

Expanding Soybean Utilization

Soybean Meal Fertilizer, Compost, and Soil—
Manufacturing and Distribution Development Potential in
Residential and Horticultural Markets

September 2024

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Executive Summary

This study, commissioned by the Minnesota Soybean Research & Promotion Council (MSR&PC), conducts a value chain analysis to outline a potential roadmap for manufacturing and marketing soybean meal-based fertilizers and to examine potential distribution models in Minnesota. Findings indicate that soybean meal-based granular fertilizer's value chain and distribution models have good potential in Minnesota and surrounding states where soybeans are produced and crushed. With the increased demand for soybean oil and expanded crush facilities, the supply of soybean meal is expected to grow.

The 24-0-8 blend, which contains urea and 25 percent soybean meal (SBM), offers pricing and performance advantages vis-à-vis competitive branded and private-label lawn fertilizers containing synthetic forms of nitrogen derived from fossil fuels. Because the 16-0-8 and 7-1-7 blends contain 50 percent soybean meal and other natural ingredients, they work well on lawns and as a winterizing fertilizer. The 7-1-7 blend, due to its lower seven percent nitrogen level, is well-suited for flower and vegetable gardens and as a winterizing fertilizer.

Manufacturing opportunities are likely best optimized at Form-A-Feed, Inc.'s Stewart, Minnesota, and New Richmond, Wisconsin, facilities. These processing plants can manage fertilizer production levels of up to 22,000 tons per day. In addition, Form-A-Feed's sales team calls on more than 500 feed stores with high faith in Form-A-Feed as a manufacturer.

Strategic partnerships beneficial to the success of soybean meal-based fertilizers include:

1. Agricultural cooperatives that serve soybean growers or have crush operations
2. Metropolitan and rural garden centers, lawn care services, landscapers, and wholesale nurseries that are interested in safety and sustainability
3. City governments that are interested in biobased products and fertilizer safety

Strategic sales firms that may be interested in distributing soybean meal-based fertilizers include:

1. Hardware distributors (e.g., Ace Hardware or True Value) which have regional buying groups that serve a variety of farm and ranch stores and rural hardware stores
2. Horticultural distributors (e.g., BFG or Carlin's) that serve independent retailers and chain retailers such as Fleet Farm or Tractor Supply
3. Turf wholesale distributors (e.g., SiteOne or Gertens Wholesale) that serve turf managers, lawn care and landscaping services, and municipal customers

Lawn care represents the highest opportunity for granular soybean meal-based fertilizers from a volume, acreage, and safety standpoint. An estimated 91,000 tons of non-farm fertilizer was sold in 2023 and used on an estimated 400,000 acres in Minnesota. Specific high-potential lawn care target segments include:

1. Do-It-Yourself (DIY) residential lawn care
2. Residential and commercial lawn care services
3. Residential and commercial landscaping services

The potential of soybean meal-based granular fertilizer is more limited in horticulture due to the dominance and preference for liquid fertilizers and pricing/performance parity concerns with existing fertilizer products. Greenhouses that grow bedding and vegetable plants primarily use liquid fertilizers during the 16-week growing period. Soil blenders have lower margins and are highly concerned about ingredient price sensitivity. Wholesale nurseries are concerned about pricing and performance parity vis-à-vis other granular fertilizers that contain synthetic forms of nitrogen.

Pricing analysis of branded residential and professional fertilizers with synthetic nutrients demonstrates that the cost per pound averages \$1.50 - \$2.00 for 30-pound bags covering 12,000-15,000 square feet (sq. ft.). Pricing analysis of branded residential and professional fertilizers with natural or organic ingredients averages \$0.30 - \$1.50 for 30-pound bags covering 2,500-5,000 sq. ft.

Preliminary high-priority distribution options for the new fertilizers could include the following:

- Over 500 feed stores in Minnesota and Wisconsin served by Form-A-Feed, Inc.
- 63 Minnesota Department of Transportation Wayside Rest stops served by Green View, Inc. (a subsidiary of Minnesota Farmers Union)
- 31 Runnings stores in Minnesota
- 24 Tractor Supply stores in Minnesota
- 17 Fleet Farm stores in Minnesota

Acknowledgments

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Project Goals and Tactics

The following is a summary of the project goals and tactics, which summarizes the outline of the report.

GOAL 1: Identify and assess value chain manufacturing and distribution models for Minnesota soybean meal use in horticultural fertilizers and soil amendments.

- **OBJECTIVES**

1. Characterize various manufacturing and distribution options in Minnesota.
2. Provide a map of distribution locations for products.

- **TACTICS**

1. Identify the best manufacturing opportunities and strategic partners for soybean meal products in Minnesota.
2. Complete a one to five-year assessment of potential soybean meal consumption.
3. Identify strategic sales firms interested in the distribution of soybean meal fertilizer products.

GOAL 2: Commercialize residential lawn and garden care prototype formulations.

- **OBJECTIVES**

1. Examine greenhouse, cooperative farm retail markets, and recreational markets for soybean meal fertilizers in Minnesota (size, location, potential market volume).

- **TACTICS**

1. Conduct a homeowner survey about desires for natural fertilizers (that include soybean meal).
2. Develop networks with agriculture retailers and other rural farm store merchants.
3. Create preliminary sales programming models.

GOAL 3: Analyze additional soybean meal and blends in value-added fertilizer and soil amendment products.

- **OBJECTIVES**

1. Examine soybean meal potential in compost blends and soil media blenders.
2. Examine the costs of inclusion and benefits offered by soybean meal in compost.
3. Formulate the 24-0-8 (25 percent soybean meal blend) for lawn markets and make it available for a Spring 2024 demo and/or distribution.

- **TACTICS**

1. Network with existing compost manufacturers and soil blenders for soybean meal inclusion opportunities.
2. Match benefits to known vertical market needs.
3. Conduct pricing analysis.

GOAL 4: Prepare a written report on “value chain identification and sales pathway.”

- **OBJECTIVES**

1. Identify the best avenues for the introduction of soybean meal-laden fertilizers (identified in 2023 Phase 1 project) into the value chain.

2. Conduct an economic analysis of the value to growers from increased soybean meal usage in the industry.
3. Identify volumes that may be possible for sales into selected channels with competitive pricing models.

- **TACTICS**

1. Identify commercialization partners for soybean meal fertilizer and compost products.
2. Complete a written report.
3. Provide selected outreach materials for MSR&PC.

Goal 1 Tactics – Overview of Findings for Value Chain Manufacturing and Distribution Models

Tactic 1: Identify the best manufacturing opportunities and strategic partners for soybean meal fertilizer products in Minnesota.

In identifying the best manufacturing opportunities for soybean meal fertilizer products in Minnesota, Axiom believes Form-a-Feed offers the best short-term manufacturing opportunities for the following reasons:

1. Increased production volume lowers manufacturing costs.
Benefit: Lower retail prices and increased flexibility with retailer profit margin demands.
2. On-demand manufacturing.
Benefit: No inventory and warehousing.
3. Complementary just-in-time delivery to customers within 90 minutes of production facilities.
Benefit: Lower transportation costs.
4. Form-A-Feed, Inc.'s sales team serves over 500 rural feed stores in Minnesota and Wisconsin.
Benefit: Existing penetration with rural customers.
5. Form-a-Feed sources feather meal at attractive prices from Central Bi-Products, a subsidiary of Farmers Union Industries (FUI), because of its feed volumes.
Benefit: Increased collaboration with FUI subsidiaries, including Green View, Inc. to aid in distribution expansion.
6. Form-A-Feed owns and operates manufacturing facilities in Stewart, Minnesota, and New Richmond, Wisconsin. Each facility has an annual fertilizer production capacity of 22,000 tons.
Benefit: Serves both Minnesota and Wisconsin with sufficient capacity.

In identifying the best strategic partners for soybean meal fertilizer products in Minnesota, Axiom reports that strategic partnership opportunities for soybean meal-based fertilizers are strong in a variety of target markets, including:

1. Cooperatives

- Minnesota Farmers Union
 - Central Bi-Products – feather meal provider for AminOrganix fertilizers
 - Farmers Union Industries – links to Tractor Supply, Mill’s Fleet Farm, and Runnings
 - Green View, Inc. – Wayside Rest stop management contracts with the State of Minnesota DOT
- CHS Inc.
 - Soybean crush plants
 - Convenience stores
 - Previously sold private-label lawn fertilizer
- Land O’Lakes
 - Feed store locations
 - Winfield United agronomy division serves turf customers

2. Metro Independent Garden Centers

- Gertens
 - Retail garden center

- Professional turf distribution center (formerly known as JRK)
- Private-label residential and professional products
- Commercial and residential landscaping division
- Bachman's
 - Retail garden center
 - Commercial and residential landscaping division
 - Private-label residential products
- Otten Brothers
 - Retail garden center
 - Commercial and residential landscaping division
 - High volume bag and bulk delivery
- Tangletown Gardens
 - Retail garden center
 - Commercial and residential landscaping
 - 140-acre farm and community-supported agriculture (CSA)

3. Metro Lawn Care Services

- Lunseth Lawn Care/Organic Lawns by Lunseth
 - Traditional and organic lawn care
 - Perennial care and maintenance
 - Weed and pest control
 - Commercial grounds maintenance
 - Landscaping
- Rainbow Lawncare
 - Organic-based lawn care services
 - Fertilization and aeration services
 - Lawn renovation and sod installation
 - Weed control and disease management
 - Tree care division
- Naturalawn of America
 - Organic-based lawn care solutions are marketed as being safe for children, pets, and the environment
 - Franchises in the Twin Cities and St. Cloud
 - Separate natural pesticide application divisions for mosquitos and ticks (Mosquito Ranger and Tick Ranger)
 - Branded Natural Alternative pesticide, nutrition, and snowmelt
 - Tree and shrub maintenance
- Midwest Escapes
 - Mowing, dethatching, and aeration services
 - Mulching, debris removal, and leaf cleanup services
 - Planting services
 - Fertilizer application
 - Pesticide spraying

- Snow removal

4. Metro Landscapers

- Natural Environments Corporation
 - Landscape design, installation, and maintenance
 - Residential and commercial focus
- Margolis Company
 - Landscape, design, construction, and maintenance
 - Commercial focus
 - Retail and wholesale nursery division
- Southview Design
 - Landscape, design, construction, and water management
 - Residential and commercial focus
 - Lakeshore portfolio
- Midwest Landscapes
 - Landscape, irrigation, and maintenance
 - Wholesale nursery division

5. Metro Wholesale Nurseries

- Bailey Nurseries
 - Trees, woody ornamentals, and annuals
 - Blends their soil mixes and includes Sustane in the mix
- Bachman's Whole Nursery & Hardscapes
 - Trees, evergreens, woody ornamentals, roses, perennials, and annuals
 - Fertilizers, garden chemicals, and garden hardgoods
- Gertens Wholesale
 - Trees, evergreens, woody ornamentals, roses, perennials, and annuals
 - Bagged mulch, rock, and soil
 - Grass seed
 - Professional turf supply
 - Bulk products
- Grove Nursery
 - Trees, shrubs, evergreens, perennials, fruit, grass and vines
 - Mulch, soil, rock, and landscape supplies

6. Government

- City of Hutchison
 - Successful demo program on road rejuvenates
 - Demo site for soybean-meal fertilizers
- Minneapolis Parks and Recreation
 - Actively looking for fertilizers with non-synthetic nutrients that do not run off for parks and golf courses
- Minnesota Department of Transportation (MnDOT)

- Active runoff reduction program that focuses on re-establishing grass in ditches and areas between roadways that have been newly built or renovated
- City of Rochester
 - Progressive city with a high interest in biobased products
- City of Edina
 - Progressive city with a high interest in biobased products

Goal 1 Tactics – Overview of Findings for Value Chain Manufacturing and Distribution Models

Tactic 2: Complete a one to five-year assessment of potential soybean meal consumption.

Table 1 below is based on Minnesota Department of Agriculture Fertilizer Use and Sales Data reports from 2017 to 2021. The 2021 report, published on July 26, 2024, is the most recent. (Minnesota Department of Agriculture, 2024)

Table 1: Fertilizer Use by Year, Minnesota					
	2017	2018	2019	2020	2021
Agricultural (Tons)	2,963,083	3,186,811	2,941,572	3,178,364	3,356,376
Non-Farm (Tons)	62,507	72,288	67,000	73,343	95,839
Total (Tons)	3,025,590	3,259,099	3,008,572	3,251,707	3,452,215

Minnesota Department of Agriculture

Based on Table 1, the average non-farm fertilizer sales growth averaged about 8,333 tons per year between 2017 and 2021. Therefore, the projected total non-farm sales would be about 104,172 tons in 2022, 112,505 tons in 2023, 120,838 tons in 2024, and 129,171 tons in 2025.

Today's Homeowner magazine made the following assessments based on data from the U.S. Census Bureau (<https://todayshomeowner.com/lawn-garden/guides/average-yard-size/>):

- The average size of a U.S. yard is 23,301 square feet or 0.5 acres.
- Minnesota's average yard size is 19,145 square feet or 0.4 acres. The size is likely more significant in small towns and rural areas.
- The magazine states that “American yards have been shrinking due to several factors linked to the way housing has evolved. Today’s homes are much larger than those built in the past. Back in the late 1970s, the average home was smaller in square footage than the homes built today. This growth in home size, with added bedrooms and bathrooms, has reduced the space available for yards.” There are 1.5-1.67 million owner-occupied homes in Minnesota.

Axiom estimates that the total turf acreage in Minnesota is between 764,000-862,000 acres. The breakdown is below:

- 660,000-735,000 residential lawn acres
 - 0.44 acres across 1.5-1.67MM owner-occupied homes
 - Assume 47 percent of acres fertilized
- 59,000-72,000 golf acres
 - 479 golf courses in the state of Minnesota, each with 125-150 acres
 - Assume 100 percent of acres fertilized
- 25,000-30,000 sports turf acres – football, soccer, and baseball fields
 - Assume 100 percent of acres fertilized
- 20,000-25,000 turf-covered park acres
 - 64 state parks and nine state recreational areas totaling 235,000 acres
 - County and municipal parks not included
 - Assume 25 percent of acres fertilized

Total fertilized acres equals:

- Residential – 330,000-367,500 acres
- Golf – 59,000-72,000 acres
- Sports Turf – 25,00-30,000 acres
- Parks – 5,000-6,250 acres

See “Lawn Care” in the table below for projections on homeowners' use of soybean meal-based fertilizers.

Table 2 below shows the amount of Minnesota soybean meal that could be consumed in manufacturing AminOrganix* fertilizers if 0.0065 percent of the initial non-farm fertilizer market could be captured with a conservative growth rate in each target market. *Note: This information is highly speculative and should not be used for decision-making.*

Table 2: Estimated Soybean Meal (SBM) Consumption for AminOrganix Fertilizers					
Coops	2025	2026	2027	2028	2029
24-0-8 25% SBM	Fertilizer: 12,000 lbs. SBM: 3,000 lbs.	Fertilizer: 24,000 lbs. SBM: 6,000 lbs.	Fertilizer: 36,000 lbs. SBM: 9,000 lbs.	Fertilizer: 40,000 lbs. SBM: 10,000 lbs.	Fertilizer: 60,000 lbs. SBM: 15,000 lbs.
	Five pallets sold to 10 retailers	Ten pallets sold to 20 retailers	15 pallets sold to 30 retailers	20 pallets sold to 40 retailers	50 pallets sold to 100 retailers
	Two pallets for samples, demos	Two pallets for samples, demos	Three pallets for samples, demos		

Garden Centers	2025	2026	2027	2028	2029
24-0-8 25% SBM	Fertilizer: 12,000 lbs. SBM: 3,000 lbs. Five pallets sold to 10 retailers Two pallets for samples, demos	Fertilizer: 24,000 lbs. SBM: 6,000 lbs. Ten pallets sold to 20 retailers Two demo pallets for samples, demos	Fertilizer: 36,000 lbs. SBM: 9,000 lbs. 15 pallets sold to 30 retailers Two pallets for samples, demos	Fertilizer: 30,000 lbs. SBM: 7,500 lbs. 15 pallets sold to 30 retailers	Fertilizer: 40,000 lbs. SBM: 10,000 lbs. 20 pallets sold to 40 retailers
16-0-8 50% SBM	Fertilizer: 12,000 lbs. SBM: 6,000 lbs. Five pallets sold to 10 retailers One pallet for samples, demos	Fertilizer: 12,000 lbs. SBM: 6,000 lbs. Five pallets sold to 10 retailers One pallet for samples, demos	Fertilizer: 22,000 lbs. SBM: 11,000 lbs. Ten pallets sold to 20 retailers One pallet for samples, demos	Fertilizer: 20,000 lbs. SBM: 10,000 lbs. Ten pallets sold to 20 retailers	Fertilizer: 20,000 lbs. SBM: 10,000 lbs. Ten pallets sold to 20 retailers
7-1-7 50% SBM	Fertilizer: 4,000 lbs. SBM: 2,000 lbs. One pallet sold to five retailers One pallet for Master Gardeners	Fertilizer: 4,000 lbs. SBM: 2,000 lbs. One pallet sold to five retailers One pallet for Master Gardeners	Fertilizer: 6,000 lbs. SBM: 3,000 lbs. Two pallets sold to 10 retailers One pallet for Master Gardeners	Fertilizer: 6,000 lbs. SBM: 3,000 lbs. Two pallets sold to 10 retailers One pallet for Master Gardeners	Fertilizer: 6,000 lbs. SBM: 3,000 lbs. Two pallets sold to 10 retailers One pallet for Master Gardeners

Lawn Care	2025	2026	2027	2028	2029
24-0-8 25% SBM	Fertilizer: 4,000 lbs. SBM: 1,000 lbs.	Fertilizer: 6,000 lbs. SBM: 1,500 lbs. One pallet sold to one lawn care service	Fertilizer: 14,000 lbs. SBM: 3,500 lbs. Five pallets sold to five lawn care services	Fertilizer: 20,000 lbs. SBM: 5,000 lbs. Ten pallets sold to 10 lawn care services	Fertilizer: 40,000 lbs. SBM: 10,000 lbs. 20 pallets sold to 40 retailers
16-0-8 50% SBM	Fertilizer: 2,000 lbs. SBM: 1,000 lbs.	Fertilizer: 2,000 lbs. SBM: 1,000 lbs.	Fertilizer: 4,000 lbs. SBM: 2,000 lbs. One pallet sold to two lawn care services	Fertilizer: 6,000 lbs. SBM: 3,000 lbs. Three pallets sold to six lawn care services	Fertilizer: 10,000 lbs. SBM: 5,000 lbs. Five pallets sold to 10 lawn care services
	One pallet for samples, demos	One pallet for samples, demos	One pallet for samples, demos		
Landscape	2025	2026	2027	2028	2029
16-0-8 50% SBM	Fertilizer: 4,000 lbs. SBM: 2,000 lbs.	Fertilizer: 6,000 lbs. SBM: 3,000 lbs. One pallet sold to two landscapers	Fertilizer: 10,000 lbs. SBM: 5,000 lbs. Three pallets sold to three landscapers	Fertilizer: 10,000 lbs. SBM: 5,000 lbs. Five pallets sold to five landscapers	Fertilizer: 14,000 lbs. SBM: 7,000 lbs. Seven pallets sold to seven landscapers
	Two pallets for samples, demos	Two demo pallets for samples, demos	Two pallets for samples, demos		
7-1-7 50% SBM	Fertilizer: 4,000 lbs.	Fertilizer: 5,000 lbs.	Fertilizer: 6,000 lbs.	Fertilizer: 6,000 lbs.	Fertilizer: 10,000 lbs.

	SBM: 2,000 lbs. Two pallets for samples, demos	SBM: 2,500 lbs. 0.5 pallets sold to one landscaper Two pallets for samples, demos	SBM: 3,000 lbs. One pallet sold to two landscapers Two pallets for samples, demos	SBM: 3,000 lbs. Three pallets sold to six landscapers	SBM: 5,000 lbs. Five pallets sold to 10 landscapers
Wholesale Nursery	2025	2026	2027	2028	2029
16-0-8 50% SBM	Fertilizer: 2,000 lbs. SBM: 1,000 lbs. One pallet for sample demos	Fertilizer: 4,000 lbs. SBM: 2,000 lbs. One super sack sold to one nursery One pallet for samples, demos	Fertilizer: 6,000 lbs. SBM: 3,000 lbs. Two super sacks sold to two nurseries One pallet for samples, demos	Fertilizer: 6,000 lbs. SBM: 3,000 lbs. Three super sacks sold to three nurseries	Fertilizer: 10,000 lbs. SBM: 10,000 lbs. Five super sacks to five nurseries
7-1-7 50% SBM	Fertilizer: 2,000 lbs. SBM: 1,000 lbs. One pallet for samples, demos	Fertilizer: 2,000 lbs. SBM: 1,000 lbs. One pallet for samples, demos	Fertilizer: 4,000 lbs. SBM: 2,000 lbs. One super sack sold to one nursery One pallet for samples, demos	Fertilizer: 4,000 lbs. SBM: 2,000 lbs. Two super sacks sold to two nurseries	Fertilizer: 6,000 lbs. SBM: 3,000 lbs. Three super sacks to three nurseries
Government	2025	2026	2027	2028	2029
24-0-8 25% SBM	Fertilizer: 4,000 lbs. SBM: 1,000 lbs.	Fertilizer: 6,000 lbs. SBM: 1,500 lbs. One super sack sold to	Fertilizer: 10,000 lbs. SBM: 2,500 lbs. Two super sacks sold to	Fertilizer: 12,000 lbs. SBM: 3,000 lbs. Three super sacks sold to	Fertilizer: 16,000 lbs. SBM: 4,000 lbs. Four super sacks sold to

		one municipality	two municipalities	three municipalities	four municipalities
		One super sack sold to one road project	Two super sacks sold to road projects	Three super sacks sold to three road projects	Four super sacks sold to four road projects
	Two pallets for samples, demos	One pallet for samples, demos	One pallet for samples, demos		
16-0-8 50% SBM	Fertilizer: 4,000 lbs. SBM: 2,000 lbs.	Fertilizer: 6,000 lbs. SBM: 3,000 lbs.	Fertilizer: 10,000 lbs. SBM: 5,000 lbs.	Fertilizer: 12,000 lbs. SBM: 6,000 lbs.	Fertilizer: 16,000 lbs. SBM: 8,000 lbs.
		One super sack sold to one municipality	Two super sacks sold to two municipalities	Three super sacks sold to three municipalities	Four super sacks sold to four municipalities
		One super sack sold to one road project	Two super sacks sold to two road projects	Three super sacks sold to three road projects	Four super sacks sold to four road projects
	Two pallets for samples, demos	One pallet for samples, demos	One pallet for samples, demos		

Axiom Marketing Communications, Inc.

Goal 1 Tactics – Overview of Findings for Value Chain Manufacturing and Distribution Models

Tactic 3: Identify strategic sales firms interested in the distribution of soybean meal fertilizers.

Below is a list of some buying groups that supply fertilizer and provide buying services for farm and ranch stores. Note: The list is not intended to be comprehensive; rather, it is intended to spur discussion about possible distribution partners.

1. Hardware

- True Value (national, Chicago-based)
 - Over 600 Agway Farm and Ranch stores

- Over 800 Home & Garden Showplace stores
- Ace (national, Chicago-based)
 - 150 Potters Ace stores in Texas
 - 114 Aubuchon Ace stores in the Northeast
 - 85 West Lake Ace stores in California
 - Over 25 Capital Ace Stores in California
 - Over 22 Frattalone Ace Stores in Minnesota
- United Hardware/Do It Best (regional, Minneapolis-based)
 - Over 600 Do It Best member-owned stores
 - Over 800 additional stores which are non-members

2. Horticultural

- Central Garden & Pet (national, Walnut Creek, California-based)
 - Over 25 Wilco Farm Stores in Oregon, Washington, and California
 - Over 40 Central Farm Supply stores in Kentucky, Indiana, Tennessee, and Ohio
- BFG Supply (national, Burton, Ohio-based)
 - Tractor Supply stores
 - Over 25 Wilco Farm Stores
- Carlin's Horticultural Supplies (regional, Easton, Pennsylvania-based)
 - 45 Blain's Farm & Fleet stores in Illinois, Wisconsin, Iowa, and Michigan
 - 22 Coastal Farm & Ranch stores in the Pacific Northwest
 - Tractor Supply stores
- Prince Corporation (regional, Grand Rapids, Michigan-based)
 - 35 Intermountain Farmers Association (IFA) Country Stores in Idaho and Utah
 - 22 Coastal Farm & Ranch stores in the Pacific Northwest

3. Turf Wholesale

- Site One Landscape Supply (national, Roswell, Georgia-based)
 - Over 500 distribution outlets are predominantly located in metro areas with high golf course penetration
 - Fertilizer, turf protection products, and irrigation focus
 - Serves golf, landscaper, lawn care services, and municipal customers
- Ewing Irrigation & Landscape Supply (regional, Phoenix-based)
 - Over 220 distribution outlets are predominantly located in South metro areas with high golf course penetration
 - Irrigation, lighting, and fertilizer focus
 - Serves golf, landscaper, and irrigation contractor customers

- Reinders (regional, Sussex, Wisconsin-based)
 - 15 distribution outlets
 - 5 Spike's stores
 - Equipment, fertilizer, turf protection, and irrigation focus
- Gertens Wholesale (regional, St. Paul-based)
 - three distribution outlets serving Minnesota and Wisconsin
 - Fertilizer, turf protection, and seed focus
 - Serves golf, landscaper, lawn care service, and municipal customers

Goal 2 Tactics – Overview of Commercialization Findings for Residential Lawn and Garden Care Prototype Formulations

Tactic 1: Conduct a homeowner survey about desires for natural fertilizers (that include soybean meal).

Axiom surveyed 500 consumers throughout the U.S. about their opinions on natural and organic lawn fertilizers. The study asked about views, experiences, safety perceptions, and purchase intent of natural and organic lawn fertilizers.

Respondents remain concerned about the safety of lawn fertilizers. Nearly half report using natural or organic fertilizers, and an additional 25 percent want to try them. Many consumers equate safety with “organic.” It appears they are now looking more carefully at ingredients to redefine what safety is for them. They still use synthetic fertilizers because of tradition, cost, and performance, but more than 95 percent prefer a natural fertilizer for safety reasons. Other key details are listed below:

- More than 90 percent of respondents believe it is important to apply safe fertilizers.
- 70 percent of respondents are concerned or extremely concerned about fertilizers polluting lakes, streams, and rivers.
- 75 percent of respondents will likely buy fertilizers made from animal feed ingredients.
- 50 percent of respondents are willing to pay 10-20 percent more for fertilizers made with animal feed ingredients.
- 80 percent of respondents say fertilizers made with pet/animal feed ingredients are safer.
- 60.5 percent of respondents prefer fertilizers made from animal feed ingredients compared to 35.3 percent for manures/sludge-based and 4.2 percent for petrochemicals (synthetics).
- 60 percent fertilize once or twice a year, making organic and natural fertilizers better suited to feeding the plant longer with their organic and natural ingredients.

Most respondents still use weed killers and other pesticides, which they know, when not used and stored properly, can be unsafe. Unfortunately, few alternatives have proven effective in consumers' eyes. The industry has been unable to create products consumers consider safe at a price they are willing to pay. Despite consumer acceptance and belief that natural and organic fertilizers are effective, there continues to be doubt about the effectiveness of natural pesticides. On the bright side, most natural and organic fertilizers contain ingredients

that feed naturally occurring soil microbes. These microorganisms break down pesticide chemical compounds. Other key details are listed below:

- 65.2 percent view pesticides as dangerous and harmful chemicals
- 67 percent have applied fertilizers with weed killers and insecticides
- 55.7 percent still use herbicides or fungicides
- 44.7 percent still use insecticides

The full 2024 National Lawn Fertilizer Study is included as Appendix A and is also available for download at: <https://axiomcom.com/wp-content/uploads/2024/08/2024-Axiom-Lawn-Garden-Fertilizer-Study.pdf>.

Goal 2 Tactics – Overview of Commercialization Findings for Residential Lawn and Garden Care Prototype Formulations

Tactic 2: Develop networks with ag retailers and other rural farm store merchants.

Commercializing residential lawn and garden care prototype formulations necessitates developing relationships with agriculture retailers and other rural farm store merchants. Axiom and AURI had several high-profile conversations related to developing distribution network options. The discussions involved drawing on Axiom's, AURI's, and MSR&PC's existing relationships to identify ways to approach distribution and potential outlets. The following is a list of those opportunities.

- High potential ag retailer and rural farm store merchant networks include:
 - Over 500 Minnesota and Wisconsin feed stores (served by Form-a-Feed)
 - 49 Fleet Farm stores in four states (served by Farmer's Union Enterprises, including 17 stores in Minnesota and 31 in Wisconsin)
 - 45 Blain's Farm & Ranch stores (served by Carlin's, including 19 in Wisconsin)
 - 80 Runnings stores in seven states (served by Farmer's Union Enterprises, including 31 stores in Minnesota and nine stores in Wisconsin)
 - 62 Minnesota and Wisconsin Tractor Supply stores (served by Farmer's Union Enterprises)
- Other potential networks include:
 - More than 2,000 Tractor Supply stores nationwide in 48 other states (served by Central Garden and Pet, BFG, and Carlin)
 - More than 1,400 CHS gas stations/C-stores in 19 states (served by CHS Inc.)
 - 600 Agway stores in 48 states (served by True Value)
 - 800 Home and Garden Showplace stores in 48 states (served by True Value)
 - 68 MnDOT rest areas (served by Green View)
 - More than 300 Ace stores in rural areas (served by Ace Hardware)

Goal 2 Tactics – Overview of Commercialization Findings for Residential Lawn and Garden Care Prototype Formula

Tactic 3: Create preliminary sales programming models.

The following are examples of distributor pricing, which is the cost to the distributor (i.e., Carlin, BFG, etc.) for different soybean meal fertilizer blends. The three charts represent what a sample fertilizer producer (AminOrganix) charges distributors based on fertilizer type and bag size.

07/30/2024



Volume	Bags per pallet	Coverage (Sq. ft.)	Bag Size (pounds)	Delivered Price* (TC only)		Pick Up Price	
				per bag	pallet	per bag	pallet
7-1-7 50% Soybean Feed Grade ORGANIC Lawn and Garden Fertilizer							
2-5 Pallets	40	5,000	50.0 lb.	\$40.89	\$1,635.63	\$ 39.60	\$1,584.14
6-11 Pallets	40	5,000	50.0 lb.	\$39.84	\$1,593.68	\$ 38.87	\$1,554.81
12-21 Pallets	40	5,000	50.0 lb.	\$38.34	\$1,533.47	\$ 37.77	\$1,510.80
22 or more	40	5,000	50.0 lb.	\$37.04	\$1,481.47	\$ 36.67	\$1,466.80
Annual >100	40	5,000	50.0 lb.	\$35.18	\$1,407.39	\$ 34.84	\$1,393.46
7-1-7 50% Soybean Feed Grade ORGANIC Lawn and Garden Fertilizer							
2-5 Pallets	80	2,500	25.0 lb.	\$21.04	\$1,683.35	\$20.38	\$1,630.37
6-11 Pallets	80	2,500	25.0 lb.	\$20.50	\$1,640.18	\$20.00	\$1,600.18
12-21 Pallets	80	2,500	25.0 lb.	\$19.73	\$1,578.21	\$19.44	\$1,554.89
22 or more	80	2,500	25.0 lb.	\$19.06	\$1,524.70	\$18.87	\$1,509.60
Annual 100	80	2,500	25.0 lb.	\$18.11	\$1,448.46	\$17.93	\$1,434.12
7-1-7 50% Soybean Feed Grade ORGANIC Lawn and Garden Fertilizer							
2-5 Pallets	400	500	5.0 lb.	\$6.35	\$2,540.80	\$6.15	\$2,460.82
6-11 Pallets	400	500	5.0 lb.	\$6.12	\$2,448.88	\$5.97	\$2,389.15
12-21 Pallets	400	500	5.0 lb.	\$5.89	\$2,354.35	\$5.80	\$2,319.56
22 or more	400	500	5.0 lb.	\$5.69	\$2,274.52	\$5.63	\$2,252.00
Annual >100	400	500	5.0 lb.	\$5.40	\$2,160.79	\$5.35	\$2,139.40

*Delivered price offered on selected areas in Minnesota. Check with sales.
 **Minimum order of any formula is 2 tons, unless in inventory or a part of another run of the same formula.
 All products are "FDA feed grade" material.

AminOrganix Terms and Conditions

CONDITIONS OF ACCEPTANCE: Prices and terms are subject to change without notice. Orders will be shipped at prices and terms in effect at time of shipment. The terms detailed on this list apply to all orders accepted, regardless of terms requested or stated on purchase orders. All orders are subject to acceptance by AminOrganix.

TERMS OF PAYMENT: Net 30 days. Past due accounts will be assessed interest at the legal rate. All payments should be made to AminOrganix 3800 American Boulevard West Suite 1500 Bloomington, MN 55431

SHIPPING TERMS-F.O.B. ORIGIN: Freight will be prepaid on all "Delivered" orders to a single destination and single billing address within the seven-county metro area. All other orders are FOB Stewart, Minnesota 55385.

MINNESOTA CONTRACT: Orders made in Minnesota will be governed by Minnesota law. Any legal problems which cannot be resolved by mutual agreement will be resolved in Minnesota by arbitration or other means.

WARRANTY: All Landscapers Choice and AminOrganix products carry a customer satisfaction guarantee for the season sold.

AminOrganix® 3800 American Boulevard West Suite 1500 Bloomington, MN 55431



2024 Key Account Pricing

Volume	Bags per pallet	Coverage (Sq. ft.)	Bag Size (pounds)	Delivered Price* (TC only)		Pick Up Price	
				per bag	pallet	per bag	pallet
16-0-8 50% Soybean Feed Grade Professional Turf Fertilizer, Natural Based							
2-5 Pallets	40	10,000	50.0 lb.	\$42.03	\$1,681.12	\$ 40.71	\$1,628.21
6-11 Pallets	40	10,000	50.0 lb.	\$40.95	\$1,638.01	\$ 39.95	\$1,598.06
12-21 Pallets	40	10,000	50.0 lb.	\$39.40	\$1,576.12	\$ 38.82	\$1,552.83
22 or more	40	10,000	50.0 lb.	\$38.07	\$1,522.68	\$ 37.69	\$1,507.60
Annual >100	40	10,000	50.0 lb.	\$36.16	\$1,446.54	\$ 35.81	\$1,432.22
16-0-8 50% Soybean Feed Grade Professional Turf Fertilizer, Natural Based							
2-5 Pallets	80	5,000	25.0 lb.	\$21.58	\$1,726.17	\$20.90	\$1,671.84
6-11 Pallets	80	5,000	25.0 lb.	\$21.02	\$1,681.90	\$20.51	\$1,640.88
12-21 Pallets	80	5,000	25.0 lb.	\$20.23	\$1,618.36	\$19.93	\$1,594.44
22 or more	80	5,000	25.0 lb.	\$19.54	\$1,563.48	\$19.35	\$1,548.00
Annual 100	80	5,000	25.0 lb.	\$18.57	\$1,485.31	\$18.38	\$1,470.60
16-0-8 50% Soybean Feed Grade Professional Turf Fertilizer, Natural Based							
2-5 Pallets	400	1,000	5.0 lb.	\$6.46	\$2,585.93	\$6.26	\$2,504.53
6-11 Pallets	400	1,000	5.0 lb.	\$6.23	\$2,492.37	\$6.08	\$2,431.58
12-21 Pallets	400	1,000	5.0 lb.	\$5.99	\$2,396.17	\$5.90	\$2,360.76
22 or more	400	1,000	5.0 lb.	\$5.79	\$2,314.92	\$5.73	\$2,292.00
Annual >100	400	1,000	5.0 lb.	\$5.50	\$2,199.17	\$5.44	\$2,177.40

*Delivered price offered on selected areas in Minnesota. Check with sales.
 **Minimum order of any formula is 2 tons, unless in inventory or a part of another run of the same formula.
 All products are "FDA feed grade" material.

AminOrganiX Terms and Conditions

CONDITIONS OF ACCEPTANCE: Prices and terms are subject to change without notice. Orders will be shipped at prices and terms in effect at time of shipment. The terms detailed on this list apply to all orders accepted, regardless of terms requested or stated on purchase orders. All orders are subject to acceptance by AminOrganiX.

TERMS OF PAYMENT: Net 30 days. Past due accounts will be assessed interest at the legal rate. All payments should be made to AminOrganiX 3800 American Boulevard West Suite 1500 Bloomington, MN 55431

SHIPPING TERMS-F.O.B. ORIGIN: Freight will be prepaid on all "Delivered" orders to a single destination and single billing address within the seven-county metro area. All other orders are FOB Stewart, Minnesota 55385.

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WARRANTY: All Landscapers Choice and AminOrganiX products carry a customer satisfaction guarantee for the season sold.

AminOrganiX® 3800 American Boulevard West Suite 1500 Bloomington, MN 55431



2024 Key Account Pricing

Volume	Bags per pallet	Coverage (Sq. ft.)	Bag Size (pounds)	Delivered Price* (TC only)		Pick Up Price	
				per bag	pallet	per bag	pallet
24-0-8 25% Soybean Feed Grade Professional Turf Fertilizer, Natural Based							
2-5 Pallets	40	16,000	50.0 lb.	\$49.15	\$1,966.14	\$ 47.61	\$1,904.26
6-11 Pallets	40	16,000	50.0 lb.	\$47.89	\$1,915.72	\$ 46.72	\$1,868.99
12-21 Pallets	40	16,000	50.0 lb.	\$46.08	\$1,843.34	\$ 45.40	\$1,816.10
22 or more	40	16,000	50.0 lb.	\$44.52	\$1,780.83	\$ 44.08	\$1,763.20
Annual >100	40	16,000	50.0 lb.	\$42.29	\$1,691.79	\$ 41.88	\$1,675.04
24-0-8 25% Soybean Feed Grade Professional Turf Fertilizer, Natural Based							
2-5 Pallets	80	8,000	25.0 lb.	\$25.22	\$2,017.88	\$24.43	\$1,954.37
6-11 Pallets	80	8,000	25.0 lb.	\$24.58	\$1,966.13	\$23.98	\$1,918.18
12-21 Pallets	80	8,000	25.0 lb.	\$23.65	\$1,891.85	\$23.30	\$1,863.89
22 or more	80	8,000	25.0 lb.	\$22.85	\$1,827.70	\$22.62	\$1,809.60
Annual 100	80	8,000	25.0 lb.	\$21.70	\$1,736.31	\$21.49	\$1,719.12
24-0-8 25% Soybean Feed Grade Professional Turf Fertilizer, Natural Based							
2-5 Pallets	400	1,600	5.0 lb.	\$7.20	\$2,879.27	\$6.97	\$2,788.64
6-11 Pallets	400	1,600	5.0 lb.	\$6.94	\$2,775.10	\$6.77	\$2,707.42
12-21 Pallets	400	1,600	5.0 lb.	\$6.67	\$2,667.99	\$6.57	\$2,628.56
22 or more	400	1,600	5.0 lb.	\$6.44	\$2,577.52	\$6.38	\$2,552.00
Annual >100	400	1,600	5.0 lb.	\$6.12	\$2,448.64	\$6.06	\$2,424.40

*Delivered price offered on selected areas in Minnesota. Check with sales.
 **Minimum order of any formula is 2 tons, unless in inventory or a part of another run of the same formula.
 All products are "FDA feed grade" material.

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WARRANTY: All Landscapers Choice and AminOrganix products carry a customer satisfaction guarantee for the season sold.

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7/30/2024

Goal 3 Tactics – Overview of the Analysis Findings for Additional Soybean Meal and Blends in Value-Added Fertilizer and Soil Amendment Products

Tactic 1: Network with existing compost manufacturers and soil blenders for soybean meal inclusion opportunities.

There are several compost manufacturers and soil blenders in Minnesota. The most comprehensive list can be found at the Minnesota Composting Council website (<http://www.mncompostingcouncil.org/resources-for-compost-sites.html>). Most municipalities have yard debris compost sites that do not do compost refining (i.e., screening, bagging, etc.) or soil blending. However, the following organic compost facilities that source-separate do some refining and soil blending:

- Creekside Soils – Hutchinson, Minnesota
- Shakopee Mdewakanton Sioux Organics Recycling facility – Shakopee, Minnesota
- Specialized Environmental Technologies’ Empire facility – Rosemount, Minnesota
- Swift County Compost – Benson, Minnesota
- Tri-County Organics – St. Cloud, Minnesota
- Western Lake Superior Sanitation District Source Separated Compost facility – Duluth, Minnesota

Other notable soil blenders include but are not limited to:

- Kristy K Organics – Sauk Centre, Minnesota
- Plaistad Companies – Elk River, Minnesota
- Pine Products – Waconia, Minnesota
- B & D Wood Recycling and Compost – Northfield, Minnesota
- Buberl Recycling and Compost – Stillwater, Minnesota
- Davey Tree Expert Co. – St. Paul, Minnesota
- Elk River Composting – Elk River, Minnesota
- Lynde and McLeod – Maple Grove, Minnesota
- RW Farms – Carver, Minnesota
- Southern Minnesota Construction Company – Mankato, Minnesota
- Vonco II – Becker, Minnesota

Most soil blenders provide blending services based on the application's specifications. However, they are usually hesitant to incorporate novel ingredients unless their customers specify them.

Goal 3 Tactics – Overview of the Analysis Findings for Additional Soybean Meal and Blends in Value-Added Fertilizer and Soil Amendment Products

Tactic 2: Match benefits to known vertical market needs.

Benefits identified by Axiom and matched to known vertical market needs are summarized below.

Concerns/Needs Aligned with Benefits

1. **Concern/Need:** Price parity to other substitute ingredients

Benefit: Soybean meal prices will likely decrease based on increased supplies; however, the common perception is that soybeans are more expensive than other ingredients. Therefore, educating consumers, distributors and retailers about the other benefits soybean meal offers compost and soil mixes will be essential. For example, soybean meal contains organic matter, which can improve beneficial microbial activity. Because of this, soil structure is improved, nutrients are released consistently throughout a more extended period, and the soil can absorb more water.

2. **Concern/Need:** Longer release curve/feed times

Benefit: Because the nutrients in soybean meal are released more slowly, they last longer than conventional fertilizers. Longer release curves allow fewer fertilizer applications, which means less labor and lower material costs. The 7-1-7 blend has a release curve of 125-150 days. Many urea-based lawn fertilizers have a release curve of approximately 45-60 days. However, according to Google AI Lab, urea can convert to ammonium bicarbonate within 48 hours of application, which can volatilize into the air as ammonia gas.

3. **Concern:** Sustainability/local sourcing

Benefit: Soybeans are a key crop for Minnesota farmers. Soybean meal can be sourced locally from a variety of Minnesota crush operations. Because these ingredients are sourced, manufactured, and distributed locally, there should be less supply chain and price inflation risk.

4. **Concern/Need:** Low-odor ingredients

Benefit: Unlike sludge, chicken or cow manure, or fish meal, soybean meal has less odor.

Outcomes of Goal 3 Demonstration Outcomes

Goal 3, Objective 3, focused on formulating a 24-0-8 (25 percent soybean meal blend— see Figure 2 below) fertilizer product for lawn markets, conducting demonstrations, and distributing the product. AURI, Axiom, and its sister company AminOrganix discussed and then formulated the soybean meal fertilizer blend.

Form-A-Feed Manufacturing Facility in Stewart, Minnesota

The Form-A-Feed facility (Figure 1) can manufacture multiple lines of soybean meal fertilizer formulations. Form-a-Feed has plants in Stewart, Minnesota, and Richmond, Wisconsin. The states of Minnesota and Wisconsin license both blending facilities. AURI and Axiom understand that both facilities could be manufacturing sites for soybean meal fertilizers in Minnesota and the Upper Midwest.


Figure 1: Form-A-Feed Facility, Stewart, Minnesota



<https://earth.google.com>

Soybean Fertilizer Blend Labels and Specifications

Figure 2: AminOrganix 24-0-8 Blend Label



AMINORGANIX[®]
SUSTAINABLE SOLUTIONS FOR GROWTH

24-0-8

Natural Based Fertilizer
No manures, made to FDA feed grade standards
Soybean Meal content 25%

Guaranteed Analysis		Derived from:
Total Nitrogen(N)	24.00%	Urea, soybean meal, hydrolyzed poultry feather meal, sulphate of potash, potassium chloride, calcium carbonate, cobalt sulfate, iron sulfate, magnesium oxide, manganese sulfate, zinc sulfate, sodium molybdate.
21.00% Urea Nitrogen		
3.00% Water Insoluble Nitrogen*		
Available Phosphate (P ₂ O ₅)	0.00%	
Soluble Potash (K ₂ O)	8.00%	
Calcium (Ca)	0.80%	
Magnesium (Mg)	0.50%	
0.18% Water Soluble Magnesium		
Sulfur (S)	1.90%	
1.60% Combined Sulfur(S)		
0.30% Free Sulfur(S)		
Cobalt (Co)	0.0005%	
Iron (Fe)	0.70%	
0.70% Water Soluble Iron		
Manganese (Mn)	0.50%	
0.08% Water Soluble Manganese		
Molybdenum (Mo)	0.0005%	
Zinc (Zn)	0.10%	
0.10% Water Soluble Zinc		

*3.00% slowly available nitrogen from soybean meal, hydrolyzed poultry feather meal, and molasses.

Lawn and Garden Fertilizer Project
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Site Demonstrations

Arboriculture Site Demonstration

Bare root tree growth demonstration with Quarry Creek Nursery of St. Cloud, Minnesota.

At Quarry Creek Nursery, soybean meal-based fertilizers were compared with conventional fertilizers in a containerized bare-root tree application. About ten apple trees and five shade trees were planted in a standard soil media containing soybean meal-based fertilizer, while all of their other trees were planted in a standard soil media using conventional fertilizer. After three months of growth, the test trees were healthy, and qualitative observations noted no difference between the conventional and soy-based fertilizer types.

Lawn Site Demonstrations in Minnesota

Two community sites, the University of Minnesota West Central Research & Outreach Center (WCROC) sites and the City of Hutchinson were chosen to demonstrate the soybean meal fertilizer 24-0-8 blend (Figures 3 and 4). The WCROC also provided 7-1-7 soybean meal blended fertilizer for its floriculture program. The 24-0-8 fertilizer was applied in Fergus Falls and Thief River Falls in April 2024 and in Hutchinson in May 2024. The 7-1-7 was applied at the WCROC in Morris in early May, and the 24-0-8 blend was applied at the WROC in Morris in late June 2024. The Morris application incorporated the horticulturist in Morris, and the other locations incorporated work with the groundskeeping departments at each location. AURI and MSR&PC delivered the product and assisted with the applications in Morris and Hutchinson. AURI delivered the product and assisted with the applications in Fergus Falls and Thief River Falls. The horticulturists applied the fertilizer on the plants at the WROC. The sites included:

1. Northland Community and Technical College (NCTC) in Thief River Falls (Figure 3)
2. Minnesota State Community and Technical College (M State) in Fergus Falls (Figure 4)
3. Oakland Cementary, Hutchinson (Figure 5)
4. WCROC, Morris (Floriculture) (Figure 6)

Below is a map of the locations of the selected sites.

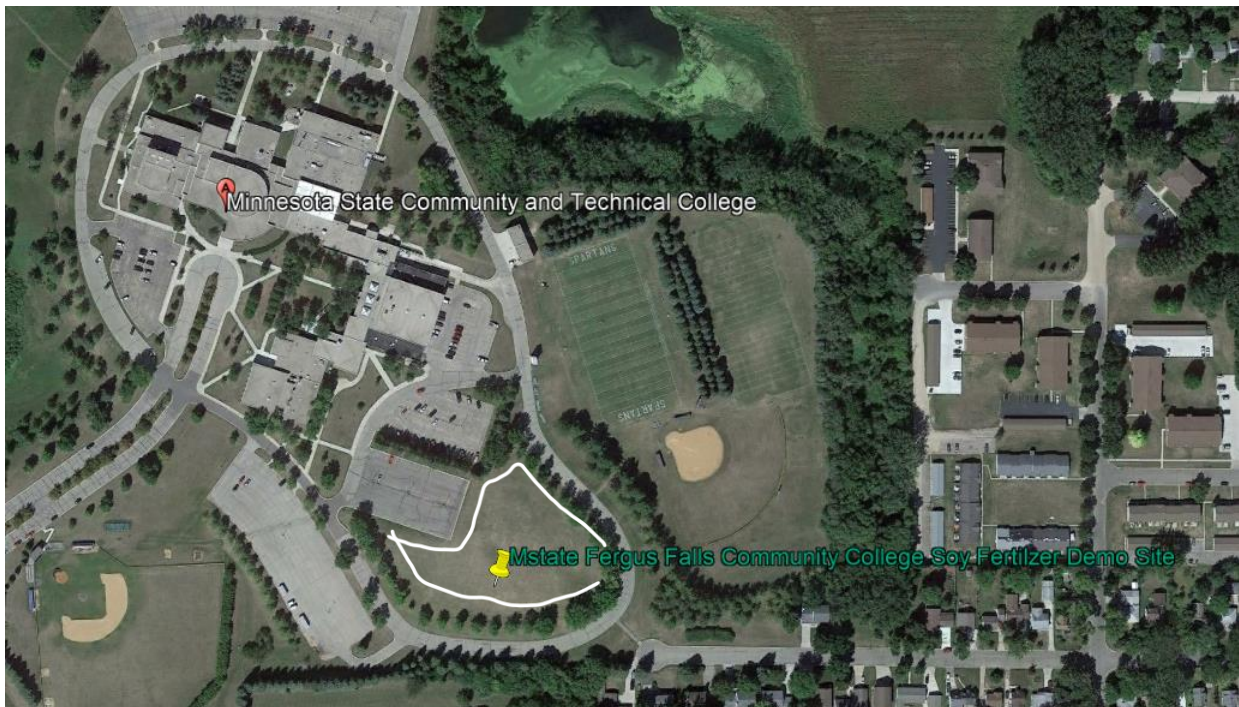
Each site comprised 100 x 100-foot application areas next to larger unfertilized grass areas. The Thief River Falls site application took place on April 23rd, and AURI staff conducted follow-up visits.

Figure 3: Northland Community and Technical College – Thief River Falls, Minnesota



<https://earth.google.com>

Figure 4: Minnesota State Fergus Falls Campus – Fergus Falls, Minnesota



<https://earth.google.com>

Figure 5: Oakland Cemetery – Hutchinson, Minnesota.



<https://earth.google.com>

Figure 6: University of Minnesota – West Central Research & Outreach Center – Morris, Minnesota.



Photo credit: Harold Stanislawski, AURI

The horticulture department at WCROC applied the 24-0-8 fertilizer blend to flowerpots in May 2024 and to the lawn in July 2024. Unfortunately, no photos of the lawn application are available. WCROC Horticulture Researcher Ella VanKempen treated the fertilized plants in Figure 7 against the control and reported that the soybean meal fertilizer performed equally well.

Figure 7: University of Minnesota – West Central Research & Outreach Center, Horticulture Department, Morris, Minnesota



Photo credit: Harold Stanislawski, AURI

Lawn demonstration application photos per site location (Figures 8-18).

Figure 8: Northland Community & Technical College Application, Thief River Falls, Minnesota



Photo credit: Becky Philipp, AURI

The product formulation was easy to apply. The material did not clump, and the spreading was uniform. The fertilizer (24-0-8 blend) was applied at the recommended rate of 1,700 square feet per 25-pound bag.

Figure 9: Minnesota State Community and Technical College, Fergus Falls, Minnesota



Photo credit: Harold Stanislawski, AURI

AURI staff worked with the maintenance department at M State in Fergus Falls for product calibration and application.

No photos were available for the applications at Oakland Cemetery in Hutchinson, Minnesota, or the WCROC Horticulture Department in Morris, Minnesota. AURI staff worked with the City of Hutchinson Public Works Department and the WCROC Horticulture Department.

Figure 10 shows the Product Evaluation (24-0-8) of soybean meal blend fertilizers as of May 13 (three weeks) in Thief River Falls at NCTC. Figure 11 depicts the product evaluation on May 29 (five weeks) after the initial application.

Figure 10: Product Application Comparison at Northland Community and Technical College, Thief River Falls, Minnesota After 3 Weeks



Photo credit: Becky Philipp, AURI
24-0-8 blend

Unfertilized area

Figure 11: Product Application Comparison at Northland Community and Technical College, Thief River Falls, Minnesota After 5 Weeks



Photo credit: Becky Philipp, AURI
24-0-8 blend

Unfertilized area

Due to the thickness of the grass, NCTC did not apply a second fertilizer application of the 24-0-8 blend. Figure 12 depicts the grass condition on September 6, 2024, with the signage placed near the southern edge of the plot.

Figure 12: Fertilized Demonstration Area at Northland Community and Technical College, Thief River Falls, Minnesota After 6 Weeks

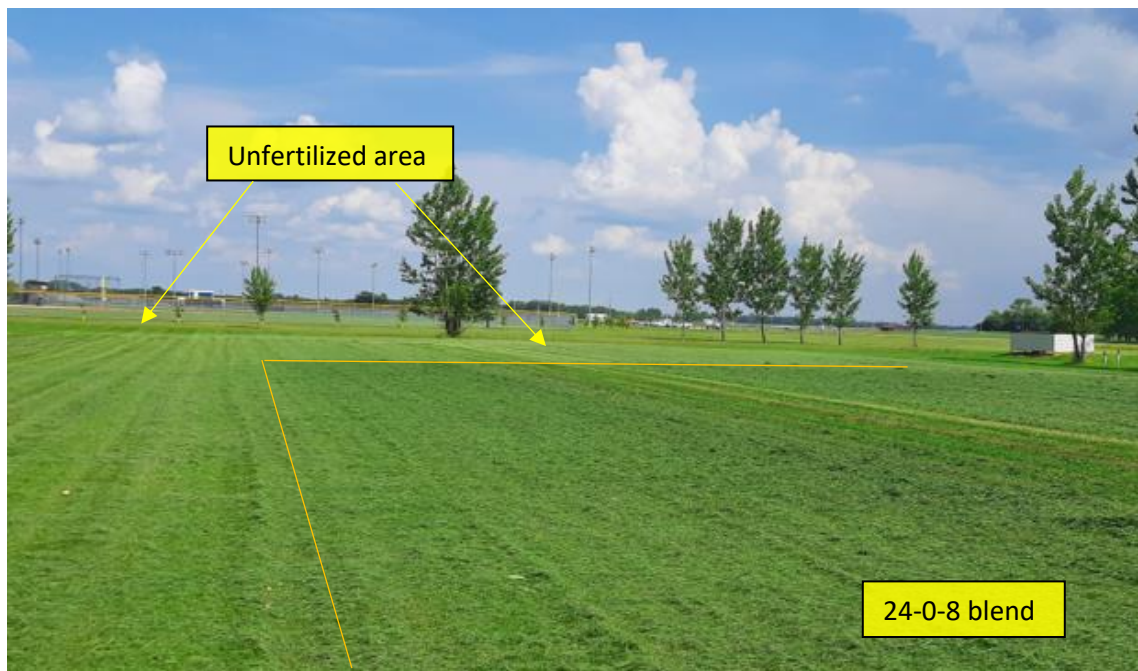


Photo credit: Becky Philipp, AURI

Figure 13: Fertilized Demonstration Area at NCTC, Shannon Boen

Positive responses were received by all of the participants in the demonstrations. According to NCTC Grounds and Roads Maintenance Coordinator Shannon Boen (Figure 13), “This spring we had the opportunity to give the 24-0-8 soybean meal blend a try on our grounds! Outstanding is the word that comes to mind. We had lots of moisture right after we applied the fertilizer and to be honest, we couldn’t keep up with the growth. I found that at times it was growing 4-5” over a weekend. Again, the conditions were perfect, and it worked great!”



Photo credit: Shannon Boen, NCTC

Like in the Thief River Falls area, M State in Fergus Falls, Minnesota, and Oakland Cemetery in Hutchinson, Minnesota, received consistent moisture throughout the product evaluation period. Figures 14 and 15 compare the fertilized portion of the grass at M State to the unfertilized grass at M State on June 26, 2024, about eight weeks after the application.

Figure 14 Product Application (24-0-8) Comparison, Minnesota State Community and Technical College, Fergus Falls, Minnesota After 8 Weeks



Photo credit: Harold Stanislawski, AURI
24-0-8 blend

Unfertilized area

Figure 15 Product Application (24-0-8) Comparison, Minnesota State Community and Technical College, Fergus Falls, Minnesota After 8 Weeks



Photo credit: Harold Stanislawski, AURI

Figure 16: M State’s Kyle Shaikoski

Kyle Shaikoski, Groundskeeper at M State Fergus Falls (Figure 16) shared with AURI that, “During the test plot this year at M State Fergus Falls, we did two treatments of fertilizer. One at the end of April and the other at the start of June. As of August 27, 2024, the test plot was still a dark rich green, thick, and extremely healthy. Looking at the product, it was easy to work with and nice to see the longevity of the product holding to this day. Looking at the area next to the test plot you can see that the grass is not healthy and needs fertilizer. Laying down strips [for athletic fields] in your turf is easy after using this product.”



Photo credit: Harold Stanislawski, AURI

Oakland Cemetery also had a good experience with the fertilizer, as depicted in Figures 17 and 18. John Olson, former city public works director in Hutchinson, Minnesota, stated, “The soybean meal fertilizer performance was outstanding.”

Figure 17: Oakland Cemetery, Hutchinson, Minnesota With Former City Public Works Director John Olson



Photo credit: Harold Stanislawski, AURI

Figure 18: Product Application (24-0-8) Comparison, Oakland Cemetery, Hutchinson, Minnesota After 4 Weeks



Photo credit: Harold Stanislawski, AURI

The 2024 growing season had abundant rainfall. This supported the performance of the fertilizer.

Goal 3 Tactics – Overview of the Analysis Findings for Additional Soybean Meal and Blends in Value-Added Fertilizer and Soil Amendment Products

Tactic 3: Conduct pricing analysis.

Soybean Meal Feed Grade Professional Turf Fertilizer, Natural Based

The pricing program from Goal 2, Tactic 3, is based on the cost to the distributor. As a result, the pricing is subject to a markup by the wholesaler or retailer. Since this analysis compares with retail pricing (i.e., Home Depot, Gertens, etc.), the pricing for the following soybean meal fertilizer in Table 3 has been doubled to account for a standard retailer markup. In addition, the lowest volume pricing tiers (i.e., two to five pallets) were used as this would reflect the reality of initial orders. As product sales grow over subsequent years, larger volumes would most likely be ordered, reducing the pricing for distributors and retailers. *NOTE: The*

prices included in Table 3 below were obtained online during July 2024 and may be subject to change based on supply and demand.

Table 3: Fertilizer Pricing Analysis						
Manufacturer	Fertilizer	Price	Bag Size	Price per Pound (lb.)	Coverage	Nutrition
AminOrganix <i>(Axiom Communications Marketing, Inc. is affiliated with AminOrganix)</i>	HI SOY	\$79.20	50 lbs.	\$1.58	5,000 sq ft	7-1-7
		\$40.76	25 lbs.	\$1.63	2,500 sq ft	
		\$12.30	5 lbs.	\$2.46	500 sq ft	
	HI SOY	\$81.42	50 lbs.	\$1.62	10,000 sq ft	16-0-8
		\$41.80	25 lbs.	\$1.67	5,000 sq ft	
		\$12.52	5 lbs.	\$2.50	1,000 sq ft	
	HI SOY	\$95.22	50 lbs.	\$1.90	16,000 sq ft	24-0-8
		\$48.86	25 lbs.	\$1.95	8,000 sq ft	
		\$13.94	5 lbs.	\$2.79	1,600 sq ft	

Select Home Depot retail synthetic and natural/organic granular fertilizers from Home Depot.com.

Table 3: Fertilizer Pricing Analysis (continued)						
Manufacturer	Fertilizer	Price	Bag Size	Price per Pound (lb.)	Coverage	Nutrition
Scotts	Turf Builder Lawn Food	\$63.47	37.5 lbs.	\$1.69	15,000 sq ft	30-0-3
		\$26.97	12.5 lbs.	\$2.15	5,000 sq ft	
	UltraFeed	\$79.97	40 lbs.	\$1.99	17,778 sq ft	40-0-5
	WinterGuard	\$61.47	32.3 lbs.	\$1.90	12,000 sq ft	32-0-10
		\$26.60	10 lbs.	\$2.60	4,000 sq ft	
	Fall	\$26.60	10 lbs.	\$2.60	4,000 sq ft	32-0-10
	Natural	\$39.86	29.1 lbs.	\$1.36	4,000 sq ft	11-2-2

	Starter (for new grass)	\$79.97 \$34.97	42 lbs. 15 lbs.	\$1.90 \$2.33	14,000 sq ft 5,000 sq ft	24-25-2
Vigoro	Vigoro	\$54.97 \$22.97	42 lbs. 14 lbs.	\$1.31 \$1.64	15,000 sq ft 5,000 sq ft	29-0-4
Pennington	Full Season	\$63.48 \$25.98	33.6 lbs. 11.2 lbs.	\$1.88 \$2.32	12,000 sq ft 4,000 sq ft	32-0-5
Greenview	Lawn Fertilizer	\$49.99 \$22.64	48 lbs. 16 lbs.	\$1.04 \$1.42	15,000 sq ft 5,000 sq ft	22-0-4
	Lawn Fertilizer	\$62.98	33 lbs.	\$1.91	10,000 sq ft	27-0-5
	Fall	\$78.39	45 lbs.	\$1.74	15,000 sq ft	30-0-12
	Starter	\$19.99	8 lbs.	\$2.59	2,500 sq ft	10-18-10
Milorganite	Lawn Fertilizer	\$19.97	32 lbs.	\$0.62	2,500 sq ft	6-4-0
Green Technologies	GreenEdge	\$21.83	40 lbs.	\$0.55	3,000 sq ft	6-2-0
Propeat	All Purpose	\$33.64 \$34.52	25 lbs. 25 lbs.	\$1.35 \$1.38	5,445 sq ft 5,445 sq ft	11-11-11 13-5-8
	Greens Grade	\$35.67	25 lbs.	\$1.42	5,445 sq ft	17-0-4
SimplyGro	Old Farmer's Almanac	\$24.05	20 lbs.	\$1.20	5,000 sq ft	10-0-2
E-blend	Lawn Fertilizer	\$54.00	40 lbs.	\$1.35	9,300 sq ft	21-0-5
	Restoration Starter	\$62.98	40 lbs.	\$1.57	8,000 sq ft	12-20-12
Purely Organic	Lawn Fertilizer	\$31.97	25 lbs,	\$1.28	Not Labeled	10-0-2

Lebanon Turf	Turf Nurture	\$48.77 \$19.99	25 lbs. 8.33 lbs.	\$1.95 \$2.40	5,000 sq ft 1,600 sq ft	15-0-7
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Select Gertens retail and professional synthetic and natural/organic granular fertilizers from Gertens.com.

Table 3: Fertilizer Pricing Analysis (continued)

Manufacturer	Fertilizer	Price	Bag Size	Price per Pound (lb.)	Coverage	Nutrition
JRK	4-Step	\$219.99	50 lbs.	\$4.39	15,000 sq ft	Various
		\$89.99	18 lbs.	\$4.99	5,000 sq ft	
	Turf Special	\$54.99	50 lbs.	\$1.10	15,000 sq ft	24-0-1
		\$19.99	18 lbs.	\$1.11	5,000 sq ft	
Starter Lawn	\$39.99	50 lbs.	\$.79	15,000 sq ft	13-25-5	
	\$16.99	18 lbs.	\$0.94	5,000 sq ft		
Winterizer	\$54.99	50 lbs.	\$1.09	15,000 sq ft	20-0-12	
	\$21.99	18 lbs.	\$1.22	5,000 sq ft		
Lebanon Turf (Professional)	Country Club	\$89.99	50 lbs.	\$1.79	10,000 sq ft	10-18-18
		\$84.99	50 lbs.	\$1.69	15,000 sq ft	16-0-18
	ProScope	\$136.65	50 lbs.	\$2.73	12,500 sq ft	13-0-5
Milorganite (Retail)	Lawn Fertilizer	\$14.99	32 lbs.	\$0.46	2,500 sq ft	6-4-0
		\$5.99	5 lbs.	\$1.20	400 sq ft	
(Professional)	Greens Grade	\$74.99	50 lbs.	\$1.50	4,000 sq ft	6-4-0
Sustane (Retail)	Early Summer	\$44.99	30 lbs.	\$1.50	5,000 sq ft	9-0-2
	Turf Starter	\$44.99	30 lbs.	\$1.50	2,500 sq ft	8-0-4
	Winterizer	\$44.99	30 lbs.	\$1.50	5,000 sq ft	8-2-4

(Professional)	All Natural	\$39.99 \$14.99	20 lbs. 5 lbs.	\$2.00 \$3.00	2,000 sq ft 500 sq ft	8-2-4
	4-6-4	\$37.50	50 lbs.	\$0.75	2,000 sq ft	4-6-4
	4-6-4 Greens	\$49.99	50 lbs.	\$1.00	2,000 sq ft	16-4-8
	16-4-8	\$116.81	50 lbs.	\$2.33	8,000 sq ft	16-4-8
	18-1-18	\$124.44	50 lbs.	\$2.48	9,000 sq ft	18-1-8
Fertilome	Starter	\$14.99	4 lbs.	\$3.00	1,000 sq ft	9-13-7
Down to Earth	All Purpose	\$16.99	5 lbs.	\$3.40	400 sq ft	4-6-2
Coop Poop	Organic Lawn and Garden	\$19.99	40 lbs.	\$0.50	4,000 sq ft	2-4-3
		\$7.99	6 lbs.	\$1.33	600 sq ft	

Select SiteOne professional granular fertilizers from individual microsites of various Twin Cities depot locations.

Table 3: Fertilizer Pricing Analysis (continued)						
Manufacturer	Fertilizer	Cost	Bag Size	Price per Pound (lb.)	Coverage	Nutrition
Lesco	36-0-6 Poly	\$98.60	50 lbs.	\$1.97	12,000 sq ft	36-0-6
	24-3-12 Poly	\$84.06	50 lbs.	\$1.68	12,000 sq ft	24-3-12
	10-0-20 Poly	\$47.51	50 lbs.	\$0.95	10,000 sq ft	10-0-20
	14-14-14	\$70.91	50 lbs.	\$1.42	13,200 sq ft	14-14-14
	14-2-14 Elite	\$65.32	50 lbs.	\$1.31	13,200 sq ft	14-2-14
	Basic Nutrition	\$35.79	50 lbs.	\$0.72	14,000 sq ft	24-0-4

Lebanon Turf	Country Club 27-0-5	\$76.81	50 lbs.	\$1.54	26,000 sq ft	27-0-5
	Country Club 18-0-8	\$59.99	50 lbs.	\$1.20	15,000 sq ft	18-0-18
	Country Club 14-7-14	\$84.99	50 lbs.	\$1.70	11,400 sq ft	14-7-14
Shaw's	Turf Food	\$37.23	50 lbs.	\$0.74	20,000 sq ft	30-0-6
Milorganite	Professional Grade	\$23.10	50 lbs.	\$0.46	4,000 sq ft	6-4-0
Sustane	18-1-18	\$107.83	50 lbs.	\$2.16	9,000 sq ft	18-1-18
	8-2-4	\$95.67	50 lbs.	\$1.91	4,000 sq ft	8-2-4

Select Fleet Farm retail granular synthetic/natural fertilizers from Fleetfarm.com.

Table 3: Fertilizer Pricing Analysis (continued)						
Manufacturer	Fertilizer	Price	Bag Size	Price per Pound (lb.)	Coverage	Nutrition
Scotts	Turf Builder	\$59.99	39.56 lbs.	\$1.52	15,000 sq ft	30-0-3
	Winterguard	\$59.99	32.3 lbs.	\$1.88	12,000 sq ft	2-0-10
		\$9.99	15.32 lbs.	\$0.65	5,000 sq ft	
	Lawn Fertilizer	\$12.99	15 lbs.	\$0.86	5,000 sq ft	26-0-3
		\$59.99	32.3 lbs.	\$1.86	12,000 sq ft	32-0-10
Fall	\$9.99	15.32 lbs.	\$0.65	5,000 sq ft		
Superior	Lawn Fertilizer	\$21.99	32 lbs.	\$0.68	10,000 sq ft	25-0-6
	Starter	\$24.99	32 lbs.	\$0.78	10,000 sq ft	12-20-06

	Winterizer	\$21.99	32 lbs.	\$0.69	10,000 sq ft	19-0-11
Milorganite	Lawn Fertilizer	\$12.00	30 lbs.	\$0.40	2,500 sq ft	6-4-0
Superior	All Natural Fertilizer	\$9.99	36 lbs.	\$0.28	2,500 sq ft	5-5-0
Espoma	Lawn Food	\$14.99	28 lbs.	\$0.53	5,000 sq ft	15-0-5

Conclusion: Soybean meal-based fertilizer is cost-competitive.

Goal 4 Tactics – Overview of Value Chain Identification and Sales Pathway Findings

Tactic 1: Identify commercialization partners for soybean meal fertilizer and compost products.

Below are commercialization partners identified for soybean meal fertilizer and compost products.

- Primary high-potential commercialization partners could include:
 - Form-a-Feed
 - Minnesota, Wisconsin, and North Dakota soybean producer associations
 - Farmer’s Union Industries / Farmers Union Enterprises
 - Cooperatives such as CHS
 - Minnesota Department of Transportation
 - City of Hutchison
 - Minneapolis Parks & Recreation
 - Lunseth
- Secondary commercialization partners could include:
 - True Value Hardware
 - Ace Hardware
- Shakopee Mdewakanton Sioux Community (SMSC) could include:
 - SMSC metropolitan composting facility
 - Dundee Landscaping
 - Gertens
 - Plaisted
 - Central Landscape Supply

Outreach

In support of Goal 4, regarding outreach efforts, AURI hosted a podcast titled “Agricultural Innovation: Soybean Meal Fertilizer” and published it on AURI’s website on August 21, 2024. Website promotional copy and interview link are included in Appendix B. The podcast is also posted on AURI’s website (<https://auri.org/auri-news/2024/08/21/agricultural-innovation-soybean-meal-fertilizer/>). AURI promoted the podcast in its September e-newsletter, *AURI Ag Innovation News Update* (see Appendix C), and through various podcast platforms, including Spotify, YouTube Music, Apple Podcast, BluBry, and others.

AURI also published an article titled “Fueling Potential for Soy Fertilizers” in its AURI Ag Innovation News, November 2023-January 2024 issue. It highlights the soybean fertilizer blends. A copy of the article is included in Appendix D.

AURI Business and Industry Development Director Harold Stanislawski and Business Development Director of Biomass Feedstocks Brad Matuska attended the 2024 Northern Green Expo tradeshow in St. Paul, Minnesota, on January 24, 2024. There were approximately 5,000 attendees at the event, comprised of various industry professionals representing areas such as landscape contractors, arborists, golf courses, sports turf, parks/recreation professionals, and more. Northern Green is the premier lawn, garden, turf applications, and tree fertilizer tradeshow. AURI had a booth at the tradeshow and handed out fertilizer samples to potential buyers. Booth traffic was steady, with an average of five to six people visiting the booth per hour. There was a lot of activity and interest in the soybean meal blended fertilizer. AURI connected with fertilizer horticulture integrators and visited with attendees representing nurseries, tree growers, greenhouses, Sustane, etc. (Figure 19). Specifically, Matuska connected with Quarry Creek Nursery, resulting in a demonstration of bare root tree growth with the fertilizer mentioned earlier in the report.

Figure 19: AURI and visitors from American Peat Technologies at Northern Green Expo



Photo credit: American Peat Technologies

In collaboration with AminOrganix (Figure 20), AURI debuted the soybean meal fertilizer blends 7-1-7, 16-0-8, and 24-0-8 blends at the 2024 Minnesota Farmfest in Redwood Falls, Minnesota, August 6-8, 2024. Questions were fielded from farmers, government officials, elected officials, and industry representatives who stopped by the booth. Farmfest attendees had a chance to see the product display and were provided with an informational handout. Questions were posed regarding performance, cost, and availability. This year’s attendance at the three-day event was estimated at over 27,000 people.

Figure 20: Mike Reiber, Minnesota Farmfest Booth and Display



Photo Credit: Lisa Martinez, AURI

AURI also developed a one-page handout on soybean meal fertilizer blends as part of the project for use at tradeshow and expos. The handout has been at Farmfest and the Big Iron Farm Show in West Fargo, North Dakota. A copy of the handout is included in Appendix E.

Posters were also developed to further educate the public about soybean meal fertilizer products at upcoming tradeshow events, such as the 2024 Prairie Grains Conference and the 2025 Minnesota Ag Expo, Mankato, Minnesota.

Regarding identifying commercialization pathways, AURI promoted the soybean meal business opportunity to Farmers Union Enterprises (FUE) and CHS, Inc. FUE is interested in supporting the possible utilization of soybean meal fertilizers in Safety Rest Areas and Waysides opportunities with its company, Green View. The Minnesota Department of Transportation contracts with Green View to provide custodial services at Minnesota safety rest areas. CHS Inc. owns the Cenex Convenience Stores and could add soybean meal fertilizers to their product lines. AURI Business and Industry Development Director Harold Stanislawski met with the CHS New Horizons Manager concerning their interest in soy-based fertilizers and distribution. In addition to planning a follow-up meeting

with CHS, AURI is also working to arrange a meeting with Forma-A-Feed, Inc., to discuss distribution opportunities. The organizations mentioned above represent potential value chain channels.

Conventional distribution was also explored with existing green industry distributors. There is interest in distributing these products, but more education is needed.

Axiom and the MSR&PC also conducted outreach to increase awareness of soybean meal fertilizer blends. On September 11, 2024, Axiom released results from its 2024 Lawn Fertilizer Survey to subscribers of Axiom's lawn and marketing surveys and all lawn/garden and greenhouse trade publications. A copy of the announcement is included in Appendix F. AminOrganix also participated in an article entitled "They're using Soybean Meal in Lawn Fertilizer," published in the November 4, 2024, volume 48 number 4 issue of *Farm Show* magazine. A copy of the article is included in Appendix G and is also available at <https://www.farmshow.com/article.php?aid=39579>. *Farm Show* has 300,000 readers in the U.S. and Canada. MSR&PC posted information about the demonstration held in the city of Hutchinson on its blog on May 15, 2024 (see Appendix H).

Harold Stanislawski will attend Bio Innovations Midwest on September 23-24 in Omaha, Nebraska. This event highlights bio innovations, value chains, and supply chains. Opportunities to advance the soy complex within these areas will be explored.

Conclusion and Recommendations

Soybean meal-based fertilizer is cost-competitive. Soybean meal blend fertilizers have market opportunities for residential and selected institutional markets. The targeted homeowner market fertilizer using soybean meal blends formulated and manufactured in Minnesota (7-1-7, 16-0-8, and 24-0-8) contains commodity soybean meal. These blends and comparable products would be the primary products for lawn and garden markets.

More educational awareness is needed on the benefits of soybean meal for plant nutrition and soil nutrition. This could be accomplished by distributing available science-based informational materials about soybean meal as fertilizer in the University of Minnesota network and through the private horticultural lawn and garden sector. Continued work is recommended to develop distributor and value chain relationships to advance market sales opportunities.

Further marketing research and promotion of these blended and natural-based fertilizer options will be critical for the future growth of soybean meal in fertilizer applications. Research from this project indicates that Minnesota has manufacturing capabilities, distribution options, adequate sources of soybean meal grown by Minnesota farmers, and interest from consumers and horticultural operators.

Work in the soybean meal fertilizer area will continue in 2025. The MSR&PC approved an AURI project to formulate liquid soybean meal fertilizers suitable for horticultural settings, and project activities are underway.

With the increased demand for soybean oil and expanded crush facilities, such as the North Dakota Soybean Processors Plant in Casselton, North Dakota (pictured below), the supply of soybean meal will grow. The North Dakota Soybean Processors crush plant generates 3,000 tons of soybean meal daily.



***North Dakota Soybean Processors Plant, Casselton, ND
Photo Credit: Jeff Beach, North Dakota Monitor***



***Soybean Meal
Photo Credit: Minnesota Soybean Processors***

References

Minnesota Department of Agriculture. (2024, September). *Fertilizer Use and Sales Data*. Retrieved from Minnesota Department of Agriculture: <https://www.mda.state.mn.us/pesticide-fertilizer/fertilizer-use-sales-data>

Appendices

NOTE: Please see the PDF Attachment Section to view each Appendix included herein.

Appendix A: 2024 National Lawn Fertilizer Study by Axiom

Appendix B: AURI Soybean Meal Fertilizer Podcast Promotion, AURI Website

Appendix C: AURI Soybean Meal Fertilizer Podcast Promotion, [Ag Innovation News Update](#)

Appendix D: AURI Ag Innovation News Article, “Fueling Potential for Soy Fertilizers”

Appendix E: Handout - Minnesota Grown Soybean Meal Fertilizer Blends for Lawn and Garden

Appendix F: 2024 National Lawn Fertilizer Survey Results Announcement by Axiom

Appendix G: *Farm Show* Article, “They’re Using Soybean Meal in Lawn Fertilizer”

Appendix H: MSR&PC Blog on the City of Hutchinson, May 15, 2024