



# AROMATIC TOBACCO

*Instruction for its Production in South Carolina*

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FIGURE 1. Field of aromatic tobacco before flowering



## PREFACE

The growing of aromatic tobaccos, commonly spoken of as Turkish tobaccos in the old country and as aromatic tobaccos in this country have through experimental tests and demonstrations been found to be a profitable practice in the Piedmont section. The crop is well adapted to the clay soils and climate in that area; its production provides additional use of farm labor and additional income; and a market has been established for its sale.

The growing of aromatic tobacco is gradually spreading into additional counties, and additional farmers within the counties where it has been previously grown are planning to plant the crop. To provide information for these and others who may be interested, the Clemson Extension Service is in this revised edition making available with certain minor revisions the information originally presented as Tobacco Bulletin No. 1, which was printed March 1947 by Duke University in cooperation with the agricultural agencies of North Carolina, South Carolina, and Virginia, and in the first edition of this bulletin printed in 1949.

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## INTRODUCTION

Aromatic tobaccos, commonly referred to as Turkish tobaccos, have been blended with domestically grown tobaccos for over thirty years, resulting in the popular blended cigarette which is familiar to the American public. In the past, the aromatic tobaccos have been imported from Turkey, Greece, Bulgaria and Soviet Russia. At present, the manufacturers of blended cigarettes have need for more than eighty million pounds of aromatic tobacco per year.

Some years ago, some of our agricultural workers thought that America could produce its own requirements of aromatic tobaccos. In 1939 Duke University began preliminary experiments to determine whether satisfactory tobaccos of this type could be produced in the southeastern United States. Following these early tests, Duke University, with the cooperation of the Experiment Stations and Extension Services of Virginia, North Carolina and South Carolina, has carried out experiments in the Piedmont and mountain areas of these three States which have shown that aromatic tobaccos, of equal value to those which have been imported, can be grown on many of our Piedmont and mountain soils.

These cooperative investigations indicate that the growing of these tobaccos will provide a cash income for the farmer and will fit in well with the crop rotations and farming practices commonly in use in these areas.

The purpose of this publication is to make recommendations, based on farm experience

and research, that will give practical help to farmers who plan to grow aromatic tobaccos.

There are numerous types and varieties of aromatic tobaccos which have been produced in Turkey and the neighboring Near East countries. Of these, three have been grown successfully in the southeastern United States. They are known as the Samsun, Smyrna, and Cavalla types. The Samsun is successfully grown in the mountains of North Carolina and in Virginia. The Smyrna and Cavalla types are being grown very satisfactorily in the Piedmont region of western South Carolina. The leaf of the Samsun has a bare stem connecting it to the stalk, is rather triangular in shape and is of a light green color. The leaf tissue of the Smyrna leaf continues down the mid-rib to the stalk. The leaf is more oblong in shape than the Samsun leaf and is a darker green in color. The Samsun leaf is generally larger and thinner than the Smyrna leaf (Figure 2).

The leaves of the Cavalla type are thin and rather delicate and for this reason are a little more difficult to handle and cure. The quality of aroma and taste, when blended with other tobaccos, is outstanding. The leaves burn well because of being light-bodied and porous.

Since the Cavalla type bears an average of 25 to 30 leaves per plant the yield, generally, is not as large as Samsun or Smyrna. The leaves grow with a yellow-green cast rather than a dark-green cast and are attached with a clasping base. (Figure 2).

## DEDICATION

This bulletin is respectfully dedicated to the following pioneers in aromatic tobacco culture in America.

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Liggett and Myers, Durham, N. C.

G. H. GRIFFIN — Oconee County Agent,  
Walhalla, S. C. (Deceased)

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# FOREWORD

The farmer who is planning to grow tobacco of the aromatic type should determine first if his soil, buildings and labor are such that he can expect to produce a tobacco of good quality. A product of good quality is in much demand and will return a significant profit to the grower. A tobacco of poor quality is not suitable to the trade and no profit can be expected from its production; consequently, the farmer may grow it at a loss.

## 1. Soil

A heavy soil with a clay base with some admixture of sand, small gravel, and broken rock fragments is the most suitable. The light sandy soils are not as suitable. The better quality aromatic tobaccos are produced on relatively poor soils or those of the intermediate type so far as natural productivity is concerned. Rich soils are not suited to produce aromatic tobaccos.

The soil should have some slope so that it will be well drained. Suitable areas are usually found near the crest of slopes. Low, flat areas are not suitable. The soil should be as free as possible of root diseases that affect tobacco plants. The better soil types include the Cecil, Appling, Madison, and Porter series.

## 2. Labor

At present, aromatic tobacco requires the cooperation of all members of the family. A smaller part of the total labor involved is in the plant bed preparation, transplanting, cultivation, and insecticidal applications. The largest part of the labor is required during the period of harvest, but since it is of a light nature, women and children may do it suc-

cessfully. To produce a tobacco of good quality it is very necessary to harvest it as soon as it matures. Harvesting usually begins about 20 to 30 days after transplanting. The mature or ripe tobacco leaves will not wait to be harvested. They deteriorate and lose quality very fast if they are allowed to become over-mature. However, new devices have been developed for labor-saving in the harvesting and curing operations. These new ways enable the grower to take care of three to four times as much tobacco now as he could using the old conventional methods. Several people can now take care of one acre by using modern methods and using their time efficiently.

## 3. Buildings

The successful production of tobacco of any type requires adequate building space.

The barn, especially designed for curing tobacco, is described in this bulletin. It is adequate for the handling of the tobacco from 1 to 2 acres of land. The farmer, however, can start the production of the crop with less adequate buildings. To grow successfully small acreages, it is necessary for him, however, to have floor space in a garage, barn or machine shed, in which to carry out the following operations. For curing, the space should be protected by a waterproof roof and weatherproof sides. In the wilting operation a cool location protected from the direct rays of the sun and direct air currents is necessary, and in addition a dry weatherproof place is required in which to store the tobacco until it can be placed on the market. It is also essential to have a bare outdoor space with a reflecting surface, which is free from shade, on which to place the curing racks while the tobacco is curing in the sun.

## 4. Plants

The plant bed is one of the most important phases in producing a crop of aromatic tobacco. In order to grow the crop, an adequate number of seedlings must be available to transplant at the proper time. These seedlings are grown by the farmer. The grower should make every effort possible to grow the seedlings, protect them from disease, and have them ready to transplant at the proper time. Poor seedlings and those placed in the field at the wrong time produce poor crops. Large, long-shanked plants should not be transplanted to the field.

## 5. Soil Preparation

As tobaccos of the aromatic type are not cultivated extensively and are sometimes fertilized with stable manures, it is desirable to break the soil and apply the manure some months before transplanting time. It is also necessary to get the soil in as good tilth as possible before transplanting and to have it prepared for transplanting before the seedlings are ready to be placed in the field. The seedlings are very hardy and during periods of favorable weather will grow very rapidly in the plant bed and may easily become overgrown before they can be transplanted, if the land has not been prepared well beforehand. When tobacco plants reach the height of two inches in the bed, the rows should be laid off for transplanting in the field. These

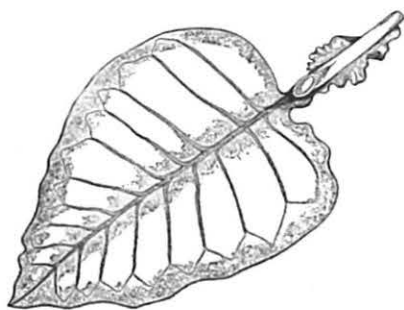
plants should be ready to transplant in five to seven days.

## 6. Storage

Aromatic tobaccos are very susceptible to mold. If the tobacco is allowed to take up much moisture from the air, or from moist materials which are near, it will mold. Molded tobacco has very little value. On the farm, using the sun-curing methods, the leaves should be cured for 12 to 14 days. The curing racks should be rolled out into the sunlight in the morning and back into the curing barn at night. When the leaves are cured, they should be placed in a hot, dry place to finish drying the stems. As soon as the leaves and stems are completely cured, the leaves should be loosely baled. The bales should weigh about 15 pounds. Tobacco goes through a fermentation process in the bale and the quality will improve greatly from curing time until marketing time. Tobacco should be baled as soon as possible for the greatest profit to the farmer.

With the new heat-curing method, when the leaves and stems are thoroughly cured, they should be loosely baled from the curing rack. These bales should weigh about 15 pounds. With this method, the leaves will improve in quality within the bale. The bales should be stored in a hot, dry place and the position of the bales should be changed every two weeks.

FIGURE 2



A.  
Drawing of Samsun leaf



B.  
Drawing of Smyrna leaf



C.  
Drawing of Cavalla leaf

# I

## THE PRODUCTION OF TOBACCO SEEDLINGS

The first important problem faced by the tobacco grower is that of producing sufficient healthy seedlings to transplant to the field at the proper time. To be assured of these seedlings, it is necessary for the grower to exercise much care in the selection of a seedbed site, the preparation and fertilization of the seedbed soil, the construction of the bed, and the protection of the seedlings from weather, insect and disease damage.

### A. Seedbed Location

It is a general practice to locate beds in the woods. Woods soils are usually relatively high in organic matter and contain fewer weed seeds and disease organisms. Care must be used in selecting the plant bed location in order to get the best use of natural heat, light and moisture. Extreme care should be taken to find a place with a southern or southwestern exposure, having a well drained soil containing organic matter, and near a stream or other convenient source of water. During extremely dry seasons, it is necessary to water the beds occasionally in order to secure a stand of plants and maintain plant growth. Shade retards plant growth and makes the plants become very tender and spindling, thus rendering them practically unfit for transplanting. Full sunlight is essential for the rapid growth of tobacco plants. All trees high enough or close enough to shade the bed should be removed.

Beds that have wind protection from the north and east have a definite advantage over non-protected beds. Most cold damage to plants is aggravated by wind. Therefore windbreaks are most desirable in protecting beds from cold damage.

It is just as important to remove excess moisture from beds during extreme wet weather as it is to supply moisture during dry periods. When the soil becomes waterlogged, air is excluded from the roots of the plants and the plants may soon die. A gentle slope and southern exposure is desired, as this affords the greatest amount of sunlight, heat, and adequate drainage.

### B. Preparation of Seedbed

After clearing the plant bed area of all trees, stumps, and roots or other trash, the soil should be well broken to a depth of three to four inches. Do not turn top soil under. A disk harrow does a very satisfactory job. In fact, any implement that will loosen and pulverize the soil without turning it will be satisfactory. After the soil has been thoroughly broken, use a rake, hoe, mattock, and axe to remove all roots and trash from the bed. It may be necessary after this operation to plow or disk the bed again. The surface of the bed should be well pulverized, smoothed and levelled by several hand rakings. Then the bed is ready for the application of fertilizer.

Where beds are to be treated with chemicals for weed and insect control, the chemical is applied after the bed has been prepared as described above. The treatment should be applied the latter part of September or not later than mid-October.

### C. Sterilization of Seedbed

Objectionable weed seed, insects and certain soil-borne diseases may be eliminated from plant bed soils by steam sterilization, by burning, or by chemical treatment.



Steam sterilization is probably the most effective method known, but it is also the most expensive. Anyone interested in this method of sterilization should contact his Experiment Station, county agent, or Extension Service for details.

Burning tobacco beds is only partly effective. It takes large quantities of wood or other material to heat the soil deep enough to be effective. Before burning, the plant bed should be thoroughly prepared and made ready for seeding, including the sowing of the fertilizer. Cotton stalks, corn stalks, the limbs of trees and bushes, or wood should be piled uniformly over the bed area to a depth of four feet and burned. The burned-over beds should be lightly raked, and unburned material removed before seeding.

A practical way to reduce the number of weeds is by the careful application of certain chemicals. Either Cyanamid, or Uramon, or a combination of the two or Methyl Bromide is recommended. Each has its particular advantages and should be used as the special conditions require.

Cyanamid used at the rate of one pound per square yard of bed space is very effective in controlling weeds but is not effective in ridding the soil of diseases. Uramon used at the rate of one to two pounds per square yard is an effective weed killer and will help in controlling soil-borne diseases.

The amount of chemical material required for the bed to be treated should be weighed. Then two-thirds of the material should be broadcast evenly over the soil. Next it should be thoroughly mixed with the top three or four inches of the soil by stirring several

times with a disk harrow or other suitable implement. The bed should then be harrowed or raked smooth and the remaining one-third of the chemical broadcast evenly over the soil and mixed with the top one-inch layer by lightly raking.

Adequate moisture is absolutely essential for the chemical to work properly. For that reason the material should be applied when the soil is moist, or the plant bed should be thoroughly soaked with water following treatment.

The beds to be treated with Cyanamid or Uramon chemicals should be prepared at least 90 to 120 days prior to seeding time. Any chemical treatment which is sufficiently toxic to kill weed seeds is also toxic to tobacco seeds. It is necessary therefore to apply the treatment long enough before seeding to allow time for toxicity to disappear. After beds are treated, do not disturb until time to fertilize and to sow the seed.

Methyl Bromide, containing 2.0 percent chloropicrin, when applied under a gas-proof cover has given excellent control of weed and grass seeds, grass stolons, nematodes, white grubs, wireworms and other soil pests. Soil disease infestation is also reduced due to the decrease of feeding lesions by nematodes and other soil pests through which disease organisms commonly enter a plant.

Soil to be treated should be plowed, mechanically tilled or spaded and worked down to seedbed condition before the application of Methyl Bromide. The soil should not have a temperature lower than 50°F. (preferably above 60° F.) and it should be friable — not too wet nor too dry. When the soil is in a

suitable condition for planting of seed it is in a satisfactory condition for treating. If the soil is dry it should be thoroughly watered several days prior to treatment in order to raise the moisture content of weed seeds. The soil mass should be uniformly moist throughout the entire depth to be treated. High seed moisture content is essential for best weed seed killing results. Soil should also be level, since the gas will tend to concentrate in low areas. Beds on sloping areas should be located at right angles to the direction of the slopes, or long beds on slopes should be divided into short sections for treating.

Methyl Bromide should be discharged by means of a "Jiffy Applicator" into a metal trough under a gas-proof cover placed over the seed bed. Use one small metal trough or a 5-foot length of eaves troughing, with both ends blocked off, for each 400 to 600 square feet of area. For long narrow seedbeds place the troughs at 25- to 30-foot intervals. Fasten one end of a length of copper or saran plastic tubing inside the trough in such a manner that in discharging the liquid fumigant it will not splash out on the soil or up on the gas-proof covering but will run directly into the trough. "Jiffy Applicators" purchased with saran tubing attached have the discharge ends of the tubing blocked off and have two small holes in the sides to direct the gas laterally. It is suggested that this tip end be cut off so that the gas will flow directly out of the end. Extend the rest of the tubing along the ground to a point well beyond the edge of the seedbed and fasten a "Jiffy Applicator" to it. Place the gas-proof cover on supports 1/2 to 1 foot above the seedbed and completely cover the edges with a soil to make a tight seal.

By means of the "Jiffy Applicator" and tubing, discharge the Methyl Bromide into

the metal troughs under the gas-proof cover. Apply the fumigant at the rate of 1 pound per 100 square feet for the control of nematodes, insects and weed seeds. The Methyl Bromide in the can is under pressure. **Do not open by any means other than the "Jiffy Applicator."**

Allow twenty-four hours after applying the Methyl Bromide before removing the gas-proof cover. Remove the cover toward the wind to avoid inhaling the gas under it. Allow the soil to aerate for thirty minutes before attempting to work it or to treat an adjacent seedbed. The treated area should be allowed to aerate for forty-eight hours after removing the cover before planting seeds.

## D. The Fertilization of Seedbeds

In order for tobacco plants to make quick growth large quantities of readily available plant food nutrients are required. It is recommended that two pounds of a complete tobacco plant bed fertilizer be used per square yard. Where chemical treatments have been used, one pound per square yard is usually sufficient.

Only a recommended tobacco plant bed fertilizer should be used on the plant bed. **Do not use a garden or truck crop fertilizer on tobacco plant beds.** The chlorine contained in most truck crop fertilizers will injure the tobacco seedlings, and render them unfit for transplanting.

For uniform distribution of fertilizer over the soil, the fertilizers should be applied both lengthwise and crosswise the bed (Figure 3).

Thoroughly mix the fertilizer with the top two or three inches of soil with a rake, spring-tooth cultivator or other suitable implement (Figure 4). If the soil is worked deeper than three inches while mixing the fertilizer with it, weed seed will be worked to the top from the unsterilized soil beneath. After the ap-

plication of fertilizer the surface of the bed should be leveled or smoothed as much as possible so as to avoid low places into which the seed can settle. The fertilizer may be safely applied to the bed two weeks before seeding. If the fertilizer has been previously applied, the soil should be freshened lightly with a rake before seeding.

**FIGURE 3**  
**Applying fertilizer**



**FIGURE 4**  
**Working fertilizer into the soil**



## E. Sowing of Seedbeds

From 1 to 1 1/2 tablespoonfuls or 3 to 6 teaspoonfuls (Figure 5) of seed should be measured out for each 100 square yards of bed area. The seed should be thoroughly mixed with cottonseed meal, fertilizer, fine sand, or sifted wood ashes, using one quart of such materials to each teaspoonful of seed. To insure seeding the bed uniformly, it is desirable to go over the area twice (Figure 6).

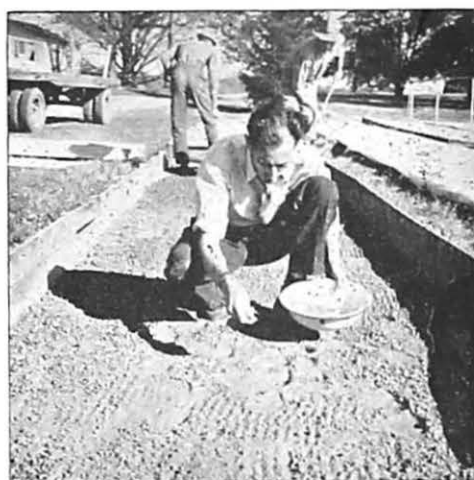
**FIGURE 5**

**A teaspoonful of tobacco seed**



**FIGURE 6**

**Sowing seed in the seedbed**



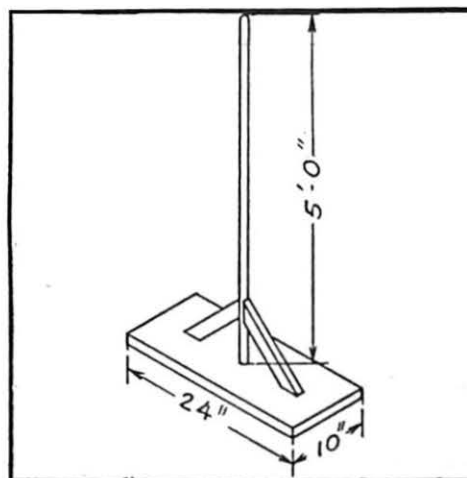
**FIGURE 7**

**Brushing and beating tobacco seed into the soil**



**FIGURE 8**

**Drawing of soil packer used to firm seed in seedbed**



## F. Size, Shape and Construction of Seedbeds

Each 100 square yards of plant bed, if well prepared and with the plants protected against diseases and insects, should produce sufficient seedlings to transplant from 1/4 to 1/2 acre of aromatic tobacco.

The size and shape of tobacco beds and the framing material used determine the ease with which the beds can be managed during the growth of seedlings. The beds may be any convenient length, but should not be over 3 yards wide. If the beds are not over 3 yards wide, the various operations such as removing and replacing cover, weeding, pulling plants, dusting, and top-dressing can easily be accomplished without having to step inside the bed.

While rough 1 x 8 or 10 inch boards make the most satisfactory border for the bed (Figures 4 and 9), straight poles 6 to 8 inches in diameter sawed square on the ends can be used to make a satisfactory border for the plant bed. (Figure 10.) Soil can be thrown around the poles from the outside, making a fairly tight bed. Surface water should not

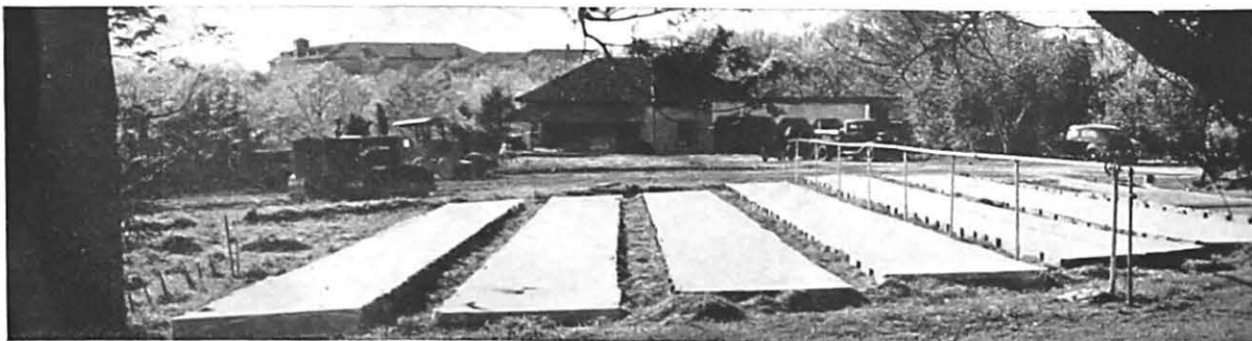
be allowed to flow over the surface of the plant bed. This can be prevented by making ditches around the beds to drain away any excess surface water. Any stakes used to hold border poles or boards stationary should be placed within the bed so they will not damage the covers.

Stakes should be placed down the center of the bed every nine feet and should be about two inches higher than the border poles or boards. A light wire, similar to baling wire, should be stretched tightly over the top of the stakes lengthwise and crosswise the bed for supporting the cover (Figure 10). Small jars inverted over sticks spaced rather closely together may also be used, in place of the wire, for supporting the cover. Any device will work satisfactorily that supports the cover 6 or 8 inches above the ground and does not tear the cover.

Small six-penny finishing nails driven part way in along the sides of the border poles or boards every 15 to 18 inches make good holders for the cover. A large-headed nail should never be used to fasten the cover to border poles or boards. A finishing nail does not tear the cover while it is being removed or

FIGURE 9

Plant bed with border made of boards, with cover attached



**FIGURE 10**  
**Plant bed with border made of poles**



replaced. Covers should be placed slightly over the edge of the border in order that the bed will be completely covered.

### **G. Seedbed Covers**

Covers on plant beds are used, primarily, to increase the soil temperature and protect the plants from unfavorable weather. The material used is an unbleached cotton cloth prepared specifically to cover tobacco plant beds. Two weaves are recommended, these being 28 x 24 or 32 x 28 threads per square inch.

During extremely cold weather, extra cover may be needed. Clean pine, oat, wheat, or barley straw may be scattered over the original cover for added protection. This extra covering should be removed as soon as the weather has returned to normal.

The larger the plants in the seedbed the more susceptible they are to damage from cold weather.

As soon as the crop has been transplanted, the covers should be taken up, washed, thoroughly dried, and stored in a dry place. If the covers are properly cared for, they can be used for several years.

### **H. Fertilizing the Seedbed by Top-dressing**

Conditions due to disease, water-logging, and excessive leaching sometimes make it desirable to top-dress the tobacco plant bed to increase the rate of growth of the plants. As the excessive or improper use of top-dressing material may cause severe damage to the seedlings, the grower should consult the Experiment Station, county agent, or Extension Service representative before top-dressing the bed. From these representatives, the grower can obtain advice as to the type and amount of top-dressing to apply.

### **I. Care of the Seedbeds**

Covers should be placed on the beds immediately after seeding, and should remain on the beds until about 7 to 10 days before the seedlings are to be transplanted. Weather permitting, the cover should be removed at least a week before the seedlings are set in the field. This is done to harden or toughen the plants to the weather so that they may better withstand the shock of transplanting. If snowfall should occur, damage to the cover from its weight may be avoided by loosening one side of the cover and allowing it to rest on the ground.

Covers should be removed occasionally and the seedlings examined for the presence of insects and diseases which may damage the plants.

During a very dry season it is often necessary to water the plant beds to obtain a satisfactory stand and growth of tobacco seedlings. To save time and labor in watering plant beds some farmers have installed irrigation systems as shown in figure 11.

When the seedlings are 4 to 7 inches tall they are usually large enough to be transplanted to the field. If the beds are not over three yards wide the seedlings may be removed without stepping in the beds.

The soil of the plant bed should be soft and moist when the seedlings are removed from the earth so as to avoid stripping the

roots from the seedlings. If the soil in the bed is dry it should be thoroughly watered several hours before any attempt is made to remove the seedlings.

Mosaic, a virus disease of the tobacco plants, may be contracted from waste tobacco and manufactured chewing and smoking tobacco. Therefore, it is essential to keep these materials away from the plant bed and workmen should not use smoking or chewing tobacco while working on the plant bed or with the tobacco seedlings.

## J. Care of the Beds After Transplanting Season

As soon as a stand of plants has been established in the field, the tobacco plants remaining in the bed should be destroyed to prevent the carry-over of diseases. This can be most readily done by cutting the remaining plants into the soil and by broadcasting over the area very thickly nematode-resistant varieties of cowpeas or soybeans or corn. Either of these crops will shade the bed area and keep weeds and grass from growing. In the late summer the peas or soybeans should be cut into the soil. Disking should be repeated as often as necessary to chop thoroughly the organic material into the soil so that it will decompose. This, in addition to reducing weed development, adds organic material to the soil.

FIGURE 11

Watering tobacco beds automatically



## II

# SOILS FOR TOBACCO FIELDS

The proper selection and preparation of the soil is very important in the growing of tobacco. The new grower should obtain the services of the Experiment Station or Extension Service representative to help him select a suitable soil location in which the plants from the bed are to be transplanted.

### A. Type of Soils

The heavier soils are more suited than the light sandy soils for the growth of aromatic tobacco. The light sands are not as well suited. A heavy soil with a clay base with some admixture of sand, fine gravel and broken rock fragments is the most suitable.

Relatively poor soils or those of the intermediate type so far as natural productivity

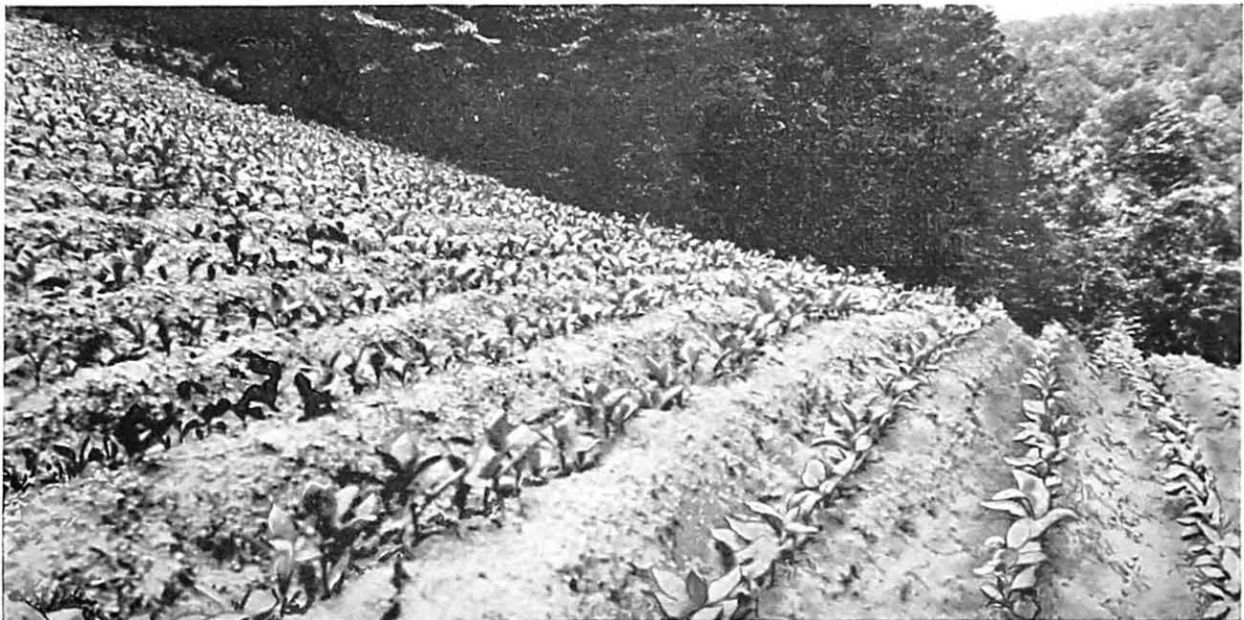
is concerned are best suited for the production of aromatic tobacco. Rich soils are not suited to the production of aromatic tobaccos.

In the Piedmont region the better soil types include the Cecil, Appling, Mecklenburg and Madison series. In the mountain region the better soil types include Watauga, Cecil, Appling, Clifton and Porter series. The services of the Experiment Station, county agent or the Extension Service representative are available to assist in identifying the soil types present on your farm. They should be called upon to give this assistance.

The best aromatic tobaccos have been grown in this country on relatively poor clay soils that contain considerable admixtures of sand, gravel or small rocks.

FIGURE 12

Tobacco field well located on the side of a hill





## **B. Location of Soil Sites**

The fields selected for the production of these tobaccos should have some slope (Figure 12) and should be well drained. The most suitable sites are usually found near the crest of slopes. Low flat areas should be avoided because of poor drainage and too great fertility.

As the tobacco plants are closely spaced and grow rather tall, they are subject to considerable wind damage. Therefore, it is desirable to select sites that are naturally protected from prevailing winds wherever such sites are available.

Soils that are infested with nematodes and other root diseases should not be used for tobacco, unless these soils have been treated for nematode control. The presence or absence of these diseases can often be determined by an examination of the root systems of plants grown on the soil the preceding year.

It has been found that poor tobaccos are produced when the crop is grown on soils immediately following legumes, or where a legume crop has been turned under as green manure. Such soil sites should be avoided. Sites on which cotton, corn or small grains were grown the preceding year are usually found to be the most suitable for the production of aromatic tobacco.

## **C. Fertilization and Preparation of the Soil**

Well-rotted stable manure is a satisfactory material to use to fertilize aromatic tobacco.

Eight tons per acre is believed to be an average application suitable for the production of good quality tobacco. This would be supplied by about three average two-horse loads per quarter acre.

The manure should be applied in the early fall, the soil plowed deeply, levelled and seeded to wheat, rye, barley or oats. As soon as the weather permits in the late winter, the small grain should be turned under. The soil should be cut several times with a disk harrow before tobacco transplanting time to insure a thorough decomposition of the cover crop. If the soil cannot be plowed in the fall, it should be broken in the winter or early spring and disked, the stable manure applied in March and thoroughly worked into the soil. It is necessary to have the soil in as fine tilth as is possible before starting to transplant, because it is not practical to do any extensive cultivation later, due to the narrow rows and close spacing of the plants in the drill.

In addition to well-rotted stable manure, superphosphate at the rate of 300 to 400 pounds per acre and 200 pounds of sulphate of potash should be applied.

Research with various sources of fertilizer materials is now in progress, but to date no definite recommendations are being made on commercial fertilizer. However, satisfactory quality tobacco has been produced on a number of field trials with farmers using 400 to 500 pounds per acre of a 4-8-12 or 3-9-6 tobacco fertilizer where no suitable manure was available and the natural fertility of the soil was too low without the addition of some form of nitrogen.

## D. Laying Off the Rows

For hand transplanting the land should be laid off in rows 20 inches apart. The rows can be laid off and the land ridged very satisfactorily for planting by means of a single shovel plow equipped with a shovel full 10 inches wide. This shovel will make rows 20 inches apart, if the furrows are run so that just a little soil rolls over into the preceding furrow. In the beginning, the new grower

should have a 20-inch stick, so that he can check the distance between the tops of the ridges. It is essential to have proper spacing between rows and between plants in the row to produce tobacco of good quality.

Where the tractor-transplanter is used, the soil should be thoroughly pulverized and have as good tilth as possible so the tobacco can be set deep enough in the soil to become well established.

### III

## TRANSPLANTING

It is very important for the grower to have sufficient seedlings to transplant his crop within a short period of time. It is necessary to use stocky, healthy plants and to transplant at least 60,000 plants per acre.

### A. Spacing

To produce aromatic tobaccos of satisfactory quality it is absolutely necessary to produce small leaves. This is accomplished primarily by closely spacing the plants in the row, thus growing a large number of plants per acre. Experience has shown that 60,000 plants per acre is the minimum number that will produce tobacco of satisfactory quality. As many as 70,000 or more plants per acre will tend to produce smaller leaves and increase the quantity and quality of the product.

It is impractical to space the rows closer than 20 inches, this being about the minimum distance between rows that will give sufficient space for cultivation and harvesting. If

the distance between rows is 20 inches the maximum distance between plants will be 5 1/2 inches in the drill if 60,000 plants are to be grown per acre. Plants should never be more than 5 1/2 inches in the drill. If they are spaced 4 1/2 inches apart in the drill there will be approximately 70,000 plants per acre.

### B. Manner of Transplanting

The field is laid off in furrows to obtain better drainage and to have the soil in better position for transplanting and cultivating.

For hand transplanting the plants should be placed on one side of the ridge approximately half the distance from the bottom to the top of the ridge (Figure 17). Experience has shown that by so placing the seedlings along the side of the ridge they are better protected from wind and water damage. Also, the plants will be disturbed less during the first cultivation and more of the soil that can be readily moved will be available to place around the plant.

FIGURE 13  
Hand transplanters in use



Weather permitting, the covers should be removed from the beds 7 to 10 days before transplanting to allow the seedlings to become hardened to the weather. This hardening process allows the plant better to withstand the shock of transplanting.

The seedlings can be most satisfactorily transplanted by means of a hand or tractor transplanter (Figures 13 and 14). These machines release the water and the plant simultaneously. Each transplanter requires one person for its operation and one to drop the plants. During extremely wet periods, when the transplanters cannot be used, transplanting can be accomplished by using a peg to make the holes for the plants, similar to the method used in transplanting tomato, cabbage, and potato plants.

The seedlings of the aromatic type can be transplanted after they have been properly hardened and are from 4 to 7 inches tall. They should not be transplanted when they are too large or too tall. Long-shanked

plants are difficult to place in the soil and fail to make normal growth after transplanting. The entire plot should be transplanted as nearly as possible at the same date. By so doing, all plants will grow up together in an even pattern, and a more uniform harvest can be accomplished with such an even growth over the entire plot. The plants of the aromatic varieties are very hardy. If strong, healthy seedlings are properly transplanted in a well prepared soil, in many seasons, all seedlings will live and no replanting will be required. If replanting is necessary, it should be done as early after the first planting as possible.

Due to their hardy nature, tobacco seedlings of the aromatic varieties grow very rapidly in the plant bed during favorable weather. Also they should be transplanted as soon in the spring as the size of the seedlings and conditions of the soil in the field will permit. They are not as susceptible to cold damage as the seedlings of most crops. If transplanted early in the season while the weather is cool they will survive the process of transplanting and take root better than they will if they are transplanted late when the weather is warmer, and when the more intense heat of the sun will cause them to wilt badly. It is normal, however, for the seedlings to wilt somewhat after they have been transplanted.

It is very desirable for the grower to have his field prepared for transplanting early and well before the seedlings are ready so that he can place them in the field when they are the proper size. Delay in preparing the field for transplanting may mean the difference between a poor and a good crop.

**FIGURE 14**

**Tractor transplanter. Tobacco is set on the level as contrasted with ridges where the hand transplanter is used**



## IV

# CULTIVATION, HARVESTING, CURING, AND STORAGE

The cultivation of aromatic tobacco requires very little work. The tobacco during harvesting, stringing, wilting and curing operations requires careful attention.

### A. Time and Manner of Cultivation

The time of cultivation of this crop depends somewhat upon weather conditions, as it does with most crops. The first cultivation should usually be made 7 to 15 days after transplanting and after the seedlings have taken root and begun to grow. Since the tobacco plants are usually low it is necessary to make the first cultivation by hand or machinery in such a way that the seedlings are not covered by soil. Various types of hand-hoe forks and hoes have been used in the past with success to rake down any ridges and to loosen the soil between and around the plants. Also various types of tractor or horse-drawn equipment using small bull-tongue plows or snake-head teeth have been used to loosen the soil for aeration of the roots of the plants.

If the second cultivation is delayed for any reason, it is often desirable to loosen the soil in the middles between the rows by the use of small sweeps or narrow bull-tongue plows. This loosening of the soil will help to aerate the roots of the plants. During this cultivation the soil should be worked as thoroughly as it can be done without injuring the plants.

During most seasons in which the plants make normal growth further cultivation will not be required. The plants will grow sufficiently to shade the soil and prevent growth

of weeds and grass. If the season is abnormal and the plants make small growth, weeds and grass will grow. These should be removed by the usual procedure of running a small bull-tongue plow down the middles of the rows. This practice serves two purposes, the removal of grass and weeds and aeration of the roots of the plants.

If dry weather prevails for several weeks during the early part of the growing season, it is normal for the plants to make slow growth. This slow growth is due to the lack of water, which is essential to make the plant food contained in the soil available to the plant. **Do not apply extra fertilizer to make the plants grow faster.** If extra fertilizer were applied it would not be effective until rain occurred. After the occurrence of rain the extra fertilizer in addition to that already present in the soil would cause the plants to grow too rapidly. Too rapid growth would produce large thin leaves; this condition would result in light-weight tobacco of poor quality.

### B. Harvesting or Priming

It is essential to prepare in advance for the beginning of harvest. **Harvest should be started at the very earliest date that the maturity of the leaves will permit — usually about 21 days after transplanting .**

The leaves of aromatic tobaccos must be harvested while they are quite green if the maximum yield and quality are to be obtained. Tobacco leaves that are showing yellow will give tobacco of light weight and poor quality, while those that show burning are worthless and should not be harvested.

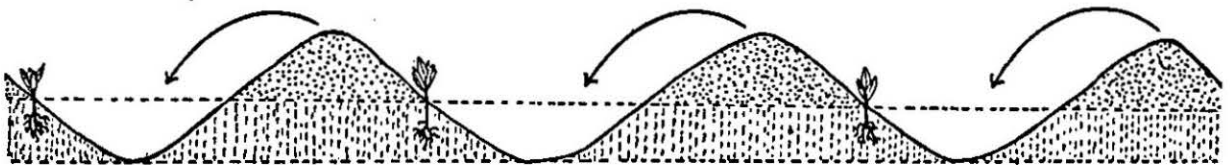
**FIGURE 15**  
Field of plants before first cultivation



**FIGURE 16**  
Field of plants after first cultivation



**FIGURE 17**  
Diagram of field and plants before first cultivation — hand transplanted



**FIGURE 18**  
Diagram of field and plants after first cultivation



←—————→  
20 INGHES

Every effort should be made to keep up with the harvesting as the leaves mature. If the grower allows his harvesting to lag, a loss in weight and quality of cured tobacco usually results.

**Tobaccos of the aromatic type are not topped.**

The leaves are harvested by a process called priming. This process consists of picking a few leaves, one to six, at a priming, beginning at the bottom of the stalk and progressing upward as the leaves mature or ripen. The need for priming usually occurs in periods ranging from 4 to 8 days. All fields should be harvested with an average of one priming or more per week.

Normal priming usually will consist of the picking of 3 to 6 leaves from each plant. If more than 6 leaves need to be removed from the average plant at any priming, some of

the leaves will be overmature, and a loss in weight will result. Likewise, the grower will suffer a loss in income, and the buyer and consumer will suffer a loss in quality. Very few normal plants can be harvested in fewer than six primings.

All plantings of aromatic tobacco should be sufficiently small to permit the available labor to harvest or prime the entire planting at least once every week.

A "priming" operation is the picking of all the mature leaves from all plants in the entire field at one period of harvest.

The topmost 6 to 8 leaves on the plant will normally require a longer period to ripen than those leaves produced lower on the stalk.

As the grower gains experience in handling the crop, he will be better able to deter-

**FIGURE 19**

**Farmer and family priming aromatic tobaccos**



mine when the tobacco should be harvested. Farmers growing the crop for the first time should ask for and accept the advice and instructions of the Experiment Station or Extension Service agents in this connection. There is no substitute for experience in determining when tobacco is mature. It can be stated, however, that it is less harmful to harvest the tobacco while it is still too green than to harvest it when overripe. The tobacco from the bottom half of the stalk can be harvested without loss in yield or quality while it is very green.

The people who remove the tobacco leaves from the stalks are called primers. The leaves can be collected in baskets or boxes or placed on wire sticks as they are harvested in the field. If the primers are careful to keep the leaves in neat, straight stacks or handfuls while priming, and place the stacks of leaves carefully in the baskets, a great amount of time can be saved in the process of stringing the leaves.

After one has had a little experience in priming aromatic tobacco, 15 to 20 leaves can be kept straight in the hand before placing the leaves on the wire stick in the field. In the case of growers harvesting aromatic tobacco for the first time, it is very desirable to have an Experiment Station or Extension Service representative demonstrate the best method of priming leaves and of keeping them straight until they are ready to be placed on the wire rod.

The ideal time to prime aromatic tobacco is early in the morning before the dew has dried from the leaves or shortly thereafter before the leaves become wilted. The priming may begin at dawn.

The leaves should never be primed when they are in a wilted condition, as they normally are during the middle and latter part of warm days when the sun is shining bright-

ly. Wilted leaves stick together very badly, bruise more easily, and require more time to string.

Extreme care should be taken at all times to keep from bruising the tobacco. The quality of tobacco is greatly reduced by bruising.

Aromatic tobacco is baled when preparing it for market. Each priming should be baled separately.

## C. Stringing

The tobacco can be put on wire rods in a fraction of the time it takes to string it on a stick. A 9- or 10-gauge wire is sufficient.

By using this method the tobacco leaves can be strung at the barn or in the field at the same time they are pulled from the stalk. Stringing in the field eliminates a second handling of the leaves. Some growers say they can handle 30 to 40 percent more tobacco by stringing it in the field. If stringing is done in the field a wire holder (Figure 20) should be used. Extreme care should be taken not to place too many leaves on each wire. Be sure to space the leaves properly so that air can pass sufficiently in and around all leaves to aid in curing.

FIGURE 20

Stringing on a wire in the field saves labor. Note the stringing horse that holds the wire and the strung tobacco





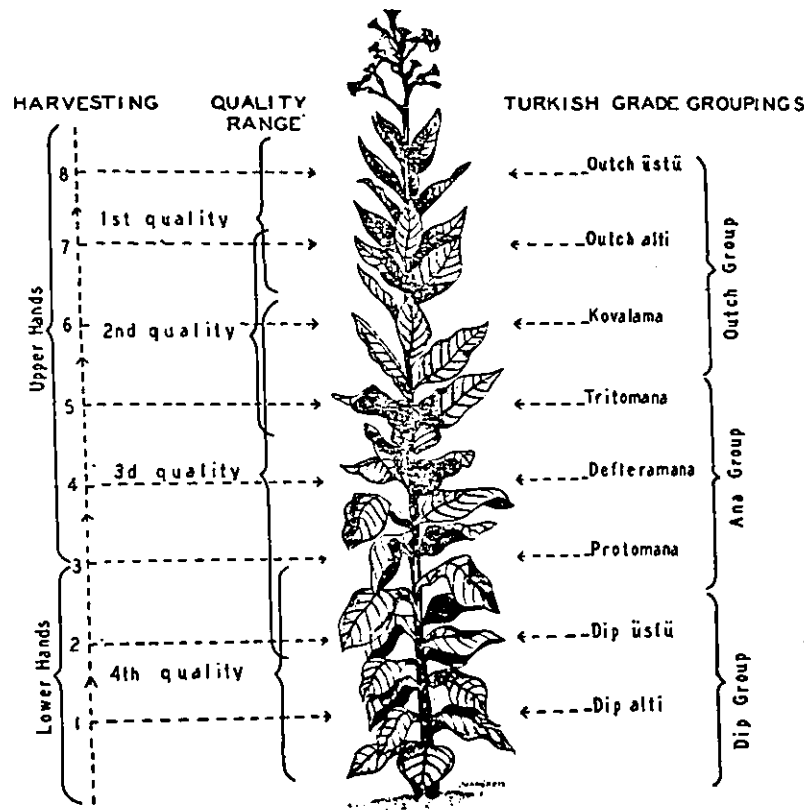


FIGURE 21

Order of removal of leaves in harvesting Turkish or Aromatic tobacco showing the relation of the location of the leaves on the stalk to quality and to usage by the American Tobacco Industry, and probable grades as customarily employed in the Near East. Gradation on the basis of stalk position may not be adhered to strictly in actual practice, but nevertheless it serves as a general guide

## D. Wilting

As soon as the tobacco is properly strung, the wires of tobacco are placed on the wilting racks (Figure 22) which have been built in a relatively cool, shady place, out of the sun and direct currents of air (Figure 22), so that the tobacco can wilt and yellow. The time usually required for wilting the tobacco varies from 36 to 72 hours. In general, two or three days are sufficient time for most primings of aromatic tobacco to wilt.

Thus, if the tobacco is placed on the wilting racks on Monday, it should be sufficient-

ly wilted to start curing on Wednesday or Thursday. The tobacco wires should be spaced so the leaves of neighboring wires just touch one another (Figure 22). For average-size aromatic tobacco, the distance between wires is about three to six inches on the wilting racks; this space gives the tobacco leaves plenty of room to wilt and yellow properly. After the first day, the wilting leaves of tobacco should be examined frequently. If drops of moisture are observed on the surface of the leaves, the wires of tobacco should be placed on the curing racks at once so that they will have free access to

**FIGURE 22**

**Frames of leaves ready for wilting racks**



the air, which will dry the droplets of moisture. Any moisture allowed to stand on the wilting or curing leaves will damage them.

## **E. Curing**

After wilting, the tobacco is ready to be placed on the curing racks (Figure 24). These racks are built to fit the barn, usually 10 feet long, 8 1/2 feet wide, with supports for holding the wire rods of tobacco. A thermostatically controlled oil furnace with forced-air circulation that supplies air at 100 degrees and that forces the air from the top down through the tobacco leaves is ideal for curing.

After the air passes through the tobacco it may be re-circulated or discharged through bottom ventilators, depending on the relative humidity. If the humidity outside the barn is higher than inside the barn, re-circulate the air.

This type of barn makes it possible to go right on curing tobacco at night and on rainy days. In the past, curing has been done entirely by sunlight. Under the new arrangement, the tobacco is rolled out of the barn on portable racks and cured by the sun on sunny days. It is rolled inside the barn at night, or on rainy days, and cured by the use of heat. Twelve to 15 days are required to cure tobacco in the sun, compared to six or eight days by the combination sun and heat method.

The ground should be covered with white sand or concrete close to the doorway of the curing shed. This serves as a runway for curing in the sun. This runway should be dry and free of grass and weeds, since vegetation causes a higher humidity and slows down the curing process.

Detailed plans on construction of curing barn, curing racks, and heat installation are available from the Agricultural Extension Service or Experiment Station.

**FIGURE 23**

**Another way of handling wires of tobacco for the wilting and curing processes**



## **F. Buildings and Barns for Curing and Storage**

The grower of aromatic tobacco must possess buildings in which to protect the tobacco from adverse weather during the curing period. A shed with 200 or more square feet of floor space will be required to house these racks. Any ordinary machine shed, garage or barn which has a dry floor, waterproof roof and fairly good sides will serve for this purpose.

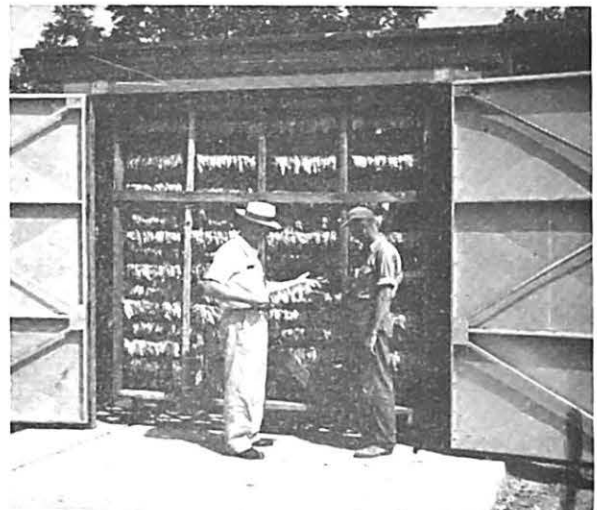
It would be to the advantage of any farmer who expects to grow the crop for several years to construct a building which is specially designed for this purpose. A recent de-

velopment is a "pilot model" tobacco curing barn (all metal) measuring 17 feet x 12 feet at the base and 10 feet high. This building is designed to serve for the curing of the tobacco grown on from 1 to 2 acres of land, depending upon the season. The curing racks used are on casters and can be rolled into and out of the barn easily and quickly. Each rack is designed to hold several hundred wires of tobacco leaves.

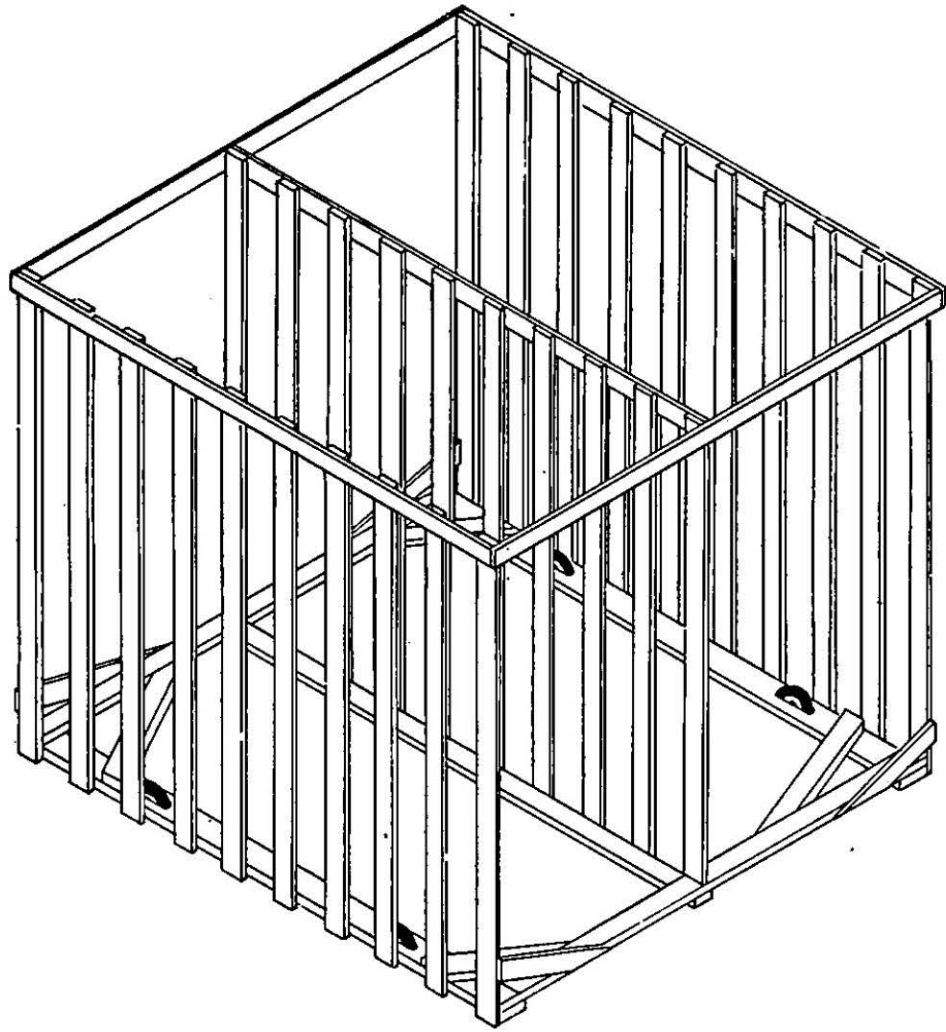
The front of the barn is so located that it is exposed to the sun all day long. The floor of the building is of concrete, which extends out beyond the front of the barn, the part outside being large enough to accommodate the racks.

**FIGURE 24**

**Curing racks and curing barn. Tobacco is rolled into the sunlight during the day and circulated oil heat, automatically controlled, is applied at night and during rainy periods**



**FIGURE 25**  
Isometric view of rolling curing rack



**FIGURE 26**  
Bales of tobacco

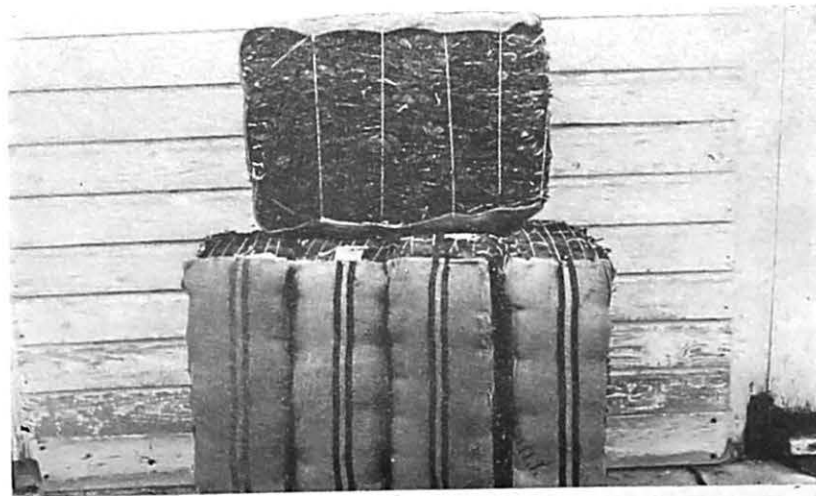
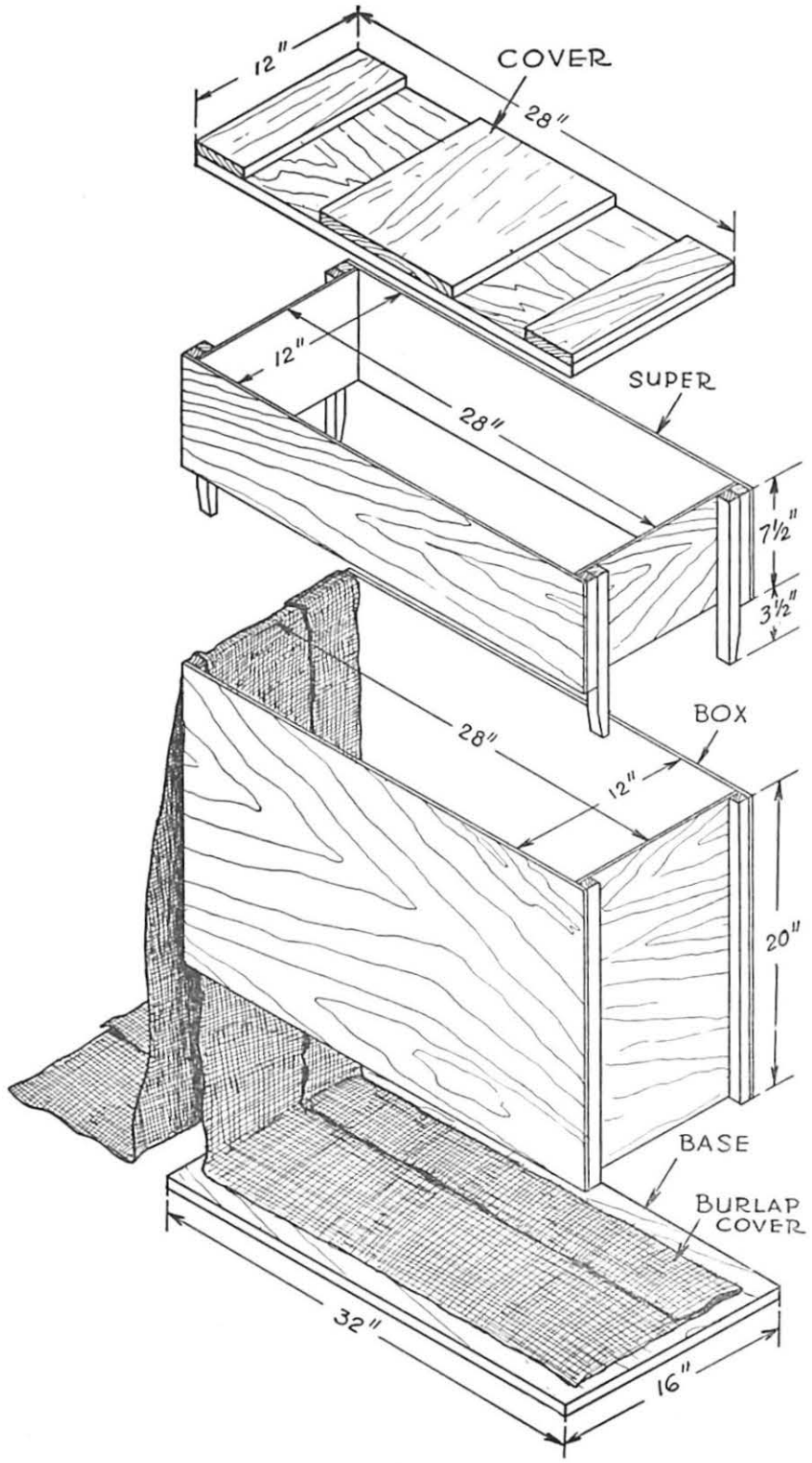


FIGURE 27  
Press used in baling tobacco



# V

## BALING

As soon as the tobacco crop is properly cured, it may be baled for delivery to the buyer. This process requires a certain amount of skill, and it is advisable to have the assistance of an experienced person when baling aromatic tobacco for the first time.

Tobaccos of the aromatic type are usually placed on the market in bales (Figure 26). These bales are only temporary packages which serve as convenient forms in which to deliver the tobacco to the buyer. Also the tobacco is placed in bales to protect it from excessive gains or losses of moisture and from physical damage. It is necessary for the grower to use care in making the bales and

to have the moisture content of the tobacco such that it will not mold.

### A. Baling Press

In order for the tobacco to be properly baled, it is necessary to have a specially constructed press. The press consists of a rectangular box, 12 x 28 x 20 inches without top or bottom (Figure 27). Plywood is an excellent material to use for its construction. A strong wooden base somewhat larger than 12 x 30 inches, and a cover that will easily slide down inside the press are necessary. An extra frame or "super" (Figure 27) that can be slipped on to give added height is very helpful.

**FIGURE 28**  
Operations in the process of making bales



←STEP 1

Placing strings of leaves in the press

STEP 2→

Press and super filled with leaves





←STEP 3  
Tightening  
baling cloth



STEP 4→  
Removing  
baling box



←STEP 5  
Adjusting cover



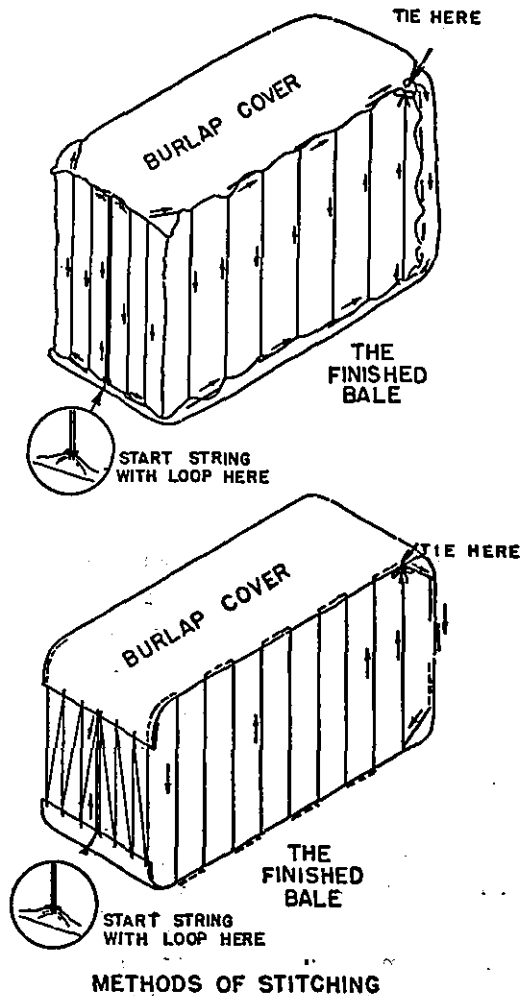
STEP 6→  
Attaching twine  
to cover



←STEP 7  
Stitching cover  
to bale

FIGURE 29

Stitching used to hold the burlap on the bale



## B. Making the Bale

To make the bale, a burlap or Hessian cloth cover, made specially to cover this type of tobacco, is spread over the base of the box with one end of the cover flush with the end of the base board (Figure 27), and the edges folded in until the sides of the box will barely catch each side of the cloth and hold it down. Thus, the press box will just cover the burlap on the end and sides.

The tobacco is placed in the bale on the strings with the stem end of the leaves just touching the sides of the press. If the two rows of tobacco leaves do not fill the space across the bale it may be necessary to add a third or fourth row of leaves. When as much tobacco has been placed in the box with the "super" added as it will hold after pressing the tobacco down with the hands (Figure 28) no more should be added. By using the inside cover, press the tobacco down with a



weight not greater than that of a man, until the tobacco fits inside the main press box. Then remove the "super" (Figure 28).

By gently pulling the loose ends the wrinkles are straightened out of the baling cover (Figure 28). The box is slipped off the bale (Figure 28) using the cover to hold the bale down. Fold the edges of the rest of the burlap cover, like that on the bottom, and bring the long end up over the top of the bale lengthwise as the press cover is removed. The bale will have expanded in height and the ends of the burlap will not meet.

Failure to expand when the pressure is released is an almost sure indication that the tobacco is too moist to be baled. By a steady pull on the burlap by one person, and by pressing with the palms of the hands, first with one and then the other by another person on the "closed" end of the bale, the bale should be pressed down until it is firm, or about 15 to 20 inches in height. The top end of the cover should just come to the edge, at which time the ends of the cover are sewn together with either a square or V-shaped stitch as shown in the illustration (Figure 29).

The average bale will require from 12 to 15 yards of string. The string is doubled and the closed end is then threaded onto the sack needle used in sewing the bale. By the use of the needle this closed end is passed through the center of the burlap at the bottom of the bale and the two loose ends are then pulled

through the closed end thus making the loop as shown in the circle of the illustration (Figure 29). This loop will indicate the bottom of the bale. The two loose ends are then threaded onto the needle and passed through the center of the burlap at the top of the bale. Then continue with one string to the right, the other to the left, as shown in the illustration (Figure 29).

Do not tighten the strings until all stitching is completed, being sure not to give the string a strong pull, but rather create slack by pressing on the top of the bale. The finished bale should be fairly firm and reasonably flat on top.

A bale such as described above should not weigh over 15 pounds. If it weighs more than 15 pounds, it is a good sign that the tobacco is too moist. The strings on each side of such a bale should be loosened and the tobacco pulled apart slightly to allow some air to get inside the bale. **Baled tobacco molds very readily, if it is too moist.** and too much emphasis cannot be put on having just enough moisture for baling and no more. It is highly desirable that an experienced person be present the first time aromatic tobacco is baled, as a grower may well lose his entire crop as a result of poor judgment at this time.

The bales of tobacco are stored off the floor in a dry place until delivered to the buyer. It is also desirable to change the position of the bales every two weeks.

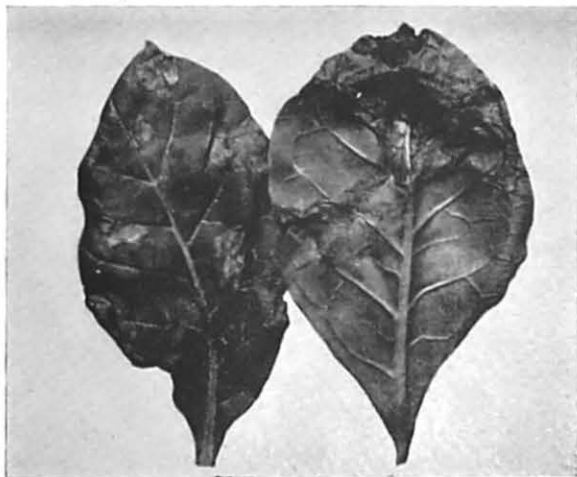
## VI

# DISEASES AND INSECTS

Diseases and insects may cause considerable damage to the farmer's tobacco crop. A few of these which may cause the grower the most loss and which he can control by taking the necessary precautions are described here briefly and methods given for their control.

FIGURE 30

Blue mold as seen on surface of tobacco leaf



### A. Blue Mold

Blue mold or downy mildew of tobacco is the most destructive plant bed disease that is likely to affect the seedlings. It is unusual for it to infect plants after they are in the field.

The spores of the disease are air-borne and are generally present in the air in large numbers during the months of April and May. The first appearance of the disease generally coincides with the blooming of the flowering dogwood. The seedlings in any bed may be attacked by the spores of the disease.

The spores enter the breathing pores or stomata openings on the surface of the leaves.

The first appearance of the disease may be recognized by a downward cupping of the tips of the leaves of a small group of seedlings. The lower surface of these cupped leaves will show a dense bluish or gray downy mold. The upper surface of the leaves usually shows a dead-green coloration which soon changes to a greenish yellow. As the disease progresses, the leaves have a scalded appearance (Figure 30) and develop the characteristic odor of decay. If the disease is not checked, the leaves and plants will be destroyed.

The disease usually progresses slowly for several days and its initial stages may not be recognized. Then a general outbreak may occur and the plants in the entire bed become badly diseased within a day or two (Figure 30).

The Extension Service representative should be contacted for advice upon the first appearance of patches of seedlings with yellowish-colored cupped leaves.

Cool, damp weather is favorable for the development and spread of the disease. Warm, bright, sunny days will tend to check the severity and spread of blue mold. To obtain the greatest benefits from the warm sunny days it is necessary to remove the covers from the beds during the periods of sunshine.

**Control:** The following new organic compounds have been found effective as both dusts and sprays in preventing losses from blue mold and are recommended:

Ferbam—(Fermate and Karbam Black)

Zineb—(Dithane Z-78 and Parzate)

It is recommended that only those dust mixtures using **pyrax** or **talc** as a diluent be used on plant beds.

Dust mixtures should be prepared so as to carry the following amounts of active ingredients:

Ferbam (Fermate and Karbam Black) 15 percent

Zineb (Dithane Z-78 and Parzate) 10 percent

#### Mixing Rates for Sprays

Ferbam (Fermate and Karbam Black — Black Powder) 2 pounds to 50 gallons water.

Zineb (Dithane Z-78 and Parzate—Yellow Powder) 1 1/2 pounds to 50 gallons water.

## B. Flea Beetles

Flea beetles may do much damage to the tobacco plants both in the plant bed and in the field. These small brown insects eat numerous holes in the leaves. This damage may prevent the normal growth of the leaf. It decreases the weight and detracts from the appearance of the leaf. If flea beetles are present in the plant bed they are carried to the field when the seedlings are transplanted. If the flea beetles are killed in the plant bed they will not be taken to the field.

**Control:** Flea beetles may be controlled in the plant beds by applying ten percent DDT with a rotary hand duster, using 1 to 2 pounds of DDT per 100 square yards of bed, depending on the size of the plants.

Repeat treatment as often as outbreak reappears.

Flea beetles may be controlled in the field by applying 10 percent DDT with a rotary hand duster using 10 to 12 pounds per acre.

Repeat treatment as often as outbreak reappears.

A DDT spray may also be used in controlling flea beetles. Use 1 pound 50 percent wettable powder to 50 gallons of water.

## C. Budworms

Small worms, known as budworms, and similar to the corn earworm, feed directly in the bud and small leaves near the top of the plants. They usually cause more damage to the plants in the field than any other insect. They eat numerous holes in the small top leaves and eat away the bud or terminal growth in the top of the plant. These injuries result in poor, lightweight leaves and a short stalk with fewer leaves.

**Control:** Ten percent DDT has proven effective as a budworm remedy. Its killing effect lasts for several days even if rain should fall. Apply 10 percent DDT dust with a puff-

FIGURE 31

Budworm feeding on the bud leaves



type duster, giving one good puff to the bud of each plant. DDT can also be applied with a bag by shaking the material on the plants, if care is observed to apply evenly. Apply insecticide in early part of day while the buds are open. Use 10 to 15 pounds per acre. Several applications are required to give plants complete protection.

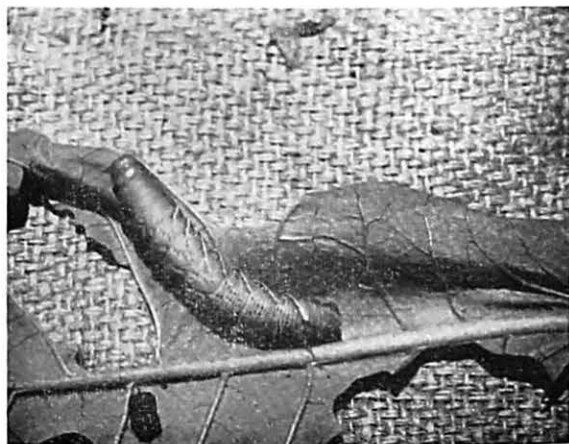
The 10 percent TDE insecticide used at the same rate and in the same manner as the DDT also gives good control of the budworms.

## D. Hornworms

As the name implies, hornworms are characterized by the horns on their backs. They are the worms that are often found feeding on tomato plants. There are two kinds; one is green, and the other is almost black. At first the worms are very small and may not be recognized or seen on the leaf. They grow very rapidly and become as large or larger than a man's little finger. While feeding, they are usually found attached to the lower surface of a leaf. These worms eat a large

FIGURE 32

Hornworm feeding on a tobacco leaf



amount of green tobacco leaves. When full-grown a single worm may eat most of the leaf tissue on a plant within a few days.

**Control:** The best means of controlling hornworms is to apply 10 percent TDE dust to the plants by means of a rotary hand duster. Twenty to 30 pounds of the TDE insecticide should be applied per acre. Good coverage must be obtained over the entire plant. Add one percent parathion if flea beetles, aphids, stink bugs or suck-flies are present.

For application in a spray, use either a wettable powder or an emulsifiable concentrate.

## E. Nematodes

Nematodes are small wormlike eels which are found in some soils. They feed on the root system of the tobacco plant; in some instances the damage is sufficient to stunt and kill the plant. There are several types; among them are the root-knot nematode and the meadow nematode. They are recognized and differentiated by the type of damage they do to the roots of the plant.

The presence of nematodes in the soil can usually be detected by an examination of the roots of the plants growing there.

**Control:** In growing tobacco the most practical nematode control at present is to select soils in which nematodes are not found.

Chemicals are available and under certain conditions are practical for field use. If the farmer should consider treating his field for nematode control, he should consult his Experiment Station or Extension Service representative before doing so.

## **F. Green Peach Aphids (Lice)**

The green peach aphid of tobacco is comparatively new in South Carolina. However, in 1948 and 1949 infestation was general over the entire flue-cured belt in South Carolina.

The green peach aphid attacks several of the truck and garden crops and is also known to live on several weeds and orchard trees.

Aphids are soft-bodied sucking insects that live by sucking sap from leaves. They are generally found on the lower surface of the leaves where they multiply extremely fast under favorable conditions.

Aphids are capable of rendering tobacco leaves worthless.

**Control of Aphids:** Research workers have found several of the new organic chemicals to be effective in the control of aphids.

The effectiveness of any material for aphid control depends on complete coverage, since aphids are killed only by contact.

Parathion dust or spray is a very effective insecticide in the control of aphids on tobacco.

If aphid infestation should occur in plant bed or field, contact your Experiment Station representative, county agent, or tobacco specialist for the proper control measure to apply.

All insecticides must be used with extreme care. Follow all precautions of manufacturers.

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The drawings were made by H. N. Haines, Miss Christine Changaris and Dr. F. A. Wolf of Duke University, and K. Ray, formerly of Clemson College.

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