



United States
Department of
Agriculture

Natural Resources Conservation Service

Nutrient Management

Apply only the nutrients plants can use.



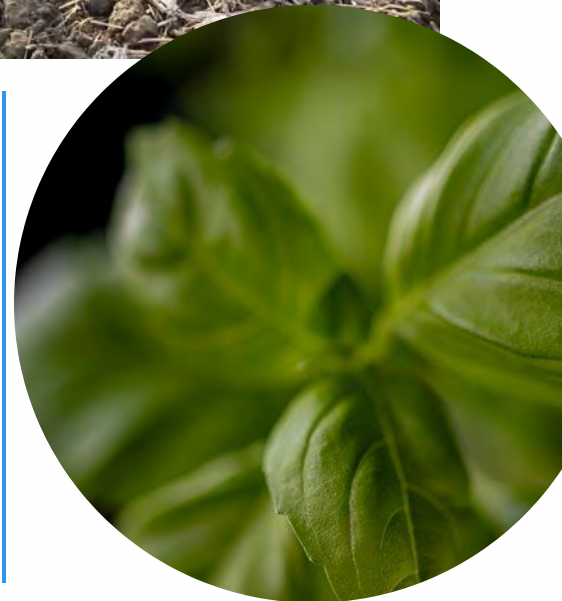
CONSERVATION
in your
BACKYARD
WE CAN ALL HAVE A HAND IN IT

In your backyard...

Twenty nutrients have been identified that are required by plants. Of these, nitrogen, phosphorus, and potassium are required in relatively large amounts. Nitrogen is associated with lush vegetative growth, adequate phosphorus is required for flowering and fruiting, and potassium is necessary for durability and disease resistance. Calcium, sulfur, and magnesium are also required in comparatively large quantities.



These six nutrients are referred to as macronutrients. The other nutrients, referred to as micronutrients, are required in very small amounts. These include such elements as copper, zinc, iron, and boron. While both macro and micronutrients are required for good plant growth, over-application can be as detrimental as a deficiency. Over-application of plant nutrients not only may impair plant growth, but may contaminate groundwater by leaching through the soil or pollute surface waters by washing away.



Natural
Resources
Conservation
Service

tx.nrcs.usda.gov



SOIL TESTING



Testing your soil for nutrients and pH is important to provide your plants with the proper balance of nutrients while avoiding over-application. If you are establishing a new lawn or landscaping, a soil test is strongly recommended. The cost of soil testing is minor in comparison to the cost of plant materials and labor. Correcting a problem before planting is much simpler and cheaper than afterwards. Once your yard is established, continue to take periodic soil samples. While many people routinely lime their lawns, this can result in raising the pH too high. However, since many fertilizers tend to lower the pH, the pH may drop below desirable levels after several years, depending on fertilization and other soil factors.

Home tests for pH, nitrogen, phosphorus, and potassium are available from garden centers. While these may give you a general idea of the nutrients in your soil, they are not as reliable as tests performed by the Cooperative Extension Service at land grant universities. University and other commercial testing services will provide more detail and you can request special tests for micronutrients if you suspect a problem. In addition to the analysis of nutrients in your soil, they often provide recommendations for the application of nutrients or on adjusting the pH.



There are numerous choices for providing nitrogen, phosphorus, and potassium. If your soil is of adequate fertility, applying compost may be the best method of applying additional nutrients. While compost is relatively low in nutrients compared to commercial fertilizers, it is especially beneficial in improving the condition of the soil. By keeping the soil loose, compost allows plant roots to grow well throughout the soil, allowing them to extract nutrients from a larger area. A loose soil enriched with compost is also an excellent habitat for earthworms and other beneficial soil microorganisms that are essential for releasing nutrients for plant use. The nutrients from compost are also released slowly so there is no concern for "burning" the plant with an over-application.





SOIL TESTING, continued

Manure is an excellent source of plant nutrients and organic matter. Manure should be composted before applying. Fresh manure may be too strong and can injure plants. Be careful when composting manure.

If exposed to rain, nutrients may leach out of the manure and the runoff can contaminate waterways.

Make sure the manure is stored in a location away from wells and any waterways, and that any runoff is confined or slowly released into a vegetated area.

Improperly applied manure also can be a source of pollution. For best results, work composted manure into the soil.



If preparing a bed before planting, compost and manure may be worked into the soil to a depth of 8 to 12 inches. If adding to existing plants, work carefully around plants. Green manures are another source of organic matter and plant nutrients. Green manures are crops that are grown and then tilled into the soil. As they break down, nitrogen and other plant nutrients become available. Green manures may also provide additional benefits of reducing soil erosion. Green manures such as rye and oats are often planted in the fall after the crops have been harvested. In the spring, these are tilled under before planting.

With all organic sources of nitrogen, the nitrogen must be changed to an inorganic form before the plants can use it. Therefore, it is important to have well-drained, aerated soils that provide favorable habitat for the soil microorganisms responsible for these conversions. There are numerous sources of commercial fertilizers that supply nitrogen, phosphorus, and potassium. The first number on the fertilizer analysis is the percentage of nitrogen, the second number is phosphorus, and the third number is the potassium content. How much of each nutrient you need depends on soil test results and the plants you are fertilizing. Nitrogen stimulates vegetative growth while phosphorus stimulates flowering. Too

much nitrogen can inhibit flowering and fruit production. For many flowers and vegetables, a fertilizer higher in phosphorus than nitrogen is preferred such as a 5-10-5. For lawns, nitrogen is required in greater amounts so a fertilizer with a greater amount of nitrogen is beneficial.



Taking a Soil Test



STEP 1

If you intend to send your sample to the land grant university in your state, contact the Cooperative Extension Service for information and sample bags. If you intend to send your sample to a private testing lab, contact the lab for specific details about submitting a sample.



STEP 2

Follow the directions carefully for submitting a soil sample. The following are general guidelines.

- Sample when the soil is moist but not wet.
- For each acre of land to be tested, 10 to 15 sub-samples are recommended. Areas that have been used differently should be sampled separately. For example, a separate sample should be submitted for an area that has been in a garden and one that has been lawn.
- Obtain a clean pail or similar container.
- Clear away the surface litter or grass.
- With a spade or soil auger, dig a small amount of soil to a depth of 6 inches.
- Place the soil in the clean pail.
- Repeat steps until the required number of samples have been collected.
- Mix the samples together thoroughly.
- From the mixture, take the sample that will be sent for analysis.
- Send immediately. Do not dry before sending.



STEP 3

If you are using a home soil testing kit, follow the above steps for taking your sample. Follow the directions in the test kit carefully.



Fertilizers and Soil Amendments



Once you have the results of the soil test, you can add nutrients or soil amendments such as lime, as needed. If you need to raise the pH, use lime. Lime is most effective when it is mixed into the soil, therefore it is best to apply before planting. For large areas, rototilling is most effective. For small areas or around plants, working the lime into the soil with a spade or cultivator is preferable.

Depending on the form of lime and the soil conditions, the change in pH may be gradual. It may take several months before a significant change is noted. Soils high in organic matter and clay tend to take larger amounts of lime to change the pH than do sandy soils. If you need to lower the pH significantly, especially for plants such as

rhododendrons, you can use aluminum sulfate. Other commercially available fertilizers will also help lower the pH. In all cases, follow the soil test or manufacturer's recommended rates of application.

There are numerous choices for providing nitrogen, phosphorus, and potassium. If your soil is of adequate fertility, applying compost may be the best method of applying additional nutrients. While compost is relatively low in nutrients compared to commercial fertilizers, it is especially beneficial in improving the condition of the soil. Compost allows plant roots to grow well throughout the soil, allowing them to extract nutrients from a larger area. A loose soil enriched

with compost is also an excellent habitat for earthworms and other beneficial soil microorganisms that are essential for releasing nutrients for plant use. Nutrients from compost are also released slowly so there is no concern for "burning" the plant with an over-application.

Manure is also an excellent source of plant nutrients and organic matter. Manure should be composted before applying. Fresh manure may be too strong and can injure plants. Be careful when composting manure. If left in the open, exposed to rain, nutrients may leach out of the manure and the runoff can contaminate waterways. Make sure the manure is stored in a location away from wells and *(continued on next page)*



Lime can be an effective way to raise the pH level in the soil.



Different plants require different soil nutrients for optimum health and growth.



Nutrient changes in the soil can take several months.





It is important to have well-drained, aerated soils that provide the favorable habitat for the soil microorganisms responsible for these conversions.

Work compost and manure into the soil before planting.



any waterways, and that any runoff is confined or slowly released into a vegetated area. Improperly applied manure also can be a source of pollution. For best results, work composted manure into the soil.

If preparing a bed before planting, compost and manure may be worked into the soil to a depth of 8 to 12 inches. If adding to existing plants, work carefully around plants. Green manures are another source of organic matter and plant nutrients. Green manures are crops that are grown and then tilled into the soil. As they break down, nitrogen and other plant nutrients become available. Green manures may also provide additional benefits of reducing soil erosion. Green manures such as rye and oats are often planted in the fall after the crops have been harvested. In the spring, these are tilled under before planting.

Soil test results help determine what nutrients you might need to add.



With all organic sources of nitrogen, whether compost or manure, the nitrogen must be changed to an inorganic form before the plants can use it. Therefore, it is important to have well-drained, aerated soils that provide the favorable habitat for the soil microorganisms responsible for these conversions. There are numerous sources of commercial fertilizers that supply nitrogen, phosphorus, and potassium. The first number on the fertilizer analysis is the percentage of nitrogen, the second number is phosphorus, and the third number is the potassium content. A fertilizer like 10-20-10 has twice as much of each of the nutrients as a 5-10-5. How much of each nutrient you need depends on your soil test results and the plants you are fertilizing. Nitrogen stimulates vegetative growth while phosphorus stimulates flowering.

Well drained aerated soils are important for soil microorganisms to work.



Too much nitrogen can inhibit flowering and fruit production.

For many flowers and vegetables, a fertilizer higher in phosphorus than nitrogen is preferred such as a 5-10-5. For lawns, nitrogen is required in greater amounts so a fertilizer with a greater amount of nitrogen is beneficial.





Fertilizer Application



Mix with water

Commercial fertilizers are normally applied as a dry granular material, or mixed with water and watered onto the garden. If using granular materials, avoid spilling on sidewalks and driveways. These materials are water soluble and can cause pollution problems if rinsed into storm sewers. Granular fertilizers are a type of salt, and if applied too heavily on plants, they can burn the plants. If using a liquid fertilizer, apply directly to or around the base of the plant.



Apply when plants have greatest need

For the most efficient use and to decrease the potential for pollution, fertilizer should be applied when the plants have the greatest need for the nutrients. Plants that are not actively growing do not have a high requirement for nutrients. Therefore, applications of nutrients to dormant plants, or plants growing slowly due to cool temperatures, are more likely to be wasted. While light applications of nitrogen may be recommended for lawns in the fall, generally, nitrogen fertilizers should not be applied to most plants in the fall in regions of the country that experience cold winters. Since nitrogen encourages vegetative growth, if it is applied in the fall it may reduce the plant's ability to harden for winter.



Don't apply directly on the plant or roots

In some gardens, fertilizer use can be reduced by applying it around the individual plants rather than broadcasting across the entire garden. In the case of phosphorus, much of the fertilizer phosphorus becomes unavailable to the plants once spread on the soil. For better plant uptake, apply the fertilizer in a band near the plant. Do not apply directly to the plant or in contact with the roots.





On the Farm

Farmers routinely test their soils to determine the nutrient status. For both ecological and economic reasons, the farmer does not want to apply any more than is needed for healthy crop development. Based on soil test results from across their fields, farmers can vary the rate of application depending on soil conditions.

Precision application of fertilizer is becoming more common as global positioning technology develops. Global positioning uses satellite technology to help the farmer apply the proper amount of fertilizer based on the soil tests results when traveling across the field. The late spring test for soil nitrate allows many corn growers to reduce the amount of nitrogen they apply to their cornfields. Farmers sample their fields when the corn is about 6 inches tall, and apply only the amount of nitrogen needed for crop growth.

Farmers apply a variety of fertilizer materials. Manure is recognized as an excellent source of plant nutrients as well as a source of organic matter. Farmers with access to livestock manure often find that manure alone can meet the nutrient needs of their crops. Commercial sources of nitrogen are commonly applied by farmers with limited access to manure. One source of nitrogen that many farmers use is anhydrous ammonia. This gaseous form of nitrogen is “knifed” into the soil between the rows, placing the fertilizer where it can readily be used by the plant roots.

Green manure crops and crop rotations involving legumes also provide farmers with an additional source of plant nutrients.





NON-DISCRIMINATION STATEMENT


In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.


Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotope, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at [How to File a Program Discrimination Complaint](#) and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov.

USDA is an equal opportunity provider, employer, and lender.

USDA Natural Resources Conservation Service
CONTACT:

 254-742-9800

 texasNRCSinfo@usda.gov



www.tx.nrcs.usda.gov

June 2021