

# STRAWBERRIES



*Presented by*



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This production summary provides an overview of strawberry growing, harvesting, and post harvesting practices. There are some common practices that many large commercial growers use when producing strawberries, and though there are variations in these practices, having an understanding of the most common methods used will be helpful when carrying out regulatory activities.

## By the end of this summary, you will be able to:

1. List the top strawberry producing regions in the U.S.
2. Identify the most common farming practices used in the production of strawberries.

### INTRODUCTION

Strawberries are a high value crop in the United States. The U.S. is, in fact, the world's largest producer of strawberries, accounting for nearly one-third of the world's total production. Different berry plant cultivars, or cultivated varieties, have been developed for different regions and climates throughout the country. The different characteristics between the varieties may include fruit ripening time frame, plant disease resistance, cold tolerance, and specific berry traits such as size, shape, firmness, and flavor.

Within the U.S., strawberries are grown in many states, but the top three producing states are California, Florida, and Oregon (Fig 1). Of these three, California produces the most fresh and frozen strawberries, accounting for nearly 90% of the strawberries grown in the U.S. Operations in California and Florida are normally large, commercial farms, where it is often economically advantageous to manage strawberries as an annual crop. Farms in Oregon tend to be smaller, and distribute to local markets or sell via road side fruit stands.



Fig 1 - Top Strawberry Producing States in the US



Other states like Washington, Pennsylvania, Michigan, New York, Wisconsin, and Ohio produce a small fraction of the U.S. strawberry crop. Operations in these states are normally small, local farms. It can be more cost effective for these small farms to harvest from their strawberry plants for several seasons before replanting. Strawberry plants are typically first grown in a nursery and then transplanted into the fields. The plants continually produce new fruit throughout the growing season, so plantings are often staggered in different climate regions to ensure a steady stream of fruit.

For example, in northern California, plants are replaced each fall at the end of the summer growing season. The new transplants lay dormant through the winter and produce fruit in the early spring. While in the southern growing regions of the state, plantings are made July through September so that the fruit is ready to harvest in the fall and winter. During the winter months when California's production is at its lowest, Florida production and imports from Mexico make up for the shortfall of strawberries produced in California.

## GROWING

Strawberries grow well in a variety of sandy or loam soils. These soils provide good drainage and warm up more readily during the day, which is especially important during cooler parts of the growing season. When strawberry fields are being prepared for planting, the soil is fumigated using an approved broad spectrum pesticide to kill soil organisms that can harm the growing plants or lead to decay of the fruit.



Raised beds are then created and covered with plastic liners which limit plant and berry contact with soil. Protecting the plants and berries from contact with the soil and standing water helps to prevent decay, pest damage, and contamination. The liners also trap heat from the sun, allowing for extension of the growing season, and they limit weed growth. There are various colors of opaque liners that are used in different regions and provide different degrees of heat absorption.

Water sources used to irrigate strawberry fields run the gamut from underground wells to surface water. The source type depends on the growing region and resources available to the farmer. Irrigation water is most often delivered to the strawberry plants via drip irrigation systems. These systems use rubber or plastic tubing buried in the raised beds to deliver water to the roots where it is needed. Drip irrigation also protects the fruit from contact with irrigation water, which could transmit plant and human pathogens or cause mildew and premature softening.

Commercial growers almost exclusively use chemical fertilizers. Use of compost is rare. Fertilizers can be added by injection into the soil, through the irrigation system by injecting into the water (also known as chemigation), or added as a side dressing in the furrow which is then distributed when it rains.

Pest, wildlife, and rodent control on strawberry farms is part of a good food safety program. Controlling these pests helps protect the quality and safety of the berries. This is common on many produce farms, not just strawberry farms. During the growing season in some regions, temperatures can drop below freezing. When this happens, it is sometimes necessary to apply water to the growing strawberry plants to protect them from frost.

Overhead irrigation is typically employed for frost protection. Water is sprayed onto the plants because when the water droplets freeze, energy is released in the form of heat. The release of heat energy by the freezing water protects the strawberry plants from the frost. When water is used for frost protection, it comes into direct contact with the edible berries. Some strawberry growing operations choose to treat the water they use for frost protection before applying it to the plants in an effort to guard against contamination of the berries.

## HARVESTING

During peak season, on average, plants are harvested every three days. Strawberries are always hand-picked and then may be packed into plastic clam shell containers. The plastic clam shell containers are then packed into larger flats. It is important to note that strawberries are not washed before being packed into plastic containers. Washing can lead to mold growth or premature softening of the berries.

When flats are filled, they are taken to a quality control supervisor who visually checks and verifies that containers are properly filled in accordance with company standards. Workers are often paid based on the number of flats that they fill each day, so harvesters usually have a system to keep track of how many flats each picker fills. Buckets are carried on field carts to collect undersized or inferior grade berries. These will go on for further processing and be either frozen or juiced.



## PACKING

Harvested strawberries are transported within an hour or two of picking to be stored. This is where field heat is removed. Cooling delays fruit decay and prolongs shelf life. Strawberries are typically cooled by forced air at 34°F. Forced air cooling is accomplished by placing a row of pallets in front of an intake fan inside a refrigerated room. A large tarp is placed over the pallets and a fan draws the refrigerated air through openings in the cardboard boxes and plastic clam shells. Within hours, cooled strawberries are distributed to their final markets in the U.S. or exported to other countries. Strawberries picked in California one day can often be on retail shelves all across the country the very next day.



## CONCLUSION

**Having a basic understanding of the way strawberries are grown, harvested, packed, and cooled will provide the basic background information that will be helpful to regulators when completing inspections or investigations in the field.**

The agricultural practices described in this production summary are common on most large commercial farms like those found in major strawberry producing regions in the United States. There are undoubtedly variations in these practices depending on the region, operation size, and individual grower preferences. This is especially true of farms outside of the U.S.

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