

# NC Good Agricultural Practices (GAP) For Tobacco

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**NC STATE UNIVERSITY**



North Carolina Department of Agriculture & Consumer Services, (NCDA&CS), Commissioner Steve Troxler led a tobacco industry round table discussion on May 25, 2010. The round table participants discussed the interest in creating a North Carolina Tobacco Good Agricultural Practice (GAP) guideline document for tobacco. There was unanimous agreement by meeting attendees to move forward under the auspices of the NCDA&CS.

Creating a NC Tobacco GAP guideline program is expected to enhance the competitiveness of NC grown tobacco using sound practices. These practices will give purchasers more reliability that our tobacco is being grown in a sustainable manner using economical and environmentally friendly procedures. The NC Tobacco GAP guidelines can be used in a proactive way to inform tobacco purchasers that NC tobacco producers are committed to continually growing the best tobacco in the world.

Participants at the July 14, 2010 follow up meeting included a broad based representation from NC State University, NC Farm Bureau, NC Grange, NC Department of Agriculture & Consumer Services, as well as representatives from the tobacco industry.

The task force used the CORESTA Good Agricultural Practices guideline as a template to tailor our version into a NC Tobacco GAP program. The committee has completed herein the NC Tobacco GAP guideline document.

The NC Tobacco GAP task force created a guideline that individual tobacco purchasers can use. The next step is to have an educational component administered by the NC Cooperative Extension Service that educates growers about all aspects of a NC Tobacco GAP program.

## **GOOD AGRICULTURAL PRACTICES**

**The concept of Good Agricultural Practice (GAP) aims at ensuring sustainable, economically viable production of tobacco with high usability and can be defined as: "Agricultural Practices which produce a quality leaf while protecting, sustaining or enhancing the environment with regard to soil, water, air, animal and plant life, and well being of those who produce the crop. At the same time, GAP must ensure economic viability for the farmer and a safe working environment for those directly involved in the production of the crop. "**

Today, increasing attention is focused upon the impact farming practices are having on the environment and there is an increasing emphasis on more sustainable methods of crop production. Systems need to be adopted that are more sensitive to environmental issues, genetic diversity, wildlife and their habitats. Furthermore, consumers around the world are becoming more sophisticated and critical than in the past, demanding to know how and what has been used to produce their agriculturally derived products.

The same is true for the tobacco industry and all the partners in the supply chain. Farmers, extension workers, leaf merchants, manufacturers and other associated agricultural based industries, have an important part to play in carrying our industry forward. Progress has already been made in several areas to ensure that the tobacco crop not only supplies a raw material of the right quality at a competitive price but that it is produced in a responsible way which safeguards the environment, natural resources, and protects the well being of those who produce the crop.

**The North Carolina Good Agricultural Practices Program includes the following core principles:**

- I. Soil and Water Management**
- II. Variety Integrity / Selection**
- III. Crop Management**
- IV. Integrated Pest Management**
- V. Agrochemical Management**
- VI. Curing and Barn Management**
- VII. On-Farm Tobacco Storage**
- VII. Non-Tobacco Related Material (NTRM) / Foreign Matter**
- IX. Farmer Training**
- X. Farm Labor Regulation**

## **SOIL AND WATER MANAGEMENT**

### **Soil Management**

Soil and Water Management is currently regulated by the United States Department of Agriculture, National Resources Conservation Service for all farms. Follow all details of farm management plan.

### **Guiding Principles and Practices**

Soil should be regarded as a dynamic, living and fragile resource.

- Criteria for site selection should be established taking into consideration:
  - Soil type, depth and fertility
  - Slope
  - Cropping history i.e. rotation
  - Drainage, etc.
- Growing tobacco in steeply sloping areas, unless terraced, should be avoided; these areas may be more suited to tree planting and conservation cropping.
- Contour planting and conservation practices and devices, such as terraces, strip planting, should be implemented; taking into consideration that they are fundamental practices which:
  - Act as barriers to runoff
  - Promote vertical infiltration of water and more efficient retention of soil
  - Reduce soil movement and erosion
- Soil nutrient status and fertilizer and lime requirements should be determined by routine soil analysis in the fall of the year prior to each tobacco crop. Soil fertility should be maintained by:
  - Focusing on cover crop management
  - Rotation crops and management
  - Applying the correct type and amount of nutrients required for the crop at the appropriate time
  - Mulching and no or minimum till systems should be implemented where feasible

## **Water Management**

Water is a limited resource and its maintenance is important in sustaining proper plant development.

- Safeguard water supplies by:
  - Protecting irrigation water sources by not mixing or applying agrochemical near surface water or water ways
  - Not allowing fertilizers or agrochemicals to enter water ways
  - Avoiding wastage of water
- Not allowing fertilized water from greenhouse seedling float production and other sources to contaminate water supplies. Evaporate residual water at the end of the seedling production season.
- Minimize water pollution (by fertilizers, agrochemicals, fossil fuels, oil, etc.).
- Follow all State and Federal Environmental Protection Agency labeled requirements

## **II. VARIETY INTEGRITY AND SELECTION**

Variety forms the foundation for a successful crop from an agronomic, environmental, quality and economic perspective.

### **Guiding Principles and Practices**

- Only plant varieties approved by the minimum standards program
- Choose varieties based on quality, yield and disease resistance.
- Bio-safety and crop identity preservation practices should be strictly followed in order to prevent mingling with genetically modified (GM) crops. Follow NCDA&CS and EPA regulations for producing tobacco.

## **III. CROP MANAGEMENT**

Crop Management forms the framework of tobacco production and requires the implementation of acceptable agronomic and environmentally sound practices from planning to post harvest to achieve the production of the type and style of tobacco leaf desired.

### **Guiding Principles and Practices**

- Seedlings should be:
  - Produced from varieties approved by the minimum standards program for variety release
- Fertilization should be:
  - Based on the results as determined by routine soil analysis in the fall of the year prior to each tobacco crop
  - Applied at the correct time and placement
  - With fertilizers approved for use in tobacco production

## **IV. INTEGRATED PEST MANAGEMENT**

Integrated Pest Management (IPM) is a systematic approach to crop protection that utilizes information to make better pest management decisions, with an emphasis on integrating all available practices. IPM does not mean completely eliminating agrochemicals, but rather their appropriate use as a defense against pests and diseases whose population cannot be maintained at acceptable levels using other alternatives. Where agrochemicals have to be applied they should be used safely and in accordance with all State and Federal laws and regulations and applied at the appropriate threshold.

### **Guiding Principles and Practices**

- Integrated Pest Management fundamentals:
  - Rotate tobacco with other crops that suppress tobacco pests and ensure a tobacco-free period between tobacco crops
  - Maintain accurate field records for all crops that include information on the field history, soil analysis, and pests, diseases, and weed monitoring sheets
  - Monitor and survey future tobacco fields for possible diseases, weed population, and production practices and review field records prior to tobacco planting

- Collect soil and root samples for nematode identification and population determination to determine management practices
  - Use resistant varieties where appropriate
  - Use disease and pest free seedlings that are uniform and healthy
  - Promote the proliferation of natural pest predators and destroy alternative host plants
  - Avoid possible transfer of infection from tobacco products, waste tobacco materials or infected soil by maintaining strict hygiene in seedling production area and during the early stages of field crop production
  - Clean or sterilize implements used in the production of seedlings and the crop regularly
  - Destroy seedling production area as soon as possible after their respective productive cycles are completed
  - Destroy all waste tobacco material, such as scrap, at the end of each cropping cycle
- Integrated Pest Management control fundamentals:
    - Accurately identify pests
    - Know all aspects of the pest, such as life cycle, habits, damage caused to tobacco, presence or absence of natural predators
    - Monitor or scout frequently and systematically for infestation by pests
    - Follow economic threshold levels for each pest to determine the appropriate level of action based on effective control measures
  - Integrated Pest Management chemical & biological control fundamentals:
    - Use only those agrochemicals and biological agents registered and EPA approved for tobacco for the particular pest problem, adhering strictly to label instructions and complying with all regulations and guidelines
    - Maintain accurate records on all agrochemical applications including the active ingredient or product selected, amount applied, and the date of application
    - Multiple control practices, methods and approved products should be utilized, only when needed, to avoid the development of pest and pathogen resistance to agrochemicals or other crop protection agents

## V. AGROCHEMICAL MANAGEMENT

Agrochemical use is often necessary in the production of tobacco. Agrochemicals should be used only after all other practical alternative pest, weed, and disease management measures have been utilized. Agrochemical use should be minimized and be in accordance with IPM principles and with a view towards environmental acceptability and worker protection. Sound agrochemical management programs address the importance of legal, safe, and environmentally responsible agrochemical selection, handling, application, storage and disposal.

### Guiding Principles and Practices

- Guidelines and training programs for growers should be developed on the safe use of agrochemicals to protect all forms of life, the farmers' communities, and the environment. These guidelines should include:
  - The use of agrochemicals according to IPM fundamentals

- Follow all aspects of the label instructions such as: safe application methods, the use of personal protective equipment (PPE), mixing, handling, observe all re-entry and harvest interval time frames, storage requirements, correct disposal of containers and residual spray solution,
  - Relevant legislation, hazards and risks posed by agrochemicals, safe working practices, emergency and accident action plans, health surveillance and record keeping
  - Prohibition of eating, drinking or using tobacco products while handling, mixing or applying agrochemicals
  - Prohibition of mixing and applying agrochemicals near open water ways or water sources
- Key principals and practices on the use of agrochemicals:
    - Adhere to all legal requirements when using agrochemicals
    - Follow application methods, post entry, and pre harvest intervals as stated on the product label
    - Address applicator safety and adequate training before handling or applying any agrochemical
    - If used, fully consider the product choice and application in relation to the IPM strategy, worker safety, and the environment
    - Apply crop production agrochemicals only when crop monitoring indicates that the economic threshold level has been reached
    - Minimize agrochemical use in terms of volume and range through targeted application and spot treatments.
    - Minimize and, if possible, avoid any negative impact on the environment
    - Wear appropriate protective clothing as stipulated on the product label when handling, mixing and applying agrochemicals
- In the selection of agrochemicals, it is important that:
    - The approved product selected is the least toxic and least persistent available and is as safe as possible to humans, wildlife and the environment while providing effective management of the pest, disease or weed problem
    - It has been selected to suit the situation and is not harmful to natural predators of the pests and trap crops
    - It is specific in mode of action and not broad spectrum
- In the specific use of Maleic Hydrazide, it is important that:
    - It has been intensely managed and applied in a manner that results in the lowest residue levels possible
- Agrochemical storage:
    - Maintain and inspect all personnel protective equipment (PPE) issued to all individuals involved with the handling, storage and use of agricultural chemicals
    - Store agrochemicals in facilities that are designed and designated for that purpose, and well away from wrapping materials and leaf, combustibles and anything that could serve as an ignition source
    - Store all agrochemicals as recommended on the Material Safety Data Sheets (MSDS), pesticide product labeling, and in accordance with pesticide storage rules under 02 NCAC 09L.1900, to ensure that the physical conditions of the store are appropriate. Concerns to be examined include: flash points,

maximum safe storage temperature, humidity restrictions (caking of granules, corrosion of containers)

- Identify all products designated as flammable or reactive and isolate these agrochemicals
  - Keep all agrochemicals well away from any fire hazard or flammable materials
  - Secure all storage areas to prevent unauthorized access especially by children, straying farm animals and wildlife. Clearly display appropriate warning and danger signs to prevent accidents
  - Ensure that the construction and maintenance of the storage structure and its contents will prevent contamination of water sources from the contents
  - Ensure that there is a means for containing spilled or washed-down material within the storage area - e.g. a containment area – and sufficient absorbent material for spill containment. Floors should slope away from the entrances
  - Store agrochemicals in original manufacturer's labels. If the original label becomes misplaced record the EPA Registration Number, Brand Name, active ingredient and their percentages, use classification on the label and signal word. Any partially used containers must be closed firmly. Never store agrochemicals in any container designed to hold food, feed, beverages, or medicine
  - Develop and maintain an emergency action plan to deal with unforeseen circumstances such as accidental spills, fires and flooding. Additional information on pesticide storage and disposal requirements can be found at <http://www.agr.state.nc.us/SPCAP/pesticides/Cmfo.htm#PesticideDisposal>
  - Keep inventory of stocks, MSDS and specimen labels outside the storage area and ensure that they are available to the emergency services
  - Keep to a minimum the amount of agrochemicals in storage by only purchasing what is required
- Agrochemical disposal:
- The correct disposal of unwanted concentrated products and empty containers is an essential part of safeguarding human health and the environment
  - Prohibited disposal procedures for any pesticide or pesticide container includes open dumping, open burning, water dumping, ocean dumping, and any violation of disposal requirements on the pesticide product labeling
  - When purchasing large volumes of chemicals, the contract should include the right to return to the supplier unused stocks contained in the original unopened container within an agreed period
  - In the disposal of old stocks, the containers should be in sound condition prior to dispatch for disposal
  - All empty containers must be rinsed at least three times, pressure rinsed or equivalent before disposal and rendered non-reusable (e.g. punctured). Empty agricultural pesticide containers should be recycled at sites that accept properly rinsed containers
  - It should be determined whether the supplier or manufacturer, or your local government has a pesticide container recycling program. General recycling programs should not be used for pesticide containers
  - An empty non-refillable pesticide container should not be used to store anything other than the original pesticide product that is listed on the label
  - Information on pesticide disposal assistance for Farmers can be found at <http://www.agr.state.nc.us/SPCAP/pesticides/PDAP/>
  - Agrochemical rinse water should be added to the original spray solution and applied to the crop

- Unwanted concentrated synthetic agrochemicals should not be disposed of by burning, burying, pouring into storm drains, sewer systems or any kind of water way

## VI. CURING AND BARN MANAGEMENT

Proper curing and barn management is critical for maximizing both yield and quality and, therefore, crop value. Curing tobacco is the culmination of all previous steps taken to produce and maintain the crop. Quality can decline with improper curing, or be maintained and realized when curing is performed correctly.

### Guiding Principles and Practices

- Curing barns should be inspected on a regular basis for cracked or leaking heat exchangers and repaired if necessary
- Curing barn design should consider:
  - Incorporate the most efficient furnaces available
  - Furnaces that provide indirect heat and prevent combustion gases from entering the curing chamber
  - Using hygrometers to either automatically or manually control relative humidity in flue curing to avoid wasting fuel and to optimize leaf quality and yield
- Curing fuels:
  - Conserve fuel by uniformly loading and employing the most energy efficient curing structures and heating equipment. Balancing barn capacity with its capability to cure efficiently and curing by the technique that optimizes output while maintaining the desired cured leaf quality

## VII. ON-FARM TOBACCO STORAGE

On-farm storage is often necessary to hold tobacco from the time it has completed curing, through grading and baling, until it is ready to be marketed. Correct tobacco leaf conditions are required to avoid deterioration in quality and loss of yield. The facility should provide safe and secure storage for the tobacco.

### Guiding Principles and Practices

- Tobacco for storage should:
  - Be stored at the correct moisture and density
  - Be free of any Non-Tobacco Related Materials (NTRM), contamination or infestation
  - Be regularly inspected for insect infestation and deterioration in quality
  - Not have any agrochemical product applied post harvest
- Storage facilities should:
  - Be clean, dry and properly ventilated structures that are free of NTRM and constructed of an appropriate material that has not been treated or contaminated by chemicals that could transfer to the tobacco
  - Have doors that are tight fitting and securable

- Have windows and other openings that are sealable and ventilation openings covered with screen-wire, or other materials, to prevent insect and pest entry
- Be monitored and inspected for leaks, damage, and insect infestation
- Not be used for agrochemical or other products that could contaminate the tobacco
- Have good site hygiene and sanitation, with the removal of all tobacco scrap and by-products within and surrounding the area storage facility
- Chemical and fumigation controls are generally not recommended for on-farm storage. This should only be done in accordance with all laws and by specially trained applicators

## VIII. NON-TOBACCO RELATED MATERIALS (NTRM) / FOREIGN MATTER

NTRM or foreign matter is a broad term that refers to all materials that are not tobacco lamina and stem. This includes, but is not limited to: soil particles, paper, string, metal fragments, tobacco stalks and suckers, plastics, foam materials, wood, grasses, weeds, oils. Providing a product that is free of all forms of NTRM is a critical aspect of GAP that begins at the farm level with elimination of NTRM sources and physical removal of all NTRM materials during on-farm tobacco handling and storage and subsequent operations in the supply chain.

### Guiding Principles and Practices

- Provide training and increase awareness on NTRM issues and the importance of clean tobacco throughout the production and marketing cycle
- Develop a proactive program to eliminate and avoid any tobacco contamination and insect infestation sources on the farm
- Remove all forms of NTRM from tobacco handling, curing, and storage areas
- Inspect all facilities, machinery and equipment for NTRM contamination
- Follow Crop Management Practices to manage weeds and grasses in the field
- Monitor and inspect farmer facilities and bales for NTRM throughout the production and marketing cycle
- On-Farm inspection and monitoring checklist facilitates rapid assessment of potential NTRM contamination. Farm level NTRM checklists often include:
  - Focus upon the individual stages of the production cycle (e.g. greenhouse seedling production area, field, harvesting, curing, grading, baling etc.)
  - Specific items to be inspected for each stage of production
  - Inspection items for all tobacco handling areas, facilities, equipment, and storages
  - General farm sanitation and cleanliness components
  - A review of all materials and products used in tobacco production, handling, curing, and storage

## IX. FARMER TRAINING

Producer training is one of the most important elements of any GAP program. It provides an opportunity to update farmers on the latest technology and crop advancements, and address the value of GAP.

## Guiding Principles and Practices

- A GAP training program should:
  - Provide continuous training and education in all the elements of GAP to ensure that everyone involved in the crop is aware of its importance
  - Address legal requirements, industry expectations, safe working conditions, proper agrochemical handling, application, storage and disposal, variety integrity, soil and water management, crop management, IPM, NTRM, curing and barn management, on-farm proper tobacco handling, grading, baling and storage

## X. FARM LABOR REGULATIONS

Farm Labor Regulation issues consist of items that are both directly and indirectly linked to tobacco production. Cost effective production of a high yielding and excellent quality crop improves the farmer's profitability and is directly connected to tobacco production. Follow all Grower labor requirements and requirements in the Worker Protection Standard and all other State and Federal Labor laws.

## GAP PROGRAM EVALUATION AND ACTION PLANS

Several GAP programs, currently implemented within the industry, have some form of evaluation to gauge the current adherence to GAP principles and practices and to measure improvement in GAP over time. Whether a percentage of compliance or point/level scale is used is a matter of buyer preference. The important aspect is that a quantifiable measurement is in place to better understand the implementation and commitment to GAP principles within an organization and/or specific origin.

Likewise, several GAP programs have sections for the development of action plans to chart the future plan for improvement in the area of GAP. The choice of terminology for such action plans, their duration or the time frame they cover is also a matter of buyer preference.

## GAP PROGRAM EVALUATION AND ACTION PLANS

The following list contains web sites and links and contact details for various GAP related information.

<http://www.coresta.org>

<http://www.nagcat.org/categories.htm>

<http://www.ctic.purdue.edu/CTIC/CTIC.html>

<http://www.cdms.net/pfa/LUpdateMsg.asp>

<http://www.fao.org/>

<http://www.nsc.org/issues/agrisafe.htm>

<http://www.nrcs.usda.gov/>

<http://lwf.ncdc.noaa.gov/oa/ncdc.html>

<http://www.aosca.org/oecd/index.htm>

<http://www.ppi-ppic.org/>

<http://www.state.tn.us/agriculture/regulate/aip/wastes.html>

<http://www.tfi.org/index.asp>

<http://water.usgs.gov/nawqa/>

<http://www.weedscience.org/in.asp>

<http://www.ncagr.com/>

<http://water.dnr.state.sc.us/water/envaff/river/rivmap.html>

[http://h2o.enr.state.nc.us/basinwide/what\\_is\\_basinwide\\_planning.htm](http://h2o.enr.state.nc.us/basinwide/what_is_basinwide_planning.htm)

<http://www.ams.usda.gov/tob/>

<http://www.fsa.usda.gov/pas/>

<http://www.gpoaccess.gov/fr/index.html>

<http://www.ers.usda.gov/publications/so/view.asp?f=specialty/tbs-bb/>

<http://www.ipmcenters.org/>

<http://www.usda.gov/>

[http://www.kyagr.com/enviro\\_out/pesticide/index.htm](http://www.kyagr.com/enviro_out/pesticide/index.htm)

[http://www.agr.state.ga.us/html/pesticide\\_recycling.html](http://www.agr.state.ga.us/html/pesticide_recycling.html)

<http://entweb.clemson.edu/pesticid/saftyed/rnsequip.htm>

<http://www.clemson.edu/peedeerec/Tobacco/default.htm> (Clemson University)

<http://tgi.ncsu.edu/> (NCSU Tobacco Genome Initiative)

<http://www.ces.ncsu.edu/resources/crops/tobacco/flue.shtml> (NCSA Flue-cured tobacco)

<http://www.ces.ncsu.edu/resources/crops/tobacco/burley.shtml> (NCSA Burley tobacco)

<http://tobaccoinfo.utk.edu/> (University of Tennessee)

<http://www.griffin.peachnet.edu/caes/tobacco/> (University of Georgia)

<http://www.uky.edu/Ag/Tobacco/> (University of Kentucky)

[http://edis.ifas.ufl.edu/TOPIC\\_Tobacco](http://edis.ifas.ufl.edu/TOPIC_Tobacco) (University of Florida)

<http://www.ext.vt.edu/cgi-bin/WebObjects/Docs.woa/wa/getcat?cat=ir-cg-cr-to-Virginia Tech>