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Development of an evergreen, interactive, and consolidated dataset of feedstuff nutrient composition

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Joint ADSA-NANP-ASAS-PSA Session—Anomalies in Analyzed Nutrient Composition of Feedstuffs

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Outline

- NANP history and mission
- NASEM partnership
- NANP committee organization
- Feed composition database
  - metrics, structure, features
- Ongoing activities

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NANP Background

Developed in 2010 as a National Research Support Program (NRSP-9) funded by:

- agInnovation
- State Ag Experiment Stations
- Natural Resource Conservation Service (NRCS)
- Hatch funds via USDA NIFA

Mission: To provide research-based data on feed ingredients, feeding strategies, and animal performance as well as software, training tools, and educational materials to support research.

NANP Focus

Serving as a forum to identify and address priority animal nutrition issues by:

- **sharing**, **collecting**, **assembling**, **synthesizing**, and **disseminating** science-based information, educational tools, and enabling technologies

Original vision was to support the National Academy of Science, Engineering, and Medicine (**NASEM**) committees in curating the **nutrient requirement series** (i.e., NRC reports)

NASEM Partnership

Significant effort required to develop/revise **animal performance models** and curate **feed composition tables** per NASEM committee report

Species-specific NASEM committees convened on an infrequent basis, whereas **NANP enables continual development** of key resources across species and time

Vision: Perennial NANP activities will increase efficiency and effectiveness of NASEM/NRC committee efforts

NATIONAL ACADEMIES *Sciences Engineering Medicine*

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NANP Organization

Coordinating Committee (Phil Miller, Chair)

- **Modeling** (Luis Tedeschi, Chair)
  To improve the use of predictive technologies and effectively create, analyze, manage, and share animal models
- **Climate-Smart Feed Management** (Luis Tedeschi, Chair)
  To provide user-friendly animal nutrition information and offer targeted training opportunities directly to stakeholders
- **Feed Composition** (Ryan Dilger, Chair)
  To curate nutrient composition data, foster communication among analytical labs, and serve as a centralized feed nutrient resource

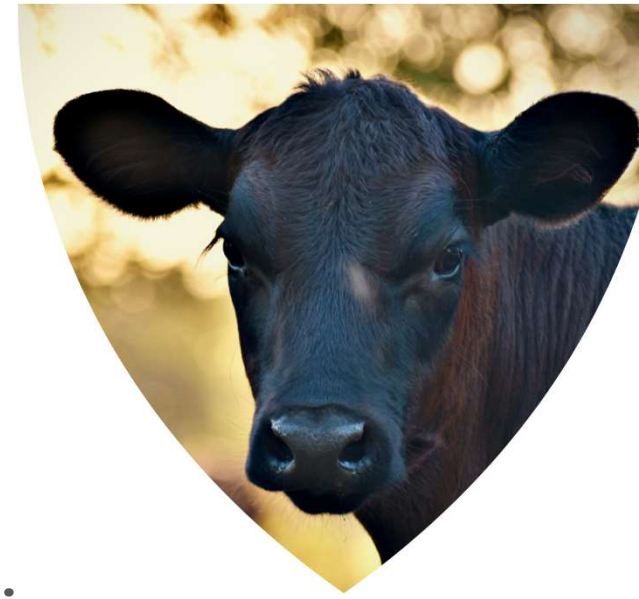
Feed Composition (FC) Committee

- **Ryan Dilger**, University of Illinois (swine/poultry)
- **Alexander Hristov**, Penn State (dairy)
- **Bill Dozier**, Auburn University (poultry)
- **Mark Edwards**, California Poly State (horse/small ruminant)
- **Brian Small**, University of Idaho (aquaculture)
- **Tara Felix**, Penn State (beef)
- **Andrew Foote**, Oklahoma State (beef)
- **Woo Kim**, University of Georgia (poultry)
- **Sandra Solaiman**, Tuskegee University (small ruminant)
- **Dong-Fang Deng**, University of Wisconsin (aquaculture)
- **Brooke Humphrey**, NutriQuest (swine/poultry)
- **Fred Owens**, Oklahoma State University (beef)

FC Committee Charge

- Develop a **flexible, comprehensive feed database** to support NASEM modeling efforts
- **Standardize methods** for evaluating literature and industry nutrient data
- Identify **critical research needs** for animal nutrition database advancement
- Review **sampling, handling, and analytical** methodologies
- **Refine a species-agnostic database** through collaborative forums
- Sustain domestic and global efforts to **maintain a robust feedstuff library**

Recent Activities



- Incorporated global **nutrition glossary of terms**
- Developed **concept assets** for curricular integration, including dry matter, units, energy, etc.
- Launched new ingredient **hierarchical structure and workflow** of the feed composition database
- Redesigned database style/function to enable **integration** into teaching curricula and external apps
- Integrated raw feedstuff composition records from the **2016 Beef NRC** and **2021 Dairy NRC reports**

FC Database Structure

- **NASEM reports covered:** dairy, beef, swine, poultry
- **Data sources:** published literature, analytical labs
- **Analytical types:** wet chemistry, NIRS
- 454 ingredients, 127 nutrients, and **>2 million unique rows**

Hierarchy	***Example***
Category	***Protein Concentrates***
Source	***Soybean***
Attributes	***meal, solvent extracted***

FC Database Nomenclature

Category: **related ingredients used to achieve similar formulation goals** (e.g., energy source)

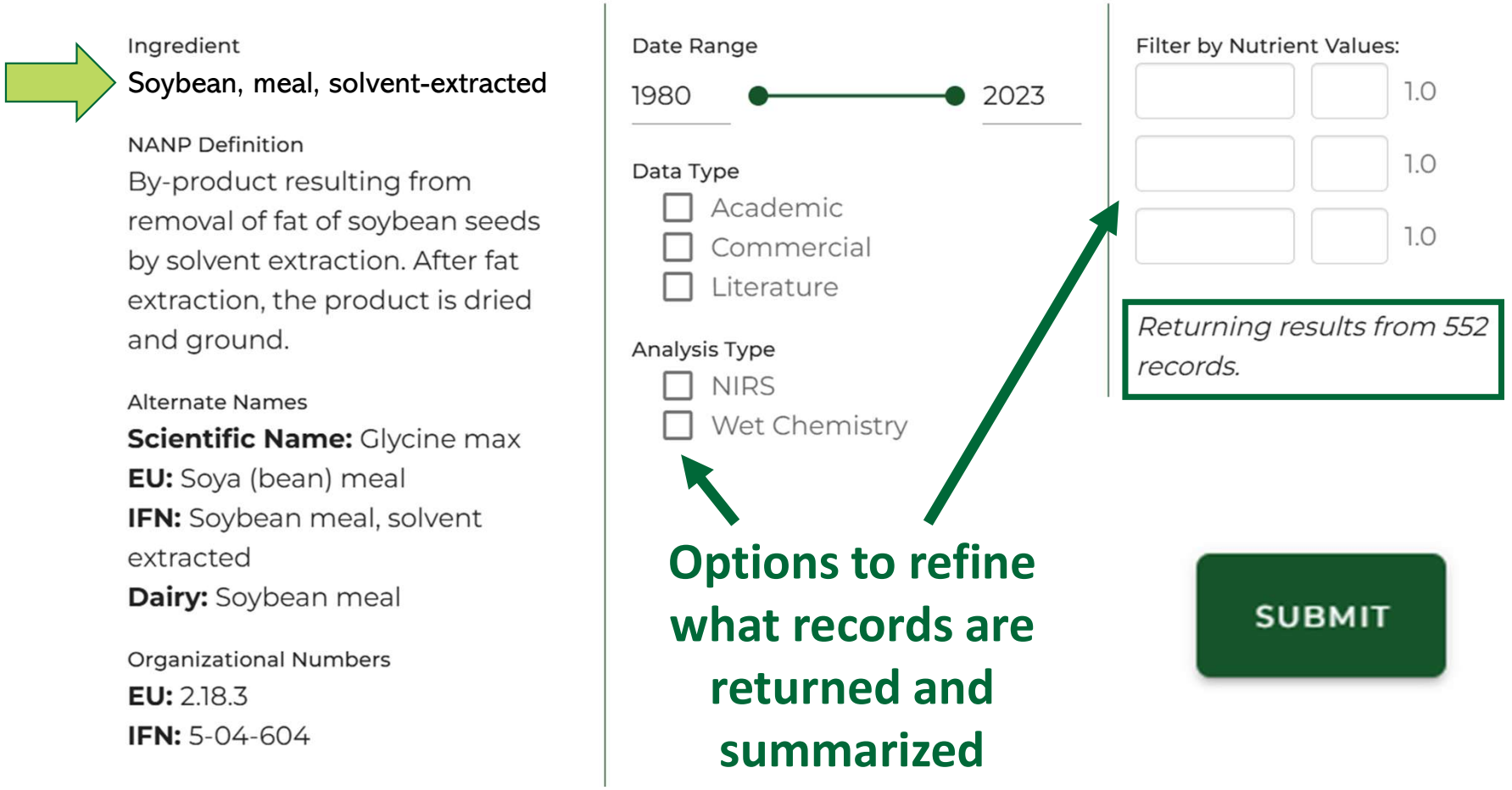
Source: **original material(s) from which the final ingredient is derived** (predicated on scientific nomenclature)

Attributes: **detailed characteristics, often indicating physical or chemical modifications** (e.g., silage, immature)

Ingredients are located via direct search or selection of hierarchical terms, resulting in the summary data display

Data Summary Header

Dry matter conversion feature returning soon



Options to refine what records are returned and summarized

Data Summary Tables

Summary download feature coming soon

MAIN CONSTITUENTS | CARBOHYDRATES | PROTEIN AND AMINO ACIDS | FATTY ACIDS | MINERALS | VITAMINS

Nutrient classification tabs

Search

Click for nutrient definitions

Nutrient (Percentage of Dry Matter)	N Sample Size	Mean	SD Standard Deviation	CV Coefficient of Variation	10th Percentile	90th Percentile
Dry matter (DM)	525	89.92	2.03	0.02	87.90	92.85
Crude Protein (CP)	528	50.92	2.95	0.06	46.97	54.20
Crude Fiber (CF)	207	5.20	1.62	0.31	3.19	7.24
Ether extract (EE)	336	2.03	1.12	0.55	0.85	3.44
Acid ether extract (AEE)	98	1.73	0.85	0.49	0.81	2.82
Ash	351	6.96	0.80	0.11	6.26	7.78
Gross energy (GE)	-	-	-	-	-	-

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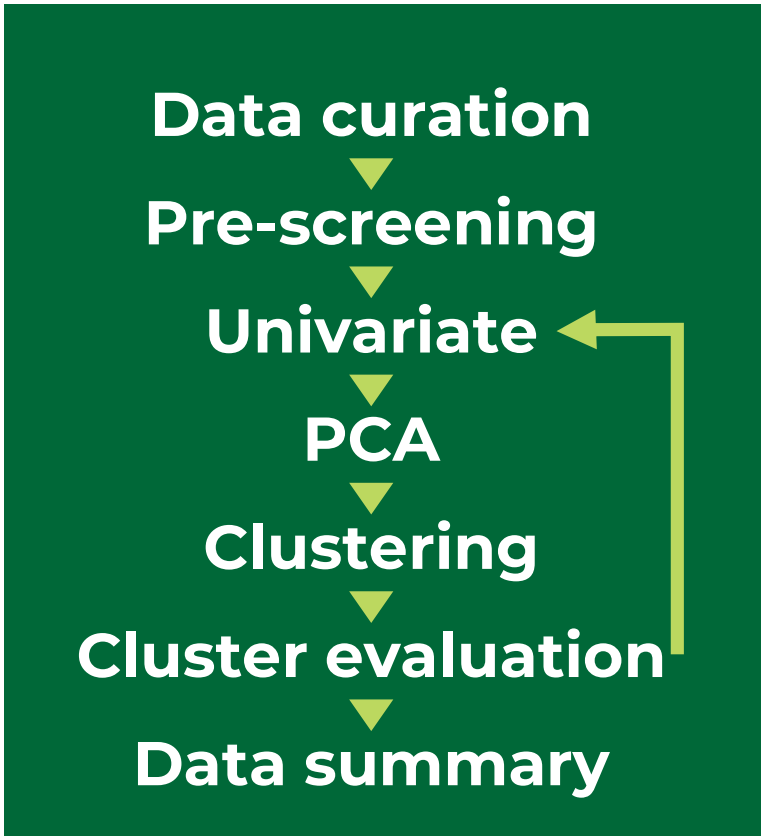
Data Curation

- Poultry NASEM report is first to **leverage NANP FC database**, with the swine NASEM committee doing the same
- Existing swine/poultry data solely **literature-based**, while beef/dairy used **commercial lab data**
- NANP accepts data from any **verified source** and previously developed a **validated screening procedure**



J. Dairy Sci. 103:3786–3803
https://doi.org/10.3168/jds.2019-16702

Development of feed composition tables using a statistical screening procedure

H. Tran,[1,2,3] A. Schlageter-Tello,[1,2] A. Caprez,[4] P. S. Miller,[1,2] M. B. Hall,[5] W. P. Weiss,[2,6] and P. J. Kononoff[1]*

Ongoing Activities

- Integrating **animal-derived values** for formulation purposes
- Creating **collections** to allow summary from consolidated sources (e.g., summarize composition data from a specific NASEM report)
- Curating **novel datasets** (e.g., zoo and aquaculture nutrition groups)
- Forming a **repository of analytical methods** deemed ‘best practice’ (or at least acceptable) for each nutrient
- **Developing an API** to directly engage with NANP feed composition records; includes integration with modeling efforts and external apps

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Questions?

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USDA

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