Small Farms Field Day
Thursday, July 6
The Fifth Annual Small Farms Field Day
Thursday, July 6, 2006

School of Agriculture and Environmental Sciences
N.C. A&T State University
University Farm

8 a.m. – Registration
8:30 a.m. – Welcome

Dr. Alton Thompson, Dean
School of Agriculture and Environmental Sciences, N.C. A&T

8:45 a.m. – Load buses and vans

9 a.m. – Tours begin
Each tour will rotate at 10:30 a.m.

TOUR A
- Label Rouge Chickens
- Goat Health
- New Pasture Based Dairy

TOUR B
- No-till, Cover-Cropped Pumpkin Production: Effects on Soil Quality
- High Tunnel Organic Tomatoes
- Asian Vegetables

Lunch available for purchase on site
Tillage, Cover Cropping and Compost for Improved Soil Quality under Vegetable Production


OBJECTIVE – This field experiment is evaluating the effects of tillage, winter cover cropping and the use of compost on soil physical, chemical and biological properties. These properties are being used to assess changes in soil quality. The ultimate goal is to identify a best management practice that proves to be highly effective at improving soil properties and therefore soil function and health.

OPPORTUNITY – Soil organic matter content continues to decline in farm fields in North Carolina, and that decline is reflected in degradation of soil quality. Intensive tillage and low organic matter inputs are major factors that have contributed to this degradation. The adoption of best management practices and the use of soil amendments will restore these soils back to acceptable productivity levels. Research is needed in this region to determine restoration techniques and to determine how to best make a transition from conventional management to low input sustainable management.

METHODS – The experimental treatments are structured as combinations of tillage levels (disk tillage or no tillage), cover crop levels (planting of a winter cover crop or no cover crop planted), and compost levels (compost added or no compost added). Compost is applied at a 5 tons-per-acre rate in the fall. Following this application, a crimson clover and Abruzzi rye bi-culture is planted and mechanically killed each spring prior to tillage and planting of the summer crops of pumpkins or butternut squash.

RESULTS – Changes in soil properties have occurred between tillage practices, compost levels and cover crop levels. Aggregate stability, soil water retention, microbial activity and soil water content were greater in no tillage than in disk tillage. Using compost increased the total carbon and cation exchange capacity for soil. Cover crop residue increased the infiltration of rain water and the soil’s ability to retain water. The mulching residue also reduced the amount of evaporation of water at the soil surface and suppressed weeds. These conditions improved yields and produced fruits of superior quality.

CONCLUSIONS – No tillage, the use of cover crops as a source of residue, and the use of compost as a soil amendment are all practices that should be considered in developing management plans for improving the quality of North Carolina soil. The combination of these three practices improved soil quality the most in this three-year study. The suppression of weeds is an additional benefit that was observed with the use of a cover crop, which ultimately resulted in a better crop yield. This study will continue to determine the long-term effects of these practices on soil quality and to determine the time required under these practices to maximize soil quality.
Asian Vegetables as Specialty Crops

RESEARCHERS – Drs. M.R. Reddy and W.A.R.N. Fernando

OBJECTIVE – This field study, conducted at the University Farm, will evaluate selected Asian vegetables for their yield and quality. It will also assess pest and disease incidences, optimize fertilizer usage, and test market the vegetables and develop technology transfer. The Asian vegetables with relatively high demand under evaluation are hot pepper, eggplant, long squash and ridged gourd (luffa). A promising variety from each vegetable is grown with cover crop amendment and different supplemental N fertilizer.

OPPORTUNITY – Specialty crops are an alternative for North Carolina farmers, particularly in light of declining tobacco production in the state. This specific crop production also coincides with an increasing demand for Asian vegetables due to the increasing Asian population in North Carolina. Most of these Asian vegetables that are consumed by the state population are currently produced and shipped from Florida. Asian vegetables have a great potential as a specialty crop to be grown within our own state. However, no information is available on the nutrient requirements and cultural practices of these vegetables under Piedmont conditions. Our study will attempt to resolve and answer these questions.

METHOD – Four Asian vegetables namely luffa, long squash, eggplant, and hot pepper are grown on raised beds. Drip irrigation and fertigation will be used to provide water and plant nutrients to the vegetables. During the project, soil and plant growth parameters will be monitored and evaluated. Pest and disease incidences will be recorded. Maturity, yield, and quality parameters will also be measured. Test marketing will be carried out at Asian specialty markets and at supermarkets. From the results, yield potentials of these vegetables will be determined under North Carolina conditions. Production technology, including cultural practices for these Asian vegetables, will be established to suit Piedmont conditions. Field demonstrations and tours on these specialty crops will be conducted at the A&T Farm for limited-resource farmers and others interested in alternative crops.

DISCUSSION – Vegetable crops require a high level of nutrients and have higher inorganic fertilizer requirements. It is important to utilize conservation practices such as winter cover crops as a means of reducing inorganic fertilizer use and thereby minimize the risk associated with nutrient losses to the environment. Fertigation practice will offer many advantages such as optimum use of inorganic fertilizers with a limited use of irrigation water. This is particularly important for enhancing soil and water quality. Fertigation also provides effective weed control, thus achieving an optimum plant nutrient utilization. This not only cuts down the cost of vegetable production but also helps to conserve our environment. The production technology and cultural practices for Asian vegetables developed in this study will benefit small-scale farmers who will produce Asian vegetables as a specialty crop in the Piedmont.
High Tunnel Organic Tomato Production Results in Early Harvest and High Prices

RESEARCHERS – Dr. Keith R. Baldwin and Rick Holness

OBJECTIVE – Limited-resource growers will increase farm income from direct market sales.

OPPORTUNITY – A high tunnel is a solar heated, manually vented, plastic-covered cold frame that is used to lengthen the traditional growing season for tomatoes and other horticulture crops. High tunnels can significantly increase the average daily temperature in the spring, speeding up maturity and providing harvestable fruit early in the season when field grown tomatoes are immature. Early season production commands a premium price, which increases the bottom line for producers. High tunnels protect plants from natural elements such as frosts, freezes and rain, as well as from insects and diseases. High tunnels do not require the same level of investment as greenhouses because they do not require electricity or heating. We are growing our tomatoes using organic methods because early, organic tomatoes provide a significant premium in the marketplace.

METHOD – At the University Farm, early maturing cultivars ‘Early Girl,’ ‘Oregon Spring,’ and ‘Early Wonder,’ along with the standard cultivar ‘Celebrity,’ were planted on March 29 in a high tunnel. Tomatoes were grown using organic production standards. The tomato crop was grown on black plastic-covered raised beds that were pulled up with a small bed shaper/mulch layer. The black plastic heats the soil, speeding root growth, and prevents weeds from emerging in the beds. The special mulch layer was purchased to be used by small-scale growers who own tractors without enough horsepower to pull standard models (<45 hp). (Contact county agents about training and use of this equipment.) Two mulch layers are available for use by growers as part of a project funded by the Tobacco Trust Fund. We planted additional beds of tomatoes in an adjacent plot outdoors at the same time. These tomatoes were planted a month earlier than they would normally be planted outdoors. We protected these tomatoes from frost by covering the plot with spun-bonded polypropylene row covers (medium-weight 1.2 oz/sq. yd) that were supported loosely over the crop row or canopy. Row covers were removed in mid-May. The soil was fertilized with chicken manure (3 tons per acre) and feather meal (1 ton per acre) before the beds were created. Additional side dressings of soluble organic fertilizer were supplied through the drip irrigation tubing, which is located along the row, underneath the plastic. Drip irrigation is essential to get water and nutrients to the crop, because both the plastic tunnel and the plastic mulch prevent rainfall from reaching crop roots.

DISCUSSION – The first harvest of fruit from the plants in the high tunnels occurred on June 6th. Harvestable fruit ripened in the outdoor plots on June 19th. Plants are compact with many clusters of clean, well-shaped fruit, except for ‘Early Wonder,’ which has a large percentage of misshapen fruit in the first two fruit clusters. In mid-June, aphids reached population thresholds that required treatment in the high tunnel, but not in the outdoor plots.
TOUR A
Label Rouge Chickens
Pasture-based Dairy
Goat Demonstration

TOUR B
Cover Crops & Soil Quality
Asian Vegetables
High Tunnel Tomatoes

LEE ST.
MCCONNELL ROAD
RESEARCHERS – Drs. Willie Willis and Keith R. Baldwin

OBJECTIVES – This trial evaluates the production performance of the Redbro Cou Nu (Red Feathered Naked Neck) chicken in a confined unit and on pasture with different placement densities. The poultry were fed organic and conventional feed.

OPPORTUNITY – There has been tremendous growth, recently, in organic, natural and such free range poultry as broilers, turkeys and layers, using the old heritage breeds. The Organic Trade Association says organic poultry is one of the fastest growing subcategories, expected to grow by about 33 percent each year through 2008. Of the many specialty poultry programs, the French Label Rouge Program is credited with producing the best poultry in the world. This program focuses on high-quality poultry, emphasizing attributes such as taste, culinary qualities (flavor and meat texture), free-range production and food safety. These are slow-growing hardy birds that eat an all grain diet with no animal products; that receive no medications, no growth stimulants, no fishmeal, and no artificial ingredients. As a result, Joyce Foods brought these chickens on board as an alternative to commercially raised chickens. This company extended the opportunity for these birds to be grown by small farmers who are more suited to handle alternative breeds for organic/natural production.

METHOD – This study will monitor 500 days of hatched Redbro Cou Nu chicks to compare indoor versus pastured production attributes. Chicks will be subjected to two placement densities (1.0 and 2.0 square feet per bird) in 5-foot by 12-foot pens with 60 and 30 birds, respectively, in a windowless house. The chicks are fed organic or conventional feed. Each placement density will be repeated four times, split with two organic and conventional feeds for each placement treatment. Two additional pens will house 72 chicks each, to be placed on pasture at three and six weeks, respectively.

DISCUSSION – High production costs remain the greatest challenge to moving specialty chicken production to the forefront. For organic feeds, providing organically grown grains and planning diets that meet regulation usually cost anywhere from $300 to $400 per ton. Those organic costs compare with conventional costs of $200 to $300. Many of the current breeds used for organic/natural production are less satisfactory for growers. Raising standard breeds under completely different production systems can result in major problems. The Redbro Cou Nu chicken has received high marks for health. Their strong immune systems help them do very well on pasture. Generating knowledge and experience of specialty chickens in free-range/pasture natural and organic production is essential in North Carolina and the nation, because many roads are headed in that direction. The modern day consumers are more health conscious than ever before. The results from this study will provide small farmers and businesses with information to fine tune their efforts to command profitability from this niche enterprise.
What is a Pasture-Based Dairy System?

RESEARCHER – Dr. Steve Washburn (N.C. State University)

OBJECTIVE – Pasture-based dairy production systems can be defined as land use and feed management systems that use the intake of forages directly harvested by grazing cows. The pasture-based system is in sharp contrast to confinement-based dairy systems for which all feeds and forages are brought to the cows. Pasture is also a critical part of organic dairy production systems.

OPPORTUNITY – North Carolina and the Southeastern United States are deficient in milk production and organic milk production. Pasture-based systems require less investment in facilities. Pasture-based dairy systems vary because landowner objectives, soil types, forage species, livestock genetics, land base and climatic conditions differ from farm to farm. Production methods and management practices vary among farms, within regions and across the continent.

METHODS – Characteristics for efficient, productive pasture-based dairy systems include those that optimize livestock performance, pasture quality, dry matter yield, and the efficiency of forage utilization. Lactating animals are introduced to pasture using a rotational stocking method where the whole herd grazes a fresh paddock at least every other day and leaves adequate forage stubble for optimal forage regrowth. Many dairy graziers provide fresh paddocks after each milking.

Lactating animals are stocked on pasture for at least 75 percent of the grazing season. Dry cows and heifers are grazed at least 90 percent of the grazing season. Lactating animals can obtain at least 50 percent of their forage through grazing. Dry cows and heifers obtain at least 90 percent of their forage through grazing.

The herd gets their water in the paddock where they are grazing or in the laneway near the paddock. Paddocks are sized to provide enough forage for adequate livestock intake during the stay while keeping adequate residual to maintain stand vigor and desired species composition. A back fence prohibits access to just-grazed paddocks while a front fence limits how much fresh grass that hasn’t been grazed is made available to the cows.

DISCUSSION – Adequate, stabilized laneways are provided to ease the movement between milk parlor and paddock. Fields are sized and laid out so that forage offered is enough to meet grazing herd demand for each period throughout the grazing season. Fields are also designed to ease mechanical harvest when it is needed to remove mature forage that exceeds herd demand during any rotation cycle. Because of nutrient recycling through urine and feces, pasture systems also greatly reduce the need for manure storage and handling.
Goat Health – Coccidiosis

RESEARCHERS – Drs. Mulumebet Worku and Ralph Noble, and Yaser Ahmed and Gary Summers

OBJECTIVE – To incorporate genetic elements into management of coccidiosis in goats.

OPPORTUNITY – Coccidiosis is a parasitic disease of the goat’s intestines, caused by microscopic one-celled organisms called coccidia. Goats are only infected by coccidia from other goats. For example, chicken coccidia cannot infect goats or vice versa. Goats consume coccidia eggs from pasture. Inside the goat, the infective stage of coccidia begins when they hatch from eggs and invade the gut. In 21 days, their life cycle is complete and they release eggs which are passed in the feces of the infected goat. On pasture, eggs need warm wet conditions for 24 to 48 hours, to become infective if eaten by a goat. Infective eggs survive in moist shaded areas even surviving freezing for up to one year. When a goat grazes, it eats infective eggs and the process starts over again. Adult goats can contain coccidia in their gut and still remain healthy. But, young, sick and stressed goats become sick more easily from coccidia and succumb to the disease coccidiosis. This happens most in contaminated environments or when animals are stressed. Hot and wet summers are ideal conditions for the development and transmission of coccidia. Stresses that can induce a coccidiosis outbreak include: weaning, drastic weather changes, rapid feed changes, transport and rough handling. Current approaches for control include banning goats from areas with large numbers of eggs, reducing stresses in the goat environment and using preventive drugs. Another approach we are investigating is whether goat genetics may help in selecting animals better able to withstand coccidia.

METHOD – Effective goat management practices at A&T’s Small Ruminant Research Unit that minimize outbreaks and rapid infection by coccidia include reducing stresses and boosting the goats’ resistance. Also, these small ruminants are on specially designed balanced diets with adequate amounts of protein, energy, minerals, vitamins and water. Goats are raised on ample pasture with low stocking rate. Raised clean feeders are used. Feeding and watering areas are arranged to minimize fecal contamination. Pens and stalls are exposed to sunlight whenever possible. Good sanitation is maintained by regular removal of droppings and by avoiding damp, shady areas as much as possible. Foot baths are used for boots to help minimize transmission. Routine culling is conducted to minimize overcrowding and exposure to unhealthy goats. Goats are handled in the coolest periods of the day as calmly and gently as possible. Coccidiostats drugs are used prior to periods when goats may become infected to prevent and control coccidiosis. Coccidiostats that are presently labeled for use in goats include monensin (Rumensin®)
and decoquinate (Deccox®). Research is being conducted on the identification of goat genes which control disease resistance against coccidiosis. We will develop new strategies for improving the genetic capacity of goats for enhanced resistance to coccidiosis to aid in management of goat coccidiosis.

**DISCUSSION** – Coccidiosis is a potentially fatal and economically significant disease of goats caused by an intestinal protozoan. Next to intestinal worms, coccidia are probably the internal parasite problem encountered most frequently. There are many species of coccidia that live in the intestinal tract of goats. Some goats are more likely to get sick than others. Kids up to weaning age are most susceptible to coccidiosis. Good management practices are required to minimize the occurrence of coccidiosis. Controlling the disease involves an integrated parasite control program of management and strategic drug use. These tactics limit exposure of goats to infective eggs and minimize stress. Your local veterinarian should also be involved in your strategy. A&T researchers will incorporate genetic selection and biotechnology to identify genes which control disease resistance against coccidiosis in goats. The results of that research will enhance our understanding of how genetics are involved in controlling and responding to coccidiosis. This research will also help in the development of DNA markers for selection of breeding stocks.
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