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Increasing the Value of Animal Manure for Farmers

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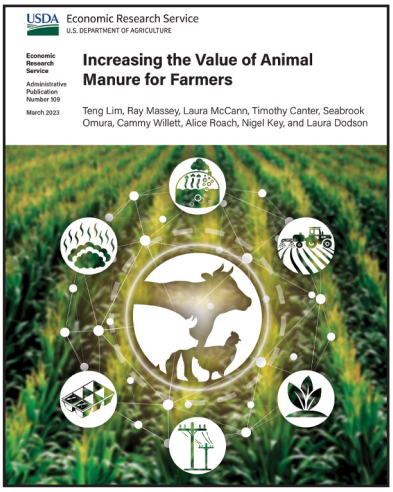
What Is the Issue?



Livestock production tends to be geographically concentrated in the United States, and in certain regions, animals generate more manure-supplied nutrients than are needed by nearby cropland. Manure has a low and variable nutrient density, making it costly to transport and apply to fields that are located far from animal production facilities. In addition, nitrogen and phosphorus levels in manures may not match the nutrient needs of crops. Inappropriately managing manure can impair air and water quality.

Developing new uses and markets for manure may result in both economic and environmental benefits.

What Did the Study Find?

There is substantial opportunity for increasing the use of manure as fertilizer. Manure was applied to only about 8 percent of the 237.7 million acres planted to 7 major U.S. field crops. Manure is a major source of crop nutrients in organic food production, which represents an expanding market in the United States. However, if manure-supplied nutrients exceed crop needs, crop producers will not demand the excess nutrients, lowering their value. Three hundred seventy-one counties in the United States have been identified as having more manure-supplied nutrients than crops need.

The fertilizer value of manure depends on the type of animal manure produced, how manure is stored and applied to land, and the cropping system to which manure is applied. The study identified several existing and emerging technologies for increasing fertilizer manure value. These include:

- Liquid-solids separation technologies create a solids component, which is more valuable and marketable as a fertilizer.
- Manure additives (such as nitrogen, alum, acid, biochar, and clay) can better match manure nutrients with crop needs, minimize negative environmental off-field impacts, and save time and cost in application.

- Composting manure—with or without animal bedding and other organic matter—reduces its volume, increases its value, kills weed seeds and pathogens, and reduces the potential for air and water pollution. USDA Agricultural Resource Management Survey (ARMS) data indicate that only 4 percent of manure-fertilized farmland received composted manure.

Manure has uses (other than fertilizer) that can create value for farmers. Processes to exploit potential non-fertilizer uses of manure that are identified in the report include:

- Anaerobic digestion can produce renewable energy (primarily methane) and turn manure and other organic wastes into a more consistent and sterile product.
- Thermochemical processes—such as pyrolysis (heating without air), gasification and combustion—yield fuel gases at a much faster rate than anaerobic digestion.
- Manure fiber can be transformed into livestock bedding and biodegradable containers for horticultural uses.

Governmental programs and policies can influence farmers' manure management decisions—with implications for farm profits, the environment, and public health. The study identified several possible ways to promote the adoption of value-added manure technologies, including:

- Technology cost sharing. Programs such as the USDA Environmental Quality Incentives Program could lower the cost of targeted manure technologies for farmers.
- Grants from governmental agencies and organizations. Research indicates that grants increased the adoption of new manure technologies.
- Co-op formation. Programs may incentivize co-op formation for participation in multi-farm digester systems and other value-added manure economic opportunities.
- Voluntary nutrient trading programs. Modifications to voluntary nutrient trading programs could increase incentives for livestock producers to participate.
- Increased Federal support for research and development could lower manure technology costs over time, enabling adoption by smaller farms. A systems approach to the research may facilitate the development of new technologies that benefit both farmers and the environment.

How Was the Study Conducted?

This report uses data from the annual ARMS—including the Soybeans (2018), Corn (2016), Oats (2015), Wheat (2017), and Cotton (2019) Phase II surveys to characterize current manure management and use. To characterize manure nutrient supply and demand, the report relied on recently published research on manuresheds.

The study synthesizes an extensive literature on manure-related research and summarizes the latest information on manure management and promising technological developments. The study also incorporates information from industry websites and commodity magazines about the most recent innovations in manure management. Information from conversations with various businesses is also incorporated to provide industry perspectives on emerging technologies and programs.