



nutrients for life

Agrium



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How does an apple a day keep the doctor away? Quite simply – with nutrients. Vitamins, carbohydrates and other nutrients are packed into this delicious fruit helping to keep us well nourished and free from disease. The question is, how do we ensure the fruits and vegetables grown on our farms are healthy? The answer to that question is also simple – with fertilizer. Because food production depletes soil nutrient supplies, farmers rely on fertilizer to keep the soils productive. You could say the fertilizer industry nourishes the soil to nourish the people.

# nutrients are essential to life



The world's population is expected to grow to nine billion people by 2050. With that growth will come even greater demand for safe, nutritious food.

## How Do Nutrients Contribute to Life

Science, research and best management practices for food production allow farmers to produce about three times as much food on virtually the same land area under cultivation as in 1960. They are also feeding twice the population. Without nutrients increasing the productivity of soil, we would need at least 50% more farmland – the equivalent of converting almost a quarter of the global forest reserves.

### Nourish

What we eat and how we treat our bodies on a daily basis has a very powerful effect on our health and quality of life. Over the past century, life expectancy has increased from 49 to 77 years. Proper nutrition has played a significant role in this achievement. Scientists are increasingly interested in the connection between plant mineral nutrition and the nutritive value of foods.

### Replenish

With each crop harvest, nutrients are removed from the soil and consumed in the food we eat. Without replenishing the soil, it becomes less productive and more susceptible to erosion and desertification. With only 3% of the earth's surface suitable for food production, the protection of soil allows farmers to meet the challenge of the future – a globally secure food supply.





## Grow

Worldwide, one in three people can neither grow nor afford to buy enough food. While people in other countries spend between 15% and 50% of their income for food, North Americans spend only about 10%. With the help of commercial fertilizer, North American farmers are able to produce the most abundant, nutritious, and affordable food in the world.

# healthy foods means healthy bodies



Isoflavones, which are found primarily in the legume soy, have shown to help prevent health problems such as cancer of the colon, breast and prostate, and most recently, the potential to reduce blood cholesterol.

## What Are Nutrients

Humans, animals and plants rely on a safe, healthy supply of food and nutrients like nitrogen, phosphorus and potassium for proper growth and development. Plant nutrients are the ‘food’ that plants need to manufacture the food humans eat.

Plants require 14 essential mineral elements for healthy growth.

These elements are critical to the growth, development and health of plants. They influence several food quality and health attributes that are important for human nutrition. Their functions are very specific and cannot be substituted by any other element. A lack of any one nutrient in the soil can limit plant growth, even when all other plant nutrients are present in adequate amounts.

Life requires both macronutrients and micronutrients to exist.

The four macronutrients most commonly limiting food production and quality are: nitrogen, potassium, phosphorus and sulphur.

Micronutrients are required in very small or ‘micro’ amounts by plants.

Fertilizers provide a precise, controlled and environmentally friendly way to provide these natural and safe nutrients. When farmers use science-based nutrient management to guide the application of fertilizer nutrients, they are not only optimizing the yield and quality of the food that plants produce, they are enhancing the health benefits of most foods as well.





## Naturally Good For You

Lycopenes, found in tomato-based products like pasta sauce and ketchup, contain powerful antioxidant properties. Diets rich in lycopene may reduce the risk of prostate cancer and certain other cancers, and play a key role in the body's defense against aging and many degenerative diseases.

# ingredients for growth



Conservationists in North America, Asia and Europe use fertilizer nutrients to replenish depleted fish habitats to ensure an adequate food supply for salmon and other fish. As stewards of the land, they base these applications on years of scientific research and observations.

All plant nutrients basically come from natural sources, either from the air we breathe, or from ancient sea beds in geological deposits. Fertilizer companies simply take these natural ingredients and convert them into a form that plants can use. Fertilizer nutrients are the most readily available and predictable source of nutrients for plant growth.

Farmers use fertilizer to meet plant nutrient requirements and to replace the nutrients that have been absorbed by plants. Each growing season, crops remove nutrients they need to grow from the soil. When those crops are harvested, these nutrients go to market having depleted the soil of this valuable resource. By fertilizing their land, farmers are simply replenishing the nutrients removed to produce food and maintain the health of their soil.

An insufficient supply of nutrients compromises the plant's ability to withstand harsh weather, disease, and other stresses. Although dry weather played a key role in the "dust bowl" conditions of the 1930s, insufficient levels of nutrients were one of the problems that plagued Depression-era farmers. Today, the United Nations estimates that over 30% of the world's land is affected by desertification, a condition that fertilizers are used to combat.

Fertilizer nutrients are also used to replenish wildlife habitats that were depleted of nutrients to support animal and plant growth. Conservationists in North America, Asia and Europe use fertilizer nutrients to replenish depleted fish habitats to ensure an adequate food supply for salmon and other fish. As stewards of the land, they base these applications on years of scientific research and observations.

# N



Gases in the earth's atmosphere are made up of about 78% nitrogen. That means there is about 75 million pounds of nitrogen in the atmosphere above every acre of land.

## Nitrogen (N)

Nitrogen is a primary building block for all life. It is a vital component in plant genes, enzymes and plant chlorophyll, and comprises 16% of protein.

It is often the most limiting nutrient in soils due to the high amount of nitrogen required by plants to produce food and fiber. Each year typical North American corn crops remove more than 5.7 billion pounds of nitrogen from our soils. This nitrogen is replaced by the judicious application of fertilizer and manure based nutrients.

### Made From Air We Breathe

The air we breathe is about 78% nitrogen, but there are very few plants that can make direct use of nitrogen in the air. To make this nitrogen available to support life, fertilizer producers take nitrogen out of the atmosphere and convert it into a form plants can use.

Nitrogen fertilizer manufacturing captures this naturally occurring atmospheric nitrogen, combines it with hydrogen from natural gas under heat and pressure to form anhydrous ammonia. The ammonia is then used to make other nitrogen fertilizer products. Once in the soil, the nitrogen from fertilizer is chemically identical to nitrogen derived from animal manure, crop residue or legumes.

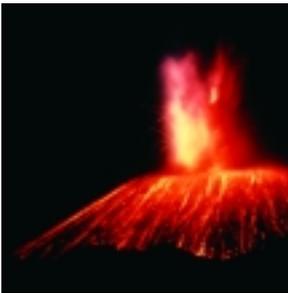
### N – The Builder

Like the human body, plants need nitrogen to grow. Often used in greater amounts than other nutrients, nitrogen helps make plants green and plays a major role in boosting yields.

Nitrogen plays a critical role in protein formation and is a major component of chlorophyll. Plants with adequate nitrogen show healthy vigorous growth, strong root development, dark green foliage, increased seed/fruit formation and higher yields.



# P



Phosphate nutrients are produced from phosphate ore, mined from deposits formed by the remains of marine life or by volcanic activity.

## Phosphorus (P)

Phosphorus is found in every living cell. It plays a critical role in the process of photosynthesis, converting the sun's energy into forms used by the plant for the production of food and fiber.

Phosphorus is the second most abundant nutrient of all the mineral nutrients contained in our bodies. It can be found in every cell, but nearly 80% is concentrated in teeth and bones. Therefore eating a balanced diet that includes sufficient phosphorus is the best defense against bad teeth, weak bones, and other potentially serious health problems.

### Made From Fossils

Phosphorus used in fertilizers comes from the fossilized remains of ancient marine life found in rock deposits in North America and other parts of the world. The phosphate manufacturing process combines phosphate rock from these natural geological deposits with sulphuric acid to produce a concentrated phosphorus solution.

### P – The Energy Supplier

Phosphorus is the plant world's equivalent of carbohydrates. It provides the energy that a plant needs to grow. Phosphorus is involved in seed germination and ensuring plants use water efficiently. Plants need phosphorus to stimulate root development and flowering and to help in the prevention of disease and stress.

Crops supplied with adequate phosphorus are more efficient in growth and development, and in turn more profitable. Fertilizer phosphate is an effective means of correcting soil phosphorus deficiencies, and supporting the production of high yielding, high quality crops.



# K



Soluble potassium salts were once part of the seas covering large areas of the planet. As these bodies of water evaporated over time they left behind mineral deposits.

## Potassium (K)

Potassium is the seventh most abundant element in the earth's crust. It is found in every cell of plants and animals. Potassium helps plants grow strong stalks, in the same way that calcium gives people strong bones.

More than 85% of the body's potassium is found in the muscles, skin, blood, digestive tract and liver. Potassium is also prescribed to patients with heart and blood pressure problems to avoid potentially dangerous side effects from medication.

### Made From Natural Mineral Deposits

Fertilizer producers mine potassium from these naturally occurring potash ore deposits that formed when seas and oceans evaporated, many which are covered with several thousands of feet of earth. Once the ore is brought to the surface, unwanted minerals are removed in the manufacturing process and the product is then sized for application.

### K – The Regulator

Potassium protects plants from extreme temperatures and helps them to fight stress, disease and pests such as weeds and insects. Potassium stops wilting, strengthens roots and stems and assists in transferring food. It activates plant enzymes and ensures the plant uses water efficiently. Potassium contributes to making the food you buy fresh.

Often referred to as the “regulator” in crop production, potassium has a major influence on protein and starch formation, influencing over 60 enzyme systems controlling the development of crop quality.

Where potassium is deficient in the soil, potash fertilizers can correct the problem and boost crop yields and quality.





## Salt Shaker

Few of us know that potash fertilizer, or potassium chloride, is a fertilizer mineral mined one km deep under the prairies of Western Canada.

But did you know that individuals who are advised by their physicians to restrict sodium (Na) intake often use potassium chloride (KCl) to season food rather than common table salt, sodium chloride (NaCl)?

This is the same potassium chloride found in commercial fertilizer that supplies these two nutrients to crops across North America and around the world.

And, it's the same potassium chloride sometimes added to drinking water through water softeners to reduce hard minerals.

In fact, the nutrients found in fertilizers are so safe that some are added to the food we eat and the water we drink.

So whether it is nourishing soils to produce healthy food, taking the sting out of hard water, or spicing up our diets, potash fertilizers play a critical role in all of our lives.

# S



Sulphur gives onions and radishes their characteristic taste.

## Sulphur (S)

Sulphur is one of the most abundant elements in the soil, and is one of the oldest elements known to man. Like nitrogen, it is an essential component in the healthy growth of all living things.

Fertilizer producers convert raw sulphur deposits into forms that can be absorbed by the crop and released later when the plants need them.

### Made From Natural Underground Deposits or Recycled From Other Processes

Modern techniques are used to extract sulphur from deep, naturally occurring underground deposits, from natural gas and crude oil, from the smelting of certain metal ores and from gases produced by burning coal.

### S – A Synthesizer

Sulphur is essential for the production of amino acids, which are used in the synthesis of proteins found in all living things. Proteins provide the sustenance humans require in their diets and plants and animals could not survive without them.

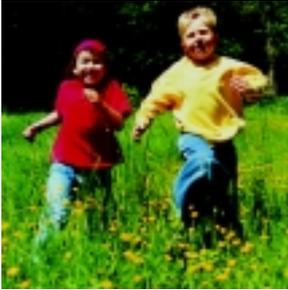




## Improving Canola Fields

Sulphur is an essential component of several amino acids inside the plant, which are important to the quality of both feed and grain crops. For example, sulphur increases the proportion of oil in oilseed crops such as flax, soybeans and canola.

## micro size – massive results



# B

The four most commonly deficient micronutrients that plants require, and that can be supplemented through the use of fertilizer nutrients, include: boron, copper, zinc and manganese. Micronutrients are part of the body's hormones and proteins. Although the combined weight of the micronutrients in your body is very small, you could not live without them.

### Boron (B)

Boron is an essential nutrient in growth and development of new cells. Boron regulates flowering, pollination, seed development, and sugar transport in plants. In humans, boron has recently been linked to the prevention of osteoporosis.

# Cu

### Copper (Cu)

Copper is a critical regulator of several plant enzyme systems and is needed for protein synthesis and nitrogen metabolism. Plants only require small amounts of copper. Copper plays an important role in the formation of protein pigments found in red blood cells.

# Zn

### Zinc (Zn)

Zinc is an essential enzyme regulator in the synthesis of protein, starch, and growth hormones in plants. The lack of zinc in the human diet can result in slow growth, bone and skin disorders and even sterility.

# Mn

### Manganese (Mn)

Manganese is a part of several plant enzyme systems. It plays a role in photosynthesis by regulating the formation of plant chlorophyll. Manganese also plays an important role in humans in the function of some enzymes and as an activator of others.



# commitment to improve



Science comes to the farm field in the form of Best Management Practices (BMP's). These include soil testing for nutrient levels, precision fertilizer applications and timing, and the use of Global Positioning Systems (GPS) for site-specific management.

We've made great strides in using fertilizer more efficiently and effectively. Last year, North American farmers produced food for 26% more people than they did in 1980, but used less commercial fertilizer than 20 years ago. They have also been able to continue to increase food supply without increasing the amount of land used for farming, protecting wildlife habitat and recreational land for the future.

Fertilizer application is based on scientific research. Since the inception of research programs at Universities and federal research stations, the study of soil nutrient supply and crop requirements has been a high priority. The fertilizer industry relies on trained scientists and professionals, including Professional Agronomists and Certified Crop Advisers (CCA), to work with the industry and farmers to ensure safe, effective, economical and environmentally friendly practices are used.

Science is used to support the management of nutrients to ensure the protection of the environment and the production of safe food. The latest advances in agricultural technology enable farmers to apply soil nutrients with pinpoint accuracy, minimizing their impact to soil, water, and air. For example, controlled release fertilizer technology minimizes losses to the environment by releasing nutrients when the crop demands it.

Fertilizer makes an enormous contribution to agriculture, the environment and society. Through science and adoption of best management practices, the industry will continue to nourish the earth, replenish the soil and grow healthy communities.



## Protecting our environment

Modern farming practices use fertilizer nutrients to build high yielding, nutritious crops, at the same time as making it possible for us to continue to use large areas of land for forests, parks and wildlife areas. By maximizing returns on available farmland, fertilizer enables habitat to exist, and in turn promotes diversity and protects species at risk.



**Corporate Headquarters**

13131 Lake Fraser Dr. SE  
Calgary, Alberta, Canada T2J 7E8  
Phone (403) 225-7000

**United States Headquarters**

Suite 1700, 4582 South Ulster Street  
Denver, Colorado, U.S.A. 80237  
Phone (303) 804-4400

**NYSE and TSX: AGU**

[www.agrium.com](http://www.agrium.com)