The Center for Environmental Farming Systems

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The Art of Farming

Rooted strong on a hillside
or as a gnarled shadow
on windswept fields
the wild fig tree's
dry leaves
whistle November:
but on the sheltered side
fat leaves, bursting
declare April

from *The Land*

By Dorothy Livesay

From the Director

We have made a lot of progress on many fronts, even though the fields are relatively quiet. On January 31 and February 1 we held a planning retreat that is the start of a refocusing effort for many of our initiatives. As CEFS has developed, both our needs and capacity have changed. We are poised to expand our outreach and programming and to refine our ongoing activities to match our evolving vision and needs. The retreat focused on *curriculum-based educational initiatives, small farm programming, and the organic unit.* All are growth areas for us. Committees have formed around these three areas and will meet over the next few months to develop program priorities and infrastructure needs. A second one-day retreat will be held on May 1. In the interim, it was agreed that the area referred to as the student farm or small farm will be called Little River Farm. The Little River Farm will continue to be integrated into various CEFS programs as appropriate.

We were fortunate to have several CEFS faculty (Schroeder, Mueller, O'Sullivan, Baldwin, and Creamer) attend the first annual Sustainable Agriculture Educators Conference near Monterey, California the end of January, which provided helpful insight for our planning process. There was good discussion about student farms and undergraduate and graduate curricula. It was exciting to see the growth in student farms and University degree programs that have emerged in recent years. In addition to strong land-grant programs, there are several noteworthy programs at small non-agriculture colleges across the country.

As mentioned in the last CEFS newsletter, CEFS has received a grant from the Institute of Conservation Leadership and the Council of Agriculture, Science, and Technology (CAST) with CFSA, RAFI, and NC Farm Bureau. The grant is to help facilitate a dialogue between conventional and sustainable agriculture groups in the state. Our goal is to bring together various agriculture groups to identify and discuss areas of mutual concern and determine if there is enough common ground to work together on various issues important for North Carolina's agriculture future. The project will host a full day meeting on March 17 in the Farm Bureau office building. One of the issues we will discuss is energy and the impact rising fossil fuel prices are likely to have on North Carolina's agriculture. Simon Rich, former CEO of Louis Dreyfus Holding Company (an agriculture and energy commodity merchant) will provide a keynote address at the meeting. Stay tuned for developments from this project.

A cooperative agroforestry project is being formulated that includes several faculty in forestry (Dr. Fred Cubbage, contact), CEFS faculty, NCDA & CS, and NRCS. A proposal is currently in preparation to develop a long-term research and demonstration project examining the biological, economic, and social opportunities for agroforestry/ silvopasture research at CEFS. This will involve evaluating opportunities in a number of related projects, including establishment of new tree and pasture systems; grazing of goats in existing, thinned timber stands; culture of pecan trees; or use of goats to thin hardwood tree regeneration.

We are in full swing with programming plans for our *Seasons of Sustainable Agriculture: Celebrating 10 years of programming at CEFS.* The series of events will kick-off with the dedication of the new swine unit on May 9. Fred Kirschenmann, Distinguished Fellow at the Leopold Center for Sustainable Agriculture, will give the keynote address at the dedication and there will be a half-day educational workshop on alternative swine production systems following the dedication. Please see the listing of the other educational events on tap on the last page of this newsletter and plan to attend!

- Dr. Nancy Creamer, Director

NC A&T Updates

Steve Moore joined the NCA&TSU staff at CEFS in late autumn. He comes from the northeast with twenty-five years of farming experience. His interests include successful sustainable and organic small farm production and marketing and sustainable energy issues. He has experience in those areas as well as small farm research. He joins Bryan Green and is already beginning to bring his expertise to questions of winter planting as well as beginning to learn about the production environment in eastern North Carolina.

Dr. Keith Baldwin, ANR Program Leader at NCA&TSU, Cooperative Extension Program in Greensboro, Trevella Free, Extension Associate with the Extension Program in Greensboro, and Steve Moore met with Wayne County Extension and other interested parties in mid December. They met to plan the beginning of an Agricultural Education program that will connect science teachers in the local school system with CEFS. The program will provide children with an outdoor learning lab at CEFS to observe agriculture and its impacts on the environment. Travella Free brings her experience in establishing and running a similar program at the NCA&TSU University Farm where she coordinates the visits of thousands of schoolchildren from Guilford County each year. The program should be running by April 2006.

NCA&TSU faculty and staff from Cooperative Extension and the School of Agriculture are actively involved in the planning process currently underway to create a Small Farm Outreach effort from CEFS. Building on new staff and the provision of other resources from NCA&TSU, CEFS partners (NCA&TSU, NCSU, NCDA&CS, CFSA, RAFI and others) can use CEFS as a springboard and pivot point to provide research- based information on sustainable agriculture production and marketing systems to small farmers in Eastern North Carolina. Stay tuned as this process becomes more clearly defined.

- Dr. John O'Sullivan, NCA&T Representative to CEFS

New Residents, New Roads, and New Signs on the Farm

If you have not visited the CEFS farm recently, there are many new sites to see. The contractor is in the process of completing construction on the fourth swine feeder/ finishing hoop house and a bedding storage hoop. Three feeder/finishing units and a gestating house have already been completed. Ten sows and fourteen gilts are in the gestation house with plans for breeding in February. There are also 12 young gilts being developed as replacements. Thirty farrowing pens were purchased from a producer in Minnesota. These pens, which sows can freely enter and leave, will be removed from the house after the pigs have been weaned. The sows will then be returned to the gestating house, and the pigs will be finished in the hoop house. We also have plans to construct an office for the swine unit staff.

The farm staff has also been working on developing composting strategies for the farm. We have been collaborating with the City of Goldsboro with a leaf-composting project, and we anticipate composting the hoop house bedding as part of our swine waste management strategy. Swine mortality composting as opposed to using an incinerator is another consideration we are investigating.

Several construction projects are also underway. The new entrance to the farm office and shop is near completion. The drive will replace the road along the railroad tracks providing a safer entrance. As peanut production has been dropped from the crop rotation, we have renovated the peanut dryer shelter into an enclosed storage building. Finally, NCDOT has installed a directional sign at the intersection of Hwy 117 and Hwy 581 for "Cherry Farm/CEFS," and there are plans to include an additional sign at the intersection of Hwy 70 and O'Berry Road

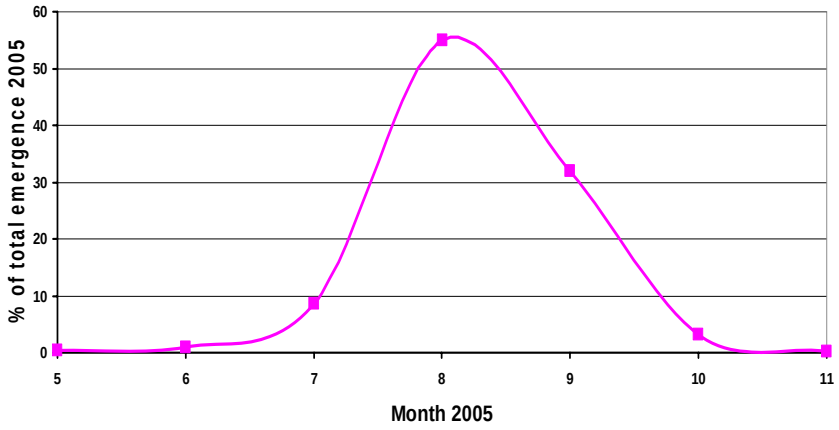
- Eddie Pitzer, Farm Superintendent

A look inside the hoop houses. Growing pigs in the finishing barn seem to be enjoying their deep bedding (left); sows in the gestation barn with feeding stalls (right).

Tropical Spiderwort Mapping in the FSRU

Those of you who were working on the farm this past season probably witnessed a group of people marching through a field with a bundle of flags on their belts and a yellow GPS receiver in hand. Well, that was my scouting crew and me. As you probably know, we were conducting a survey and eradication effort for tropical spiderwort - TSW (*Commelina benghalensis* L.).

TSW is a federally noxious annual weed. It has been reported in four southeastern states: Florida, Georgia, Alabama, and North Carolina. The species is resistant to glyphoshate, and the increased use of glyphosate and concurrent decrease in the use of other soil-applied herbicides have been implicated as contributors to the rapid spread of TSW. TSW was first identified at CEFS in 2001 and has since been found in other locations in North Carolina.



In spring 2005 we developed a survey and eradication plan that we followed throughout the growing season. According to that plan, all fields in the field systems research unit (FSRU) and field C2 (adjacent to Little River Farm) were surveyed on a grid system established using GPS software. We overlaid a grid of 15 m X 15 m cells over the entire farm. Throughout the summer (and into the fall), we recorded the number of emerged TSW plants in each cell within a field for each scouting date. Those fields with the highest level of infestation according to data collected in 2004 were surveyed once every 10 days. Fields with less severe infestation or adjacent to fields with severe infestation were surveyed once every 14 days. We surveyed those fields with no known occurrence of TSW every 21 days. Areas of a field where TSW was found were flagged and geo-referenced for spot treatment with 2,4-D or the appropriate organic control measure. We treated all plants within 24 hours of discovery, and scouted following treatment to ensure efficacy. Any plants at a growth stage sufficient to produce seed were removed from the field.

Of the fields in the FSRU and field C2, sixteen had TSW emergence in 2005; this is 32% of the total number of fields surveyed by our crew. Overall, we discovered TSW in 7% of the total area surveyed (FSRU and C2). Our results indicate that the infestation is concentrated in a few areas on the farm, as three fields contained over 90% of the total TSW emergence. Field 27 (a woodlot) contained the highest amount of TSW discovered in the surveyed area, 54.0% of the total. Field 12 (a BMP treatment) contained 18.2% of the total emergence, and field 47 (a woodlot) had 17.7% of the total.

As noted above, we recorded the number of plants in each 15 m x 15 m cell surveyed using GPS. Data analysis indicated that in infested cells, 90% of the area had less than one plant per square meter. Two-thirds of the area in infested cells had less than one plant per ten square meters.

As figure 1 demonstrates, the month of August was the busiest month for us as almost 55% of the TSW plants germinated and emerged within those 31 days.

In conclusion, we feel the 2005 survey effort provides a good baseline for comparisons of future results. We also believe that our intensive scouting and treatment effort significantly depleted the seedbank in infested areas. Finally, it is important to remember that proper phytosanitary procedures reduce intra-farm spread of TSW. Washing of equipment, vehicles, and boots is an important tool in stopping this troublesome weed. We want to thank everyone for their continued cooperation in the eradication of TSW from CEFS.

- Matt Finney, FSRU Research Associate

New CEFS Publications

Casteel, M. J., M D. Sobsey, and J. P. Mueller. 2006. Fecal Contamination of Agricultural Soils Before and After Hurricane-Associated Flooding in North Carolina. Journal of Environmental Science and Health Part A. 41:173–184.

Forehand, L. M., D. B. Orr. and H. M. Linker. Evaluation of a commercially available beneficial insect habitat for management of Lepidoptera pests in organic tomato production. Journal of Economic Entomology (In Print)

Schroeder, M.S., N.G. Creamer, H.M Linker, J.P. Mueller, and P. Rzewnicki. Interdisciplinary and Multi-Level Approach to Organic and Sustainable Agriculture Education at North Carolina State University. Hort Tech (accepted)

Tu, C., F.J. Louws, N.G. Creamer, J.P. Mueller, C. Brownie, K. FAger, M. Bell, and S. Hu. 2006. Responses of soil microbial biomass and N availability to transition strategies from conventional to organic farming systems. Agriculture, Ecosystems, and Environment. 113:206-215.

Soybean Varieties for Organic Production in North Carolina

Background

There is increasing interest among North Carolina crop producers to capture the profitability offered by the certified organic market. Demand for organic livestock feed grains is growing in the state, particularly for feeding organic poultry. There is also increased interest in developing organic dairy and pork production. In the organic industry, there is also a large demand overseas for food grade soybeans but farmers in our state have not yet considered which varieties to grow. Currently popular varieties in food soybean markets are of very short maturity. The fuller range of soybean maturity that is attainable under North Carolina growing conditions may support interest in other varieties. Feed grade varieties grown in performance trials under conventional management may not perform similarly under organic production practices. For food grade varieties few or no performance reports are available. The objective of this trial was to evaluate food grade and feed grade soybeans grown under organic management conditions.

Method

The soybean varieties in this trial were grown using organic management practices at the Center for Environmental Farming Systems. Feed grade varieties currently used by North Carolina organic producers, organically produced food grade seed, a food grade variety popular in the organic industry, non-GMO feed grade varieties that performed well under conventional management in recent NCSU trials, and a food grade variety not yet available on the market were grown in replicated variety performance strips. Nine food grade and five feed grade varieties (see boxes, right) were evaluated for early growth vigor, crop canopy development, grain quality, stand and yield. Target planting rate was calculated to achieve 7 to 8 plants per foot of row (120,000 to 140,000 germinated seeds per acre) adjusting for seed weights and germination rates.

The test site soil type consists primarily of Wickham sandy loam. The previous crop was annual small grain grown as a cover crop and rolled for ground cover before grain heading occurred. Prior to soybean planting, lime was applied at 1400 lb/ac on April 22, 2005, and 60% potash was applied at a rate of 200 lb/ac on April 29. The soybeans were inoculated prior to planting with Nitragin (Optimize) at a rate 4.25 ounces per 100 lb of seed. The cultivars were planted with a 4-row planter on May 24 in 30" rows with four replications in a randomized complete block design. Each variety strip was eight rows wide and approximately 200 feet in length. The food grade and feed grade varieties were planted as separate groups within each replication. Weed control was two passes of a row cultivator with sweeps between the rows when the soybeans were 3 to 4 inches tall and again when they were about 12 inches tall.

Results and discussion

Soybean growth was observed weekly in one replication from five to twelve weeks after planting. By the eighth week canopy closer was achieved in six varieties (NC+36YP6, Ohio FG4, Ohio FG5, Hutcheson, NC Raleigh and Cook). By the twelfth week after planting, all the varieties in the trial had closed canopies and with the exception of three feed grade varieties that had set pods. The only sign of plant disease observed was a slight infestation of frogeye leaf spot on four varieties, all of which were received from the same seed company. Insect damage was moderate across the feed grain varieties by corn earworm but this was confined to a single replication.

Since the varieties span a wide range of maturity groups, harvest occurred on three different dates. The first harvest date was October 7 and included Groups I and III. The second harvest date was October 19 and included Groups IV and V. Cool, moist climate after the first hard freeze slowed moisture dry down of beans that had developed in remaining pods and it was not until December 14 that the remaining varieties were harvested. The center six

Food grade varieties, maturity groups and seed sources

Vinton 81 Group I, Albert Lea Seed (MN)

NC+ 36YP6 Group III, Blue River Organics (NE)

Ohio FG4 late Group III, Ohio Foundation Seeds

Ohio FG5 Group IV, Ohio Foundation Seeds

NC+ 41YP5 early Group IV, Blue River Organics (NE)

NC+ 43A7 Group IV, Blue River Organics (NE)

NC+ 52Y6 Group V, Blue River Organics (NE)

R1705 Group V, K&K Farm Service (AR)

N01-10974 Group VI, experimental from Tommy Carter, USDA-ARS at NC State

Feed grade varieties, maturity groups and seed sources

HBK 5894 Group V, Hornbeck Seed (AR)

Hutcheson Group V, Earl York & Son (NC)

USG 5002T Group V, UniSouth Genetics (TN)

NC Roy Group VI, North Carolina Foundation Seed

NC Raleigh Group Group VIII, North Carolina Foundation Seed

Cook Group Group VIII, Georgia Certified Seed

Soybean Varieties (con't)

rows of each variety strip were combined in three of the four replications. Excessive weed growth in one replication prevented machine harvesting until all weed material had matured and dried down adequately. In this replicate, yield determination was done by hand harvest sampling at the same time as the other replications of each variety were mechanically combined.

The yield of each variety in the trial is presented in Tables 1 and 2. Lack of precipitation in the 2005 growing season was a major factor contributing to reduced soybean yields in this trial. The first hard freeze occurred November 11, 2005. From planting until this date, only 16.8 inches of precipitation occurred at the Cherry Research Farm where the trial was located. For the same period, normal annual precipitation at Goldsboro has a 30-year (1970-2000) average of 21.9 inches. Statewide, the average soybean yield for 2005 was 27 bushels/acre.

Samples have been submitted on all varieties for protein and oil content analysis. Some tofu quality testing will be done on a few food grade samples for educational purposes. However, tofu quality comparisons among all the food grades may not be possible. According to ARS agronomist, Dr.Tommy Carter, many of the soybeans would not meet market acceptability standards due to the weathering exposure of the seeds. This was attributed to this season's cool, humid conditions during late seed development. For food grade soybeans, as seed pods approach the R6 stage and seeds mature during R7 and R8, ideal conditions call for low humidity and harvesting within a few days. Minimizing exposure of full seed to adverse weather is essential to preserving attractive seed coat and seed shape quality in the food grade market. This project was supported in part by a grant from the North Carolina Crop Improvement Association. Assistance in preparation for the project was provided by Dr. Jim Dunphy in Crop Science.

- Dr. Phil Rzewnicki, Organic Unit Coordinator

Table 1. Yield of food grade soybeans grown organically in 2005 at CEFS.

Variety	Yield
Ohio FG4	31.0 a
NC+ 43A7	27.9 ab
Ohio FG5	27.1 abc
NC+ 36YP6	25.3 abc
NC+ 41YP5	23.6 bcd
NC+ 52Y6	20.5 cd
Vinton 81	20.2 cd
R1705	16.4 de
N01-10974	12.3 e
lsd (.05)	7.2

Table 2. Yield of feed grade soybeans grown organically in 2005 at CEFS.

Variety	Yield
HBK 5894	18.5
Hutcheson	20.0
USG 5002T	26.3
NC Roy	21.8
NC Raleigh	22.2
Cook	19.9
	ns

NC Choices Expanding

This winter and spring North Carolina Choices is updating their website to list even more North Carolina farmers producing pasture-raised and antibiotic-free pork. We are looking for farmers across the state that raise pigs and have an interest in direct marketing their own pork. If you would like to be a part of this program and have your farm listed for free on the NC Choices website, contact Susan Mellage (susan_mellage@ncsu.edu).

In 2006, we will be conducting many educational events for local consumers as well as placement of some paid advertising in local publications and on NPR radio stations. Also, if your civic, volunteer, or faith group would like to learn more about sustainable farming practices and how your group can make food choices that matter to your family, your community, and your environment, contact Susan Mellage (susan_mellage@ncsu.edu) for details.

As always, please visit www.ncchoices.com for more information and to find a farmer near you!

- Susan Mellage, Program Coordinator

Organic Grain Production Guide

The North Carolina Organic Grain Production Guide (AG- 660) is now available through NCSU Agricultural Communication Services. The guide provides extensive information on production of organic corn, small grains, and soybeans, organic weed management, fertility, organic certification, marketing, and organic crop budgets. Funding for the production of the guide was provided by the Z. Smith Reynolds Foundation. It can be ordered from the distribution center of the Agriculture Communication Services through Jeanne Marie Wallace, telephone: 919-513-3152 or fax 919-515-6938.

Contact Molly Hamilton (molly_hamilton@ncsu.edu) for more information

Corn gluten feed as an alternative ingredient in finishing diets for Senepol– and Angus-sired steers

Background

In most situations in North Carolina, beef producers own brood-cow herds and sell calves at, or shortly after, weaning. This practice limits their ability to determine how their calves perform after entering the feedlot phase of the conventional beef industry. This structure hinders the flow of information back to producers about consumer acceptance of the final product. At the Center for Environmental Farming Systems (CEFS) beef unit, we have sought to develop alternative channels for our calves that would allow us to collect more complete data on the finishing and marketing of our beef and better serve North Carolina beef producers.

Photos (clockwise from top): Senepol-sired steer, Senepol-sired steer, Angus-sired steer, Angus-sired steer

During the early years of the beef project at CEFS, we sent steers to a feedlot in Texas where they were fed for about 140 days. We maintained ownership of the calves, received carcass data, and were paid on carcass value. This was a good program that allowed us to know what happened to the calves after they left our farm and gave us useful information on how our Senepol-sired calves performed relative to our Angus-sired calves. However, this arrangement gave us little input into management and marketing decisions and did not provide us complete information about feed consumption by individual animals.

As an alternative, we began to finish our calves at the experimental feedlot at NCSU's Butner Beef Cattle Field Laboratory three years ago. Using this facility allows us to gather individual feed intake data on each calf during the time they are on feed and to impose nutritional treatments to measure how calves respond to different diets. Once calves are ready to harvest, they are marketed to a beef packer in Pennsylvania where carcass data is gathered by a technician from Penn State University. This system is particularly relevant to beef producers in North Carolina who have expressed a renewed interest in finishing their calves locally on a small scale and marketing them in North Carolina or to packers in Pennsylvania. One such group is the Bladen County Feeders cooperative. These producers finish small numbers of cattle and collectively market their cattle. Many of these feeders have Senepol genetics in their cow herds and have found that their Senepol influenced calves grow well and are accepted by their market. Partnering with the Butner feedlot enables us to support these producers through projects such as evaluating locally available ingredients for finishing diets.

We recently completed a two year study to determine the value of a corn byproduct that is produced in Winston Salem, NC. The wet corn milling process yields corn syrup and corn germ (which is further processed to corn oil), and corn gluten meal, a high quality protein feed for poultry and swine. The primary by-product is corn gluten feed, which has a moderate protein level (18 to 24%) and is composed of corn bran and condensed steep liquids that result from soaking the grain in a mild sulfurous dioxide solution. Because of its fiber content, corn gluten feed is not of much value as a feed for poultry or swine, and is mostly used in cattle feeding.

Corn gluten feed is initially wet (approximately 60 to 65% moisture), and in some cases marketed as "wet corn gluten feed." Because not all of the byproduct stream can be marketed in the wet form, it may also be dried. The goals of our study were to compare wet and dry forms of corn gluten feed to a conventional corn and soybean meal based diet and to determine how our Angus- and Senepol-sired steers respond to each diet.

Method

For two years 40 Angus-sired and 25 Senepol-sired steers were fed one of three finishing diets. The control diet was typical of an industry diet and consisted of 10% corn silage, 77% corn and 11.4% soybean meal (dry basis). Two corn gluten feed diets had wet or dry corn gluten feed at 35% of the dry matter as a substitute to the soybean meal and a portion of the corn. Protein and mineral levels were maintained at similar levels for all three diets.

Corn Gluten Feed (con't)

The steers were born in February and March at CEFS, weaned in September, and then shipped to Butner in December where they began their designated diet in January. Calves were fed for 138 days in the first year and 147 days in the second year and went to harvest at 15 to 17 months of age. Health, performance, and carcass data were collected for all calves in the study.

Results and discussion

Feed composition. The corn gluten feed was fairly consistent over the two years of the study. Wet corn gluten was 35% dry matter and 17% protein (dry basis) in year 1 and 39% dry matter and 19% protein in year 2. Dry corn gluten feed was 90% dry matter and 26% protein (dry basis) in both years. Each of the diets averaged 14% protein and 80% TDN on a dry matter basis.

Performance and carcass data. Health and performance of the calves was good throughout both years. Each type of steer responded to the different diets in a similar manner . Representative steers from the Angus- and the Senepol-sired groups a few days before harvest are shown in the pictures. Calves gained very well at about 3.3 lbs/day average with no difference in diets. Calves on dry corn gluten feed diet ate more feed than those on the other two diets, resulting in a lower efficiency of converting feed to beef. Carcasses from steers on all three diets weighed the same, and they had a similar backfat thickness and rib-eye size. Calves on dry corn gluten feed had slightly more marbling in the meat than the other two diets. Calves on wet corn gluten feed had a lower USDA quality grade than those on the other two diets.

Performance and carcass data are shown in the table. Senepol-sired steers weighed the same as Angus-sired steers to start the study, but they gained weight slower and had a lower final weight than Angus-sired calves. This is consistent with our earlier observations from the western feedlot. We usually have higher weaning weights for Senepol-sired calves at CEFS, probably due to their heat tolerance, but they give up that advantage during the finishing phase. The main reason for reduced gain in Senepol-sired calves is that they ate less feed than the Angus-sired calves. The Senepol-sired calves also were slightly less efficient at converting feed to beef than Angus-sired calves. Senepol-sired calves had slightly less marbling than the Angus-sired calves and also had slightly less backfat. Rib-eye size and USDA quality grade were not significantly different between the sire breeds.

Contrast information listed in the last column of the table indicates which major comparisons indicated differences beyond what would be expected based on random chance. The three comparisons we made were (1) Angus- vs. Senepol-sired calves, (2) control diet vs. corn gluten feed diets,

Table 1. Performance and carcass characteristics of CEFS steers finished on a control diet with corn and soybean meal, or on diets containing dry corn gluten feed (DCGF) or wet corn gluten feed (WCGF).

Item	Angus	½ Senepol	Control	DCGF	WCGF	Contrast[a]
Number of animals	40	25	21	22	22	-
Initial weight, lbs	746	748	746	746	748	-
Final weight, lbs	1228	1173	1184	1214	1201	1
ADG, lb/d	3.48	3.10	3.19	3.39	3.28	1
Dry intake, lb/d	22.4	20.9	20.4	23.3	21.2	1, 2, 3
Feed/Gain	6.46	6.79	6.46	6.91	6.51	1, 3
Carcass wt, lb	770	737	744	763	755	1
Yield Grade	3.00	2.85	2.89	3.00	2.89	-
Marbling score[b]	6.01	5.60	5.76	6.14	5.51	1, 3
Quality grade[c]	17.5	17.2	17.3	17.8	17.0	3
Backfat, inches	0.52	0.42	0.47	0.50	0.45	1
Ribeye area, sq. in.	12.7	12.3	12.5	12.6	12.3	-
Feed cost, $/lb gain	0.47	0.50	0.52	0.46	0.47	1, 2

[a] Contrasts: 1 = Angus and ½ Senepol differ, $P < 0.05$; 2 = Control and corn gluten feed rations differ, $P < 0.05$; 3 = dry corn gluten feed and wet corn gluten feed differ, $P < 0.05$.

[b] Marbling scores: 4 = slight, 5 = small, 6 = modest, 7 = moderate.

Corn Gluten Feed (con't)

and (3) wet corn gluten vs. dry corn gluten feed diets. Note that a comparison is significant when a P value is less than 0.05, which means there is only a 5% chance that the difference observed between values was simply due to random chance. These results indicate that either dry or wet corn gluten feed can be used in this kind of finishing diet with minimal effects on either the rate of gain, feed efficiency or carcass characteristics.

Economics. To determine the economics of a feeding system, feed prices must be determined. We used market value of ingredients delivered to the Butner Beef Cattle Field Laboratory which is about 100 miles from the plant in Winston-Salem that produces the corn gluten feed. Based on our feed costs, it turned out to be more economical to put gain on the calves using either of the corn gluten feed diets as compared to the control diet, with no difference in feed ingredient cost per pound of gain between the wet and the dry corn gluten feed. We also found that it was more expensive to put gain on Senepol-sired calves than as compared to Angus-sired calves.

Economics of wet vs. dry corn gluten feed will depend on the distance the producer is from the plant, because of the difference in freight cost for the wet and dry ingredient. This is because a tractor trailer load of wet corn gluten feed has about 9 tons of dry matter while a load of dry corn gluten fed has about 21 tons of dry matter and the delivery cost per mile is similar.

The cattle on the wet corn gluten feed ration had a lower USDA quality grade, which affects market value and points to the need to include carcass characteristics in the evaluation of alternative rations. There were breed differences in carcass characteristics that affect market value but a complete evaluation of profitability is beyond the scope of this study.

This study demonstrates clearly that byproducts can be an economical part of the ration when cattle are finished in our area but that you have to consider the cost of ingredients along with animal performance.

Conclusions

Finishing our steers at the Butner Beef Cattle Field Lab proved to be better for our purposes than finishing at the western feedlot. We were in control of the cattle management, had multiple field days and tours where producers were able to see the cattle, and were able to compare local feeding options. We also were able to gather individual animal intake and feed efficiency data which are key to economic analysis.

Our study indicates that corn gluten feed is a viable alternative feed for finishing diets in North Carolina. Relative value of wet and dry corn gluten feed, however, will depend on the distance the producer is from the corn processing plant.

The growth and carcass data of our Senepol-sired steers confirms earlier observations that they grow slightly slower and don't have quite the carcass quality of the Angus steers. However, it is important to note that they did grow quite well and produced very good quality carcasses that are very acceptable to the conventional beef industry. While Senepol-sired steers did not quite perform up to the level of the Angus-sired steers we have observed other advantages with Senepol-influenced cattle including heat and fly resistance that are desirable in our environment.

We have a strong interest in the F-1 Senepol x Angus cows, and future research will address how those perform relative to straight Angus cows in our hot environment. We will also continue to research alternative feeds using the Butner Beef Cattle Field Lab as the finishing location for CEFS steers. This work with contribute to our goal of optimizing beef production on North Carolina's many cow/calf farms and support producers who finish and market cattle locally.

Acknowledgements. We wish to thank Eddie Pitzer, Andy Meier, Earl Toler and the rest of the crew at CEFS, and Dean Askew, Greg Shaeffer and the rest of the crew at the Butner Beef Cattle Field Lab. Also, thanks go to April Shaeffer in the Department of Animal Science at NCSU who managed the data and ran the lab work on the feed samples and ingredients. Without the help and cooperation of a lot of folks, this project would not have been possible.

- Dr. Matt Poore, Beef Unit Coordinator
- Joe Cassady
- Dr. Geoff Benson

Congratulations!

Ken Fager received a Pride of the Wolfpack Award. This award was given by the College of Agriculture & Life Science in recognition and appreciation of Ken's contribution to NC State University. And we thank Ken for all of his contributions to CEFS!

CEFS new banner display received a 3rd place award at the National Small Farm Conference held last October in Greensboro. **Denise Finney** and **Susan Mellage** worked with Sandy Schultz Smith of NCSU Agricultural Communications to create the banners. These banners are available for everyone's use, and we encourage you to take them with you for any talks, workshops, or booths/exhibits. Please contact Denise Finney (denise_finney@ncsu.edu) to sign them out.

Evaluation of Potential Plants for Beneficial Insect Habitat in N.C.

Beneficial insects are an integral part of insect pest management on organic farms. Sugar and proteins have been shown to increase the lifespan and reproductive output of beneficial insects. These food sources can be found in flowers in the form of nectar and pollen. Many flowers have been heralded both in the scientific literature and anecdotally by farmers and seed companies as a way to attract and retain beneficial insects, thereby reducing numbers of crop pests. Organic farmers often grow flowering plants on their farms hoping to provide habitat to beneficial insects in order to enhance biological control. Contrary to popular belief, in many cases, the beneficial insects we cannot see are the most important. Parasitic microwasps can be extremely efficient in reducing crop pest numbers. However, because these wasps are so tiny, it is difficult to determine whether microwasps feed from flowers. The current study attempted to ascertain which flowers are most attractive to parasitic microwasps.

We first conducted a preliminary study from June-August of 2004 in order to determine which flowers were most attractive to larger beneficials (both predators and parasites) without also being attractive to crop pests. Flower strips (9 x 180ft) were planted in three locations on Little River Farm (formerly the Small Farm) at the Center for Environmental Farming Systems in 2003. Flower strips included 19 different flower species. For each flower species, three sample sites of 1 ft^2 were observed for two minutes on seven dates between 12 and 1PM. All insects feeding directly from the flowers were recorded. We found that five plants were the most attractive to beneficial insects: cockscomb (*Celosia cristata* L.), buckwheat (*Fagopyrum esculentum* Moench), black-eyed Susan (*Rudbeckia hirta* L. 'Indian Summer'), fennel (*Foeniculum vulgare* , P. Mill. 'Smokey bronze'), and yarrow, (*Achillea millefolium* L.).

In 2005, we turned our focus to the attractiveness of flowers to parasitic microwasps only. In this part of the study, we planted six plots in each of three locations containing the five most attractive plants from 2004 as treatments. We used plots of crabgrass as a control since it provided a leafy habitat without nectar-producing flowers. Since we could not visually observe these tiny microwasps, we used sticky-traps to determine whether they were present or not in the flower strips. In the laboratory we used a microscope to count the numbers of three important kinds of microwasps caught on the traps; scelionids, trichogramma, and mymarids. In order to test if flowers were responsible for attraction, we removed all flower heads from half of each plot. Because the crabgrass had no flowers, we mowed half of the control plots to test if cutting vegetation influenced attractiveness. Traps were placed in the center of each half of the plot at three heights: flower height, half of plant height, and 1.5 times plant height. We theorized that if microwasps were attracted to flowers, they would be found in higher numbers at flower height in the half of the plot where flowers were still available.

Sticky trap set in celosia at Little River Farm.

Sticky trap set in black-eyed Susan

Data analysis showed that overall the flowers we studied played no role in attracting the microwasps we were interested in. Only one type of wasp, the scelionids, responded to just two of the flowers, cockscomb and black-eyed Susan. Fennel, buckwheat, and yarrow did not appear to be attractive to scelionids. There was no apparent attraction to any of the flowers for trichogramma or mymarids. Surprisingly, we found the highest number of trichogramma at the low height in the un-mowed grass control plots. For trichogramma it appears that habitat may play a role in attraction but that flowers were not responsible for this attraction.

These results do not imply that farmers should stop planting flowers and simply allow their grass to become overgrown. What it does show us is that different types of beneficial microwasps vary in their response to different habitat plantings and that flowers alone are unlikely to attract microwasps to a particular habitat. Future research on the attractiveness of habitat could be conducted using a wider variety of flowers and examining additional types of microwasps.

–Brooke Witting , Entomology Graduate Student

Growings on at Little River Farm

That's right! Our diverse fruit and vegetable farm beyond the steam pipe is now referred to as the *Little River Farm*. Meetings are planned throughout the year to focus and design programs based on the farm in order to achieve our stated goals of education, research and extension/ outreach. Although that is a work in progress, the farm is moving rapidly into spring. Under Bryan Green's capable hands (and heart) Little River Farm continues to refine production to grow the best possible produce, small fruits and meat on the least amount of space. Steve Moore has added additional energy to the farm, with specific emphasis on season extension and bio-intensive and sustainable agriculture.

This season, Little River Farm will feature three demonstration, research, and teaching areas. The main production area will continue to focus on the integration of cover crops, livestock, small fruits, and vegetables. A smaller area will be a system based on cover cropping, fallow periods, and vegetable/ small fruit production. The third area will be a small bio-intensive system that focuses on the production of calories, calcium, protein, and carbon crops for composting. Imbedded in these systems will be specific research and teaching plots. One imbedded research project will evaluate heritage poultry under pastured growing conditions with the American Livestock Breeds Conservancy. The farm will also demonstrate various weed management strategies such as intercropping covers, straw mulch, fabric mulches, and roll down methods. The interest to increase energy conversion efficiency, reducing non-renewables like fossil fuel, will continue to play a role in the farm design and farm demonstrations. There are areas outside these systems for additional research and demonstrations relevant to small producers.

Four events are planned for the brickyard on NC State's campus. These events will replace the weekly brickyard sales during the 2006 growing season. The first will be on Earth Day and the other three will be announced as dates are set. Sales of plants, small fruits, vegetables and other farm related products will accompany educational activities, music, and other forms of enjoyment.

Outreach will continue through the WGBR radio broadcast and a new Discover Ag program for Wayne County third graders. Additional Goldsboro/Wayne County projects include a possible youth community garden and assistance in the development of a downtown farmer's market. On an international note, collaboration between CEFS and the University of Chapingo (Mexico) was strengthened over the winter as Bryan and Denise Finney visited and set up cooperative arrangements. We look forward to hosting three students from Mexico this summer. Quite a number of grants have been submitted for outreach to minority, limited resource and new small farmers, and heritage/open pollinated seed trials, so keep an eye for some new funding and the continued growth and evolution of our small farm program.

We received several applications for our apprentice program and have selected two individuals to work as Little River Farm Apprentices this summer. Both are beginning work on the farm this month. We'll introduce them in the spring Inside CEFS.

Steve presented a workshop on growing in high tunnels year round at Chatham County Extension, Tuesday Feb. 28 . Attendance was excellent and Steve was happy to have the opportunity to meet area farmers!

If you have any questions or ideas for us at the Little River Farm, contact Bryan Green (bfgreen@ncsu.edu; 919-920- 8564) or Steve Moore (srmoore2@ncat.edu; 919-731- 3280).

- Bryan Green, Farm Manager
- Steve Moore, Research and Extension Associate

Swine Unit Dedication &

Seasons of Sustainable Agriculture Kick-off

May 9, 2006 9:30 am

At CEFS

Breeding Season at the Dairy

In the last issue of *Inside CEFS*, you read about the busy seasonal calving period when well over 100 calves were born within a few weeks. By January, most of that hectic calving period was over, and we hope the farm crew has forgotten how tough it was. When their memories of that labor-intensive period have sufficiently dulled, they will begin breeding the cows and heifers again so that the concentrated calving can start with a fury next October.

What is involved in breeding heifers for the first time? The yearling heifers (12 to 15 months of age) need to be well grown and having estrous cycles, factors that indicate they have reached puberty and are ovulating at approximately 21-day intervals. Because we have both Holstein and Jersey breeds and crosses between those breeds, there are potential differences in the age that can heifers start calving. Graduate student Christina Williams collected blood samples though the fall to monitor progesterone levels among the current group of yearling dairy heifers. There was evidence that the Jersey and crossbred heifers were cycling at higher percentages at younger ages and at lighter body weights than were the Holsteins. Those preliminary data led us to monitor the next crop of heifers more intensely in order to determine the age of puberty. Large differences in age at puberty in may create a need to manage the respective breed groups differently to ensure that all are cyclic and ready to breed following our seasonal breeding schedule. Although different sizes of heifers are expected among these diverse breeds, the nutrition program needs to be monitored to see that all heifers reach targeted breeding weights, are cyclic, and are in a moderate body condition for the breeding season.

Another issue when breeding heifers is dystocia, or calving difficulty. Sires with a low risk of causing calving difficulty should be selected for use in artificial insemination of dairy heifers. We have found this is of greater concern when using Holstein sires and than when Jersey sires are used. We are collecting data on the various combinations of sire and dam breeds to see how calving difficulty varies by breed.

There are different considerations when rebreeding the dairy cow herd compared to breeding heifers. The dairy cows that calved from October through December have to go through a process of uterine involution; the uterus that recently contained 50 to 100 pounds of calf plus comparable amounts of fluid and placenta has to shrink back to normal size. The hormonal system of the cow also has to reset so that she begins to ovulate and have regular cycles again. If a cow starts with calving difficulty and/or if she has a retained placenta, she is more likely to get an infection, delaying uterine involution and return to cyclicity. There are also potential breed differences in onset of postpartum cyclicity. Brian Hester at CEFS has been collecting milk samples twice a week from all of the early lactation cows. The samples are being analyzed for progesterone by Christina Williams to determine when postpartum ovulations begin within the Holstein, Jersey, and crossbred cow groups. We know from previous years that Holstein cows are less fertile than Jerseys and crossbred cows. We expect that there may also be differences in postpartum cyclicity patterns among those breed groups.

As we begin the breeding season in January, cows are often in various stages of readiness for rebreeding. Cows that calved in October and November have had more time to recover from calving and to begin cycling again than those that calved in December. Because the latter are in early lactation, they are likely under nutritional stress, as milk production increases for several weeks after calving. For younger cows that are not yet at a mature size, their requirements for growth may also delay the onset of reproductive cycles if the feeding program is not optimal. These variations can add to the challenge of the breeding season.

In both heifers and cows, the key to a successful seasonal breeding program is the ability to catch cows in estrus or "heat." Estrual periods only last a few hours within any 21- day cycle. A cow or heifer that stands willing to let another animal mount her is the ultimate confirmation of "standing heat". Ovulation usually occurs about 24 to 30 hours after beginning of estrus. Artificial insemination is usually best timed at about 8 to 12 hours after onset of estrus so that live sperm are in the reproductive tract at the time of ovulation. If the timing is off, it is 21 days until the next opportunity. At CEFS, we also use paint on the tailheads of cows to assist with detection of estrus. If a cow is mounted multiple times when not being observed, the paint will be worn off, telling farm crew that the cow had been recently in heat. In the early part of the breeding season when most cows have not yet been inseminated, there is generally more activity and it is easier to catch cows in heat. However, as the breeding season progresses into late February and March, it takes even closer observation because there is less overall activity when more cows are pregnant and fewer are cyclic.

We strive to "catch as many heats" as possible, and often use ultrasound 25 to 30 days after insemination to confirm the success or failure of artificial insemination. Cows and heifers can also be observed after insemination for standing heat. Cows for whom we've "missed heat" must be reinseminated. Although hormonal intervention and synchronization of estruses can be done to increase proportions of cows successfully inseminated, we are reluctant to use these techniques, as that may bias our evaluation of breed differences. In addition, if we choose to adopt organic standards in the future, such tools will no longer be available.

With successful seasonal breeding this winter and spring, it should be a fun time at calving again this fall!

- Dr. Steve Washburn, Dairy Unit Coordinator

Another Livestock Species on the Farm

This past growing season, 12 inquisitive, friendly, multi-stomached, four-legged forage munchers were integrated into the Organic Unit. These twelve creatures, white-bodied with sharp little horns, drooping ears and brown heads, were yearling Boer goat females, a meat breed whose origin stems from South Africa.

These animals were controlled-grazed with temporary fences made of electronetting because goats are known to be escape artists, and they lived up to their reputation. They fed on small plots planted with forages mixes such as fescue, orchard grass, white clover and chicory. As part of the rotation devised by Bryan "Busha" Green, heavy nitrogen feeder vegetables will be planted following two years of grazing by the goats. For winter grazing, other plots were planted last fall with cereal rye. Newly acquired goats will graze these plots as soon as forage growth is sufficient.

Goats play an important role in organic farming systems from the standpoint of nutrient cycling, soil improvement, income generation and conversion of fibrous resources into value-added products, to name a few. In addition, goats add another dimension to any operation because they live at their own pace, have their own specific needs, and have to be cared for on a daily basis. Furthermore, they are interesting to observe and offer great companionship. Thus, we can all learn from them if we take the time to slow down a little bit. As humans, we do not tend to give the animals we live and work with the credit and respect they fully deserve while in our care.

These 12 friendly goats were used to teach principles of controlled–grazing, animal husbandry and health practices to the summer interns. During the 2006 season the goats, along with the chickens and turkeys, will be a welcome addition to the Little River Farm for the 1000 or so schoolchildren that will visit as part of the new Discover Ag Program.

Our goal is permanent integration of goats into the Little River Farm by breeding them in the fall, raising the kids on the farm, and selling the excess animals. We are planning to have a three-sided shelter built on the premises.

- Dr. Jean-Marie Luginbuhl
- Bryan Green, Little River Farm Manager

Goats will again take up residence at the Little River Farm during the 2006 season. The goats are happy to munch on chickory (left) and oats (right).

Upcoming Events in Sustainable Agriculture

March 3, 2006: The Northern Piedmont Specialty Crops School in Roxboro, NC. Sponsored by North Carolina Cooperative Extension. Contact: Carl Cantaluppi, 919-603-1350.

March 8, 2006: Organic Dairy Workshop in Hillsborough, NC. Sponsored by Organic Valley, North Carolina State University, and Carolina Farm Stewardship Association. Workshop will cover organic farm management, considerations for organic forage, soil and animal management in North Carolina, and more. Contact: Organic Valley 888-809-9297.

March 11, 2006: 13th Annual Organic Growers' School at Blue Ridge Community College in Flat Rock, NC. Website: www.organicgrowersschool.org

March 14, 2006: Homestead Milk Production Shortcourse sponsored by NC Cooperative Extension in Burlington, NC. Contact: Marti Day, 336-375-5876.

March (various dates): Mushroom Inoculation Workshop sponsored by NCA&T. Several locations in North Carolina. Website: www.ces.ncsu.edu/chatham/ag/SustAg/mushroomworkshops.html

April 8, 2006: Chatham Beekeepers' Field Day in Pittsboro, NC. Contact : Jim Williams, 919-362-1794.

April 22-23, 2006: Annual Piedmont Farm Tour sponsored by Carolina Farm Stewardship Association (CFSA). Website: www.carolinafarmstewards.org

May 9, 2006: CEFS Swine Unit Dedication and Kick-off to the "Seasons of Sustainable Agriculture" Celebration of CEFS in Goldsboro, NC.

June 24-25, 2006: Annual Mountain Tour sponsored by CFSA. Website: www.carolinafarmstewards.org

Seasons of Sustainable Agriculture Celebration

2006 is a landmark year for CEFS - this year marks our 10th year of programming! To celebrate our achievements in research, education, and extension over the last 10 years and to look forward to a future of continued innovation and leadership in sustainable agriculture, we're having a season full of events!

The *Seasons of Sustainable Agriculture* celebration begins May 9, 2006 with the dedication of the new swine unit at CEFS. The keynote speaker for this occasion is Dr. Fred Kirschenmann, Distinguished Fellow at the Leopold Center for Sustainable Agriculture in Iowa. Please plan to attend this event which begins at 9:30am. The dedication will be followed by lunch and half-day educational workshop for farmers and extension agents on alternative swine production systems.

The *Seasons of Sustainable Agriculture* celebration will continue throughout the summer and fall with educational events for farmers, extension agents, and the public. And you won't want to miss our Fall Festival in September! More information about all Seasons of Sustainable Agriculture events will be distributed through the CEFS email list and our Inside CEFS newsletter, so stay tuned.

Seasons of Sustainable Agriculture

Workshops and Events at CEFS

May 6: Home Gardening & Nutrition Workshop

May 9: Alternative Swine Unit Dedication and *Seasons of Sustainable Agriculture* Kick-off.

May 9: Alternative Swine Production Workshop

May 22: Post Harvest Handling of Vegetable Crops Workshop

June 6: Grazing Systems for Small Farms Workshop

June 12: Emerging Local Markets Workshop

June 17: CSA Workshop for Consumers

July 11: Weed Management in Organic Grains Workshop

July 17: Beneficial Insect Habitat and Release Strategies Workshop

August 14: Organic Certification Mini-Course

August 21: Small Farm Equipment Workshop

September 16: CEFS Fall Festival

September 18: Season Extension Workshop

October 16: High Tunnel Greenhouse Workshop

October 31-November 1: Mid-Atlantic Dairy Grazing Conference

December 12: Organic Grain Producers Panel

Workshop times and fees will be announced.

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Inside CEFS is edited by Denise Finney, denise_finney@ncsu.edu. The next edition will be published in April 2006; the submission deadline is April 10.