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# Site and soil requirements for small fruit crops

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Site selection is a major consideration for berry production. Since berry crops are very perishable and often sold directly to consumers, location can have a major impact on marketing possibilities. For example, Pick-Your-Own (PYO) marketing is common in many areas in the Northeast and Midwest. However, if a site is located away from a major highway or population center, then PYO marketing may not be successful. Even if one has access to a good location for PYO, not all of the land can be planted to berries. A portion of the site must be utilized for parking and crop rotation. Even if one intends to sell the berries through retail outlets, production fields should be close to the outlets or warehouse facilities to minimize the time that strawberries will be in transit. The selection of a site and marketing strategy must be considered together. The Northeast Regional Agricultural Engineering Service publishes a series of production guides for strawberries (NRAES-88), blueberries (NRAES-55) and brambles (NRAES-35) that contain detailed information on marketing and site location.

**Location**

Berry crops require a chilling period for breaking of dormancy, but the requirement differs depending on the species and cultivar: strawberries (200-300 hrs), blueberries (650-850), blackberries (700), raspberries (800-1700), currants and gooseberries (800-1500), and cranberries (2000). In the Northeast, all berry crops receive a sufficient number of chilling hours when grown outdoors.

The climate in the Northeast imposes constraints on the production of most berry crops because of winter low temperatures. Although strawberries can be grown throughout the state if winter mulches are applied, highbush blueberries and fall raspberries are only successful south of a line extending from Muskegon, MI to the southern end of Lake Champlain to Portland, ME. The season is not sufficiently long north of this line to consistently ripen fall raspberries, and temperatures below –20F (common in northern New York) will kill blueberry shoot and flower buds. With the proper selection of varieties, summer raspberries can be grown in all but the coldest locations (e.g. Adirondacks) as some hardy varieties tolerate temperatures as low as – 25F. Blackberries are usually successful only in the warmest sites (e.g. lakeshores, Long Island) because they are injured at temperatures less than –5 F.

Fluctuating early spring temperatures cause more damage to berry crops than mid-winter low temperatures. Strawberries are particularly susceptible to spring frosts. For these reasons, sites with good air drainage or sites located near large bodies of water are best for berries.

Steep slopes (>5%) should be avoided because they are erodable, and difficult to cultivate and irrigate uniformly. Moderate slopes (3-5%) allow air to drain which reduces the risk of frost injury. South-facing slopes tend to increase the risk of frost injury in spring because plants generally bloom earlier, and west-facing slopes are at the greatest risk for winter injury because they are exposed to persistent desiccating winds in winter.

All berry crops have shallow root systems, so it is essential to select a site with available water for irrigation. Most strawberry growers use trickle irrigation for routine watering and overhead irrigation for frost protection. Detailed information on irrigating berry crops can be found in the NRAES production guides.

**Site history**

Do not grow strawberries for 5 or more consecutive years on the same site without some type of crop rotation. The longer that strawberries are grown on a site, the greater the risk of black root rot disease. Plan to reserve at least 30% of the available land (preferably 50 - 70%) for rotation in future years because 3 years (minimum) should elapse between plantings on the same site. The same rule applies for blueberries and raspberries. Land not in berries should be planted to soil-improving cover crops or to cash crops in which weeds can be managed easily.

Pay careful attention to herbicide use the year prior to planting berries. Herbicide carryover can impede the establishment of berry plants and can make berries more susceptible to root diseases.

Avoid planting raspberries, especially black raspberries, where solanaceous crops were previously planted within the last 3 years. These can harbor verticillium wilt disease. All sites should be tested for nematodes prior to planting raspberries or strawberries. Some type of fumigation or cover cropping may be required if levels of root lesion or dagger nematodes are high.

**Soil properties**

Berry crops cannot tolerate standing water during the growing season or the diseases associated with wet soil conditions. Internal soil drainage, therefore, is a critical component of a good site. If a site is too wet for berry production, then subsoil drainage can be installed to dissipate excess water. Berries often can be grown successfully on wetter sites if they are planted on raised beds.

Strawberries, raspberries, gooseberries, currants and elderberries can tolerate a wide range of soil types, provided that nutrients are available. However, blueberries and cranberries have more exacting soil requirements. These crops grow poorly if the clay and/or silt content is greater than 20%. Planting, cultivating and harvesting is particularly difficult for strawberries if the soil is stony.

For most berry crops, the ideal soil is a well-drained, sandy loam with a pH of 6.2 - 6.8 and a moderate to high organic matter content (>3%). In general, sites that produce good alfalfa crops tend to be good for strawberries and raspberries. For blueberries, the ideal pH is between 4.2 and 4.8 and the ideal soil is a loamy sand with high organic matter (>4%). Blueberries can be grown on muck soils as well. Fertile sites are best for most berries, although blueberries and cranberries thrive in poorer

soils with a low cation exchange capacity (<18). Too much calcium (>20% saturation of the CEC) is detrimental to blueberry plant growth. Blueberries have a low requirement for phosphorus, and can obtain adequate amounts when soil levels are low – especially when conditions are favorable for growth of endomycorrhizal fungi. The presence of wild blueberries in the area is an indication that the soil will support cultivated blueberries.

**Site Preparation**

*Weeds.* A major step in site preparation is the elimination of perennial weeds. This is particularly important because few herbicides are labeled for use in berries, and their activity on perennial weeds is limited. Weeds cause a greater economic loss in berry crops than diseases and insects combined. In addition, weeds also encourage the establishment of other pest populations. Eliminating weeds the year before planting is much easier than controlling them later. Too many growers plant directly into a site in which perennial weeds were not eliminated the previous summer, and then spend the next several years trying to find the right combination of herbicides to undo the damage. Starting site preparation 2 or 3 years in advance will be rewarded in future years.

Rotation, coupled with the use of a broad-spectrum post-emergent herbicide the summer before planting, is an effective approach. Repeated cultivation or covering a site with black plastic for several months are also effective. Ideally, begin site preparation 2 or 3 years before the crop is planted to eliminate perennial weeds, especially if organic methods are to be used.

Fumigation at high rates will suppress weeds, although its use worldwide will likely be restricted because of environmental concerns, availability and expense. In some situations, nematodes, soil diseases, soil insects or intense weed pressure may justify fumigation. The soil should be friable, warm (>50F) and without decomposing plant material for fumigation to work properly. The best time to fumigate is late summer or early fall of the year prior to planting

*Nutrient amendments.* Test the soil for pH, potassium, phosphorus, magnesium, calcium and boron. Sample soil in a V-shape pattern within the field, collecting from at least 10 locations. The sample should represent the profile of the top 10 - 12 inches. Plow the site, add the recommended amount of nutrients, then disc. Because soil testing procedures are not standardized across the region, follow the recommendations from the laboratory where the samples were analyzed. Do not use the test results from one laboratory and the sufficiency ranges from another.

Our recommended strategy is to apply sufficient potassium, phosphorus, magnesium and calcium prior to planting to sustain the planting for its productive life, and supplement with other nutrients as required. It is difficult to make these nutrients available to plants when they are applied after planting.

It takes one year for lime to raise, and for sulfur to lower the soil pH, so it is necessary to apply these one year in advance of planting. Sulfur is effective at lowering soil pH, but time is required for bacteria to oxidize the sulfur into a usable form. Sulfur comes as a wettable powder or prills, with the former reacting faster top lower the soil pH. Aluminum sulfate is sometimes recommended for acidification

because it provides an already oxidized form of sulfur, but it is expensive and six times as much is required to do the same job as sulfur. Also, aluminum toxicity can occur with large amounts of aluminum sulfate, so we do not recommend it.

Certain nutrients, like phosphorus, are very insoluble in water and move very slowly through the soil. It may take years for phosphorus applied to the soil surface to reach the root zone of the plant and be taken up. For this reason it is imperative to apply a sufficient amount prior to planting and mix it into the root zone.

Animal manures and legumes offer a good source of slow-release nitrogen when incorporated prior to planting. Animal manures also contain significant amounts of potassium, phosphorus and calcium, but little magnesium and are a potential source of weed seeds. Manure applied to fields should be well-composted and worked into the soil prior to planting to minimize any risk of fruit contamination from pathogenic bacteria and to reduce weed seed germination. Supplemental magnesium may be required if manures are used to provide nutrients.

*Irrigation.* Transplants will require immediate watering to settle soil around roots and prevent dessication. Any preemergent herbicide applied after transplanting will likely need to be watered in by rain or irrigation to be effective. For these reasons, the irrigation system should be operational prior to planting. Also, in early spring, the irrigation system may be a necessary tool for frost protection.

*Preplant cover crops.* Seeding a cover crop on the site the year before planting is an excellent way to improve soil structure, suppress weeds, and if the proper cover crop is grown, suppress nematode populations. Benefits of a cover crop are greatest when the soil is sandy and/or the soil organic matter content is low. Most cover crops grow under the same soil conditions as strawberries. Except for additional nitrogen (40 lb/A prior to seeding) and perhaps phosphorus, other amendments are not likely to be required.

Minimum seeding rates are used when the objective is to supply an acceptable stand for harvesting the grain or straw. But when a vigorous, dense stand is desired for weed suppression and organic matter, higher seeding rates are recommended.

Preplant cover crops are usually plowed under in the late fall or early spring prior to planting. Those with low nitrogen contents (grains and grasses) should be plowed under early in the fall to allow adequate time for decomposition, unless the soil and site are prone to erosion. Legumes contain more nitrogen and decompose quickly, so they can be turned under within a month of planting. The NRAES production guides contain detailed descriptions of cover crops suitable for berry producers.