ATTRA Organic Tobacco Production

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NCAT

This publication is a general overview, not a detailed plan for growing organic tobacco—either for contract producers or for backyard growers.

Foreword

As of 2003, the former federal tobacco program—consisting of price supports, quotas/acreage allotments, and no-net-cost assessments for burley, flue-cured, dark, and certain cigar leaf tobaccos—was terminated. Growers with acreage allotments were compensated by means of a buy-out. That same year, the Santa Fe Natural Tobacco Co. was acquired by RJ Reynolds, which, according to a company spokesman, planned to move production of its natural brand, American Spirit Tobacco, overseas.

At present, two U.S. grower networks are recruiting for contract production of organic tobacco for new product lines:

- Organic Smoke, 2014 Redlawn Rd., Boydton, VA 23917
- Organic Leaf Cooperative, 2932 Newton Rd., Viroqua, WI 54665

Production contracts for 2007 were signed with growers in Wisconsin, Kentucky, Virginia, and North Carolina, but growers in other states are eligible to apply. The companies are seeking experienced tobacco growers that have organic certification already in place.

After 2003, when USDA/ERS began to publish organic production statistics, tobacco was lumped in with "unclassified crops, other land." This means that we can only say, "no more than X acres were devoted to organic tobacco" in a given state.

In 2005, the latest year for which statistics have been published, no more than the designated number of acres shown below was devoted to "Christmas trees, tobacco,

coffee, ginger, wheat grass, vetch, clover, alfalfa and rye seed, shade and ornamental trees, Indian corn, sugar cane, CRP land, and [designated on-farm] wildlife habitat." It is possible that no acres were planted in organic tobacco that year. [Organic acreage statistics for tobacco for subsequent years are being compiled.]

- Alabama ..... 51 acres
- Kentucky ..... 28 acres
- North Carolina . 248 acres
- Virginia ..... 1,079 acres
- Wisconsin ..... 1,637 acres

Research on organic tobacco is being conducted at North Carolina State University by a former principal of Santa Fe Natural Tobacco Co.

Introduction

There are several species of tobacco, all of them native to the Americas. *Nicotiana tabacum* L. is the most widely grown, providing virtually all the domestic leaf used in commercial production of cigars, cigarettes, and smokeless tobacco products. Another species, *N. rustica*, more commonly grown overseas, has generated interest because of its high nicotine content, useful in the making of insecticides and for other specialized uses. However, *N. rustica* is not a well-domesticated species and is reputedly difficult to grow, in the absence of varietal improvement. A selection of tobacco books, focusing on *N. rustica*, is offered by the Ethnobotanical Catalog of Seeds, published by the seed company J.L. Hudson, Seedsman (*www.JLHudsonSeeds.net*).

Related ATTRA Publications

NCAT Organic Crops Workbook

Backyard growers have established at least two forums to discuss micro-production and curing of tobacco for home use. See *www.HomeGrownTobacco.yuku.com* and *www.techgroups.yahoo.com/group/Home-Grown-Tobacco*. It should be emphasized that while organic regulations exempt very small growers (under $5,000 annual sales) from formally certifying, they are prohibited from selling to processors or using the USDA seal. In addition, some states prohibit the sale of home-grown and home-processed tobacco.

As a crop, tobacco is very valuable but also very labor-intensive, even with modern mechanization. As such, it has been considered the only feasible high-value crop for small family farms in certain mountainous parts of the U.S. that have poor soil. Information about the lengths to which Kentucky has gone to compensate its farmers for the loss of tobacco allotments can be found at *www.uky.edu/ag/TobaccoEcon/publications/Mcintyre.html*. Some conventional farmers have resorted to producing pharmacrop (transgenic) tobacco on contract. Sources working with transgenic tobacco say that safeguards against cross-pollination include removing flower stalks and conducting transgenic tobacco trials in counties that have not traditionally produced tobacco. China is a major source of transgenic tobacco seed.

This publication will focus on techniques appropriate to organic tobacco production. Resources for conventional production can be obtained through archived Cooperative Extension publications, USDA, and, of course, sources such as grower networks or processors that contract for production.

Quality factors are extremely important to the marketability of tobacco. High-quality leaves are high in carbohydrates and potash; low in nitrogen, fiber, calcium, and ash; and of uniform color. Surprisingly, moderate to low nicotine levels are preferred for high-quality tobacco, despite the fact that nicotine is the chemical responsible for the stimulating effect of tobacco use.

Factors affecting crop quality include soil type, fertilization, cultural practices, season, and climate. Current tobacco growing regions typically have an annual rainfall of 40 to 45 inches, though it is somewhat less in the Midwest. Summer rainfall and adequate humidity, especially in the fall, are major factors that delimit growing regions. Tobacco is unsuited to areas with high winds or with alkaline soils high in nitrogen. As a result, commercial production of tobacco in the United States is located almost entirely in regions east of the Mississippi River and the midwestern states that border it. Soil types within any region also affect tobacco quality. Light tobaccos with a fine texture, normally preferred for cigars and cigarettes, are typically grown on sandy loams with a moderate level of fertility. In contrast, heavy clay loams with high fertility produce heavy, coarse plants.

Tobacco Culture

The culture of tobacco can be divided into several key areas: 1) transplant production; 2) field growing; 3) harvest; 4) curing; and 5) marketing. (Marketing tobacco since 2003 has been covered in the Foreword.)

Transplant Production

Traditional Bed Preparation: Traditionally, tobacco is seeded into beds or cold frames, and then transplanted to the production field when plants reach a height

Tobacco Classes, Uses, and Producing Regions in the United States before 2003		
Class	**Common Uses**	**Principle Production Areas**
Flue-cured	Cigarettes, pipe and chewing tobacco, export	North and South Carolina, Virginia, Georgia, Florida
Fire-cured	Snuff plug wrappers, export	Virginia, Kentucky, Tennessee
Air-cured (includes burley, Maryland, & Green River)	Dark types of chewing tobacco, plug and export; Maryland for cigarettes and pipe and chewing tobacco	Kentucky, Tennessee, Ohio, Indiana, Maryland, Virginia, Missouri
Cigar Fillers	Cigars	Pennsylvania, Georgia, Florida, Ohio, Indiana
Cigar Binders	Cigars	Wisconsin, New York, Pennsylvania, Connecticut, Massachusetts, New Hampshire, Minnesota
Cigar Wrappers	Cigars	Connecticut, Massachusetts, New Hampshire, Georgia, Florida

of five to seven inches. Seedling beds are located on well-drained sites that have been well cleared of weeds and trash. Sloping beds on southern exposure produce the strongest transplants.

The soil is sterilized using chemicals on most conventional farms. Wood fires and steam may be used as alternatives. Soil solarization may be another option, though it is not specifically mentioned in the literature. A good introduction to sterilization is available from the University of California.(1) Unless some form of soil sterilization is employed, planting bed locations should be changed each year.

The seedling bed should be manured the previous fall, shallow-tilled, and planted to a cover crop if possible. This cover crop should be incorporated in early spring, well in advance of seeding. The seedling tobacco bed typically receives additional supplementary fertilization. Rates vary depending on the type of tobacco being grown. Flue-cured tobacco receives relatively high rates of fertilizer, while fire-cured, burley, dark, air-cured, and shade-grown cigar-wrapper types receive low rates. Medium rates of fertilizer are provided to other cigar types and to aromatic tobaccos.

Float Bed Transplant Production: An alternative system of seedling production using hydroponics is coming into wider use. Tobacco is seeded into Styrofoam trays with a soil-less potting mix. The trays are then floated on a bed of water. *Burley Tobacco: Float Bed Transplant Production*, by Stanley R. Holloway (3) provides an excellent description of this approach, including budgets.

In conventional float bed systems, soluble fertilizers are placed in the water solution for plant feeding. Organic growers might avoid the use of salt-based fertilizers through the use of soluble fish and seaweed products, and other materials suitable for organic hydroponics. Suppliers of liquid organic fertilizers often are found in the periodical *The Growing Edge* (4), which caters to hydroponic producers. For further information on liquid fertilizers and systems, see the ATTRA publication *Greenhouse and Hydroponic Vegetable Production Resources on the Internet* (Web only).

Sourcing tobacco seed

Contract producers customarily use seed supplied by the organization for which they are growing. Sources such as Workman Tobacco Seed Co. are now online (www.workmantobacco.com/Burley_Varieties_if.htm). Home growers may find it difficult to obtain seed, except through the network of other growers. For heirloom varieties, the Seed Savers Exchange 2008 Yearbook lists 13 types.(2)

Tobacco mosaic. Photo courtesy of www.ipmimages.org.

Blue mold. Photo courtesy of www.ipmimages.org.

Pests and Diseases in Seedling Beds: Tobacco mosaic, also called "calico" or "walloon," is a serious viral disease that often gets a head start in the seedling bed. Sterilization of the soil (by wood fire or steam, as mentioned above) is a first step in suppression, followed by common sanitation procedures like removing crop residues, washing hands, and restricting use of tobacco products when working with the seedlings. In the field, the spread of mosaic may be slowed by similar procedures, and by removing and destroying diseased plants and eliminating solanaceous (nightshade family) weeds.

One novel approach to controlling tobacco mosaic was reported in the Indian Journal *Honey Bee*. The journal stated that farmers in parts of India used skimmed milk as a treatment to prevent this disease. A solution of five liters of milk in 100 liters of water is sprayed about one month into the season.(5)

Bacterial diseases such as angular leaf spot (*Pseudomonas angulata*), also called "blackfire," and bacterial leaf spot (*P. tabaci*), also called "wildfire," can be problematic in seedling beds. Streptomycin and copper sprays have commonly been used in these instances.

Blue mold or downy mildew in tobacco is caused by the fungal organism *Peronospora tabacina*. Primarily confined to planting beds, the disease is a serious one that may cause complete loss of plants if not controlled. It is favored by wet warm weather, and winds easily scatter the spores over large areas.

Traditional cultural techniques to suppress blue mold include (3):

- Rotating the planting bed to a new location each year
- Selecting sites with good air and water drainage, sunny exposure, and no shade
- Sowing more bed space than is needed for the crop and compartmentalizing the planting—creating two to three smaller beds rather than one large one
- Sowing beds early
- Avoiding high plant densities
- Removing covers from plant beds frequently to admit sunlight and air
- Fertilizing and watering properly to assure vigorous plants
- Transplanting as early as conditions permit
- Soil sterilization
- Copper sprays

Cutworms are an occasional pest of tobacco in seedling beds. Removing weeds from around the bed area is a good prevention measure. *Bacillus thuringiensis* (Bt), formulated as a granular bait, may be used to control the pest. More information on cutworm control can be found in ATTRA's *Organic Field Corn Production.*

Flea beetles (*Epitrix spp.*) are often a pest in seedling beds. Bed sterilization, as well as burning or clearing vegetation around the beds, enhances control. Also, covering the beds with tobacco cloth or similar cover, with a minimum 25 strands per inch, will provide a suitable physical barrier. Historically, cryolite and 1% rotenone dusts have been used to control flea beetles. For further information, ask for ATTRA's *Flea Beetle: Organic Control Options.*

Field Growing

Rotations: Growing tobacco in a planned rotation with other crops is a good way to manage fertility and suppress many weeds, insect pests, and plant diseases—particularly black root rot (*Thielaviopsis basicola*), nematodes, and bacterial wilt (*Pseudomonas solanacearum*). Since the economic value of tobacco is very high, it is at the top of the pecking order with regard to planned rotations, and the welfare of other crops is of secondary concern.

As a rule, tobacco does very well following corn, cotton, and small-grain crops. Leaf quality usually is reduced following leguminous forage crops and cover crops because of excessive soil nitrogen and organic matter. Quality also has been observed to vary following legume crops of peanuts, crotolaria, soybeans, cowpeas, velvetbean, and lespedeza.

To control bacterial wilt, a four- or five-year rotation is suggested, avoiding susceptible crops such as tomatoes, peppers, and peanuts.

Tobacco does well on virgin soils and soils previously in grass or grass-legume sods. Wireworms (*Limonius spp.*) can, however, be a problem in sod soils and remain a significant pest to crops up to five years after the sod is broken.

Cultivation and Fertility: Good field preparation should include a well-prepared seedbed, free of clods and weeds. Transplants are set out in rows, which may vary from three to four feet in width, with plant spacing 18–36 inches apart in the row. Factors such as tobacco type and variety, soil type, and equipment determine the precise spacings used.

Supplementary fertilization using standard commercial fertilizers is the routine practice on conventionally managed farms. Nitrogen is managed carefully to avoid excessive growth and accumulation of nitrogen compounds in the leaves. Phosphate also is managed carefully, as excessive amounts in the leaves alter burning characteristics of the leaf. High potash levels, on the other hand, are desirable. Adequate soil potash is also important in suppressing angular leaf spot (*P. angulata*) and bacterial leaf spot (*P. tabaci*). Chlorine-based fertilizers, however, such as potassium chloride, cannot be used, as they too reduce burning quality of the tobacco. Supplementary fertilization commonly includes a source of magnesium. Inadequate levels of soil magnesium encourage incidence of a nutritional disorder called "sand drown." About 24–35 lbs/acre of soluble magnesium is considered adequate for most fields. Either dolomitic lime or sulfate of potash-magnesia is commonly used to supply magnesium in both conventional and organic cropping systems.

Soil pH should be maintained in the slightly acidic range (5.5–6.5) with an available calcium level five times that of magnesium.(6) At higher pH levels, the incidence of black root rot increases.

Manures have historically been used in tobacco production, with rates of supplementary fertilizers reduced accordingly. Dark tobacco, especially, responds well to fertilization by manures, though it is advisable that they be applied and incorporated the previous fall. Application of animal manures to flue-cured and other lighter tobaccos is much more risky. Dr. W.D. Smith of North Carolina State Cooperative Extension has advised that manures be used on corn and other crops in rotation, to minimize any possible side effects on the tobacco crop.(7) ATTRA provides additional guidelines for manure use in *Manures for Organic Crop Production.*

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Mechanical cultivation and hand hoeing are used for weed management. The additional labor costs for hoeing are justified by the high value of the crop. Deep cultivation is allowable shortly after transplanting, but may damage crop roots if continued into the season. Cultivation and hoeing have the additional value of breaking the soil crust, allowing proper air exchange and improving crop yield and quality. For further information on weed control strategies and options, please ask for ATTRA's *Principles of Sustainable Weed Management for Croplands.*

Topping and Suckering: When the tobacco crop is about half-grown, flower buds begin to appear. These flower heads are removed or "topped" to prevent seed formation, forcing the plant to focus on leaf production. The result is larger, thicker, darker leaves that mature more uniformly and contain more nicotine. Topping may be done by hand or with special machines that cut the flower heads and sacrifice a few leaves. Topping requires two or three trips over the field to catch all the plants.

Topping of plants also stimulates the growth of secondary stems from the base and/or leaf axils. These "suckers" must also be removed to assure uniformity and quality. While chemicals are available to suppress suckering, these may not be allowable under organic certification standards. The alternative is removal by hand every seven to ten days. Suckering is one of the most labor-intensive activities in tobacco production, as many plants sucker two or three times before harvest.

Insect Pests and Diseases in the Field: Tobacco has a number of insect pests. Among the most threatening of these are two species of hornworm: the tomato hornworm (*Manduca quinquemaculata*) and the tobacco hornworm (*Protoparce sexta*). Hornworm caterpillars are large and easily recognized. Considerable control can be achieved by hand picking in conjunction with other labor-intensive field operations. Post-harvest tillage operations to destroy and bury residues are one means of destroying many of

Adult tomato hornworm. Courtesy of Jim Occi, BugPics, **www.Bugwood.org.**

Tobacco hornworm larva. Photo courtesy of **www.ipmimages.org.**

Adult tobacco hornworm. Photo courtesy of **www.ipmimages.org.**

the overwintering pupae. Destruction of residues is also a means of controlling flea beetles.

Populations of hornworms often are kept in check by parasitic braconid wasps and other beneficial insects. Parasitized worms are readily recognized by the presence of small white cocoons arrayed along their backs. If the majority of worms found are parasitized, further control measures should be avoided, if possible, to allow the parasites to hatch and continue working.

Tobacco also is attacked by the tobacco budworm (*Heliothis virescens*). Populations of this pest are suppressed through fall management of crop residues. Both budworms and hornworms are lepidopterous pests, vulnerable to formulations of the biopesticide *Bacillus thuringiensis* (Bt). To be truly effective, however, treatments must be made when the worms are small.

Harvesting

There are two primary harvesting methods: *priming* and *stalk-cutting*. Priming entails the picking of individual leaves as they come into their prime. Usually five to six pickings are required at five to ten-day intervals to complete harvest. Leaves may be strung on special sticks or handled in loose bulk form for curing. Priming usually results in higher total yields than stalk-cutting. It is used in the harvest of flue-cured types, shade-grown cigar wrappers, and several other cigar-tobacco types.

Stalk-cutting of tobacco is done by cutting the stalk at the base. In the case of burley and fire-cured types, the stalk is often split to hasten drying and to facilitate placement on wooden laths for curing.

Curing

Curing is the process of drying, chlorophyll decomposition, and other natural chemical changes that result in the desired tobacco product. Proper curing is essential to quality. There are three primary forms of barn curing: *air curing*, *flue curing*, and *fire curing*.

All curing takes place in large, tight barns in which temperature and humidity are carefully controlled, usually through the use of ventilation and artificial heat. Air curing requires from four to eight weeks. Flue curing entails the use of higher temperatures in the early stages of curing, which results in a lighter color. Fire curing utilizes natural drying for the first three to five days, followed by the use of hardwood fires for higher-temperature drying, and to impart a characteristic odor and taste to the tobacco. Chewing-plug and snuff tobaccos are commonly fire-cured.

Preparing tobacco to dry in a drying barn. Photo courtesy of USDA.

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2) Seed Savers Exchange. Decorah, IA. *www.seedsavers.org* (Access to the Yearbook is by subscription. ATTRA can provide some information on individual listings.)

3) Holloway, Stanley R. 1996. Burley Tobacco: Float Bed Transplant Production. North Carolina Cooperative Extension. Raleigh, NC. 38 p.

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Wechsler, Debbie. 1999. Raising organic tobacco. Carolina Farm Stewardship Ass'n Journal. Vol. 19, No. 2. p. 1.

Whitty, E.B. 2005. Growing Tobacco in the Home Garden. Florida Ext. *http://edis.ifas.ufl.edu/AA260*

Wilson, Gilbert L. 1987. Buffalo Bird Woman's Garden. Minnesota Historical Society Press, St. Paul, MN. 152 p.
A sequel to this book has recently been published. Also, J.L. Hudson lists two additional titles of interest: Tobacco among the Karuk Indians of California (1929) and The Tobacco Society of the Crow Indians (1919).

Note: University libraries designated as U.S. Government Document Repositories also have Farmers' Bulletins archived.

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