



## Compost use in the production fruits and vegetables

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### 1st quarter report

McGill Environmental Systems launched its 2001 compost use study funded by the NC Department of Environment and Natural Resources, Office of Pollution Prevention and Environmental Assistance, with two trial sites in neighboring Duplin County. Duplin, the largest agricultural county in North Carolina, produces more food and fiber than any other county in the state. It is one of the 10 top agricultural counties in the U.S.

Joining McGill in its compost research this year was Burch Farms, one of the largest commercial growing operations in the Carolina's with 2,500 acres of mixed produce production and a packing operation located in Sampson County near the town of Faison. Burch Farms has been utilizing **Farm Grade** compost product from the McGill facility for three years to build organic matter.

Preliminary plans to conduct 2001 grant research activities at the McGill facility were modified when Burch approached McGill with plans to conduct its own research on a 12-acre field using compost as a nutrient source. It was decided to combine research efforts, using McGill's in-house horticultural expert, Lewis Flynn, as the lead researcher responsible for data collection.

Flynn, sales manager for McGill's compost products, has a background in horticultural research and farming. He joined McGill in the fall of 2000 and has been working with a number of growers and landscapers to help them maximize their use of compost materials, significantly expanding McGill's customer base this spring.

In addition to Burch Farms, McGill continued research at a field a few miles south of Faison near the town of Magnolia and dedicated four raised beds at the McGill Regional Composting facility at Delway to observations related to the use of compost products as a landscape mulch.

### BURCH FARMS

Burch Farms used McGill's **Farm Grade** compost as a general cultural practice on all of its acreage, incorporating compost prior to planting at a rate of 15 cubic yards per acre

broadcast. An exception to this practice was the nitrogen-sensitive Beauregard variety of sweet potatoes, which received no compost application.

This season, Burch Farms purchased two field applicators for compost application which allowed the company to apply 15 acres per day during wet spring weather when spreader trucks were very busy and/or could not enter wet fields (which was a problem at the Magnolia Farm last year). Burch believes these spreaders will recoup their purchase cost in the first year.

Cost of a commercial spreader was about \$75 per load and Burch spread 500 truckloads this year.

**Field trial.** A formal 12-acre study trial investigated the results of using higher rates (35 cubic yards per acre) of McGill's more mature and more expensive **Soil Builder** compost.

The expectation was a reduced need for mineral fertilizer and an off-setting benefit with improved crop performance, as well as a reduction in insects and disease obtained from the ameliorative effect of compost. Crop for trial were pepper varieties King Arthur (early) and Camelot (10 days later variety) planted on six acres, with an adjoining six-acre control field.

Crop was planted on sandy loam soil, in double rows, on raised plastic covered beds with drip irrigation. Compost plot had 35 cubic yards of compost broadcast and 350 pounds of 8-8-16 incorporated prior to bed formation. Control plot had a standard broadcast application of 500 pounds of 8-8-16 incorporated and 500 pounds of 8-8-16 banded in the bed. Crop was monitored from planting in April until harvest in June.

**Equipment modification for banded row application.** Time did not allow for the development of a practical means to apply compost directly to the bed rather than broadcast. Bed application would allow for application of only 17 cubic yards of compost to the acre, but with an effective application of 35 cyds/acre in the bed.

The project plan also anticipated the fall modification of a Burch four-row gate hopper, chain drop spreader to apply compost in rows prior to bed formation, as well as mounting rolling cultivator spiders ahead of the bed formation plows to adequately incorporate compost during bed formation.

It was expected that this equipment modification would pay for itself quickly if Burch decided to expand the use of the more costly **Soil Builder** compost, a more mature compost product than **Farm Grade**. (Larger agricultural operations can certainly make use of economies of scale by modifying or purchasing equipment for applying compost.)

## **MAGNOLIA RESEARCH FIELD**

McGill Environmental Systems renewed its lease of a 28-acre field in Magnolia, Duplin

County, to study the long-term benefits of utilizing side-streamed MSW materials in an agricultural setting. The intention of this trial is to use these types of products exclusively, avoiding the application of chemicals whenever possible, for a period of at least five years.

During this period, yields of the test field will be compared to regional averages if fields are harvested. Winter wheat or rye, corn, and soybeans -- the "bread and butter" of this region's agriculture -- will be grown in rotation. Cultivation practices for other regional crops, like tobacco and cotton, require chemical input and/or intensive management and are not planned for this research site.

Also under observation in the Magnolia field are large areas where drainage has become a problem to determine if compost products will have a positive impact in facilitating drainage, curbing erosion, and returning these problem zones to full production.

The field has been divided into three sections. One will function as the control, receiving no compost or other amendments. Two sections will receive compost. One of those sections will receive additional pH adjustment.

Last fall, **Farm Grade** compost was broadcast on the field at a rate of 10 tons per acre. Wood ash was also applied to one section of the field to allow evaluation related to its use for pH adjustment. No commercial products were applied to the field.

The entire field (all three sections) was planted to winter wheat.

Observations this spring led to the conclusion that more nitrogen was needed for a successful crop. The section of the field that did not receive pH adjustment was selected to receive an additional broadcast treatment of compost at a rate of one 16 cubic yard load per acre or a total of 160 cubic yards (60.94 tons).

## **COMPOST AS MULCH**

Given current cultivation methods employed by mainstream agriculture, it has been concluded that compost will have limited use as a mulch material in conventional farming because of the cost of material and application equipment. Plastic bed covering, although not environmentally friendly, is much cheaper and more practical at the moment. It may, however, have practical application in the landscaping industry where mulches are often applied by hand as a standard practice. In addition to the mulch trials at the McGill Delway facility, the company intends to work with landscape professionals to monitor compost use as mulch in landscape work on residential sites in Wilmington.

## **COMPOST REPLACING METHYL BROMIDE**

With some work, McGill should be able to develop a compost as a replacement for methyl bromide in an effort to replicate successful trials by others. However, such a trial would

require a compost product that has aged for two to six months. Steady demand this spring for **Farm Grade** product did not provide an opportunity to set aside the quantities required.

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## 2nd quarter report

### BURCH FARMS

**Pepper field trial.** A late freeze in April threatened the pepper crop planted in a test field outside of Faison. However, the use of two helicopters on the morning of April 18<sup>th</sup> to stir the air is credited with saving the crop.

Growing conditions in April and May were good. There was some plant loss in young plants purchased rather than grown by Burch Farms. Some plants were burned at the time of transplant because of contact with black bed plastic.

Both the control plot (using approximately 8 tons of compost per acre) and the test plot (using 14 tons per acre) have matured strong and pest free and are currently undergoing harvest.

**Equipment modification for banded row application.** Lewis Flynn is scheduled to meet with Burch Farms in mid-July to review designs for modifying farm equipment for banded application of compost prior to bed formation. Julian Bradsher, McGill's plant maintenance technician, and Burch shop employees will perform the necessary modifications under the direction of Flynn and Ted Burch.

### McGILL MAGNOLIA FIELD

**Winter wheat.** A drier than normal winter growing season affected this field in the same manner as others planted with winter wheat at about the same time in the same area by the grower contracted by McGill to put in the test crop.

As with the other fields, it was determined that the projected yield would not justify the cost of harvesting the wheat crop. The crop is still standing in the field, scheduled to be turned under and planted with soybeans within the next few days.

Another compost application of 10 tons per acre will be applied and disked into the soil before the soybeans are planted.

### COMPOST AS POTTING MIX

McGill did some work with Cypress Pond Nursery in Hampstead, Pender County, to evaluate compost as an ingredient in potting mix.

A blend of 30 percent compost, 20 percent pine fines, 40 percent aged hardwood, and 10 percent charcoal ash (a side-streamed MSW material) was used for potting up large (5 to 30-gallon containers) plants such as Crepe Myrtle and Ilex. This potting mix was based on various blend trials with customers.

Observations will be made regarding plant and root growth in the potting medium over the next few months.

## **COMPOST AS MULCH**

McGill constructed four raised bed plots at its Delway facility for observations related to the use of composts as landscape mulches. On May 22, 2001, three beds were planted with identical varieties of typical landscape plants (Golden Euonymus, Daylily, and Vinca), but each was mulched with a different product. One bed received a one-inch layer of pine nuggets; the other two received two-inch layers of **Soil Builder Compost** and **Landscape Mix**, respectively.

A fourth bed was planted with Big Boy tomatoes in three rows. One row was mulched with pine nuggets, one with **Soil Builder Compost**, and one with **Landscape Mix**.

The potting media in all four beds was a mix of compost and topsoil that has been in the planters for several years. The media was loosened, turned, and weeds removed prior to planting. Water and mulch was applied the same day as planting. A sprinkler system was installed and adjusted to assure even overhead irrigation to all beds.

About three weeks after planting, the tomato plants mulched with compost and compost mix were larger and more vigorous than the plants mulched with bark (see above photo). But, as the plants have only begun to blossom, it is not known whether this difference will impact fruit production. Some weed emergence was observed in all beds, with the pine bark mulch showing the fewest weeds.

A more accurate weed count will be made within the next few days and additional compost/compost mix added to evaluate the effectiveness of a thicker layer of material. Soil moisture meters (tensionmeters) were also installed on June 22, which will provide data related to moisture retention value of the various mulch products used in the raised beds.

## **COMPOST AS A REPLACEMENT FOR METHYL BROMIDE**

Though not part of the formal study program this year, Burch Farms has observed higher yields in plots without methyl bromide treatment when compared to fumigated plots. (All Burch Farms acreage was amended with compost prior to the planting season; some fields are in their second and third year of compost application.)

The observation corroborates findings made during last year's cantaloupe trials at the

Williamson farm in Clinton, which indicated better yields without methyl bromide treatment in both compost and non-compost test plots.

### 3rd quarter report

#### BURCH FARMS

**Pepper field trial.** Observations made during the growth of both the compost and control (methyl bromide) blocks noted no significant difference in plant health or growth. Soil and tissue samples indicated similar plant nutrient levels, consistent with the recommended ranges for the crop.

Both the control and compost plots received identical drip irrigation and fertigation with CN 9 and 408. *Kocide* and *Manzate* fungicides, along with *Spintor* insecticide, were sprayed at similar rates to both blocks. Both plots received 500 pounds of 6-6-18 per acre.

**Yield comparisons.** Crop weight yields were gathered on June 22 with four random sample harvests of 120 plants taken from both the control and composted plots. Results indicated a 38 percent yield increase by weight on the plots where compost was used. The methyl bromide plot yielded 23.7 pounds per 120 plants; the compost plot yielded 32.4 pounds per 120 plants.

On June 25, the first field harvest count was conducted with five rows taken from both the control and compost plots. The harvest grade and quality of peppers harvested from both blocks was high. Each five-row harvest plot equaled approximately two acres.

The results were 3,087 boxes from the fumigated block and 4,327 from the compost block – a 40 percent increase.

<b>PLOT COMPARISONS</b>			
	<b>METHYL BROMIDE</b>	<b>COMPOST</b>	<b>DIFFERENCE</b>
<b>POUNDS/120 plants</b>	23.7	32.4	+ 8.7 pounds
<b>BOXES/5-row harvest</b>	3,087	4,327	+ 1,240 boxes
<b>\$ INPUT/acre<sup>1</sup></b>	350	410	+ 60 dollars
<b>\$ YIELD/acre</b>	9,000	12,600	+ 3,600 dollars
<b># BOXES/acre</b>	1,500	2,100	+ 600 boxes

<sup>1</sup> <b>Does not include cost of identical applications to each field such as fungicides, fertigation, etc.</b>
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**Per acre comparisons.** Per acre input cost of the 20-acre control plot was \$385<sup>1</sup>, producing 1,500 boxes with a market value of \$9,000. These costs included an additional pre-plant fertilizer application of 6-6-18 at 500 pounds per acre (\$50/acre) and 50 pounds of methyl bromide fumigation per acre (\$300/acre). It should be noted that Burch Farms costs for fumigation may be lower than regional averages because Burch has its own application equipment and does not use an outside contractor. In addition, its typical application rates are lower than manufacturer recommendations.

Per acre differential input cost of the six-acre compost plot was \$410<sup>1</sup> yielding 2,100 boxes with a market value of \$12,600. This included a broadcast application of *Leprechaun Soil Builder Compost* at a rate of 35 cubic yards per acre (\$385/acre) and a single application of Treflan/Command (\$25/acre) to control weeds emerging in the open ground centers of the compost plot. The compost section was not fumigated.

The non-fumigated compost plot produced 600 additional boxes of bell peppers per acre at a median market value of **\$3,600**.

**Impact.** As a result of this year's study, Burch Farms intends to replace all of its methyl bromide fumigation with compost next season.

A formal report of the Pepper study may be viewed [here](#) or contact Lewis Flynn at 910-532-2539 ext. 28 to receive a faxed copy.

**Equipment modification for banded row application.** After considering a number of options, it was concluded that there is no "good" way to modify equipment for banded row application, considering the volume of material to be applied and equipment types currently available in the marketplace.

Cost of such modification of equipment of the size required to spread multiple rows of compost in one pass would require spreader hoppers of an impractical size. Time/motion/turn-around evaluations also indicated this would not be practical for large-acreage growers.

It was concluded that the best piece of equipment for the job is a pull behind broadcast spreader with high floatation tires ... such as the spreaders used at Burch Farms this year for compost application.

## **McGILL MAGNOLIA FIELD**

**Winter wheat.** This field is currently being prepared for planting next month.

A general observation, based on comparisons between the low compost application rate of this field and the higher rates at the Burch farm indicate that, in most cases, when compost is applied at low rates (< 15 cyds/acre), the benefits are hard to discern.

For 15 cyds/acre or greater, the value of the crop, in most cases, will have to be higher than traditional field crops (i.e., corn, wheat, soybeans) to offset the cost of the compost.

However, 35 cyds/acre in the first year may add sufficient organic/humic matter to provide biological activity at beneficial levels. **This is an area that needs more research, especially with farm grade product and lower application rates.**

## **COMPOST AS POTTING MIX**

Cypress Pond nursery has been using compost for a number of months as an amendment in its potting mixes and has concluded that compost appears to be an effective amendment for large container potting mixes. This nursery customer will continue to use amendment, noting that plant health is as good or superior to plants now growing in the mix.

This coming season, Cypress Pond plans to do trials on a variety of other large container nursery plants.

## **COMPOST AS MULCH**

Observations of the four trial beds at the McGill Delway facility have resulted in a conclusion that pine bark at two to three inches depth is far superior to compost or a compost mix as mulch.

The bark was unable to suppress sedge and common Bermuda grass (as expected), but was effective in control of other grasses and broadleaf weeds.

It is possible that using a compost layer that is denser and thicker may have some suppression value.

No discernable difference in plant health or yield was observed during the growing season.

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## **December update**

### **BURCH FARMS**

Burch Family Farms continues to rely on compost as a major component in its produce production operations. This coming season, they plan to discontinue the use of soil fumigants, replacing them with compost application.

Jim Burch spoke to the annual meeting of the Southeast Fruit and Vegetable growers in December, stating that their use of compost was driven by higher yields, a reduced use of chemicals, and the simple motivation of good economics.

Burch will rely on McGill to supply compost for its conventional and organic growing.

Compost use in the greenhouse will be analyzed this coming year following a promising trial this fall with compost used as a suppressant of wire stem disease in seedlings.

## **COMPOST FOR NOP ORGANICS PRODUCTION**

McGill will begin production of a custom-blend NOP-certified organic compost for the 2002 growing season.

Product certification will be made in conjunction with growers and USDA certified inspectors. Principal organic crop will be Burch Farms' Beauregard sweet potatoes.

## **FUTURE OF COMPOST USE AND COMPOST RESEARCH**

Compost was supplied this fall to the NCDOT as part of ongoing highway erosion control work. Research continues across the state using compost products from a variety of manufacturers in erosion control studies.

McGill will continue to review nursery customers who use its compost products as part of both seedling and container nursery production. Also expected are continuing trials of compost amended tree and bedding soils with compost and non-compost amended planting mix trials set side by side.

This year, approximately 500 cubic yards of compost was used by McGill customers in formal utilization studies with an average dollar value of \$8 per cubic yard.

In addition, about 15,000 cubic yards of compost were sold to Burch Farms for general cropping use.

Based on the success of the trials by Cypress Pond Nursery, Burch Farms, and others, McGill expects a steady increase in demand for recycled organics in both the agriculture and horticulture industries. Especially promising is the use of compost as a replacement for methyl bromide in conventional cropping systems.

Recent findings by other compost researchers and growers, corroborated by results of McGill's studies over the past two years, indicate further research is needed to determine specific compost:conventional product ratios during early and later years of compost use to maximize utilization of both product categories.

It is hoped that the success of these trials will encourage formal research by the academic community to establish definitive guidelines for conventional growers transitioning from chemical products to compost products.