

GROW  MORE

## Multi-Purpose Micronutrients For Soil And Foliage

MANGANESE • IRON • ZINC •

# FERT-ALL

• COPPER • MOLYBDENUM

## Natural Organic Chelating Agent

### The Key To Healthy Crops

The production and profit of all crops can be increased by better management practices. With improvement in cultural practices such as fertilization, use of better varieties, plant spacing, cultivation, soil amendments, irrigation and pest/disease control, crops can always be improved.

Optimum amounts of the trace elements (micro-nutrients) iron, zinc, manganese, copper and molybdenum, readily available for absorption by the plant, are necessary to allow the plant to grow at its full genetic capacity. The FERT-ALL product line offers more than 27 different micro-nutrient formulas. These elements have interacting function in plant metabolism. A deficiency of one or more of these elements materially affect the vigor, productiveness and yield of any varieties of plant. Micronutrients are, therefore, added to deficient soil to enrich and make more productive.

#### WHY USE FERT-ALL MICRONUTRIENTS

In actual practice, it is often not easy to visually identify specific nutrient deficiencies as they become evident.

Therefore for the maintenance or correction of deficiencies, we advocate prevention, which is far better than correction of a



pronounced deficiency, that occurs during the growing season, when crop yields would be adversely affected.

Probably the most significant cause of border line and hidden deficiencies is high production per acre/hectare, stimulated by diminishing amounts of nutrients by the natural process of crop nutrient removal.

Even if a particular soil has an adequate supply of nutrients, high production – season after season, year after year, – reduces the supply of available micronutrients.

Good farm managers throughout the world recognize the need for micronutrients in their fertility maintenance program.

#### NATURAL ORGANIC CHELATING AGENT – LIGNOSULFONATE

FERT-ALL products are manufactured in a carefully controlled environment, checked for consistent quality, and are manufactured using a special natural organic chelating agent of the lignosulfonate group which is naturally derived from wood. The chelating agent consists approximately 80% lignin sulfonate, together with about 11% carbohydrates,

sugars and their derivatives with about 9% other constituents.

**A typical analysis is as follows:**

|  |       |
|--|-------|
| Lignin Sulfonate Chelating Agent .....                       | 80.0% |
| Carbohydrates (Glucose, Xylose, Arabinose<br>Galactose ..... | 11.0% |
| Magnesium .....  | 0.3%  |
| Calcium .....  | 0.5%  |
| Potassium .....  | 0.1%  |
| Iron .....   | 0.1%  |
| Carbon .....   | 4.5%  |
| Phosphorus.....  | 0.5%  |
| Nitrogen .....   | 0.1%  |
| Other Minerals & Organics .....                              | 2.9%  |

Fert-All organic chelates are non-toxic to the plant and provide agronomic efficiency over synthetic chelating agents.

- 1) FERT-ALL products are chelated with lignosulfonate, a compound that can be easily absorbed by the plant.
- 2) Soluble and non-phytotoxic, can be applied at higher application rates than synthetic chelates or metal sulfates
- 3) Naturally adhesive cationically (+) charged chelate that has a high natural affinity for absorption and attraction to foliage.
- 4) Compatible with most crop protection chemicals.
- 5) FERT-ALL is up to 20 times more efficient than organics in the soil.
- 6) Sufficiently stable to resist decomposition for a period prior to uptake by the plant.
- 7) Lignosulfonate is non-toxic plant derived material, which can be re-metabolized or eliminated from plant tissue readily.
- 8) FERT-ALL products provide remedy of multiple or single element micronutrient deficiencies.

**ADDITIONAL BENEFITS – BIODEGRADATION OF LIGNOSULFONATE**

**S**oil Application: The breakdown by-products of the lignosulfonates - carbohydrates, sugars and other constituents provide a source of nutrients for beneficial microbes living in the rhizosphere (root zone) which directly and indirectly benefit the plant. Sugars and carbohydrates also supply a source of carbon. Carbon flux in rhizosphere is crucial to the soil-root interface and affects carbon dioxide (CO<sub>2</sub>) fixation in the roots. It is generally agreed among researchers that rhizosphere micro-organism influence the acquisition of mineral nutrients. The breakdown products of FERT-ALL contributes to the overall productivity of the soil.

Foliar application: sugars, carbohydrates and other minerals are absorbed into plant tissues and stored in the cytosol and vacuoles becoming part of the nutrient storage pools of the plant. These storage constituents can then be re-metabolized in effect saving plant energy that can be directed to other functions (ie. roots, fruiting, etc.).

- Synthetic chelating agent (EDTA, EDDHA etc.) cannot provide these added benefits.

**FOLIAR OR SOIL APPLICATION**

**F**oliar applied products have the advantage of providing quick correction of deficiencies any time during the growing season and are compatible and tank mixable with most commonly used pesticides and fungicides. Ultimately, however, the deficiency must be corrected in the soil. Soil application through the irrigation system (fertigation, drip, sprinklers etc.) has distinct advantages. Application simplicity is a distinct cost advantage and weather is less critical when micronutrients are applied via the irrigation system. The movement of water carries FERT-ALL into the root zone. When the water movement stops, the cationically (+) charged FERT-ALL molecule attaches itself to soil particles to form a leach resistant compound that will not move deeper into the soil with subsequent irrigation. (figure 1)

**MICRONUTRIENT FUNCTIONS**

**COBALT (Co)** Cobalt has been known to be an essential nutrient for legumes and root nodule non-legumes when these are dependent on symbiotic nitrogen fixation. It is in grazing animals that the symptoms of deficiency appear. Cobalt is an inseparable part of Vitamin B12 and its analogues and is essential to grazing animals. Non-ruminants need cobalt as Vitamin B12 and ruminants can synthesize Vitamin B12 from cobalt compounds. The common symptoms of cobalt deficiency are: cattle and sheep fail to thrive, gradual loss of appetite, emaciation, rough coat, scaly skin, anemia. Soil and tissue analysis is the best way of diagnosing cobalt deficiency. The content of cobalt in deficient soil varies with pH and organic matter content. The usual range is 0.1-0.7 ppm of cobalt in air dried soil. For sheep, the pasture herbage should contain 0.1 ppm cobalt in dry matter. The requirement for cattle is slightly less than for sheep. Legumes can grow normally and fix nitrogen if the cobalt content in the foliage is 0.08 ppm.

**IRON (Fe) The Energy Element.** Iron deficiency is probably the most frequently observed of all trace element deficiencies, the

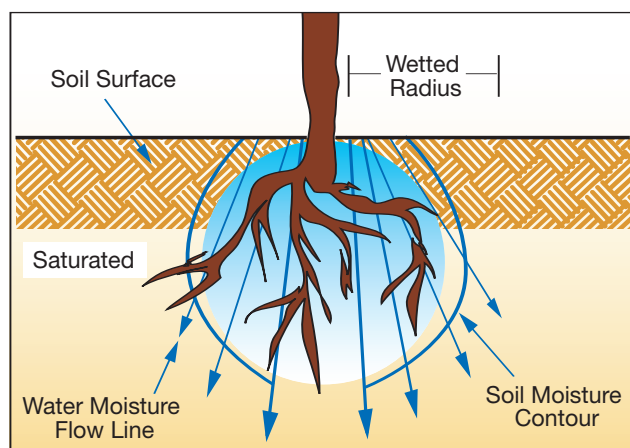


Figure 1

visual symptoms being a chlorotic mottling or whitening of the leaf at the growing points. In severe cases, the growth is retarded and the plant or tree may even die. Iron is required by all plants, being essential for the formation of the chlorophyll molecule. Iron deficiency may be caused by many factors other than the obvious one of a real shortage of the elements. Excessive phosphate content and low level potassium may be contributing factors in causing iron deficiency. The deficiency is worse under condition of high light intensity and drought.

### **MANGANESE (Mn) The Enzyme**

**Element.** Manganese is important for certain physiological processes in plants and its availability depends on complex soil chemistry. If too acidic, excessive amount of manganese may be released. The availability of manganese may fall below the plant's requirements after liming or on alkaline soils. Organic matter forms complex with manganese and may render it unavailable to the plant. High levels of iron salts may also influence the amount of available manganese. Thus a correct balance between these two elements is essential since they are believed to control the reduction-oxidation potential in plant cells. Leaf tissue analysis of the young plant is the only certain method of diagnosis. For most arable crops a content of less than 20 ppm Mn in dry matter is almost certainly a deficiency. Manganese deficiencies do not occur in isolation. Often iron, copper, zinc and/or magnesium may also be deficient or at low level. Applying only manganese may induce or increase the deficiency of another element. Manganese deficiency usually show up as interveinal chlorosis or whitening or sometimes speckling on older leaves.

**CALCIUM (Ca) The Second Messenger.** Calcium serves a number of physiological roles, cell wall stabilization bound as pectate in the middle lamella. Cell extension by new cells and at the site of root growth, root extension stops if an exogenous supply of calcium is absent. Calcium is necessary for protein synthesis and for normal mitosis, it regulates the translocation of carbohydrates, regulates cell acidity and permeability and serves as an antagonist for other cations. Calcium is localized in vacuoles and plays a part in Osmoregulation (cation-anion balance).

Calcium stabilizes cell membranes by bridging phosphate and carbohydrates groups of phospholipids and proteins at membrane surfaces. Calcium deficiency results in increased respiration rates, leakage of low molecular weight solubles from membrane surfaces, senescence, and freezing injury.

Deficiency symptoms, leaves have wrinkled appearance, young leaves and terminal buds hooked or distorted, young leaves may never unfold, roots are short and very branched.

**MOLYBDENUM (Mo) The Nitrogen Reducer.** Needed in symbiotic nitrogen fixation in legumes and in protein synthesis in all plants. A deficiency results in irregular growth, stunted appearance of plant, pale yellow foliage, broad leaf plants subject to leaf cupping and marginal chlorosis. In citrus, chlorotic spots develop on leaves.

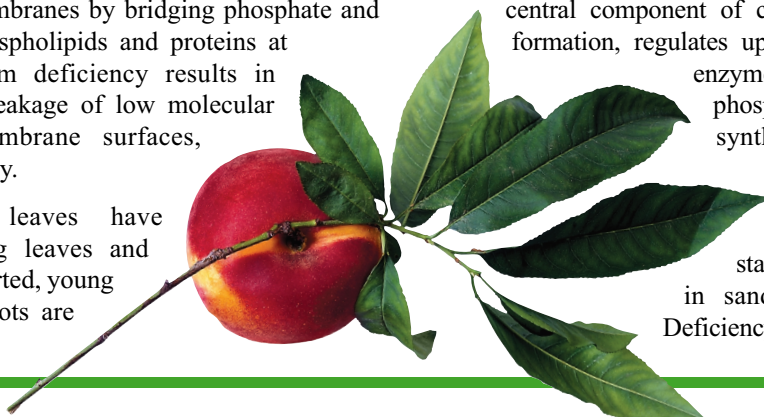
### **COPPER (Cu) The Amino Acid Converter.**

Copper was among the earliest micronutrient to be identified. This deficiency most often occurs on sand and gravel soils. Cereals of all kinds are susceptible as are sugar beet, peas and beans. Copper deficiency shows up as withering and twisting of the young leaves with eventual die-back. Yellowing of the tips and leaves of cereals, sugar beet, peas and bean occur. The leaves develop a bluish green sheen and may have necrotic spots. Livestock on copper deficient pastures do not thrive. Nearly all copper sprayed onto a pasture are removed in the first cut or in the first grazing, therefore repeat applications are needed. Copper deficiency can be induced by high level of molybdenum.

**ZINC (Zn) The Auxin Builder.** Some soil conditions may reduce the availability of zinc as a plant nutrient since they can only take up exchangeable or water soluble form of zinc. Zinc is rendered unavailable by the formation of the insoluble phosphate or hydroxide. On acid soils the zinc is leached away. Thus zinc deficiency is common on acid, sandy soils, alkaline soils with high organic matter content and on soils with high phosphate level. Magnesium is also thought to reduce the amount of available zinc. The most common symptom of zinc deficiency is yellowing of the plant leaves. The symptoms are characteristic on certain crops, i.e. on citrus fruit, the first sign of deficiency is interveinal chlorosis or mottle leaf of 'frenching' on some leaves. Later leaves are small with a rosette of leaves at the growing point. Shoots may die. On apples, the buds fail to develop, the leaves are small and narrow and form rosettes at the tip of the shoots. In maize, the older leaves have streaks between the veins and cropping is delayed. In severe cases, the plants are stunted. In olives, the foliage may be yellowish and there is a tendency to biennial bearing. Few new shoots are produced in the fruiting year. Shortage of nitrogen and residual weed killer damage may give foliage effect very similar to zinc deficiency.

### **MAGNESIUM (Mg) The ATP Connection.**

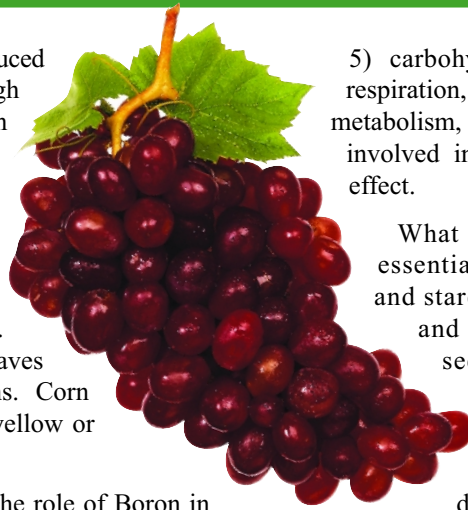
Functions as a central component of chlorophyll, necessary for sugar formation, regulates uptake of other nutrients through enzyme reactions. Acts as a carrier of phosphorous synthesis of ATP and synthesis in isolated chloroplast (photophosphorylation). Promotes formation of oils and fats, active in transport of starches. Deficiencies occur mostly in sandy soil or soil of high pH. Deficiency is rarely due to an absolute



deficiency in the soil but is usually an induced deficiency caused by high calcium or high potassium ratio. This condition is often found in intensively cultivated vegetable market soils and fruit tree soils, also in greenhouse cultivation.

Deficiency symptoms are evident by general loss of green color starting at bottom leaves and later moving up stalk. Veins of leaves remain green. Cotton leaves turn purplish-red between green veins. Corn develops stripped appearance, light or yellow or white between the parallel veins.

**Boron (B) The Starch Producer.** The role of Boron in plant nutrient is still the least understood of all the mineral nutrients. Boron is neither an enzyme constituent nor is there convincing evidence that it directly affects enzyme activity. There is a long list of proposed roles of Boron: 1) sugar transport, 2) cell wall synthesis, 3) lignification, 4) cell wall structure,



5) carbohydrate metabolism, 6) RNA metabolism, 7) respiration, 8) indole acetic acid (IAA) metabolism, 9) phenol metabolism, 10) membranes. The list also indicates Boron is involved in a number of metabolic pathways or cascade effect.

What most all researchers agree on is Boron is essential for maintaining a balance between sugar and starch and functions in the translocation of sugar and carbohydrate. Important in pollination and seed production. Necessary for normal cell division, nitrogen metabolism and protein formation.

Deficiency symptoms: Progressive deterioration of terminal growth, thickening, curling and chlorotic leaves develop on short stemmed plants. Stems and petioles develop unusual brittleness. Corky centers in apples, cracked stem of celery, brown heart of beets, hollow heart of peanuts, brown rot on cauliflower, yellow top of alfalfa. ■

## FOLIAR APPLICATION

FERT-ALL products are highly successful in nutrient sprays for foliage independently or with insecticides, pesticides, herbicides, fungicides and various nitrogen solutions. FERT-ALL may be used in combination with low biuret urea, uan, aqua ammonia, ammonium nitrate and with suitable spreading agents.

### Use for Field, Vegetable, Fruit, Nut and Vine Crops.

|                             | Acre        | Hectare       |
|-----------------------------|-------------|---------------|
| Maintenance Application     | 1-3 quarts  | 2-9 liters    |
| Light to Medium Deficiency  | 2-6 quarts  | 4.5-14 liters |
| Medium to Severe Deficiency | 4-12 quarts | 9-27 liters   |

Apply as a full coverage spray. May be applied by any suitable spraying equipment providing a misty spray, backpack, tractor mounted spray equipment or by aircraft. FERT-ALL organic chelates are absorbed more easily and readily by foliage, because they are derived from plant materials themselves.

Vegetables – May be applied at young plant stage when enough foliage has developed to accept spray, or any time during the growing season.

Fruit & Nuts – Apply as full coverage spray. Not recommended to be applied during bloom. May be applied in Spring or when growth is 3 to 4 inches long (7 to 10cm) or at any time during the growing season.



• The optimum time to apply foliage sprays is when new growth begins.

## SOIL APPLICATION

FERT-ALL products may be applied in irrigation water flowing between crop rows in overhead sprinkler system or metered into drip irrigation system with nitrogen solution.



FERT-ALL is readily carried into the root zone where the chelate absorbs to soil particles forming a soil compound that is highly leach resistant, yet available for absorption into the plant root system.

FERT-ALL provides advantageous buffering action in the preferred range of acidic pH, slightly below neutrality.

**Field & Vegetable Crops:** Apply to the soil by itself or in irrigation water, use 3-10 Quarts per acre. (6.8 - 23 Liters/HA)

**Fruit & Nut Crops:** Apply to the soil in combination with other treatments or by itself, use 8-16 Quarts per acre. (18 - 36 Liters/HA)

## SEED ZONE PLACEMENT

FERT-ALL products are effective if side dressed, banded or placed slightly below the seed level at planting time. FERT-ALL MB powder is non toxic when used in seed zone for promoting seedling response, particularly in calcareous and alkaline soils. For certain crops FERT-ALL MB can increase the survival rate of seed.

**These FERT-ALL Products replace important trace elements depleted by overwork soil.  
Natural organic lignosulfonate chelate are approved for organic farming**

| FERT-ALL PRODUCTS          | In % PERCENTAGE  |      |     |      |      |      |      |     |      |      |     |                      | FORMULAS APPROVED FOR ORGANIC FARMING |     |
|----------------------------|------------------|------|-----|------|------|------|------|-----|------|------|-----|----------------------|---------------------------------------|-----|
|                            | Fe               | Cu   | Mg  | Mn   | Zn   | B    | Ca   | S   | Mo   | Co   | K   | N                    | No                                    | Yes |
|                            | FERT-ALL Ag Crop | 1.0  |     | 1.0  | 1.0  | 3.0  |      |     | 4.0  |      |     |                      |                                       |     |
| FERT-ALL Bor-Cal           |                  |      |     |      |      | 1.0  | 4.0  | 4.0 |      |      |     |                      |                                       | x   |
| FERT-ALL Boron 5%          |                  |      |     |      |      | 5.0  |      |     |      |      |     |                      |                                       | x   |
| FERT-ALL Boron 10%         |                  |      |     |      |      | 10.0 |      |     |      |      |     |                      |                                       | x   |
| FERT-ALL CAB w/attractant  |                  |      |     |      |      | 2.0  | 6.0  |     |      |      |     |                      |                                       | x   |
| FERT-ALL Cal-Bo-Zinc       |                  |      |     |      | 1.0  | 1.0  | 12.0 |     |      |      |     |                      | x                                     |     |
| FERT-ALL Calcium 6.0%      |                  |      |     |      |      |      | 6.0  |     |      |      |     |                      |                                       | x   |
| FERT-ALL Calcium 6.0%      |                  |      |     |      |      |      | 6.0  | 0.5 |      |      |     | 4.5 Nitrate/0.5 Urea | x                                     |     |
| FERT-ALL Calcium 12.0%     |                  |      |     |      |      |      | 12.0 |     |      |      |     |                      |                                       | x   |
| FERT-ALL Cal-Zinc          |                  |      |     |      | 3.0  |      | 5.0  |     |      |      |     |                      |                                       | x   |
| FERT-ALL Cobalt            |                  |      |     |      |      |      |      |     |      | 5.0  |     |                      | x                                     |     |
| FERT-ALL Copper            |                  | 5.0  |     |      |      |      |      | 2.0 |      |      |     |                      |                                       | x   |
| FERT-ALL Field Crop        | 1.0              |      |     | 1.0  | 4.0  |      |      | 2.2 |      |      |     | 5.0 Urea             |                                       | x   |
| FERT-ALL Foliage Booster   | 1.0              | 0.1  | 0.6 | 0.6  | 4.0  |      |      | 3.0 |      |      | 2.0 | 0.5 Nitrate/2.5 Urea | x                                     |     |
| FERT-ALL General Purpose   | 2.0              | 0.16 | 1.0 | 0.5  | 0.6  | 0.03 |      | 3.0 | 0.04 | 0.03 |     |                      |                                       | x   |
| FERT-ALL Horticulture Mix  | 4.0              |      | 0.5 | 0.5  | 0.5  |      |      | 3.0 |      |      |     |                      |                                       | x   |
| FERT-ALL Iron Plus         | 5.0              |      |     |      |      |      |      | 3.0 |      |      |     |                      |                                       | x   |
| FERT-ALL M                 | 1.2              | 0.1  |     | 0.4  | 2.4  |      |      | 2.0 | 0.04 |      |     |                      |                                       | x   |
| FERT-ALL MB                | 1.6              | 0.16 |     | 0.48 | 1.6  | 0.32 |      | 2.0 | 0.04 |      |     |                      |                                       | x   |
| FERT-ALL Magnesium         |                  |      | 4.0 |      |      |      |      | 4.0 |      |      |     |                      |                                       | x   |
| FERT-ALL Manganese         |                  |      |     | 7.0  |      |      |      | 2.0 |      |      |     |                      |                                       | x   |
| FERT-ALL Molybdenum        |                  |      |     |      |      |      |      |     | 5.0  |      |     |                      |                                       | x   |
| FERT-ALL Nitro-Cal-Mag     |                  |      | 2.0 |      |      |      | 3.0  |     |      |      |     | 2.2 Nitrate          | x                                     |     |
| FERT-ALL Nitro-Cal-Zinc    |                  |      |     |      | 3.0  |      | 5.0  |     |      |      |     | 3.8 Nitrate          | x                                     |     |
| FERT-ALL SETT w/attractant |                  |      |     |      |      | 1.0  | 8.0  |     |      |      |     |                      |                                       | x   |
| FERT-ALL Tree & Vine       | 4.0              |      | 0.6 | 0.05 | 0.05 |      |      | 3.0 |      |      |     | 5.0 Urea             | x                                     |     |
| FERT-ALL ZM (Citrus)       |                  |      |     | 2.0  | 5.0  |      |      | 2.5 |      |      |     |                      | x                                     |     |
| FERT-ALL Zinc Plus         |                  |      |     |      | 10.0 |      |      | 4.0 |      |      |     |                      |                                       | x   |

FERT-ALL products are manufactured carefully in a controlled environment checked for consistent quality. FERT-ALL products are manufactured as a special natural organic chelating agent of the lignin sulfonate group, which is derived from wood. Synthetic chelates will move in the soil, leach out or tie up. FERT-ALL will not migrate out of the root zone or surface soil - it remains in a readily available form.

FERT-ALL products are highly successful as nutrient sprays

for foliar nutrition of deciduous fruit trees, evergreens, nut trees, field crops, lawns, and ornamental gardens.

In agricultural crops, this practice results in significant yield increase and improved quality. In ornamental and shade trees, the benefits are measured in term of increased vigor, lush new growth, and increase in the number, size and color of blossoms. Composting is accelerated by the addition of micronutrients.

## **UNLOCK SOIL NUTRIENT**

## **IMPROVE QUALITY**

## **INCREASE YIELD**

## **ENHANCE STORAGE STABILITY**

## **UNIFORM MATURING**

### **FERT-ALL PRODUCTS ARE:**

Quick acting by foliar application.

Non-burning to foliage

Non-toxic and safe for use by the applicator.

Superlative in drip irrigation systems.

100% soluble and naturally adhesive.

Non-sludging in the spray tank and non-abrasive.

Non-plugging to screens and nozzles.

Provide maintenance of adequate micronutrient levels.

Provide remedy of the multiple or specific micronutrient deficiency.

More efficient than inorganics.

Effective and desirable for application to turf, shrubs and plants in various landscaping applications, and in the greenhouse, nursery, home and garden.

### **FERT-ALL PRODUCTS PROVIDE:**

Increased yields earlier, more even harvests.

Improved quality of food and fibers.

Healthier, more vigorous plants which can withstand adverse weather and disease.

A product which can be applied over fruit with no staining or alkaline residue.

A foliar or soil applicant which can be used in injection equipment, irrigation water and in combination with foliage treatments.

Buffering action.

Provided in the preferred pH range slightly below neutrality.

### **SAVE MICRONUTRIENTS BY FOLIAR USE**

**Faster Application** – More acres per day with spray equipment

**Uniform Application** – Each drop contains the same analysis as the entire solution.

**Low Cost** – The cost per acre is less.

**Versatile** – Insecticides and herbicides may be readily mixed into solution to get perfect coverage with less soil compaction. "Once across the field, the job is done."

**Improved Quality Larger Yields** – Use FERT-ALL products and they will show a difference come harvest time.

GROW  MORE

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