



APPLICATION FOR COMPONENT ADDITION TO NRCS

NRCS Practice Standard 629

For Acceptance of Pyrolysis
Technology

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APPLICATION FOR COMPONENT ADDITION TO NRCS Practice Standard 629:

Pyrolysis Technology

REQUEST

As dairy farms face increasing scrutiny from environmental, regulatory, and legal stakeholders regarding manure management and waste treatment, interest in practical, science-based technologies continues to grow. Among the emerging options, pyrolysis systems—which thermochemically convert manure solids into stable, carbon-rich biochar—are gaining attention for their potential to enhance nutrient stability, reduce waste volume, and support circular resource use on dairy farms. However, dairy producers often rely on information provided by equipment suppliers, which can limit the objective evaluation needed to fully understand system performance and environmental outcomes.

To address this challenge, Washington State University, in partnership with Newtrient, developed a standardized evaluation framework aligned with the NRCS Conservation Practice Standard (CPS) Waste Treatment (629). Newtrient has applied this framework to evaluate pyrolysis technology under commercial dairy conditions, including a field-based assessment of the pilot Biomass Controls PBC system operating at Spruce Haven Dairy. This evaluation provides consistent, science-based insights into the feasibility, performance, and potential conservation benefits of pyrolysis as a manure treatment technology.

This inclusion request is submitted for consideration under NRCS CPS 629 and is intended to inform the potential adoption of pyrolysis systems within the practice standard. Based on current findings, pyrolysis offers a promising pathway for converting dairy manure into a stabilized, nutrient-rich biochar while supporting broader goals related to environmental protection, resource conservation, and on-farm sustainability.

BRIEF DESCRIPTION OF COMPONENT CLASS

Pyrolysis systems thermochemically convert dairy manure solids into a stable, carbon-rich biochar under controlled, oxygen-free conditions. These systems function as a waste-treatment component by reducing moisture, stabilizing nutrients, lowering volatile emissions, and producing a valuable soil amendment that can support long-term nutrient management objectives on dairy farms.

DETAILED DESCRIPTION

Pyrolysis is a thermal waste-treatment process in which dairy manure solids are heated at moderately high temperatures in an oxygen-free environment, resulting in the

conversion of organic material into three primary products: biochar, non-condensable gases, and condensable vapors/bio-oils. For manure-based systems, the primary desired output is biochar, a stabilized carbon-rich material suitable for agronomic and other uses.

A typical dairy manure pyrolysis system includes the following component operations:

1. Feedstock Preparation:

Manure is collected, mechanically separated to maintain system energy balance and improve the carbon content of the biochar produced, and partially dried to achieve the moisture content required for efficient thermochemical conversion. Moisture reduction may occur through screw press or other waste separation technologies, passive or forced drying systems, or integrated thermal dryers. Consistent particle size and moisture content are critical to maintaining controlled feed rates and preventing plugging.

2. Thermal Conversion:

Prepared solids enter an oxygen-limited reactor where they are exposed to elevated temperatures (generally 400–700°C) in an environment with limited or no oxygen. Under these conditions, the organic fraction of the manure degrades through thermal decomposition, resulting in significant reductions in volatile mass, destruction of pathogens, and stabilization of nutrients.

3. Heat Recovery and System Integration:

Waste heat and hot gases produced during pyrolysis may be captured and recirculated to support upstream drying, thereby improving system efficiency and reducing external energy demands. Some systems incorporate automated controls, sensors, and remote monitoring to maintain consistent operating conditions.

4. Biochar Handling and Use:

The resulting biochar is a dry, friable material with concentrated carbon, phosphorus, potassium, and stabilized nitrogen compounds. Biochar's physical and chemical properties allow it to serve as a soil amendment with potential benefits including improved water-holding capacity, enhanced nutrient retention, reduced bulk density, and long-term carbon sequestration. Its stability makes it suitable for transport and use in field applications, nutrient management

programs, or specialty markets. Other markets such as carbon filters are also being developed for biochar.

5. Environmental and Waste Treatment Functions:

Pyrolysis reduces overall waste volume, converts nutrients into more stable forms, and lowers methane emissions, odors, and pathogens as compared to untreated manure solids. By transforming manure into a consistent, stable product, pyrolysis functions as a waste treatment component consistent with CPS 629 objectives, particularly related to nutrient stabilization, environmental protection, and improved waste handling.

This component class supports dairy producers seeking an alternative waste treatment pathway that enhances nutrient recovery, promotes circular resource use, and creates a marketable byproduct while meeting NRCS conservation and environmental management goals.

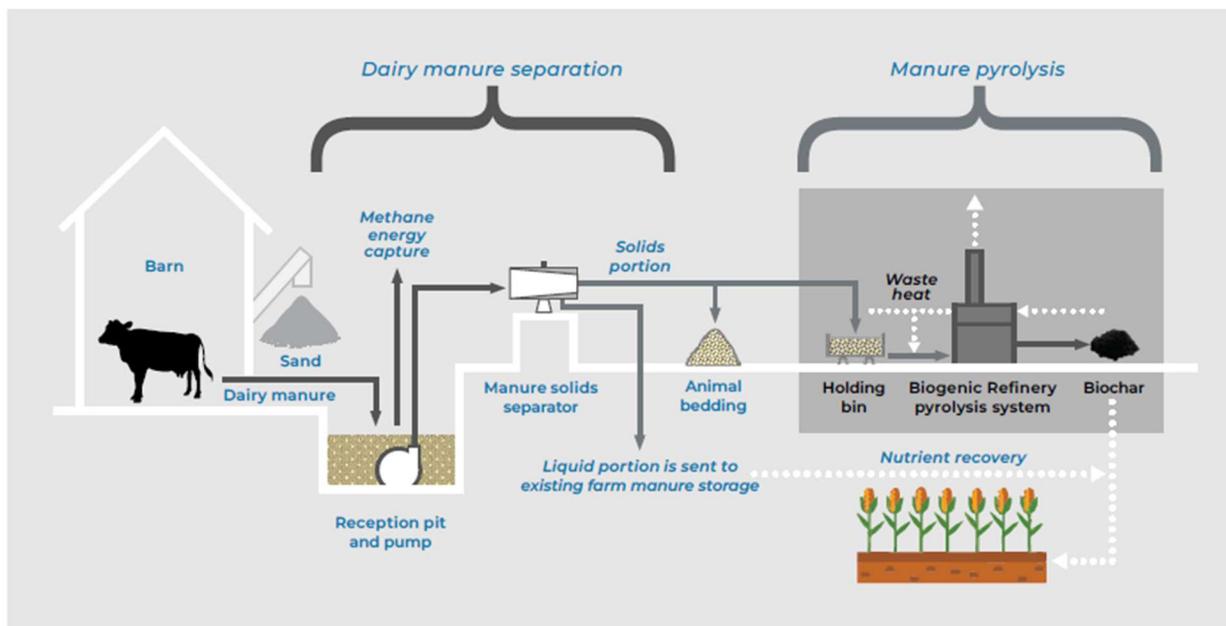


Figure 1: A general overview of the manure management at Spruce Haven Farm (<https://biomasscontrols.com/project-products/>)

THE PROCESS

At Spruce Haven Farm, dairy manure follows a multi-stage treatment pathway (Figure 1) that integrates sand separation, anaerobic digestion, solids separation, drying, and pyrolysis. Following sand separation, manure from freestall barns first enters a

reception pit, where it is directed into the anaerobic digester. Methane (CH₄) gas produced during digestion is captured. Some of the biogas is used for on-farm energy, and the remainder is cleaned and injected into a natural gas pipeline. After digestion, the manure is pumped to a screw press separator, which divides the stream into liquid effluent and press solids. A portion of the nutrients is contained in each waste stream.

The solids are stored in a hopper and then fed into a prototype hydronic jacket dryer that uses recaptured thermal energy from the pyrolysis unit to reduce moisture content. Once dried, these solids enter the Biomass Controls pyrolysis system via a feed auger that conveys them into the pyrolysis chamber. Inside the chamber, the material is thermochemically transformed at high temperatures in an oxygen-free environment, breaking down volatile compounds and leaving behind a carbon-rich biochar (Figure 2).

The hot air and gases generated during this process are harnessed to assist in drying subsequent manure solids batches, improving thermal efficiency and reducing external energy input. The system's design includes feedback loops for heat recovery, automated augers for controlled feeding, and a biochar collection system for finished product handling. This pyrolysis unit operates most effectively at a feedstock moisture range of 35–40%, producing a consistent and nutrient-dense biochar.

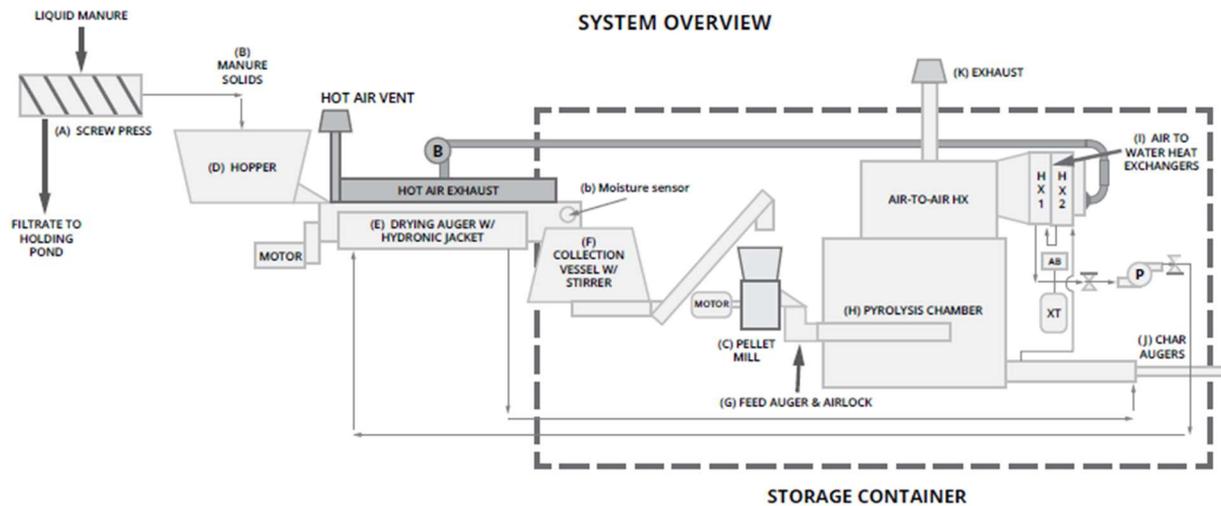


Figure 2. Schematic of the pyrolysis unit set up in use at Spruce Haven Farm. Currently the pellet mill is not being used. (Provided by Lucinda Lu, Cornell University).

HOW PROPOSED SYSTEM ACCOMPLISHES PURPOSES OF THE STANDARD

Pyrolysis supports the purposes of NRCS Conservation Practice Standard 629 by providing a controlled, oxygen-free thermochemical process that stabilizes nutrients,

reduces waste volume, and minimizes risks to soil, water, and air quality. High-temperature treatment (400–700°C) converts manure solids into a carbon-rich biochar while destroying pathogens, lowering volatile emissions, and preventing combustion-related pollutants.

The process concentrates and stabilizes key nutrients, including carbon (C), phosphorus (P), potassium (K), and a portion of nitrogen (N), calcium (Ca), and magnesium (Mg) thereby reducing the potential for nutrient leaching or runoff. By producing dry, lightweight, and stable material, pyrolysis improves manure handling, storage, and transport. The resulting biochar provides long-term agronomic benefits such as enhanced soil structure, nutrient retention, water-holding capacity, and carbon sequestration. Additional markets are also being developed for the use of biochar.

Newtrient (<https://www.newtrient.com/>), a company sponsored by the dairy industry and committed to enhancing value and sustainability in manure management, has conducted a thorough assessment of technology systems and practices within the field, focusing on their impact on critical environmental metrics, specifically water quality. The information in this report is based on an evaluation of the pilot-scale pyrolysis technology at Spruce Haven Farm in Union Springs, New York by a former Wells College professor.

This evaluation focused on environmental outcomes, operational feasibility, nutrient stabilization, and system reliability—key elements relevant to NRCS waste treatment objectives. Additional supporting information from the field study at Spruce Haven Farm and from Biomass Controls demonstrates the capacity of pyrolysis to consistently produce a stabilized biochar product and reduce environmental risks associated with raw manure solids.

In support of this discussion, Appendix A provides a summary of the environmental benefits associated with manure-to-biochar conversion. Appendix B includes a technology evaluation of a pilot-scale pyrolysis system at Spruce Haven Farm in New York, and these findings highlight key benefits and challenges. Appendix C contains the final report from the field study conducted by a former Wells College professor, offering deeper insights into system performance and the operational advantages of integrating manure preprocessing with pyrolysis technology.

Reducing nutrient content, organic strength

Pyrolysis reduces the concentration of volatile organic compounds and stabilizes organic matter, converting labile nutrients into more stable forms. While some N is lost as gases

during thermal treatment (generally as N₂ gas), C, P, and K are concentrated in the biochar, producing a nutrient-stabilized, slow-release, and low-moisture material that lowers the risk of nutrient leaching and runoff when paired with adequate nutrient planning and erosion control. This transformation decreases the organic strength of raw manure while retaining long-term agronomic value in a stable, transportable product.

Reducing odor and gaseous emissions

Pyrolysis reduces odors and gaseous loss by thermochemically converting manure solids in an oxygen-free environment. Moderately high temperature treatment (400–700°C) of pyrolysis thermally breaks down organic material reducing odor-causing compounds, while preventing the uncontrolled release of gases associated with raw or partially treated manure. For the unit evaluated, the syngas is utilized in the combustion chamber generating heat and further reducing odors. The resulting biochar stabilizes nutrients and is low in moisture, further minimizing odor and gas release during storage or land application.

Facilitating desirable waste handling and storage

The pyrolysis process facilitates improved waste handling and storage by converting wet, bulky manure solids into a dry, lightweight, and stable biochar. The resulting material is easier to transport, stack, and apply to fields, reducing storage space requirements and the risk of nutrient loss or leachate compared to raw or partially treated manure. This transformation supports safer, more efficient on-farm management of manure while maintaining long-term agronomic value. Manure volume is reduced by up to 90 percent, making it more economical to transport longer distances.

Producing value added byproducts that facilitate manure and waste utilization

Pyrolysis produces a value-added byproduct—biochar—that enhances manure and waste utilization. This stabilized material concentrates nutrients such as C, N, P, K, Ca, and Mg making them more suitable for agronomic use, while also improving soil structure, water-holding capacity, and carbon sequestration. By converting raw manure into a manageable, transportable product, it supports circular nutrient use and sustainable waste management practices on the farm. Other markets and uses for biochar are also being pursued.

RANGE OF VOLUMETRIC AND MASS FLOW CAPACITIES AS WELL AS HYDRAULIC RETENTION TIME

The following section provides an overview of key operational parameters that influence the performance of a pyrolysis system. These parameters may vary depending on facility design, herd size and type, feedstock characteristics, system configuration, and the use of manure preprocessing technologies.

- *Volumetric Flow*: The volumetric flow of manure solids entering the pyrolysis system depends on the throughput of the screw press or other separation technology and drying auger. In the Spruce Haven evaluation, solids were manually processed in discrete batches, with flow controlled by the feed auger into the pyrolysis chamber. Volumetric flow is variable and depends on solids moisture content, particle size, and preprocessing configuration.
- *Mass Flow*: Mass flow of solids into the pyrolysis unit is determined by the screw press or other separation technology output and the dryer's ability to reduce moisture. In the study, wet solids from the screw press were further dried to a target moisture content of 35–40% before pyrolysis. Mass flow was intermittent, reflecting manual batch feeding rather than continuous operation. Under optimal conditions, the system produced consistent biochar outputs once feed parameters were maintained.
- *Hydraulic Retention Times (HRT)*: While pyrolysis is a thermochemical rather than liquid-based process, HRT can be interpreted as the residence time of solids in the pyrolysis chamber. In the Spruce Haven system, solids were retained long enough to achieve full thermochemical conversion, with continuous movement through feed and char augers. Residence time was influenced by feed rate, auger speed, and solids moisture content, generally ranging from several minutes to approximately one hour per batch to ensure complete conversion.

DESIRED FEEDSTOCK CHARACTERISTICS

To ensure consistent and efficient operation of a pyrolysis system, the following feedstock characteristics are desired:

- **Moisture Content**: 35–40% moisture in solids is optimal for efficient thermochemical conversion. Higher moisture (>40%) can reduce pyrolysis efficiency, limit heat generation, and increase the risk of inlet plugging.
- **Particle Size/Consistency**: Uniform particle size improves feed flow and reduces the potential for clogging. Solids may be shredded, pelletized, or otherwise homogenized to achieve consistent size.
- **Solids Content**: Manure solids should be separated from liquid manure via a screw press or equivalent coarse solids separation system. Higher solids content

supports stable feed into the pyrolysis chamber. For sand bedded dairies, sand separation should be performed before solids enter the pyrolysis chamber.

- **Organic Matter Composition:** Feedstock should contain a high proportion of carbon-rich material to maximize biochar yield. Preprocessing through anaerobic digestion may slightly alter nutrient composition but does not impede pyrolysis.
- **Free of Large Debris:** Non-organic contaminants, such as stones, plastics, or metals, should be removed to prevent mechanical damage and maintain system longevity.
- **Temperature and Storage:** Feedstock should be stored in covered hoppers or bins to prevent excessive moisture gain or drying prior to processing.

EXPECTED SYSTEM PERFORMANCE

Pyrolysis systems are designed to convert manure solids into a stable, nutrient-rich biochar while minimizing environmental impacts and supporting improved waste management. Under controlled, oxygen-free conditions and high temperatures, these systems reduce the volume of organic material, stabilize nutrients, and destroy pathogens. The process concentrates key nutrients—C, N, P, K, Ca, and Mg—in the resulting biochar, producing a low-moisture, safe, and valuable commodity as a soil amendment suitable for land application or other uses. Expected system performance depends on feedstock characteristics, moisture content, particle size, and operational parameters such as feed rate and residence time, which together determine the efficiency, consistency, and quality of the biochar produced.

- *Changes in form or handling characteristics*

The pyrolysis process transforms wet, bulky manure solids into a dry, lightweight, and stable biochar, fundamentally altering its physical form and handling properties. According to the Spruce Haven evaluation, manure solids were first processed through a screw press and prototype hydronic jacket dryer to achieve a target moisture content of 35–40% prior to pyrolysis. The resulting biochar was substantially lower in moisture than the original solids, and the volume was greatly reduced, facilitating easier transport, stacking, and storage.

The thermochemical conversion also reduces the organic mass and bulk density of the feedstock. In the study, biochar output was consistent once the unit was operated under optimal moisture and feed conditions, demonstrating that the material can be handled more efficiently than raw or

partially treated manure. Reduced stickiness and improved flow characteristics minimize clogging and simplify mechanical handling for land application via spreading or incorporation into soil.

Overall, the change in form from wet, high-moisture manure solids to dry, friable biochar enhances operational efficiency, reduces storage space requirements, and lowers the potential for nutrient loss or leachate during storage or land application.

- *Nutrient fate or end use projections*

The pyrolysis process alters the form and availability of key macro-nutrients—C, N, P, and K—in manure solids. According to the Spruce Haven evaluation, biochar produced from anaerobically digested and undigested manure exhibited higher concentrations of C, P, and K compared to the feedstock, reflecting both moisture reduction and nutrient densification. Since a portion of the C was utilized in generating biogas with the digested manure, the resulting C levels were lower in those manure samples.

N behaved differently: while total N was largely retained, a portion was lost during pyrolysis, primarily as nitrogen gas (N_2), as estimated in the study. Ammonium (NH_4^+) content decreased significantly during the thermochemical conversion, whereas total organic N remained concentrated in the biochar, resulting in a stable nitrogen form less prone to leaching or volatilization.

P and K were concentrated in the biochar, with P densified by approximately 7.3–7.9 times compared to dried solids after the prototype hydronic dryer. This transformation reflects both nutrient retention and partial stabilization, producing a slow-release form that can be safely applied to soils while minimizing the risk of surface water contamination when paired with adequate nutrient planning and erosion control.

Note – the increased P in digested manure is due to the farm’s use of an iron-based chemical treatment in the digester to reduce the production of hydrogen sulfide (H_2S) in the biogas. Since this material is composed of iron, it also has the effect of binding with P as a flocculant, allowing more P to be removed during waste separation technologies.

- *Macro-nutrient reductions or transformations*

See ‘*Nutrient fate or end use projections*’ above.

- *Pathogen reductions or eliminations*

The pyrolysis process provides effective pathogen reduction by exposing manure solids to high temperatures (400–700°C) under oxygen-free conditions. According to the Spruce Haven evaluation, the thermochemical conversion destroyed pathogens present in both anaerobically digested and undigested manure, producing a stable biochar product that is biologically safe for handling, land application, or other uses.

High temperatures and extended residence times in the pyrolysis chamber denature proteins and deactivate bacteria, viruses, and other pathogens. Unlike raw or partially treated manure, biochar generated through this controlled process eliminates the risk of disease transmission to livestock, farm workers, or the surrounding environment.

The Spruce Haven study demonstrates that, once feedstock moisture and solids consistency were optimized, pathogen destruction was consistently achieved, highlighting pyrolysis as a reliable method for producing a biologically safe soil amendment.

- *Air quality*

The pyrolysis process improves air quality by minimizing the release of odor-causing compounds and volatile gases from manure solids. According to the Spruce Haven evaluation, high-temperature thermochemical conversion under oxygen-free conditions breaks down organic material reducing odor causing compounds, preventing the uncontrollable release of gases and air pollution commonly found in raw or partially treated manure.

Because the system operates in a sealed, controlled environment, the potential for uncontrolled gaseous release is greatly reduced compared to open storage or conventional treatment methods. The biochar product is low in moisture and stable, further limiting odor generation during storage or land application.

- *Water quality*

The pyrolysis process supports water quality protection by stabilizing nutrients in manure solids and reducing the risk of nutrient runoff or leaching. According to the Spruce Haven evaluation, conversion of manure into dry, low-moisture biochar concentrated nutrients such as C, N, P, K, Mg, and Ca while reducing moisture content and the mobility of labile compounds.

By transforming wet, high-moisture solids into a stable, friable product, the potential for surface water contamination or groundwater infiltration from raw manure is minimized. The biochar can be safely stored and transported, further preventing nutrient loss during handling. Additionally, pathogen destruction during pyrolysis reduces the risk of waterborne disease spread associated with untreated manure.

PROCESS MONITORING AND CONTROL SYSTEM REQUIREMENTS

Effective process monitoring and control are critical to ensuring optimal performance, nutrient stabilization, pathogen reduction, and operational reliability in pyrolysis systems. Maintaining precise control over feedstock moisture, temperature, and feed rates prevents process upsets, reduces odor, maximizes biochar quality, and ensures consistent nutrient retention. Continuous oversight allows operators to respond promptly to deviations, maintaining the controlled, oxygen-free environment necessary for efficient thermochemical conversion.

Required Monitoring:

During system operation, the following parameters should be routinely monitored:

- **Feedstock moisture content**, to ensure solids are within the optimal 35–40% range for efficient pyrolysis.
- **Pyrolysis chamber temperature**, to confirm target temperatures (400–700°C) are maintained for nutrient stabilization and pathogen destruction.
- **Feed rate and mass flow**, to maintain proper residence time and avoid overloading the pyrolysis chamber.
- **Residence time of solids**, to verify complete thermochemical conversion.
- **Visual inspection** of augers, hoppers, and char output for consistency, clogs, or irregular flow.

Required Control:

Operators must actively manage and adjust the following during operation:

- **Feedstock input rate and auger speed**, to maintain consistent residence time and prevent blockages.
- **Moisture adjustment**, including pre-drying or dryer control, to achieve target solids moisture.

- **Pyrolysis temperature and heating rate**, to ensure complete conversion, nutrient stabilization, and pathogen elimination.
- **Char removal and collection**, to prevent accumulation in the chamber and maintain smooth flow.
- **Preprocessing or particle size adjustments**, if necessary, to maintain uniform feedstock consistency.

Equipment Included for Monitoring:

Typical monitoring tools and sensors integrated into the system may include:

- Temperature probes or thermocouples within the pyrolysis chamber.
- Moisture sensors for feedstock prior to and during entry into the chamber.
- Flow meters on feed augers to track solids throughput.
- Visual inspection protocols to assess feedstock flow, chamber operation, and biochar consistency.

Equipment Included for Controlling:

To manage pyrolysis conditions, the system commonly includes:

- Automated feed augers with adjustable speed to regulate solids input.
- Dryers or preheating systems to achieve target feedstock moisture. The Spruce Haven project used a prototype hydronic dryer and required numerous adjustments and modifications throughout the study.
- Pyrolysis chamber temperature controllers and alarms to maintain thermal consistency.
- Char augers and collection systems to remove finished biochar efficiently.
- Optional preprocessing equipment (grinders, pelletizers, or screw presses) to ensure uniform feedstock.

TYPICAL OPERATIONS/MAINTENANCE PLAN WITH MONITORING REQUIREMENTS AND REPLACEMENT SCHEDULE

Pyrolysis systems are designed to efficiently convert manure solids into a stable, nutrient-rich biochar while minimizing odors, nutrient losses, and environmental risks. Maintaining system performance relies on consistent operation, proactive monitoring,

and routine maintenance to ensure proper feedstock handling, moisture content, temperature control, and biochar quality.

Below is an outline of a typical operations and maintenance plan, including key monitoring requirements and suggested component replacement schedules for pyrolysis systems.

System Monitoring

Routine and frequent monitoring is critical to maintaining optimal thermochemical conversion, consistent biochar quality, and safe system operation.

- **Feedstock Moisture:** Check moisture levels regularly (daily to weekly) using handheld meters or sensors to maintain 35–40% solids. Adjust pre-drying or dryer operation as needed.
- **Pyrolysis Temperature:** Monitor chamber temperature continuously to ensure target temperatures (400–700°C) are maintained for nutrient stabilization and pathogen destruction.
- **Feed Rate/Mass Flow:** Monitor feed auger speed and solids throughput to maintain proper residence time and avoid overloading or underfeeding the pyrolysis chamber.
- **Residence Time:** Verify solids remain in the chamber long enough for complete thermochemical conversion.
- **Visual Inspection:** Inspect the feed hoppers, augers, pyrolysis chamber, and char collection systems daily for clogs, irregular flow, or equipment wear.
- **Feedstock Consistency:** Confirm uniform particle size and composition to prevent blockages and maintain conversion efficiency.

Typical Maintenance Activities

Routine maintenance ensures the system operates efficiently, produces consistent biochar, and extends equipment lifespan.

- **Feed Augers and Conveyors:** Clean and inspect augers, screw presses or other coarse solids separation technology, and conveyors monthly or as needed to prevent blockages and maintain consistent feed.

- **Dryer/Pre-drying Systems:** Inspect heating elements, fans, and moisture sensors regularly to ensure proper drying of solids before entering the pyrolysis chamber.
- **Pyrolysis Chamber and Char Augers:** Remove ash buildup, check for wear, and lubricate moving parts according to manufacturer recommendations.
- **Temperature and Moisture Sensors:** Calibrate at least annually or replace if readings are inconsistent.
- **Preprocessing Equipment (Grinders, Pelletizers):** Maintain according to manufacturer guidelines to ensure uniform feedstock particle size.
- **Structural Components:** Inspect hoppers, bins, piping, and insulation for wear or damage; repair as needed to maintain containment and safe operation.
- **Record Keeping:** Maintain logs of monitoring data, maintenance activities, feedstock characteristics, and any operational deviations for performance review and regulatory compliance.

Replacement Schedule

- **Feed Augers/Conveyors:** Replace or overhaul every 5–7 years, depending on usage and maintenance.
- **Dryer Components:** Fans, heaters, and piping typically replaced every 5–10 years or sooner if wear affects performance.
- **Pyrolysis Chamber Components and Char Augers:** Replace or refurbish every 7–10 years, depending on thermal exposure and operational conditions.
- **Temperature and Moisture Sensors:** Calibrate annually; replace every 1–3 years or if readings become unreliable.
- **Preprocessing Equipment (Grinders, Pelletizers):** Replace or overhaul every 3–5 years per manufacturer guidelines and operational wear.
- **Structural Hoppers and Piping:** Replace every 7–10 years, depending on material type, environmental exposure, and physical wear.

CHEMICAL INFORMATION

Pyrolysis of manure solids does not require the addition of chemicals to facilitate the process. The system relies on controlled thermochemical conversion under high temperatures (typically 400–700°C) in an oxygen-free environment to stabilize nutrients, reduce pathogens, and convert feedstock into biochar. All chemical transformations occur naturally, including concentration of C, N, P, K, Ca, and Mg, reduction of NH_4^+ , and loss of volatile N as N_2 . Moisture content is managed mechanically through drying, and no external chemical amendments

are necessary for pathogen destruction, nutrient stabilization, or improved handling characteristics.

It should be noted that the higher P concentration observed in digested manure at Spruce Haven Farm is influenced by the farm's use of an iron (Fe)-based chemical in the anaerobic digester to reduce H₂S production in biogas. The Fe also acts as a flocculant, binding P and allowing more P to be removed during solids-liquid separation prior to pyrolysis. This contributes to the elevated P content in the feedstock solids, which is subsequently concentrated further in the resulting biochar.

ESTIMATED INSTALLATION AND OPERATION COST

Equipment and Installation Capital Costs

As of 2025, the vendor of the evaluated pilot pyrolysis system is only leasing their equipment. The cost to lease a pyrolysis unit, including maintenance costs, is approximately \$10,000/month and if a dryer is added, it is \$15,000/month.

Operation and Maintenance Costs (O&M)

- **Electrical**— The primary electrical costs in a pyrolysis system are associated with powering feed augers, conveyors, dryers, and the pyrolysis chamber itself (heaters, fans, and control systems). Energy usage depends on system size, feedstock throughput, and operational hours but typically represents a moderate portion of total O&M expenses. Operating costs are expected to be low, as the system can provide its own energy if the feedstock is sufficiently dry and has a high energy content. Efficient operation, proper insulation, and routine maintenance help minimize electricity consumption.
- **Labor**— Labor costs include time spent monitoring feedstock moisture (35–40%), pyrolysis chamber temperature (400–700°C), and feed rates; loading and preprocessing manure solids; removing and collecting biochar; maintaining equipment; and recording operational data. Systems with automated feed and drying controls reduce labor demands by minimizing manual intervention. Overall, labor requirements are moderate and can be optimized through automation and structured management practices.
- **Maintenance Replacement**— Maintenance expenses cover routine inspection, cleaning, and repair of augers, conveyors, dryers, pyrolysis chamber components, sensors, and feedstock preprocessing equipment. Periodic replacement of

temperature and moisture sensors, feed augers, char augers, and structural components is necessary to maintain system performance and prevent downtime. Scheduled preventive maintenance reduces the risk of costly failures and extends equipment lifespan.

EXAMPLE WARRANTY

Warranty provisions for pyrolysis systems vary by manufacturer and system design, but typical warranties generally include the following:

1. Warranty Coverage

Most warranties cover defects in materials and workmanship for a period of 1 to 3 years from the date of installation or purchase, depending on the manufacturer and system type.

2. What Is Covered

- **System Components:** Coverage typically includes key mechanical and electrical components such as feed augers, conveyors, dryers, pyrolysis chamber components, char augers, and control systems.
- **Repair or Replacement:** Defective parts identified within the warranty period are usually repaired or replaced at no cost to the owner. Terms concerning labor, shipping, and installation costs vary and should be reviewed in the warranty documentation.

3. What Is Not Covered

- **Improper Use or Maintenance:** Damage resulting from misuse, neglect, incorrect operation, or failure to follow recommended maintenance protocols is excluded.
- **Environmental or External Damage:** Damage caused by natural events (e.g., storms, flooding), power surges, or accidents is generally not covered.
- **Normal Wear and Tear:** Expected wear from regular operation, including auger motor degradation, dryer component wear, or chamber lining erosion due to thermal exposure, is excluded.
- **Unauthorized Repairs or Modifications:** Any repairs or alterations made by unauthorized personnel may void the warranty.

Owners should carefully review the specific warranty terms provided by their pyrolysis system manufacturer or vendor at the time of purchase to understand the full scope of coverage and responsibilities.

RECOMMENDED RECORD-KEEPING FOR PYROLYSIS SYSTEMS

Proper record-keeping is essential to track system performance, optimize operation, and support preventive maintenance. Records should be maintained systematically and stored in a manner that allows for easy reference. Key recommended records include:

1. Operational Data

- **Feedstock Characteristics:** Document moisture content (%), particle size, and whether manure is digested or undigested.
- **Feedstock Loading:** Record quantities of solids processed daily, including total mass and volumetric flow.
- **Pyrolysis Chamber Conditions:** Track temperature (°C), residence time (hours), and chamber operational status.
- **Dryer/Pre-Drying:** Log inlet and outlet moisture percentages, drying duration, and energy usage.

2. Biochar Output

- Quantity of biochar produced (mass and volume).
- Moisture content, C, N, P, and K concentrations in biochar.
- Observations of biochar quality, consistency, or any operational anomalies.

3. System Maintenance and Inspections

- Dates and details of routine inspections, cleaning, lubrication, or part replacements.
- Calibration records for temperature and moisture sensors.
- Notes on equipment issues, repairs, modifications, or downtimes.

4. Energy and Resource Use

- Electrical consumption for feed augers, dryers, and pyrolysis heating.
- Any auxiliary energy usage or fuel consumed.

5. Environmental Observations

- Odor levels, dust, or other air quality observations.
- Any visible signs of leachate or runoff from feedstock storage areas.

6. Compliance and Reporting

- Documentation of adherence to CPS 629 operational standards.
- Records of staff training and any corrective actions taken during operation.

ALTERNATIVES FOR THE USE OF BYPRODUCTS

The primary byproduct of pyrolysis is biochar, a carbon-rich, stable material with concentrated nutrients. Pyrolysis biochar offers multiple practical and environmentally

beneficial uses, providing flexibility for farms and other agricultural operations. Key alternatives include:

1. Soil Amendment

- Biochar can be applied directly to cropland to improve soil structure, increase water-holding capacity, and enhance nutrient retention (C, N, P, K, Ca, Mg) as a slow-release fertilizer.
- Provides long-term carbon sequestration, supporting sustainable agriculture practices.
- Can be incorporated into nutrient management plans to reduce reliance on synthetic fertilizers.

2. Compost or Manure Blends

- Biochar can be mixed with compost or liquid manure to improve aeration, absorb moisture, and retain nutrients.
- Helps reduce odors, limit nutrient leaching, and stabilize organic matter during storage or field application.

3. Animal Bedding or Feed Additive (Optional)

- In some systems, biochar can be used as a bedding amendment for livestock, improving absorbency and reducing odors.
- Certain applications explore low-percentage inclusion as a feed additive to improve digestive health and reduce ammonia emissions.

4. Horticultural or Specialty Applications

- Biochar can be incorporated into potting media, landscaping soils, or erosion control projects.
- Provides slow-release nutrient benefits and enhances microbial activity in specialized horticultural systems.

5. Energy or Industrial Uses (Optional)

- Some biochar can be further processed for use as a renewable fuel, activated carbon, or soil remediation material.
- These applications are dependent on additional processing and are less common in standard farm-scale operations.

The selection of biochar utilization depends on farm size, crop types, soil needs, and local market opportunities.

INDEPENDENT VERIFIABLE DATA DEMONSTRATING RESULTS/CREDENTIALS

Appendix A is a summary of the expert opinion and technical data available for this class of technology and how it relates to key performance indicators within NRCS Standard 629. This information is available through Newtrient.

Appendix B provides a summary of data from a Newtrient-managed third-party review of a pyrolysis unit. The data comes from a system performance analysis conducted by a former Wells College professor but has not been peer-reviewed.

Appendix C contains the full third-party report detailing the review at Spruce Haven Farm in Union Springs, NY.

CONTACT INFORMATION—VENDOR

While not an absolute conclusive list, the list below identifies vendors that are active in the application of this class of technology on manure projects within the U.S.

1. **ARTi**

Address: 1800 Dixie Street, Suite C, Des Moines, Iowa 50316

Phone: (515) 495-5101

Website: <https://www.arti.com/>

Contact: ARTi@ARTi.com

Company Information: ARTi is an international company that develops pyrolysis technologies, research and development projects, and carbon products through sustainable, healthy, and innovative processes. They manufacture and develop top-of-the line pyrolysis reactors to produce biochar, activated carbon, and “green” carbon black. Their mission is to demonstrate the value of biochar as a green technology able to sequester CO₂ from the atmosphere and bring life back into the soils. ARTi develops complete, automated, and modular biochar production systems.

2. **Kore Infrastructure Pyrolysis**

Address: 200 N. Sepulveda Boulevard, Suite 340, El Segundo, CA

Phone: (888)-858-KORE

Website: <https://koreinfrastructure.com/>

Contact: info@koreinfrastructure.com

Company Information: Kore’s mission is to commercialize an innovative solution that will rebalance profit and planet by unlocking the energy in

what humanity discards. To accomplish this, Kore produces 100% renewable energy from organic waste using a closed-loop, carbon-negative process. Kore's carbon-negative pyrolysis process offers businesses an environmentally and economically sustainable way to convert organic waste into renewable energy. This means more incentives to decarbonize, fewer landfills and incinerators, permanent carbon sequestration, and measurable environmental impact in our lifetime. At Kore, they believe we have the power to change where our energy comes from.

3. **Biomass Controls PBC**

Address: 30 Crabtree Lane Woodstock, CT 06281

Phone: (860)-315-5735

Website: <https://biomasscontrols.com/>

Contact: info@biomasscontrols.com

Company Information: Biomass Controls PBC provides innovative thermal technologies to address modern challenges in sanitation, agricultural, and food output sectors through pathogen treatment, greenhouse gas reduction, carbon sequestration, and soil health improvements. Focusing on decentralized, community scale implementations, Biomass Controls provides rapid nutrient recovery and treatment of high moisture biogenic resources such as manure, textiles, food, and excreta.

CONTACT INFORMATION—USER

There are limited commercial facilities presently operating in the U.S. with this class of technology. The list below is a best effort of identifying those facilities but may not be completely inclusive of all installations.

Pyrolysis Technology

Spruce Haven Farm – Union Springs, New York (pilot-scale)

Scott Brothers Dairy – Moreno Valley, California

OTHER CONSIDERATIONS

While the Biomass Controls pilot-scale pyrolysis system at Spruce Haven Farm demonstrated strong potential for nutrient stabilization, carbon (C) retention, and biochar production, several operational and technical challenges were identified that should be considered when implementing pyrolysis at a commercial scale.

Feedstock Moisture Variability: Maintaining consistent feedstock moisture was a primary operational constraint. The prototype hydronic dryer used in the Spruce Haven study typically reduced solids to ~45% moisture, whereas optimal pyrolysis performance occurred between 35–40% moisture. Feedstocks outside this range corresponded with lower C yield and incomplete conversion. Variability between digested and undigested manure streams further affected consistency, highlighting the need for enhanced drying capacity or inline moisture monitoring to stabilize system performance.

Inlet Plugging and Material Handling: Differences in particle size and fiber content occasionally caused bridging and compaction at the feed inlet, requiring temporary shutdowns for manual clearing. Pre-conditioning strategies such as grinding, pelletizing, or vibratory feeding could minimize plugging and maintain uniform feed flow.

Limited Continuous Operation: The system reliably completed multi-hour batch runs, but fully continuous 24-hour operation was constrained by manual feed control and moisture fluctuations. Automation of feed rate and temperature regulation would improve runtime stability, labor efficiency, and overall operational reliability.

Heat Recovery and Energy Utilization: While waste heat was partially reused via the prototype hydronic dryer at the Spruce Haven study, incomplete heat transfer reduced overall thermal efficiency. Enhancements such as improved duct insulation, optimized heat-exchange surfaces, or supplemental use of digester biogas could increase energy recovery and system sustainability.

Data Collection and Sample Timing: Nutrient and C data were robust, but intermittent downtime limited continuous logging of temperature and gas composition. Synchronizing operational metrics with nutrient analyses would allow finer control over process efficiency and biochar quality.

System Mobility and Scalability: The pilot-scale system was moved multiple times during the study, and variations in setup affected data continuity. Modular design, stable installation, and scalable infrastructure will be critical for replication at commercial dairies. Lessons from differences in digested versus undigested feedstock performance can inform design refinements for larger, stationary systems.

Addressing these considerations will be key to achieving consistent nutrient stabilization, improved carbon retention, reliable continuous operation, and efficient biochar production in commercial-scale pyrolysis applications.

Conclusion

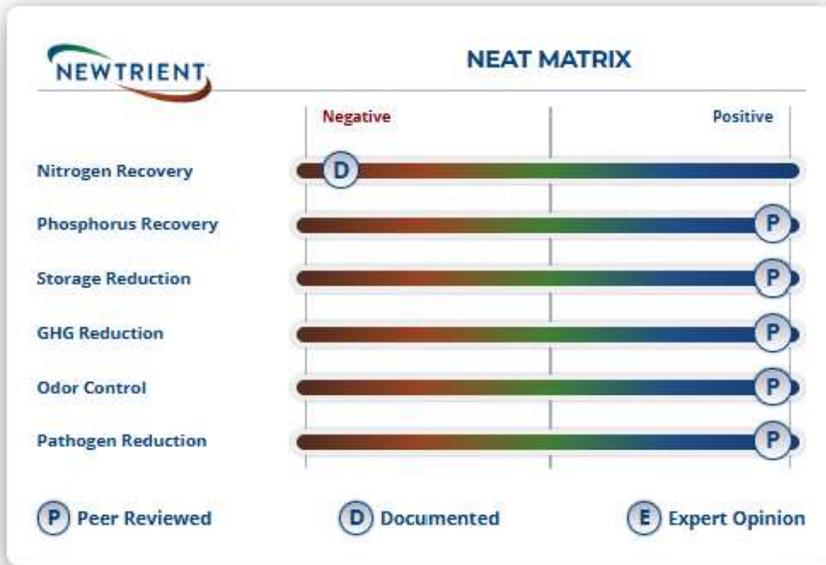
Pyrolysis of dairy manure solids offers a controlled, thermochemical approach to waste treatment that aligns with the objectives of NRCS Conservation Practice Standard 629. The process effectively stabilizes nutrients, reduces moisture and volatile solids, destroys pathogens, and converts manure into a carbon-rich, stable biochar. This biochar can be used as a soil amendment, improving soil structure, nutrient retention (C, N, P, K, Ca, and Mg), and water-holding capacity while supporting long-term carbon sequestration and sustainable land application practices.

The evaluation of the Biomass Controls pilot-scale pyrolysis unit at Spruce Haven Farm demonstrated that, when feedstock moisture, particle size, and feed rates are properly managed, the system consistently produces high-quality biochar while minimizing risks to soil, water, and air. Operational challenges, including feedstock moisture variability, inlet plugging, limited continuous operation, and heat recovery efficiency, highlight opportunities for optimization through automation, improved drying, and pre-conditioning of feedstock.

Overall, pyrolysis provides a practical, scalable, and environmentally responsible method for managing dairy manure, producing a valuable byproduct, and supporting circular nutrient reuse on the farm. Continued refinement of system design and operational protocols will enhance reliability, efficiency, and adoption potential at commercial-scale dairy operations.

Appendix A

NEWTRIENT CRITICAL ANALYSIS – PYROLYSIS TECHNOLOGY



Overall Summary

Pyrolysis is a thermal treatment technology designed to process previously separated dairy manure solids to produce value-added byproducts, including carbon-rich biochar, bio-oil, and syngas. The process is most effective with dry feedstocks and favors solids that have undergone separation or drying. Key strengths of pyrolysis include the production of a stable soil amendment in the form of biochar, which retains carbon (C) and essential nutrients such as phosphorus (P) and potassium (K), reduces overall storage volume, and improves manure handling and transport efficiency. High-temperature treatment also destroys pathogens, mitigates odors, and limits greenhouse gas (GHG) emissions relative to liquid storage. The exothermic reaction can be self-sustaining, using syngas or a portion of bio-oil to supply process energy, and the rapid processing time allows for smaller plant footprints compared to other manure treatment methods.

Secondary benefits of pyrolysis include the potential for GHG mitigation and odor reduction when properly controlled, as well as the production of energy-dense byproducts that may be refined into liquid fuels. However, the technology has several limitations. Nitrogen (N) losses to the atmosphere are significant, reducing the potential for N recovery, and the process is less effective with high-moisture feedstocks, requiring

adequate solid separation or drying. Capital and operational costs are high, and commercial-scale systems for dairy manure are limited, with most installations being prototypes. Markets for biochar and bio-oil are still emerging and regionally variable, which introduces economic uncertainty and affects return on investment. Higher-value outlets may require consistent quality specifications and documentation. The system also requires skilled labor for operation and maintenance, and performance can vary depending on feedstock characteristics, moisture content, and particle size.

Critical indicators for pyrolysis success include consistent feedstock moisture and particle size to optimize carbon yield and biochar quality, as well as effective energy management to achieve a self-sustaining reaction. Pretreatment steps such as solid separation and drying, and potential post-treatment to refine bio-oil or biochar, may be required. While pyrolysis demonstrates strong potential for nutrient stabilization, storage reduction, pathogen destruction, and sustainable byproduct generation, further research is needed to quantify benefits for carbon sequestration, crop yield improvements, and GHG mitigation.

Appendix B

Third-Party Review of Pyrolysis Technology – Union Springs, NY (Report Summary)

University Partner

Dr. Jaclyn Schnurr
Professor Emerita
Wells College
Aurora, NY 13026

OCTOBER 2025

BACKGROUND

Sustainable manure management remains one of the central challenges in modern dairy production. Manure contains valuable nutrients such as nitrogen (N), phosphorus (P), and potassium (K), yet when unmanaged, these same nutrients can contribute to runoff, groundwater contamination, and greenhouse gas (GHG) emissions. Traditional practices like storage lagoons or holding ponds and land application provide partial solutions but often fail to capture the full nutrient and energy potential of manure.

In response, farms and research partners are exploring innovative technologies that convert manure into stable, beneficial products. Among these, pyrolysis, the thermochemical conversion of organic matter in an oxygen-free environment, has emerged as a promising approach. The process produces biochar, a carbon-rich, nutrient-dense material known to improve soil structure, enhance nutrient retention, and store carbon long-term.

Spruce Haven Farm in Union Springs, New York, has positioned itself as a leader in this field. Home to approximately 2,000 lactating dairy cows and 1,800 heifers, the farm has integrated several sustainability practices, including anaerobic digestion and nutrient recovery. The addition of a Biomass Controls PBC pyrolysis unit represents the next step in developing a closed-loop manure management system on the farm that seeks not only to treat waste but to generate renewable value from it.

INTRODUCTION

This evaluation focuses on the Biomass Controls pyrolysis system installed as a pilot at Spruce Haven Farm, assessing how effectively it converts dairy manure solids into a high-quality, nutrient-stable biochar. The study examined system performance, operational consistency, and nutrient transformations at multiple stages of processing, with particular attention to N, carbon (C), K, and P retention. Both anaerobically digested and undigested feedstocks were analyzed to determine how prior treatment influences biochar composition.

The research aimed to provide a comprehensive technical and environmental assessment of the pyrolysis system under working farm conditions. In doing so, it offers insight into how such systems can

complement existing anaerobic digesters and nutrient recovery technologies to improve resource efficiency, reduce emissions, and enhance soil health.

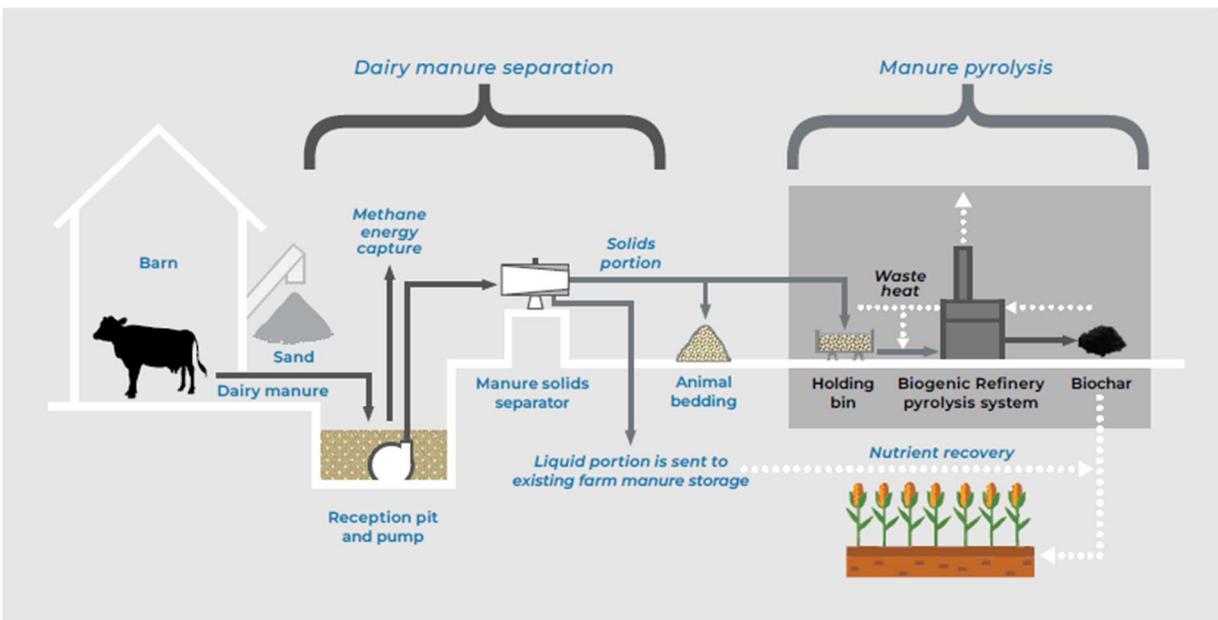


Figure 1: A general overview of the manure management at Spruce Haven Dairy (adapted) (<https://biomasscontrols.com/project-products/>)

THE PROCESS

At Spruce Haven Farm, dairy manure follows a multi-stage treatment pathway (Figure 1) that integrates sand separation, anaerobic digestion, solids separation, drying, and pyrolysis. Following sand separation, manure from freestall barns first enters a reception pit, where it is directed into the anaerobic digester. Methane (CH_4) gas produced during digestion is captured, cleaned, and added to the gas pipeline for energy use. After digestion, the manure is pumped to a screw press separator, which divides the stream into liquid effluent and pressed solids.

The solids with 65%-75% moisture were stored in a hopper and then fed into a prototype hydronic jacket dryer that uses recaptured thermal energy from the pyrolysis unit to reduce moisture content. Once dried, these solids enter the Biomass Controls pyrolysis system via a feed auger that conveys them into the pyrolysis chamber. Inside the chamber, the material is thermochemically transformed at moderately high temperatures in an oxygen-free environment, breaking down volatile compounds and leaving behind carbon-rich biochar (Figure 2).

The hot air and gases generated during this process are harnessed to assist in drying subsequent batches, improving thermal efficiency and reducing external energy input. The system's design includes feedback loops for heat recovery, automated augers for controlled feeding, and a biochar collection system for finished product handling. The pyrolysis unit operates most effectively at a feedstock moisture range of 35%–40%, producing a consistent and nutrient-dense biochar.

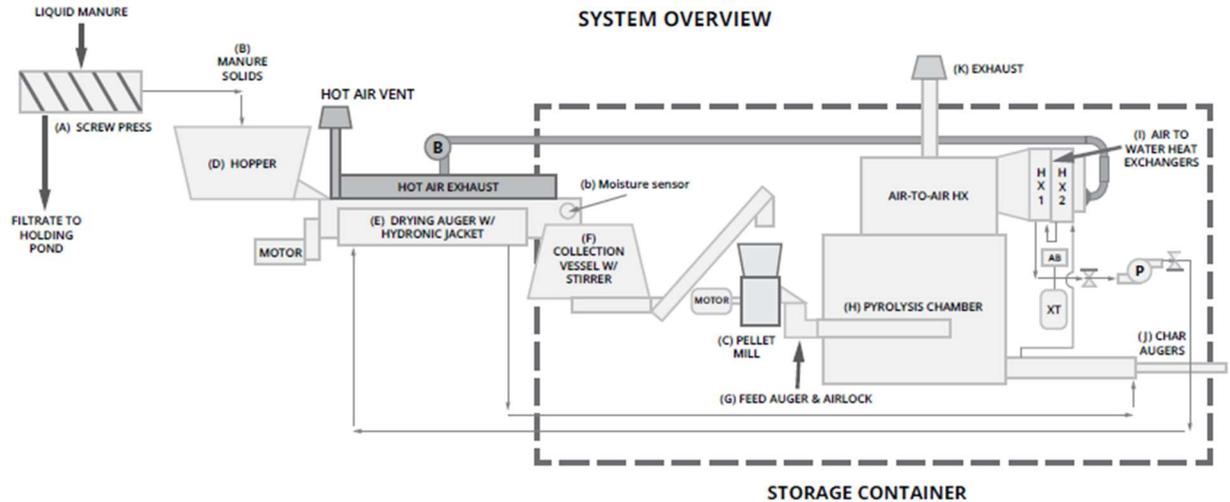


Figure 2. Schematic of the pyrolysis unit set up in use at Spruce Haven Farm. Currently the pellet mill is not being used. (Provided by Lucinda Lu, Cornell University).

METHODOLOGY

Samples throughout the treatment process were collected twice daily over a 24-day period during June and July 2025. Sampling included multiple manure treatment stages: liquid inflow, liquid digestate outflow, wet solids from the screw press, dried solids after the prototype hydronic jacket dryer, and final biochar output. Both anaerobically digested and undigested manure streams were evaluated.

A total of 24 samples were analyzed for each category (16 digested, 8 undigested). Samples were frozen immediately upon collection and shipped to A&L Laboratories in Fort Wayne, Indiana for analysis using the M7 Manure Package, which measures parameters including moisture, total N, ammonium (NH_4^+), P, K, C, and ash content. Statistical analyses were conducted using SYSTAT v13.2, with Analysis of Variance and Tukey pairwise comparisons applied to identify significant differences among the sample categories.

Operationally, the pilot unit was evaluated for stability, throughput, and drying efficiency. The study tracked the system's ability to maintain appropriate moisture content, prevent feed inlet plugging, and sustain continuous operation under typical farm conditions.

DISCUSSION OF RESULTS

The results from the evaluation of the Biomass Controls prototype pyrolysis system at Spruce Haven Farm provide important insights into its performance as a manure management and nutrient stabilization technology. Data collected from multiple processing stages—ranging from raw inflow manure to final biochar—offer a detailed understanding of how nutrient concentrations, moisture content, and carbon composition change throughout the treatment sequence.

This section summarizes those findings to assess the system's overall efficiency, nutrient transformation performance, and operational consistency under working farm conditions. By comparing digested and undigested feedstocks, the analysis also reveals how prior anaerobic treatment influences nutrient retention and the quality of the resulting biochar.

KEY BENEFITS OF PYROLYSIS

Nutrient Stabilization and Densification

Pyrolysis substantially increased nutrient concentrations in the solid fraction. As shown in Table 1, Phosphorous (P) levels in biochar were 7.3 times higher for undigested manure and 7.9 times higher for digested manure, compared to the dairy manure solids following the prototype hydronic dryer. A higher P in the digested manure is due to the farm's use of an iron-based chemical treatment in the digester to reduce the production of hydrogen sulfide (H_2S) in the biogas. Since this material contains iron, it also binds with P as a flocculant, allowing more P to be removed during waste separation. The effect of increased P levels typically dissipates after approximately 30 days, potentially providing the benefit of a slow-release P fertilizer (Sanford et al. 2022). Additionally, the evaluation of this effect emphasizes the importance of understanding the entire manure management system, rather than individual processes. K concentrations also rose markedly, confirming the strong thermal densification effect of the process. Most of the ammonia (NH_3) was lost through volatilization. A portion of other nitrogen components were also released to the atmosphere, but due to the lower operating temperatures of the pyrolysis process and no oxygen, it was emitted as N_2 gas. These findings illustrate the system's ability to retain and stabilize nutrients, reducing the risk of runoff or leaching that often accompanies the land application of liquid or raw manure.

Table 1: The percentage of moisture and organic carbon, total nitrogen, ammonium nitrogen, potassium and phosphorus in A. digested and B. undigested samples. In the parentheses is the standard error of the mean. For each column, like letters indicate that the samples are not significantly different while unlike letters indicate that Tukey pairwise comparisons show differences at the P<0.05 level or better.

A. Digested						
	MOISTURE	CARBON	NITROGEN	AMMONIUM	POTASSIUM	PHOSPHORUS
INFLOW	94.978 (0.096) A	2.208 (0.054) A	0.296 (0.003) A	0.158 (0.001) A	0.235 (0.006) A	0.041 (0.001) A
OUTFLOW	96.216 (0.066) A	1.467 (0.032) A	0.282 (0.002) A	0.155 (0.002) A	0.273 (0.003) A	0.04 (0.0001) A
WET SOLIDS	65.387 (0.745) B	18.314 (0.38) B	0.591 (0.013) B	0.151 (0.006) A	0.257 (0.004) A	0.109 (0.003) AB
DRY SOLIDS	45.173 (2.694) C	28.992 (1.393) C	0.786(0.029) C	0.105 (0.007) B	0.408 (0.021) A	0.168 (0.009) B
BIOCHAR	0.955 (0.166) D	31.339 (1.941) C	0.829 (0.056) C	0.002 (0.001) C	2.777 (0.173) B	1.328 (0.052) C
A. Undigested						
	MOISTURE	CARBON	NITROGEN	AMMONIUM	POTASSIUM	PHOSPHORUS
INFLOW	92.508 (0.177) A	3.507 (0.075) A	0.282 (0.005) A	0.101 (0.002) A	0.217 (0.006) A	0.038 (0.001) A
OUTFLOW	95.722 (0.052) A	1.773 (0.021) A	0.25 (0.003) A	0.107 (0.003) A	0.212 (0.004) A	0.036 (0.001) A
WET SOLIDS	65.146 (0.788) B	17.603 (0.333) B	0.426 (0.021) B	0.068 (0.01) B	0.222 (0.004) A	0.052 (0.001) A
DRY SOLIDS	42.514 (1.753) C	29.472 (1.053) C	0.607 (0.019) C	0.07 (0.005) B	0.359 (0.009) A	0.084 (0.003) A
BIOCHAR	0.731 (0.145) D	37.042 (0.957) D	0.925 (0.047) D	0.007 (0.004) C	2.051 (0.113) B	0.61 (0.05) B

Carbon (C) Retention and Soil Health Improvement

C composition increased progressively through each treatment stage, reaching 50%–55% by weight in the final biochar (Table 1). The C content of the undigested manure solids was higher than the digested material. This likely resulted because a large portion of C from the digested solids was utilized with the production of biogas (methane). This result carried through to the C content in the biochar. This stable C fraction contributes to long-term soil organic matter and durable C sequestration. When applied to agricultural soils, biochar improves cation exchange capacity and water retention, increasing fertility and resilience, particularly during drought periods. Similar research indicates that such amendments can raise soil water holding capacity by 15%–30% and enhance nutrient-use efficiency by up to 20%. The use of biochar as a valuable soil amendment can reduce the reliance on commercial fertilizers, presenting cost savings to the farm.

Odor, Pathogen, and GHG Reduction

At operating temperatures above 400°C, the pyrolysis process effectively destroyed odor-causing volatile compounds and eliminated pathogens present in raw manure. This conversion also prevented CH₄ and nitrous oxide (N₂O) emissions normally produced during manure storage or surface application. When considered alongside the nutrient retention data in Table 1 and the compositional differences between digested and undigested samples (Figure 3), these reductions demonstrate the system’s potential for substantial GHG mitigation while producing a clean, pathogen-free end product.

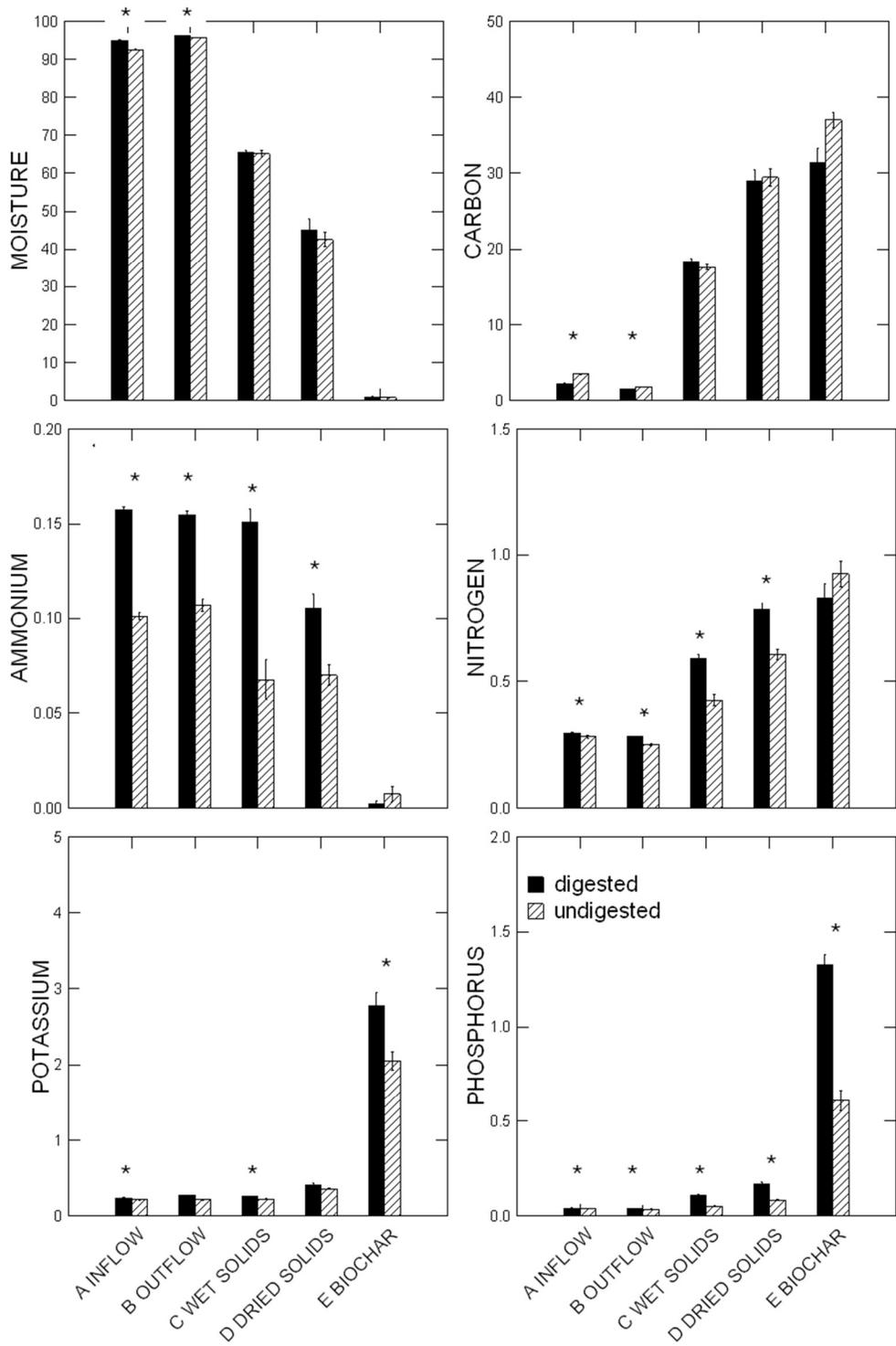


Figure 3. Differences between undigested and digested samples for each of the examined nutrients. Asterisks indicate a significant difference at the $P < 0.001$ level (Möller & Müller 2012).

Operational Efficiency and Energy Integration

The system's integrated design allowed partial recovery of waste heat from the pyrolysis chamber. The prototype hydronic dryer reused this captured heat to lower feedstock moisture prior to processing, directly supporting the 35%–40% moisture window associated with optimal operation (Figure 3). Maintaining this range produced uniform, high-quality biochar and reduced external energy demand. With additional heat-exchange optimization and potential integration of digester biogas as supplemental fuel, near-energy-neutral operation is achievable.

Reduced Volume and Transportation Cost

The pyrolysis process reduced the total solids volume by approximately 70%–80%, transforming wet, bulky waste into a lightweight biochar, easing transportation. This volume reduction lowers hauling costs and allows for the redistribution of stabilized nutrients beyond the immediate farm gate. The resulting biochar product is drier, more stable, and easier to manage for long-term storage and application logistics.

Economic and Market Opportunities

Although markets for biochar are emerging and regionally available, the nutrient-dense, carbon-rich biochar documented in Table 1 and Figure 3 presents emerging market potential as both a soil amendment and a carbon credit commodity. Using conservative carbon offset values (\$50–\$60 per ton CO₂e) and observed nutrient densification ratios, a large-scale dairy operating a comparable system could generate more than \$30,000 per year in carbon credit revenue, alongside additional income from biochar sales for agricultural, landscaping, or other commercial uses.

EVALUATION KEY CHALLENGES AND ISSUES

While the Biomass Controls pyrolysis system at Spruce Haven Farm demonstrated strong potential for nutrient stabilization and C retention, several operational and technical challenges were identified during the evaluation. Addressing these limitations will be critical for improving system efficiency and enabling sustained, continuous operation at a commercial scale.

Feedstock Moisture Variability

Maintaining consistent moisture content in the feedstock was the most significant operational constraint of this evaluation. The prototype hydronic dryer typically reduced solids to about 45% moisture, but the studied system performed best between 35% and 40%. Higher moisture content in the solids impacted the pyrolysis unit in maintaining the proper operating temperature. This temperature dropped, and the efficiency of the dryer also decreased, which resulted in increasing moisture content, impacting system performance. Variability in solids from digested versus undigested streams illustrated in Figure 3 further affected consistency. Enhancing drying capacity or incorporating inline moisture sensors could stabilize performance. Biomass Controls is evaluating other dryers for producing a more consistent and dryer feedstock to improve performance and consistent operation.

Inlet Plugging and Material Handling

Differences in moisture content, particle size, and fiber content occasionally caused bridging and compaction at the feed inlet. These blockages required temporary shutdowns for manual clearing,

interrupting continuous operation. Adopting pre-conditioning steps such as grinding, pelletizing, or vibratory feeding could minimize plugging and maintain uniform flow.



Figure 4: Occurrence of inlet plugging and material handling.

Limited Continuous Operation

Although the system achieved reliable multi-hour batch runs, fully continuous 24-hour operation was constrained by manual feed control and moisture fluctuations. Automation of feed rate and temperature control would improve runtime stability and labor efficiency.

Heat Recovery and Energy Utilization

While waste heat was reused via the prototype hydronic dryer, it was difficult to maintain consistent temperature and moisture levels, impacting system performance and operational periods. Enhancing duct insulation, optimizing heat-exchange surface area, or integrating digester biogas as auxiliary fuel could improve thermal recovery and overall system sustainability. The use of improved commercial dryers is currently under review by Biomass Controls.

Data Collection and Sample Timing

Nutrient and C data were robust, but intermittent system downtime limited continuous logging of temperature and gas composition data. Synchronizing operational metrics with nutrient and C analyses as shown in Table 1 would allow finer resolution of process control and nutrient transformation dynamics.

System Mobility and Scalability

Because the pilot-scale system was moved multiple times during the study, setup variations affected data continuity. Ensuring modular design, stable installation, and scalable infrastructure will be critical for replication at commercial dairies. Lessons drawn from the differences between digested and undigested sample performance in Figure 3 can assist in design refinements for larger, stationary systems.

IMPLICATIONS

Results from this evaluation confirm that pyrolysis of dairy manure solids can effectively generate a stable, nutrient-dense biochar with significant potential for improving soil health and C sequestration. For dairy farms seeking to reduce waste volumes, improve nutrient management, and participate in emerging carbon markets, this technology offers a promising pathway.

The integration of pyrolysis with existing anaerobic digestion systems could create a synergistic manure management strategy—capturing CH₄ for energy, concentrating nutrients into biochar, and recycling water for reuse. Continued refinement of drying systems and feed controls will improve reliability and allow for near-continuous operation.

Spruce Haven's experience with a prototype pyrolysis system offers a practical model for other dairies seeking to enhance environmental stewardship, reduce waste, and generate additional value from manure resources. As system optimization progresses, pyrolysis could play a key role in achieving the long-term sustainability goals of the U.S. dairy industry.

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Appendix C

Third-Party Review of Pyrolysis Technology – Union Springs, NY (Full Report)

**Evaluation of the Biomass Controls pyrolysis unit at
Spruce Haven Farm, Union Springs NY**

Jaclyn Schnurr, Professor emerita, Wells College, Aurora, NY 13026



Introduction

Finding sustainable uses for dairy manure has been the focus of many technologies, with farmers always looking for better ways to manage and use the manure produced on their farms. One new technology is the conversion of manure solids to biochar, an important soil amendment that has been used for thousands of years in sustainable agriculture. This paper investigates the Spruce Haven Dairy's pyrolysis unit (Biomass Controls) to determine the efficacy of this technology for sustainable manure management.

Pyrolysis uses heat to thermochemically convert manure to biochar. Figure 1 describes the process. Manure from the barn goes to a reception pit where it is anaerobically digested, collecting methane that can be used as an energy source. (In this study a few non-digested samples were also evaluated through the pyrolysis unit.) Next it is pumped to a manure solids separator, a screw press that removes some of the moisture (the liquid is returned to a storage holding pond) and produces a dryer solid. That solid portion is then further processed for pyrolysis (Figure 2). The solids are stored in a hopper, and then dried in a drying auger with a hydronic jacket. At this time the dried solids enter the pyrolysis unit and are fed into the feed auger and pyrolysis chamber where they are thermochemically transformed. The hot air from the pyrolysis unit is captured and used to help dry the solids in the hydronic jacket, and the solids are passed through the unit by the char augers and collected as biochar.

Spruce Haven Farm is located in Union Springs, New York. The Farm was established in 1987 and currently has about 2000 cows and 1800 heifers (<https://drinkspruce.com/spruce-haven>). It is committed to developing sustainable manure management. In 2015 they installed an anaerobic digester and in 2017 patented a nutrient boom for applying liquid manure to the 3100-acre farm. The pyrolysis unit is operated in partnership with Cornell University and Biomass Controls, who is developing the technology. This paper serves as an independent test of that technology.

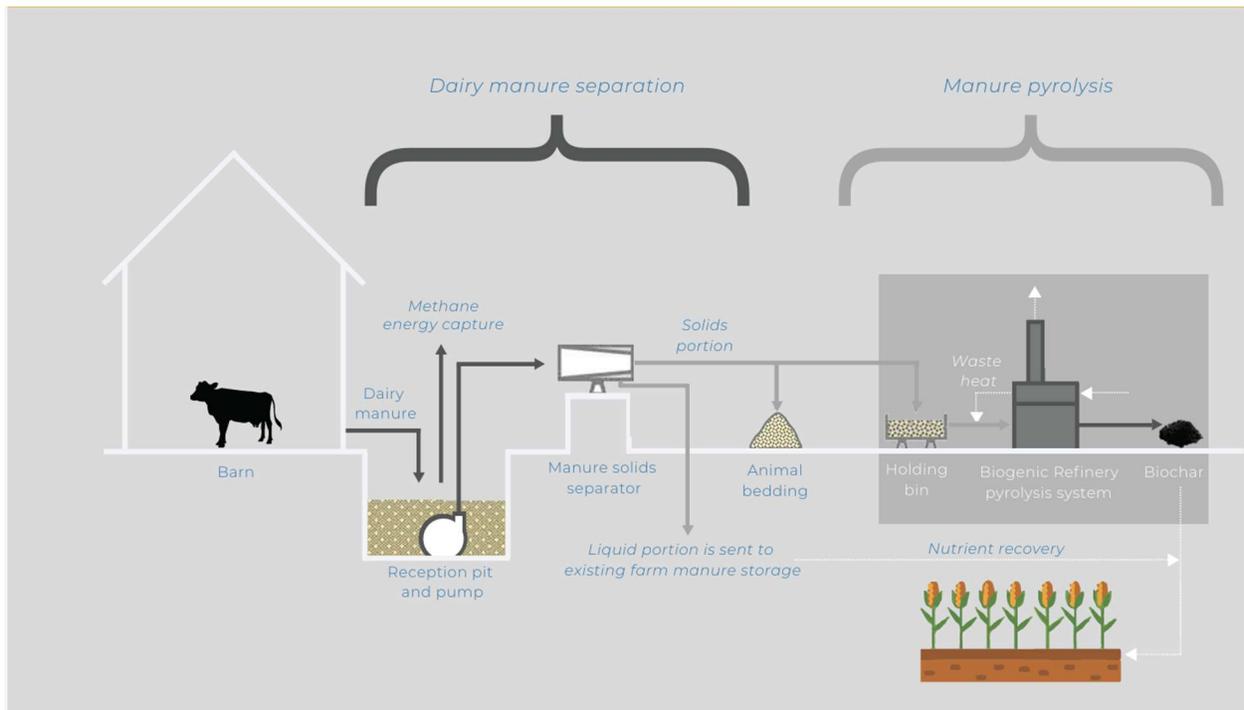


Figure 1: A general overview of the manure management at Spruce Haven Dairy (<https://biomasscontrols.com/project-products/>)

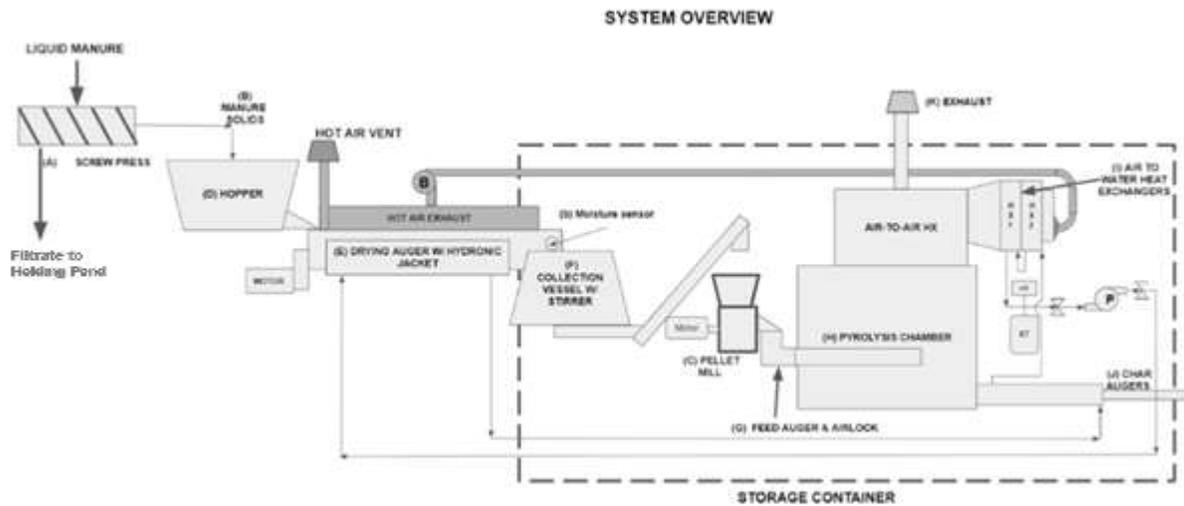


Figure 2: Schematic of the pyrolysis unit set up in use at Spruce Haven Farm. Currently the pellet mill is not being used. (Provided by Lucinda Lu, Cornell University).

Methods

As in any developing technology, there were some issues getting the unit running consistently in order to take samples for analysis. Samples were taken twice a day for 24 days during June and July of 2025. Samples were taken of the liquid manure (“inflow”), the liquid digestate (“outflow”) and solids (“wet solids”) from the screw press, after the hydronic jacket dryer (“dried solids”), and the biochar. During the sampling period Spruce Haven had a clog in between manure collection and the anaerobic digester, which allowed us to examine biochar produced from anaerobically digested versus undigested manure. There were 16 samples that were anaerobically digested and 8 samples that were not, for a total of 24 samples for each category.

Samples were collected in the field and immediately frozen to stop any microbial growth or alteration. Samples were shipped in coolers to A&L Laboratories in Fort Wayne, Indiana and were analyzed using the M7 package (Moisture, Total N, Ammonium (NH₄-N), P, K, S, Ca, Mg, Na, Fe, Al, Mn, Cu, Zn, Ash, OM, C:N Ratio). For this analysis we specifically looked at the percentages of moisture, carbon, total nitrogen, ammonium, potassium and phosphorus that made up the raw samples.

Data was analyzed using Analysis of Variance in SYSTAT v13.2, and Tukey pairwise comparisons were used to determine differences among the sampling categories.

Results and Discussion

There were significant differences between the undigested and the digested samples (Figure 3), which led to analyzing each data set separately. As would be expected, moisture percentage was highest in the inflow and the outflow, which were the only categories that showed significant differences between digested and undigested samples for moisture. Similarly, percentage of carbon was lowest in the inflow and outflow samples compared to the other categories. Dried solids and biochar had similar percentages of carbon and those differed from the other categories but not each other (Table 1).

Ammonium is known to be enhanced in digested samples, which is supported by our data (Figure 3; Möller & Müller 2012). Compared to the undigested samples, ammonium percentage was significantly increased in all sample types except for biochar (Figure 3). The liquid samples and the wet solids had similar percentages in the digested samples, while dry solids and biochar were significantly different from those and from each other (Table 1). Pyrolysis decreased the percentage of ammonium in both digested and undigested samples, a similar result to one found by Sanford et al. (2022). Pyrolysis, however, did not significantly decrease the percentage of total organic nitrogen, causing biochar to have the highest percentage nitrogen of any sample category. Total nitrogen was significantly greater in the digested samples for all categories other than biochar. Within the digested samples, total nitrogen was significantly different between the wet solids and the liquid samples, which were not significantly different than each other, and the dried solids and biochar, which were also similar. The undigested samples had a slightly different result, with the dried solids also being significantly different than biochar (Table 1). Through the pyrolysis process, much of the nitrogen that is lost is driven off as nitrogen gas

(N₂). Since no emission tests were performed, it is estimated that more than 96 percent of the nitrogen lost was emitted as N₂ (Manure Treatment Technologies 2016.)

Both potassium and phosphorus had their highest percentages in biochar, perhaps due to chemical enhancement that may have occurred in the anaerobic digestion step (Figure 3). For potassium, biochar was the only sample type that was significantly different than all the other sample types (Table 1). Phosphorus was significantly increased in digested samples (Figure 3, Table 1); wet solids had almost twice the percentage of phosphorus in the digested samples and that caused both dry solids and biochar to be similarly enhanced. Phosphorus was densified by 7.3 times for non-digested and 7.9 times for anaerobically digested dairy manure when compared to the solids following the hydronic dryer. This result is supported by other studies (Möller & Müller 2012, Sanford et al. 2022), who found that phosphorus mineralized during anaerobic digestion binds to solids, increasing the phosphorus percentage in the solids as compared to the liquid inflow and digestate. Even though not part of this evaluation, other studies have shown that the pyrolysis process reduces the amount of phosphorus immediately available for crop uptake. This effect is gone after approximately 30 days, which may provide the benefit of a slow-release phosphorus fertilizer (Sanford et al. 2022).

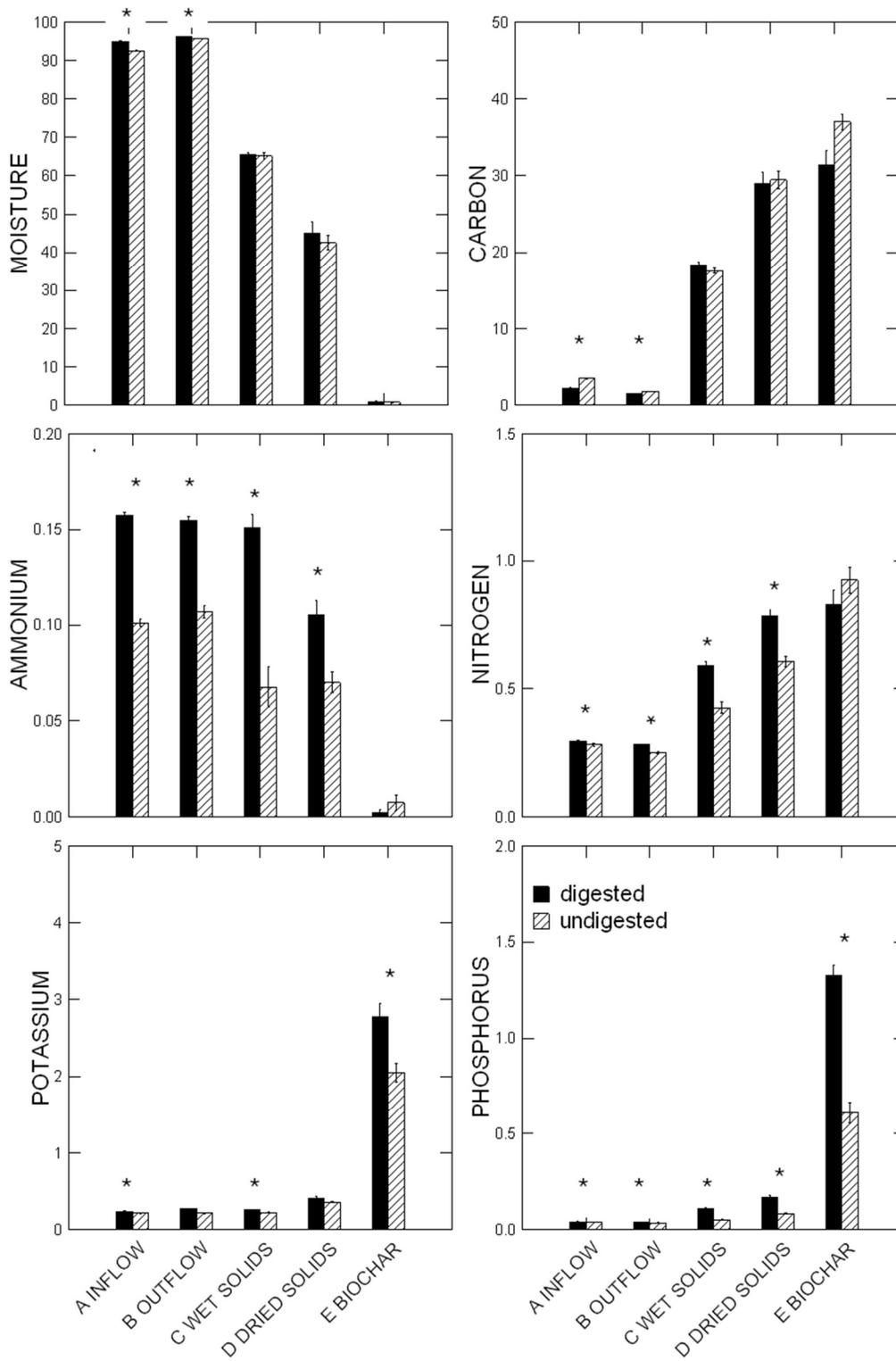


Figure 3: Differences between undigested and digested samples for each of the examined nutrients. Asterisks indicate a significant difference at the P<0.001 level.

Table 1: The percentage of moisture and organic carbon, total nitrogen, ammonium nitrogen, potassium and phosphorus in A. digested and B. undigested samples. In the parentheses is the standard error of the mean. For each column, like letters indicate that the samples are not significantly different while unlike letters indicate that Tukey pairwise comparisons show differences at the P<0.05 level or better.

A. Digested						
	MOISTURE	CARBON	NITROGEN	AMMONIUM	POTASSIUM	PHOSPHORUS
INFLOW	94.978 (0.096) A	2.208 (0.054) A	0.296 (0.003) A	0.158 (0.001) A	0.235 (0.006) A	0.041 (0.001) A
OUTFLOW	96.216 (0.066) A	1.467 (0.032) A	0.282 (0.002) A	0.155 (0.002) A	0.273 (0.003) A	0.04 (0.0001) A
WET SOLIDS	65.387 (0.745) B	18.314 (0.38) B	0.591 (0.013) B	0.151 (0.006) A	0.257 (0.004) A	0.109 (0.003) AB
DRY SOLIDS	45.173 (2.694) C	28.992 (1.393) C	0.786(0.029) C	0.105 (0.007) B	0.408 (0.021) A	0.168 (0.009) B
BIOCHAR	0.955 (0.166) D	31.339 (1.941) C	0.829 (0.056) C	0.002 (0.001) C	2.777 (0.173) B	1.328 (0.052) C
A. Undigested						
	MOISTURE	CARBON	NITROGEN	AMMONIUM	POTASSIUM	PHOSPHORUS
INFLOW	92.508 (0.177) A	3.507 (0.075) A	0.282 (0.005) A	0.101 (0.002) A	0.217 (0.006) A	0.038 (0.001) A
OUTFLOW	95.722 (0.052) A	1.773 (0.021) A	0.25 (0.003) A	0.107 (0.003) A	0.212 (0.004) A	0.036 (0.001) A
WET SOLIDS	65.146 (0.788) B	17.603 (0.333) B	0.426 (0.021) B	0.068 (0.01) B	0.222 (0.004) A	0.052 (0.001) A
DRY SOLIDS	42.514 (1.753) C	29.472 (1.053) C	0.607 (0.019) C	0.07 (0.005) B	0.359 (0.009) A	0.084 (0.003) A
BIOCHAR	0.731 (0.145) D	37.042 (0.957) D	0.925 (0.047) D	0.007 (0.004) C	2.051 (0.113) B	0.61 (0.05) B

System Performance

Obtaining results from this evaluation were delayed for several months due to sampling of other biomass materials from another entity, moving the pyrolysis unit multiple times and updates that were made to the biomass drying system.

One of the critical issues during this study was reaching the proper moisture content for the pyrolysis unit to operate properly. The unit ran most efficiently in a moisture range of 35-40 percent. The current hydronic dryer would reduce the moisture content by about 20 points to around 45 percent. This higher resulting moisture content gradually reduced the heat generated by the pyrolysis unit which also reduced the drying effect of the hydronic dryer over time. Even though the unit could be run for several hours at a time, with the current drying approach, it could not be operated on a continual basis.

Another issue that arose was plugging of the pyrolysis inlet with manure solids. This also seems to be moisture related. When the moisture content was above 40 percent, plugging became more of an issue. Pelletizing the manure or grinding the manure solids to a more consistent size could help plugging of the inlet.

Even though the unit can be computer controlled and has internet access for monitoring, the current would need to be modified to allow for continual operation. When the manure solids met the required input parameters, the pyrolysis unit produced a consistent biochar. With correct moisture content and solid feed controls, this system has the potential to generate a quality by-product from dairy manure.

Conclusion

Creation of biochar from dairy manure produces a nutrient rich product that is easy to transport, has enhanced carbon, nitrogen, potassium and phosphorus, and is a stable soil amendment. These factors make pyrolysis of manure a promising next step in manure management for large dairy farms.

Biochar produced from dairy manure allows farmers to utilize a waste product in a more productive manner. Historically biochar has been widely used in sustainable agriculture to increase the nutrient retention and water holding capacity of soils. Soils known as 'terra preta' that contain biochar residues have been discovered in the Amazon basin and are thought to be thousands of years old. In nutrient poor soils these amendments led to greater crop growth because of their improved soil properties. By using biochar created from pyrolysis of dairy manure in their crop rotations farmer's have the ability to maintain the productivity of their farms in a closed-loop system.

Literature Cited

Bachmann, S., Uptmoor, R., & Eichler-Löbermann, B. (2016). Phosphorus distribution and availability in untreated and mechanically separated digestates from biogas plants. *Biology and Fertility of Soils*, 52(3), 329-342. <https://doi.org/10.1007/s00374-015-1077-9>

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Möller, K., & Müller, T. (2012). Effects of anaerobic digestion on digestate nutrient availability and crop growth: A review. *Engineering in Life Sciences*, 12(3), 242-257. <https://doi.org/10.1002/elsc.201100085>

Sanford, J.R., D. Johnstone, and R.A. Larson. 2022. Assessing changes to nutrient density and availability following separation, drying, and pyrolysis of manure solids. *Bioresource Technology Reports* 19: <https://doi.org/10.1016/j.biteb.2022.101169>



Appendix

Report Number
F25191-6500
Account Number
63570



3505 Conestoga Dr.
Fort Wayne, IN 46808
260.483.4759
algreatlakes.com

To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75074
Sample ID: AFTER AM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/28/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 1 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal [†]	First Year Availability [Ⓔ] Pounds Per 1,000 Gal
Moisture	%	96.17	8011	
Solids	%	3.83	319	
Ash @ 550 C	%	1.23	102.8	
Organic Matter (LOI @ 550 C)	%	2.60	216.3	
Organic Carbon (LOI @ 550 C)	%	1.51	125.4	
Carbon:Nitrogen Ratio (C:N)	-		5.2:1	
Nitrogen, Total Kjeldahl (TKN)	%	0.288	24.0	16.5 *
Nitrogen, Ammonium (NH ₄ -N)	%	0.160	13.3	13.3 *
Nitrogen, Organic (N)	%	0.128	10.7	3.2 *
Phosphorus (P)	%	0.041	7.7 (as P ₂ O ₅)	7.7 * (as P ₂ O ₅)
Potassium (K)	%	0.279	27.9 (as K ₂ O)	27.9 * (as K ₂ O)
Sulfur (S)	%	0.02	2.0	0.9 #

[Ⓔ] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.

* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin

** Manure density assumed to be 8.33 lb/gallon

Report Approved By:

Approval Date: 7/16/2025

Daniel Fulton - Agronomist / Technical Services - CPAg/CCA

Report Number
F25191-6500
Account Number
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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75074
Sample ID: AFTER AM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/28/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 2 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal ^{**}	First Year Availability [Ⓢ] Pounds Per 1,000 Gal
Magnesium (Mg)	%	0.07	6.2	3.2 #
Calcium (Ca)	%	0.16	13.3	7.3 #
Sodium (Na)	%	0.09	7.7	
Aluminum (Al)	ppm	83	0.7	
Copper (Cu)	ppm	6.2	0.1	<0.1 #
Iron (Fe)	ppm	145	1.2	0.8 #
Manganese (Mn)	ppm	13	0.1	0.1 #
Zinc (Zn)	ppm	13	0.1	0.1 #

Ⓢ Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
 * Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin
 ** Manure density assumed to be 8.33 lb/gallon

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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75075
Sample ID: AFTER PM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/28/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 3 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal ^{**}	First Year Availability [Ⓢ] Pounds Per 1,000 Gal
Moisture	%	96.25	8018	
Solids	%	3.75	312	
Ash @ 550 C	%	1.22	101.6	
Organic Matter (LOI @ 550 C)	%	2.53	210.8	
Organic Carbon (LOI @ 550 C)	%	1.47	122.2	
Carbon:Nitrogen Ratio (C:N)	-		5.4:1	
Nitrogen, Total Kjeldahl (TKN)	%	0.270	22.5	16.1*
Nitrogen, Ammonium (NH ₄ -N)	%	0.160	13.3	13.3*
Nitrogen, Organic (N)	%	0.110	9.2	2.8*
Phosphorus (P)	%	0.039	7.4 (as P ₂ O ₅)	7.4* (as P ₂ O ₅)
Potassium (K)	%	0.291	29.0 (as K ₂ O)	29.0* (as K ₂ O)
Sulfur (S)	%	0.02	1.7	0.9 [#]

Ⓢ Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.

* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin

** Manure density assumed to be 8.33 lb/gallon

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To: NEWTRIENT LLC - SIG GRANT
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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75075
Sample ID: AFTER PM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/28/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 4 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal ^{**}	First Year Availability [Ⓢ] Pounds Per 1,000 Gal
Magnesium (Mg)	%	0.07	6.2	3.2 #
Calcium (Ca)	%	0.16	13.6	7.3 #
Sodium (Na)	%	0.08	6.8	
Aluminum (Al)	ppm	86	0.7	
Copper (Cu)	ppm	5.8	<0.1	<0.1 #
Iron (Fe)	ppm	138	1.1	0.7 #
Manganese (Mn)	ppm	13	0.1	0.1 #
Zinc (Zn)	ppm	12	0.1	0.1 #

Ⓢ Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.

* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin

** Manure density assumed to be 8.33 lb/gallon

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11510 LAURIE DR
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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75076
Sample ID: BEFORE PM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/28/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 5 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal**	First Year Availability [Ⓔ] Pounds Per 1,000 Gal
Moisture	%	94.66	7885	
Solids	%	5.34	445	
Ash @ 550 C	%	1.25	104.4	
Organic Matter (LOI @ 550 C)	%	4.09	340.4	
Organic Carbon (LOI @ 550 C)	%	2.37	197.4	
Carbon:Nitrogen Ratio (C:N)	-		8.4:1	
Nitrogen, Total Kjeldahl (TKN)	%	0.283	23.6	16.4 *
Nitrogen, Ammonium (NH ₄ -N)	%	0.160	13.3	13.3 *
Nitrogen, Organic (N)	%	0.123	10.2	3.1 *
Phosphorus (P)	%	0.045	8.7 (as P ₂ O ₅)	8.7 * (as P ₂ O ₅)
Potassium (K)	%	0.242	24.2 (as K ₂ O)	24.2 * (as K ₂ O)
Sulfur (S)	%	0.03	2.2	1.4 #

[Ⓔ] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin
** Manure density assumed to be 8.33 lb/gallon

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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75076
Sample ID: BEFORE PM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/28/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 6 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal ^{**}	First Year Availability [Ⓢ] Pounds Per 1,000 Gal
Magnesium (Mg)	%	0.08	7.0	3.7 #
Calcium (Ca)	%	0.18	15.3	8.2 #
Sodium (Na)	%	0.07	5.9	
Aluminum (Al)	ppm	102	0.9	
Copper (Cu)	ppm	6.8	0.1	<0.1 #
Iron (Fe)	ppm	172	1.4	0.9 #
Manganese (Mn)	ppm	15	0.1	0.1 #
Zinc (Zn)	ppm	15	0.1	0.1 #

Ⓢ Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.

* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin

** Manure density assumed to be 8.33 lb/gallon

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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75077
Sample ID: BEFORE AM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/27/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 7 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal ^{**}	First Year Availability [Ⓢ] Pounds Per 1,000 Gal
Moisture	%	94.83	7899	
Solids	%	5.17	431	
Ash @ 550 C	%	1.21	100.6	
Organic Matter (LOI @ 550 C)	%	3.96	330.0	
Organic Carbon (LOI @ 550 C)	%	2.30	191.4	
Carbon:Nitrogen Ratio (C:N)	-		8.0:1	
Nitrogen, Total Kjeldahl (TKN)	%	0.286	23.8	17.1 [*]
Nitrogen, Ammonium (NH ₄ -N)	%	0.170	14.2	14.2 [*]
Nitrogen, Organic (N)	%	0.116	9.7	2.9 [*]
Phosphorus (P)	%	0.045	8.6 (as P ₂ O ₅)	8.6 [*] (as P ₂ O ₅)
Potassium (K)	%	0.225	22.5 (as K ₂ O)	22.5 [*] (as K ₂ O)
Sulfur (S)	%	0.03	2.2	1.4 [#]

Ⓢ Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
^{*} Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 [#] Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin
^{**} Manure density assumed to be 8.33 lb/gallon

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To: NEWTRIENT LLC - SIG GRANT
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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75077
Sample ID: BEFORE AM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/27/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 8 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal**	First Year Availability [Ⓢ] Pounds Per 1,000 Gal
Magnesium (Mg)	%	0.08	7.0	3.7 #
Calcium (Ca)	%	0.18	15.3	8.2 #
Sodium (Na)	%	0.06	5.1	
Aluminum (Al)	ppm	98	0.8	
Copper (Cu)	ppm	6.8	0.1	<0.1 #
Iron (Fe)	ppm	172	1.4	0.9 #
Manganese (Mn)	ppm	15	0.1	0.1 #
Zinc (Zn)	ppm	15	0.1	0.1 #

[Ⓢ] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin
** Manure density assumed to be 8.33 lb/gallon

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To: NEWTRIENT LLC - SIG GRANT
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WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75078
Sample ID: BEFORE PM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/27/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 9 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal**	First Year Availability [Ⓔ] Pounds Per 1,000 Gal
Moisture	%	94.60	7880	
Solids	%	5.40	450	
Ash @ 550 C	%	1.20	99.7	
Organic Matter (LOI @ 550 C)	%	4.20	350.2	
Organic Carbon (LOI @ 550 C)	%	2.44	203.1	
Carbon:Nitrogen Ratio (C:N)	-		8.0:1	
Nitrogen, Total Kjeldahl (TKN)	%	0.306	25.5	17.0 *
Nitrogen, Ammonium (NH ₄ -N)	%	0.160	13.3	13.3 *
Nitrogen, Organic (N)	%	0.146	12.2	3.7 *
Phosphorus (P)	%	0.046	8.7 (as P ₂ O ₅)	8.7 * (as P ₂ O ₅)
Potassium (K)	%	0.308	30.8 (as K ₂ O)	30.8 * (as K ₂ O)
Sulfur (S)	%	0.03	2.4	1.4 #

Ⓔ Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin
** Manure density assumed to be 8.33 lb/gallon

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11510 LAURIE DR
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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75078
Sample ID: BEFORE PM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/27/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 10 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal ^{**}	First Year Availability [Ⓢ] Pounds Per 1,000 Gal
Magnesium (Mg)	%	0.08	7.0	3.7 #
Calcium (Ca)	%	0.18	14.7	8.2 #
Sodium (Na)	%	0.09	7.2	
Aluminum (Al)	ppm	97	0.8	
Copper (Cu)	ppm	6.9	0.1	<0.1 #
Iron (Fe)	ppm	168	1.4	0.9 #
Manganese (Mn)	ppm	14	0.1	0.1 #
Zinc (Zn)	ppm	15	0.1	0.1 #

[Ⓢ] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin
** Manure density assumed to be 8.33 lb/gallon

Report Number
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11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75079
Sample ID: AFTER PM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/27/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 11 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal **	First Year Availability [Ⓢ] Pounds Per 1,000 Gal
Moisture	%	96.04	8000	
Solids	%	3.96	330	
Ash @ 550 C	%	1.30	108.5	
Organic Matter (LOI @ 550 C)	%	2.66	221.3	
Organic Carbon (LOI @ 550 C)	%	1.54	128.4	
Carbon:Nitrogen Ratio (C:N)	-		5.6:1	
Nitrogen, Total Kjeldahl (TKN)	%	0.276	23.0	15.1 *
Nitrogen, Ammonium (NH ₄ -N)	%	0.140	11.7	11.7 *
Nitrogen, Organic (N)	%	0.136	11.3	3.4 *
Phosphorus (P)	%	0.041	7.8 (as P ₂ O ₅)	7.8 * (as P ₂ O ₅)
Potassium (K)	%	0.289	28.9 (as K ₂ O)	28.9 * (as K ₂ O)
Sulfur (S)	%	0.02	1.8	0.9 #

[Ⓢ] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin
** Manure density assumed to be 8.33 lb/gallon

Report Number
F25191-6500
Account Number
63570



3505 Conestoga Dr.
Fort Wayne, IN 46808
260.483.4759
aigreatlakes.com

To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75079
Sample ID: AFTER PM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/27/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 12 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal**	First Year Availability [Ⓢ] Pounds Per 1,000 Gal
Magnesium (Mg)	%	0.08	6.3	3.7 #
Calcium (Ca)	%	0.16	13.6	7.3 #
Sodium (Na)	%	0.08	6.8	
Aluminum (Al)	ppm	87	0.7	
Copper (Cu)	ppm	6.2	0.1	<0.1 #
Iron (Fe)	ppm	145	1.2	0.8 #
Manganese (Mn)	ppm	14	0.1	0.1 #
Zinc (Zn)	ppm	13	0.1	0.1 #

[Ⓢ] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.

* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin

** Manure density assumed to be 8.33 lb/gallon

Report Number
F25191-6500
Account Number
63570



3505 Conestoga Dr.
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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75080
Sample ID: AFTER AM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/29/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 13 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal ^{**}	First Year Availability [Ⓢ] Pounds Per 1,000 Gal
Moisture	%	96.26	8018	
Solids	%	3.74	312	
Ash @ 550 C	%	1.22	101.9	
Organic Matter (LOI @ 550 C)	%	2.52	209.7	
Organic Carbon (LOI @ 550 C)	%	1.46	121.6	
Carbon:Nitrogen Ratio (C:N)	-		5.1:1	
Nitrogen, Total Kjeldahl (TKN)	%	0.284	23.7	15.3 *
Nitrogen, Ammonium (NH ₄ -N)	%	0.140	11.7	11.7 *
Nitrogen, Organic (N)	%	0.144	12.0	3.6 *
Phosphorus (P)	%	0.038	7.3 (as P ₂ O ₅)	7.3 * (as P ₂ O ₅)
Potassium (K)	%	0.271	27.1 (as K ₂ O)	27.1 * (as K ₂ O)
Sulfur (S)	%	0.02	1.7	0.9 #

Ⓢ Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.

* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin

** Manure density assumed to be 8.33 lb/gallon

Report Number
F25191-6500
Account Number
63570



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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75080
Sample ID: AFTER AM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/29/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 14 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal ^{**}	First Year Availability [Ⓢ] Pounds Per 1,000 Gal
Magnesium (Mg)	%	0.07	6.1	3.2 #
Calcium (Ca)	%	0.15	12.6	6.9 #
Sodium (Na)	%	0.08	6.6	
Aluminum (Al)	ppm	85	0.7	
Copper (Cu)	ppm	5.8	<0.1	<0.1 #
Iron (Fe)	ppm	143	1.2	0.8 #
Manganese (Mn)	ppm	13	0.1	0.1 #
Zinc (Zn)	ppm	13	0.1	0.1 #

Ⓢ Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
 * Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin
 ** Manure density assumed to be 8.33 lb/gallon

Report Number
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Account Number
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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75081
Sample ID: AFTER PM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/29/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 15 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal**	First Year Availability [Ⓢ] Pounds Per 1,000 Gal
Moisture	%	96.22	8015	
Solids	%	3.78	315	
Ash @ 550 C	%	1.25	103.9	
Organic Matter (LOI @ 550 C)	%	2.53	210.9	
Organic Carbon (LOI @ 550 C)	%	1.47	122.3	
Carbon:Nitrogen Ratio (C:N)	-		5.5:1	
Nitrogen, Total Kjeldahl (TKN)	%	0.266	22.2	15.4 *
Nitrogen, Ammonium (NH ₄ -N)	%	0.150	12.5	12.5 *
Nitrogen, Organic (N)	%	0.116	9.7	2.9 *
Phosphorus (P)	%	0.040	7.6 (as P ₂ O ₅)	7.6 * (as P ₂ O ₅)
Potassium (K)	%	0.266	26.6 (as K ₂ O)	26.6 * (as K ₂ O)
Sulfur (S)	%	0.02	1.8	0.9 #

[Ⓢ] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin
** Manure density assumed to be 8.33 lb/gallon

Report Number
F25191-6500
Account Number
63570



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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75081
Sample ID: AFTER PM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/29/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 16 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal**	First Year Availability [Ⓢ] Pounds Per 1,000 Gal
Magnesium (Mg)	%	0.07	6.1	3.2 #
Calcium (Ca)	%	0.15	12.1	6.9 #
Sodium (Na)	%	0.08	6.7	
Aluminum (Al)	ppm	85	0.7	
Copper (Cu)	ppm	5.9	<0.1	<0.1 #
Iron (Fe)	ppm	138	1.1	0.7 #
Manganese (Mn)	ppm	13	0.1	0.1 #
Zinc (Zn)	ppm	13	0.1	0.1 #

[Ⓢ] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
 * Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin
 ** Manure density assumed to be 8.33 lb/gallon

Report Number
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Account Number
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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75082
Sample ID: BEFORE AM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/29/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 17 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal ^{**}	First Year Availability [Ⓢ] Pounds Per 1,000 Gal
Moisture	%	94.84	7900	
Solids	%	5.16	430	
Ash @ 550 C	%	1.20	99.9	
Organic Matter (LOI @ 550 C)	%	3.96	329.9	
Organic Carbon (LOI @ 550 C)	%	2.30	191.4	
Carbon:Nitrogen Ratio (C:N)	-		7.7:1	
Nitrogen, Total Kjeldahl (TKN)	%	0.299	24.9	16.8 *
Nitrogen, Ammonium (NH ₄ -N)	%	0.160	13.3	13.3 *
Nitrogen, Organic (N)	%	0.139	11.6	3.5 *
Phosphorus (P)	%	0.041	7.9 (as P ₂ O ₅)	7.9 * (as P ₂ O ₅)
Potassium (K)	%	0.207	20.7 (as K ₂ O)	20.7 * (as K ₂ O)
Sulfur (S)	%	0.02	2.0	0.9 #

Ⓢ Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.

* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin

** Manure density assumed to be 8.33 lb/gallon

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To: NEWTRIENT LLC - SIG GRANT
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WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75082
Sample ID: BEFORE AM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/29/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 18 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal	First Year Availability [®] Pounds Per 1,000 Gal
Magnesium (Mg)	%	0.08	6.8	3.7 #
Calcium (Ca)	%	0.16	13.7	7.3 #
Sodium (Na)	%	0.06	4.8	
Aluminum (Al)	ppm	93	0.8	
Copper (Cu)	ppm	6.5	0.1	<0.1 #
Iron (Fe)	ppm	165	1.4	0.9 #
Manganese (Mn)	ppm	12	0.1	0.1 #
Zinc (Zn)	ppm	15	0.1	0.1 #

[®] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin
** Manure density assumed to be 8.33 lb/gallon

Report Number
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Account Number
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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75083
Sample ID: BEFORE PM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/29/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 19 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal [†]	First Year Availability [®] Pounds Per 1,000 Gal
Moisture	%	95.22	7932	
Solids	%	4.78	398	
Ash @ 550 C	%	1.15	96.1	
Organic Matter (LOI @ 550 C)	%	3.63	302.1	
Organic Carbon (LOI @ 550 C)	%	2.10	175.2	
Carbon:Nitrogen Ratio (C:N)	-		7.2:1	
Nitrogen, Total Kjeldahl (TKN)	%	0.293	24.4	16.6*
Nitrogen, Ammonium (NH ₄ -N)	%	0.160	13.3	13.3*
Nitrogen, Organic (N)	%	0.133	11.1	3.3*
Phosphorus (P)	%	0.041	7.8 (as P ₂ O ₅)	7.8* (as P ₂ O ₅)
Potassium (K)	%	0.231	23.1 (as K ₂ O)	23.1* (as K ₂ O)
Sulfur (S)	%	0.02	1.9	0.9 [#]

[®] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.

* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 [#] Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin

** Manure density assumed to be 8.33 lb/gallon

Report Number
F25191-6500
Account Number
63570



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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75083
Sample ID: BEFORE PM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/29/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 20 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal ^{**}	First Year Availability [Ⓢ] Pounds Per 1,000 Gal
Magnesium (Mg)	%	0.08	6.6	3.7 #
Calcium (Ca)	%	0.15	12.5	6.9 #
Sodium (Na)	%	0.07	5.7	
Aluminum (Al)	ppm	98	0.8	
Copper (Cu)	ppm	6.4	0.1	<0.1 #
Iron (Fe)	ppm	152	1.3	0.8 #
Manganese (Mn)	ppm	13	0.1	0.1 #
Zinc (Zn)	ppm	14	0.1	0.1 #

[Ⓢ] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.

* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin

** Manure density assumed to be 8.33 lb/gallon

Report Number
F25191-6500
Account Number
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3505 Conestoga Dr.
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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75084
Sample ID: BEFORE AM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/30/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 21 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal ^{**}	First Year Availability [Ⓢ] Pounds Per 1,000 Gal
Moisture	%	94.98	7912	
Solids	%	5.02	418	
Ash @ 550 C	%	1.22	101.4	
Organic Matter (LOI @ 550 C)	%	3.80	316.8	
Organic Carbon (LOI @ 550 C)	%	2.21	183.7	
Carbon:Nitrogen Ratio (C:N)	-		7.5:1	
Nitrogen, Total Kjeldahl (TKN)	%	0.293	24.4	16.1*
Nitrogen, Ammonium (NH ₄ -N)	%	0.150	12.5	12.5*
Nitrogen, Organic (N)	%	0.143	11.9	3.6*
Phosphorus (P)	%	0.041	7.7 (as P ₂ O ₅)	7.7* (as P ₂ O ₅)
Potassium (K)	%	0.243	24.3 (as K ₂ O)	24.3* (as K ₂ O)
Sulfur (S)	%	0.02	2.0	0.9#

Ⓢ Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin
** Manure density assumed to be 8.33 lb/gallon

Report Number
F25191-6500
Account Number
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To: NEWTRIENT LLC - SIG GRANT
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WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75084
Sample ID: BEFORE AM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/30/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 22 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal**	First Year Availability [Ⓢ] Pounds Per 1,000 Gal
Magnesium (Mg)	%	0.08	6.5	3.7 #
Calcium (Ca)	%	0.16	13.1	7.3 #
Sodium (Na)	%	0.07	6.2	
Aluminum (Al)	ppm	94	0.8	
Copper (Cu)	ppm	6.4	0.1	<0.1 #
Iron (Fe)	ppm	160	1.3	0.9 #
Manganese (Mn)	ppm	12	0.1	0.1 #
Zinc (Zn)	ppm	14	0.1	0.1 #

[Ⓢ] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.

* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin

** Manure density assumed to be 8.33 lb/gallon

Report Number
F25191-6500
Account Number
63570



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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75085
Sample ID: BEFORE PM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/30/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 23 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal**	First Year Availability [Ⓢ] Pounds Per 1,000 Gal
Moisture	%	94.78	7895	
Solids	%	5.22	435	
Ash @ 550 C	%	1.22	101.5	
Organic Matter (LOI @ 550 C)	%	4.00	333.4	
Organic Carbon (LOI @ 550 C)	%	2.32	193.4	
Carbon:Nitrogen Ratio (C:N)	-		8.0:1	
Nitrogen, Total Kjeldahl (TKN)	%	0.289	24.1	16.0 *
Nitrogen, Ammonium (NH ₄ -N)	%	0.150	12.5	12.5 *
Nitrogen, Organic (N)	%	0.139	11.6	3.5 *
Phosphorus (P)	%	0.041	7.8 (as P ₂ O ₅)	7.8 * (as P ₂ O ₅)
Potassium (K)	%	0.234	23.4 (as K ₂ O)	23.4 * (as K ₂ O)
Sulfur (S)	%	0.02	2.0	0.9 #

[Ⓢ] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin
** Manure density assumed to be 8.33 lb/gallon

Report Number
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Account Number
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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75085
Sample ID: BEFORE PM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/30/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 24 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal ^{**}	First Year Availability [Ⓢ] Pounds Per 1,000 Gal
Magnesium (Mg)	%	0.08	6.8	3.7 #
Calcium (Ca)	%	0.17	13.9	7.8 #
Sodium (Na)	%	0.07	6.0	
Aluminum (Al)	ppm	101	0.8	
Copper (Cu)	ppm	6.8	0.1	<0.1 #
Iron (Fe)	ppm	165	1.4	0.9 #
Manganese (Mn)	ppm	13	0.1	0.1 #
Zinc (Zn)	ppm	15	0.1	0.1 #

[Ⓢ] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.

* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin

** Manure density assumed to be 8.33 lb/gallon

Report Number
F25191-6500
Account Number
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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75086
Sample ID: AFTER AM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/30/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 25 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal**	First Year Availability [Ⓔ] Pounds Per 1,000 Gal
Moisture	%	96.19	8013	
Solids	%	3.81	317	
Ash @ 550 C	%	1.26	105.1	
Organic Matter (LOI @ 550 C)	%	2.55	212.2	
Organic Carbon (LOI @ 550 C)	%	1.48	123.1	
Carbon:Nitrogen Ratio (C:N)	-		5.3:1	
Nitrogen, Total Kjeldahl (TKN)	%	0.279	23.2	16.3 *
Nitrogen, Ammonium (NH ₄ -N)	%	0.160	13.3	13.3 *
Nitrogen, Organic (N)	%	0.119	9.9	3.0 *
Phosphorus (P)	%	0.043	8.2 (as P ₂ O ₅)	8.2 * (as P ₂ O ₅)
Potassium (K)	%	0.284	28.4 (as K ₂ O)	28.4 * (as K ₂ O)
Sulfur (S)	%	0.02	1.9	0.9 #

[Ⓔ] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.

* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin

** Manure density assumed to be 8.33 lb/gallon

Report Number
F25191-6500
Account Number
63570



3505 Conestoga Dr.
Fort Wayne, IN 46808
260.483.4759
algreatlakes.com

To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75086
Sample ID: AFTER AM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/30/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 26 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal ^{**}	First Year Availability [Ⓢ] Pounds Per 1,000 Gal
Magnesium (Mg)	%	0.07	6.2	3.2 #
Calcium (Ca)	%	0.16	13.1	7.3 #
Sodium (Na)	%	0.08	6.6	
Aluminum (Al)	ppm	89	0.7	
Copper (Cu)	ppm	6.0	<0.1	<0.1 #
Iron (Fe)	ppm	142	1.2	0.8 #
Manganese (Mn)	ppm	13	0.1	0.1 #
Zinc (Zn)	ppm	13	0.1	0.1 #

Ⓢ Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
 * Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin
 ** Manure density assumed to be 8.33 lb/gallon

Report Number
F25191-6500
Account Number
63570



3505 Conestoga Dr.
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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75087
Sample ID: AFTER PM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/30/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 27 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal**	First Year Availability [Ⓔ] Pounds Per 1,000 Gal
Moisture	%	96.08	8003	
Solids	%	3.92	327	
Ash @ 550 C	%	1.29	107.3	
Organic Matter (LOI @ 550 C)	%	2.63	219.3	
Organic Carbon (LOI @ 550 C)	%	1.53	127.2	
Carbon:Nitrogen Ratio (C:N)	-		5.4:1	
Nitrogen, Total Kjeldahl (TKN)	%	0.282	23.5	16.4 *
Nitrogen, Ammonium (NH ₄ -N)	%	0.160	13.3	13.3 *
Nitrogen, Organic (N)	%	0.122	10.2	3.1 *
Phosphorus (P)	%	0.041	7.8 (as P ₂ O ₅)	7.8 * (as P ₂ O ₅)
Potassium (K)	%	0.273	27.3 (as K ₂ O)	27.3 * (as K ₂ O)
Sulfur (S)	%	0.02	1.8	0.9 #

[Ⓔ] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.

* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin

** Manure density assumed to be 8.33 lb/gallon

Report Number
F25191-6500
Account Number
63570



3505 Conestoga Dr.
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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75087
Sample ID: AFTER PM
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/30/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 28 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal ^{**}	First Year Availability [Ⓢ] Pounds Per 1,000 Gal
Magnesium (Mg)	%	0.07	6.1	3.2 #
Calcium (Ca)	%	0.15	12.8	6.9 #
Sodium (Na)	%	0.08	6.5	
Aluminum (Al)	ppm	92	0.8	
Copper (Cu)	ppm	6.4	0.1	<0.1 #
Iron (Fe)	ppm	143	1.2	0.8 #
Manganese (Mn)	ppm	14	0.1	0.1 #
Zinc (Zn)	ppm	13	0.1	0.1 #

Ⓢ Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
 * Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin
 ** Manure density assumed to be 8.33 lb/gallon

Report Number
F25191-6500
Account Number
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3505 Conestoga Dr.
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algreatlakes.com

To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75088
Sample ID: AFTER
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/26/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 29 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal ^{**}	First Year Availability [Ⓢ] Pounds Per 1,000 Gal
Moisture	%	95.81	7981	
Solids	%	4.19	349	
Ash @ 550 C	%	1.32	109.9	
Organic Matter (LOI @ 550 C)	%	2.87	239.1	
Organic Carbon (LOI @ 550 C)	%	1.67	138.7	
Carbon:Nitrogen Ratio (C:N)	-		5.9:1	
Nitrogen, Total Kjeldahl (TKN)	%	0.281	23.4	15.8 *
Nitrogen, Ammonium (NH ₄ -N)	%	0.150	12.5	12.5 *
Nitrogen, Organic (N)	%	0.131	10.9	3.3 *
Phosphorus (P)	%	0.043	8.1 (as P ₂ O ₅)	8.1 * (as P ₂ O ₅)
Potassium (K)	%	0.280	28.0 (as K ₂ O)	28.0 * (as K ₂ O)
Sulfur (S)	%	0.02	1.9	0.9 #

Ⓢ Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.

* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin

** Manure density assumed to be 8.33 lb/gallon

Report Number
F25191-6500
Account Number
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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75088
Sample ID: AFTER
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/26/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 30 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal ^{**}	First Year Availability [Ⓢ] Pounds Per 1,000 Gal
Magnesium (Mg)	%	0.08	6.4	3.7 #
Calcium (Ca)	%	0.17	14.0	7.8 #
Sodium (Na)	%	0.08	6.8	
Aluminum (Al)	ppm	73	0.6	
Copper (Cu)	ppm	6.7	0.1	<0.1 #
Iron (Fe)	ppm	146	1.2	0.8 #
Manganese (Mn)	ppm	15	0.1	0.1 #
Zinc (Zn)	ppm	14	0.1	0.1 #

Ⓢ Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.

* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin

** Manure density assumed to be 8.33 lb/gallon

Report Number
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Account Number
63570



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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75089
Sample ID: BEFORE
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/26/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 31 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal ^{***}	First Year Availability [®] Pounds Per 1,000 Gal
Moisture	%	94.47	7869	
Solids	%	5.53	461	
Ash @ 550 C	%	1.23	102.7	
Organic Matter (LOI @ 550 C)	%	4.30	357.9	
Organic Carbon (LOI @ 550 C)	%	2.49	207.6	
Carbon:Nitrogen Ratio (C:N)	-		8.4:1	
Nitrogen, Total Kjeldahl (TKN)	%	0.298	24.8	16.2*
Nitrogen, Ammonium (NH ₄ -N)	%	0.150	12.5	12.5*
Nitrogen, Organic (N)	%	0.148	12.3	3.7*
Phosphorus (P)	%	0.044	8.3 (as P ₂ O ₅)	8.3* (as P ₂ O ₅)
Potassium (K)	%	0.216	21.5 (as K ₂ O)	21.5* (as K ₂ O)
Sulfur (S)	%	0.03	2.3	1.4 [#]

[®] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 [#] Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin
** Manure density assumed to be 8.33 lb/gallon

Report Number
F25191-6500
Account Number
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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75089
Sample ID: BEFORE
Manure Type: DAIRY, LIQUID PIT (20)

Date Sampled: 6/26/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 32 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per 1,000 Gal**	First Year Availability [Ⓢ] Pounds Per 1,000 Gal
Magnesium (Mg)	%	0.07	5.5	3.2 #
Calcium (Ca)	%	0.17	14.5	7.8 #
Sodium (Na)	%	0.06	5.2	
Aluminum (Al)	ppm	93	0.8	
Copper (Cu)	ppm	7.4	0.1	<0.1 #
Iron (Fe)	ppm	172	1.4	0.9 #
Manganese (Mn)	ppm	13	0.1	0.1 #
Zinc (Zn)	ppm	15	0.1	0.1 #

[Ⓢ] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin
** Manure density assumed to be 8.33 lb/gallon

Report Number
F25191-6501
Account Number
63570



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a@greatlakes.com

To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75090
Sample ID: AFTER PRESS AM
Manure Type: DAIRY, SOLID WITH BEDDING (7)

Date Sampled: 7/2/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 1 of 8

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton	First Year Availability [®] Pounds Per Ton
Moisture	%	65.38	1308	
Solids	%	34.62	692	
Ash @ 550 C	%	2.76	55.2	
Organic Matter (LOI @ 550 C)	%	31.86	637.2	
Organic Carbon (LOI @ 550 C)	%	18.48	369.5	
Carbon:Nitrogen Ratio (C:N)	-		29.7:1	
Nitrogen, Total Kjeldahl (TKN)	%	0.622	12.4	5.5 *
Nitrogen, Ammonium (NH ₄ -N)	%	0.160	3.2	3.2 *
Nitrogen, Organic (N)	%	0.462	9.2	2.3 *
Phosphorus (P)	%	0.104	4.8 (as P ₂ O ₅)	4.8 * (as P ₂ O ₅)
Potassium (K)	%	0.269	6.5 (as K ₂ O)	6.5 * (as K ₂ O)
Sulfur (S)	%	0.11	2.2	1.2 #

[®] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin

Report Approved By:  Approval Date: 7/16/2025
Daniel Fulton - Agronomist / Technical Services - CPAg/CCA

Report Number
F25191-6501
Account Number
63570



3505 Conestoga Dr.
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algreatlakes.com

To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75090
Sample ID: AFTER PRESS AM
Manure Type: DAIRY, SOLID WITH BEDDING (7)

Date Sampled: 7/2/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 2 of 8

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton	First Year Availability [®] Pounds Per Ton
Magnesium (Mg)	%	0.17	3.4	1.9 #
Calcium (Ca)	%	0.54	10.8	5.9 #
Sodium (Na)	%	0.07	1.4	
Aluminum (Al)	ppm	199	0.4	
Copper (Cu)	ppm	17	<0.1	<0.1 #
Iron (Fe)	ppm	677	1.4	0.9 #
Manganese (Mn)	ppm	29	0.1	<0.1 #
Zinc (Zn)	ppm	37	0.1	<0.1 #

[®] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
 * Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin

Report Number
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Account Number
63570



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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75091
Sample ID: AFTER PRESS AM
Manure Type: DAIRY, SOLID WITH BEDDING (7)

Date Sampled: 7/3/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 3 of 8

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton	First Year Availability [®] Pounds Per Ton
Moisture	%	61.23	1225	
Solids	%	38.77	775	
Ash @ 550 C	%	2.29	45.9	
Organic Matter (LOI @ 550 C)	%	36.48	729.5	
Organic Carbon (LOI @ 550 C)	%	21.16	423.1	
Carbon:Nitrogen Ratio (C:N)	-		33.5:1	
Nitrogen, Total Kjeldahl (TKN)	%	0.631	12.6	5.6 *
Nitrogen, Ammonium (NH ₄ -N)	%	0.160	3.2	3.2 *
Nitrogen, Organic (N)	%	0.471	9.4	2.4 *
Phosphorus (P)	%	0.126	5.8 (as P ₂ O ₅)	5.8 * (as P ₂ O ₅)
Potassium (K)	%	0.279	6.7 (as K ₂ O)	6.7 * (as K ₂ O)
Sulfur (S)	%	0.14	2.8	1.5 #

[®] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin

Report Number
F25191-6501
Account Number
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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75091
Sample ID: AFTER PRESS AM
Manure Type: DAIRY, SOLID WITH BEDDING (7)

Date Sampled: 7/3/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 4 of 8

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton	First Year Availability [®] Pounds Per Ton
Magnesium (Mg)	%	0.18	3.6	2.0 #
Calcium (Ca)	%	0.64	12.7	7.0 #
Sodium (Na)	%	0.07	1.4	
Aluminum (Al)	ppm	271	0.5	
Copper (Cu)	ppm	21	<0.1	<0.1 #
Iron (Fe)	ppm	833	1.7	1.1 #
Manganese (Mn)	ppm	35	0.1	<0.1 #
Zinc (Zn)	ppm	47	0.1	0.1 #

[®] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
 * Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin

Report Number
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Account Number
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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75092
Sample ID: AFTER PRESS PM
Manure Type: DAIRY, SOLID WITH BEDDING (7)

Date Sampled: 6/28/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 5 of 8

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton	First Year Availability [®] Pounds Per Ton
Moisture	%	65.45	1309	
Solids	%	34.55	691	
Ash @ 550 C	%	2.18	43.7	
Organic Matter (LOI @ 550 C)	%	32.37	647.3	
Organic Carbon (LOI @ 550 C)	%	18.77	375.4	
Carbon:Nitrogen Ratio (C:N)	-		31.1:1	
Nitrogen, Total Kjeldahl (TKN)	%	0.604	12.1	5.3 *
Nitrogen, Ammonium (NH ₄ -N)	%	0.150	3.0	3.0 *
Nitrogen, Organic (N)	%	0.454	9.1	2.3 *
Phosphorus (P)	%	0.109	5.0 (as P ₂ O ₅)	5.0 * (as P ₂ O ₅)
Potassium (K)	%	0.258	6.2 (as K ₂ O)	6.2 * (as K ₂ O)
Sulfur (S)	%	0.12	2.3	1.3 #

[®] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin

Report Number
F25191-6501
Account Number
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3505 Conestoga Dr.
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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75092
Sample ID: AFTER PRESS PM
Manure Type: DAIRY, SOLID WITH BEDDING (7)

Date Sampled: 6/28/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 6 of 8

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton	First Year Availability [Ⓔ] Pounds Per Ton
Magnesium (Mg)	%	0.15	3.1	1.7 #
Calcium (Ca)	%	0.57	11.5	6.3 #
Sodium (Na)	%	0.06	1.3	
Aluminum (Al)	ppm	210	0.4	
Copper (Cu)	ppm	18	<0.1	<0.1 #
Iron (Fe)	ppm	715	1.4	0.9 #
Manganese (Mn)	ppm	30	0.1	<0.1 #
Zinc (Zn)	ppm	38	0.1	<0.1 #

[Ⓔ] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin

Report Number
F25191-6501
Account Number
63570



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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75093
Sample ID: AFTER PRESS PM
Manure Type: DAIRY, SOLID WITH BEDDING (7)

Date Sampled: 7/1/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 7 of 8

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton	First Year Availability [Ⓔ] Pounds Per Ton
Moisture	%	63.94	1279	
Solids	%	36.06	721	
Ash @ 550 C	%	2.80	56.0	
Organic Matter (LOI @ 550 C)	%	33.26	665.2	
Organic Carbon (LOI @ 550 C)	%	19.29	385.8	
Carbon:Nitrogen Ratio (C:N)	-		31.4:1	
Nitrogen, Total Kjeldahl (TKN)	%	0.614	12.3	5.2 [*]
Nitrogen, Ammonium (NH ₄ -N)	%	0.140	2.8	2.8 [*]
Nitrogen, Organic (N)	%	0.474	9.5	2.4 [*]
Phosphorus (P)	%	0.112	5.1 (as P ₂ O ₅)	5.1 [*] (as P ₂ O ₅)
Potassium (K)	%	0.276	6.6 (as K ₂ O)	6.6 [*] (as K ₂ O)
Sulfur (S)	%	0.12	2.4	1.3 [#]

[Ⓔ] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
^{*} Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 [#] Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin

Report Number
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Account Number
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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75093
Sample ID: AFTER PRESS PM
Manure Type: DAIRY, SOLID WITH BEDDING (7)

Date Sampled: 7/1/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 8 of 8

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton	First Year Availability [®] Pounds Per Ton
Magnesium (Mg)	%	0.16	3.2	1.8 #
Calcium (Ca)	%	0.56	11.2	6.2 #
Sodium (Na)	%	0.07	1.4	
Aluminum (Al)	ppm	257	0.5	
Copper (Cu)	ppm	19	<0.1	<0.1 #
Iron (Fe)	ppm	752	1.5	1.0 #
Manganese (Mn)	ppm	32	0.1	<0.1 #
Zinc (Zn)	ppm	42	0.1	0.1 #

[®] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 # Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin

Report Number
F25191-6503
Account Number
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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75110
Sample ID: AFTER AM
Manure Type: DAIRY, SOLID WITH BEDDING (7)

Date Sampled: 6/28/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 1 of 8

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton	First Year Availability [®] Pounds Per Ton
Moisture	%	35.98	720	
Solids	%	64.02	1280	
Ash @ 550 C	%	6.46	129.1	
Organic Matter (LOI @ 550 C)	%	57.56	1151.3	
Organic Carbon (LOI @ 550 C)	%	33.39	667.7	
Carbon:Nitrogen Ratio (C:N)	-		36.4:1	
Nitrogen, Total Kjeldahl (TKN)	%	0.916	18.3	5.9*
Nitrogen, Ammonium (NH ₄ -N)	%	0.090	1.8	1.8*
Nitrogen, Organic (N)	%	0.826	16.5	4.1*
Phosphorus (P)	%	0.207	9.5 (as P ₂ O ₅)	9.5* (as P ₂ O ₅)
Potassium (K)	%	0.511	12.3 (as K ₂ O)	12.3* (as K ₂ O)
Sulfur (S)	%	0.20	4.1	2.2 [#]

[®] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
* Source: MWPS-18, Livestock Waste Facilities Handbook, 1993 [#] Source: A3411, "Manure Nutrient Credit Worksheet", University of Wisconsin

Report Approved By:  Approval Date: 7/16/2025
Daniel Fulton - Agronomist / Technical Services - CPAg/OCA

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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75110
Sample ID: AFTER AM
Manure Type: DAIRY, SOLID WITH BEDDING (7)

Date Sampled: 6/28/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 2 of 8

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton	First Year Availability [®] Pounds Per Ton
Magnesium (Mg)	%	0.31	6.3	3.4 #
Calcium (Ca)	%	0.94	18.7	10.3 #
Sodium (Na)	%	0.12	2.5	
Aluminum (Al)	ppm	402	0.8	
Copper (Cu)	ppm	34	0.1	<0.1 #
Iron (Fe)	ppm	1253	2.5	1.6 #
Manganese (Mn)	ppm	55	0.1	0.1 #
Zinc (Zn)	ppm	67	0.1	0.1 #

[®] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
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WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75111
Sample ID: AFTER PM
Manure Type: DAIRY, SOLID WITH BEDDING (7)

Date Sampled: 6/28/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 3 of 8

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton	First Year Availability [Ⓔ] Pounds Per Ton
Moisture	%	33.33	667	
Solids	%	66.67	1333	
Ash @ 550 C	%	6.43	128.5	
Organic Matter (LOI @ 550 C)	%	60.24	1204.9	
Organic Carbon (LOI @ 550 C)	%	34.94	698.8	
Carbon:Nitrogen Ratio (C:N)	-		33.3:1	
Nitrogen, Total Kjeldahl (TKN)	%	1.049	21.0	6.2 *
Nitrogen, Ammonium (NH ₄ -N)	%	0.060	1.2	1.2 *
Nitrogen, Organic (N)	%	0.989	19.8	5.0 *
Phosphorus (P)	%	0.201	9.2 (as P ₂ O ₅)	9.2 * (as P ₂ O ₅)
Potassium (K)	%	0.497	11.9 (as K ₂ O)	11.9 * (as K ₂ O)
Sulfur (S)	%	0.21	4.2	2.3 #

[Ⓔ] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
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WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75111
Sample ID: AFTER PM
Manure Type: DAIRY, SOLID WITH BEDDING (7)

Date Sampled: 6/28/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 4 of 8

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton	First Year Availability [®] Pounds Per Ton
Magnesium (Mg)	%	0.30	6.0	3.3 #
Calcium (Ca)	%	0.87	17.4	9.6 #
Sodium (Na)	%	0.12	2.4	
Aluminum (Al)	ppm	426	0.9	
Copper (Cu)	ppm	33	0.1	<0.1 #
Iron (Fe)	ppm	1173	2.3	1.5 #
Manganese (Mn)	ppm	52	0.1	0.1 #
Zinc (Zn)	ppm	70	0.1	0.1 #

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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75112
Sample ID: AFTER PM
Manure Type: DAIRY, SOLID WITH BEDDING (7)

Date Sampled: 7/1/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 5 of 8

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton	First Year Availability [Ⓔ] Pounds Per Ton
Moisture	%	42.73	855	
Solids	%	57.27	1145	
Ash @ 550 C	%	4.91	98.2	
Organic Matter (LOI @ 550 C)	%	52.36	1047.2	
Organic Carbon (LOI @ 550 C)	%	30.37	607.4	
Carbon:Nitrogen Ratio (C:N)	-		38.2:1	
Nitrogen, Total Kjeldahl (TKN)	%	0.795	15.9	5.0 *
Nitrogen, Ammonium (NH ₄ -N)	%	0.070	1.4	1.4 *
Nitrogen, Organic (N)	%	0.725	14.5	3.6 *
Phosphorus (P)	%	0.174	8.0 (as P ₂ O ₅)	8.0 * (as P ₂ O ₅)
Potassium (K)	%	0.401	9.6 (as K ₂ O)	9.6 * (as K ₂ O)
Sulfur (S)	%	0.18	3.6	2.0 #

[Ⓔ] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75112
Sample ID: AFTER PM
Manure Type: DAIRY, SOLID WITH BEDDING (7)

Date Sampled: 7/1/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 6 of 8

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton	First Year Availability [Ⓐ] Pounds Per Ton
Magnesium (Mg)	%	0.26	5.2	2.9 #
Calcium (Ca)	%	0.78	15.7	8.6 #
Sodium (Na)	%	0.10	1.9	
Aluminum (Al)	ppm	331	0.7	
Copper (Cu)	ppm	27	0.1	<0.1 #
Iron (Fe)	ppm	938	1.9	1.2 #
Manganese (Mn)	ppm	45	0.1	0.1 #
Zinc (Zn)	ppm	60	0.1	0.1 #

[Ⓐ] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75113
Sample ID: AFTER PM
Manure Type: DAIRY, SOLID WITH BEDDING (7)

Date Sampled: 7/2/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 7 of 8

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton	First Year Availability [®] Pounds Per Ton
Moisture	%	41.31	826	
Solids	%	58.69	1174	
Ash @ 550 C	%	4.30	86.0	
Organic Matter (LOI @ 550 C)	%	54.39	1087.8	
Organic Carbon (LOI @ 550 C)	%	31.55	630.9	
Carbon:Nitrogen Ratio (C:N)	-		35.8:1	
Nitrogen, Total Kjeldahl (TKN)	%	0.880	17.6	5.8*
Nitrogen, Ammonium (NH ₄ -N)	%	0.090	1.8	1.8*
Nitrogen, Organic (N)	%	0.790	15.8	4.0*
Phosphorus (P)	%	0.183	8.4 (as P ₂ O ₅)	8.4* (as P ₂ O ₅)
Potassium (K)	%	0.423	10.2 (as K ₂ O)	10.2* (as K ₂ O)
Sulfur (S)	%	0.19	3.7	2.1 [#]

[®] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75113
Sample ID: AFTER PM
Manure Type: DAIRY, SOLID WITH BEDDING (7)

Date Sampled: 7/2/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 8 of 8

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton	First Year Availability [Ⓔ] Pounds Per Ton
Magnesium (Mg)	%	0.28	5.5	3.1 #
Calcium (Ca)	%	0.84	16.9	9.2 #
Sodium (Na)	%	0.12	2.4	
Aluminum (Al)	ppm	342	0.7	
Copper (Cu)	ppm	28	0.1	<0.1 #
Iron (Fe)	ppm	1053	2.1	1.4 #
Manganese (Mn)	ppm	47	0.1	0.1 #
Zinc (Zn)	ppm	74	0.1	0.1 #

[Ⓔ] Estimate of first-year availability does not account for incorporation losses. Consult MWPS-18, "Livestock Waste Facilities Handbook" for additional information.
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WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75114
Sample ID: BIOCHAR
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 6/18/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 1 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Moisture	%	1.74	35
Solids	%	98.26	1965
Ash @ 550 C	%	83.31	1666.2
Organic Matter (LOI @ 550 C)	%	14.95	299.0
Organic Carbon (LOI @ 550 C)	%	8.67	173.4
Carbon:Nitrogen Ratio (C:N)	-		26.6:1
Nitrogen, Total Kjeldahl (TKN)	%	0.326	6.5
Nitrogen, Ammonium (NH ₄ -N)	%	0.010	0.2
Nitrogen, Organic (N)	%	0.316	6.3
Phosphorus (P)	%	1.805	82.7 (as P ₂ O ₅)
Potassium (K)	%	4.617	110.8 (as K ₂ O)
Sulfur (S)	%	0.31	6.2

Report Approved By:

Approval Date: 7/16/2025

Don Burgess - Agronomist / Technical Services - CPAg/CPSS/CCA

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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75114
Sample ID: BIOCHAR
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 6/18/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 2 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Magnesium (Mg)	%	2.69	53.8
Calcium (Ca)	%	10.42	208.3
Sodium (Na)	%	0.75	15.0
Aluminum (Al)	ppm	7681	15.4
Copper (Cu)	ppm	242	0.5
Iron (Fe)	ppm	17657	35.3
Manganese (Mn)	ppm	695	1.4
Zinc (Zn)	ppm	293	0.6

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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75115
Sample ID: BIOCHAR
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 6/26/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 3 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Moisture	%	1.01	20
Solids	%	98.99	1980
Ash @ 550 C	%	65.85	1316.9
Organic Matter (LOI @ 550 C)	%	33.14	662.9
Organic Carbon (LOI @ 550 C)	%	19.22	384.5
Carbon:Nitrogen Ratio (C:N)	-		31.2:1
Nitrogen, Total Kjeldahl (TKN)	%	0.617	12.3
Nitrogen, Ammonium (NH ₄ -N)	%	0.010	0.2
Nitrogen, Organic (N)	%	0.607	12.1
Phosphorus (P)	%	1.603	73.4 (as P ₂ O ₅)
Potassium (K)	%	3.877	93.0 (as K ₂ O)
Sulfur (S)	%	0.31	6.1

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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75115
Sample ID: BIOCHAR
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 6/26/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 4 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Magnesium (Mg)	%	2.41	48.1
Calcium (Ca)	%	10.05	200.9
Sodium (Na)	%	0.72	14.5
Aluminum (Al)	ppm	6755	13.5
Copper (Cu)	ppm	252	0.5
Iron (Fe)	ppm	22174	44.3
Manganese (Mn)	ppm	663	1.3
Zinc (Zn)	ppm	348	0.7

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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75116
Sample ID: BIOCHAR AM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 6/27/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 5 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Moisture	%	2.25	45
Solids	%	97.75	1955
Ash @ 550 C	%	43.64	872.8
Organic Matter (LOI @ 550 C)	%	54.11	1082.2
Organic Carbon (LOI @ 550 C)	%	31.38	627.7
Carbon:Nitrogen Ratio (C:N)	-		52.2:1
Nitrogen, Total Kjeldahl (TKN)	%	0.601	12.0
Nitrogen, Ammonium (NH ₄ -N)	%	0.000	0.0
Nitrogen, Organic (N)	%	0.601	12.0
Phosphorus (P)	%	1.389	63.6 (as P ₂ O ₅)
Potassium (K)	%	3.450	82.8 (as K ₂ O)
Sulfur (S)	%	0.19	3.9

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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75116
Sample ID: BIOCHAR AM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 6/27/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 6 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Magnesium (Mg)	%	1.74	34.8
Calcium (Ca)	%	5.04	100.9
Sodium (Na)	%	0.42	8.5
Aluminum (Al)	ppm	3499	7.0
Copper (Cu)	ppm	141	0.3
Iron (Fe)	ppm	17018	34.0
Manganese (Mn)	ppm	438	0.9
Zinc (Zn)	ppm	172	0.3

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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75117
Sample ID: BIOCHAR PM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 6/27/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 7 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Moisture	%	1.15	23
Solids	%	98.85	1977
Ash @ 550 C	%	51.88	1037.7
Organic Matter (LOI @ 550 C)	%	46.97	939.3
Organic Carbon (LOI @ 550 C)	%	27.24	544.8
Carbon:Nitrogen Ratio (C:N)	-		39.9:1
Nitrogen, Total Kjeldahl (TKN)	%	0.682	13.6
Nitrogen, Ammonium (NH ₄ -N)	%	0.000	0.0
Nitrogen, Organic (N)	%	0.682	13.6
Phosphorus (P)	%	1.452	66.5 (as P ₂ O ₅)
Potassium (K)	%	3.116	74.8 (as K ₂ O)
Sulfur (S)	%	0.29	5.7

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To: NEWTRIENT LLC - SIG GRANT
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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75117
Sample ID: BIOCHAR PM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 6/27/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 8 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Magnesium (Mg)	%	2.36	47.3
Calcium (Ca)	%	7.59	151.7
Sodium (Na)	%	0.73	14.5
Aluminum (Al)	ppm	5828	11.7
Copper (Cu)	ppm	232	0.5
Iron (Fe)	ppm	10261	20.5
Manganese (Mn)	ppm	486	1.0
Zinc (Zn)	ppm	358	0.7

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11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75118
Sample ID: BIOCHAR AM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 6/28/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 9 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Moisture	%	1.06	21
Solids	%	98.94	1979
Ash @ 550 C	%	42.15	842.9
Organic Matter (LOI @ 550 C)	%	56.79	1135.9
Organic Carbon (LOI @ 550 C)	%	32.94	658.8
Carbon:Nitrogen Ratio (C:N)	-	-	46.2:1
Nitrogen, Total Kjeldahl (TKN)	%	0.713	14.3
Nitrogen, Ammonium (NH ₄ -N)	%	0.000	0.0
Nitrogen, Organic (N)	%	0.713	14.3
Phosphorus (P)	%	1.078	49.4 (as P ₂ O ₅)
Potassium (K)	%	2.464	59.1 (as K ₂ O)
Sulfur (S)	%	0.23	4.6

Report Number
F25191-6504
Account Number
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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75118
Sample ID: BIOCHAR AM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 6/28/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 10 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Magnesium (Mg)	%	1.80	35.9
Calcium (Ca)	%	5.43	108.5
Sodium (Na)	%	0.53	10.5
Aluminum (Al)	ppm	4668	9.3
Copper (Cu)	ppm	165	0.3
Iron (Fe)	ppm	10141	20.3
Manganese (Mn)	ppm	430	0.9
Zinc (Zn)	ppm	195	0.4

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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75119
Sample ID: BIOCHAR PM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 6/28/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 11 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Moisture	%	1.59	32
Solids	%	98.41	1968
Ash @ 550 C	%	49.10	982.0
Organic Matter (LOI @ 550 C)	%	49.31	986.2
Organic Carbon (LOI @ 550 C)	%	28.60	572.0
Carbon:Nitrogen Ratio (C:N)	-		35.3:1
Nitrogen, Total Kjeldahl (TKN)	%	0.811	16.2
Nitrogen, Ammonium (NH ₄ -N)	%	0.000	0.0
Nitrogen, Organic (N)	%	0.811	16.2
Phosphorus (P)	%	1.408	64.5 (as P ₂ O ₅)
Potassium (K)	%	2.942	70.6 (as K ₂ O)
Sulfur (S)	%	0.28	5.5

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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75119
Sample ID: BIOCHAR PM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 6/28/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 12 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Magnesium (Mg)	%	2.23	44.5
Calcium (Ca)	%	7.87	157.5
Sodium (Na)	%	0.66	13.2
Aluminum (Al)	ppm	6207	12.4
Copper (Cu)	ppm	237	0.5
Iron (Fe)	ppm	14840	29.7
Manganese (Mn)	ppm	569	1.1
Zinc (Zn)	ppm	268	0.5

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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75120
Sample ID: BIOCHAR AM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 6/29/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 13 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Moisture	%	0.74	15
Solids	%	99.26	1985
Ash @ 550 C	%	34.07	681.5
Organic Matter (LOI @ 550 C)	%	65.19	1303.7
Organic Carbon (LOI @ 550 C)	%	37.81	756.2
Carbon:Nitrogen Ratio (C:N)	-		33.5:1
Nitrogen, Total Kjeldahl (TKN)	%	1.129	22.6
Nitrogen, Ammonium (NH ₄ -N)	%	0.000	0.0
Nitrogen, Organic (N)	%	1.129	22.6
Phosphorus (P)	%	1.080	49.5 (as P ₂ O ₅)
Potassium (K)	%	2.128	51.1 (as K ₂ O)
Sulfur (S)	%	0.19	3.7

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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75120
Sample ID: BIOCHAR AM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 6/29/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 14 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Magnesium (Mg)	%	1.75	35.0
Calcium (Ca)	%	4.70	94.0
Sodium (Na)	%	0.53	10.6
Aluminum (Al)	ppm	3331	6.7
Copper (Cu)	ppm	147	0.3
Iron (Fe)	ppm	6973	13.9
Manganese (Mn)	ppm	323	0.6
Zinc (Zn)	ppm	292	0.6

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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75121
Sample ID: BIOCHAR PM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 6/29/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 15 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Moisture	%	0.17	3
Solids	%	99.83	1997
Ash @ 550 C	%	37.33	746.5
Organic Matter (LOI @ 550 C)	%	62.50	1250.1
Organic Carbon (LOI @ 550 C)	%	36.25	725.0
Carbon:Nitrogen Ratio (C:N)	-		33.1:1
Nitrogen, Total Kjeldahl (TKN)	%	1.094	21.9
Nitrogen, Ammonium (NH ₄ -N)	%	0.000	0.0
Nitrogen, Organic (N)	%	1.094	21.9
Phosphorus (P)	%	1.182	54.2 (as P ₂ O ₅)
Potassium (K)	%	2.297	55.1 (as K ₂ O)
Sulfur (S)	%	0.20	4.0

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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75121
Sample ID: BIOCHAR PM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 6/29/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 16 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Magnesium (Mg)	%	1.92	38.5
Calcium (Ca)	%	5.19	103.8
Sodium (Na)	%	0.57	11.4
Aluminum (Al)	ppm	3956	7.9
Copper (Cu)	ppm	155	0.3
Iron (Fe)	ppm	6318	12.6
Manganese (Mn)	ppm	329	0.7
Zinc (Zn)	ppm	303	0.6

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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75122
Sample ID: BIOCHAR AM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 6/30/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 17 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Moisture	%	0.37	7
Solids	%	99.63	1993
Ash @ 550 C	%	44.87	897.3
Organic Matter (LOI @ 550 C)	%	54.76	1095.3
Organic Carbon (LOI @ 550 C)	%	31.76	635.3
Carbon:Nitrogen Ratio (C:N)	-		37.4:1
Nitrogen, Total Kjeldahl (TKN)	%	0.849	17.0
Nitrogen, Ammonium (NH ₄ -N)	%	0.000	0.0
Nitrogen, Organic (N)	%	0.849	17.0
Phosphorus (P)	%	1.474	67.5 (as P ₂ O ₅)
Potassium (K)	%	2.716	65.2 (as K ₂ O)
Sulfur (S)	%	0.26	5.2

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To: NEWTRIENT LLC - SIG GRANT
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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75122
Sample ID: BIOCHAR AM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 6/30/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 18 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Magnesium (Mg)	%	2.25	44.9
Calcium (Ca)	%	7.65	153.1
Sodium (Na)	%	0.63	12.6
Aluminum (Al)	ppm	4916	9.8
Copper (Cu)	ppm	182	0.4
Iron (Fe)	ppm	9026	18.1
Manganese (Mn)	ppm	470	0.9
Zinc (Zn)	ppm	309	0.6

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11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75123
Sample ID: BIOCHAR PM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 6/30/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 19 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Moisture	%	1.47	29
Solids	%	98.53	1971
Ash @ 550 C	%	39.97	799.4
Organic Matter (LOI @ 550 C)	%	58.56	1171.2
Organic Carbon (LOI @ 550 C)	%	33.96	679.3
Carbon:Nitrogen Ratio (C:N)	-		38.2:1
Nitrogen, Total Kjeldahl (TKN)	%	0.888	17.8
Nitrogen, Ammonium (NH ₄ -N)	%	0.000	0.0
Nitrogen, Organic (N)	%	0.888	17.8
Phosphorus (P)	%	1.259	57.7 (as P ₂ O ₅)
Potassium (K)	%	2.528	60.7 (as K ₂ O)
Sulfur (S)	%	0.24	4.8

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To: NEWTRIENT LLC - SIG GRANT
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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75123
Sample ID: BIOCHAR PM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 6/30/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 20 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Magnesium (Mg)	%	1.96	39.2
Calcium (Ca)	%	6.95	139.1
Sodium (Na)	%	0.55	11.1
Aluminum (Al)	ppm	4549	9.1
Copper (Cu)	ppm	165	0.3
Iron (Fe)	ppm	9559	19.1
Manganese (Mn)	ppm	455	0.9
Zinc (Zn)	ppm	265	0.5

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WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75124
Sample ID: BIOCHAR AM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 7/1/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 21 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Moisture	%	1.81	36
Solids	%	98.19	1964
Ash @ 550 C	%	42.08	841.6
Organic Matter (LOI @ 550 C)	%	56.11	1122.2
Organic Carbon (LOI @ 550 C)	%	32.54	650.9
Carbon:Nitrogen Ratio (C:N)	-		46.6:1
Nitrogen, Total Kjeldahl (TKN)	%	0.699	14.0
Nitrogen, Ammonium (NH ₄ -N)	%	0.000	0.0
Nitrogen, Organic (N)	%	0.699	14.0
Phosphorus (P)	%	1.242	56.9 (as P ₂ O ₅)
Potassium (K)	%	2.497	59.9 (as K ₂ O)
Sulfur (S)	%	0.26	5.1

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To: NEWTRIENT LLC - SIG GRANT
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WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75124
Sample ID: BIOCHAR AM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 7/1/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 22 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Magnesium (Mg)	%	1.93	38.7
Calcium (Ca)	%	7.08	141.6
Sodium (Na)	%	0.54	10.7
Aluminum (Al)	ppm	4481	9.0
Copper (Cu)	ppm	162	0.3
Iron (Fe)	ppm	9185	18.4
Manganese (Mn)	ppm	473	0.9
Zinc (Zn)	ppm	235	0.5

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To: NEWTRIENT LLC - SIG GRANT
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WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75125
Sample ID: BIOCHAR PM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 7/1/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 23 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Moisture	%	0.77	15
Solids	%	99.23	1985
Ash @ 550 C	%	30.51	610.1
Organic Matter (LOI @ 550 C)	%	68.72	1374.5
Organic Carbon (LOI @ 550 C)	%	39.86	797.2
Carbon:Nitrogen Ratio (C:N)	-		46.4:1
Nitrogen, Total Kjeldahl (TKN)	%	0.859	17.2
Nitrogen, Ammonium (NH ₄ -N)	%	0.000	0.0
Nitrogen, Organic (N)	%	0.859	17.2
Phosphorus (P)	%	0.982	45.0 (as P ₂ O ₅)
Potassium (K)	%	2.086	50.1 (as K ₂ O)
Sulfur (S)	%	0.18	3.5

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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75125
Sample ID: BIOCHAR PM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 7/1/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 24 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Magnesium (Mg)	%	1.60	32.0
Calcium (Ca)	%	4.62	92.3
Sodium (Na)	%	0.48	9.5
Aluminum (Al)	ppm	3398	6.8
Copper (Cu)	ppm	136	0.3
Iron (Fe)	ppm	5871	11.7
Manganese (Mn)	ppm	320	0.6
Zinc (Zn)	ppm	232	0.5

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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75126
Sample ID: BIOCHAR AM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 7/2/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 25 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Moisture	%	0.10	2
Solids	%	99.90	1998
Ash @ 550 C	%	36.29	725.8
Organic Matter (LOI @ 550 C)	%	63.61	1272.2
Organic Carbon (LOI @ 550 C)	%	36.89	737.9
Carbon:Nitrogen Ratio (C:N)	-		30.8:1
Nitrogen, Total Kjeldahl (TKN)	%	1.198	24.0
Nitrogen, Ammonium (NH ₄ -N)	%	0.010	0.2
Nitrogen, Organic (N)	%	1.188	23.8
Phosphorus (P)	%	1.287	58.9 (as P ₂ O ₅)
Potassium (K)	%	2.277	54.7 (as K ₂ O)
Sulfur (S)	%	0.25	5.0

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To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75126
Sample ID: BIOCHAR AM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 7/2/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 26 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Magnesium (Mg)	%	2.03	40.6
Calcium (Ca)	%	5.58	111.7
Sodium (Na)	%	0.59	11.7
Aluminum (Al)	ppm	4227	8.5
Copper (Cu)	ppm	163	0.3
Iron (Fe)	ppm	9837	19.7
Manganese (Mn)	ppm	391	0.8
Zinc (Zn)	ppm	294	0.6

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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75127
Sample ID: BIOCHAR PM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 7/2/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 27 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Moisture	%	0.22	4
Solids	%	99.78	1996
Ash @ 550 C	%	38.38	767.5
Organic Matter (LOI @ 550 C)	%	61.40	1228.1
Organic Carbon (LOI @ 550 C)	%	35.61	712.3
Carbon:Nitrogen Ratio (C:N)	-		33.1:1
Nitrogen, Total Kjeldahl (TKN)	%	1.075	21.5
Nitrogen, Ammonium (NH ₄ -N)	%	0.010	0.2
Nitrogen, Organic (N)	%	1.065	21.3
Phosphorus (P)	%	1.260	57.7 (as P ₂ O ₅)
Potassium (K)	%	2.237	53.7 (as K ₂ O)
Sulfur (S)	%	0.20	4.1

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To: NEWTRIENT LLC - SIG GRANT
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WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75127
Sample ID: BIOCHAR PM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 7/2/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 28 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Magnesium (Mg)	%	1.97	39.4
Calcium (Ca)	%	5.26	105.2
Sodium (Na)	%	0.58	11.5
Aluminum (Al)	ppm	3623	7.2
Copper (Cu)	ppm	157	0.3
Iron (Fe)	ppm	7648	15.3
Manganese (Mn)	ppm	334	0.7
Zinc (Zn)	ppm	326	0.7

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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75128
Sample ID: BIOCHAR AM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 7/3/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 29 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Moisture	%	0.37	7
Solids	%	99.63	1993
Ash @ 550 C	%	38.54	770.8
Organic Matter (LOI @ 550 C)	%	61.09	1221.8
Organic Carbon (LOI @ 550 C)	%	35.43	708.7
Carbon:Nitrogen Ratio (C:N)	-	-	41.2:1
Nitrogen, Total Kjeldahl (TKN)	%	0.861	17.2
Nitrogen, Ammonium (NH ₄ -N)	%	0.000	0.0
Nitrogen, Organic (N)	%	0.861	17.2
Phosphorus (P)	%	1.380	63.2 (as P ₂ O ₅)
Potassium (K)	%	2.650	63.6 (as K ₂ O)
Sulfur (S)	%	0.22	4.4

Report Number
F25191-6504
Account Number
63570



3505 Conestoga Dr.
Fort Wayne, IN 46808
260.483.4759
algreatlakes.com

To: NEWTRIENT LLC - SIG GRANT
11510 LAURIE DR
WHEATFIELD, IN 46392-7364

For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75128
Sample ID: BIOCHAR AM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 7/3/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 30 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Magnesium (Mg)	%	2.16	43.3
Calcium (Ca)	%	7.02	140.5
Sodium (Na)	%	0.62	12.4
Aluminum (Al)	ppm	4709	9.4
Copper (Cu)	ppm	174	0.3
Iron (Fe)	ppm	7010	14.0
Manganese (Mn)	ppm	427	0.9
Zinc (Zn)	ppm	298	0.6

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For: JACKIE SCHNURR

Attn: MARK STOERMAN

Purchase Order: JACKIE SCHNURR

Lab Number: 75129
Sample ID: BIOCHAR PM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 7/3/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 31 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Moisture	%	0.46	9
Solids	%	99.54	1991
Ash @ 550 C	%	42.24	844.8
Organic Matter (LOI @ 550 C)	%	57.30	1146.0
Organic Carbon (LOI @ 550 C)	%	33.23	664.7
Carbon:Nitrogen Ratio (C:N)	-		38.9:1
Nitrogen, Total Kjeldahl (TKN)	%	0.854	17.1
Nitrogen, Ammonium (NH ₄ -N)	%	0.000	0.0
Nitrogen, Organic (N)	%	0.854	17.1
Phosphorus (P)	%	1.368	62.6 (as P ₂ O ₅)
Potassium (K)	%	2.548	61.1 (as K ₂ O)
Sulfur (S)	%	0.21	4.2

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Lab Number: 75129
Sample ID: BIOCHAR PM
Manure Type: OTHER / NOT SPECIFIED

Date Sampled: 7/3/2025
Date Received: 7/10/2025
Date Reported: 7/16/2025 Page: 32 of 32

MANURE ANALYSIS

Analysis	Unit	Analysis Result (As Received)	Pounds Per Ton
Magnesium (Mg)	%	2.18	43.6
Calcium (Ca)	%	5.95	118.9
Sodium (Na)	%	0.63	12.7
Aluminum (Al)	ppm	5252	10.5
Copper (Cu)	ppm	176	0.4
Iron (Fe)	ppm	7416	14.8
Manganese (Mn)	ppm	374	0.7
Zinc (Zn)	ppm	285	0.6

