

# **Systems-Based Approach**

Brandon Meiners, Director of Agronomy

# A Systems-based Approach to Solving Issues

Innovative Solutions for Soil Health, Water Efficiency, and Nutrient Management



## About Midwestern BioAg

A pioneering company in sustainable & regenerative agriculture focusing on enhancing soil health, nutrient use efficiency and farm productivity.



## What We Do

Transforming agriculture with innovative systems-based solutions for profitability and sustainability by providing the most advanced and effective fertilizers in the industry.



## Area of Focus

Soil degradation, nutrient imbalances and inefficiencies, water scarcity, and economic pressures.

# Understanding a Systems-Based Approach

Optimizing Agricultural Ecosystems for Sustainability

## Definition and Core Principles:

A holistic method that integrates soil, plants, water, and inputs for maximum efficiency and sustainability.

## Key Principles:

Interconnectivity, sustainability, efficiency, and adaptability to achieve optimal outcomes.

## Why It Matters:

Builds resilience, reduces environmental impact, and improves profitability for farmers.



# Integrating Products into a Systems-Based Approach

Bio-Cal, Bio-Gel, and TerraNu in Action



## Soil Health Enhancement - Bio-Cal

Bio-Cal improves soil structure, increases nutrient availability, and supports plant growth by providing both immediate and slow-release calcium.

## Water Efficiency - Bio-Gel

Bio-Gel retains moisture in the root zone, promotes microbial activity, and stabilizes soil to reduce water stress and support growth.

## Nutrient Management - TerraNu

TerraNu integrates organic carbon with essential nutrients to improve soil fertility, enhance microbial activity, and provide balanced nutrition.

## Systems Integration

These products complement one another to create a holistic solution that enhances productivity and sustainability across the farming ecosystem.

# Practical Steps for Farmers

Implementing a Systems-Based Approach with Midwestern BioAg

## Comprehensive Diagnostics:

Analyze soil pH, nutrient levels, and organic matter to determine baseline conditions and guide input strategies (Midwest Labs, EarthOptics/Pattern Ag, BiomeMakers).

## Targeted Product Applications:

Apply Bio-Cal to increase nutrient availability and improve soil structure, Bio-Gel for enhanced nutrient efficiency and moisture retention, and TerraNu for improved nutrient delivery based on crop-specific needs.

## Crop Rotation and Soil Management:

Incorporate green manure crops, increase rotation, and manage residue decomposition to support soil microbial health and nutrient cycling.

## Monitor and Optimize:

Track progress through yield analysis, soil testing, and crop health monitoring to refine strategies for the next season.



# Main Issues Causing Yield Loss in Commodity Crops

Challenges Facing Modern Agriculture



## Drought and Water Stress

Lack of consistent water availability disrupts plant growth and reduces yields, especially in water-scarce regions.



## Poor Soil Structure

Compacted or degraded soil limits root growth, water infiltration, and nutrient uptake.



## Low Organic Matter

Depleted organic content reduces soil fertility, water retention, and microbial activity.



## Nutrient Inefficiency

Imbalanced or inefficient nutrient use leads to deficiencies or toxicities, hindering crop productivity.

# Midwestern BioAg Solutions to Key Challenges

Addressing Yield Loss with Bio-Cal, Bio-Gel, and TerraNu

## **Bio-Gel**<sup>®</sup>

### **Combating Drought**

BioGel retains water in the root zone, reducing water stress and ensuring plants have consistent hydration. BioCal helps to breakdown residue and increase soil structure, leading to more water holding capacity.

## **TERRANU**<sup>®</sup>

### **Restoring Organic Matter**

TerraNu combines organic carbon with nutrients, improving soil fertility and microbial activity which will promote increased organic matter production.

## **Bio-Cal**<sup>®</sup>

### **Improving Soil Structure**

BioCal enhances soil structure by adding calcium which helps to increase soil flocculation, promoting root penetration and water infiltration.



### **Maximizing Nutrient Efficiency**

TerraNu delivers nutrients precisely and balances soil nutrition, reducing waste and improving crop health. BioGel enhances the retention and plant use efficiency of other applied nutrients. BioCal increases availability of soil bases nutrients.

## Bio-Gel<sup>®</sup> Applications

- **Bio-Gel<sup>®</sup> RootSurge**—Apply 2 quarts per acre, in-furrow, at planting. Can also be applied with pre-emerge spray and side-dress. May be applied with multiple applications at reduced or standard rates. Not recommended for foliar at this time.
- Best results when pairing with a high-quality liquid starter.
- Can be used as a standalone starter.





## Bio-Gel<sup>®</sup> Applications

- **Bio-Gel<sup>®</sup> NSurge**—Apply 2 quarts per acre, with UAN, at planting or side-dress. Can also be applied with pre-emerge spray or early season foliar pass. May be applied with multiple applications at reduced or standard rates.
- Recommended to be paired with UAN but can be mixed with other types of fertilizer (in-furrow or foliar).
- Ideal to add 1 quart at planting with 2x2 pass and 2 quarts at side-dress.



## Bio-Gel® Applications

- **Bio-Gel® DG**—Apply 1 lb of DG solubilized per acre. For in-furrow applications, DG must be solubilized into a minimum of 5 gallons of liquid fertilizer or water for in-furrow applications. For foliar or side dress applications, DG must be solubilized into a minimum of 8 gallons of liquid fertilizer or water. May be applied with multiple applications at reduced or standard rates.

**Bio-Gel® Technologies are currently designed for early season crop needs. Avoid using Bio-Gel® products during reproductive crop stages!**



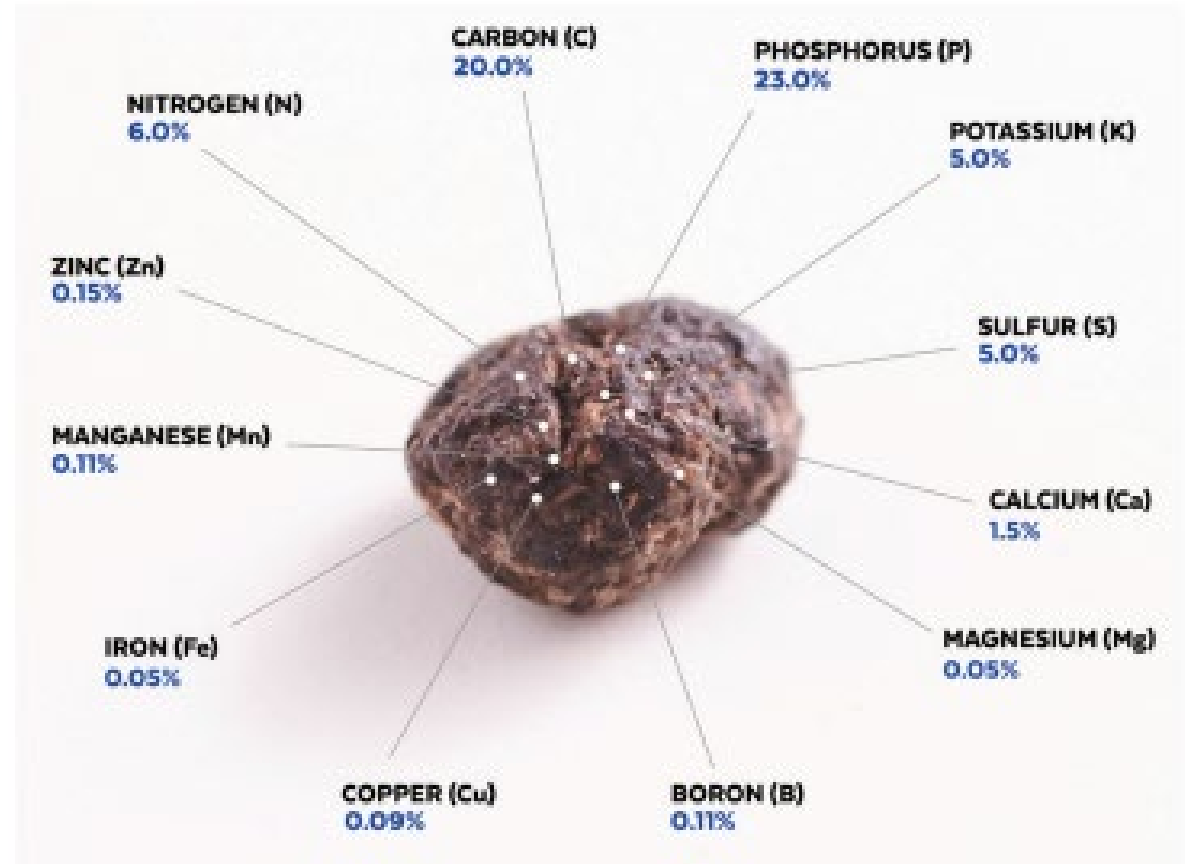
# Bio-Cal®/ OrganiCal™ Applications

- **Bio-Cal®/OrganiCal™**—Apply between 500-1,000 lbs per acre. Products must be bulk spread. Fall application is recommended.
- **Bio-Cal®/OrganiCal™** can be applied in the spring before planting or in-season on alfalfa.



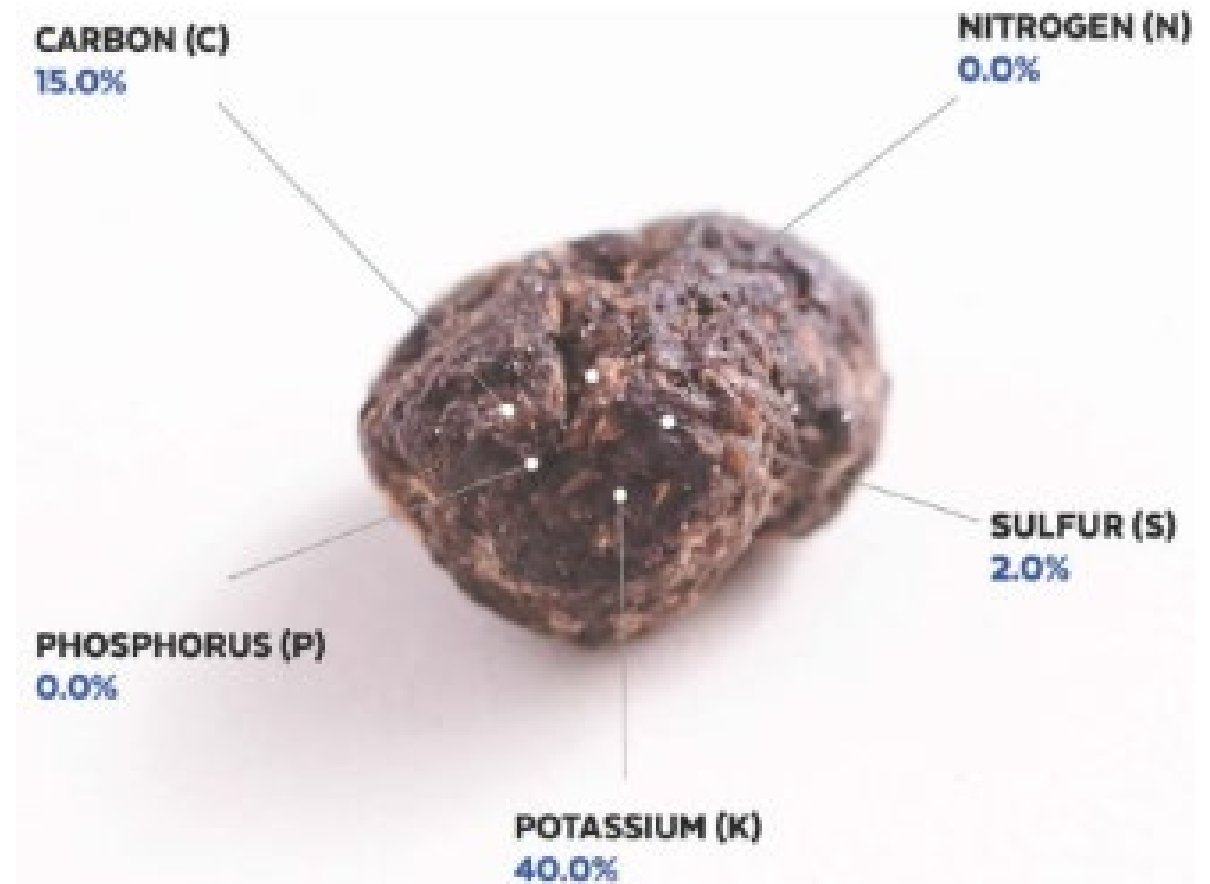
# TerraNu® Applications

- **TerraNu® P-Base**—Apply between 50-150 lbs per acre depending on soil/crop needs and management practices.
- Can be applied as a stand-alone product or blended with other **TerraNu®** Technologies and standard fertilizers. P-Base is safe for all application types. It is recommended to place the product as close to the root zone as possible, such as through a strip-till machine or air-seeder.



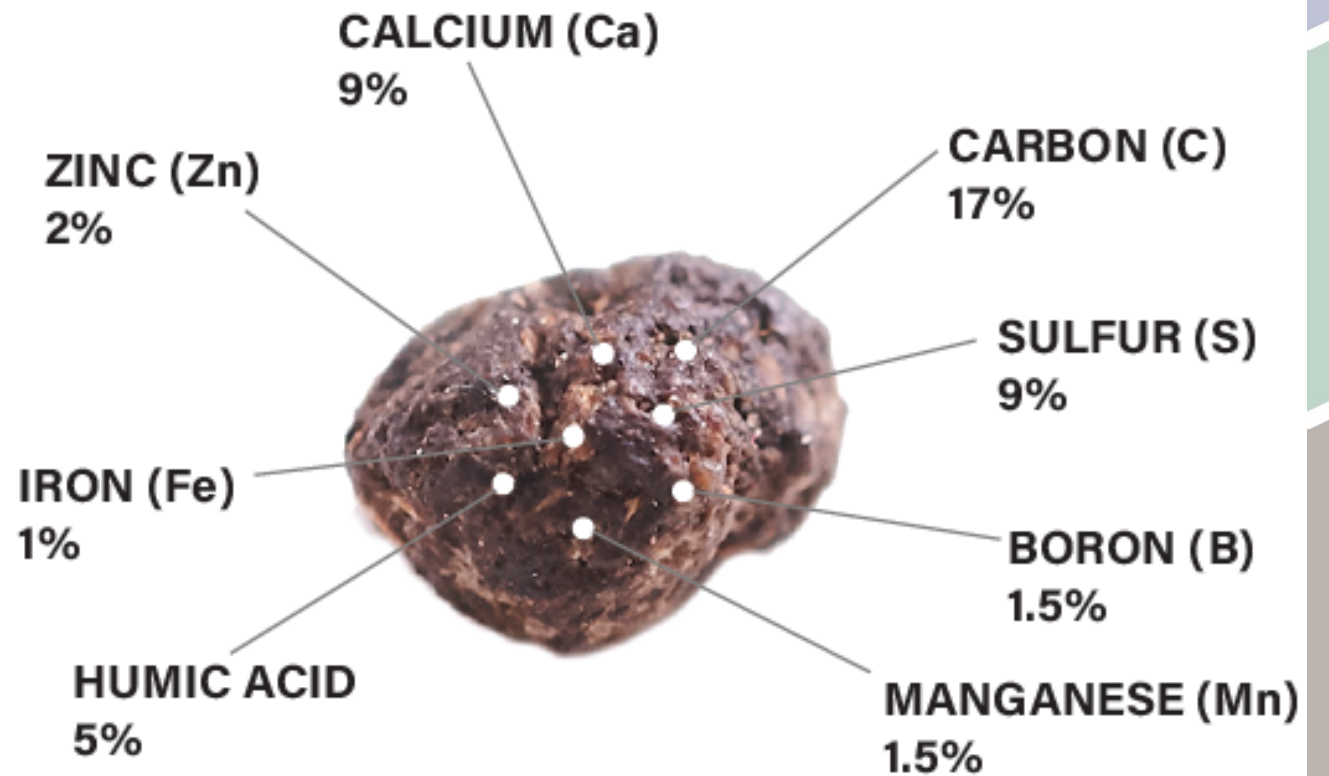
## TerraNu® Applications

- **TerraNu® K+**—Apply between 30-150 lbs per acre depending on soil/crop needs and management practices. Can be applied as a stand-alone product or blended with other
- **TerraNu® Technologies and fertilizers.** K+ is safe for most applications. Caution should be taken when applying in-furrow. In-furrow applications are only recommended up to 30 lbs per acre currently.



# TerraNu® Applications

- **TerraNu® MicroCaSH**—Apply between 25-75 lbs per acre depending on soil/crop needs and management practices.
- Product should be blended with other **TerraNu®** Technologies or standard fertilizers to maximize product distribution. MicroCaSH is safe for all application types.



# Conclusion:

## Embracing a Systems-Based Approach

### Revolutionizing Agriculture from the Soil Up



- **Integrated Solutions:** Bio-Cal, Bio-Gel, and TerraNu work synergistically to enhance soil, water, and nutrient management.
- **Proven Results:** Case studies demonstrate measurable improvements in yields and sustainability.
- **Commitment to Sustainability:** Midwestern BioAg enables farmers to achieve **profitability** while preserving environmental resources.