Manure as the Biomass of Choice

Advancing the Bioeconomy Through Data, Equity, and Innovation

Prepared by the North American Bioeconomy Data Alliance (NABDA) Steering Committee

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NORTH AMERICAN BIOECONOMY DATA ALLIANCE™

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Executive Summary

Manure[1], an abundant, underutilized agricultural byproduct, offers promise as a foundational biomass feedstock for the North American bioeconomy. Compared to traditional sources like soybeans or canola, manure is more economically viable, environmentally sustainable, and operationally scalable. By centering data infrastructure, circular economy models, and inclusive innovation, this approach aligns with the mission of the North American Bioeconomy Data Alliance (NABDA) and supports national goals in renewable energy, soil health, water quality, and rural equity.

The Case for Manure

- Serves as high-value organic fertilizer for crops
- Readily available and low-cost
- Reduces greenhouse gas emissions compared to synthetic fertilizers
- Improves soil health and water retention
- Convert waste to renewable biogas
- Need for high manure production areas to export manure
- Supports circular economy models
- Scalable across small and large operations

Manure as a Buffer Against Volatile Input Costs

Volatility in synthetic fertilizer prices, driven by global supply chain disruptions, energy market instability, and geopolitical uncertainty, has placed increasing financial pressure on North American growers. Between 2020 and 2023, fertilizer costs rose by more than 80%

[1] While manure was selected as the initial focus for this pilot, its selection followed careful consideration of other biomass options such as soybean and canola. Manure best aligns with NABDA's broader agenda to identify and scale viable data-driven management opportunities for a wide range of biomass feedstocks. This specific initiative serves as a model for future efforts to apply data infrastructure, equity principles, and innovation frameworks to other underutilized bioresources across North America.

in some regions, disrupting planning and profitability for producers of all scales (World Bank, 2022).

Manure-based fertilizers offer a domestically-sourced alternative.
Their adoption can:

1. *Mitigate input cost volatility* by reducing dependence on synthetic fertilizers derived from imported natural gas or mined minerals.
2. *Improve long-term soil fertility*, reducing the need for repeated inputs and fostering soil health resilience.
3. *Provide price stability through local nutrient sourcing*, particularly when integrated with regionally coordinated auction platforms and cooperative digester models.

Data-Driven Justification

NABDA and partners, including the USDA and Precision Conservation LLC, have documented key advantages of manure:

- Nutrient value & energy potential: According to Precision Conservation, LLC, the TAM (Total Addressable Market) in the US for recoverable manure is $3.2 billion. The potential goes far beyond this figure across North America.

- Lifecycle impact: Manure-based biofuel systems demonstrate lower lifecycle emissions than most crop-based biofuels (IEA Bioenergy, 2022).
- Evolving nutrient flows in manuresheds have highlighted locations with more nutrients than they can agronomically utilize (Flynn et al., 2023).
- Pilot evidence: Manure-to-energy digester projects are delivering tangible savings in waste management and synthetic fertilizer use.

Policy & Standards Recommendations

-Increase utilization and modernization of manure characteristics standards such as ASAE D384(R2019) Manure Production and Characteristics standard (ASABE, 2019).
- Leverage ManureDB as a trusted, open-source manure data repository.
- Support small and mid-sized producers with cooperative digester models.
- Integrate manure into USDA and DOE program eligibility criteria.

Equity & Accessibility

This strategy ensures small farms and underserved communities are not left behind, contributing to rural economic vitality. Cooperative models reduce upfront costs while localized digester solutions create new jobs, training opportunities, and revenue streams in rural regions.

Evolving Operational Models for the Manure Economy

As the manure economy evolves, multiple operational models are emerging to meet the diverse regional, economic, and logistical needs of producers and nutrient users. NABDA recognizes that no one-size-fits-all approach will suffice. Instead, scalable, adaptable models must be tailored to local infrastructure, policy landscapes, and producer readiness. Two promising pathways include:

1. Buy/Sell Marketplace Model

This market-driven approach leverages digital tools, such as the Online Manure Auction, to facilitate direct transactions between livestock operations and nutrient-deficient croplands. Key advantages include:

- Immediate revenue generation for manure producers
- Price, nutrient content, and distance transparency for buyers
- Competitive market dynamics that improve nutrient sourcing
- Effective in regions with robust hauling capacity and existing nutrient management policies

2. Cooperative Digester Model

For areas where individual hauling or energy production is less feasible, cooperative ownership and operation of manure-to-energy digesters offer a viable alternative. Core benefits include:

- Shared capital investment and risk among producers
- Localized biogas and renewable energy generation
- Community-level job creation and technical training
- Enhanced monitoring of environmental outcomes at scale

Both models support nutrient circularity, agricultural and environmental goals, and rural economic revitalization. NABDA and its partners plan to advance these models through regionally diverse pilot projects and stakeholder engagement throughout 2025 and beyond, with the aim of identifying inclusive and replicable frameworks across North America.

Monetization Through Online Auctions

The Online Manure Auction platform is a powerful tool that unlocks the market value of manure. Developed by Precision Conservation LLC, this initiative connects surplus manure suppliers with nutrient-deficient croplands through a transparent and user-friendly bidding process.

While the environmental and economic benefits of using manure as an alternative to commercial fertilizer are well recognized, a persistent gap remains between manure supply and demand. The online manure auction is designed to close that gap, connecting crop producers in need of nutrients with livestock owners who have surplus manure.

Unlike existing platforms that simply list buyers and sellers, this auction-based system actively facilitates transactions. Buyers can place bids on available manure lots, and upon winning, they will have access to post-purchase services, including loading, hauling, and application. This integrated service approach streamlines the transaction process, ensuring a more efficient and user-friendly experience for all participants.

To help bidders make informed decisions, the auction site includes a built-in valuation tool that estimates the total value of each manure offering. This tool factors in nutrient content, hauling distance, application costs, and other related expenses, providing buyers with a clearer understanding of the net value before placing a bid. This feature encourages smarter, more competitive bidding based on real agronomic and economic data.

In addition to facilitating direct transactions, the platform opens up new monetization pathways for farmers through incentive payments tied to ecosystem services. These include carbon credits, water quality improvements, and greenhouse gas reduction metrics, making manure not only a local input, but also a global climate asset.

The auction will be built around two guiding principles: ease of use and transparency. Farmers already familiar with online platforms for equipment auctions will find the interface intuitive. By increasing market transparency and lowering transaction barriers, the system helps establish a more reliable and efficient manure marketplace.

Key Features:

- Real-time bidding for raw manure and derivatives
- Seamless coordination of post-sale services (hauling, application)
- Valuation tools to guide competitive bidding
- Access to accurate sampling, pricing, and storage protocols

Market Impact:

- Unlocks new revenue streams for livestock operations
- Promotes nutrient recycling at scale while protecting water quality
- Encourages regenerative soil practices and reduces input costs

By improving access, pricing accuracy, and transparency, the Online Manure Auction platform is more than just a digital marketplace; it is an innovation engine for enhancing soil health, promoting economic resilience, and advancing climate-smart agriculture.

Next Steps for NABDA

- **Expand NABDA membership** to strengthen representation and partnerships across the manure value chain.
- **Educate and engage stakeholders** to align priorities, build awareness, and identify actionable next steps.
- **Advocate for national standards and strategies** for manure and organic amendment data collection and utilization
- **Complete and validate feedstock and stakeholder data inventories** to support accurate platform development and implementation.
- **Develop real-world use cases** for ManureDB data streams to demonstrate impact and scalability.
- **Explore monetization pathways**, including integration with digital auction platforms.
- **Publish findings in open-access formats** to inform policymakers, producers, and ag tech practitioners.
- **Champion manure-inclusive incentives** within USDA, DOE, and other federal funding and policy frameworks
- **Seek opportunities** outside of the US for data expansion
- **Continue evaluating data management opportunities** in other feedstock sources

A Call to the Agriculture Industry

To realize the full potential of manure as a national resource, collaboration is essential. We call on ag retailers, crop advisors, grower groups, technology providers, and sustainability officers to:

- Engage in pilot collaborations and data-sharing initiatives
- Support regional nutrient circularity through auction and digester adoption
- Advocate for manure-inclusive financing and conservation frameworks in federal programs

By working together, we can turn a historic challenge, waste management, into a modern agricultural asset and environmentally-friendly solution.

We invite you to become a member of the North American Bioeconomy Data Alliance (NABDA) and help shape the future of nutrient management. By joining, your voice contributes to building data-driven solutions that benefit producers, protect natural resources, and unlock new value streams across the agricultural economy. Together, we can advance a more connected, circular, and profitable future for agriculture.

Conclusion

Manure is no longer a waste product; it is a strategic national asset. Through thoughtful policy, innovative market mechanisms, and inclusive data stewardship, we can accelerate its role in a resilient, regenerative bioeconomy.

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