

## **Matted Row Strawberries: The Basics**

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The matted row system for strawberry production has been both successful and profitable in cold growing regions for many years. Despite some recent adoption of other production systems adapted from warmer climates, the matted row system has remained widely planted in northern regions because of its proven advantages. These include relatively low initial investment costs, adaptation to cold climates, and the ability to maintain the planting for several years. The matted row system works well because it exploits the natural growing habit of the strawberry plant, optimizing both its vegetative characteristics and its fruiting potential to produce a profitable crop with a relatively low level of inputs.

Yields from matted row strawberries vary widely, ranging from 3000 pounds per acre to nearly 20,000 pounds per acre. The differences in production tend to be the result of management. Following good management practices, especially in regards to variety selection, plant stands, nutrient management, water management and pest management will maximize crop yield and prolong the profitable life of the planting.

### **Selecting A Planting Site**

Selecting an appropriate planting site is the first critical decision that must be made. Planting strawberries in a poor or marginal site will result in poor plant stand, poor plant vigor and poor yields. While strawberries can tolerate a variety of soil types, they grow best in a deep sandy loam, rich in organic matter. The soil must be well drained. Avoid areas that remain wet late into the spring. Strawberries produce best if they receive full sunlight and are planted on a gradual slope. This helps to prevent frost injury by allowing cold air to drain away from the plants. Do not plant strawberries in an area where tomatoes, potatoes, peppers, or eggplant have been grown in the past four years. These crops carry a root rot (*Verticillium*) which also attacks strawberries. Do not plant strawberries into recently plowed grass or sod areas. This can lead to devastating weed problems and damage by white grubs, a common turf pest, which will feed upon strawberry roots. Finally, choose a site where there is ready access to a water supply. Irrigation is important for good plant establishment, to maintain growth during dry periods, and is also used to prevent frost injury to strawberry flowers in the spring.

### **Preparing the Soil**

Getting ready for strawberry planting may take two years, depending upon the condition of the site. Have the soil tested for pH and fertility. Strawberries prefer a soil pH of 5.8 to 6.2; this may require applications of ground limestone. Soil testing information is available at your Cooperative Extension office. If the organic matter level of the soil is low (less than 2%) and/or perennial weeds are a problem, a cover crop such as buckwheat, Sudan grass or oats can be sown and later plowed into the soil before it goes to seed. Applications of compost or barnyard manure and regular tilling for a full season can be used as an alternative to cover crops.

Fertilizer can be applied and worked into the soil prior to planting, or banded into the soil after planting. Rates should be determined through soil tests taken the previous fall. In general, a rate of approximately 30 lbs. of nitrogen, 60 lbs. of phosphorus (P<sub>2</sub>O<sub>5</sub>) and 60 lbs. of potassium (K<sub>2</sub>O) should be incorporated into the soil prior to planting (e.g. 300 pounds/acre of 10-20-20 or its equivalent). An additional 30 pounds of nitrogen per acre (e.g. 65 lbs. urea) should be applied over the plants in July to promote runner development. Another, lighter application of nitrogen may be applied in August to aid in flower bud development (e.g. 40 lbs. urea). Do not apply heavy applications of nitrogen in the fall. This will increase the likelihood of winter injury to the plants.

### **Planting and First Season Care**

Plant strawberries in the spring as soon as the soil can be prepared. Purchase only certified disease-free plants from a reputable nursery. Plants should have large crowns and lots of healthy, light-colored roots.

Strawberries should be planted deep enough to bring the soil half way up the compressed stem or crown. Pack the soil firmly around the plants, and irrigate immediately after planting. Mechanical transplanters are available that work very well and greatly speed up planting.

The strawberry crowns should be initially planted 18 inches apart within rows, with 48 to 52 inches between rows. This will require about 7300 crowns per acre. These plants will produce runners during the summer that will root and fill out the rows. The width of the rows should be limited to 24 inches to maintain easy access in the planting. Runner plants that grow outside the 24-inch row width should be pinned back into the row or removed if the plants become too crowded (less than 6 inches between plants). Varieties known to produce few runners can be initially spaced closer together (12 to 16 inches) within the row to compensate. This will require that a higher number of plants be ordered and therefore will increase planting costs.

Matted rows may be established on raised beds. This improves drainage and air circulation, reducing disease problems, and it makes harvesting the fruit easier. Raised beds should be six to ten inches high, and one to two feet across. The disadvantages of raised beds include added labor and equipment costs, and an increased potential for drought and winter injury to the plants.

All flower blossoms that emerge during the planting year should be pinched off. This encourages runner growth and plant vigor and leads to better yields next year. Because of the initial wide spacing of the crowns the planting year crop would be very small, difficult to harvest and thus of little value.

The new planting should be irrigated after planting and regularly thereafter to insure optimum growth. One to two inches of water per week is ideal. Increasingly, growers are using trickle irrigation in matted row strawberry plantings. One or two lines of trickle tube is either buried 3-4 inches under the bed prior to planting or laid on top of the bed just after planting. Trickle irrigation is a more efficient method of getting water to the plants and, unlike overhead irrigation, doesn't soak the foliage, which can encourage disease problems. Trickle lines can also be used to deliver soluble fertilizers to the plants. However, trickle irrigation will not provide

frost protection as overhead irrigation can, and care must be taken to avoid damaging the trickle lines during the renovation process.

### **Mulching**

Mulch should be applied over strawberries in the late fall to protect the plants from extreme winter cold and from damage to the roots caused by rapid freezing and thawing of the soil. Straw is the most commonly used mulch, but any loose material that will provide cover without matting can be used, such as sawdust or wood shavings. Do not use hay, because it contains weed seeds, which will start to grow among the strawberries next spring.

Strawberry plants provide a good indication of when mulch should be applied. After a few hard frosts the leaves turn reddish and collapse down around the crowns. This is a sign that the plants are dormant (usually late November). Mulch should be applied anytime after that, but before the ground freezes. Two to five tons of straw per acre is recommended (approximately one ton of straw provides one inch of coverage per acre). Use the higher rates if your fields are exposed and do not get consistent snow cover. The mulch layer should be approximately 6 inches deep over the plants. Be discriminating about your source of straw. Straw from weedy fields will result in weed infestations in your strawberries.

In the early spring (late March-early April) the mulch should be pulled off the plants and placed into the aisles between rows. This creates a clean walkway and keeps the fruit dry and clean.

A light application of fertilizer may be applied after mulch removal to stimulate spring growth. Only 10 to 15 lbs of actual nitrogen is recommended to prevent excessive vegetative growth at this time, which can lead to fruit rot problems (e.g. 85 lbs./acre of calcium nitrate). Light applications (1 to 2 lbs./acre) of boron are also often applied in the spring to help fruit development.

### **Frost Protection**

If a frost is predicted after the mulch has been removed irrigation should be set up to protect the flower buds. Set up sprinklers to provide complete coverage of the planting, and turn the water on when the temperature drops to 33° F. Continue to run the water until all the ice formed on the plants has completely melted. Frost nozzles are available for sprinklers that will provide protection using less water than regular nozzles, saving energy and preventing flooding.

Fabric, "floating" row covers may also be placed over the plants to provide some winter and frost protection. These lightweight fabrics create a greenhouse effect that will make the plants bloom and fruit earlier in the spring and produce larger yields. Rowcovers should be placed over the plants in the early fall. The plants and rowcovers may be covered with straw in late fall for additional winter protection. Remove the straw in early spring, or as soon as the snow melts. Leave the rowcovers on until the plants begin to bloom. This may occur 2 to 3 weeks earlier than plants without rowcovers, so you must be prepared to protect the flower buds from frost. Although the rowcovers will provide some frost protection, it is best to use irrigation over the rowcovers if the temperature drops below 30°F. Row covers may also be applied only in the early spring and removed when flowers first appear. This avoids the problems of trying to maintain the rowcovers over the winter, but the increased yield effects tend to be reduced.

## **Renewing the Planting**

Strawberry beds can usually be carried over for three to five years. Annual bed renovation is a critical part of successful strawberry production with the matted row system. Renovation is primarily a plant thinning process carried out after harvest to stimulate healthy new vegetative growth. This in turn will promote a good crop for the following year. A strawberry bed that has had a productive season and that has vigorous plants, which are free from serious insect, disease, and weed problems should be carried over for another year. The renovation process will insure that such beds will have another good crop. All beds to be carried over should undergo the following steps beginning soon after harvest is complete.

1. Broadleaf Weed Control: If perennial broadleaf weeds (dandelion, daisy, etc.), and/or a high population of emerged annual broadleaf weeds (lambquarter, pigweed) are present 2,4-D amine (Amine 4®) can be applied for control. 2,4-D is a post-emergent herbicide, which is effective on broadleaf perennial weeds. It will not control grasses, nor does it offer any pre-emergent control. If 2,4-D is not applied all broadleaf perennial weeds should be removed by hand.

2. Mowing: If 2,4-D was applied to the planting, wait four to five days following the application then mow off the leaves of the strawberries about 1 1/2 inches above the crowns. This allows time for the material to be taken in by the weeds. The leaves can be mowed immediately after harvest if 2,4-D is not applied. Mowing stimulates new leaf growth and may provide control of leaf diseases. Removal of the leaf canopy also improves the distribution of fertilizers and herbicides. However, if the planting is stressed from drought or appears weak and will be carried over to next year in spite of this, than mowing can be eliminated from the renovation process. Mowing weak plants may inhibit recovery.

3. Fertilization: Apply fertilizer according to soil test recommendations. Soil testing kits and information are available from your county Cooperative Extension office. Typically about 40 pounds of actual nitrogen per acre is applied at this time (e.g. 87 lbs. of urea), with another 20 pounds of actual nitrogen applied four to six weeks later. Balanced fertilizers, such as 10-10-10, containing phosphorus and potassium may be used if soil tests indicate a need for these nutrients. Avoid over-fertilization with nitrogen. The resulting excessive growth on plants can lead to problems with winter injury, spider mite infestations and fruit rots, in addition to potential water contamination problems from soil leaching. Tissue nutrient analysis of leaves after renovation can offer more precise guidance to appropriate fertilizer rates for each field. Contact your state Extension specialist for information on tissue analysis. A very light application of nitrogen is often applied the following spring after removal of the mulch. Ten to 15 pounds of actual nitrogen at this time can help to stimulate early plant growth. Heavier applications should be avoided because this could cause excessive vegetative growth and increase the likelihood of fruit rot. Light applications of boron (1 to 2 lbs. per acre) and calcium may also provide some benefit to fruit development in the spring.

4. Plant Thinning: Strawberry rows should not be allowed to get more than 24 inches wide. Till the sides of the rows to narrow the beds back to a width of ten to twelve inches. Set the tiller so it incorporates the mowed leaves and fertilizer, and spreads about one inch of soil over the remaining crowns. During the summer, new daughter plants should be allowed to root to fill out the row to the desired 24-inch width.

5. Pre-emergent Weed Control: To control annual weeds, terbacil (Sinbar 80WP) may be applied according to label directions. Terbacil is an effective pre-emergent herbicide with some post-emergent activity. It should be applied after mowing and tilling the beds, but before new growth begins. No more than 6 oz. of Sinbar may be applied in a single application, and no more than 8 oz. may be applied in one season. Sinbar can cause injury to strawberry plants. It is important to determine appropriate rates for each location. Certain strawberry varieties are especially sensitive to Sinbar, including Kent and Annapolis. Be sure to read and follow all precautions on the label.

6. Irrigation: Encourage optimal plant growth and get the most out of your fertilizers and herbicides by regular irrigation. Strawberries will grow best if they receive 1 1/2 inches of water per week during the growing season.

Do not delay the renovation process. Late renovation will delay the rooting of new runners needed to reestablish the bed. This will result in smaller plants and lower yields next year. Be vigilant! Be on the lookout for weeds, insects, spider mites and diseases throughout the year. Cultivation and/or sprays are likely to be necessary as the summer wears on.

Beds that will not be renovated and carried over should be plowed down and seeded to a suitable cover crop to reduce weed, insect and disease problems that have developed and to increase soil organic matter content. Ideally, beds that are plowed down should be rotated out of strawberries for at least three years. If properly managed, crop rotation will greatly reduce pest problems and improve the vigor and longevity of strawberry beds.

Growers who want to produce strawberries organically often forego the renovation process and simply plow the bed down after the first fruiting year, and have another bed planted that spring to harvest the following year. This is to prevent the build up of weeds in a field that will usually occur without the use of herbicides. While planting beds every year and not carrying over them beyond one harvest may cost the grower a bit more, the profit margin of a well-run organic strawberry bed can still be good.

### **Pest Management**

Numerous pests can potentially cause problems to strawberry plantings. Consult local University Extension recommendations for the best management techniques for problems in your area. It is important to note that weed infestations are the most common cause of poor production in matted row strawberry plantings. This is due to the fact that the plantings are in place for several years, allowing weed populations to build up, and the relatively small selection of chemical weed control options available.

Good pre-plant weed control is essential for the successful establishment of a profitable strawberry planting. Strawberry growers should develop a planting rotation, which includes the use of cover crops and/or alternate cash crops for which herbicides different from those used on strawberries can be utilized. Crop rotations should allow fields to have at least three years between strawberry plantings. This will prevent the build up of weed species that defy strawberry weed management programs and will also help to renew the soil, so that the next planting of strawberries will be as good as or better than the last.

There are several types of cultivators that will provide good control of weeds between the rows of strawberries. Multi-head rotary tillers; spring-tooth harrows; and basket, finger and rolling cultivators can all be very effective, depending on the soil type, weed species and frequency of use. Weeds emerging within the strawberry rows will not be controlled. However, in combination with good pre-plant weed control and some hand-pulling of weeds within strawberry rows, cultivation can form the basis of an effective weed management program.

For more detailed information on strawberry production, see the *Strawberry Production Guide for the Northeast, Midwest and Eastern Canada*, published by the Natural Resource, Agriculture and Engineering Service (NRAES-88), and available through your University Cooperative Extension.

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