AgBioData Integration of Phenomic and Genomic Knowledge
with the World as we Know it

March 4, 2026

Overview

- Integrated Genomic–Phenomic–Nutrition Database Systems in Agriculture

- High-Level Needs, Integration Pathways, and Sustainability Framework

- What are YOU doing?

- What do you WANT to do?

- What is preventing you, what do you NEED?

Relevent Books

- Impact Networks (Impact Networks: Create Connection, Spark Collaboration, and Catalyze Systemic Change) David Ehrlichman 2021
  – Excellent real examples of successful networks
  – Types and purposes of networks
  – Action and Impact Networks-how to be successful
- Learning with AI Learning with AI: The K-12 Teacher's Guide to a New Era of Human Learning , 2025 NSTA Press , Joan Monahan Watson
  – Centered on teaching, but really on all uses
  – How in fact, it is the PEOPLE that are creative, efficient, etc, by using AI as a computer program for what is was intended.

Chat with GPT 1

- Write an outline, less than 1000 words, on the needs, development, uses, and applications of phenomic databases in all aspects of agriculture and food production from basic science to in the field and home applications, and relate databases on phenomics with those on genomics, crop and animal production, food distribution and waste. Include the role of the Office of Science and Technology Policy memo on publicly accessible data, include up to 20 key review papers, white papers, grant RFPs.

- Now take that outline, and in another 1000 words, add more points and details to each section.
- ok, using what you have made here, and in this word document from a previous chat, and the other added files on databases, phenomics, genomics, and sustainability and sustainable funding, also looking up the NIFA/ USDA research Ag2PI program and related databases in ag (BUT NOT NAAS and ag commodity databases, focus on research for now). Include our work from the AgBioData group and the summaries of the ARS USDA NRSP 8, NRSP and NRSP 10 projects you can find online. Make a summary of the key high level needs for integrating genomic and phenomic databases, and integrating genetic/genomic, phenomic databases with nutritional databases like NRSP 9, NANP. It is a big ask, but try to limit it to the top 15 to 20 major points on 'Why do we need to integrate genomics and phenomics databases and other phenotype databases like NANP 9 and those in NRSP 8? How do we integrate genomics and phenomics databases (not a lot of technical detail, but some possibilities and examples (are there examples in biomedicine? or other fields?)) and how do we sustain such databases so that scientists, practitioners, teachers, can use them?

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- using the embedded file, build a ppt with appropriate readability (don't crowd the slides.4 to 6 bullets max) name the ppt "AgBioData Integration of Phenomic and Genomic Knowledge with the World as we Know it. March 4, 2026" with a suitable ag genomic phenomic theme design.

I. WHY WE NEED TO INTEGRATE GENOMIC, PHENOMIC, AND NUTRITIONAL DATABASES

- 1. Biology operates across scales — databases must also
- Integrated databases are required to understand real biological expression in crops and animals.
- 2. Trait discovery requires linked genotype ↔ phenotype datasets
- linking genomic and phenomic data accelerates discovery and validation.
- 3. Nutrition is phenotype expression

I. WHY WE NEED TO INTEGRATE GENOMIC, PHENOMIC, AND NUTRITIONAL DATABASES

- Programs such as NRSP-9 / NANP demonstrate that nutrient requirements are functional phenotypes and must be linked to genomics and phenomics.

- 4. Historical databases prove the model works

- DHIA, NRC nutrient tables, and germplasm repositories show that empirical phenotype + environment data drives productivity gains.

- 5. Climate adaptation requires integrated data

I. WHY WE NEED TO INTEGRATE GENOMIC, PHENOMIC, AND NUTRITIONAL DATABASES

- 6. G×E×N modeling is impossible without integration

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- 7. Translational agriculture depends on phenotype layers
- phenomics translates gene data into actionable traits.
- 8. Precision agriculture needs phenotype feedback loops

I. WHY WE NEED TO INTEGRATE GENOMIC, PHENOMIC, AND NUTRITIONAL DATABASES

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- 9. Food quality, storage, and waste link to phenotype
- Shelf life, bruising resistance, ripeness curves, and spoilage dynamics are phenomic traits affecting distribution and waste.
- 10. Livestock sustainability metrics require integration
- Methane emissions, feed conversion, and nitrogen excretion combine genetics, diet, and management phenotypes.

I. WHY WE NEED TO INTEGRATE GENOMIC, PHENOMIC, AND NUTRITIONAL DATABASES

- 11. Cross-species discovery accelerates innovation
- trait discovery across crops, livestock, and microbes.
- 12. AI/ML requires integrated datasets
- Predictive modeling depends on large, interoperable, multi-omic datasets.
- 13. Workforce and education depend on integrated platforms

I. WHY WE NEED TO INTEGRATE GENOMIC, PHENOMIC, AND NUTRITIONAL DATABASES

- 14. Policy and economic modeling require phenotype linkages
- Production efficiency, food prices, sustainability metrics, and trade modeling depend on integrated biological data.
- 15. Public trust and transparency
- Open integrated databases improve consumer understanding of food systems.

II. HOW DO WE INTEGRATE GENOMICS, PHENOMICS, AND NUTRITION DATABASES?

- 16. Adopt shared FAIR data frameworks
- 17. Develop shared ontologies across domains
- 18. Use API-based interoperability

II. HOW DO WE INTEGRATE GENOMICS, PHENOMICS, AND NUTRITION DATABASES?

- 19. Build federated database architectures
- Community databases interoperable through shared frameworks.
- 20. Integrate germplasm, breeding, and phenotyping systems
- NRSP-8, NRSP-10, AG2PI, and FAANG genomic layers link to phenotype repositories.

II. HOW DO WE INTEGRATE GENOMICS, PHENOMICS, AND NUTRITION DATABASES?

- 21. Link nutrition phenotype platforms

- 22. Incorporate environmental and management layers

- 23. Embed AI/ML integration layers

III. HOW DO WE SUSTAIN AND OPERATIONALIZE INTEGRATED DATABASES?

- 25. Establish line-item federal funding
- USDA, NIFA, ARS, NSF, and interagency programs must provide sustained base funding.
- 26. Build public–private co-funding models
- Commodity groups, breed associations, and industry partnerships extend sustainability.
- 27. Develop interagency governance structures

III. HOW DO WE SUSTAIN AND OPERATIONALIZE INTEGRATED DATABASES?

- Coordination across USDA, NSF, DOE, NIH enables shared infrastructure.
- 28. Sustain community database consortia
- AgBioData demonstrates collaborative governance linking databases.
- 29. Invest in data curation workforce
- Biocurators, ontologists, and data stewards are essential.

III. HOW DO WE SUSTAIN AND OPERATIONALIZE INTEGRATED DATABASES?

- 30. Build discovery portals and tool registries
- Centralized platforms prevent duplication and improve access.
- 31. Support open data policy frameworks
- OSTP public access policy ensures availability of federally funded data.
- 32. Fund cyberinfrastructure and cloud storage

III. HOW DO WE SUSTAIN AND OPERATIONALIZE INTEGRATED DATABASES?

- 35. Embed education and workforce development
- Training in bioinformatics, AI, and agricultural data science is required.

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IV. SYSTEMS-LEVEL VALUE PROPOSITION

- • Improved human health outcomes
- • Supply chain optimization
- They form the biological knowledge infrastructure for the global food system.

IV. SYSTEMS-LEVEL VALUE PROPOSITION

- Integrated genomic–phenomic–nutrition databases enable:
- • Predictive breeding
- • Precision feeding
- • Climate resilience
- • Reduced waste

III. HOW DO WE SUSTAIN AND OPERATIONALIZE INTEGRATED DATABASES?

- Hybrid cloud, HPC, and data lakes support phenomic data scale.
- 33. Incentivize data submission and reuse
- Citation credit, DOIs, and journal requirements drive participation.
- 34. Link databases to decision tools
- Producer dashboards, breeding platforms, and extension tools operationalize data.