



POWERING UP PLANT VIGOR

With the arrival of spring, U.S. farmers have begun their annual ritual of planting and fertilizing their crops. Fertilizer boosts plant vigor and can be the difference between crop success or crop failure. But like many chemicals released into the environment, the production and application of fertilizer both can solve and create problems.

Fertilizer application is essential to feeding a world population that has grown from 1.3 billion in 1940 to 6.3 billion in 2004. Currently, one 50-lb. (23-kg) bag of chemical fertilizer is used annually for each person on Earth (DeBlij et al).

The application of fertilizer on field crops helps plants grow to their full potentials. Yet fertilizer must be judiciously applied to reduce the amount accumulating in the environment, particularly in surface and ground water.

There are two types of fertilizers used by farmers and gardeners, organic and mineral. Both supply critical nutrients for plant growth. Organic fertilizers include animal waste, sewage water waste and composted plant and household waste.

Commercial mineral fertilizers may contain any or all of the three basic chemical elements, nitrogen, phosphorus (FAHS-fuhr-us) and potassium. In fact, the numerical system imprinted on bags of mineral fertilizers (e.g. 8-10-20) refers to 8 parts nitrogen, 10 parts phosphorus (as phosphate) and 20 parts potassium (as potash).

Ammonia is the principal source of commercial nitrogen fertilizer. Mixing natural nitrogen from the air with hydrogen from natural gas produces ammonia. The process requires heavy fossil energy inputs.

Leading producers of synthetic nitrogen are China (22 percent), United States (13 percent), India (8) and Russia (8).

Potassium chloride is the major source of potassium (referred to in general as potash) in fertilizer. It is mined in Utah and New Mexico, but Canada is the leading producer at 35 percent of the world's production, followed by Germany (13 percent), Belarus (12), Russia (11) and the United States (6).

Phosphorus, on the other hand, comes from phosphate rock. The United States mines 33 percent of the world's commercial phosphate rock. Leading states in production are Florida, Idaho and North Carolina. Other countries leading in production are China (16 percent), Morocco (16 percent), Russia (7), Tunisia (5), Jordan (4) and Israel (2).

Phosphorus is a naturally occurring chemical element essential to all life. The element phosphorus is found in abundance in phosphate rocks, which are sedimentary rocks formed on the ocean floor. Through the geologic processes, these rocks are lifted above sea level. When these phosphate rocks are weathered and eroded, phosphorus begins its natural cycle through the environment.

Plants use it, animals eat the plants, and animals eat animals. Ultimately, the phosphorus is returned to the soil through the animals' body waste and through their dead carcasses. Ground and surface water may carry the residual phosphorus back to the ocean and deposit it on the ocean floor, where it again becomes a component of phosphate rock.

Phosphate is strip mined, generally with major disruption of the surface fea-

tures and the ground water in the mined areas. Although miners are required now to reclaim mined lands, much of the areas mined for phosphate in central Florida, for example, have some resemblance to reclaimed strip mined areas of the Appalachian coal fields.

A leading environmental issue is excessive applications of mineral fertilizer, where nitrogen, phosphorus and potassium are leached into ground water or carried into surface water. An over-abundance of these elements can cause health problems for those who consume water from contaminated wells, especially the very young and old and the infirmed. When these elements, particularly nitrogen and phosphorus, are carried by surface water into streams, lakes, sounds and bays, they rapidly produce algae blooms and reduce the water's oxygen. This process is called *eutrophication* and the result may be the death of natural aquatic organisms.

Although supplying supplementary nutrients to crops is an essential part of farming, there is a growing concern about residual nutrients that enter human and animal diets. Farmers are caught between producing more food and protecting the environment.

And that is Geography in the News. April 16, 2004. #724.

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Additional Source: DeBlij, H.J., et al, *Physical Geography: The Global Environment*, Oxford University Press, New York, 2004; and <http://www.chem.uidaho.edu/~honors/ammonia.html>

Prosperous Fertilizer

