

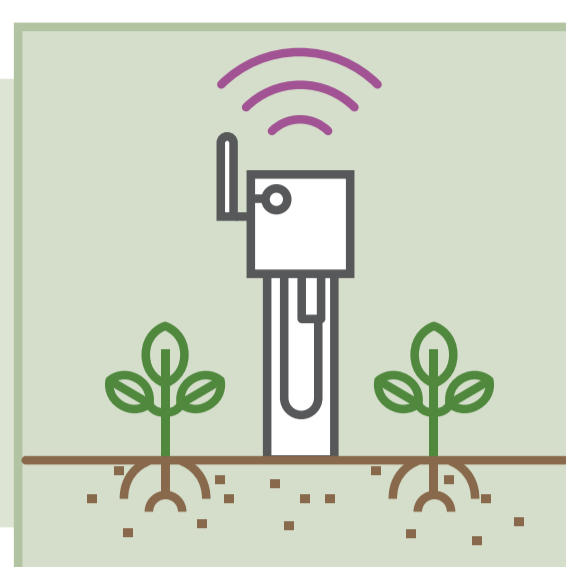
# How Precision Agriculture is Improving Plant Nutrition

Precision agriculture uses a growing range of technologies and data to make farming, including plant nutrition, more efficient while increasing crop yields and quality.

Here are some of the tools that farmers are using to apply fertilizers in an ever more precise manner to grow more food on existing farmland while reducing nutrient losses to the environment.

## On-Farm Sensors

Sensors measure the nutrient content of soils and plants. This helps farmers select the right nutrients to apply in the right amount and at the right time and right place, which minimizes nutrient losses to air and water while maximizing crop quality and yield.

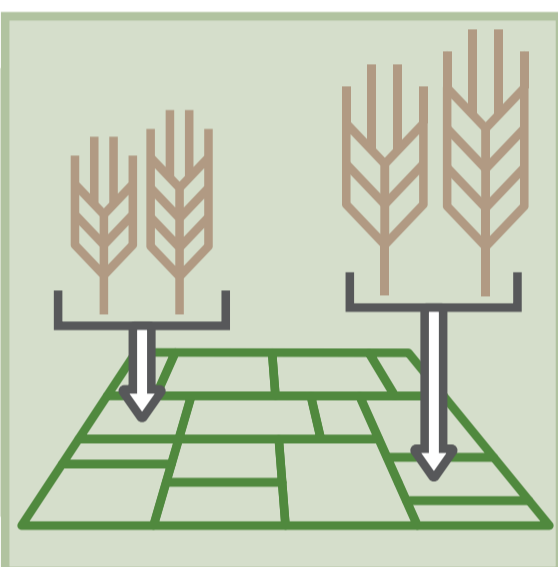
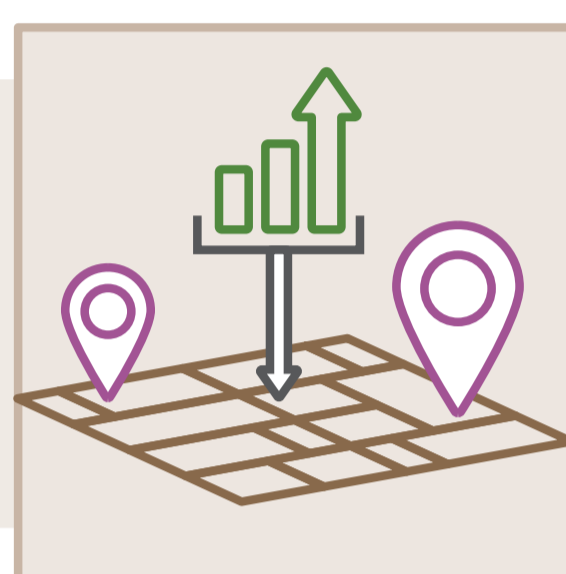


## Decision Support Software

Computer and smartphone apps use algorithms to analyze data on soil, crops, weather and farming practices to offer increasingly precise fertilizer application recommendations.

## Variable Rate Prescriptions

Since nutrient requirements can differ within a specific field, detailed nutrient measurements allow farmers to plot the specific nutrient requirements for each area of the field, ensuring site-specific nutrient management.

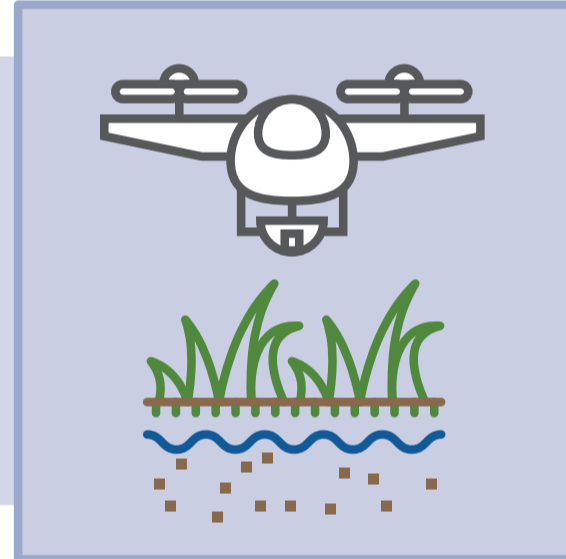


## Yield Maps

Yield maps created using GPS and harvest monitors help farmers track yield distribution within a field from year to year and improve their fertilizer applications.

## Multispectral Imaging

Multispectral images from drones and satellites reflect nutrient levels in the plant canopy, which allows farmers to quickly identify and respond to fertilizer deficiencies at crucial crop growing stages.

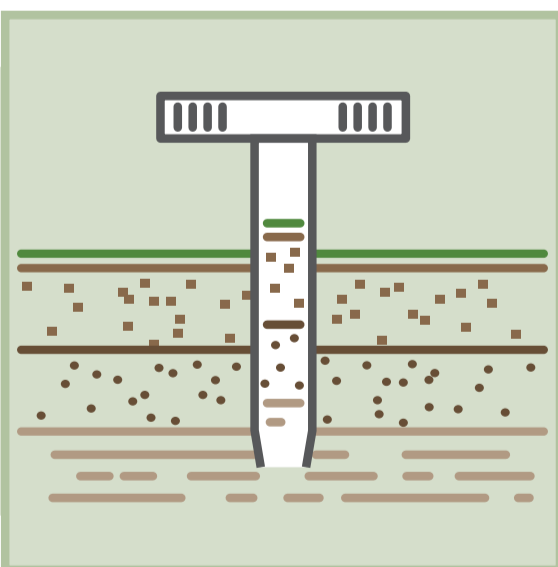
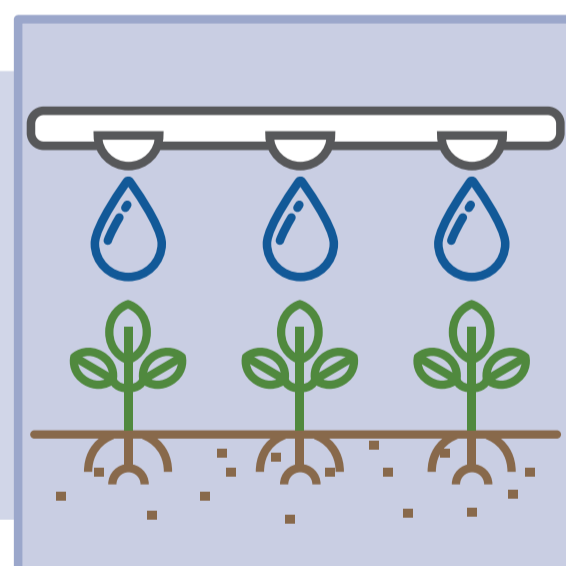


## Auto-Guidance Systems

Automatic GPS-steered tractors allow farmers to accurately and methodically monitor fields and apply exactly the right amount of fertilizers to the right areas to avoid nutrient losses and grow more produce.

## Fertigation

Combining precise fertilization with irrigation ensures excellent nutrient and water use efficiency, which helps farmers grow crops more effectively in areas with water scarcity or drought.

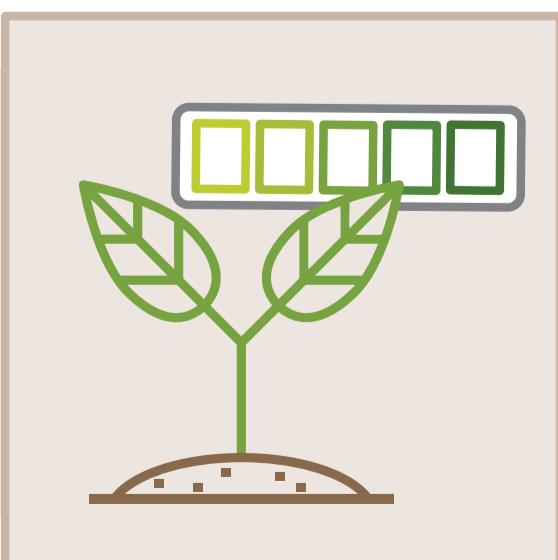
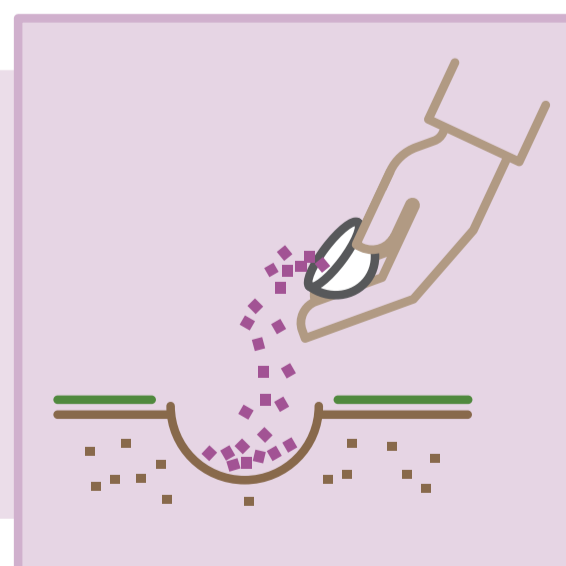


## Soil Mapping

Soil fertility maps based on intensive soil sampling provide an estimate of soil nutrient content and acidity by region. Soil mapping helps farmers, especially in developing countries with limited access to soil testing, to better understand their crops' nutrient needs.

## Microdosing

Using bottle caps to consistently apply small quantities of fertilizers, either during planting or 3 to 4 weeks after plant emergence, allows smallholder farmers to improve their productivity at a manageable cost.



## Leaf Colour Charts

This simple but effective tool allows less technologically advanced farmers to analyze the colour of their crop leaves to see whether additional nitrogen-based fertilizer is needed to improve yields.