

Fertilizing Commercial Hop Fields in New York

by Steve Miller

Fertilizing hops is a very complicated subject and you will find that as years go on you will develop more detailed practices based on your farm's soils, climate, and varieties. Hops are heavy feeders. Every grower would love to have a cookbook on exactly what fertilizer to add at exactly the right time. Keep good records of what you do each year and you will develop what is right for your farm. Keep in mind that growers in the Pacific Northwest have been growing hops on the same farms for several generations and this experiential information is their greatest farm asset. It should be yours as well.

Success should start with a thorough evaluation of the site for drainage, air flow, and access to water for irrigation. Next obtain soil maps of the fields. These will have contours outlining the different soils by name. Definitions for these names, such as Cazenovia or Lima, are outlined describing characteristics that will help you determine the limits and potential for that field. Chapter 3 of the Cornell Integrated Hops production Guide has a more detailed discussion on soils and fertility.

A soil test is next on the list. In New York we suggest you send your soil samples to DairyOne/AgroOne. Go online to obtain a box and print out the "F" form for hops and fruit. Enter the soil name on the form. Your test results will come back with some recommendations based on if you marked the box for hops establishment or for maintenance of an already established field.

You should adjust the pH to 6.5 to 6.8 or so. Soil organic matter is very beneficial to most crops, hops included, so everything you can do to start with 3% or more will help hold moisture and provide nutrients and maintain good soil structure. Each percent of soil organic matter will contribute 20 pounds of nitrogen per acre as it decomposes.

Hops start growing very early in the Spring, put on height for the first 6-8 weeks and then really bulk up with leaves and cones for the next 6 weeks. A ready source of nitrogen (N) is a must to get them going. Organic sources are great but they do not provide much nitrogen until later in June. Mature hop plants will need 150-200 #s of actual N per Acre for the season. Newly planted baby hops require about 75#s of N per acre. Because we have relatively cool soils in the Spring we need to use a nitrogen source that the plants can take up readily.

This brings up the question of nitrogen sources from legumes. It is true that legumes fix nitrogen from the atmosphere and store it in the roots of the plant, i.e. peas, clover, etc. This nitrogen does not become available to the other plants until the legume is killed and starts to decompose. A well-established legume that is plowed under may release 50 pounds of nitrogen the first year into the soil, and some additional the second year. Consult with your local agronomist or web sources to see how much might be realized from different legume species.

Growers should plan to use a variety of fertilizer methods to keep hops healthy and growing. In the northeast growers are having success with putting down about half of the nitrogen requirement as granular, with the rest through the drip and possibly some with foliar feeding. Foliar feeding should not be taken lightly. It is easy to burn the plants. Water quality such as excessive minerals may impact not only foliar feeding but also pesticide efficacy. Growers may want to experiment with small plots before using this technique in the whole yard.

The following techniques and materials are often used by hop growers out west and some growers here have used them with great success. Smaller scale growers may find it difficult to find materials and apply them. Also, there are other sources of nitrogen and you may find some work best for you. Urea is a commonly used form of nitrogen fertilizer that has pluses and minuses. First of all, it is relatively inexpensive and readily

available. It is very soluble in water however and can volatilize into the atmosphere readily on a hot day. Therefore urea (46% N) should be applied right before a light rain or gently incorporated into the soil to prevent losses. Another option is to use a slow release form of urea such as ESN 46% (environmentally smart nitrogen). These are coated with a polymer that reacts to water and soil temperature to gradually release over about 80 days. Use about 100 pounds of this material per acre (46 pounds of actual N) banded or spread over the hop row in early May (timing depends on where you are in the state and when the soils warm up above 40 F). In addition, use about 50 pounds of MAP 11-52-0 (mono ammonium phosphate, the phosphate number may vary somewhat) and incorporate it into the soil. These may be applied together. Follow the soil test recommendations for the amount of potash needed and apply this too as a broadcast or band with the other materials. Sul-Po-Mag 0-0-22 may be a good option especially if your pH is too high.

Along with this, apply 100 pounds of a liquid CAN 17 (calcium ammonia nitrate) through the drip. This will get some readily available N to the roots and includes some calcium to help maintain the pH. It does not have to be applied on the same day as the other materials and can be done as weather permits. It is important to remember that by the time hop plants are 12 ft the apical bud has differentiated the cells to develop the rest of the plant. By the time the plant is at 16 ft the plant has developed all of their potential buds for side arms and hop flowers internally. This is why spring fertility practices are so critical for a successful yield. A plant that is too weak by late June is not going to produce as it should.

Fertigation through the drip should continue through the growing season until the cones reach about $\frac{1}{2}$ to $\frac{3}{4}$ their full size for that variety. Many growers use UAN 32 (also known as UN32) urea ammonia nitrate through the drip. In early June use about 30 gallons/A (mixed in with 3000 gals of water through an injector) each time you irrigate. By late June reduce this to 10 gals/A each time. Another material that may be used is CN9 which is a solution of calcium nitrate that has 9% nitrogen. In Yakima, hops are fertilized at a lesser concentration most every time they are irrigated, that is on a daily basis.



Fertigation practices on Roy Farms, Inc. in Moxee, Washington
Photo: Mike Roy

This is often more difficult to do here because we do receive much greater rainfall. Excessive rain can also have an impact on how much nitrogen is available to the plants with the more soluble sources being prone to leaching beyond the root zone.

Hops also require Sulphur, Zinc, and Boron, Mg, Ca. as well as other micro nutrients. These nutrients should be applied when soil test results indicate they are in short supply. New York soils are often low in sulfur especially as sulfur emissions have been greatly reduced from power plants in the mid-west. If the soil test indicates it, you may want to add some granular sulfur each spring. If Boron is low then use about a pound of Boron per acre in your granular fertilizer mix as well. Boron is toxic to plants so do not over do this! Many growers out west use foliar sprays of zinc, starting when the plants are $\frac{1}{2}$ to $\frac{3}{4}$ of the way to the wire. These should be stopped before bloom. Consult the manufacturer's label for rates.

What about other soil health amendments. Some growers are experimenting with various materials like worm castings, spent mushroom soils and others that aide the plant in taking up nutrients. There are many organic based materials that can have a positive effect on nutrient uptake and my suggestion is to speak with growers who have used them and see what kind of results they have had.