

Growing Plants Using

Space Technology

Vitamins for Plants?

Just as we need to get proper nutrition from our food, so do plants. But instead of eating hamburgers or apples to get nutrients, like we do, plants make their own food in their leaves. Many people think plants get all their food through their roots, but that really isn't true. They do take nutrients from the soil to help their leaves make food more efficiently, but they couldn't survive without the food produced in their leaves. You might compare the nutrients plants get from the soil to the vitamin pills people take to stay healthy. People can live without taking vitamins, but if they don't get all the vitamins they need, they don't function as well and get sick more easily. Plants are much like this. If they don't get important nutrients from the soil, they don't function as well.

As a farmer's crop grows, it produces the product the farmer sells, called its yield. For example, the amount of oranges produced in an orange grove is referred to as the crop yield from that grove. In order for crops to produce high yields, they must receive the proper nutrients. Plants depend on farmers to deliver those nutrients. Farmers want to make sure they apply these expensive nutrients at the right time and in the right amounts to keep the plants healthy and produce high yields.

Hard Work for Healthy Plants

A farmer treats crop fields with vital nutrients by using a tractor to deliver fertilizer. It sounds simple, but it's not. Here's what the farmer has to take into consideration:

Delivery of fertilizer - Farmers have the difficult job of trying to match their use of fertilizers to the times when the plants need them and when conditions in the field are best for fertilizers to be applied.

Different soil types - Different parts of a farmer's field need different amounts of fertilizer. If a farmer put the same amount of fertilizer on every part of the field, some plants would get more than they needed, and others would not get enough.

of the nutrients may end up in groundwater or surface water instead of being used by the crop. When that happens, the excess nutrients are of no value to the crop, the farmer has wasted money, and a poor crop yield may result.

✦ Excess plant nutrients can be a major source of groundwater contamination.

Farming by Satellite

This is where space comes in. Maybe you've heard of the cool new technology called GPS, which stands for Global Positioning System. It is the only system today able to help people know their exact position on the Earth anytime, in any weather, anywhere. Here's how it works: GPS satellites, 24 in all, orbit at 9,600 miles above the Earth. The

satellites in space transmit signals that can be detected by anyone on Earth with a GPS receiver.

Using GPS to identify soil characteristics, farmers are now able to precisely:

- ✦ Plant crops
- ✦ Apply sprays to kill harmful weeds and insects
- ✦ Apply accurate amounts of fertilizer
- ✦ Water crops when and where they need it most
- ✦ Check how well the crop is performing in all parts of a field.

Solutions from Space
GPS uses space technology to solve a lot of problems for the farmers who use it. You've read about how GPS is used to control the amount and location of fertilizer applied. Farmers can use GPS for many other things as well, such as controlling the number of seeds planted in a certain part of the field, knowing how deep to plant seeds in the soil, controlling the amount of irrigation water applied to the field, finding the places in the field where harmful weeds like to grow, and measuring the yield of the field during harvest. All of these things save time and money and minimize work while helping the environment. None of this would be possible without technology in space!



Photo courtesy of John Deere

Apply it Right!

Incorrectly fertilized lawns, golf courses and crop fields may cause problems for plants, but also can harm the environment. Let's take a look at how this happens.

✦ When more nutrients are added to the soil than the crop can use or the soil can hold, some

Space-Age Farmers

By combining soil sensors with GPS information, farmers can use hundreds of soil measurements while planting, fertilizing and harvesting, and then return days and weeks later to repeat the measurements in the exact same location! GPS receivers are mounted on tractors, fertilizer applicators and combines (a machine that harvests crops). With the touch of a button, GPS can pinpoint the tractor's exact location in the field within ten inches! A computer screen that farmers watch while driving in the field shows them maps that display where the soil in the field is moist, where the soil eroded over the winter, where more nutrients are needed, and where other factors in the soil might be bad for crop growth. Information is sent to a computer in the tractor to identify thriving areas and areas in trouble. Then this data is transmitted to a machine that automatically regulates the application of nutrients in the exact amounts and exact locations that they are needed.



Photo courtesy of John Deere

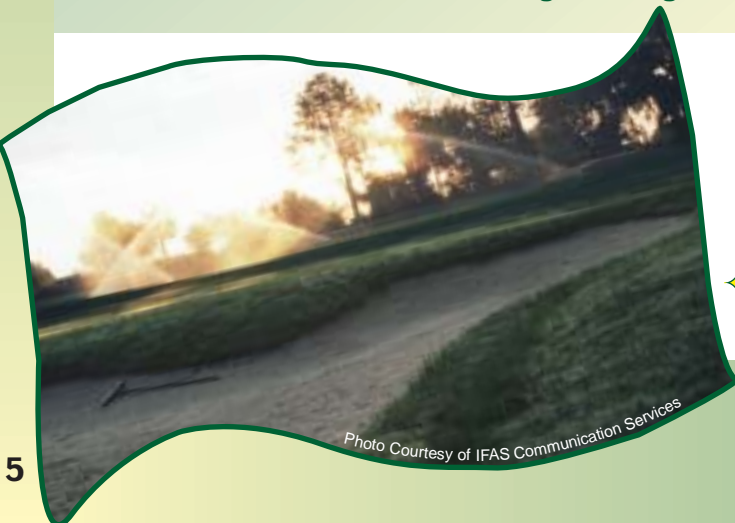


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