HAWAI'I-FRIENDLY BEST MANAGEMENT PRACTICES FOR FERTILIZER USE

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Sourced from: Green Industries BMPs

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INFORMATION IN THIS DOCUMENT

Defining Fertilizer

Fertilizer is any material of natural or synthetic origin that is applied to soils or plant tissues to supply one or more nutrients essential to the growth of plants.

Nutrient Content

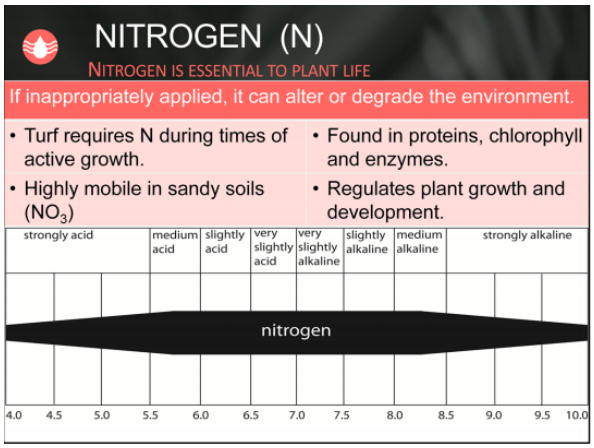
Nutrients are essential to plant life. However, excess nutrients can be more damaging than beneficial to plants, animals, humans, and the environment.

Phosphorus is a limiting nutrient in some Hawaiian soils that is necessary for plant life. A soil and/or tissue test for plant-available phosphorus should be done before applying a fertilizer containing phosphorus because it can degrade the environment if applied inappropriately. Phosphorus needs can increase if plants are stressed so soils tests should be done annually.

Nitrogen applied in excess can alter or degrade the environment, and may also result in nonpoint source pollution of water bodies by nitrate leaching or runoff. Nitrogen should be applied judiciously throughout the dry season and within the recommended amount per area. There are both organic and inorganic forms of nitrogen, which are used to produce slow and quick-release fertilizers, respectively.

Forms of Nitrogen

Nitrogen is available at various rates depending on its form, as well as depending on the environment it is in such as pH, seen in the following figure.



Organic forms of nitrogen
Organic fertilizers are another source of nitrogen that is slowly made available through microbial degradation. In this case, the release rates depend on nature of the product and the prior treatment that it has received as well as temperature and moisture. Organic fertilizers, including biosolids from wastewater treatment plants, generally have low N:P_2O_5 ratios.

Inorganic forms of nitrogen
Fertilizers that contains all of its N as Nitrate-N, Ammoniacal-N, and/or Water Soluble N are inorganic forms of nitrogen, and have a high potential for leaching.

Insoluble sources of nitrogen

- Urea-form Fertilizer Materials (sparingly soluble) are reaction products of urea and formaldehyde which contain at least thirty-five percent (35%) nitrogen, largely in insoluble but slowly available form.
- Urea-Formaldehyde Products (sparingly soluble) are reaction products of urea and formaldehyde which contain less than thirty-five percent (35%) nitrogen, largely in insoluble but slowly available form.
- Sulfur Coated Urea (SCU) is a coated slow release fertilizer consisting of urea particles coated with sulfur.
- Polymer Coated Urea (PCU) is a coated slow release fertilizer consisting of urea particles coated with a polymer (plastic) resin.
- Methylenediurea (MDU) is a water soluble condensation product.
- Triazone is a water soluble compound of formula, which contains at least forty percent (40%) total nitrogen.

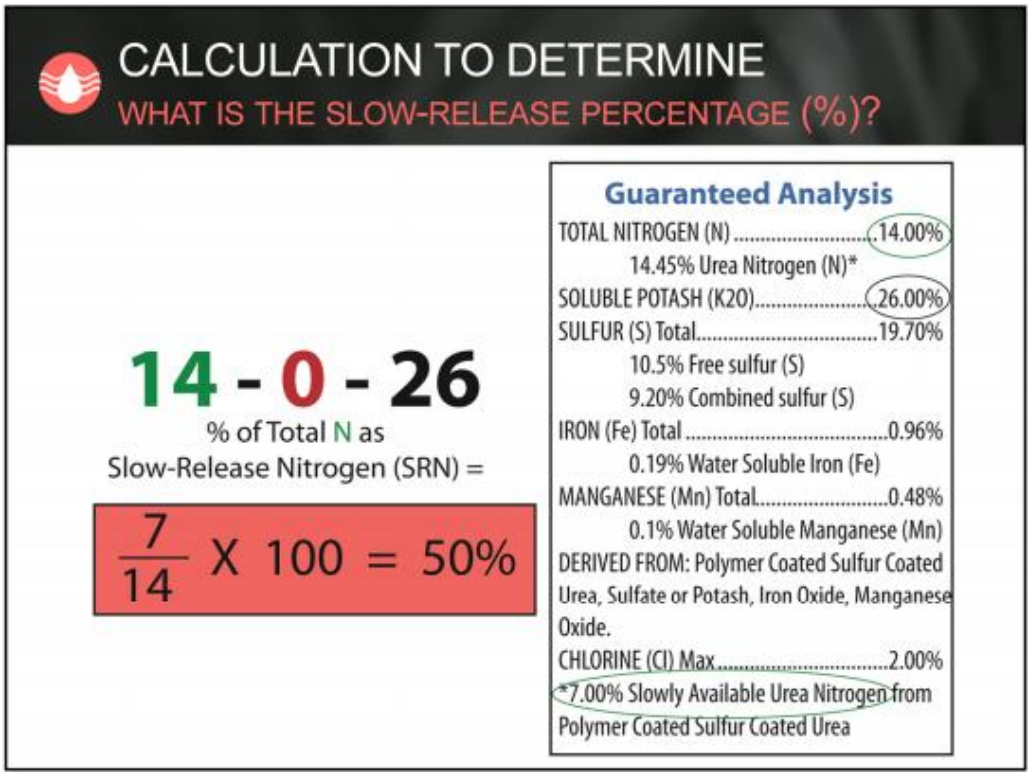
Soluble sources of nitrogen

- Urea (46% N), is a water-soluble, synthetic organic nitrogen fertilizer with quick N-release characteristics. Urea can be applied as either liquid or granules, and is subject to volatilization, or loss of nitrogen to the atmosphere.
- Ammonium Nitrate (AN) and Ammonium Sulfate (AS) are two other soluble, quick-release N sources commonly used by professional lawn-care services. These two materials are not as high in N as urea. AN (33.5% N) and AS (21% N), however, have a higher salt index and burn potential than urea on a per-pound-of-N basis. AS is also a very acidifying N source. For each pound of N applied as AS, 5.35 pounds of acidity are produced due to the ammonium-ion content. AS is often the preferred N source on high pH soils due to its acidifying properties. granules, and is subject to volatilization, or loss of nitrogen to the atmosphere.

Understanding Labels

The Fertilizer "grade" or "analysis" is the percent nitrogen, phosphorus, and potassium guaranteed by the manufacturer to be in the fertilizer, e.g. a 12-32-16 grade of NPK complex fertilizer indicates the presence of 12% nitrogen (N), 32% phosphorus (P_2O_5) and 16% potash (K_2O). The percent sign is not used, but instead the numbers are separated by dashes, and the order is always N, P_2O_5 and K_2O. The elemental symbols: N, P and K, respectively, are used for nitrogen, phosphorus, and potassium.

On the following label:
- Total Nitrogen is 14%
- Slowly available is 7% as a polymer-coated urea
- So, this fertilizer is 50% slow release Nitrogen

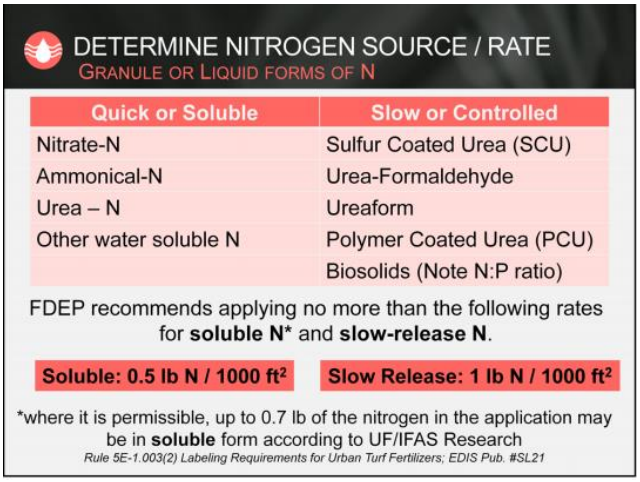


Types of Fertilizers

1. Quick-release fertilizers are referred to as water-soluble or readily available and they:
    a. Typically have about a 30-day response period.
    b. Are readily dissolvable in water and are often applied dissolved in water through a sprayer.
    c. May also be applied in a granular form.

2. Slow-release fertilizers are also called water-insoluble or controlled release and they:
    a. Release nitrogen at a rate more consistent with plants' needs
    b. Extend availability for a longer time
    c. Are a more efficient use of nitrogen
    d. Are usually more expensive than soluble fertilizers
    e. May be "organic" sources such as Milorganite

3. Many fertilizers now have a mixture of both slow- and quick-release sources of Nitrogen.
    a. Future regulations for HI may require the use of at least 50% slow release content.
    b. Several Florida counties and cities currently require at least 50% slow release content.



Slow or controlled-release fertilizer is defined as a fertilizer containing a plant nutrient in a form that delays its availability for plant uptake and use after application, or that extends its availability to the plant significantly longer than a reference quick or soluble such as ammonium nitrate, urea or other water soluble sources of nitrogen. Slow-release fertilizers use methods such as coatings or insoluble polymers to control the availability of Nitrogen.

It is important to note that a slow-release product needs to contain 15% or more slow-release net content. Using at least 30% slow-release product is recommended for Hawai'i and future fertilizer regulation could require at least 50% slow-release content for fertilizer use.

Application Rates

For nitrogen, application is limited to 0.5 pound of N per 1,000 square feet of quick-release product and one pound per 1,000 square feet of slow-release product.

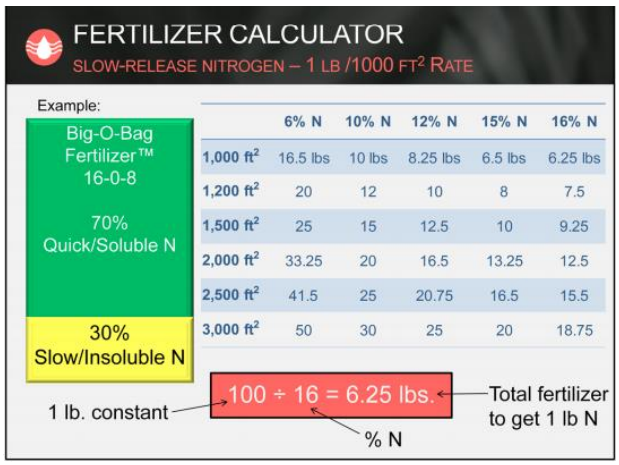
For phosphorus, application is limited to 0.25 pounds of P_2O5 per 1,000 square feet for any single application and no more than 0.50 pounds of P_2O5 per 1,000 square feet annually. This means that you may see "no-phosphate" or "low-phosphate" fertilizers. Fertilizers that have a high ratio of P to N should be used sparingly, only after soil tests have been performed and application rates have been calculated.

Best Management Practices

1. *Area calculation*
   This section contains the necessary calculations and practices to ensure appropriate rates and application regimes are followed. Knowing the exact square footage of the area where the fertilizer is being applied is essential in order to deliver the correct amount. This saves time, money and prevents adverse impacts on the environment.

   While, not all properties are perfectly square or rectangular, as close to an exact number of square footage should be obtained. Using the area calculation for a rectangle, determine the area of application by calculating length times width (in feet).

2. *Fertilizer calculation*
   Calculate the recommended application rate with the following table and equation.



	6% N	10% N	12% N	15% N	16% N
1,000 ft²	16.5 lbs	10 lbs	8.25 lbs	6.5 lbs	6.25 lbs
1,200 ft²	20	12	10	8	7.5
1,500 ft²	25	15	12.5	10	9.25
2,000 ft²	33.25	20	16.5	13.25	12.5
2,500 ft²	41.5	25	20.75	16.5	15.5
3,000 ft²	50	30	25	20	18.75

3. *Equipment calibration*
   Deliver the correct amount to an area. Make sure the spreader/application equipment is properly calibrated and set to deliver the correct amount of fertilizer. Inspect equipment to insure it is in safe, good condition and working correctly. Be sure to check the gate, agitator, pressure, flow, and deflector shield.