

THE POWER OF HUMIC ACID

According to Dr. Robert E. Pettit, Emeritus Associate Professor at Texas A&M University, "Humic substances are recognized by most soil scientists and agronomists as the most important component of a healthy, fertile soil."

A HISTORY OF HUMIC SUBSTANCES

Humus, the stable form of organic matter, is the primary source of carbon in the soil. Soils rich in humus contain an abundance of biological activity that allows for the oxidation of crop residues and animal manures. Soils across the United States contain varying levels of humus. Research has shown agricultural practices focused on maximum output can reduce humus and beneficial bacteria in soil, causing the soil to lose some of its natural productivity and fertility.

Just as humus is formed in rich, productive soils, humates are naturally occurring deposits of highly oxidized organic material that are buried deep in the earth's surface. Today's growers are looking for ways to utilize precision production practices to bridge the organic matter gap in the soil. Once mined, humates can provide a concentrated source of available carbon to build organic matter In the soil.

Humates, or humic substances, can be divided into three major humic fractions: fulvic acids, humic acids, and humins. Each of these fractions has some similar and some unique physical and chemical properties that contribute to their effectiveness and complement fertilizer programs.

THE THREE HUMIC FRACTIONS

NATURALLY DERIVED BIO-ORGANIC CARBON SOURCES



Foliar Uptake



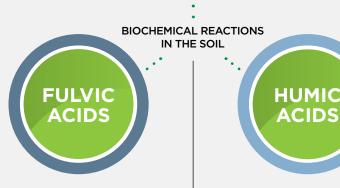
Soil Uptake

FULVIC ACIDS are lowest in molecular weight and are the most soluble of the three fractions. They can be readily absorbed by leaves and roots, making them well suited for foliar application. Fulvic acids enhance the absorption of nutrients and the efficiency of plant metabolic reactions. Since fulvic acids last up to thirty days in the soil (depending on weather conditions), they are also an ideal enhancement for an in-furrow row starter.

HUMIC ACIDS are higher in molecular weight than fulvic acids, but lower than humins, and are moderately soluble. They have a high cation exchange capacity (CEC) and are typically more efficient as a soil application. Humic acid molecules chelate many essential nutrients and help stimulate soil microbiology. Humic acids have limited benefit as a foliar application.

HUMINS are highest in molecular weight and are the least soluble of the three fractions. This allows them to persist in the soil over time. They contain high levels of carbon and have large nutrient holding capacity. Humins are best used through soil application.

HUMIC ACID PRECURSOR





Highly Soluble • • • •

Insoluble

Low Molecular Weight •••

• • • • • High Molecular Weight











In addition to the three humic fractions, humic products utilizing The Andersons Dispersing Granule (DG) technology contain a unique and powerful ingredient we call humic acid precursor. **HUMIC ACID PRECURSOR** contains a soluble form of organic carbon that releases into the soil as DG granules disperse. Through biochemical reactions, it is transformed into humic and fulvic acids, enhancing nutrient uptake and improving soil health.

WHAT IS HUMIC ACID?

When you think of humic acid, think carbon. Carbon is one of 17 essential elements required by plants for optimal growth. Oxidized lignite, also known as leonardite, is the carbon source in The Andersons humic offering. Similar to carbon's functions in the soil, humic acid is a natural soil conditioner that acts as a chelator and microbial stimulator. Its unique carbon matrix of carboxyl and hydroxyl groups includes a high concentration of organic acids and trace minerals.

SOIL ANALYSIS: NUMBERS DON'T LIE

The application of humic substances has the potential to impact soil qualities including organic matter, soil texture, and cation exchange capacity (CEC). Because many soils' organic matter levels have degraded in recent years, resulting in lower CEC, regular soil testing is a vital tool for indicating the need to build organic matter and available carbon. Carbon-based product application is becoming an increasingly accepted and economical farm management strategy. The Andersons humic offering can be a powerful tool in this effort.

INCREASED CARBON = INCREASED MICROBES = INCREASED NUTRIENT CYCLING AND NUTRIENT EFFICIENCY

The carbon in our humic acid is an essential plant nutrient that provides soil microbes with a food source and habitat, stimulating soil microbiology.

Microbes support soil and overall plant health by making nutrients available to plants in the inorganic form. Humic acid is the primary food source to grow populations of beneficial soil fungi, including mychorrhizal fungi. When compared with soil bacteria, soil fungi do more of the heavy lifting in building humus, improving soil structure, and fighting predatory fungi. This is especially true in the root zone, where fungi work to increase root size and vigor, while reducing susceptibility to plant pests and stress.

Humic acid also activates key soil chemistry to react with nutrients through chelation and complexation. The larger molecules of humic acids physically modify soil structure by binding soil particles together (clay-organic matter complexes). This increases soil aggregate stability and improves water infiltration, nutrient holding capacity, aeration, soil tilth, and workability. This also increases the availability of key micronutrients to the plant.



INCREASE CROP QUANTITY AND QUALITY¹

Over a six year study, USDA researchers found the application of humates yielded average increases of 5-15 bushels per acre for corn and 2-7 bushels per acre for soybeans. Other impressive findings included increases in corn stover proportional to those of grain and an increase in root growth by 15-25%. Research conducted in a variety of conditions and soils has shown that a positive return on

investment can be expected when using humic products from the right source, at the right rate, at the right time, and in the right place.



 Dobberstein, John. Humics Emerging as a Tool to Increase Root Growth, Yields. No-Till Farmer. May 2016.

	Product	Form	Application Method	% Humic Acid	Fulvic Acid	Humic Acid	Humin	Humic Acid Precursor	OMRI Listed
	Humic DG™	Dispersing Granule	Dry Applied	70%	X	X	X	×	X
	Black Gypsum DG®	Dispersing Granule	Dry Applied	10%	Х	X	X	X	X
	MicroCarb®	Liquid (with micros)	Liquid Applied	0%*	Х				
	UltraMate® LQ	Liquid (sulfonated)	Liquid Applied	12%	X	X			
	K-Mate SG™	Soluble Granule	Liquid Applied	99%	X	X			X

DISPERSIBLE GRANULES

HUMIC DG™ | BLACK GYPSUM DG®

DISPERSIBLE

The Andersons Dispersing Granule (DG) technology creates spherical, dust free, and ultra dry particles. These granules rapidly disperse upon contact with soil moisture, creating tens of thousands of microparticles, which greatly increases surface area and allows for faster breakdown and availability of the humic substances.



SPREADABLE

DG technology creates uniform, spherical granules that are clean, dust free, and easy to handle (left). DG granules can be spread evenly and consistently through all types of application equipment. Competitor's dry humic acid product is dusty, non uniform and contains up to 20% moisture, making it hard to handle and difficult to spread (right).



BLENDABLE

DG granules are designed to be ultra dry, which allows for successful blending with all types of dry fertilizers, including urea.



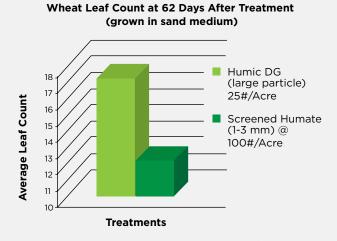


4X AS EFFECTIVE!

Humic DG granules provide better performance than screened humate, at one fourth the typical rate.

DG TECHNOLOGY IMPROVES EFFICACY

HUMIC DG™ VS. SCREENED HUMATE



Greater leaf count in wheat treated with 25 #/A Humic DG compared to those treated with 100 #/A screened humate.

LIQUIDS

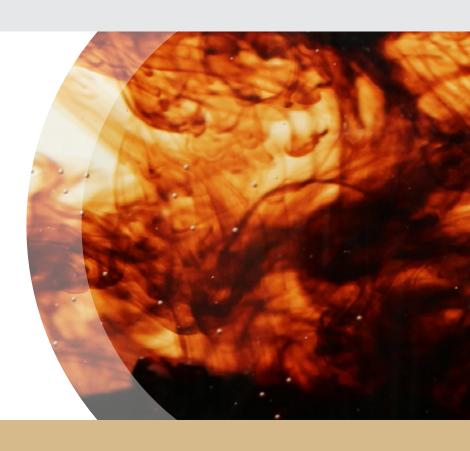
MICROCARB® | ULTRAMATE® LQ

CONVENIENT

The Andersons liquid humates form a complete solution when added directly to liquid fertilizer, micronutrient, or pesticide formulations over a wide range of pH values. Our liquid humates offer up-front availability of fulvic and/or humic acid, helping to increase seed germination and nutrient availability.

FLEXIBLE

The compatibility of our liquid humates allows them to be either soil or foliar applied through a variety of application equipment including sprayers, tank mixes, fertigation, injectors, drip irrigation, and other liquid applicators.



SOLUBLE GRANULES

K-MATE SG™

SOLUBLE

The Andersons Soluble Granule (SG) technology creates unique, highly concentrated, water soluble particles. These granules are easy to use, and they rapidly dissolve in water. This humic acid solution can then be blended with other liquid fertilizers.

EFFICIENT

SG technology creates granules that, compared to powders, are clean, dust free, and easy to handle. Our granules rapidly solubilize, making them easy to mix. Our highly concentrated granular formulation eliminates the need to ship and store water, reducing both shipping and storage costs, as compared to liquid formulations.

FLEXIBLE

Once in a complete solution, our SG products can be either soil or foliar applied through a variety of application equipment including sprayers, tank mixes, fertigation, injectors, drip irrigation, and other liquid applicators.



When dissolved in water, The Andersons' soluble granules (above, left) dissolve more rapidly and completely than the competitor's (above, right).

Humic DG^m









Humic DG granules contain 70% humic acid and 10% humic acid precursor. DG technology creates a dust free, spherical, ultra dry particle that rapidly disperses into thousands of microparticles upon contact with moisture. Humic DG granules' increased surface area, when compared to screened humate, creates greater availability to the plant. It performs in a wide range of conditions and soil types, independent of application method and feature dual carbon sources that are unique to The Andersons granular humic products. Humic DG contains the full spectrum of humic substances: fulvic acid, humic acid, and humin, as well as humic acid precursor.





NON-PLANT FOOD INGREDIENTS

PHYSICAL PROPERTIES

Hq	3.2-3.9
Density	43.0 lbs/ft ³
Carbon Content	
Color	Black

APPLICATION

	Application	Use Rate (per acre)	Timing
Row crops, specialty crops, legumes	Soil	4-10 pounds in furrow; up to 40 pounds maintenance or corrective broadcast	Post harvest up through planting

PRODUCT USAGE INFORMATION

S Broadcast

Air Drill/Strip Till

(V)

In-Furrow



FEATURES & BENEFITS

- Flexible application allows for use as a stand alone product or in blends with granular fertilizers
- 4X more efficient than screened humate
- Enhances nitrogen and phosphorus efficiency
- Promotes good soil structure and increases water holding capacity
- Enhances root system development
- Easy to handle and spread through all types of application equipment
- Economical application cost per acre compared to liquid and screened humates

FREQUENTLY ASKED QUESTIONS

- Q: How does the humic acid content of Humic DG granules compare to other liquid and dry humic acid products?
- A: As a granular soil amendment with 70% humic acid (A&L method), Humic DG granules compare favorably to dry, granular, and powdered humic acid products. The humic acid is more effective in the soil than most of the competitive products due to the self-incorporating microparticles that provide greater surface area for soil activity and contain all three humic fractions.
- Q: How does humic acid affect nitrogen volatilization?
- A: The high reactivity of humic acid retains the nitrogen in the ammonium form, preventing it from volatilizing to ammonia and not being utilized by the plant.
- Q: Do humic acids influence phosphorus activity in the soil?
- A: Yes, increased phosphorus availability has been observed in academic studies. Humic acid impacts both short-term and long-term phosphorus availability.



Left: Untreated Right: Humic DG (15 lb/A broadcast)

^{*}Derived from Leonardite

^{**}Inactive components of leonardite, proprietary binding agent, water

Black Gypsum DG®









Black Gypsum DG granules are homogenous and combine natural gypsum and humic substances to form a unique bio-amendment. DG technology creates a dust-free, spherical, ultra-dry granule that rapidly disperses into thousands of microparticles upon contact with moisture. These microparticles deliver calcium, sulfur, and carbon directly into the soil. The DG technology allows for reduced application rates, as compared to other agricultural-grade gypsum products, which makes this a very economical soil amendment.









GUARANTEED ANALYSIS

Calcium Sulfate Dihydrate (CaSO ₄ • 2H ₂ O)	70.0%
Calcium (Ca)	17.0%
Sulfur (S)	13.0%
13.0%Combined Sulfur	

Plant nutrients derived from calcium sulfate and mined gypsum

NON-PLANT FOOD INGREDIENTS

10% humic acid derived from leonardite

PHYSICAL PROPERTIES

pH	6*
Density	56.0 lbs/ft ³

APPLICATION

Application	Rate per acre
Row crops, specialty crops, horticulture crops	150-300 lbs.*
Soil Detoxification	600-800 lbs.

^{*}Supplies 15-30 pounds of humic acid per acre*

PRODUCT USAGE INFORMATION

O Broadcas

of Air Drill/Strip Till

In-Furrow



FEATURES & BENEFITS

- Contains 70.0% calcium sulfate dihydrate (CaSO₄·2H₂O)
 - » Water soluble
 - » Increases calcium and sulfur without changing soil pH
- 10% humic acid from oxidized lignite (leonardite)
- Improves root development, plant nutrient uptake, and phosphorus stability
- Provides secondary nutrients (calcium and sulfur)
- Enhances soil health by stimulating soil microbial populations and relieving compaction and salinity
- Blends with fertilizer or can be used alone

FREQUENTLY ASKED QUESTIONS

- Q: What advantages do Black Gypsum DG granules have over other types of standard gypsum?
- A: Our gypsum source is calcium sulfate dihydrate (CaSO₄·2H₂O), which, with two extra water molecules, is more water soluble than the anhydrite form (CaSO₄). These extra molecules make calcium and sulfur more readily available to the plant as soon as Black Gypsum DG granules enter the soil solution. While a plant receiving the anhydrite form of calcium would be forced to wait days or weeks to take advantage of the applied nutrients, a plant receiving an application of Black Gypsum DG granules begins to utilize the nutrients quickly. Black Gypsum DG granules deliver 10% humic acid in every application. This humate is quick acting, and provides further chelation of applied and existing nutrients, increasing their availability to the plant.

Q: How does the application of carbon enhance soil health?

A: Humic substances contain carbon, which will provide soil microbes with a food source and habitat, allowing them to flourish. As a result, essential macro and micronutrients held in the soil will become more available, and additional fertility will be utilized more efficiently. Humic acids also have a high cation exchange capacity, which enhances the soil's ability to hold nutrients.

MICR CARB

Fulvic Acid

Humic Acid

Humin

Humic Acid Precursor

MicroCarb contains carbon substances from vegetable origin that increase soil cation exchange capacity, improving nutrient availability. MicroCarb should be used early in the season, prior to fruit set for maximum agronomic benefit. New improved formulation provides increased compatibility with a wider range of products.









GUARANTEED ANALYSIS

Boron (B)	0.1%
0.1%Water Soluble Boron	
Manganese (Mn)	0.5%
0.5%Chelated Manganese	
Zinc (Zn)	0.75%
0.75%Chelated Zinc	

Derived from: boric acid, manganese EDTA, zinc EDTA Also contains non-plant food ingredient: carbon

PHYSICAL PROPERTIES

Hq	7.5-9.0
Specific Gravity	1.055 @ 68°F
Density	8.8 lbs/gal
Equilibrium Temperature	

APPLICATION

	Application	Use Rate (per acre)	Timing
Field & row crops;	Soil	1-2 quarts	With starter (in furrow or 2x2)
vegetables	Foliar	1-2 pints	Post emergence
Turf	Foliar	1-2 quarts (0.75-1.5 ounces/1000 ft²)	Every 7-14 days or to correct nutrient deficiencies

PRODUCT USAGE INFORMATION

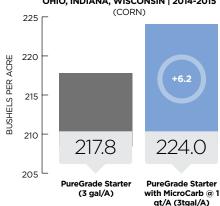
FEATURES & BENEFITS

- Aids in the relief of plant stress
- Contains a proprietary micronutrient blend that includes fulvic acid and other carbon sources for enhanced efficiency
- Available carbon source promotes an increase in beneficial soil microbe population
- Compatible with fertilizer solutions of all pH's, as well as most plant protection products
- Positive cost-to-benefit ratio and return on investment in all economic environments
- High CEC components increase the efficiency of nutrient uptake in both soil and foliar applications

FREQUENTLY ASKED QUESTIONS

- Q: Can MicroCarb liquid fertilizer be used in conjunction with low-salt fertilizers?
- Yes. MicroCarb liquid fertilizer has shown significant benefits when used with low-salt starters and foliars to enhance the efficiency and promote the uptake of nutrients. It allows for the full genetic expression of the seed's potential. MicroCarb liquid fertilizer is also compatible with insecticides, fungicides, and herbicides, as well as acidic, neutral, and alkaline fertilizers. It is ideal for use in foliar and fertigation programs. As always, jar test for compatibility.
- Q: What makes MicroCarb liquid fertilizer unique?
- A: We have further enhanced the fulvic acids with a combination of more simple carbon chains to get nutrients, along with the fulvic acids, into the plant even faster. We have added EDTA chelated zinc and manganese, along with boron, to assist in meeting the micronutrient needs of your crop.

AVERAGE YIELD OF SIX REPLICATED TRIALS OHIO, INDIANA, WISCONSIN | 2014-2015



Ultra Mate LQ

Fulvic Acid

Humic Acid

Humin

Humic Acid Precursor

UltraMate LQ liquid humate is a sulfonated potassium formulation. It forms a complete solution when added directly to liquid fertilizer, micronutrient, or pesticide formulations over a wide range of pH values. UltraMate LQ liquid humate is highly compatible allowing application methods which are unacceptable for conventional humic products, including tank mixing and drip irrigation. UltraMate LQ liquid humate allows plants to utilize applied N, P, and micronutrients more efficiently, reducing leaching and improving soil structure.







GUARANTEED ANALYSIS

Soluble Potash (K ₂ O)	3.0%
Sulfur (S)	1.0%
1.0%Combined Sulfur	

Derived from: potassium hydroxide, potassium sulfate, potassium humate

NON-PLANT FOOD INGREDIENTS

Active Ingredients	
Humic Acid*	12.0%
Total Other Ingredients	88.0%
*Derived from leonardite	

PHYSICAL PROPERTIES

pHHq	8.0-10.0
Specific Gravity	1.08 @ 68°F
Density	9.0 lbs/gal
Fauilibrium Temperature	32°F

APPLICATION

	Application	Use Rate (per acre)	Timing
Field & row crops;	Soil	1-3 gallons	Before or at planting
vegetable crops; soft & tree fruit	Foliar		Post emergence

PRODUCT USAGE INFO	RMATION
⊘ Spray	(Hydroponics
Orip Irrigation	Sub-irrigation
√ Fertigation	

FEATURES & BENEFITS

- Stabilizes nitrogen, reducing volatility while increasing utilization
- Increases seed germination and nutrient availability
- Promotes phosphorus utilization and decreases leaching
- Mixes easily and stores well in totes and mixes
- Compatible with liquid fertilizer, micronutrient or pesticide formulations
- Up-front availability of humic and fulvic acids
- Wide range of pH compatibility: 2-12
- Wide range of application methods: foliar spray, soil application, drip irrigation, water run, center pivot, or hydroponics

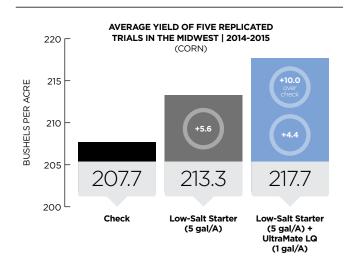
FREQUENTLY ASKED QUESTIONS

Q: What crops can UltraMate LQ liquid humate be used on?

A: UltraMate LQ liquid humate can be applied to all crops including row crops, fruits, vegetables, trees, vines, flowers, ornamentals, turf (including lawns, sod farms, commercial properties, athletic fields, golf greens, tees, and fairways), greenhouse plants, and other indoor crops.

Q: How does UltraMate LQ liquid humate differ from other humic acid products?

A: UltraMate LQ liquid humate contains high quality humic acid. Its sulfonation sets it apart, allowing for ease of tank mixing, increased activity in low pH soils, and stability in storage when mixed.



K-Mate SG

√ Fulvic Acid

✓ Humic Acid

Humin

Humic Acid Precursor

K-Mate SG granules are formulated with super concentrated, soluble potassium humate. These 99% humic acid soluble granules provide maximum efficiency to dealers and large operations, allowing them to make their own solution ranging from pH 6-12. K-Mate SG granules allow plants to utilize applied N, P, and micronutrients more efficiently, reducing leaching and improving soil structure.







GUARANTEED ANALYSIS

Soluble Potash (K₂O).....12.0%

Nutrients derived from potassium humate

NON-PLANT FOOD INGREDIENTS

Active Ingredients	
Humic Acid*	99.0%
Total Other Ingredients	1.0%

*Derived from leonardite

PHYSICAL PROPERTIES

Hq	9**
Specific Gravity	n/a
Density	52.0 lbs/ft ³
Equilibrium Temperature	n/a

APPLICATION

	Application	Use Rate (per acre)	Timing
Row crops, specialty crops, legumes	Soil	1-3 pounds	Before or at planting
	Foliar		Post emergence

PRODUCT USAGE INFORMATION



Spray

Hydroponics



Drip Irrigation



Sub-irrigation

(v)

Fertigation

FEATURES & BENEFITS

- Can be applied through a wide range of application methods, including sprayers, drip irrigation, fertigation, and in-furrow
- Easy to handle and cost effective; provides up to 86% cost savings in freight and storage versus conventional humic acid products
- 1.1 lbs of K-Mate SG granules are equivalent to 1 gallon of 12% liquid humic acid
- One ton of K-Mate SG granules is roughly equivalent to eight 250 gallon totes of 12% liquid humic acid

FREQUENTLY ASKED QUESTIONS

Q: How should K-Mate SG granules be mixed?

A: K-Mate SG granules are best mixed under continuous, mild agitation or circulation.

Q: What crops can K-Mate SG granules be used on?

- A: K-Mate SG granules can be applied to all crops including fruits, vegetables, trees, vines, flowers, ornamentals, turf (including lawns, sod farms, commercial properties, athletic fields, golf greens, tees and fairways) grain and other row crops, greenhouse plants and other indoor crops.
- Q: Is there any restriction on the concentration of humic acid liquid that can be produced with K-Mate SG granules?
- A: Solutions of 3-12% humic acid can be mixed using K-Mate SG granules. To enhance the ease of mixing large quantities, ask your Territory Manager about our Humic Solutionizer.

**acquired as a 10% dilution

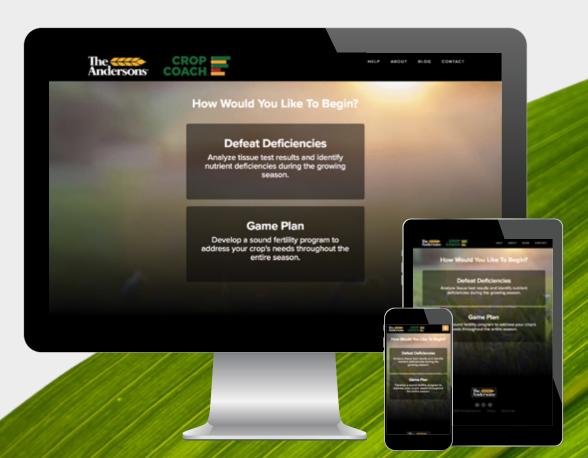


DEVELOP A GAME PLAN THIS SEASON

The Andersons humic solutions is one important aspect of a sound fertility program. Visit CropCoach.com today and select "Game Plan" to develop a complete crop nutrition program that addresses your crop's needs throughout the entire season. Our CropCoach web application recommends using a combination of products within our PureGrade® Liquid Fertilizers, MicroSolutions®, Select Nutrients, Enhanced Efficiency Products, and Soil Amendments categories to maximize crop potential and ROI.

5 STEPS TO CREATE YOUR GAME PLAN

- VISIT CROPCOACH.COM AND SELECT
 "GAME PLAN." Once you've reviewed how the application works, select "Let's Get Started."
- SELECT YOUR CROP AND CHOOSE HOW YOU WOULD LIKE TO START. Our Starting Lineup recommends a comprehensive fertility program, or you can build your own system from scratch.
- SELECT PRODUCTS BY APPLICATION WINDOW. Our products are designed to help reach high-end yields and maximize the genetic potential of seed investments.
- REVIEW SELECTED PRODUCTS AND EXPLORE MORE DETAILED INFORMATION such as benefits and physical properties. Product selections are displayed over a crop growth illustration, allowing users to see how everything fits together in a season-long system.
- ADD NOTES, EMAIL AND PRINT YOUR PRODUCT RECOMMENDATIONS. You may also select to email a copy to your dealer.



ABOUT THE ANDERSONS, INC.

The Andersons, Inc. (Nasdaq: ANDE) is a diversified company rooted in agriculture that conducts business in the commodity trading, ethanol, plant nutrient and rail sectors. The company is known for growing enduring relationships through extraordinary service, a deep knowledge of the market and a knack for finding new ways to add value.

Founded by Harold Anderson and his family in 1947 in Maumee, Ohio, and privately owned until 1996, the premise of the original organization was to make it as easy as possible for regional farmers to take their grain to market. The business model of serving others is the foundation on which the company was built. Today, The Andersons' more than 2,400 employees conduct business from over 130 locations and continue to be committed to providing extraordinary service with the utmost integrity.







Our Mission:

We firmly believe that our Company is a powerful vehicle through which we channel our time, talent, and energy in pursuit of the fundamental goal of serving God by serving others. Through our collective action, we greatly magnify the impact of our individual efforts to:

- Provide extraordinary service to our customers
- Help each other improve
- Support our communities
- Increase the value of our Company



www.AndersonsHumates.com 800-831-4815