Basic Cultural Practices for Flue-Cured Tobacco

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Introduction and Terminology

Tobacco is grown primarily for use in cigarettes, cigars, pipe or smoking tobacco, chewing tobacco, and snuff. Extracts from tobacco have been used in insecticides, but today this use is negligible in the United States. Extraction of proteins, pharmaceuticals, and other food or industrial chemical compounds may someday prove to be commercially feasible. These potential uses of tobacco would likely require different cultural practices than those discussed below.

There are several kinds of tobacco; the climate, soil, cultural practices, variety, curing procedures, and intended use are factors in determining the classification. Flue-cured, the primary tobacco grown in Florida, is used in cigarettes. The name "flue-cured" was derived from the original method of curing whereby heat was distributed throughout the curing barn by metal pipes or "flues." Flue-cured tobacco is also grown in mostly Alabama, Georgia, South Carolina, North Carolina and Virginia. Other tobacco used in cigarettes includes burley, an air-cured tobacco grown in Kentucky, Tennessee, and other states; Maryland, an air-cured tobacco grown in Maryland; and Oriental or Turkish tobacco that is imported from the Mediterranean area. Other tobaccos are used in cigars, pipe tobacco, chewing tobacco, and snuff.

The following information is intended to familiarize readers that have little or no experience with a general understanding of how flue-cured tobacco is produced in Florida. More detailed information for producers is provided in other publications.

Tobacco seed are very small (over 300,000 per ounce); therefore plantbeds or greenhouses, where germinating seed and small plants can be provided protection from drying or cold, are needed. Transplantable seedlings are produced in 50-90 days depending on temperature and moisture conditions. Since the seed are not covered, but remain on the surface of the soil, moisture maintenance is critical. Most greenhouse production involves the use of styrofoam trays that float on water. Transplanting normally begins in March in Florida. Each plant produces 20 or more leaves over the next 60-90 days. As the flower head begins to form, it is removed by hand or by machine so that the upper leaves will be larger and thicker than if the flower is not removed.

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This removal of the flower head is called topping and results in a loss of apical dominance. As a result, axillary buds or suckers could develop at each leaf axil. The potential suckers are prevented or killed by use of chemical growth regulators or removed by hand.

Harvesting may be mechanical or by hand and begins in flue-cured tobacco at approximately the same time as topping. Leaves are removed, starting with the lower leaves and periodically progressing up the stalk. This harvesting by stalk position, also called cropping or priming, is accomplished over a 6-to-10 week period. Leaves are usually kept separate by stalk position because leaf chemical characteristics vary by stalk position, which must be considered when blending different tobaccos together for cigarette manufacture.

After harvesting, the leaves are immediately placed in racks or boxes that are metal frames that hold the leaves in place during curing. The racks or boxes of tobacco are placed in the curing barns where heat is applied to first cause the leaves to develop an orange or yellow color and then to remove the moisture from the leaves. After curing, the tobacco is removed from the curing barn and stored until marketing. Most tobacco is sold by a contract system. After it is sold, the buyer will process and store the tobacco until it is used in a manufactured product.

**Variety Selection**

Available varieties have varying combinations of resistance to diseases, nematodes, and insects, as well as agronomic features. Selection of a variety is based on the individual needs of the farmer. A grower may wish to select two or more varieties to accommodate the needs of the entire farming operation.

**Plant Production**

Plants may be produced in plant beds or in greenhouses. Most Florida farmers use plant beds and begin preparation in November or December by removing or burying existing crop or weed residue with tillage equipment. Methyl bromide, in mixtures with other materials, is used to fumigate the soil and kill disease organisms, nematodes, and weed seed. After fumigation, pelleted tobacco seed may be planted in rows or raw seed broadcast uniformly over the soil surface. The soil surface is firmed to ensure good seed-to-soil contact. Some fertilizer is added prior to seeding, but more is often topdressed after the plants begin growing. Pesticides are applied as needed. The tobacco beds are covered with plastic film.

In greenhouse production, pelleted seed are placed on potting media in styrofoam trays. The trays are segmented, which allows the root system of an individual plant to remain separate from that of other plants. The trays float on a pool of water and nutrients and pesticides are used as needed.

Clipping, which is accomplished by using a mower to remove the upper part of the foliage, is practiced in both plantbeds and greenhouses. Clipping, especially repeated clipping, allows the smaller plant to catch up with the larger plant and assures that all plants will be approximately the same size at transplanting. These practices greatly increase the efficiency of plant pulling.

**Soil Selection and Crop Rotation**

Tobacco is usually grown on well-drained soils because excess moisture in poorly-drained soils can result in crop damage or loss. In some instances, the use of drainage ditches and transplanting on raised beds can prevent crop damage from excess water. Drought and leaching of nutrients can be problems when growing tobacco on excessively-drained soils.

To help reduce losses to diseases and nematodes, tobacco is often grown in rotation with grass or other crops that can prevent excessive populations of the pests that attack tobacco. If crop rotation is not practiced, greater reliance must be given to pesticides and other pest control practices.

**Field Preparation**

Fields are prepared for transplanting by destroying and burying previous crop or weed residue, usually with a turn plow. Most preplant pesticides are incorporated by disking, but fumigant nematicides are injected either as the land is turned or afterwards as a separate operation. In most situations, the rows are bedded during field preparation,
especially if a fumigant nematicide is injected in the row. However on some soils, the field can be left flat for transplanting.

To prevent wind-blown sand from damaging young tobacco, windbreaks of rye or other small grain are often planted at some time during the field preparation. Wind erosion is also reduced if the preceding crop was a perennial grass. Sandy soils are particularly susceptible to wind erosion.

**Transplanting**

In Florida, tobacco is normally transplanted from early March to early April. Plants are pulled from plantbeds or from greenhouse trays by hand, then transplanted in rows that are 42-48 inches apart. Plants are spaced 16-24 inches apart in the row. The transplant water may contain an insecticide to aid in control of insects that could destroy or damage the roots or stems of the young plants and thereby reduce stands. On a tractor-drawn mechanical transplanter, riders place the plants in clips, cups, or other devices for placing the plants in the soil. Fertilizer may be applied at transplanting if the transplanter is properly equipped. Irrigation is applied, if needed and available, after transplanting.

**Fertilization and Cultivation**

Fertilizers used for tobacco are special formulations that contain little or no chlorine, have about half of the nitrogen in the nitrate form, and usually contain liberal amounts of sulfur and magnesium. Fertilizers may be applied before and/or at transplanting, but most are applied after transplanting. To reduce the chance for leaching losses, fertilizers are applied in two to four or more side dressings. The later side dressings often contain only nitrogen and potassium. In the event that rain leaches nitrogen and potassium below the root zone of the tobacco, replacement of these nutrients is advisable. Estimation of losses are needed to aid in predicting the amount of nutrients to replace.

Tobacco is normally cultivated two to four times to control weeds and to form or maintain a bed. A high bed is needed for good drainage on the less well-drained soils and to facilitate mechanical harvesting equipment.

**Irrigation**

Due to the sandy nature of most soils used for tobacco in Florida, irrigation is needed to help ensure good yields. As labor has become less available and more costly and farms have become larger, center pivot systems are becoming popular. Traveling guns are still used on much of Florida's tobacco. Solid set systems are no longer used to an appreciable extent. Some Florida tobacco is not irrigated.

Tobacco is usually irrigated immediately after transplanting and then as needed throughout the season. The frequency of irrigation increases as the plants grow and water use increases. From 0.25 to 1.0 inches of irrigation are applied at each application. Applications may be needed every three to four days during periods of peak water use by the plants.

**Pest Control**

Several weeds, nematodes, insects, and diseases are problems in tobacco. Weeds are controlled by herbicides that are applied before transplanting, but others may be applied after transplanting. Cultivation also aids in weed control.

Most nematode pests are the root-knot species. Nematodes are controlled by crop rotation, resistant varieties, and chemicals. Commonly-used fumigant nematicides are applied before transplanting. Some non-fumigant nematicides are used and also applied before transplanting.

Insect pests include the soil-borne types, such as wireworms, molecrickets, cutworms, and white-fringed beetle larva, that are best controlled by soil applications of an insecticide. Foliage feeders include budworms, aphids, and hornworms. Various insecticides can be applied to control these insects. Splitworms and fleabeetles are also pests of tobacco, as are other occasional insects.

A number of fungal, bacterial, and viral diseases are common in tobacco. In Florida, blackshank and damping-off are the major soil-borne diseases. Foliage and stalk diseases include blue mold, target spot, brown spot, sore shin, soft rot, angular leafspot, and the virus diseases that include potato virus-Y, Archival copy: for current recommendations see http://edis.ifas.ufl.edu or your local extension office.
tobacco etch virus, tomato spotted wilt virus, tobacco mosaic virus, and recently cucumber mosaic virus. Cultural practices, crop rotation, resistant varieties, and chemicals are used to reduce losses to some of these diseases.

**Topping and Suckering**

A terminal flower forms in the tobacco plant as it approaches maturity. This flower is removed, ideally in the early button stage of development, to cause the upper leaves of the plant to be larger and thicker, thereby increasing the value of the crop. With this loss of apical dominance, axillary buds, or suckers, develop at each leaf axil and could negate the benefits of topping. Chemicals can be applied to prevent or kill these suckers. The suckers could also be removed by hand.

**Harvesting**

As the tobacco plant reaches the topping stage, the lower leaves also become mature. At this time these lower leaves are removed, either mechanically or by hand. Harvesting proceeds up the stalk as more leaves mature and is complete in about six to eight weeks. Normally there will be three to five harvests, but many growers use a preharvest chemical curing aid which causes yellowing of the leaves and allows more of them to be harvested in a single and final harvest. Contracts may specify the number of harvests and other procedures.

**Curing**

Immediately after harvest, the leaves are placed into metal racks or boxes for curing. Heated air is forced through the tobacco to cause it to first turn yellow or orange in color, and then to dry the leaves and stems. The initial temperature for yellowing the leaves is 95 to 100 degrees F, and is then increased incrementally to 165 or 170 degrees. Ventilation is part of the curing process and is varied as needed to remove moisture while retaining quality of the tobacco. It takes five to seven days to cure a barn of tobacco, and six to nine curings may be made in each barn in a season. After the tobacco is cured, moist but unheated air is forced through the tobacco to cause the leaves to become pliable enough so they will not shatter during the unloading process.

**Marketing**

As the tobacco is removed from the barn, it is baled and stored on the farm until taken to a market to be sold. Bales may weigh about 750 pounds. Until 2001, tobacco was sold through an auction system, but has now been largely replaced by a contract system. Contracts are usually signed before transplanting and prices are specified by grade. The buyer grades the tobacco and then takes possession of it. Processing and aging of the tobacco precedes the manufacture of cigarettes.

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