M.; Henderson, B; Duncan, A.; Blummel, M.; Ramana Reddy, Y.; Herrero, M. (2017) Yield gap analyses to estimate attainable bovine milk yields and evaluate options to increase production in Ethiopia and India. Ag. Sys. 155 pp 43-51

Models

- Rushton, J. (2009) Economics of livestock production and health. CABI, UK pp 95-106
- Gilbert, W., Bellet, C., Blake, D.P., Tomley, F.M., Rushton, J. (2020) Revisiting the economic impacts of *Eimeria* and its control in European intensive broiler systems with a recursive modelling approach. Front. Vet. Sci. 7:558182. <https://doi.org/10.3389/fvets.2020.558182>