



304P

National Animal Nutrition Program (NANP): Databases, Modeling Resources, and Training for Poultry Nutrition Research

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ABSTRACT

- The 10th revised edition of *Nutrient Requirements of Poultry* published by the National Academies of Sciences, Engineering, and Medicine (NASEM) recommended the development of dynamic computer models to predict nutrient requirements for diverse genetic potentials, environments, production systems, and marketing goals.
- The committee concluded that modeling provides an efficient framework for integrating empirical data and keeping pace with changes in poultry genetics and management systems.
- The NANP (NRSP-9) provides curated, research-based databases and modeling resources that support model development, parameterization, testing, and evaluation.
- By linking diet, animal, and response variables, NANP resources enable more transparent and comparable approaches to predictive modeling.
- Through the Nutrition Modeling Committee, NANP promotes observed-data repositories, interoperable platforms, shared workflows, and guidance for model implementation.
- Training workshops and open educational materials further support best practices in reproducible analysis.
- Together, NANP strengthens modeling infrastructure, enhances reproducibility, supports sustainable software stewardship, and development of AI-integrated decision-support tools for poultry nutrition research and practice.

NANP AT A GLANCE

500K+

Animal performance & metabolism observations

4M+

Feed ingredient records archived

320+

Modeling & statistics resources

35+

Peer-reviewed publications

- ~1000 workshop participants from five continents
- Materials viewed 3,500+ times
- Led by 31 scientists across 22 institutions with diverse species expertise

MODELING COMMITTEE: Poultry focus

Focus

- Nutrient Efficiency:** Improve predictions of digestion and nutrient partitioning to support model evaluation across datasets.
- Sustainable Systems:** Quantify trade-offs among productivity, nutrient excretion, and emissions under diverse diets and management.
- Precision Management:** Develop and test data-driven approaches for predicting performance across heterogeneous environments.

Impact Areas

- Modernizing Standards:** NANP databases and modeling resources support model development, benchmarking, and reporting consistency relevant to nutrient requirement frameworks.
- Climate-Smart Solutions:** Integrate nutrient-use efficiency, environmental outcomes, and sustainability metrics to support comparative assessments.

NANP RESOURCES

Nutrients

Day Sex	FAO ID	Tall ID	Tall ID	Support ID	Var Name	Var Value	Var Units	Var Type	Var ID	Var ID
Day-100	15	1	15	-	15.00	15.00	15.00	-	-	-
Day-100	15	1	15	-	15.00	15.00	15.00	-	-	-
Day-100	15	1	15	-	15.00	15.00	15.00	-	-	-
Day-100	15	1	15	-	15.00	15.00	15.00	-	-	-

Performance Data

Day Sex	FAO ID	Tall ID	Tall ID	Support ID	Var Name	Var Value	Var Units	Var Type	Var ID	Var ID
Day-100	15	1	15	-	15.00	15.00	15.00	-	-	-
Day-100	15	1	15	-	15.00	15.00	15.00	-	-	-
Day-100	15	1	15	-	15.00	15.00	15.00	-	-	-
Day-100	15	1	15	-	15.00	15.00	15.00	-	-	-

Database

Nutrient Requirement Models

NUTRITION MODELING

Nutrition Modeling Committee

Nutrient Requirement Models

Publications

Shinyapps, Codes & Software

SHINYAPP: Diet Formulator for Beef Cattle

SHINYAPP: Horse NRC

SHINYAPP: Microbe Decoder

SHINYAPP: NASEM 2021 Dairy

SHINYAPP: Swine Nutrition System

BEEF CATTLE

Nutrient Requirements of Beef Cattle: Eighth Revised Edition 2016

Download version 1.0.37.25

National Academies of Sciences, Engineering, and Medicine website

Additional information about the NRC (2016)

Nutrient Requirements of Beef Cattle: Seventh Revised Edition 1996, 2000

Download version 1.0.5

Modifications in the NRC (Beef model) (1996, 2000)

Detailed NRC (Beef, 1996, 2000) Software Modifications

Additional information about the NRC (Beef Model) (1996, 2000)

DAIRY CATTLE

Nutrient Requirements of Dairy Cattle: Eighth Revised Edition 2021

National Academies of Sciences, Engineering, and Medicine website

Nutrient Requirements of Dairy Cattle: Seventh Revised Edition 2001

Download version 1.1.14

Modifications in the NRC Dairy model (2001) software

Detailed NRC Dairy (2001) Software Modifications

Additional information about the NRC Dairy Model (2001)

SWINE

Nutrient Requirements of Swine: Eleventh Revised Edition (2012)

NRC Swine Model 2012

POULTRY

Nutrient Requirements of Poultry: Tenth Revised Edition (2020)

Software (user tool)

Modeling articles & books (100+)

Publications used NANP resource (35+)

MODELING & STATISTICAL REFERENCES

SCIENTIFIC MODELING

Topical Reviews

Modeling Books

Growth Models for Ruminants

Growth Models for Non-Ruminants

Lactation Models

Gestation Models

Grassland Models for Beef Cattle

Grassland Models for Dairy Cattle

Farm Systems Models II: Dairy

Farm Systems Models II: Beef

Farm Systems Models III: Methane

Aquaculture Modeling

Other Publications of the NANP Modeling Committee

MODEL EVALUATION METHODS

Residuals Analysis

Reassessment of biases in predicted nitrogen flows to the duodenum by NRC 2001

Diagnostic tests as residual analysis

Residuals and influence in regression

Sensitivity Analysis

Validation of biophysical models: issues and methodologies: A review

Measurement in medicine: the analysis of method comparison studies

Assessment of the adequacy of mathematical models

An exploratory on verification and validation of simulation models

Simulation model verification and validation

Testing ecological models: the meaning of validation

MODEL FITTING METHODS

A multivariate nonlinear mixed effect method for analyzing energy partitioning in growing pigs

The use of Mixed models in the analysis of animal experiments with repeated measures data

MCMC methods for multi-response generalized linear mixed models: the MCMCglmm R package

Bayesian model choice via Markov chain Monte Carlo methods

Bayesian model averaging for linear regression models

Inverse problem theory and methods for model parameter estimation

EXPERIMENTAL DESIGN

Applied Linear Statistical Models

Statistical Analysis of Designed Experiments

Applied Multivariate Statistical Analysis

Design of Experiments: Statistical Principles of Research Design and Analysis

Applied Linear Statistical Models

EXPERIMENTAL ANALYSES

Designing and analyzing quantitative factorial experiments

Statistical design and analysis of experiments

D.C. Montgomery, 2008/0, John Wiley and Sons Inc, Hoboken, NJ

META ANALYSES

Invited review: Integrating quantitative findings from multiple studies using mixed model methodology

Conducting Meta-Analysis using SAS

Statistical Methods for Meta-Analysis

Methods of Meta-Analysis: Correcting error and bias in research findings

Primary, secondary and meta-analysis of research

Summing Up: The science of reviewing research

Bias in meta-analysis detected by a simple graphical test

Meta-regression in Data

Maximum likelihood approaches to variance component estimation and to related problems

FUTURE WORK

- Expand observed data**
 - ✓ Add voluntary feed and nutrient intake, digestibility, efficiencies of utilization, meat and egg yield/components for decision-making and benchmarking.
- Standardize study reporting**
 - ✓ Harmonize dietary composition, economics, and management metadata for reproducible modeling.
- Integrate sustainability**
 - ✓ Include Nitrogen and Phosphorus utilization efficiency and excreta nutrient flows.
- Improve feedstuff libraries**
 - ✓ Expand customized databases of energy and nutrient composition, and component-feeding libraries.

MORE INFO

animalnutrition.org

USDA

The NANP is supported through NRSP-9 by agInnovation, State Agricultural Experiment Stations, NRCS, and USDA-NIFA Hatch Funds.