Appendix F

County Compost Use Demonstration Reports

Comanche County

Coryell County

Erath County

McLennan County

Palo Pinto County

Somervell County

Stephens County

Tarrant County

COMANCHE COUNTY DEMONSTRATION
Comanche Post Office Lawn

LOCATION
The Comanche Post Office lawn Located at West Oak Avenue in Comanche, TX.

OBJECTIVE
The primary objective of this demonstration is to compare the effects of dairy manure compost and inorganic fertilizer on the growth and appearance of the turfgrass on a city post office lawn in Comanche, Texas.

INTRODUCTION
Given the close proximity and connection of Comanche to the dairy industry, the use of dairy manure compost by Comanche citizens would be an ideal market for the material. With this in mind, Robert Whitney, Comanche County Extension Agent, developed plots (Figure 1) on the post office lawn to demonstrate the potential benefits dairy compost can provide to soil and turfgrass. By utilizing the Post Office lawn for this demonstration, citizens could conveniently view the impacts of dairy manure compost on the appearance and growth habits of the turfgrass.

1	2	3
2	1	3
3	2	1

Figure 1. Plot design of the Comanche County turfgrass demonstration. Each plot was 20 ft by 9 ft. Numbers in figure represent various treatments and each treatment was replicated 3 times. A 3 ft alley separated each replication of treatments.

PROCEDURE
The demonstration consisted of nine plots (three treatments replicated three times each) and was established on the post office lawn in Comanche, Texas. Each of the three treatments were randomly assigned to the nine plots. Compost applications were applied on March 30, 2004 and inorganic nitrogen fertilizer treatments were applied on April 21, July 15, and September 15, 2004.

The three treatments included:
1. Inorganic nitrogen fertilizer (Figure 2)
2. Dairy manure compost applied once (Figure 3)
3. Dairy manure compost applied twice (Figure 4)

Dairy manure compost was applied at a rate of 20 tons per acre in both treatment 2 and 3. Also, both dairy manure compost treatments received subsequent timely applications of inorganic nitrogen fertilizer at a rate of 20 pounds per acres.

RESULTS

Few visual differences were noted throughout the growing season between each plot created on the post office lawn in Comanche, TX. In addition, no numerical data such as soil tests were obtained for the plots.

The only noticeable difference was in treatment 2, replication 2, where the St. Augustine grass grew into all surrounding plots. This was potentially due to high rainfall received during 2004 that favored the St. Augustine over Bermuda grass. Further, the St. Augustine plot was more dense than any other plot at the initiation of the demonstration.

All other plots except for the St. Augustine were somewhat thin and yellow.

CONCLUSION

The high amounts of natural nutrients present in the post office lawn potentially created a situation in which all plots performed equally well resulting in few visual differences. The thin and yellow appearance of most of the plots, although not verified with data, could have resulted from an iron deficiency caused by excess phosphorus.

Ideally, a new location, which contains lower soil nutrients, would be a better location for a demonstration in the future.

Figure 2: Treatment 1, which received an application of only inorganic fertilizer**.**

Figure 3: Treatment 2, which received a single application of dairy manure compost at 20 tons per acre rate followed by an inorganic nitrogen fertilizer application at a rate of 20 lbs per acre applied 4 times.

Figure 4: Treatment 3, which was treated twice with dairy manure compost at 20 tons per acre followed by an application of inorganic nitrogen fertilizer at 20 lbs. per acre applied 4 times.

CORYELL COUNTY DEMONSTRATION
Coryell County Courthouse

LOCATION
The Coryell County Courthouse lawn located on East Main in Gatesville, Texas.

OBJECTIVE
The primary objective was to demonstrate to Coryell County residents the benefits of dairy manure compost produced in the Bosque River Watershed when utilized as an amendment to improve vegetation and soil properties.

INTRODUCTION
Coryell County is located within the Leon River Watershed, which along with its neighboring North Bosque River Watershed, is dominated by the dairy industry. In an effort to prevent potential runoff from dairies, compost is being produced from dairy manure in both the Leon and Bosque River Watersheds. Given both watersheds benefit economically from the dairy industry, it is imperative that local support is given to the dairy and compost producers.

The Coryell County courthouse project allows residents to see the many benefits of dairy manure compost, specifically, its use to improve vegetation quality and soil properties. By utilizing dairy manure compost in local landscapes, the public is helping protect the environment while at the same time supporting the dairy industry.

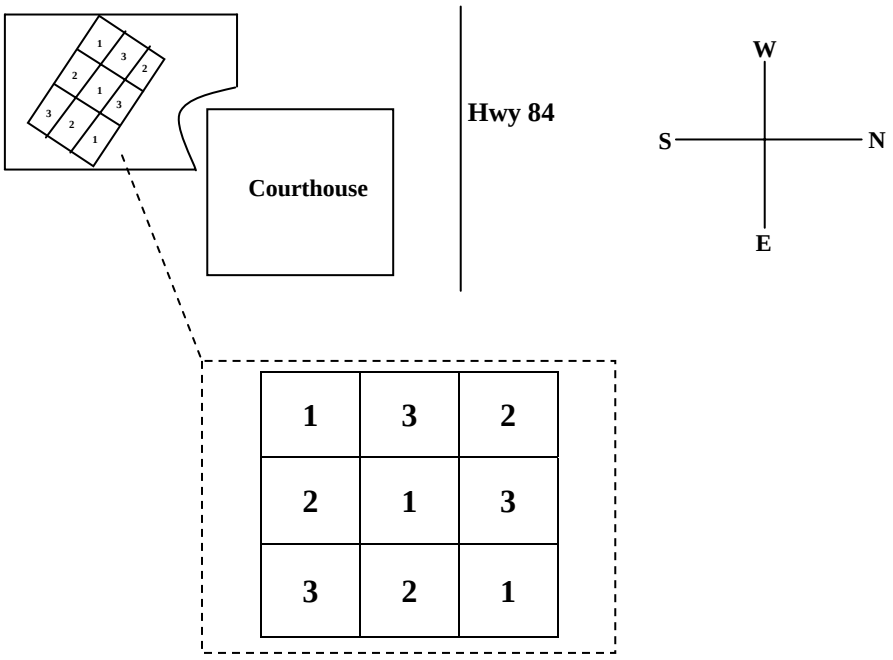

Figure 1. Demonstration location and plot design. Numbers in figure represent various treatments utilized in the demonstration

PROCEDURE

Nine plots, each measuring 20 feet by 10 feet, were established on the Coryell County courthouse lawn in Gatesville, Texas. Three different treatments were applied and each treatment was randomly assigned and replicated 3 times (Figure 1).

The three treatments utilized were:

1. Untreated
2. Compost at 20 tons per acre
3. Compost at 40 tons per acre.

Inorganic fertilizer (N-P-K) was applied as a part of the standard maintenance practices to the entire plot area and courthouse lawn (including the demonstration area) on April 26, 2004. Compost was evenly spread onto plots receiving treatments 2 and 3 using a rolling basket applicator (Figure 2) on April 27, 2004.

Figure 2: Dairy compost was applied using a rolling basket applicator.

Table 1. Soil analysis results for the Coryell County Courthouse lawn prior to compost application.

N	P	K	Ca	Mg	Na	Z	Fe	Cu	Mn	DM	LOI	pH	EC
%					ppm					%			umhos/cm
0.785	0.1702	0.2735	2.6215	0.2098	0.2154	85.6	4785	35.81	119.1	63.7	18.9	8.1	1280

RESULTS

Visual differences between treatments were not evident due to several factors. TCE was not able to secure plot location prior to the spring fertilization and therefore, as a standard maintenance practice inorganic fertilizer was applied to the lawn before demonstration installation, which meant all plots (all treatments) also received inorganic fertilizer. Thus, the inorganic fertilizer provided adequate nutrients to the entire lawn resulting in little to no response from the nutrient benefits of compost.

Secondly, rainfall for the summer was well above normal, which also resulted in little to no visual growth response from compost applications. While no visual results were observed, the addition of dairy compost to the lawn did potentially benefit soil chemical and physical properties. Table 1 displays the soil analysis results of the compost applied to the courthouse lawn.

CONCLUSION

The dairy compost used on the Coryell County courthouse lawn did not result in visible differences when compared to the 'untreated' plot. Lack of results was most likely due to the application of inorganic fertilizer prior to compost application. Regardless of the lack of visible differences, the benefits of compost, the improved soil properties, were still a potential outcome.

As part of the objective to publicize the use of dairy compost, the Gatesville Messenger published an article highlighting the demonstration on May 15, 2004. This article can be found at http://compost.tamu.edu/demos/coryell_compost-study.pdf

ERATH COUNTY DEMONSTRATION
Lovell Lawn and Landscape Raises Oak Tress in Dairy Compost

LOCATION
The business of Lovell Lawn and Landscape located 6744 South U.S Highway 281 in Stephenville, TX.

OBJECTIVE
The primary objective of this demonstration was to evaluate the use of dairy manure compost and similar dairy manure products to enhance the production of Live Oak trees being grown at Lovell Lawn and Landscape.

INTRODUCTION
Jason Lovell, president of the Lovell Lawn and Landscape Company, primarily had been using bark mulch for potting his landscape plants. However, in working with Mr. Joe Pope, Erath County Extension Agent (retired), Mr. Lovell agreed to conduct a demonstration utilizing dairy manure compost and other products as an alternative potting mix.

Lovell compared bark mulch, dairy manure compost and Bovinite™ as growth media for approximately 100 Live Oak trees grown during the spring and summer of 2004. Bovinite™ is a commercial dairy compost product specially processed to reduce overall salt content and increase the nitrogen to phosphorus ratio. Further the material contains a high organic matter content, which decreases the overall density compared to the typical dairy manure compost produced in the Bosque River Watershed.

PROCEDURE
The three treatments compared by the landscape company included:

1. 100% general potting mix (bark mulch)
2. 100% Bovinite™ (commercial high organic matter material)
3. 100% Dairy Compost

Each treatment was introduced as growth media when the Live Oaks were repotted from 30-gallon to 45-gallon containers between February 2004 and September 2004. To improve validity of the demonstration, each treatment was replicated three times.

RESULTS
Initially, Pope and Lovell planned to take measurements on changes in tree diameter and other indicators of plant response. Opportunity to sell the trees, however, precluded collection of measured growth data. In the absence of measured data, landscape personnel did make the following visual observations.

Live oaks grown in Bovinite™ exhibited the best overall performance followed by those grown in the dairy manure compost. Trees grown in those media outperformed those potted in the bark mulch in rate of growth, root proliferation and overall appearance.

Specifically, trees grown in both Bovinite™ and the dairy manure compost required less frequent irrigation than those potted in the bark mulch, which therefore minimized moisture stress due to delayed water. In addition to improved performance, the use of the higher organic material also resulted in some time and labor savings

.

The dairy manure compost utilized in the demonstration had a higher inorganic (sand) content and lower organic matter content than both the Bovinite™ and bark mulch. Consequently, containers with live oaks potted in dairy manure compost were heavier than those trees potted in Bovinite™ and bark mulch**.**

CONCLUSION

The dairy manure compost and Bovinite™ produced in the Bosque and Leon River Watershed proved to be better potting materials than the bark mulch Lovell Lawn and Landscape was previously using. Both materials allowed for less irrigation and fertilization, which in turn decreased labor costs. Although the dairy compost did increase container weight due to the excess amount of inorganic material (sand), Lovell reported that customers were pleased with the condition of the Live Oaks and not concerned about weight differences.

As a result of the demonstration, Lovell Lawn and Landscape continues to buy about six truckloads of dairy manure compost a year from the commercial composting operations located in the North Bosque and Leon River watersheds. The majority of the compost is used in the maintenance and renovation of landscapes (lawns, flower beds, etc.) for customers that include private home owners and businesses in Stephenville and surrounding communities.

Currently, the company produces only a limited number of container grown trees. For this, Lovell utilizes a commercial potting media that contains dairy manure compost and is specifically formulated and marketed for that purpose by a local composter.

McLENNAN COUNTY DEMONSTRATION
Riesel ISD utilizes Dairy Compost to Maintain Football Practice Field

LOCATION
The Riesel Independent School District High School practice football field in McLennan County.

OBJECTIVE
The primary objective of this demonstration was to evaluate the health, density, and appearance of the practice football field following a top dress application of dairy manure compost alone and dairy manure compost combined with fertilizer on a.

INTRODUCTION
The Riesel Independent School District's high school practice football field was recently recrowned and in fair condition. School personnel wanted to maintain the field's excellent health and further improve the density of the existing turf. Further, the School realized the poor condition of their actual playing field and were exploring options to improve its quality. Treatment and maintenance of the practice field was an excellent opportunity to evaluate some of these management techniques, which would ensure they could choose the most effective and cost efficient method to improve their playing field.

With assistance from Mr. Will Kiker, McLennan County Extension Agent, and Dr. Jim McAfee, Texas Cooperative Extension Turfgrass Specialist, Riesel ISD formulated a plan to conduct a demonstration on the practice field and implement specific management practices for their playing field. Because of the Dairy Manure Compost Incentive Program, Riesel ISD elected to apply dairy manure compost on the practice field as an alternative nutrient source. Application of the compost, mechanical aeration and efficient irrigation were all components of the practice field demonstration.

PROCEDURE
The demonstration was initiated on June 22, 2005 when approximately 80 tons per acre of top-dress quality dairy manure compost was uniformly applied to the Riesel ISD practice football field. The compost was applied (Figure 1) utilizing a Turf Tiger® spreading unit (Figure 2) provided by the Agricultural Research Experiment Station in Stephenville. The compost spreader was purchased with grant funds provided by the Texas Commission on Environmental Quality through an US EPA Clean Water Act Section 319(h) Grant. Also in conjunction with the grant, Riesel ISD received a rebate of $5 per CY of compost purchased, which improved the economics of the demonstration and specifically, this management practice for the school.

The spreading unit was calibrated (Figure 3) prior to adding dairy manure compost to the field to ensure a uniform application. Subsequently, the field was mechanically aerated to partially incorporate the compost, enhance nutrient and water uptake and to reduce compaction.

Figure 1. Broadcast application of dairy manure compost on Riesel ISD practice football field.

Figure 2. Loading Turf Tiger® spreading unit with top-dress quality dairy manure compost.

Figure 3. To calibrate the spreader, dairy manure compost is applied into collection unit and weighed as indicated above. By calculating distance of spreader and amount applied, the spreader can be accurately calibrated to ensure a uniform application rate across the field.

Irrigation was applied (Figure 4) for the first time 3 weeks after compost application. As the season progressed, school personnel wanted to evaluate the addition of inorganic nitrogen fertilizer as well. Therefore, an application of inorganic nitrogen was applied to the south end of the field at a rate of 1 lb nitrogen per 1,000 square feet approximately 4 weeks after the compost application.

Figure 4. Irrigation was applied for the first time approximately 3 weeks after compost application.

Supplemental applications of inorganic nitrogen are typically utilized because the ratio of nutrient concentrations in a compost product is rarely an exact fit for turfgrass needs. An application of compost that meets nitrogen requirements will often provide excess phosphorus. As a result, compost application rates should be determined based on turfgrass phosphorus requirements and supplemented with a phosphorus free inorganic fertilizer to complete turfgrass nitrogen and/or potassium requirements.

In addition to the demonstration conducted on the practice field, TCE personnel also worked with the School to implement alternative management techniques on the playing field. Realizing the field potentially needed complete reconstruction, the school opted to implement inexpensive management techniques for the current year in order to bring the field to proper playing condition for the upcoming season. Throughout the summer of 2005, the school mechanically aerated the playing field on a frequent basis and TCE conducted an irrigation audit in July to ensure irrigation applications were both effective and efficient. By implementing these inexpensive management practices, the school was able to better arrange funding for pending future activities such as recrowning and / or dairy compost applications. Further, the school was able to evaluate the effects of dairy manure compost on the practice field without investing additional funds in the playing field.

RESULTS

A pre and post soil sample was collected from the practice field. The pre soil sample was collected in May 2005 and a follow-up soil sample was taken 6 months after demonstration installation. The post treatment soil sample was collected from both the North and the South ends of the football field. The North end as stated did not receive a supplemental rate of inorganic N, while the South end did receive the supplemental inorganic nitrogen application at a rate of 1 lb nitrogen per 1,000 square feet approximately 4 weeks after the compost application. All soil sample results are presented in Table 1.

Dairy manure compost was sampled prior to application in June 2005 and results for dairy manure compost characteristics are presented in Table 2.

Table 1. Laboratory analysis results of soil samples taken before (PRE) application of compost and 5 months after (POST) the application of compost.

		Nitrate-N	**P**	**K**	**Ca**	**Mg**	**S**	**Na**	**pH**	**Cond.**
		----------ppm----------								umho/cm
PRE	**Whole field**	19	87	320	4,381	186	28	240	7.8	291
POST	**North**	46	161	513	4827	251	50	402	7.9	465
	South	55	169	567	5650	281	70	357	7.8	516

Table 2. Laboratory analysis results of top-dress quality dairy manure compost based on an oven dried sample (% and ppm) and based on an as received basis (pounds per wet ton).

N	**P**	**K**	**Ca**	**Mg**	**Na**	**Zn**	**Fe**	**Cu**	**Mn**	**Moisture**
----------%----------						----------ppm----------				%
1.3600	0.3915	1.4216	13.2474	0.6471	0.5650	140	8,095	59.5	260.5	11.9
----------lbs per wet ton of compost----------										
23.97	15.80	30.07	233.48	11.40	9.96	0.247	14.267	0.105	0.459	NA

The dairy manure compost application, aeration and efficient irrigation resulted in improved turfgrass density and uniformity on the practice field (Figure 5). These improvements were noted as the field grew greener in color and the turf even began out competing some of the unwanted grass species. The post soil sample results did exhibit elevated levels of P. While these results were not at an environmentally harmful level, it should be noted that school personnel should avoid any applications of P or organic type fertilizers for several years or until soil tests indicate a need for P.

Figure 5. Riesel ISD practice football field overview prior (left) to and 1 month after (right) top dress quality dairy manure compost was applied.

CONCLUSION

By cooperating with TCE, Riesel ISD was able to evaluate various management techniques for the maintenance of their practice field and the recovery of their playing field in an economical manner. In addition, the School District was supporting a local industry and helping protect a neighboring natural water source.

PALO PINTO COUNTY DEMONSTRATION
Santo ISD Football Field

LOCATION
The Santo I.S.D. High School Football Field located at Farm-to-Market Road 2201 in Santo, TX.

OBJECTIVE
The primary objective of this demonstration was to evaluate the effects of proper management practices such as the addition of dairy manure compost and commercial (nitrogen) fertilizer, aeration and timely irrigation on the condition of the Santo ISD football field.

INTRODUCTION
The Fighting Wildcats of Santo High School played football on a field that was considered to be in "fair to poor" condition largely due to compacted soil and substandard turfgrass cover (Figure 1). Scott Mauney, Palo Pinto County Extension Agent, Texas Cooperative Extension, offered his assistance to the School Board in renovating the field. Mauney contacted Dr. Jim McAfee, Extension Turfgrass Specialist in Dallas, and together they formulated a sports field management program that included mechanical aeration of the football field, top-dress applications of dairy manure compost and commercial (nitrogen) fertilizer, timely applications of irrigation and efficient weed control practices.

Figure 1: A close-up photograph of the football field vegetation prior to demonstration initiation. Compacted soils reduced turfgrass stand, which led to bare areas and excess weed growth.

PROCEDURE

The demonstration was implemented in May, 2004, when top-dress quality dairy manure compost (Figure 2) was uniformly applied to the Santo High School football field at a rate of 80 tons per acre (approximately 108 cubic yards per acre) using a Turf Tiger® spreading unit (Figure 3).

The spreading unit was calibrated (Figure 4) prior to adding dairy manure compost to the field to ensure a uniform application (Figure 5). Subsequently, the field was mechanically aerated to partially incorporate the compost, enhance nutrient and water uptake and to reduce compaction. Immediately following compost application and aeration, the field received an application of 20 pounds per acre of inorganic nitrogen fertilizer (Figure 6). As the season progressed, the field received an additional 20 pounds of inorganic nitrogen fertilizer per acre and was mechanically aerated a second time.

The supplemental rate of inorganic nitrogen is typically utilized because the ratio of nutrient concentrations in a compost product is rarely an exact fit for turfgrass needs. An application of compost that meets nitrogen requirements will often provide excess phosphorus. As a result, compost application rates should be determined based on turfgrass phosphorus requirements and supplemented with a phosphorus free inorganic fertilizer to complete turfgrass nitrogen and/or potassium requirements.

Figure 2. Top-dress quality dairy manure compost prior to application

Figure 3. Tractor pulled Turf Tiger® mechanical spreading unit.

Figure 4. Calibration of the spreading unit to ensure accuracy

Figure 5. Uniform application of dairy manure compost across the football field.

Figure 6. Application of inorganic nitrogen fertilizer following the dairy manure compost application.

RESULTS

The treatments and timely maintenance resulted in improved turfgrass coverage and uniformity. Improvements were noted in grass density, health, color and overall appearance (Figure 7).

Unfortunately, the condition of the field has again declined primarily due to overuse this last season. Athletes from a newly constructed school were temporarily reassigned to the Santo ISD field and it was also utilized by community soccer programs. The expectation is that with the addition of new sports facilities in the community, use of this field will again be largely limited to varsity sporting events and field health can once again improve.

It is at this point that the board expects their investment in the dairy manure compost application to pay dividends. The one-time heavy application of compost is expected to improve chemical and physical properties of the soil, which will potentially hasten the recovery of the field from damage caused by overuse or other stresses such as climate. In addition, large compost applications can improve turfgrass health and optimize turfgrass response to fertilization, irrigation, aeration, and other management practices. Thus, standard fertilizer treatments and management practices (e.g. irrigation, aeration, etc.) can maintain the field for several years before re-treatment with compost is again necessary.

CONCLUSION

The members of the Santo ISD board were satisfied with the improvements the addition of dairy manure compost, inorganic nitrogen fertilizer, and proper management techniques had on the Santo High School football field.

Because of the positive results, the Santo ISD School Bard considered a similar compost-fertilizer-management program for the baseball field in 2005. However, plans, to construct a

new field were also under consideration. Thus, the board decided to delay the substantial investment of a dairy compost application until baseball field construction plans were finalized.

The costs of purchasing and hauling dairy compost can be substantial, especially for smaller school districts with limited budgets. Figure 8 is an example of the itemized costs associated with compost purchase and transport.

Figure 7. Santo ISD football field closeup (left) and overview (right) several months after implementation of the sports field management program, which included applications of dairy manure compost and inorganic nitrogen fertilizer.

Compost Budget Sheet

Compost (200 CY @ $16.00/CY)	$ 3,200.00
Freight (50 Mi @ $3.00/loaded Mi X 3 loads)	$ 450.00
Sub-total (before rebate)	$ 3,650.00
Composted Manure Incentive Payment (Rebate of $5.00/CY)	-$ 1,000.00
TOTAL COSTS	**$ 2,650.00**

Figure 8. Estimated costs for the purchase and transportation of dairy manure compost. Costs are related based on a top-dress application on a football field at a rate of 80 tons per acre.

SOMERVELL COUNTY DEMONSTRATION
City Park Soccer Field

LOCATION
The dairy compost demonstration was located near the Glen Rose City Soccer Field located on Texas Drive in Glen Rose, TX.

OBJECTIVE
The primary objective of this demonstration was to evaluate the effects of dairy manure compost on the growth and appearance of turfgrass on a city soccer field in Glen Rose, Texas.

INTRODUCTION
In cooperation with the City of Glen Rose, Mr. Joe Geistweidt, Somervell County Extension Agent (retired), selected an area immediately adjacent to the city soccer field for the dairy manure compost demonstration. Given the extensive use of city sports fields, Geistweidt was unable to utilize the actual field for the demonstration. However, by implementing the plots beside the field, he would be able to compare the effects of dairy manure compost to the standard management program of the soccer field. Finally, the use of an organic amendment, such as dairy manure compost, on such sports fields was an ideal fit given their high traffic patterns and the desire to reduce inorganic chemical use.

1	**2**	**3**	**4**
2	**4**	**1**	**3**
3	**1**	**4**	**2**

Figure 1. Plot design of the Somervell County turfgrass demonstration. Each plot was 10 ft by 10 ft. Numbers in figure represent various treatments and each treatment was replicated 3 times. A 3 ft alley separated each replication of treatments.

PROCEDURE
Twelve plots (Figure 1) were established immediately adjacent to a city soccer field in Glen Rose, Texas. The four treatments, each replicated three times, were randomly assigned to the 12 plots.

The four treatments used included:
1. Untreated (no compost or fertilizer)
2. Inorganic Fertilizer
3. Dairy manure compost applied once
4. Dairy manure compost applied twice

Both dairy manure compost treatments were applied at a rate of 20 tons per acre and both were supplemented with inorganic fertilizer at 20 pounds nitrogen per acre applied 4 times throughout the growth season.

To accurately determine the application rates, compost was weighed in the field and applied using a basket spreader (Figure 2).

The data collected throughout the demonstration included a pre (approximately March) and post (approximately November) soil sample analyzed for nutrients, pH, organic matter and salinity, In addition, turf color, quality and density and weed presence were rated every 2 weeks from April thru July. Color, density and quality ratings were conducted on a scale of 1 to 9 with a higher number representing better color, density or quality. A good rule of thumb is any rating of 6 or higher represents a turf that would be acceptable in the average yard. Weed presence ratings were also conducted on a scale of 1 to 9 where 1 represents no weeds present and 9 represents excessive weed growth within the plot. Finally, photo documentation was collected throughout the season.

Figure 2. Dairy manure compost being weighed (left) and applied (right) utilizing a basket spreader.

RESULTS

Data from all four ratings are presented in Tables 1 through 4. Standard deviations between means are also listed to show significance difference.

In all rate timings presented, plots treated with inorganic fertilizer and compost had significantly better color than the untreated plot. However, no significant differences were observed between the dairy manure compost and the inorganic fertilizer treatments.

Turf density displayed similar results with the exception of the June 16 rating. The inorganic fertilizer treatment yielded significantly better turf quality than the untreated at all three ratings. However, compost treated plots had variable turf quality results compared to both the untreated and the inorganic fertilizer treated plot.

Finally, weed presence was variable across all four treatments.

Rating Date	Treatments				STD DEV
	Untreated	IF	DMC once	DMC twice	
May 18	5.3	6.7	7.7	7.0	0.98
June 16	5.0	6.3	6.3	6.7	0.74
July 13	5.0	7.3	7.0	7.0	1.07

Table 2. Turf density evaluations

Rating Date	Treatments				STD DEV
	Untreated	IF	DMC once	DMC twice	
May 18	7.0	7.7	8.0	7.7	0.42
June 16	7.7	8.0	7.3	7.0	0.43
July 13	7.3	7.7	8.0	7.7	0.27

Table 3. Turf quality evaluations.

Rating Date	Treatments				STD DEV
	Untreated	IF	DMC once	DMC twice	
May 18	5.0	5.7	6.3	5.3	0.57
June 16	5.0	5.3	5.0	5.0	0.17
July 13	5.0	5.3	5.3	5.0	0.19

Table 4. Weed presence evaluations.

Rating Date	Treatments				STD DEV
	Untreated	IF	DMC once	DMC twice	
May 18	3.3	3.3	2.3	3.7	0.58
June 16	2.7	2.3	3.0	3.0	0.32
July 13	3.0	2.3	1.7	2.7	0.57

CONCLUSION

Visual differences in turf color, density and quality between treatments during the first year resulted primarily from the addition and availability of nutrients. While both dairy manure compost and inorganic fertilizer provide such nutrients, the inorganic nutrients are more immediately available and therefore, these plots typically showed visual differences. Photo documentation throughout the demonstration illustrated this point (Figure 3).

Organic amendments, such as dairy manure compost, provide long term benefits such as the addition of micronutrients and improvements in soil tilthe, which enhances the water holding capacity of the soil and its aeration. However, these benefits were not recorded given the limited evaluation period of the demonstration. Further, such benefits are difficult to measure especially given the limited scope of the demonstration.

Regarding weed density, results were considered typical as none of these treatments should immediately affect weed presence. However, the consistent use of any nutrient amendment can potentially provide weed control over time. Essentially, turf density and quality responds to the nutrient inputs and out competes foreign species. The limited evaluation period for this demonstration, however, does not allow these benefits to be seen.

A second purpose for obtaining weed presence ratings was to determine if viable weed seed was present in the dairy manure compost. During the composting process, temperatures should reach adequate levels to destroy viable weed seeds and thus, produce a weed free material. Given the demonstration setting, however, Geistweidt utilized the opportunity to verify the dairy manure compost was weed free. With the weed ratings, it was determined only pre-existing weeds were present in the plots and therefore, the dairy manure compost was weed free.

Figure 3. Plot overview taken in May (left) and then taken in October (right). Nutrient availability in May was more consistent as noted by no visual differences between plots. However, plot boundaries are distinctly obvious in October picture. Plots with dark green color signify those that received subsequent nitrogen applications and therefore, had higher nutrient availability.

STEPHENS COUNTY DEMONSTRATION
Breckenridge ISD Practice Football Field

LOCATION
The Breckenridge High School football practice field located at 500 Block 2nd Street in Breckenridge, TX.

OBJECTIVE
The primary objective of this demonstration was to evaluate the effects of compost, and fertilizer on the health, density, and appearance of the turfgrass on the Breckenridge High School practice football field.

INTRODUCTION
The Buckaroos of Breckenridge High School had been practicing football on a field with compacted soil and poor grass cover and density on many sections. In conjunction with the Dairy Compost Utilization Project, Phillip Bales, Stephens County Extension Agent, offered to work with the school district to address these problems. With inputs from Dr. Jim McAfee, Extension Turfgrass Specialist in Dallas, Bales formulated a turf management demonstration that included mechanical aeration of the field, fertilization with dairy manure compost supplemented with inorganic nitrogen, and timely irrigation.

1	2	3
2	1	3
3	2	1

Figure 1. Plot design of the practice field demonstration at Breckenridge High School. Numbers in figure represent various treatments in the demonstration

PROCEDURE
Nine equally sized plots were developed within the 50’ by 100’ area high school football practice field in Breckenridge, TX (Figure 1). Each of the nine plots was randomly assigned one of the three treatments allowing for three replications of each treatment.

The treatments applied included:
1. Compost at 40 tons per acre
2. Compost at 40 tons per acre plus inorganic Nitrogen at 20 lbs N per acre
3. Inorganic Nitrogen at 60 lbs N per acre

The compost spreader and scale were calibrated to ensure accurate amounts of dairy compost were applied (Figure 2). Compost was applied with a tractor pulled Turf Tiger® spreading unit (Figure 3) provided by the Dairy Compost Utilization Project funds.

Figure 2: The compost spreader (left) and scale (right) were calibrated to ensure accuracy.

Figure 3: The tractor pulled rotary spreader.

RESULTS

Visual assessments of turf stand, density, color, and weed presence were collected through the summer and fall growing seasons. Overall health of practice field vegetation has improved across all treatments. Specifically, turf density improved providing coverage on many previously bare areas and the improvement was sustained even after athletic activity was resumed this school year.

Figure 4: Treatment 1.

Figure 5: Treatment 2.

CONCLUSION

Unfortunately the dairy compost used in the trial was not of top-dress quality, which resulted in some unintended consequences. This "general use" grade material contained small rock (limestone or caliche) fragments, which had to be removed by hand. Also, the appearance of some weeds in the turf suggested that the product was not fully composted, e.g. proper temperatures were not maintained. When composted correctly, dairy manure compost should not contain any viable weed seeds. While use of this product could be effective in other situations, such as cases where it would be incorporated into the soil, its use as a top-dress would not be recommended.

Tommy Wolfe, Director of Maintenance and Transportation, Breckenridge Independent School District, said that $200 was spent annually to purchase and apply inorganic fertilizer to the football field before the demonstration and the $150 spent on irrigation annually was not affected. Because the price of the compost exceeds the amount budgeted for the practice field every year, it is not likely that Breckenridge ISD will purchase more and it has recently been decided that artificial turf will soon be used on the field.

TARRANT COUNTY DEMONSTRATION
Hurst Courthouse Lawn and Flowerbeds

LOCATION
The lawn area and perennial flowerbeds of the Tarrant County Northeast Sub-Courthouse located at 645 Grapevine Highway in Hurst, TX.

OBJECTIVE
The primary objective of this demonstration was to improve the growth habits and healthy appearance of turfgrasses and perennial flowers at the Tarrant County Northeast Sub-Courthouse.

INTRODUCTION
The landscape maintenance staff for the Tarrant County Northeast Sub-Courthouse continually encountered problems in maintaining good growth and healthy appearance of turfgrasses and perennial flowers at the facility. When increasing the irrigation schedule from once to twice per week failed to improve plant performance and appearance, Dotty Woodson, Tarrant County Extension Agent, suspected problems related to fertility and soil conditions.

To address these landscape issues, Woodson established test plots to demonstrate the use of dairy manure compost combined with recommended rates of commercial fertilizer on turfgrass (Figure 1) and perennial flowerbeds (Figure 2). The dairy manure compost was purchased from a commercial composter located in the North Bosque River Watershed. Research and demonstration trials conducted at the Dallas Research and Extension Center showed dairy manure compost used in combination with inorganic fertilizer optimized plant growth, prepared soil for new plantings, and renovated problem areas in turfgrass and flower beds.

PROCEDURE
For both the perennial flowerbed and the lawn area, project personnel utilized different combinations of inorganic nitrogen fertilizer and dairy manure compost as a soil and vegetation amendment. By comparing different mixtures, personnel could determine the most beneficial mixture required to optimize and improve turfgrass and perennial growing conditions.

The treatments utilized in the turfgrass demonstration were:

1. Inorganic fertilizer only
   A recommended rate of 8 pounds nitrogen per 1,000 square feet applied twice during the growing season
2. Dairy manure compost applied once
   A rate equivalent to 20 tons per acre
3. Dairy manure compost applied twice
   A rate equivalent to 20 tons per acre

1	2	3
2	1	3
3	2	1

Figure 1. Plot design of the turfgrass demonstration. Numbers in figure represent various treatments in demonstration.

In addition, both dairy compost treatments also received 20 pounds of inorganic nitrogen applied twice during the growing season. The supplemental rate of nitrogen is typically utilized because the ratio of nutrient concentrations in a compost product is rarely an exact fit for crop needs. An application of compost that meets nitrogen requirements will often provide excess phosphorus. As a result, compost application rates should be determined based on crop phosphorus requirements and supplemented with a phosphorus free inorganic fertilizer to complete crop nitrogen and/or potassium requirements.

The treatments utilized for the perennial flowerbeds included:

1. Inorganic fertilizer only
   A rate of 8 pounds of nitrogen per 1,000 square feet
2. Dairy manure compost
   At a rate equivalent to 100 tons per acre and incorporated to a 6 inch depth
3. Dairy manure compost plus 20 pounds of inorganic nitrogen
   At a rate equivalent to 100 tons per acre and incorporated to a 6 inch depth

To convert the application rate to a smaller scale for the flowerbeds, Woodson determined the 100 ton per acre rate is equivalent to approximately a 6 inch layer of the material evenly applied on the soil surface.

If the specified use or surrounding vegetation allows for incorporation of compost, it is recommended as incorporation of organic amendments, such as dairy compost, typically provides greater benefit than topdress applications.

Bed 1	1	2	3
Bed 2	2	1	3
Bed 3	3	2	1

Figure 2. Plot design of the perennial flowerbed demonstration. Numbers in figure represent treatments in demonstration

RESULTS

Turfgrass growth improved in vigor and color in the demonstration plots where compost and fertilizer were added. The differences were clearly visible and prompted many clients visiting the sub-courthouse to comment about the improved appearance of the turfgrass.

The growth and vigor of the ornamental plants were also greatly improved in the plots where compost and compost plus fertilizer were added.

CONCLUSION

In the flowerbed demonstration incorporation of the compost into the top 6 inches of soil created a much improved environment for plant growth and development. The dairy manure compost provided essential nutrients required by plants, added organic matter that improved soil physical properties, and increased water infiltration and retention within the soil.

Dotty Woodson said the county staff has decreased water costs after the demonstrations plots were established on the sub-courthouse turfgrass and flowerbeds. In the past, the staff watered twice a week, and following the demonstration the staff decreased watering to once a week. Woodson was unsure of the water savings in dollars for the county as a result of the education programs and demonstrations, but she was sure her time with the staff throughout the education programs and demonstrations helped decrease the volume of irrigation water and saved the county money.

In addition to water savings for Tarrant County, the use of dairy manure compost also benefited neighboring counties by recycling and removing the valuable nutrients and organic material produced cooperatively by the dairy operations and compost facilities in the North Bosque Watershed.