# Demonstration of Composting

# As a

# Best Management Practice For Poultry Operations

## FINAL REPORT

## FY 95 EPA (h) Grant


**Gonzales Soil and Water Conservation District**

**Gonzales, Texas**

**December 31, 1998**

95-4

# Demonstration of Composting as a Best Management Practice for Poultry Operations
# FY95 EPA 319 (h) Grant

## Executive Summary


Between March, 1995 and December, 1998,approximately $162,000 of EPA 319(h) funds and $109,000 of Gonzales Soil and Water Conservation District (SWCD) and local poultry producers matching funds allowed the SWCD BMP Project to construct 6 demonstration composting facilities to:

- Compost approximately 1.4 million pounds of poultry mortality.
- Develop a high quality, 13-minute BMP video.
- Set up BMP display with literature at 2 state wide RC&D meetings and was viewed by 500 individuals
- Conducted three BMP presentations to three groups, directly reaching 207 poultry producers.
- Construct six demonstration sites for the three classes of poultry: broilers, layers, and turkeys.
- Host 3 regional wide meetings for poultry producers with 300 in attendance.
- Publish dozens of BMP articles in Poultry Times, Victoria Advocate, Guadalupe Valley Farmer-Rancher, Cloth World and other local newspapers.
- Monitor six tracts for BMP compliance and the utilization of N, P, and K.
- Install six billboards as a cooperative between Gonzales SWCD,TSSWCB, EPA NRCS, TAES, and poultry producers.
- Prepared and disseminated a fact sheet on poultry composting.
- Assembled and distributed a poultry composting handbook to 50 producers.

# Non-point Source Pollution Control Program for Poultry Producers in Texas (EPA FY 1995 Sec. 319 Grant)

## Final Report
## Covering Activities from March, 1995 through December, 1998

Introduction

The Demonstration of Composting as a Best Management Practice for Poultry Operations is a cooperative project that reduces nonpoint source pollution from poultry operations by encouraging the widespread adoption of voluntary composting of poultry mortality as a Best Management Practice by poultry producers. The Project was funded by a FY 1995 Clean Water Act Section 319(h) grant from the U.S. Environmental Protection Agency thru the TSSWCB. The program objective has been to demonstrate the use of composting to prevent potential water contamination from inadequate disposal methods for flock mortality, and to determine the economic feasibility of construction and operation of composting. The project contained four tasks:

1. **Project Coordination and Acceptance:** To gain acceptance and use of composting as a Best Management Practice by poultry producers by getting producers in the informational loop in planning the demonstration.

2. **Proper Application of Compost and Assessment of Effectiveness:** To provide enduring, effective and accurate BMP demonstration each site will be tested for nitrogen and phosphorus levels and apply compost based on soil test to ensure complete utilization to insure the results in the abatement of nonpoint source pollution.

3. **Design and Construction of Composting Facilities:** To insure the success of the project, each compost facility will be designed to meet the individual producer needs and to reflect recent technology.

4. **Technology Transfer and Economic Feasibility:** To Provide for increased awareness, acceptance, and feasibility of the Project a video, audio, and written articles and fact sheets will be used to review costs and benefits to establish economics and marketability of composting as a BMP.

This final report summarizes accomplishments of these four tasks and provides recommendations for future efforts.

Task1.2 Identified and information loop to allow cooperators to stay abreast of project activities.

- The coordinating committee will serve as the informational loop.

- Cooperators met quarterly to fine tune composting facilities.

Task 1.2A Utilized information loop to coordinate projects activities and generates interest in the project.

- All information about the project was sent to local news papers and magazines

- Resulted in the publishing of 14 articles with exposure to over 1,500,000 people in the area and State. **(See appendix A)**

- Information plan outlined.

Task 1.3 Conduct quarterly meetings of cooperators to facilitate decision-making on project activities.

- Held 12 meetings with an average of 11 in attendance with coordinating committee and producers.

- Utilized a booth at the Texas association of RC&D areas with over 250 in attendance.

- Held three producer field days with more than 100 in attendance at each meeting.

- Video has been shown to more than 1200 people interested in composting.
- The City of Austin toured the compost facilities to utilize composting for road kill in the Austin area.

**Deliverables:** Measuring the success of Program Element 1.

1) Meeting minutes and reports of meetings with attendee lists.

   **Three meetings were held with the coordinating committee and producers with an average of 70 in attendance.**

2) Informational plan outline.

   **See Appendix B.**

   **A total of 12 quarterly reports were filed on time and gave an Outline of what was completed and what needed to be completed.**

3) Reports on activities of cooperating entities, listing of demonstration cooperators, report of quarterly meeting.

   **Producers and coordinating committee gave reports of progress and activities that effect poultry producers and composting.**

4) Report on number of facilities needed to demonstrate technology.

   **The coordinating committee determined that there was a need for six facilities utilizing two basic designs for their types of birds with three different recipes. The basic two designs consist of wood using the delmarva design, two of concrete using the delmarva design and two of concrete using an experimental design made by Plantation foods.**

PROGRAM ELEMENT 2: Application of Compost to Fields and Assessment of Effectiveness.

Task 2.4 Prepare a report of existing and preimplementation conditions.

- Each site tested for NPK. **(See charts in Appendix c)**

Task 2.5 Test compost prior to application to land and apply based on estimated forage uptake of these nutrients.

- Compost was lower in nitrogen than at first thought.

Task 2.6 Report on proper compost application, how they were determined and how this reduces the potential for NPS pollution.

- **See appendix C**

**DELIVERABLES:** Measuring the success of Program Element 2.

1) QAPP, quarterly reports, annual reports

2) Report on Pre-implementation conditions.
   **(See appendix C)**

3) Report on compost analysis.
   **(See appendix C)**

4. Report on field application of compost and comparison of pre- and post-conditions

5. Final Report

PROGRAM ELEMENT 3: Construction of Compositors

Task 3.1 Review production data for each operation.

- [redacted] broilers 161,000 with 5,000 broilers composted each run.
- hens 17,000 with 510 hens composted each run.
- turkeys 49,000 with 1,470 turkeys composted each run.
- turkeys 49,000 with 1,470 turkeys composted each run.
- hens with 42,800 with 1,84 hens composted each run.
- broilers with 172,000 with 6,160 broilers composed each run.

Task 3.2 Design compost facility tailored to each operation based on production needs.

- [redacted] broilers with 6 bins
- hens with 2 bins
- turkeys with 8 bins
- turkeys with 8 bins
- hens with 4 bins
- broilers with 6 bins

Task 3.3 Construct compost facilities for each operation

- Two were constructed of wood using NRCS design. **(See appendix A)**

- Two were constructed of concrete using NRCS design.

- Two were constructed using Plantation design with steel and concrete. **(See appendix A)**

Task 3.3 Construct Compost facilities for each operation.

- Constructed using NRCS standards and specifications.

Task 3.4 Manage each facility according to management plan.

- Six different receipts **(see attached appendix A)**

**DELIVERABLES:** Measuring the success of Program Element 3.

1) Preliminary design report submitted through channels for concurrence.

2) Final design of site specific facilities with final recipe.

3) Management plan for each demonstration site.

PROGRAM ELEMENT 4: Technology Transfer and Economics

Task 4.1 Produce and distribute composting guide

- Poultry carcass composting fact sheets were developed and provided at each meeting. **(See Appendix A)**

- Prepare poultry composting handbook and make available to 55 producers. Additional copies are available in the SWCD. **(See appendix A)**

Task 4.2 Conduct field days in conjunction with producers and partners.

- Three area wide meetings/field days were held with a total of 207 in attendance.

Task 4.3 Document technology at field days for use at meetings, etc. Through use of video, audio and written articles and fact sheets.

- The video on poultry composting was shown at one field day with 52 in attendance. This video has been made available to producers.

Task 4.4 Identify implementation of new compost facilities in the area.

- Four producers have requested designs for compost facilities.
- Compost facilities were added to EQIP practices for cost share.
- Two EQIP applicants have requested compost facilities.

Task 4.5 Determine economic feasibility and marketability.

- The cost of each facility has been totaled. **(See appendix B)**
- Conclusions are that concrete facilities are twice as costly as wood and are cost prohibitive.

**DELIVERABLES:** Measuring the success of Program Element 4.

1) Listing of targeted audience

**Poultry producers, consumers, and others interested in Composting.**

2) Guide to composting for targeted audience

**(See appendix A)**

4) Field day report

**Three meetings with 207 in attendance.**

5) Video demonstration production

**Video produced and distributed to poultry associations.**
**Video viewed by 1200 people.**

6) Identifying the new composting facilities installed and planned, and the support of local community.

**Four new compost facilities started.**

7) Report on economic feasibility of this BMP.

Conclusions are that concrete facilities are twice as costly as wood and are cost prohibitive.

## VALUATION OF COMPOSTING POULTRY MORTALITY FOR POULTRY PRODUCERS

## INTRODUCTION

This appendix represents an estimate of poultry mortality and appropriate application rates of compost to be applied to forage crops to improve soil structure and soil fertility, and to balance this application with crop nutrient requirement to prevent NPS pollution in and around the Gonzales area.

The estimated annual mortality is based on data received from Tyson, Plantation and Cal-Maine. The land application of compost was made at recommended agronomic rates in accordance with Natural Resource Conservation Service standard and specification.

Compost and forage sample analyses for nitrogen and phosphorus were used to provide additional information and to verify proper application rates. Composite samples were utilized to ensure that samples are representative of the population from which they were collected.

BMP compliance monitoring was assured through the Texas Agricultural Extension Service Soil, Water and Forage Testing Laboratory in College Station to determine the precision and accuracy through laboratory analysis.

## DISCUSSION

Gonzales and Lavaca counties have long been noted for the production of poultry. According to local sources, there are three distinct poultry production sectors in the area. These sectors are turkey production, broiler production, and egg production (laying hens). Inherent to these production systems is the incidence of death from among the birds (5% of approximately 55 million birds presently), and generation of fecal material. These constituents have the potential to become a water quality problem.

Efforts are currently underway to address carcass and poultry litter disposal

These constituents have the potential to become a water quality problem.

Efforts are currently underway to address carcass and poultry litter disposal issues before they become a water quality problem. Many producers in the area presently dispose of flock mortality by rendering. However, the rendering plant is not in the area, service is very poor, and the cost is not economical. This leaves producers with few options for disposal, including burning and on-site burial/disposal pits. These options are not considered environmentally sound methods.

With these considerations in mind, this project was requested by local producers to demonstrate the effectiveness of compost facilities. Composting is especially beneficial as it offers producers an economical means of waste/mortality management that protects water quality by reducing nutrients and killing pathogenic organisms.

## Baseline Nutrient Levels and After Application

The nutrient levels after application were not significantly different than before application.

## Estimated Improvement to Water Quality

Compliance with Best Management Practices recommended guidelines has been assessed through monitoring systems which evaluated BMPs on the six selected sites between February 1996 and December 1998.

# FACT SHEET
# POULTRY CARCASS COMPOSTING

## Loading the Primary Composter

Materials should be loaded into the primary bins as follows:

1. Place 1 foot of dry manure on the floor of the bin.
2. Add a 6-inch layer of straw. This adds additional carbon and aids aeration under the birds.
3. Add a layer of carcasses. Spread the birds in a single layer keeping them at least 6 inches away from the wall.
4. Cover the carcasses with manure. Several layers of straw, birds, and manure may be needed during a single day when the birds reach maturity.
5. Add water by wetting the surface. Less water may be needed as the birds reach maturity.
6. When the last layer of chickens is added to a bin, cap the pile with an extra layer of manure
7. Monitor the temperature with a 36-inch probe-type thermometer.

Temperatures should reach about 140 degrees in 7 to 10 days after capping. If temperature does not reach 140 degrees try using less water or more of the carbon source. 140 degrees is needed to kill fly larvae, bacteria, and viruses

## Poultry Carcass Composting

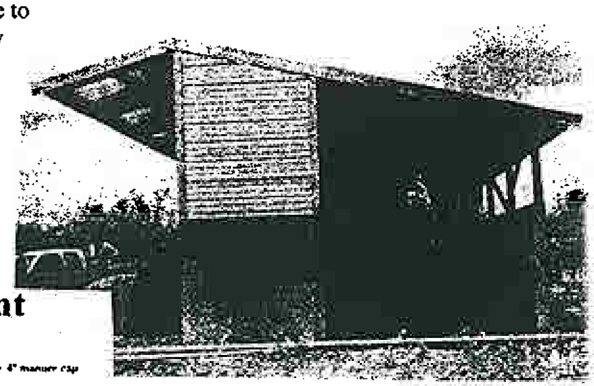
Disposal of dead birds has always been a problem for commercial farmers. Incineration is too slow and expensive. burial in pits does not comply with state law and rendering facilities are not available. The age-old method of composting is today's more cost-effective and cleanest way for poultry farmers to utilize and dispose of mortality.

Research and practical experience have shown that mixing a prescribed recipe of dead poultry and chicken manure as a nitrogen source, and rice hulls, cottonseed hulls or peanut hulls as a carbon source with the right moisture content will cause microorganisms to break down. It is a two-stage process in which the material is moved from the primary bins to the secondary bins for additional composting.

*Proportions of materials needed in composting*

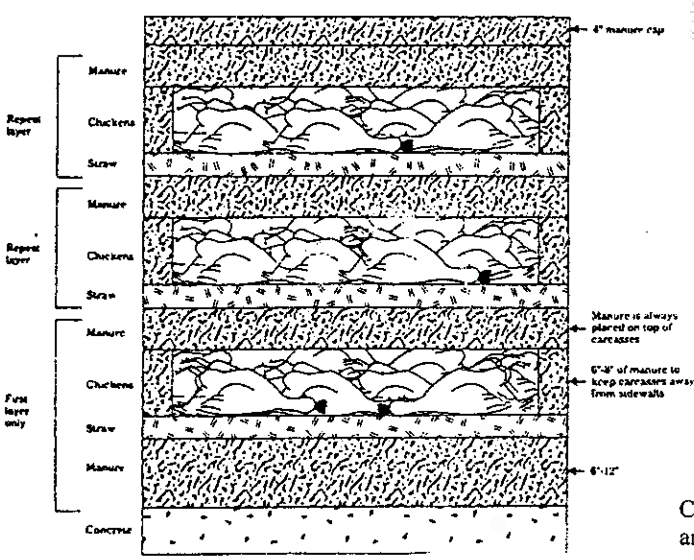
| *Materials* | *By Vol.* | *By Wt.* |
|---|---|---|
| Dead Poultry | 1.0 | 1.0 |
| Manure | 2.0 | 1.5 |
| Straw or Hulls | 1.0 | 0.1 |
| Water | .02 | .03 |

Stages 1 (Primary bin) As dead birds are collected add the correct recipe of carcasses, manure, hulls and water to the primary bin. In a few days, temperatures should increase to 140 to 150 degrees F. Once the temperature drops below 130 degrees F move the material to the secondary bin.
Stage 2 (Secondary bin) Moving the material increases aeration and activates microorganism activity. When temperatures peak in a few days and drop off, apply the material to the field.



A free standing dead poultry composter.

## Poultry Mortality Management




## Cautions

Three cautions to remember

1. Composting dead poultry is not for everyone. Although only 20 minutes per day should be needed in loading and caring for the composter, good management is needed or the system may develop bad odors and attract flies and vermin.
2. The composter is designed for normal mortality. It is not designed for large dieoffs from diseases or excessive heat.
3. Avoid getting the mix too wet. 20% moisture content seems to be ideal. Too dry and it will not heat up properly, too wet and the system becomes odorous. A little trial and error will soon tell you how best to manage your composter.

Contact your local NRCS Office or Soil and Water Conservation District for more information.

# For the Media

TEXAS STATE SOIL AND WATER CONSERVATION BOARD



P. O. BOX 658 / TEMPLE, TEXAS 76503 / (817) 773-2250 / FAX (817) 773-3311


## Producers Demonstrate Alternative Method for Poultry Carcass Disposal

For Release: Immediately


For More Information: Melissa Burns, Information Specialist
Texas State Soil and Water Conservation Board
(817) 773-2250


**Gonzales**--Poultry producers in Texas may be using all but the "cluck" of the chicken when they demonstrate the effectiveness of composting carcasses and poultry litter to produce a high quality compost while protecting ground and surface water quality.

On a daily basis, Texas producers must deal with poultry mortality and ways to dispose of the carcasses. Three of the most common means of disposal are burial pits, incineration and rendering, but recent concerns with the environment and operational costs have generated an interest in composting as an alternative method of carcass disposal.

"Composting is an environmentally safe way to dispose of poultry carcasses. It has been illegal in Texas to compost animal carcasses until the law was recently changed. This gave us the go ahead to begin demonstrating the efficiency of composting as a form of disposal," said Rindle Wilson, project coordinator for the De-La-Go Resource Conservation and Development office.

The project, which is located in Gonzales and Lavaca counties, demonstrates composting techniques in cooperation with six poultry producers in the area. The project is sponsored by the U.S. Environmental Protection Agency under Section 319(h) of the Clean Water Act and funded through the Texas State Soil and Water Conservation Board (TSSWCB) under their agricultural/silvicultural nonpoint source (NPS) pollution management program.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TSSWCB is the lead agency for the state's agricultural/silvicultural NPS pollution program. Funding under Section 319(h) is provided to implement activities that demonstrate ways to control and prevent NPS pollution associated with runoff from agricultural/silvicultural, urban and construction activities.

Project cooperator, Viola Holt of Harwood, initiated the interest in this project by contacting the USDA Natural Resources Conservation Service in Gonzales about the need for proper disposal of carcasses. "The rendering trucks would not come by when they were supposed to and the buzzards would scatter the birds leaving a smelly mess," said Holt. "My son's father-in-law composts in Missouri and I wanted to find out if it was viable for my operation and the area."

The compost facility is a wooden shed on concrete divided into primary and secondary compartments with a storage bin. The primary compartment will house the first compost batch consisting of layers of poultry litter as a base. Straw is then added to maintain air flow, followed by evenly distributed carcasses with more litter to cover the birds. Water is added to keep the mixture moist.

"As the natural aerobic breakdown occurs, beneficial microorganisms reduce and transform two waste materials into a valuable and useful end product--compost," said Wilson. "With temperatures reaching between 135-160 degrees, the pathogens and other possible diseases, like salmonella and E. Coli, are destroyed reducing the possibility of residues going into surface or ground water."

In five to seven days, after the temperature has peaked, the layered mixture is transferred to the secondary compartment for aeration. The compost is then ready to be moved to the storage area and used for land application.

-more-

"We are going to show producers how to set up a composting operation designed to fit their needs as well as demonstrate the economic feasibility of construction and operation," said Wilson. "Composting is a practical, sanitary and economical means of carcass disposal compared to other methods. We realize composting is not for everyone, but we want producers to make their decision after they know the facts."

According to Wilson, the project will demonstrate the following benefits to poultry producers:

- An environmentally safe and reliable method of carcass and poultry litter disposal
- A relatively inexpensive means of disposal compared to other methods
- Readily available composting materials such as litter, carcasses, straw and water
- Can be designed to fit any operation according to size and needs

According to a Texas Poultry Federation survey conducted by the Texas Agricultural Extension Service, the poultry industry employs 25,000 people and is a $3.5 billion dollar value-added agricultural industry in Texas. Therefore, the results of this demonstration could have a far-reaching effect for Texas.

For more information on this project, to request information on NPS pollution, or submit a potential project for NPS development, contact the Texas State Soil and Water Conservation Board, Statewide Management Program at (817) 773-2250.

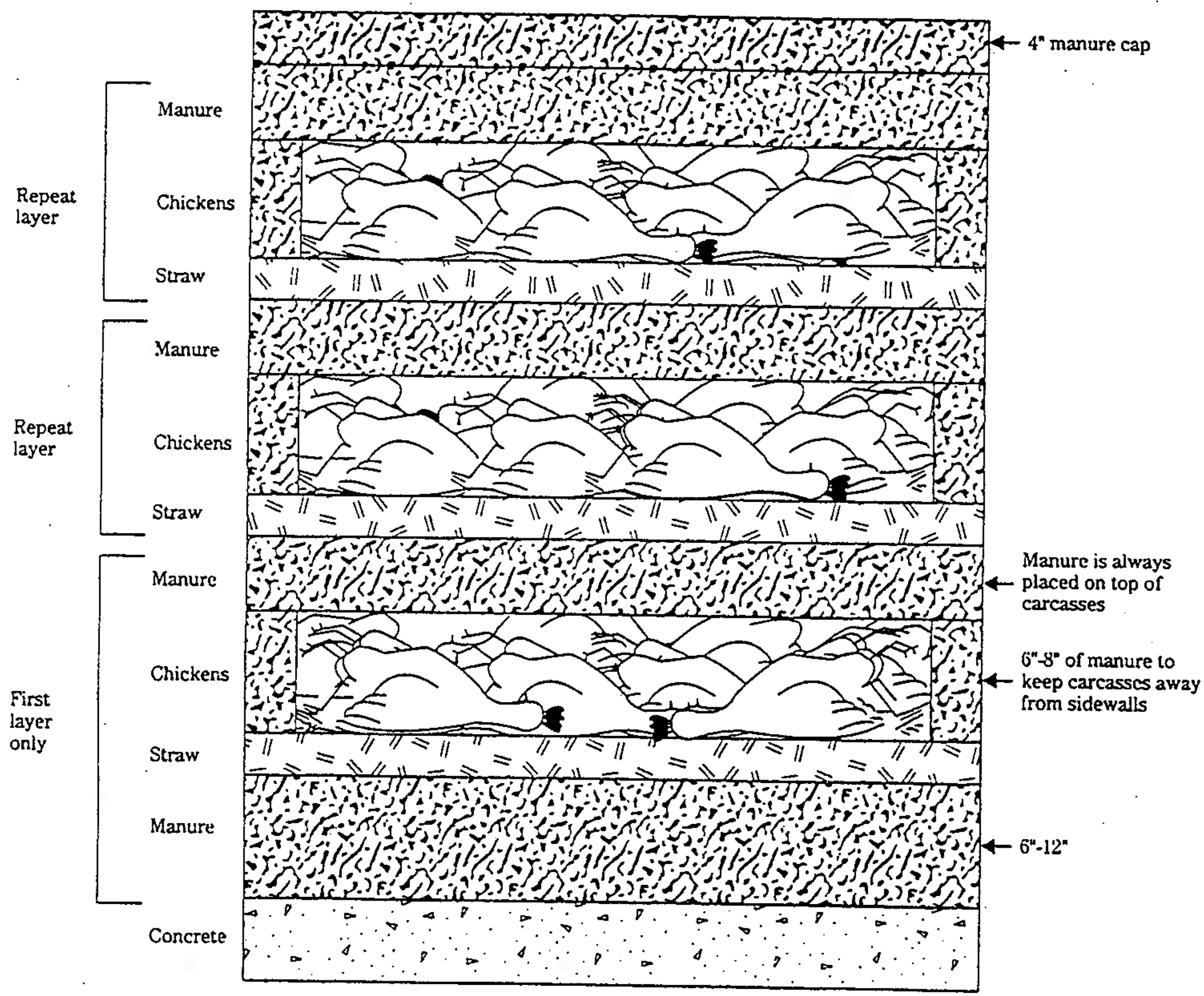


Figure 4.—Recommended layering for dead bird composting.

# For The Media

TEXAS STATE SOIL AND WATER CONSERVATION BOARD

P.O. BOX 658 / TEMPLE, TEXAS 76503 / (254) 773-2250 / FAX (254) 773-3311

## COMPOSTING VIDEO TO HELP POULTRY PRODUCERS

FOR IMMEDIATE RELEASE

FOR MORE INFORMATION: Clay Wright, Information Specialist
Texas State Soil and Water Conservation Board
Phone (254) 773-2250
Fax (254) 773-3311

To assist commercial poultry producers in safely dealing with the mortalities and litter generated in poultry production, the Texas State Soil and Water Conservation Board (TSSWCB) in conjunction with the USDA Natural Resources Conservation Service and the United States Environmental Protection Agency (EPA) has released an informative video which examines the benefits of poultry composting.

The video shows the procedure for taking poultry mortalities and waste, from start to finish, through a two-stage process to convert two potentially polluting waste by-products into a beneficial, nutrient-rich resource.

The video details how a prescribed mixture of carcasses, litter, straw and water will cause microorganisms to break down the waste materials into a compost that can be land-applied based on soil tests.

The video also helps producers assess their needs and design the best composter for their operation.

Finding ways to deal with poultry waste, particularly carcasses, has been a

-- more --

long-standing problem for many commercial producers. Proper waste management helps today's producers in their continuing challenge to clear a critical hurdle—balancing concerns for cost-effectiveness with concerns for the environment.

With good management, composting provides a clean, cost-effective method for disposing of poultry carcasses and litter, and helps prevent a potential source of nonpoint source (NPS) water pollution.

In accord with Section 319(h) of the Clean Water Act, the EPA provides funding to the TSSWCB to implement activities that result in demonstrated progress in achieving Congress' goal of controlling and abating agricultural and silvicultural (forestry) NPS pollution. NPS pollution originates from different sources that cannot be traced to any single source.

For more information on poultry best management practices or to purchase a copy of the poultry composting video for $15, contact TSSWCB Information Specialist, Clay Wright at (254) 773-2250. The video may also be checked-out from the TSSWCB video library.

Country World, Central TX 5a
Terry Stepp (800)624-2668
Thurs, May 2nd

# Producers demonstrate alternative method for poultry carcass disposal

Poultry producers in Texas may be using all but the "cluck" of the chicken when they demonstrate the effectiveness of composting carcasses and poultry litter to produce a high quality compost while protecting ground and surface water quality.

On a daily basis, Texas producers must deal with poultry mortality and ways to dispose of the carcasses. Three of the most common means of disposal are burial pits, incineration and rendering, but recent concerns with the environment and operational costs have generated an interest in composting as an alternative method of carcass disposal.

"Composting is an environmentally safe way to dispose of poultry carcasses. It has been illegal in Texas to compost animal carcasses until the law was recently changed. This gave us the go ahead to begin demonstrating the efficiency of composting as a form of disposal," said Rindle Wilson, project coordinator for the De-La-Jo Resource Conservation and Development office.

The project, which is located in Gonzales and Lavaca counties, demonstrates composting techniques in cooperation with six poultry producers in the area.

The project is sponsored by the U.S. Environmental Protection Agency under Section 319(h) of the Clean Water Act and funded through the Texas Soil and Water Conservation Board (TSSWCB) under their agricultural/silvicultural nonpoint source (NPS) pollution management program.

TSSWCB is the lead agency for the state's agricultural/silvicultural NPS pollution program. Funding under Section 319(h) is provided implement activities that demonstrate ways to control and prevent NPS pollution associated with runoff from agricultural/silvicultural, urban and construction activities.

Project cooperator, Viola Holt of Harwood, initiated the interest in this project by contacting USDA Natural Resources Conservation Service in Gonzales about the need for proper disposal of carcasses.

"The rendering trucks would not come by when they were supposed to and the buzzards would scatter the birds leaving a smelly mess," said Holt. "My son's father-in-law composts in Missouri and I wanted to find out if it was viable for my operation and the area."

The compost facility is a wooden shed on concrete divided into primary and secondary compartments with a storage bin.

The primary compartment will house the first compost batch consisting of layers of poultry litter as a base. Straw is then added to maintain air flow, followed by evenly distributed carcasses with more litter to cover the birds. Water is added to keep the mixture moist.

"As the natural aerobic breakdown occurs, beneficial microorganisms reduce and transform two waste materials into a valuable and useful end product—compost," said Wilson. "With temperatures reaching between 135-160 degrees, the pathogens and other possible diseases like salmonella and E. Coli are destroyed, reducing the possibility of residues going into surface or ground water."

POULTRY MORTALITY MANAGEMENT

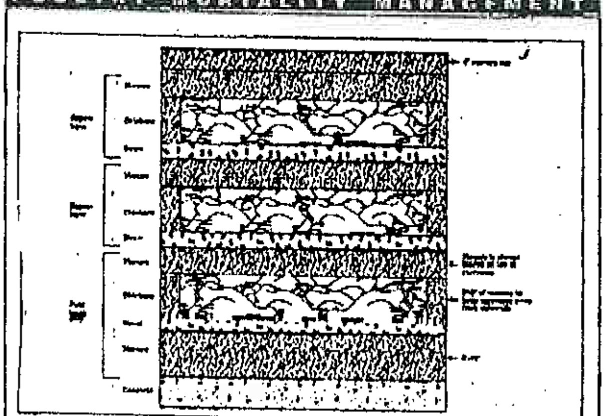

Figure 1.—Recommended layering for dead bird composting.

In five to seven days, after the temperature has peaked, the layered mixture is transferred to the secondary compartment for aeration. The compost is then ready to be moved to the storage area and used for land application.

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According to a Texas Poultry Federation survey conducted by the Texas Agricultural Extension Service, the poultry industry employs 25,000 people and is a $3.5 billion dollar value added agricultural industry in Texas.

Therefore, the results of this demonstration could have a far-reaching effect for Texas.

For more information on the project, to request information on NPS pollution, or submit a potential project for NPS development, contact the Texas State Soil and Water Conservation Board, Statewide Management Program at (817)773-2250.

Sulphur Springs
Lori Cope (903)885-203c



# Poultry carcass disposal method demonstrated

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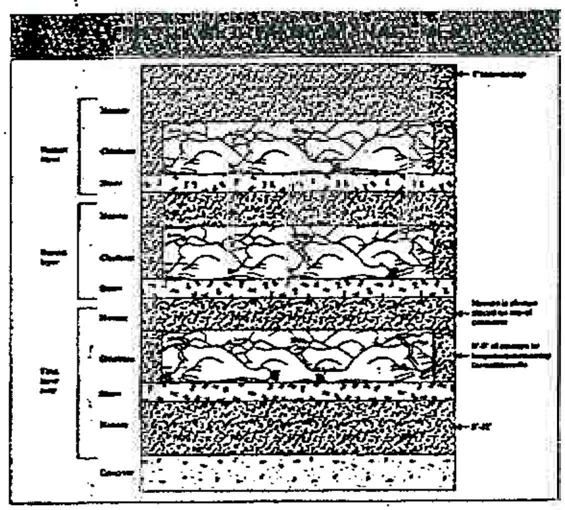

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# Producers turn to compost to deal with dead chickens

MARSHA MOULDER
The Victoria Advocate

Farm

GONZALES — Mortality is a fact of life in the poultry business, so Gonzales and Lavaca county producers are looking at a way to take those losses and turn them into gains in grass and crop production.

Six poultry producers, including those with breeder, broiler and turkey operations, are preparing to build poultry composting facilities, in which dead poultry and poultry litter are used to produce high-quality compost.

Before Ted and Julie Reiley got into the chicken breeder business two years ago, they visited many chicken operations, and saw many different ways producers disposed of dead chickens. "But composting makes the most sense because you're not doing anything to the environment, and you're not using fuel."

"Some use incinerators, but that takes a lot of propane, which is real wasteful, and it stinks," Julie added.

"We want to try to leave the place even better than we found it," Ted said about the farm they bought when they moved to Gonzales County.

It was actually Vi Holt who initiated the composting project in Gonzales County by contacting the county office of the Natural Resources Conservation Service.

Holt's late husband built one of the first broiler houses in Gonzales County. With more than 25 years in the business, Holt has had plenty of experience in disposing of dead chickens.

"We fed chickens to hogs for a long time, but we got our hands slapped by the USDA because they said the chickens could carry salmonella and could pass it on to the hogs," she said.

"So we tried burying them, but that bothers me because a lot depends on how shallow your water is and how deep the holes are you dig.

"Then we tried a rendering plant. They picked them up for free, but they got to where they didn't pick them up regularly. We would have to set barrels of dead chickens out by the road. The summer before last, I set eight barrels of chickens out there on a Thursday. I had to pick them up every day because the buzzards scattered them. By the time the rendering plant truck came on Monday, needless to say the chickens were all juice. People driving down the road complained about the smell. So, I knew we just had to do something."

Her son also has broiler houses, so between the two of them, they have about 20,000 dead birds a year.

Holt had read about poultry producers on the East Coast composting their dead chickens. And she knew that in Arkansas, anyone wanting to start a new poultry facility could not get financing unless their plans included a composting facility. So she thought it was time that Texas poultry producers got into composting.

It was only recently that the Texas law was changed to allow the composting of animal carcasses.

The compost facility is a wooden shed on concrete divided into primary and secondary compartments with a storage bin. The primary compartment will house the first compost batch consisting of layers of poultry litter as a base. Straw is then added to maintain air flow, followed by evenly distributed carcasses with more litter to cover the birds. Water is added to keep the mixture moist.

Temperatures should reach 135 to 160 degrees inside the facility. Heat is not only important in the composting procedure, it also destroys pathogens and other possible diseases, like salmonella and E. Coli, reducing the possibility of residues going into surface or underground water, according to Rindle Wilson, project coordinator for the De-Go-La Resource Conservation and Development office.

Wilson helped secure sponsorship for the composting project in Gonzales and Lavaca counties from the Environmental Protection Agency under the Clean Water Act for funding through the Texas State Soil and Water Conservation Board under its agricultural/silvicultural nonpoint source pollution management program.

The Reileys plan to use their compost in their corn field, while Holt plans to spread her compost over pastureland.

"It will be real good for the land," Ted said.

The compost should produce 44 pounds of nitrogen per ton, 66 pounds of phosphorous per ton and 48 pounds of potassium per ton, according to Polly Williams with the Natural Resources Conservation Service, who is working with the poultry producers on the project.

"It's a natural fertilizer, so there should be a slower release and it will add water-holding capacity," Ted said.

He might find he doesn't have to apply the natural fertilizer to the land as often as he does commercial fertilizer, he noted.

But before they put the compost on their corn field, the Reileys will first test the compost on a strip of land where they haven't been applying commercial fertilizer.

Over the first three years of the project, the Natural Resources Conservation Service will monitor the land where the compost has been applied to determine if there are any bad effects, Williams said.

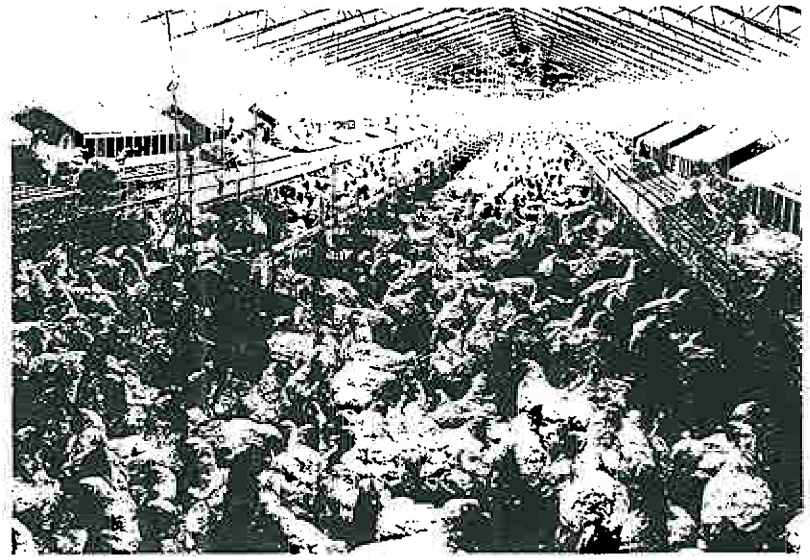
"We're real tickled to be in on this," Ted said. "It's right where we wanted to go because it makes environmental sense, and it makes a product we want. It's the public perception of our business that can hurt us. We're not trying to get away with anything. We're trying to make the best of the situation."

In an effort to make their chicken breeder operation as environmentally sound as possible, the Reileys put cats in their chicken houses for mice control rather than using bait.

And in an attempt to get away from using chemicals to control flies in and around the chicken houses, the Reileys are using Trichogramma, tiny wasps that kill fly larva.

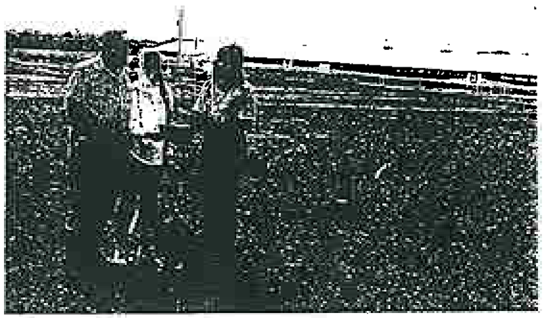
And because they were afraid the cats in the houses might lead to flea problems, they are experimenting with another wasp species that will control fleas.

"We don't want to go backward with anything we do. We want to go forward," Ted said.



Marsha Moulder/The Victoria Advocate

**Ted and Julie Reiley stand amid the stakes marking off the area for their poultry composting facility as they go over project plans with Polly Williams of the Natural Resources Conservation Service. The dirt work in back is where the Reileys will build two chicken breeder houses.**



Marsha Moulder/The Victoria Advocate

**With a poultry producer raising more than 10,000 chickens in one house, there is no way to avoid some mortality.**

# Composting: a beneficial use of dead poultry

It's one of the major dilemmas of the poultry industry—how do you get rid of your dead birds? If you have a large operation, that can be a serious problem. There are ways of dealing with the problem, but some of them just aren't satisfactory.

According to people at the Gonzales NRCS (Natural Resource Conservation Service) office, one of the strangest-sounding methods may turn out to be the most practical—poultry composting. It turns chickens and turkeys into useful fertilizer, without a bad smell.

Composting facilities will soon go up at six area poultry operations, thanks to a federal grant. "The program came about several years ago when it became apparent farmers were having a problem disposing of dead poultry," said Buddy Remmers. Remmers is District Conservationist for the USDA, Natural Resource Conservation Service, a federal employee.

The composting method is already common in East Texas, and in other states. There is also a facility in Waco. "In Missouri, before you can get a permit for poultry houses, you have to build a compost facility," said Remmers.

Remmers credits the late George White for getting the composting project rolling in the Gonzales area. "George White was the chairman of the local Gonzales Soil and Water Conservation Service. He was the one who kind of instigated it."

Rindle Wilson, working through the State Soil and Water Conservation Board, went to the Environmental Protection Agency and obtained a $162,000 federal grant. Wilson is Resource Conservation and Development Coordinator for the De-Go-La District (DeWitt, Gonzales, and Lavaca Counties).

Under the terms of the grant, EPA contributes 60 percent of the expenses, with a 40 percent local match. The 40 percent match is furnished through local labor.

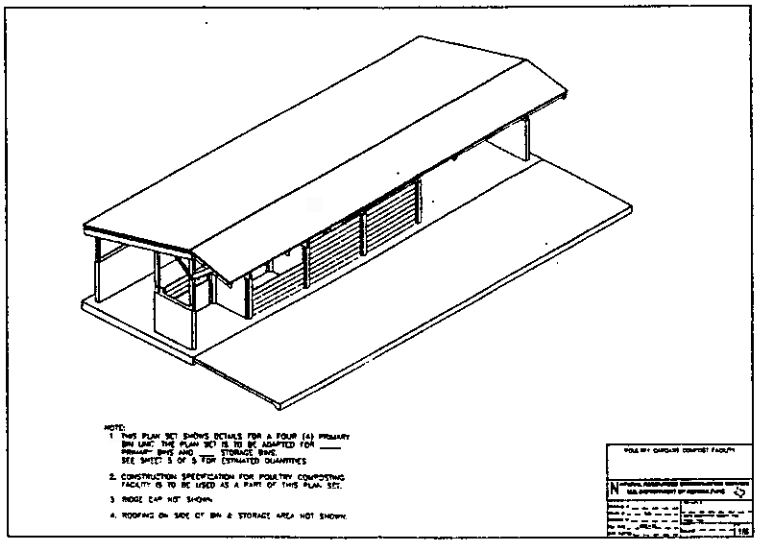
According to Remmers, area poultry producers have been unsatisfied with the rendering disposal method. This method uses poultry efficiently, turning it into pet food. Unfortunately, the birds can't be picked up soon enough to prevent a mess. "Ideally, that would be the best way to dispose of dead poultry, but it's not quick enough."

Two composters are being put in on a broiler operation, two on a breeder hen operation, and two more on a turkey operation.

"Land owners shouldn't have any out of pocket expense," said Remmers. "Their expense is in labor. This is a three-year monitoring project. They'll furnish land where composted poultry will be spread as fertilizer. The tests will determine how much should be added to the land, and if there are any unforeseen problems. The soil will be monitored for three years."

Part of the grant money will pay for Wain Fairchild's time on the project. Though he works out of the same office as Remmers, Wain is District Technician for the state-funded Gonzales County Soil and Water Conservation District.

Others in the office are federal employees and can't receive any compensation from the grant funds. Besides Remmers, these employees include: Ace Fairchild, Soil Conservation Technician for NRCS; and Polly Williams, Conservation Agronomist for NRCS.



**The Gonzales NRCS office has obtained a grant to build six proto-type poultry composters like the one above. The process is simple and practical: a layer of manure, a layer of straw, then a layer of birds—more layers in the same order. There's no foul odor and birds can be totally broken down in a month. A barn contains a concrete slab, a roof, and either concrete or wood walls.**

The NRCS crew has visited a number of composting operations. And, according to Ace Fairchild: "It works, beyond a shadow of a doubt. It's an efficient way to dispose of birds. You can go through the complete process within a month. The end product is a fertilizer-type mulch. The bones, and most of the feathers totally decompose."

"In a lot of areas, this is a highly sought-after compost for gardeners," said Remmers. "Disease bacteria are killed by the heat."

"It's quite possible that down the road, this could become a salable product," said Ace.

County Extension Agent Travis Franke will also be a part of the project, by helping monitor the soil. Samples will be sent to Texas A&M for testing.

The project is up and going. The NRCS office is now in the process of getting bids and some compost facilities should be constructed within two months.

If you'd like to learn more about this, contact the NRCS at 672-8371.

# Composting video to help poultry producers with mortalities and litter

To assist commercial poultry producers in safely dealing with the mortalities and litter generated in poultry production, the Texas State Soil and Water Conservation Board (TSSWCB) in conjunction with the USDA Natural Resources Conservation Service and the United States Environmental Protection Agency (EPA) has released an informative video which examines the benefits of poultry composting.

The video shows the procedure for taking poultry mortalities and waste, from start to finish, through a two-stage process to convert two potentially polluting waste by-products into a beneficial, nutrient-rich resource.

The video details how a prescribed mixture of carcasses, litter, straw and water will cause microorganisms to break down the waste materials into a compost that can be land-applied based on soil tests.

The video also helps producers assess their needs and design the best composter for their operation.

> Finding ways to deal with poultry waste, particularly carcasses, has been a long-standing problem for many commercial producers.

Finding ways to deal with poultry waste, particularly carcasses, has been a long-standing problem for many commercial producers. Proper waste management helps today's producers in their continuing challenge to clear a critical hurdle – balancing concerns for cost-effectiveness with concerns for the environment.

With good management, composting provides a clean, cost-effective method for disposing of poultry carcasses and litter, and helps prevent a potential source of nonpoint source (NPS) water pollution.

In accord with Section 319(h) of the Clean Water Act, the EPA provides funding to the TSSWCB to implement activities that result in demonstrated progress in achieving Congress' goal of controlling and abating agricultural and silvicultural (forestry) NPS pollution. NPS pollution originates from different sources that cannot be traced to any single source.

For more information on poultry best management practices or to purchase a copy of the poultry composting video for $15, contact TSSWCB Information Specialist, Clay Wright at (254) 773-2250. The video may also be checked-out from the TSSWCB video library.

# Texas wheat production up 5 percent from last year

Texas wheat producers expect to harvest 125.0 million bushels this year, 5% above the 1997 crop and 66% above the drought plagued 1996 crop.

According to an April 1 survey conducted by the Texas Agricultural Statistics Service, planted acreage for the 1998 crop estimated at 6.1 million acres, down 3% from 1997 but up 2% from 1996.

...duction on the Northern ... bushels, up 16% from last year. Planted acres for the region were unchanged from the previous year at 780,000 acres. Moisture conditions are very good in this region. Fields have made very good progress.

Statewide winter wheat condition around April 1 was rated at 76% of normal, the same as last year.

Texas is the only state that makes an April 1 winter wheat production estimate. The first national wheat forecast will be released May 12, 1998.

Gonz Inquirer
May 23, 1997

# Poultry composting program planned for Tuesday May 27

BY TRAVIS FRANKE
County Extension Agent

The Texas Agricultural Extension Service and the Natural Resource Conservation Service will be sponsoring a Poultry Composting Program on Tuesday, May 27 at the Gonzales Junior High School Cafeteria. Registration will be held at 6:30 p.m. and the program will start at 7 p.m.

Rindle Wilson, RC&D Coordinator with the NRCS will be first on the agenda and will explain how the composting started locally. At 7:10 p.m. Wain Fairchild will present a slide program on the construction and design of the composters. Dr. Sam Feagley, Professor and State Soil Environmental Specialist, will discuss compost and litter effect on soil profiles and will also discuss soil testing. The program will conclude with a panel discussion consisting of producers that have composters. Attendants will have the opportunity to ask producers about the composters and how they work.

1 CEU will be given for private, commercial, and non-commercial applicators. For more information about the program contact the Extension Office at 210-672-8531.

Sept 1996 Progressive Farmer

# POULTRY

## Good News for Egg Lovers

New research has exonerated eggs. Unless you are among the 30% of the population who have trouble processing cholesterol, one or two eggs a day may be good for you. "We now know that eggs contain 22% less cholesterol than previously thought," says Patricia Curtis, a food scientist at NC State. "Eggs have so much to offer nutritionally that adding eggs to a low-fat diet makes a lot of sense."

Eggs are one of the most inexpensive, nutritionally dense foods available, according to Curtis. Each is relatively low in fat, with 1.5 grams of saturated fat, and contains about 75 calories.

Here are some other facts about eggs:

- They contain folic acid, which helps prevent defects in human embryos.
- Eggs contain vitamin E, an important antioxidant.
- One egg provides 15% of the recommended daily allowance of protein.
- Eggs contain 12 minerals and all vitamins except vitamin C.

By using patented means of feed and management, some flocks lay eggs that have 15 fewer calories and 6 times the vitamin E of normal eggs.

## Perdue Opens New Plant

Earlier this year, Perdue Farms began broiler production at its newest processing plant in Cromwell, Ky. Broilers are being processed there for Midwestern markets.

At full capacity, the operation should employ 800 workers and process 800,000 birds per week.

## Robotic Slicers

A Food Safety Consortium research team is programming a computer-driven robotic arm to slice chicken carcasses.

One objective of this research is to make the slices so precise that processors can skip manual evisceration and eliminate the need for running carcasses through a chiller bath. Both steps are sources of contamination.

Robotic operations could also reduce work related injuries that occur from repetitive motions of cutting up chickens. The Food Safety Consortium includes the University of Arkansas, Iowa State University, and Kansas State University.

## Dead-Bird Disposal

Texas is the latest state to try composting dead chickens. Until a recent change in state law, composting animal carcasses was illegal in Texas. Most dead birds were buried, burned, or removed from the farm for rendering.

Projects in other states show that composting can be an effective alternative, however.

Six poultry growers in Gonzales and Lavaca counties are demonstrating composting to other producers. The project is sponsored by EPA and funded through the Texas State Soil and Water Conservation Board. ■

# RICE

## Seeking Weevil Control

The scramble has been on to find effective replacements for Furadan 5G granules to control rice water weevils. Of nine different products under evaluation at the Rice Experiment Station near Biggs, Calif., two products rise to the top of the list: Fipronil 1.5G and Dimilin 25W.

Also, the liquid product Furadan 4F has shown promise, according to Larry Godfrey, Extension entomologist at the University of California–Davis. But it takes about twice as much material to be as effective as granular Furadan.

EPA and FMC Corp. have agreed to gradually phase out Furadan 5G because of bird kills associated with use—and misuse—of the product.

## Foreign Rices Outdo Weeds

When planted at Stuttgart, Ark., some rice varieties from the Philippines and China elbowed out up to 90% of weeds without any help from herbicides.

The three foreign lines were compared with four U.S. long-grain varieties: Lemont, Kaybonnet, Starbonnet, and Cypress. In the field tests, each grew in plots treated with zero, 25%, 50%, or 100% of the normal rate of propanil. Two weeds, barnyardgrass and bearded sprangletop, competed for space, sunlight, water, and nutrients.

Lemont ranked lowest in yield and ability to compete, crowding out only 60% of the weeds that would have grown if no rice had been present. Kaybonnet and Starbonnet performed slightly better. Cypress ranked highest among the four U.S. varieties. The variety from the Philippines topped the field.

These results were posted during the first year of a two-year trial.

"The idea is to find rice varieties that have natural traits we want," says David R. Gealy, a plant physiologist with the USDA National Rice Germplasm Evaluation and Enhancement Center. "Then we will incorporate those natural qualities into our commercial varieties through crossbreeding." ■

# Producers Demonstrate Alternative Method For Poultry Carcass Disposal

Poultry producers in Texas may start using all but the "cluck" of the chicken as they demonstrate the benefits of composting carcasses.

On a daily basis, producers must deal with poultry mortality and ways to dispose of the carcasses. Three of the most common means of disposal are burial pits, incineration and rendering, but recent concerns with the environment and operational costs have generated an interest in composting as an alternative method of carcass disposal.

"Composting is an environmentally safe way to dispose of poultry carcasses. It was illegal in Texas to compost animal carcasses until the law changed in 1995. This gave us the go ahead to begin demonstrating the efficiency of composting as a form of disposal," said Rindle Wilson, project coordinator for the De-Go-La Resource Conservation and Development Area (RC&D).

The project, which is located in Gonzales and Lavaca Counties, demonstrates composting techniques in cooperation with six poultry producers in the area.

Project cooperator, Viola Holt of Harwood, initiated the interest in this project by contacting the USDA Natural Resources Conservation Service (NRCS) in Gonzales about the need for proper disposal of carcasses.

"We had problems with the rendering trucks not coming when they were supposed to and the carcasses would start smelling," said Holt. "Plus, my son's father-in-law composts in Missouri and I wanted to find out if it was viable for my operation and the area."

After the initial interest was sparked, the De-Go-La RC&D was brought in to assist in gathering background information on poultry composting as well as write the Section 319(h) grant proposal.

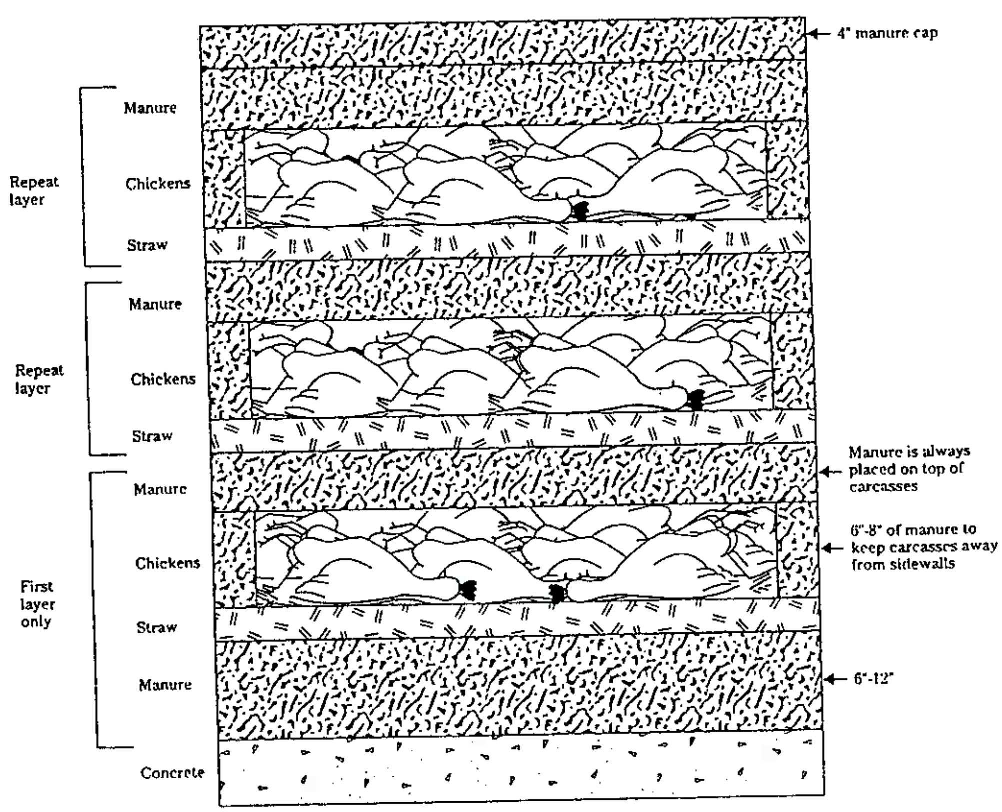
After funding was awarded, a meeting was held between the De-Go-La RC&D, Gonzales and Lavaca County extension agents, NRCS, and the Gonzales County Soil and Water Conservation District to finalize plans on selecting potential producers and to review composter design plans. Six producers agreed to participate in the project. They include two laying operations, two broiler operations, and two turkey operations.

Five of the composters are wooden structures and the sixth composter is made of concrete, except for the roofing. They are built on concrete slabs and are divided into primary and secondary compartments with a storage area.

The composter's primary compartment holds the first compost batch consisting

*(See Poultry Carcass, page 7)*

## Poultry Mortality Management



# Poultry Carcass Disposal (continued from page 3)

of layers of poultry litter, straw and carcasses. About six inches of poultry litter forms the base. Straw is spread on top to maintain air flow followed by evenly distributed carcasses with more litter to cover the birds. Water is added to keep the mixture moist.

"As the natural aerobic breakdown occurs, beneficial micro-organisms reduce and transform two waste materials into a valuable and useful end product — compost," said Wilson. "With temperatures reaching between 135-160 degrees, the pathogens and other possible diseases, like *salmonella* and *E. coli*, are destroyed reducing the possibility of residues going into surface or ground water."

In five to seven days, after the temperature has peaked, the layered mixture is transferred to the secondary compartment where the composting continues for another week. The compost is then ready to be moved to the storage area and used for land application.

"We are going to show producers how to set up a composting operation designed to fit their needs as well as demonstrate the economic feasibility of construction and operation," said Wilson. "Composting is a practical, sanitary and economical means of carcass disposal compared to other methods. We realize composting is not for everyone, but we want producers to be able to make an informed decision."

According to Wilson, the project will demonstrate the following benefits to poultry producers:

- An environmentally safe and reliable method of carcass and poultry litter disposal.
- A relatively inexpensive means of disposal compared to other methods.
- Readily available composting materials such as litter, carcasses, straw and water.
- Can be designed to fit any operation according to size and needs.

According to a Texas Poultry Federation survey conducted by the Texas Agricultural Extension Service, the poultry industry employs 25,000 people and is a $3.5 billion dollar value-added agricultural industry in the state. Thus, the results of this demonstration could have a far-reaching effect for Texas.❖

# BMP Practices (continued from page 4)

(TSSWCB), Environmental Protection Agency (EPA), Texas Institute for Applied Environmental Research (TIAER), Natural Resources Conservation Service (NRCS), and Hamilton-Coryell and Upper Leon Soil and Water Conservation Districts (SWCDs). The team is collecting water samples after rainfall events to obtain pre-BMP implementation data from the Leon River watershed, which includes Belton Lake, Proctor Lake and Cowhouse Creek in Central Texas.

Samples will also be taken after BMPs have been installed to monitor their success in reducing or preventing nonpoint source (NPS) pollution. Once appropriate BMPs are identified, the project team will work on educating agricultural producers as to the benefits of BMPs and demonstrate their effectiveness at the demonstration sites.

"It is anticipated the results will indicate several BMPs can be implemented in the Leon River watershed to help reduce NPS pollution," said Dr. Dennis Hoffman, project leader and research scientist at Blackland.❖

# ATTENTION

The State Law requires all state agencies which publish periodicals, at no charge, on quarterly intervals or more to annually insert a notice in three consecutive issues, indicating that anyone desiring to continue to receive the publication must indicate so in writing.

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# Compost facilities up and operational in Guadalupe Valley area

/ JIM CUNNINGHAM

Vi Holt is a Gonzales County poultry—primarily broilers—producer.

She's in the process of baking some dead chickens. And the temperature is the key to the turning of the broilers. But once the process is complete, they won't be served up for a Sunday sit-down finger-lickin' dinner.

Holt is one of six area poultry producers—five in Gonzales County and one in Lavaca County—participating in a 3-year composting project that utilizes a process of layering manure, straw and dead birds—chickens and turkeys— that turns the mixture into a useful, slow-release fertilizer.

A composter with six bins was recently constructed at Holt's farm. One bin is now 1/2 full. Holt allows it is layered with litter, hay and chickens that have been slow-stewing for three weeks.

"It keeps your casserole cooking," muses Holt, who enjoys a low mortality rate among her flock as only about 2 percent don't make it to market.

In addition to Holt's composter, two others have been completed at the Allen Reiley and Sean Roberts properties.

*"... reason this all started was that producers were having a tough time getting dead birds picked up in a timely manner by the rendering plants.*

*—Buddy Remmers*

Reiley and Roberts are involved in the breeding hens business. Under construction is a broiler composter at Gus Targac's place in Lavaca County, while two turkey composters will soon be built on the Ken Ginter and John Parr operations.

Four of the proto-type poultry composters in the project will be constructed out of concrete, while two will be made out of wood.

Holt's bins are wood.

"People up in Missouri say wood is better because it doesn't sweat as much. That remains to be seen," opines Oren C. (Buddy) Remmers, USDA district conservationist with the Natural Resource Conservation Service.

Remmers, based in Gonzales, allows the project has been made possible via a 60-40 Environmental Protection Agency grant for $160,000 to the Texas State Soil and Water Conservation Board. Remmers says producers pay 40 percent of the cost, but notes most of their expense is in labor and machine cost over the three-year project period as the soil will be monitored.

Monitoring duties of the composted fertilizer falls on Wain Fairchild, district technician for the state-funded Gonzales County S&WCD, and County Extension Agent Travis Franke.

"It'll be a slow-release fertilizer since 70 percent of the total nitrogen in the dead bird compost is in an organic form," says Fairchild. "We haven't tested the fertility of the compost yet, but the nitrogen content will be about 40 percent."

Fairchild and Franke will be working with the producers in their monitoring. During the next three years "we'll take samples of the fertilizer; samples of the soil where it'll be applied; and after application of the fertilizer to the forage (grass) we'll come back and check soil samples again three months later," says Fairchild.

An average bin is 8-feet wide, 5-feet tall and 5-feet deep with a 200 cubic-foot capacity, says Fairchild. He adds, "As of now, we don't know how many pounds of fertilizer that'll make."

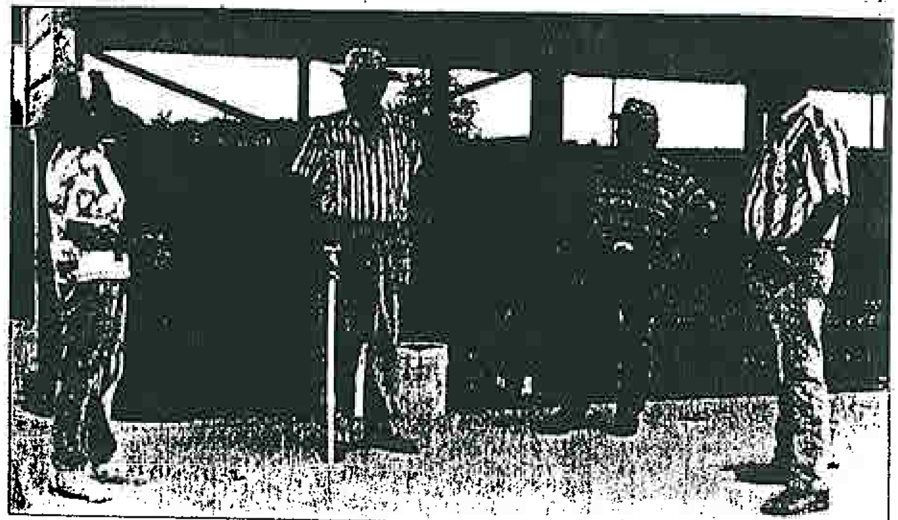
Though the composting facilities up and running at area poultry producers are new to Texas, they've been around for a while, notes Remmers.

"In Missouri, before you can get a permit for a poultry house, you have to build a composter. It's the law up there; if you have a chicken plant you have to have a composter," explains Remmers.

"The reason this all started was that producers were having a tough time getting dead birds picked up in a timely manner by the rendering plants. They'd lay around and draw flies and buzzards. It was a real mess.

"So here in Texas, rather have

See *Compost*, Page 9



Vi Holt, left, a broilers' producer, visits with Frank Stockton, GC SW&WCD chairman; Travis Franke, Gonzales County agent; and Oren Remmers, Natural Resource Conservation Service district technician, late last month at the composter built on her property. Holt enjoys a low mortality rate on her chickens as only about 2 percent don't make it to market. The composter will effectively take care of the carcasses by layering the birds, litter and straw into a viable fertilizer.

*Photo by Jim Cunningham*

From Page 8

# Compost

to be regulated, we let the producers do it on their own to get it (composting) off the ground," says Remmers.

Once a bin is full, the mixture will reach a temperature of 150 to 170 degrees within seven to 10 days. When the compost cools down, it's turned into a second bin to get oxygen in it and the mixture will then go back through another heat process. Such a process kills bacteria because of the heat involved and makes the mixture a desirable fertilizer.

Remmers says he anticipates all six composting facility sites in the project to be in operation by mid-August.

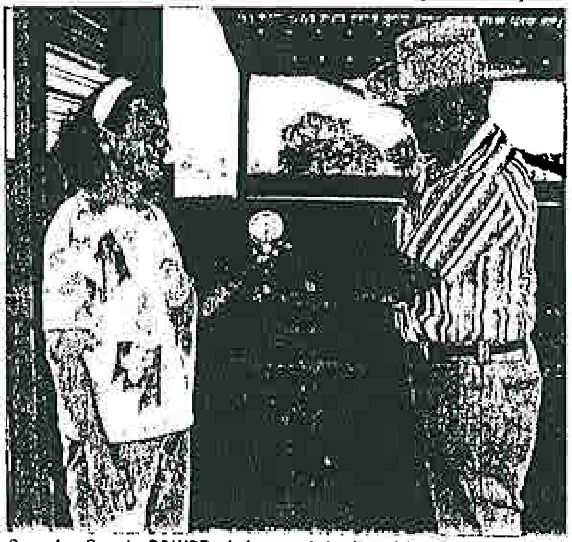
Gonzales County is big on birds. In 1995, broilers tallied up to $90.9 million and eggs accounted for $27.9 million. Four major broiler companies—Tyson Foods alone has 477 active chicken houses in the county—produces approximately 56 million broilers annually with egg companies and independent producers counting out some 61.3 million dozen eggs. Turkey production adds up to 2.9 million in the county each year.

Estimated gross receipts for agricultural commodities in Gonzales County for 1995 totaled $195,289,300.

County Agent Franke and Frank Stockton, a retired county agent now serving as the GC S&WCD chairman of the board, both feel the figures are low. So the bird biz continues to fly in the Guadalupe Valley area.

Composting is an efficient way to dispose of dead birds, says Remmers. He adds the facilities are also a useful resource by guarding against pollution problems caused by the carcasses going unattended.

The composting process appears to appeal to the poultry producers. There is little stink to it as the mixture turns into fertilizer. As Vi Holt offers, "The odor won't be any worse than the chicken houses."



Gonzales County S&WCD chairman of the board Frank Stockton and broiler producer Vi Holt checks the temperature of a compost bin on Holt's property. The composter is one of six in the area being monitored on a three year project where dead birds—chickens and turkeys—are turned into an efficient and effective fertilizer. *JC Photo*

## Independent Cattlemen's Association asks USDA to drop yogurt proposal; says it 'defies reason' to consider it

The Independent Cattlemen's Association (ICA) has called upon the United States Department of Agriculture (USDA) to drop its consideration of a proposed rule that would allow the nation's 93,000 schools that participate in the school lunch and breakfast programs to offer yogurt as a meat substitute. If approved, the rule would allow schools to be reimbursed by the federal government for the yogurt they purchase to use in school free meal programs.

"This ridiculous proposal reminds me of a time when certain individuals suggested to the Agriculture Department that ketchup was actually a vegetable," ICA President Jim Selman said. "I think it's time people quit monkeying around with our children's dietary health, just so they can squeeze some more money out of our taxpayers."

The proposed rule would permit yogurt to be credited as a meat alternative for all meals regulated by the USDA, which includes the department's low income and summer feeding programs. Currently, 25 million students participate in the Agriculture Department's school lunch program.

The plan is supported by yogurt makers who stand to make a substantial profit if the rule is approved. The yogurt and dairy industries have been pushing for yogurt as a reimbursable item on school lunch menus since 1981.

If the rule is approved after a public comment period, it could take effect as early as January, 1997.

Selman argues that while yogurt is a good protein source, it lacks other essential nutrients offered by meat. "According to the Department of Agriculture, there are four basic food groups: meat, diary, and fruits and vegetables. Yogurt is a dairy product, it's in a completely separate category. It defies reason that the Agriculture Department would even entertain such a silly proposal," Selman said.





# Texas composting project deals with poultry mortality

GONZALES, Texas — Poultry producers in Texas may be using all but the "cluck" of the chicken when they demonstrate the effectiveness of composting carcasses and poultry litter to produce a high-quality compost while protecting ground and surface water quality.

On a daily basis, Texas producers must deal with poultry mortality and ways to dispose of the carcasses. Three of the most common means of disposal are burial pits, incineration and rendering, but recent concerns wth the environment and operational costs have generated an interest in composting as an alternative method of carcass disposal.

"Composting is an environmentally safe way to dispose of poultry carcasses. It has been illegal in Texas to compost animal carcasses until the law was recently changed. This gave us the go-ahead to begin demonstrating the efficiency of composting as a form of disposal," said Rindle Wilson, project coordinator for the De-La-Go Resource Conservation & Development office.

The project, which is located in Gonzales and Lavaca counties, demonstrates composting techniques in cooperation with six poultry producers in the area. The project is sponsored by the U.S. Environmental Protection Agency under Section 319(h) of the Clean Water Act and funded through the Texas State Soil & Water Conservation Board under its agricultural/silvicultural nonpoint source pollution management program. TSSWCB is the lead agency for the state's agricultural/silvicultural NPS pollution program. Funding under Section 319(h) is provided to implement activities that demonstrate ways to control and prevent NPS pollution associated with runoff from agricultural/silvicultural, urban and construction activities.

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The compost facility is a wooden shed on concrete divided into primary and secondary compartments with a storage bin. The primary compartment will house the first compost batch consisting of layers of poultry litter as a base. Straw is then added to maintain air flow, followed by evenly distributed carcasses with more litter to cover the birds. Water is added to keep the mixture moist.

"As the natural aerobic breakdown occurs, beneficial microorganisms reduce and transform two waste materials into a valuable and useful end product — compost," said Wilson. "With temperatues reaching between 135 and 160 degrees F, the pathogens and other possible diseases, like salmonella and *E. coli*, are destroyed, reducing the possibility of residues going into surface or ground water."

In five to seven days, after the temperature has peaked, the layered mixture is transferred to the secondary compartment for aeration. The compost is then ready to be moved to the storage area and used for land application.

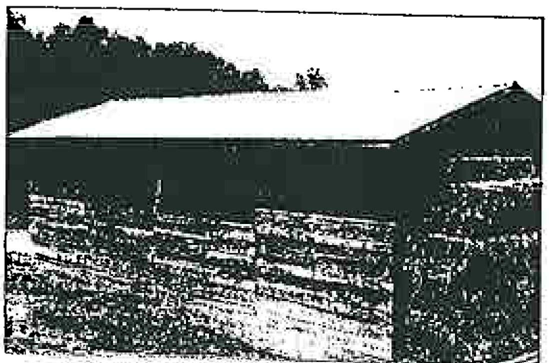
"We are going to show producers how to set up a composting operation designed to fit their needs as well as demonstrate the economic feasibility of construction and operation," said Wilson. "Composting is a practical, sanitary and economical means of carcass disposal compared to other methods. We realize composting is not for everyone, but we want producers to make their decision after they know all the facts."

According to Wilson, the project will demonstrate the following benefits to poultry producers:

- An environmentally safe and reliable method of carcass and poultry litter disposal.
- A relatively inexpensive means of disposal compared to other methods.
- Readily available composting materials such as litter, carcasses, straw and water.
- Can be designed to fit any operation according to size and needs.

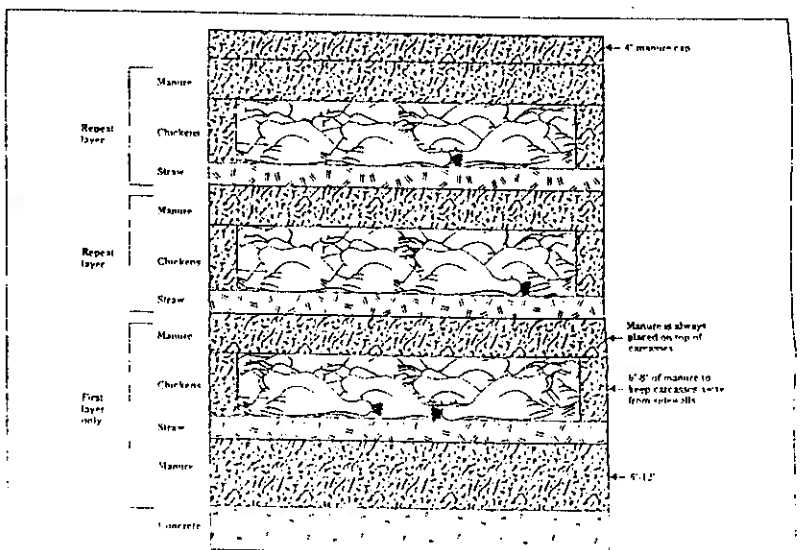
According to a Texas Poultry Federation survey conducted by the Texas Agricultural Extension Service, the poultry industry employs 25,000 people and is a $3.5 billion value-added agricultural industry in Texas. Therefore, the results of this demonstration could have a far-reaching effect for the state.

More information on this projct, information on NPS pollution or potential projects for NPS development can be obtained by contacting the Texas State Soil & Water Conservation Board, Statewide Management Program, at 817-773-2250.



Compost facility for Gonzales/Lavaca project.





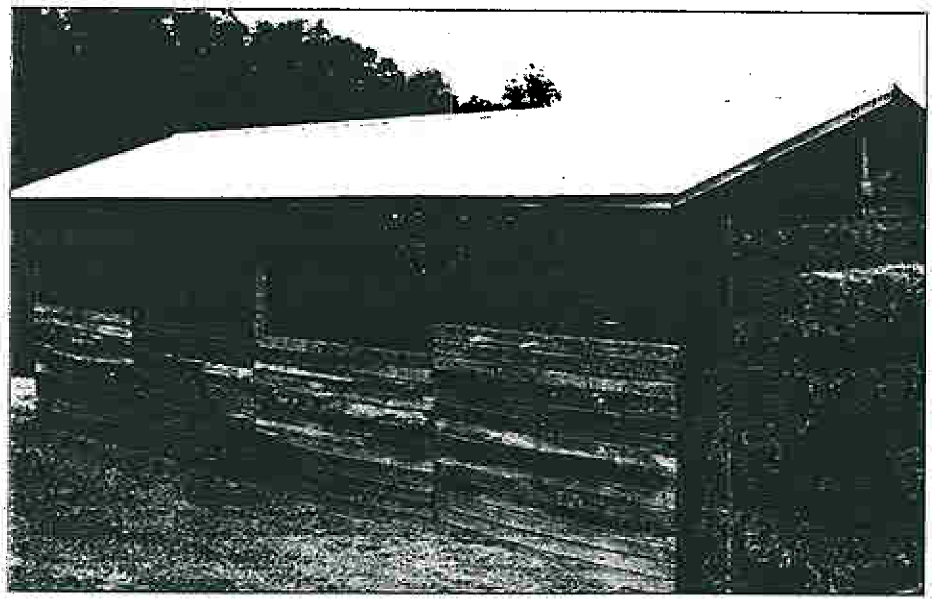

Recommended layering for dead bird composting

# Farm & Ranch

## Producers demonstrate alternative method of poultry carcass disposal

Poultry producers in Texas may be using all but the "cluck" of the chicken when they demonstrate the effectiveness of composting carcasses and poultry litter to produce a high quality compost while protecting ground and surface water quality.

On a daily basis, Texas producers must deal with poultry mortality and ways to dispose of the carcasses. Three of the most common means of disposal are burial pits, incineration and rendering, but recent concerns with the environment and operational costs have generated an interest in composting as an alternative method of carcass disposal.



*Poultry Carcass Disposal Unit*
The compost facility is a wooden shed on concrete divided into primary and secondary compartments with a storage bin.

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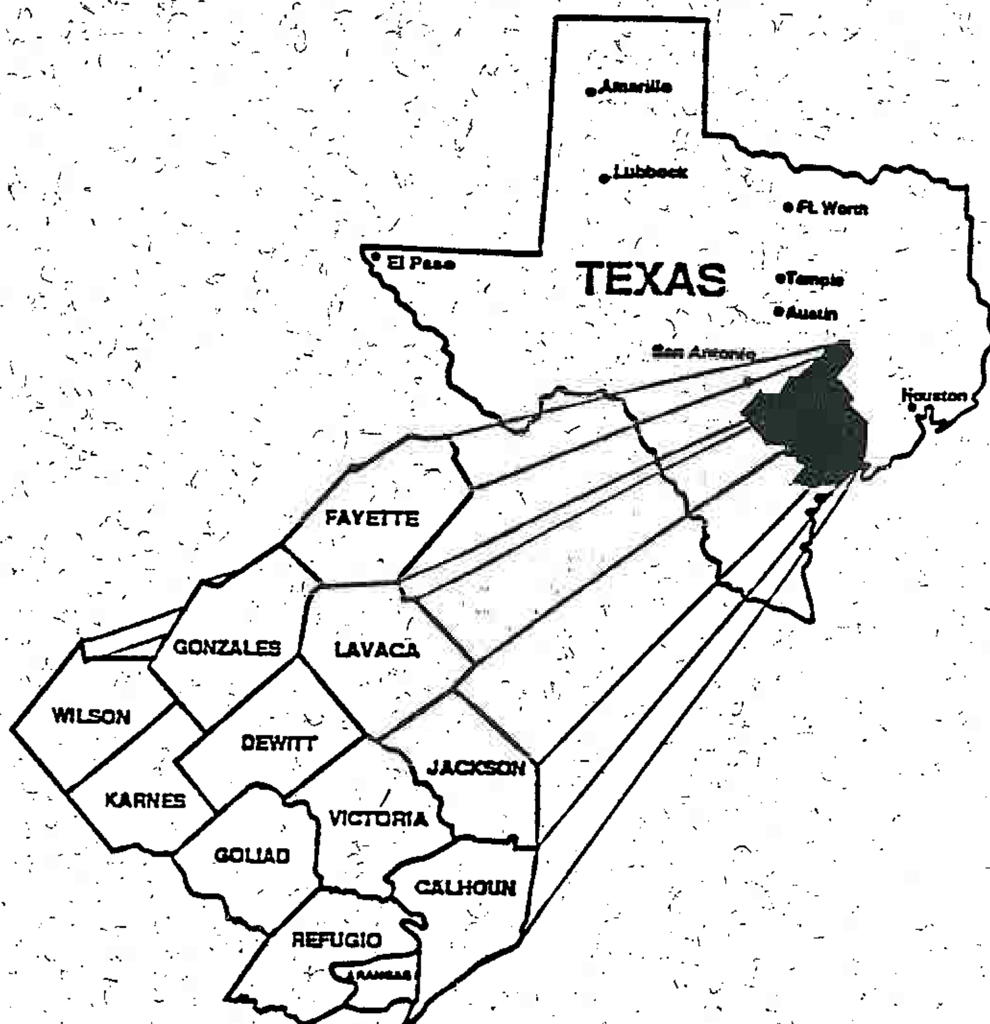
# De-Go-La Resource Conservation and Development Project Plan




De-Go-La Resource Conservation and Development Area, Texas

Prepared by the De-Go-La RC&D Board of Directors
Assisted by the U.S. Department of Agriculture, Soil Conservation Service
and
Cooperating Federal, State and Local agencies.

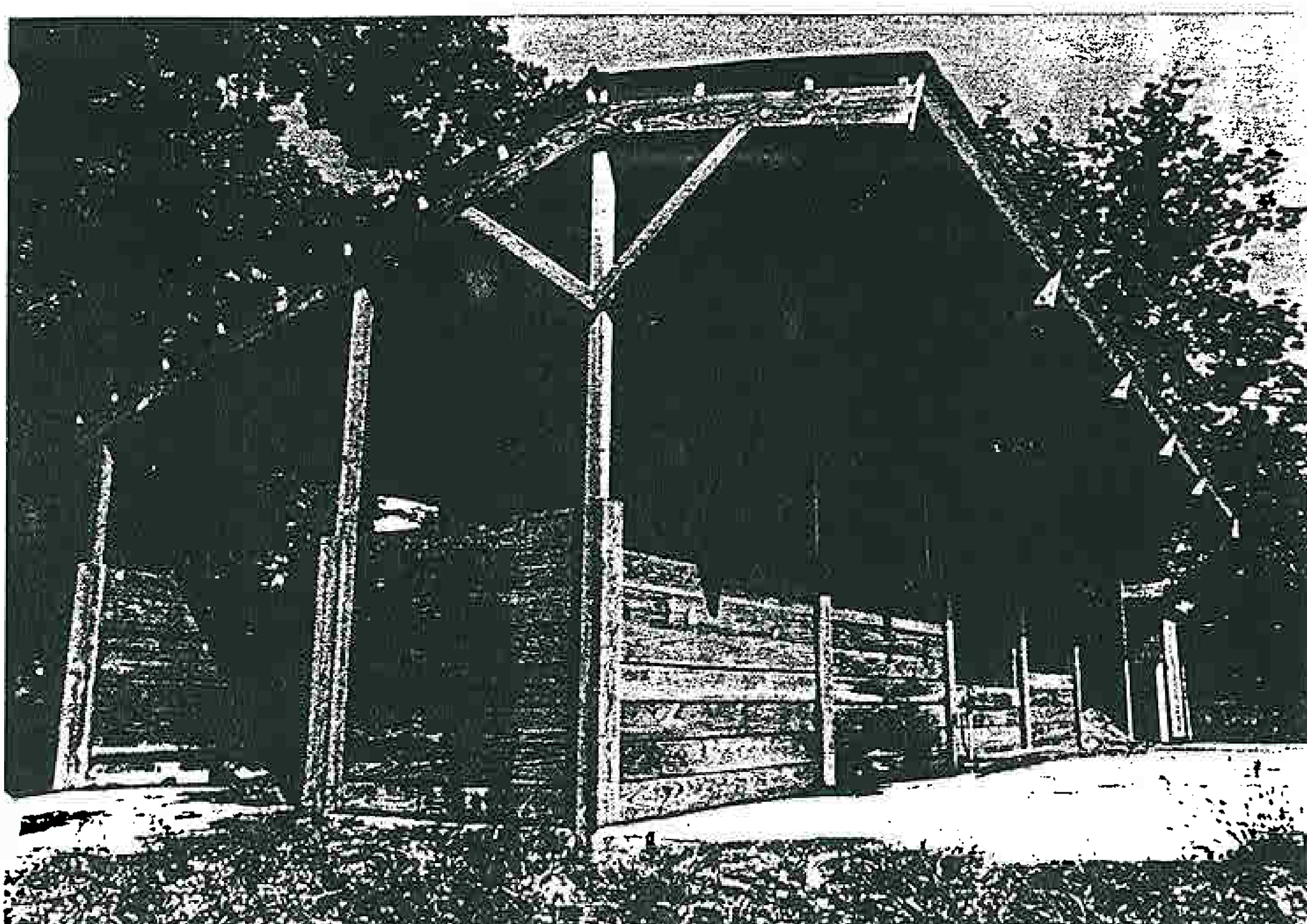
# HANDBOOK

Water Quality

Focus Area
Nutrients and Bacterial Wastes

Published by University Extension, University of Missouri-System

# Composting Poultry Carcasses in Missouri



# Contents

# Composting mortalities

Poultry operations in Missouri are finding that management of mortalities is an ever-increasing problem. Increasing sizes of operations as well as projections of significant growth of the industry suggest that difficulties with mortality management will continue to expand. For example, a 100,000 bird broiler operation may experience the need to properly manage and dispose of as many as 150 dead birds per day, or more.

Traditional methods of livestock mortality disposal in Missouri include hauling to a rendering facility, hauling to a sanitary landfill, on-site incineration, and, probably the most common in the past, on-site burial, or disposal pits.

## Alternatives for managing mortalities

The Missouri Department of Natural Resources suggests the following alternatives for managing mortalities, ranked in order of environmental preference.

### Rendering

State licensed and approved rendering facilities in Missouri are few, and are not located in animal production areas. Hence, the logistics and cost of collection and transport of mortalities is restricted in most cases. Additionally, disease considerations may preclude the same vehicle collecting mortalities from more than one production unit. Haulers and renderers must be licensed by the Missouri Department of Agriculture per RSMo 269.

### Composting

Mortalities can be disposed of in a properly designed composter, with the end product being field spread as a fertilizer/soil conditioner, or some other suitable end use.

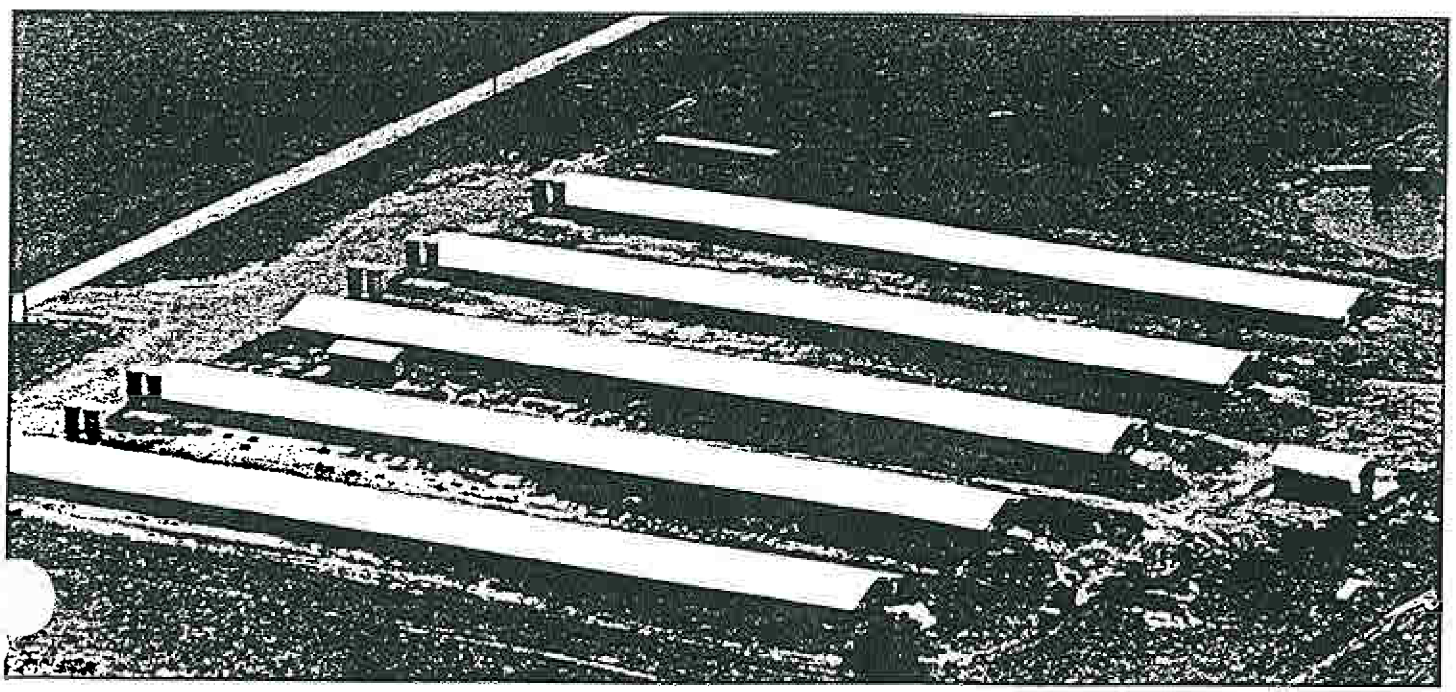
Composting mortalities is a relatively new and developing technology, but has been shown to be an effective means of managing mortalities, especially in the poultry industry. No permits, licenses, or other approvals are presently required for on-site composting of mortalities.

### Landfilling

This option may be feasible in cases where a suitable landfill is located near production units. Any such landfill must have a permit under the Missouri Solid Waste Management Law and regulations, 10 CSR 80-2.020. However, landfill numbers are decreasing, new landfills are extremely difficult to site and permit, existing landfills are "filling up", and there is a definite regulatory trend toward prohibiting landfill disposal of materials which can be composted on-site. Hence it is doubtful that landfill disposal will be a feasible option for most producers in the future.

### Incinerating

Incineration of mortalities is energy intensive, with associated high capital and operational costs. Emissions which do not meet Clean Air standards are likely if the incinerator is not operated and maintained properly. Incineration generally requires a permit under Air Conservation Law and regulations 10 CSR 10-3.040



Modern poultry production units must be able to manage large numbers of dead birds in an environmentally sound manner.

## Carbon/Nitrogen ratio

The carbon/nitrogen (C:N) ratio of the material to be composted is important because it influences the rate which the composting process proceeds. Carbon and nitrogen are vital nutrients for growth and reproduction of bacteria and fungi during composting. Conditions are most ideal for composting when the C:N ratio is between 20:1 and 35:1. If the ratio is too high, the process slows due to insufficient nitrogen, and nitrogen-containing materials such as manure, urea, or ammonium nitrate must be added to the composting mixture to adjust the C:N ratio to the proper level. If the C:N ratio is too low, the bacteria and fungi cannot use all the available nitrogen, and excess ammonia can result in unpleasant odors. A carbon source such as straw or sawdust can be added to a composting mixture to raise the C:N ratio if it is too low.

## Temperature

Temperature is the best indicator of proper biological activity in a composting process. Bacteria and fungi instrumental to the composting process function best in the range of 100-150 deg F. Hence temperatures increasing within this range are indicative of material which is composting properly with no limitations due to moisture, C:N ratio or oxygen starvation. When temperatures peak and start decreasing, some factors become limiting in the composting process. This limiting factor is usually the amount of oxygen available to the bacteria and fungi. Oxygen can be replenished by turning or aerating the composting mass. The temperature will then increase again as the composting process repeats itself. This cycle of composting and re-aeration can be repeated as long as there is organic material available to compost, and no other limitations such as moisture or C:N ratio are present.

The composting process, as it might apply to the breakdown and stabilization of poultry carcasses, was first investigated by Dr. Dennis Murphy at the University of Maryland, Poultry Research and Education Facility, Princess Anne, MD. Much of the present knowledge of poultry composting stems from research and field experiences in the poultry producing areas of Maryland and Delaware.

The original work with poultry mortality composting identified five basic objectives as necessary for the process to be feasible for managing mortalities in a production setting:

1. The system must work with normal mortalities during all seasons of the year.

2. The system can be constructed at reasonable cost with typically available skills and materials.

3. The system must fit within the everyday management capabilities available at the typical production enterprise.

4. The system must work without production of offensive odors, or danger of disease to people or poultry.

5. The composted product must be safe and useful as a crop fertilizer or soil conditioner.

# The composting recipe

It is essential to develop a "recipe" for composting. Bacteria and fungi are important ingredients in the composting process because they maintain the given range of the C:N ratio.

Primary considerations for a recipe are the C:N ratios and moisture contents of the various composting ingredients. Research work and field experience in Maryland has resulted in the recipe shown in Table 1. This recipe is applicable to poultry operations where the primary compost ingredients are dead poultry, litter or cake (usually a mixture of poultry manure and a bedding material such as sawdust, wood shavings, rice hulls, etc.) and straw.

**Table 1.** Recipe for composting poultry mortalities with litter and straw as ingredients.

| Ingredients | Parts by weight |
|---|---|
| Dead poultry | 1.0 |
| Litter or cake | 1.5 |
| Straw | 0.1 |

D. W. Murphy, Dept. of Poultry Science, Univ. of Maryland

An immediate question in the development of a composting recipe concerns the use of ingredients which may be available in some operations, but not in others. For example, a caged layer operation may not have litter available as a composting ingredient, so an alternative recipe must be developed. This process involves calculating or estimating C:N ratios for available ingredients, then verifying that the recipe will work with field experiments.

Preliminary field research by the University of Missouri has shown that the recipe in Table 2 will result in good composting of caged layer mortalities utilizing straw and caged layer manure as ingredients.

It is notable that neither of the above recipes call for water as an ingredient. Original work at Maryland suggested that some water may need to be added to the recipe to adjust the moisture content to the best level at the beginning of the composting process. Subsequent

**EXAMPLE 1.**

Size a composter for a turkey operation which houses nominally 12,000 birds in a brooder building, and 12,000 birds in a grower building. Birds are kept in the brooder building from 0-6 weeks of age, then moved to the grower building and marketed at 16 weeks of age. Maximum on-farm liveweight occurs when the birds in the brooder building are 6 weeks of age (6 lbs.), and the birds in the grower building are 16 weeks of age (23 lbs.). Records show that mortality rate in the brooder building is 1.2 percent, and mortality rate in the grower building is 6.9 percent.

**WORKSHEET 1.** Composter sizing for one poultry building.

Owner ______________________ Date ______________________

Bird type ___turkeys___ Building type ___brooder___

1. Enter the number of live birds entering the building, (BI) ___12,000___
2. Enter the percent mortality rate for the building, (M) ___1.2___
3. Calculate the number of birds leaving the building at the end of the growth cycle, (BO)
   BI x (1-M/100) = BO
   12,000 x (1-1.2/100) = ___11,856___
4. Enter the maximum liveweight of birds when removed from the building in pounds, (W) ___6.0___
5. Enter the design constant of 1 cu. ft. composter volume per pound daily mortality, (C) ___1___
6. Enter the safety factor of 2.5, (SF) ___2.5___
7. Enter the number of days the birds are in the building, (D) ___42___
8. Calculate the primary volume for the composter, (PV)
   BO x W x M/100 x C x SF/D = PV
   11,856 x 6 x 1.2/100 x 1 x 2.5/42 = ___50___
9. Secondary composter volume (SV) equals primary composter volume ___50___

10. Calculate composter volume for all buildings (complete Worksheet 1 for each building)

| Building type | Primary volume | Secondary volume |
|---|---|---|
| brooder | 50 | 50 |
| | | |
| | | |
| | | |
| | | |
| | | |
| Total | | |

**EXAMPLE 3.**

Use the data in Table 3 to size a composter for a laying operation which houses nominally 50,000 birds in each of 10 houses. Table 3 indicates that layers have a 10.5% mortality rate over a flock life of 60 weeks. Use Worksheet 1 to size the composter.

---

**WORKSHEET 1.** Composter sizing for one poultry building.

Owner__________ Date __________

Bird type ___layers___ Building type ___layer___

| | |
|---|---|
| 1. Enter the number of live birds entering the building, (BI) | 50,000 |
| 2. Enter the percent mortality rate for the building, (M) | 10.5 |
| 3. Calculate the number of birds leaving the building at the end of the growth cycle, (BO)<br>BI x (1-M/100) = BO<br>50,000 x (1-10.5/100) = | 44,750 |
| 4. Enter the maximum liveweight of birds when removed from the building in pounds, (W) | 3.5 |
| 5. Enter the design constant of 1 cu. ft. composter volume per pound daily mortality, (C) | 1 |
| 6. Enter the safety factor of 2.5, (SF) | 2.5 |
| 7. Enter the number of days the birds are in the building, (D) | 420 |
| 8. Calculate the primary volume for the composter, (PV)<br>BO x W x M/100 x C x SF/D = PV<br>44,750 x 3.5 x 10.5/100 x 1 x 2.5/420 = | 98 |
| 9. Secondary composter volume (SV) equals primary composter volume | 98 |

10. Calculate composter volume for all buildings (complete Worksheet 1 for each building)

| Building type | Primary volume | Secondary volume |
|---|---|---|
| 10-layer | 98x10=980 | 98x10=980 |
| | | |
| | | |
| | | |
| | | |
| | | |
| Total | 980 | 980 |

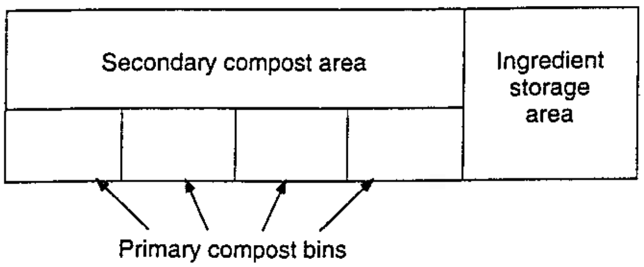



**Figure 1:** Composter layout with ingredient storage

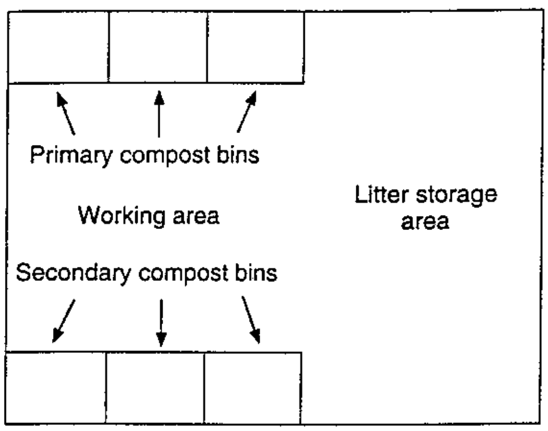



**Figure 2:** Composter layout with litter storage area

**EXAMPLE 4.**

How many primary bins are needed for composting the mortalities as calculated in example 1. As calculated in Worksheet 1, required primary composting volume is 678 cu ft. A skid-steer loader with a 5 ft wide bucket will be used to load and unload the bins.

**WORKSHEET 2.** Number of primary bins.

| | | |
|---|---|---|
| 1. | Primary composting volume<br>calculated primary composting volume | = 678 cu ft |
| 2. | Primary bin depth<br>recommended depth 5 ft | = 5 ft |
| 3. | Primary bin width<br>(bucket width plus1-3 ft recommended)<br>5 ft bucket width + 2 ft | = 7 ft |
| 4. | Primary bin length (5-6 ft recommended)<br>primary bin length | = 6 ft |
| 5. | Primary bin volume (2 x 3 x 4)<br>5 ft x 7 ft x 6 ft | = 210 cu ft |
| 6. | Number of primary bins (1/5)<br>678 cu ft / 210 cu ft | = 3.23 bins |

greatly increases the flexibility of a producer in scheduling poultry house cleanout and land spreading operations.

# Composter construction

Actual construction of a composter can take one of many different forms with good results in composting. Some essential features to consider are location, type of structure, construction materials and ingredient storage. Good composters may vary considerably in type and appearance, but will include some or all of the following characteristics:

## Location/access

Location of a composter should take the farm residence and any nearby neighbor residences which may be affected into account. While offensive odors are not usually generated in the composting process, the handling of dead birds, manure and litter on a daily basis may not be aesthetically pleasing. When locating a composter, consideration should be given to traffic patterns required in moving dead birds to the composter, moving the required ingredients to the composter and removing finished compost from the composter. The composter site should be well-drained and provide all-weather capability for access roads and work area.

## Foundation/floor

An impervious, weight-bearing foundation and floor should be provided under all composting areas (primary and secondary bins). This feature insures all-weather operation, helps secure the composter against rodent activity and generally minimizes the potential for contamination of the surrounding area. In addition to providing concrete under the compost bins, consideration should also be given to providing a similar concrete floor in traffic areas and work alleys. Experience has shown that, with the frequent loading/unloading activities associated with composting, dirt or even gravel areas tend to become rutted and potholed. This condition becomes worse if the work alleys are not roofed. A concrete floor will alleviate most of these difficulties.

**Table 4.** Additional percentage of primary composter volume necessary for different ingredient storage periods.*

| Ingredients storage period (weeks) | Percentage primary volume for litter | Percentage primary volume for straw | Percentage primary volume litter & straw |
|---|---|---|---|
| 1 | 13 | 5 | 18 |
| 2 | 25 | 9 | 34 |
| 3 | 38 | 14 | 52 |
| 4 | 51 | 19 | 70 |
| 5 | 64 | 24 | 88 |
| 6 | 76 | 28 | 104 |
| 7 | 89 | 33 | 122 |
| 10 | 127 | 47 | 174 |
| 14 | 178 | 66 | 244 |
| 18 | 229 | 85 | 314 |

* Table based on recipe in Table 1, and a bulk density of 33 lbs./cu.ft. for litter and 6 lbs./cu.ft. for baled straw.

**EXAMPLE 5.**

Estimate ingredient storage needs for a three week composting period for the operation described in example 1.

**WORKSHEET 3.** Estimation of ingredient storage based on recipe in Table 1.

1. Weight of daily mortalities (refer to Worksheet 1)

| | BO | x | W/D | x | M/100 | | |
|---|---|---|---|---|---|---|---|
| Brooder | 11,856 | x | 6/42 | x | 1.2/100 | = | 21 |
| Grower | 11,038 | x | 23/70 | x | 6.9/100 | = | 250 |
| Total (pounds) | | | | | | = | 271 |

2. Desired storage period in weeks = 3
3. Volume of storage required for litter*
   (weight mortalities) x (weeks) x(0.318)***
   271 x 3 x 0.318 = 259 cu. ft.
4. Volume of storage required for straw**
   (weight mortalities) x (weeks) x(0.117)***
   271 x 3 x 0.117 = 95 cu. ft.
5. Total volume for litter and straw
   (litter cu. ft.) + (straw cu. ft.)
   259 + 95 = 354 cu. ft.

*Bulk density of litter = 33 lbs./cu.ft.
**Bulk density of baled straw = 6 lbs./cu.ft.
***Constants relate data from Table 1 and bulk densities of straw and litter.

more than the calculated 354 cu ft.

A quick estimate of the percentage increase in primary composting volume required for different storage riods is shown in Table 4.

For example, increasing calculated primary composting volume by 52% will provide 3 wks storage for litter and straw. In the case of example 1, calculated primary composting volume is 678 cu ft, hence 678 x 0.52 = 353 cu ft is the required ingredient storage volume for a 3 week period. Similarly, the number of primary bins could be increased by the same percentage to obtain ingredient storage. In example 3, four primary composting bins are needed. Table 4 then suggests that 4 x 0.52 = 2.08, or that approximately two extra bins of primary composting size will provide the desired 3 weeks storage.

If the composter can be constructed in conjunction with a litter storage facility, ingredient storage may be greatly simplified. Litter will be readily available from the litter storage area and other ingredients can be stored appropriately in the litter storage facility. Although most poultry operations in Missouri do not use litter storage facilities, experience has shown that a litter storage facility can greatly enhance the management of building cleanout and litter spreading operations. Since outside storage of litter in "open" piles represents a potential environmental liability, litter storage facilities may be required by regulation in erations where litter storage cannot be accommodat- within the poultry buildings at all times.

## Finished compost storage

Secondary compost bins provide a place for compost to undergo a second heating cycle and further composting. However, as secondary bins become full, the compost must either be used (spread on the land) or moved to a finished compost storage area. Any compost storage area should be covered to prevent rainfall from saturating the pile, with resultant leaching. A litter storage facility may be used to store finished compost until land spreading can be conveniently accomplished.

## Utilities

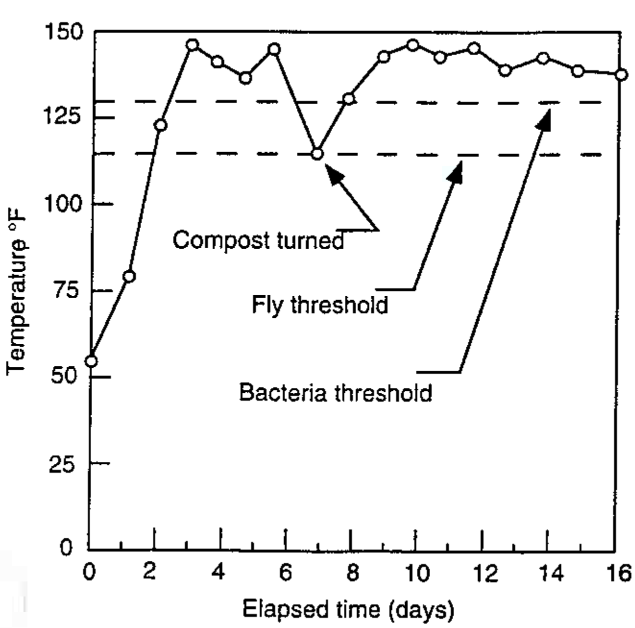
A water line with freeze-proof hydrant at the composting facility will aid in adjusting the moisture content of the recipe if needed, and facilitate cleanup and washdown of personnel, equipment and the composting area as needed. Electricity in the form of at least one 20-amp circuit will facilitate the use of power tools, lights or other appliances which may be needed at the compost facility.

# Making compost

Making compost is simply a matter of placing the ingredients in the primary composting bins in the proper proportions as specified by the recipe.

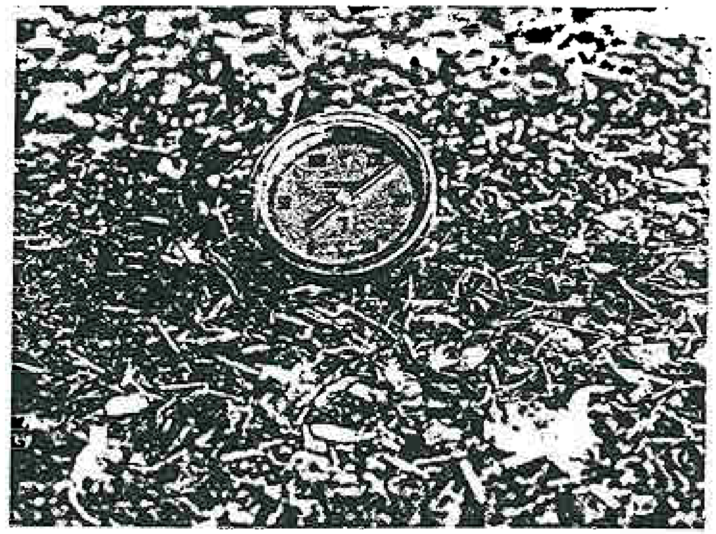
ith a 36" stem is a good instrument for monitoring temperatures in the composting bins. Temperature should be checked daily to ascertain the condition of the compost. Normally, temperatures in the primary bins should rise to the 130-150 deg F range in one or two days, and should peak in the 140-160 deg F range in 7 to 10 days. Temperature is an important parameter in the control of fly larvae and pathogens in the composting process. Fly larvae control occurs at about 115 deg F, and bacteria control at about 130 deg F. Typical temperature profiles for primary and secondary compost are shown in Figure 4.

Although experience indicates that temperatures above 170 deg F are rare, a remote possibility exists that temperatures could rise to spontaneous combustion levels. Conditions conducive to spontaneous combustion are damp, deep-piled, compacted masses of organic matter such as might occur with hay baled and stacked in a too-wet condition. Experience indicates that compost piles limited to 5 ft. depth, with the proper porosity and moisture levels do not exhibit conditions conducive to spontaneous combustion. Nevertheless, the potential for spontaneous combustion should be kept in mind as temperatures are monitored in the composting process. If temperatures appear to be rising ove the 170 deg F range at a constant, or increasing .e, the compost should be removed from the bin and spread on the ground to cool so that spontaneous combustion does not occur.




Source: D. W. Murphy, University of Maryland

**Figure 4.** Typical heating in 2-stage compost for bacteria and fly control.



Temperatures in the 150 – 160 degree F range indicates proper composting.

## Secondary compost

After temperature has peaked in the primary composting bins (typically within 7-10 days) compost should be moved to the secondary composting bins. This movement re-aerates the compost, and provides a mixing action which tends to make a more homogeneous mixture, which in turn results in more constant temperature profiles throughout the cross section of the composting mass. Compost may be left in secondary bins until the space is needed for a new batch of compost, or it may be removed after temperatures peak and begin to drop. Secondary compost should be immediately land-spread, or stored in a covered area to prevent leaching or runoff from the pile. Storage of finished compost for 30 days will result in a drier product which may be easier to land-spread. Pile depths should not exceed 7 ft in storage to minimize the potential for spontaneous combustion.

# Compost costs and uses

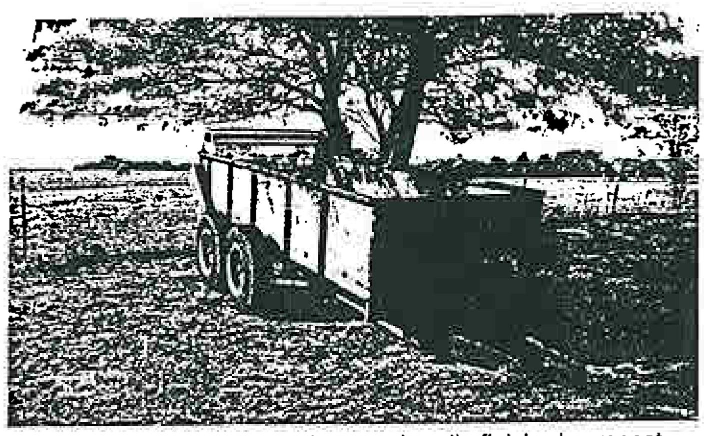
Costs of composters depend upon many factors such as size, configuration (work areas, ingredient/finished compost storage, etc.), and utilities such as water and electricity. Because composters are new in Missouri, there is little previous experience to indicate what actual costs will be.

Composter costs can usually be divided into three general categories:

**Roof and support structure**

This would include poles, structural bracing, rafters or trusses, roof purlins, and roof metal or tin. Limited data suggests that, for a pole type structure, cost for this component may be in the range of $2.50-$3.50 per square foot.

Compost can be handled and land-applied like litter. However, if a recipe contains unusual amounts of long hay or straw, spinner-plate type spreaders may not handle compost as well. This type material may need to be spread with a conventional manure spreader.



Conventional manure spreaders can handle finished compost containing straw.

# New developments in composting

## Long-term single-stage composting

Some research work is being carried out in New York to investigate the possibility of composting mortalities in a single step, rather than using a primary and secondary phase. Advantages of this approach are less labor and management required for the composting process. Preliminary work has shown some success with this technique, although more precise recipe formulation may be needed than with the primary/secondary technique. Use of finished compost as a nitrogen source for new compost appears to enhance the composting process according to preliminary trials. More research and experience is needed to define the proper equipment (ie. bin sizes and number), composting time required, recipe formulation and management of the single-stage process. Until this work is accomplished, the established primary/secondary procedures are most advisable for composting poultry mortalities.

## Recycling finished compost

Information on operating composters indicates that finished compost can be used as an ingredient to replace litter in primary bins. This practice is advantageous in reducing ingredient storage requirements and serving as a litter substitute in operations where litter may not be available, such as layer facilities. Additionally, 10 - 20 percent of the litter produced in a poultry operation may be used in the composting operation.

## Composting other animal species

Because disposal of mortalities is a problem common to any livestock production enterprise, the question of using composting to manage mortalities of other species naturally arises. In Missouri many swine operations are large enough to generate significant weights of mortalities to be properly managed. Preliminary research work at the University of Missouri suggests that composting may offer some solution to the problem of managing swine mortalities. Work thus far indicates that a recipe using swine carcasses, swine manure and straw will support the composting process. The following describes research at the University of Missouri, but should not be considered final recommendations for composting swine carcasses.

### Composter bins

Composter bins similar to those used for poultry were used in initial research and functioned adequately. Insufficient data with initial research has been accumulated to develop a bin sizing parameter for swine. Preliminary experience would suggest that sizing for swine should be greater than that for poultry (1 cu ft per pound of daily mortality with a safety factor of 2.5) because larger carcasses take longer to compost. Compost bins in the research study were 3.2 ft by 9.5 ft for a total of about 30 sq ft in plan view. These bins were somewhat smaller than those typically used in field-scale poultry composters.

### Compost recipe

Ingredients used in this research were swine carcasses, straw, and a swine manure/straw mixture scraped from grower pens with solid concrete floors. Approximate ingredient ratios used were as follows:

**Table 6.** Recipe for composting swine mortalities with manure and straw as ingredients.

| Ingredients | Parts by weight |
|---|---|
| Swine carcass | 1.0 |
| Manure/straw mixture | 1.0 |
| Straw | 0.5 |

### Layering of ingredients

Bins were started by placing straw on the concrete floor at the rate of 5 lb per sq ft of floor area. This rate was adequate for farrowing and nursery pigs, but needed to be increased by a factor of 2-3 when market hogs or sows were placed in the bin first.

naller in size than the volume suggested by Worksheet 1. The safety factor of 2.5 used in Worksheet 1 may not generally be applied in the sizing of commercial composter units.

# Plans for composters

As noted earlier in this bulletin, no specific plan or layout for composters works best in all cases. Many different designs will perform adequately for the composting process. Hence, each composter should be designed and tailored to meet the needs and requirements of the operator.

Several states, Maryland, Delaware, Alabama and Arkansas, have published plans for composters. To obtain these plans, contact the Extension Service or Soil Conservation Service (SCS) in these states.

Standard plans for composters are being developed for Missouri by the SCS. These plans will be available in 1992 through local SCS or Extension offices. Refer to Guidesheets WQ 206 through WQ 210 for drawings of composters that were constructed as demonstration units in the southwest Missouri Poultry Composting Project.

**WORKSHEET 2.** Number of primary bins.

| | | |
|---|---|---|
| 1. Primary composting volume<br>calculated primary composting volume | = | ______ |
| 2. Primary bin depth<br>recommended depth 5 ft | = | ______ |
| 3. Primary bin width<br>(bucket width plus1-3 ft recommended)<br>__ ft bucket width + __ ft | = | ______ |
| 4. Primary bin length (5-6 ft recommended)<br>primary bin length | = | ______ |
| 5. Primary bin volume (2 x 3 x 4)<br>__ ft x __ ft x __ ft | = | ______ |
| 6. Number of primary bins (1/5)<br>___ cu ft / ___ cu ft | = | ______ |

**WORKSHEET 3.** Estimation of ingredient storage based on recipe in Table 1.

1. Weight of daily mortalities (refer to Worksheet 1)

| | BO | x | W/D | x | M/100 | | |
|---|---|---|---|---|---|---|---|
| Brooder | _____ | x | ___/___ | x | ___/100 | = | _____ |
| Grower | _____ | x | ___/___ | x | ___/100 | = | _____ |
| Total (pounds) | | | | | | = | _____ |

2. Desired storage period in weeks = _____

3. Volume of storage required for litter*
(weight mortalities) x (weeks) x (0.318)
_____ x ___ x 0.318 = _____

4. Volume of storage required for straw**
(weight mortalities) x (weeks) x (0.117)
_____ x ___ x 0.117 = _____

5. Total volume for litter and straw
(litter cu. ft.) + (straw cu. ft.)
_____ + ___ = _____

*Bulk density of litter = 33 lbs./cu.ft.

**Bulk density of baled straw = 6 lbs./cu.ft.

# Notes

University Extension
UNIVERSITY OF MISSOURI
COLUMBIA

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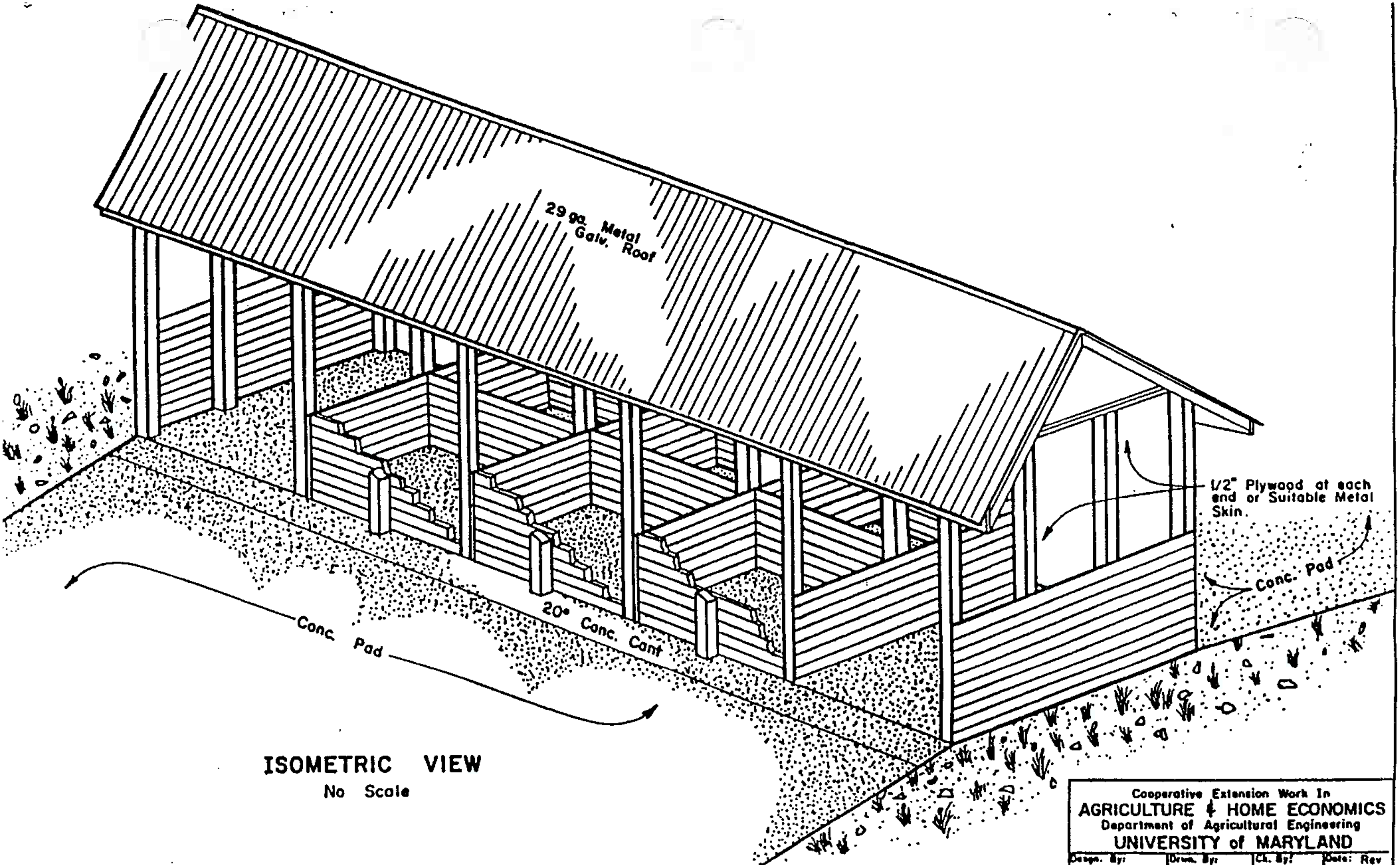
# STANDARD DRAWINGS

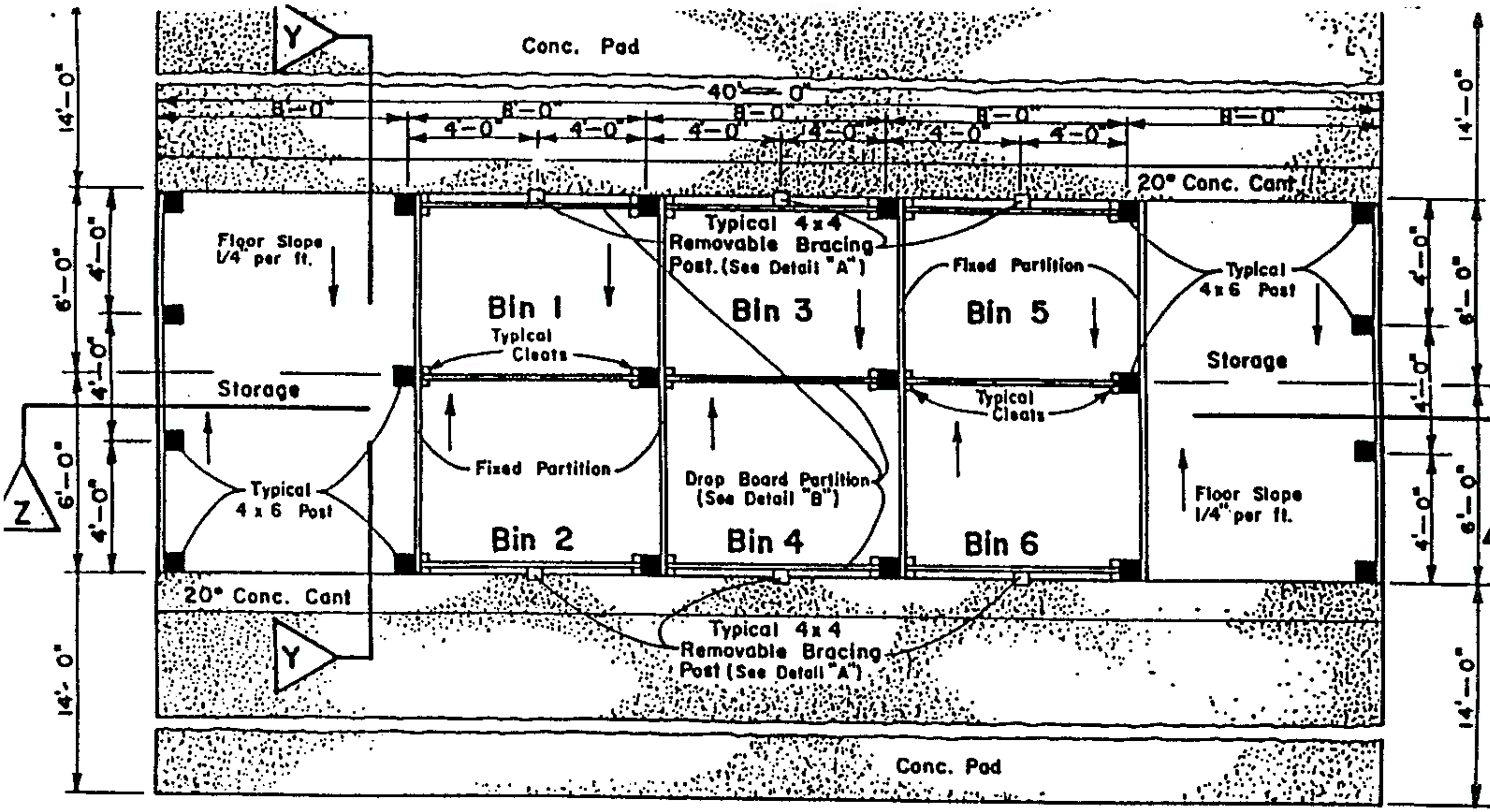



ISOMETRIC VIEW

No Scale

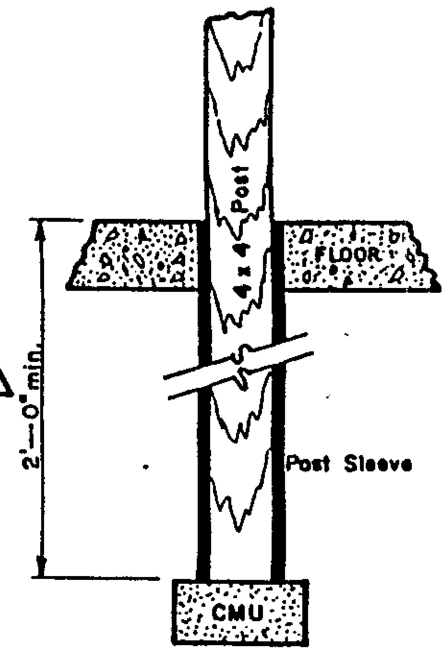
Approved by SCS for use in Arkansas

| Cooperative Extension Work In AGRICULTURE & HOME ECONOMICS Department of Agricultural Engineering UNIVERSITY of MARYLAND | | | |
|---|---|---|---|
| Desgn. By: Carr/Murphy | Drwn. By: L. Hicks | Ck. By: L.E. Stewart | Date: Rev 2/1/89 |
| Title: POULTRY COMPOSTING SHED | | | |
| SHEET 1 of 4 | Drawg. No: 89-02-01 | | |




## PLAN VIEW

Scale 1/4" = 1'—0"

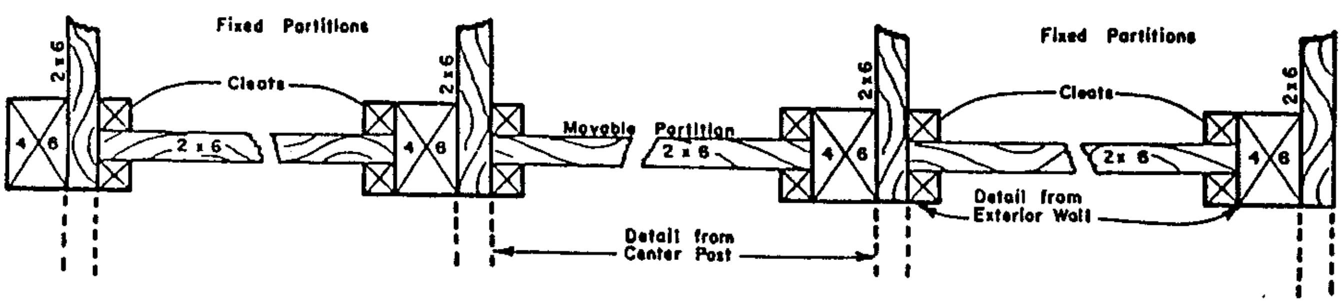



## DETAIL "A" (Optional

Scale 1/2" = 1'—0"

NOTE:

CMU = Concrete Masonry Unit (Cinder Block)



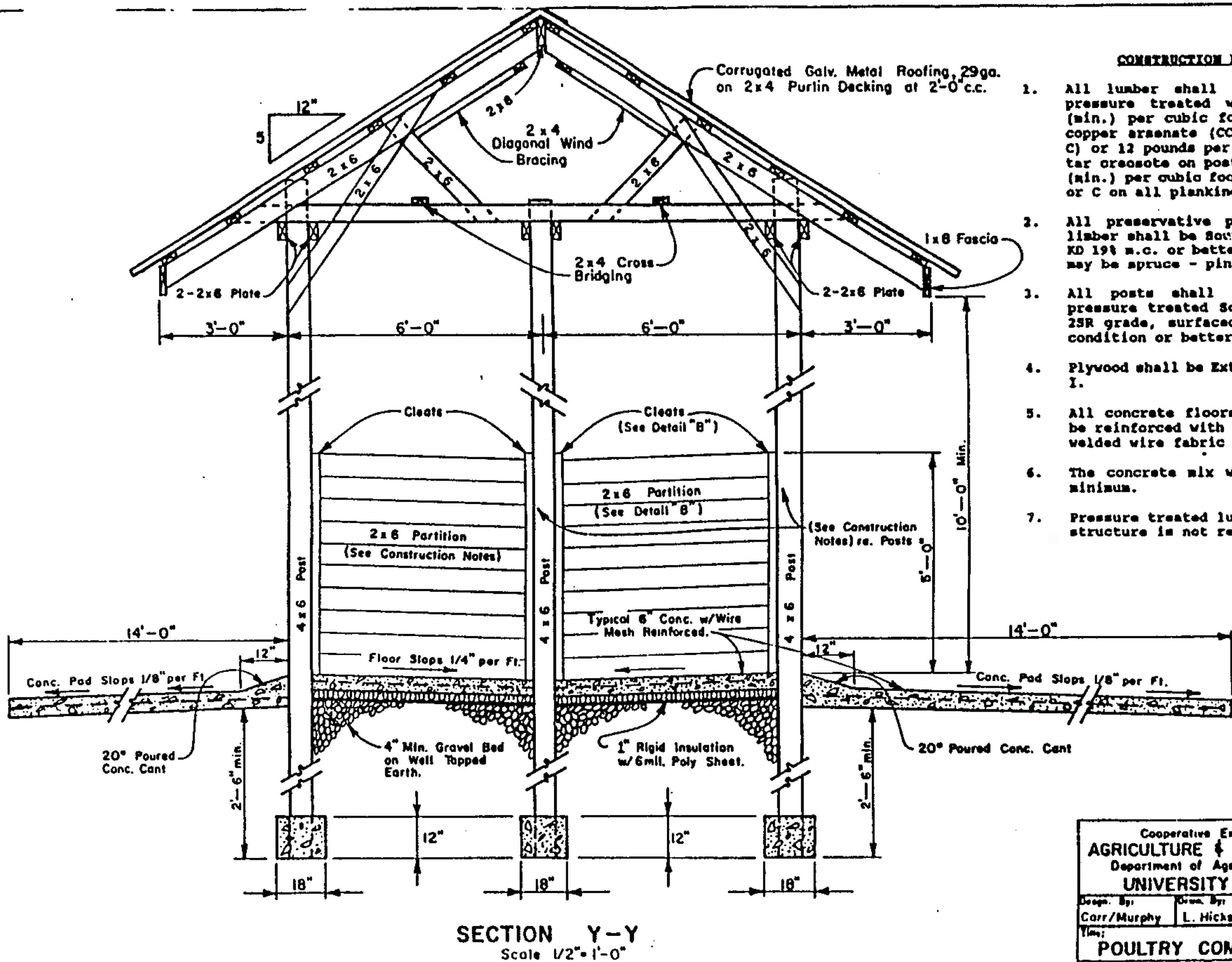

## DETAIL "B"

Scale 1/2" = 1'—0"

Cooperative Extension Work In
AGRICULTURE & HOME ECONOMICS
Department of Agricultural Engineering
UNIVERSITY of MARYLAND

| Design. By: | Drwn. By: | Ch. By: | Date: Rev. |
|---|---|---|---|
| Carr/Murphy | L. Hicks | L. E. Stewart | 2/1/90 |

Title: POULTRY COMPOSTING SHED




SECTION Y-Y
Scale 1/2" = 1'-0"

CONSTRUCTION NOTES

1. All lumber shall be preservative pressure treated with 0.6 pounds (min.) per cubic foot of chromated copper arsenate (CCA-Type A, B, or C) or 12 pounds per cubic foot coal tar creosote on post and 0.4 pounds (min.) per cubic foot CCA-Type A, B, or C on all planking.

2. All preservative pressure treated limber shall be Southern Pine No. 2 KD 19% m.c. or better. Other lumber may be spruce - pine - fir.

3. All posts shall be preservative pressure treated Southern Pine No. 2SR grade, surfaced green-used any condition or better.

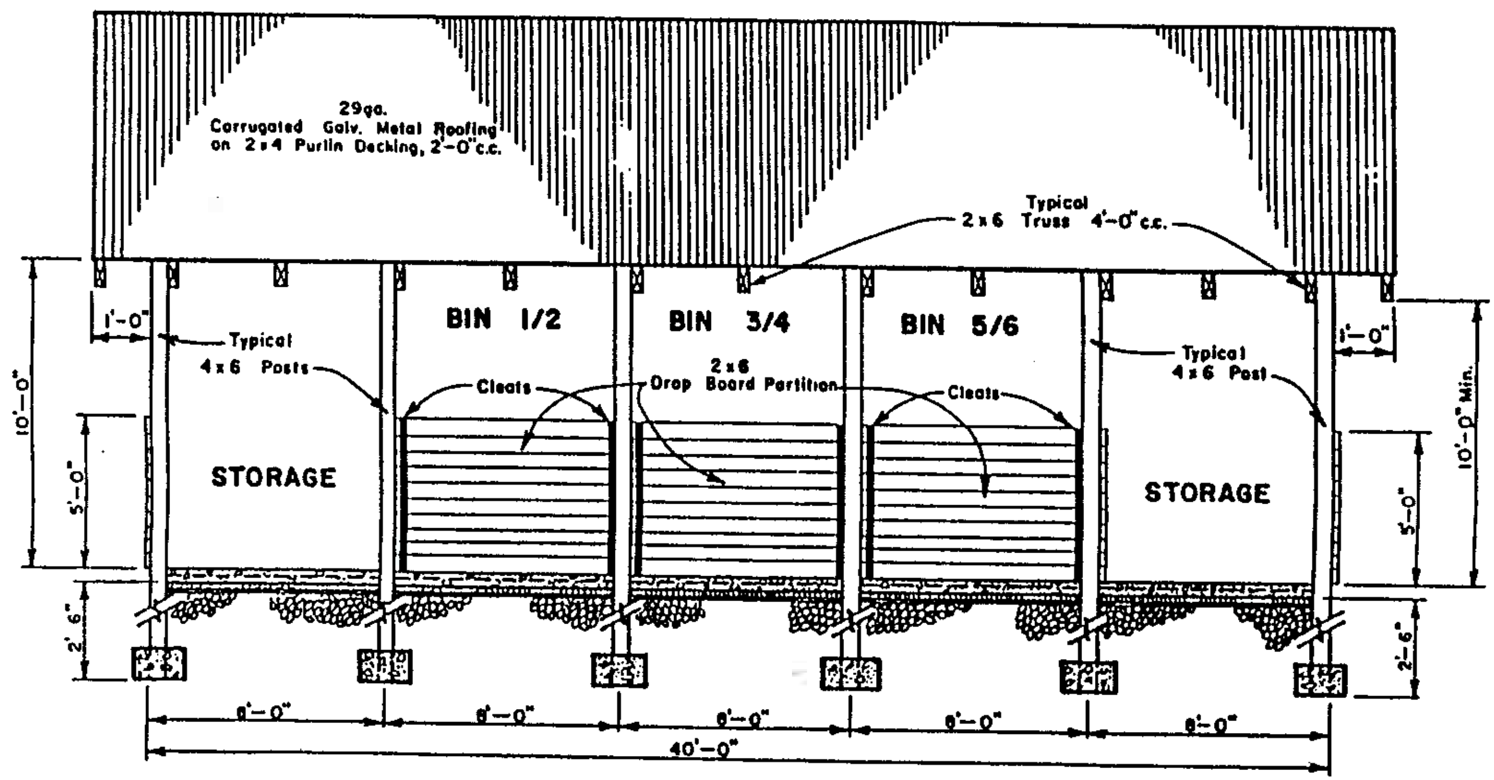
4. Plywood shall be Ext. C-C Structural I.

5. All concrete floors and pads shall be reinforced with 6" X 6" 10 gauge welded wire fabric reinforcement.

6. The concrete mix will be 3500 psi minimum.

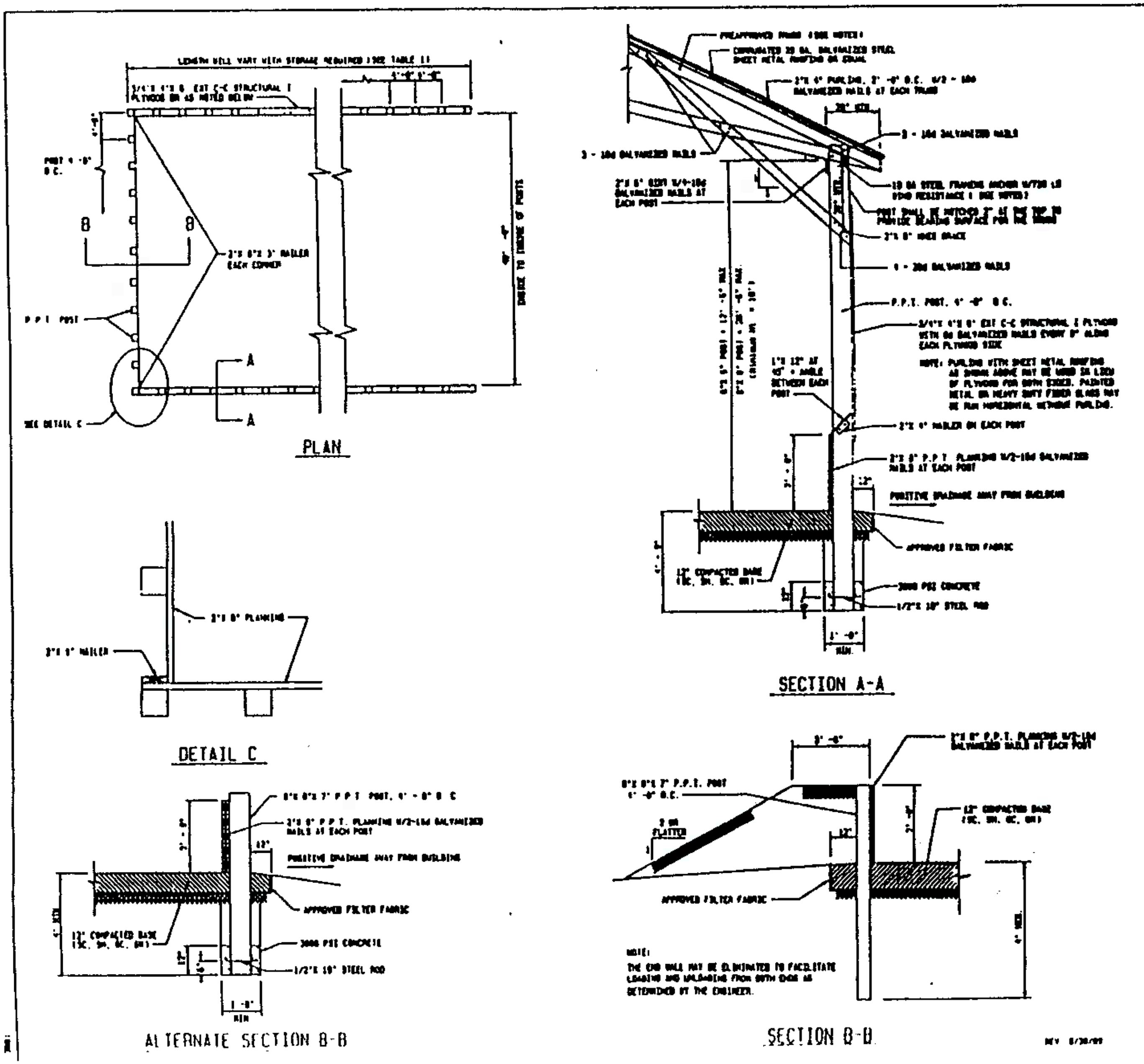
7. Pressure treated lumber in the roof structure is not required.

| Cooperative Extension Work In AGRICULTURE & HOME ECONOMICS Department of Agricultural Engineering UNIVERSITY of MARYLAND | | | |
|---|---|---|---|
| Design By: Carr/Murphy | Drwn. By: L. Hicks | Ck. By: L. Stewart | Date: 2/1/90 Rev. |
| Title: POULTRY COMPOSTING SHED | | | |




SECTION Z-Z w/ROOF
Scale 1/4" = 1'-0"

| | | | |
|---|---|---|---|
| Cooperative Extension Work In<br>AGRICULTURE & HOME ECONOMICS<br>Department of Agricultural Engineering<br>UNIVERSITY of MARYLAND | | | |
| Dsgn. By: Carr/Murphy | Drwn. By: L. Hicks | Ck. By: L. Stewart | Date: Rev. 2/1/90 |
| Title: POULTRY COMPOSTING SHED | | | |




## CONSTRUCTION NOTES

1. ALL PRESERVATIVE PRESSURE TREATED (P.P.T.) LUMBER SHALL BE TREATED WITH 0.6 POUNDS PER CUBIC FOOT OF CHROMATED COPPER ARSENATE (CCA-TYPE A, B, OR C) OR 12 POUNDS PER CUBIC FOOT FOR CREOSOTE ON POST AND 0.4 POUNDS PER CUBIC FOOT CCA-TYPE A, B, OR C ON ALL PLANKING.
2. ALL PRESERVATIVE PRESSURE TREATED LUMBER SHALL BE SOUTHERN PINE NO. 2 KD (19% M.C. OR BETTER). OTHER LUMBER MAY BE SPRUCE-PINE-FIR.
3. ALL PRESERVATIVE PRESSURE TREATED POST SHALL BE SOUTHERN PINE NO. 2 GRADE, SURFACED GREEN - USED ANY CONDITION OR BETTER.
4. THE COMPACTED BASE SHALL EXTEND A MIN. DISTANCE OF 1 FOOT BEYOND THE OUTER EDGE OF THE POST. IT IS TO BE PLACED PRIOR TO THE POST INSTALLATION.
5. FILTER FABRIC USED SHALL BE FROM AN APPROVED LIST OF MANUFACTURERS. THE MANUFACTURER MUST SUBMIT CERTIFICATION AND TEST DATA TO SCS FOR APPROVAL SHOWING: (a) EOS BETWEEN 70 AND 100 (b) WOVEN OR NONWOVEN FABRIC MATERIAL (c) TENSILE STRENGTH OF 100 LB. MIN. (d) PUNCTURE STRENGTH OF 40 LB. MIN. AND (e) ABRASION RESISTANCE OF 25 LB. MIN. IN ANY PRINCIPLE DIRECTION
6. THE FINISHED FLOOR ELE. SHALL BE A MIN. OF 2 FEET ABOVE THE NORMAL WATER TABLE
7. TRUSSES AND ANCHORS USED SHALL BE FROM AN APPROVED LIST OF MANUFACTURERS. THE MANUFACTURER MUST SUBMIT CERTIFICATION AND TRUSS DESIGN TO SCS FOR APPROVAL USING THE FOLLOWING LOADINGS:

   CASE I - UNIFORM LOAD, 20 PSF ENTIRE TRUSS

   CASE II - UNIFORM LOAD, 30 PSF HALF TRUSS

   CASE III - UNIFORM UPLIFT, 5 PSF
8. TRUSS BRACING SHALL BE REQUIRED AS RECOMMENDED BY THE TRUSS FABRICATOR
9. PROTECTION SUCH AS A CLEAR PRESERVATIVE, PAINT, OR PRESSURE TREATMENT SHALL BE REQUIRED FOR THE PLYWOOD
10. THE COMPACTED BASE, (SC, SM, GC, GM, USCS CLASSIFICATION) SHALL CONSIST OF GREATER THAN 12% FINES. COMPACTION SHALL BE ACCOMPLISHED BY AT LEAST ONE PASS OF THE EQUIPMENT USED FOR GRADING OVER THE ENTIRE SURFACE.
11. IF A CONCRETE FLOOR IS USED IN LIEU OF THE COMPACTED SOIL BASE, THE CONCRETE SHALL BE 3000 PSI AND ENTRAINED WITH A MINIMUM THICKNESS OF 5 INCHES, AND REINFORCED WITH 6X6 - 10X10 WELDED WIRE FABRIC. THE CONCRETE SHALL BE PLACED ON 2" POLYSTYRENE OVER 6.0 MIL PLASTIC VAPOR BARRIER.

TABLE 1.

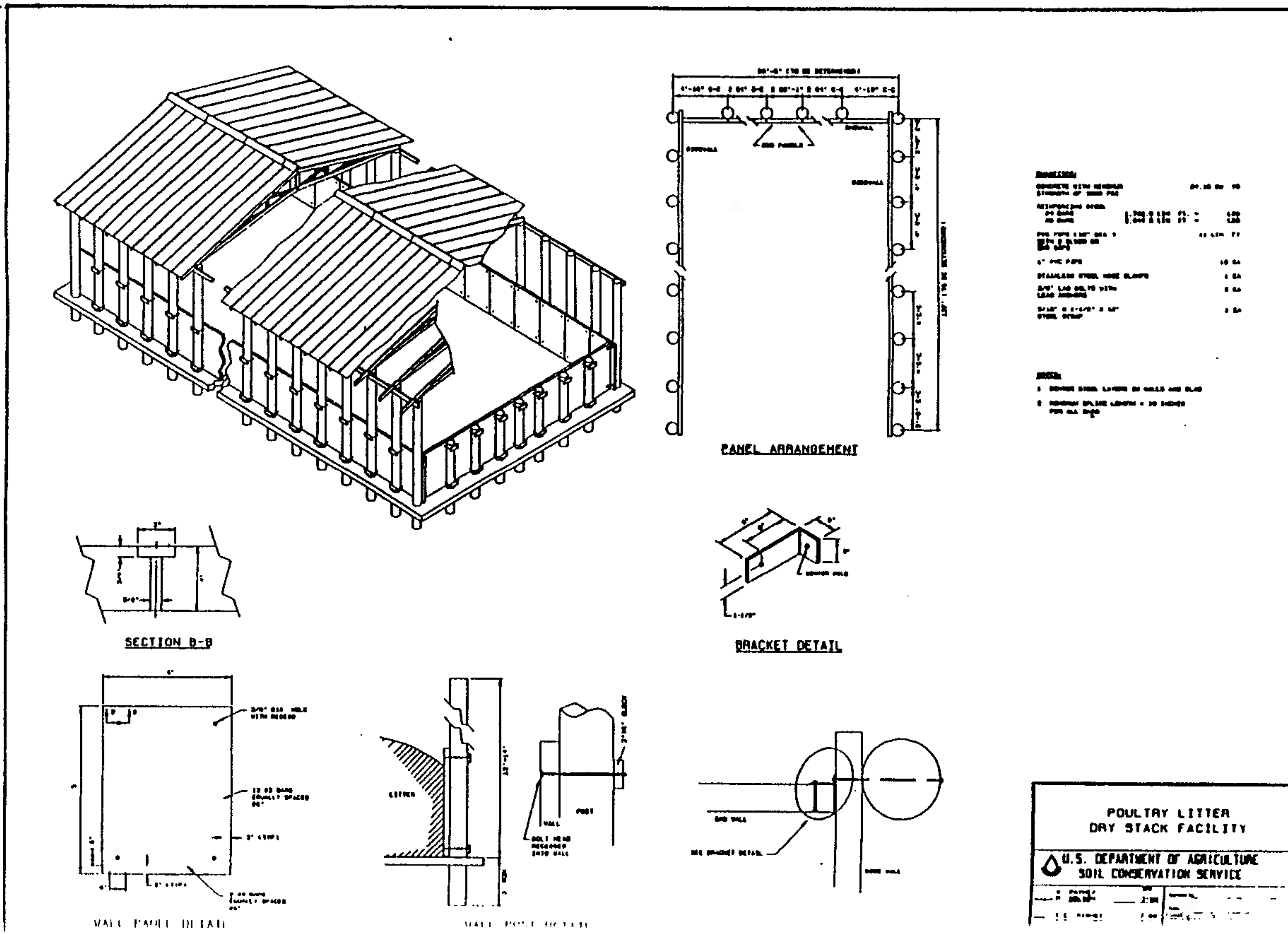
REQUIRED LENGTH FOR 180 DAY STORAGE

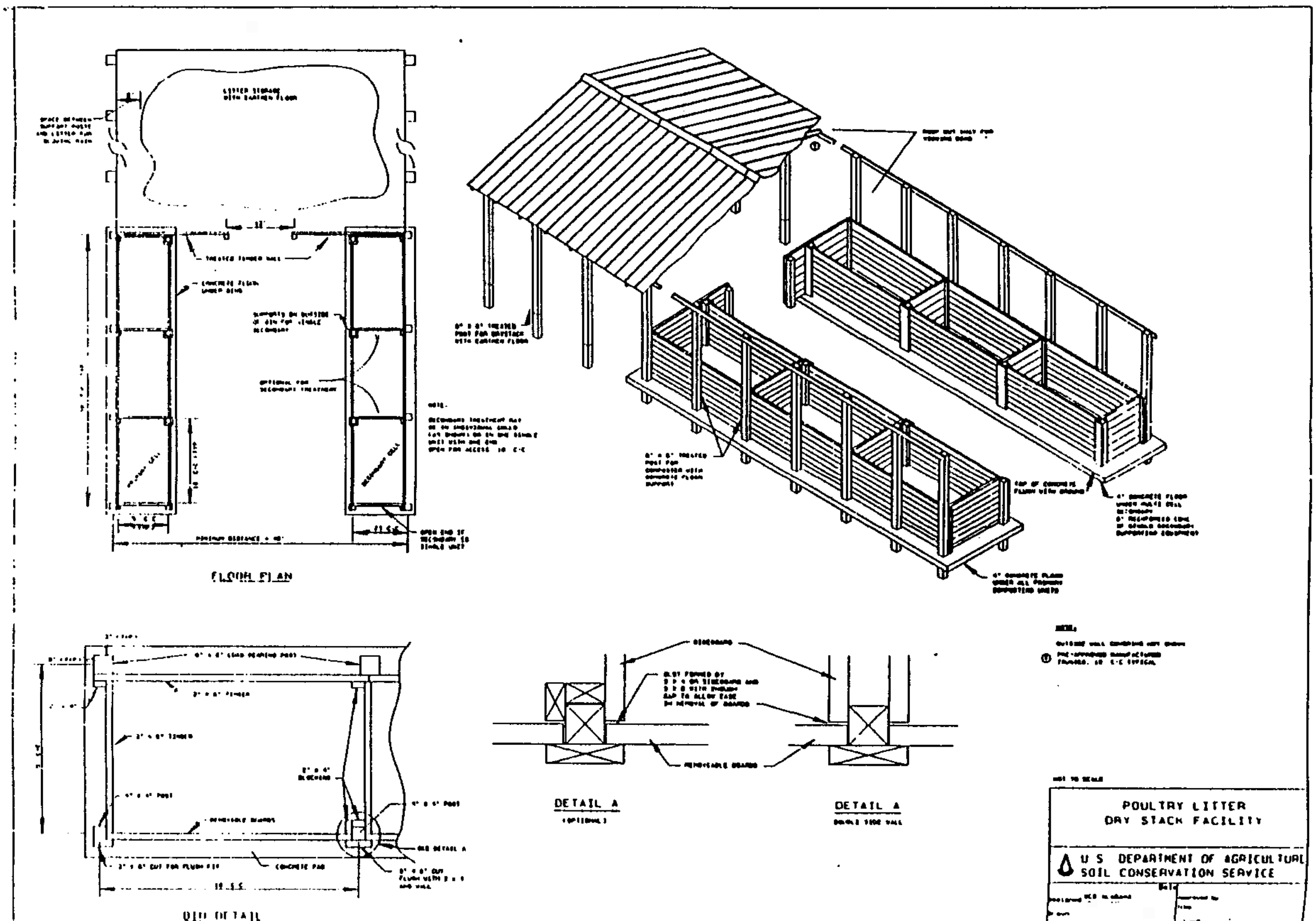
| FLOCK SIZE | LENGTH |
|---|---|
| 20,000 | 36 |
| 40,000 | 60 |
| 60,000 | 84 |
| 80,000 | 108 |
| 100,000 | 132 |

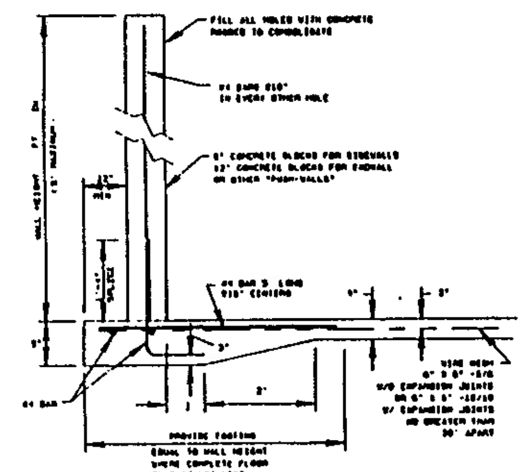
ROOFED ANIMAL WASTE STRUCTURE

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

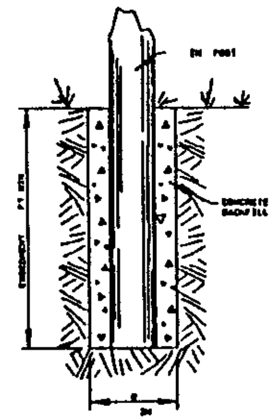
REV 8/30/89


PANEL ARRANGEMENT
BRACKET DETAIL
SECTION B-B
WALL PANEL DETAIL
WALL POST DETAIL
POULTRY LITTER
DRY STACK FACILITY
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

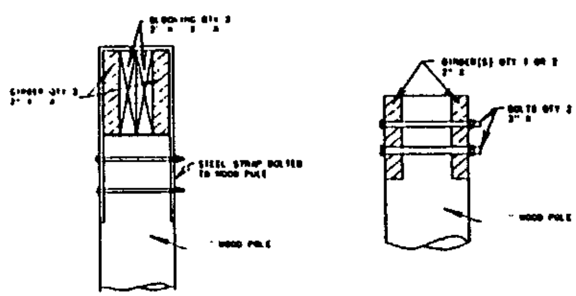

FLOOR PLAN
BIN DETAIL
DETAIL A
(OPTIONAL)
DETAIL A
DOUBLE SIDE WALL
NOT TO SCALE
POULTRY LITTER
DRY STACK FACILITY
U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE



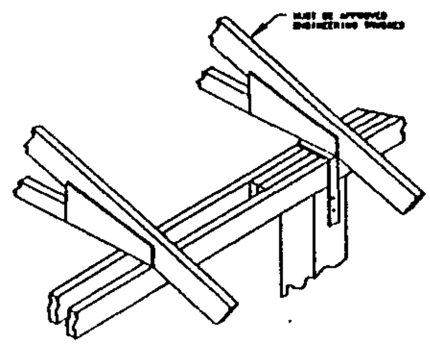
BLOCK WALL DETAIL




POSTHOLE DETAIL




POLE CONNECTION DETAILS - TYPICAL

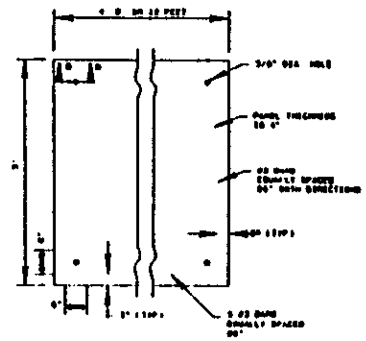


GIRDER DETAIL - TYPICAL

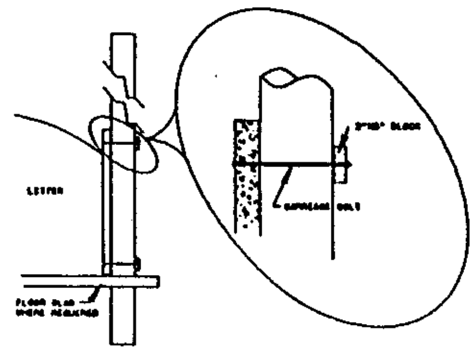
RECORD

POULTRY LITTER
DRY STACK FACILITY

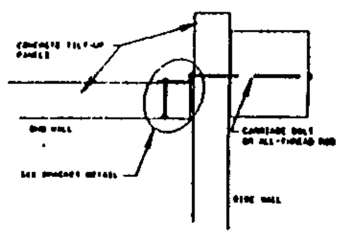
U.S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE



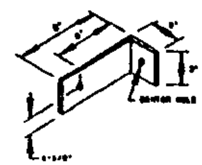

PANEL DETAIL




POST DETAIL




CORNER DETAIL



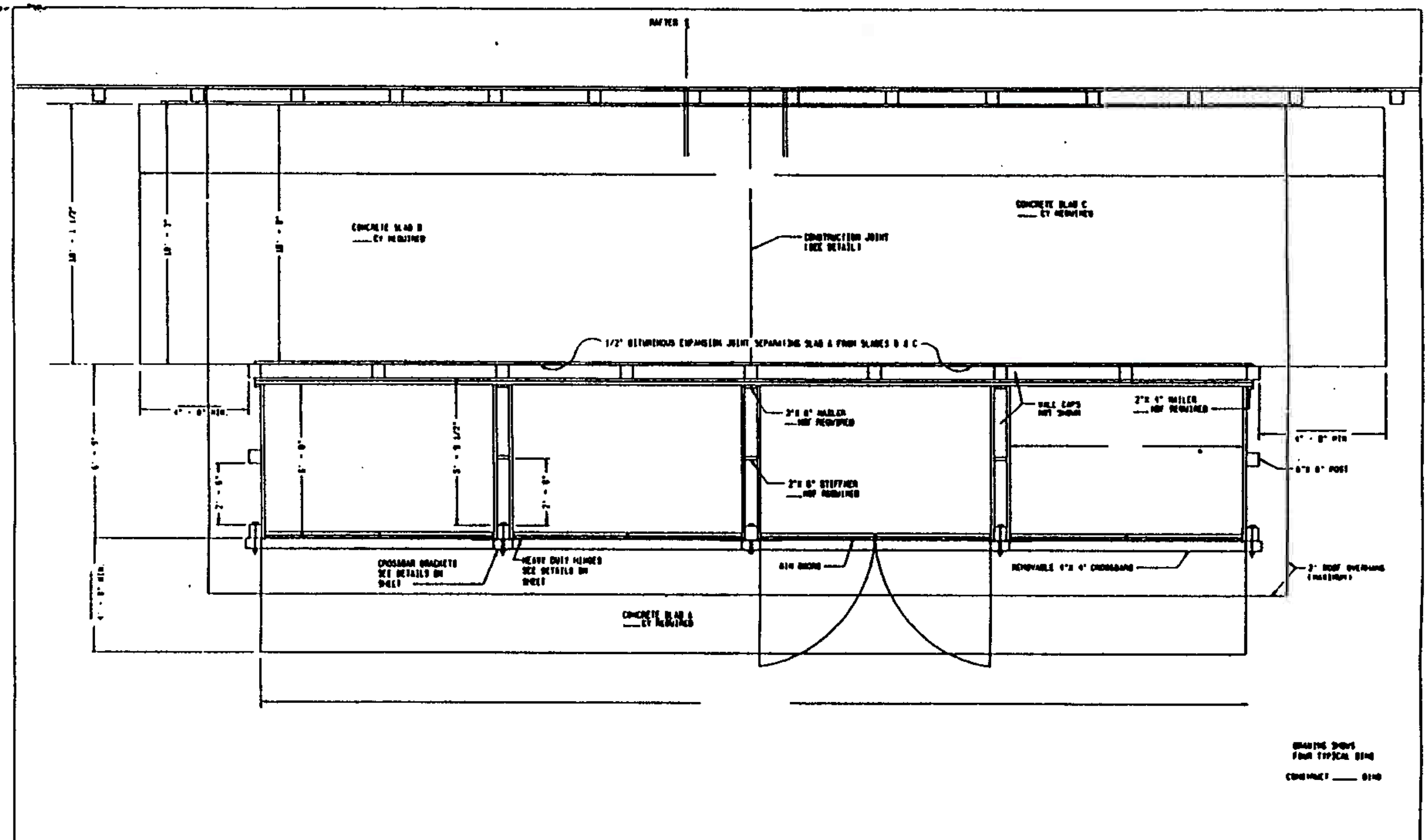

BRACKET DETAIL

DETAILS FOR DRY STACK WITH TILT-UP, CONCRETE WALL PANELS

RECORD

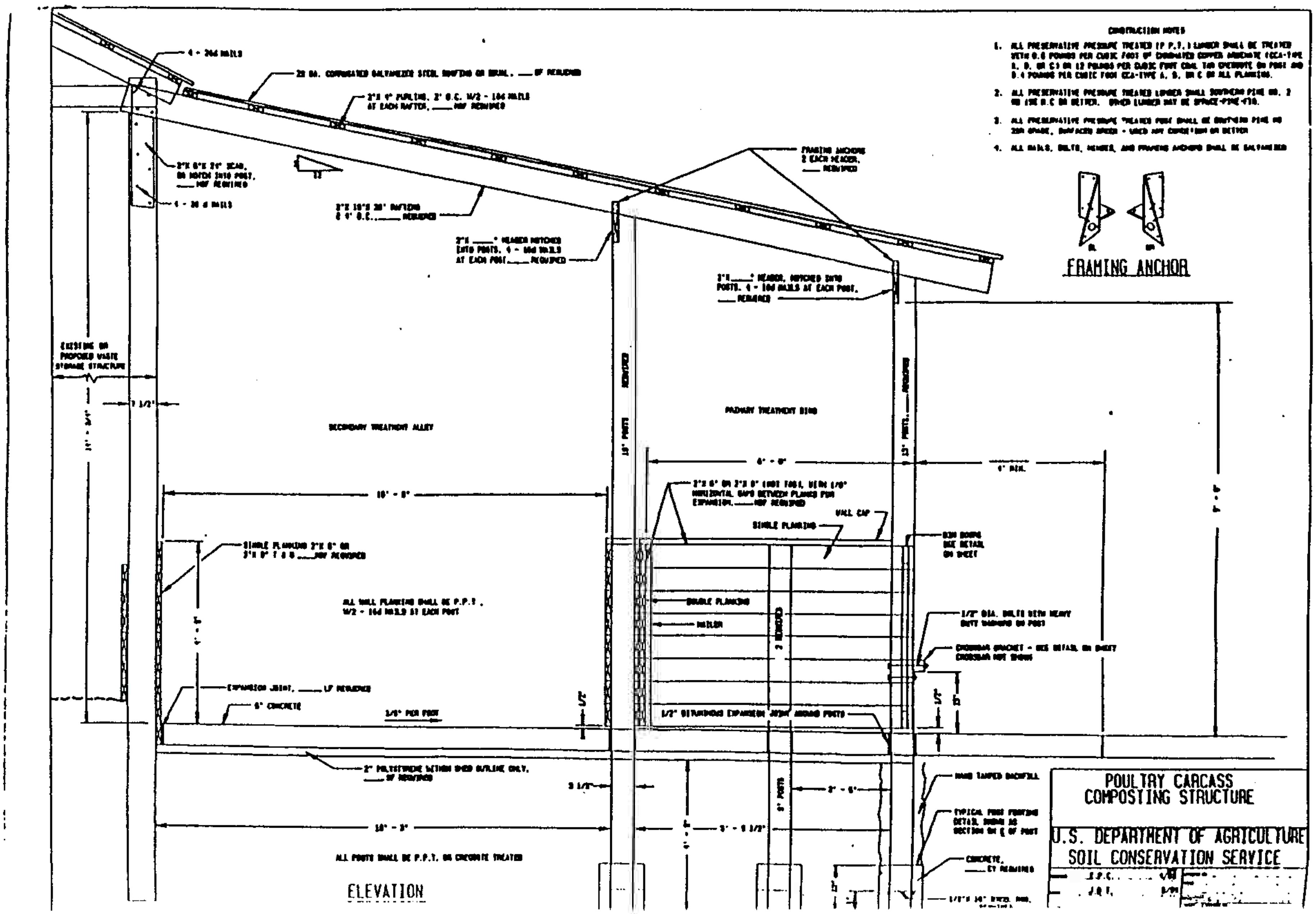
POULTRY LITTER
DRY STACK FACILITY

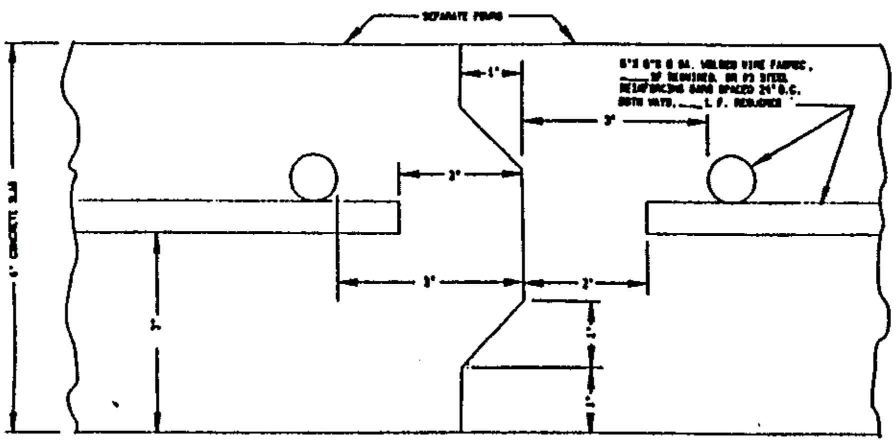
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE



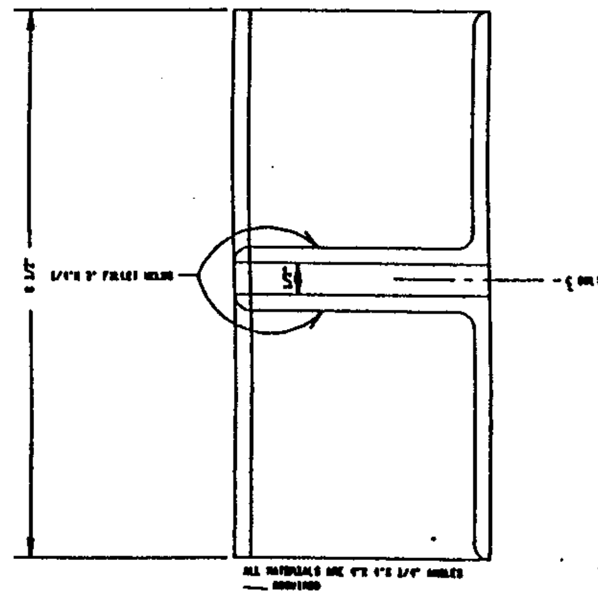

POULTRY CARCASS
COMPOSTING STRUCTURE

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

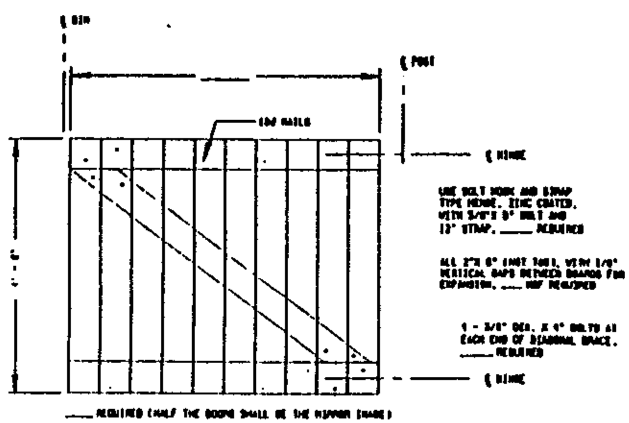

FRAMING ANCHOR
ELEVATION
POULTRY CARCASS
COMPOSTING STRUCTURE
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE



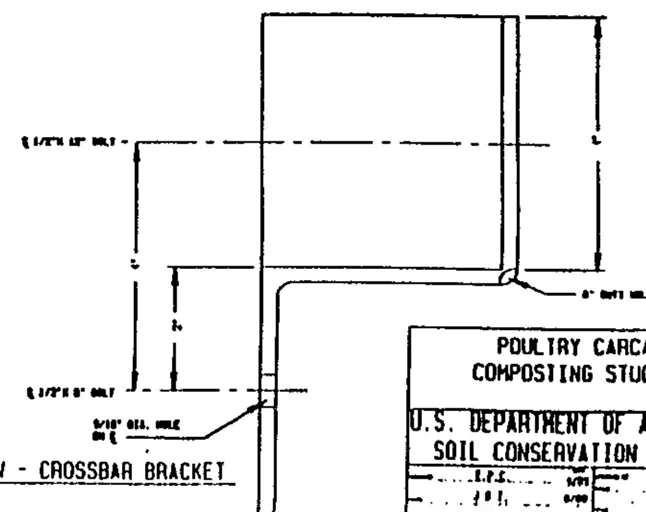
CONSTRUCTION JOINT



TOP VIEW



EXTERIOR ELEVATION OF BIN DOOR



SIDE VIEW - CROSSBAR BRACKET

POULTRY CARCASS
COMPOSTING STUCTURE

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

CONSTRUCTION NOTES

1 The construction site shall be cleared of all trees, roots, brush, boulders, sod and debris. All material not suitable for subgrade shall be removed from foundation areas and replaced with compacted earth fill

2 The structure shall be constructed to the neat lines and grades as shown on the drawings and/or as staked in the field.

3 All lumber shall be Southern Pine No. 2 KD 19% m.c. or better.

4 All posts shall be Southern Pine No. 2SR grade, surfaced green - S4S dry condition or better

5 All lumber shall be preservative pressure treated (P.P.T.) with 0.6 pounds per cubic foot of chromated copper arsenate (CCA-Type A, B, or C), or 12 pounds per cubic foot coal tar creosote on posts and 0.4 pounds per cubic foot CCA-Type A, B, or C on all other lumber.

6 All nails shall be 20d and zinc-coated

7 All concrete materials and construction procedures shall be in accordance with the Reinforced Concrete Construction Specification. Concrete shall be air entrained (Type IA), and Class 3000.

8 Reinforcing steel shall be of the size shown, shall be placed according to the construction drawings, securely tied, and supported on plastic chairs prior to delivery of concrete.

9 Expansion joints shall be located at maximum spacings of 25 feet in either direction. Slabs shall be separated by 1/2-inch thick bituminous expansion joint material

10 Construction joint locations shall be approved by the government inspector. Construction joint details are shown on the constructio drawings.

11 A protective cover of vegetation shall be established on all exposed surfaces of embankments, borrow areas, or other disturbed areas. Newly vegetated areas shall be fenced where necessary to protect the vegetation

12 The covers may be corrugated aluminum plate or corrugated polyvinylchloride (PVC) sheeting meeting the following specificatio

A. Corrugated aluminum plate.

Corrugation 2-1/2" x 9"
Alloy 3003-H 14)
Chemical properties - ASTM B209
Mechanical properties - AASHTO M219-88
Length 6'9-3/4" or 81.75"
Width 4'9-1/2"
Thickness 0.100"
Weight per plate 52.7 lb. or 1.6 Lb./S.F.
Available from CONTECH, 1516 DuPont Blvd., New Castle, DE 19720 Tele: 302-655-1151

B. Corrugated polyvinylchloride (PVC) sheeting.

Corrugation 1-1/4" x 9"
Standard Specifications:
ASTM-D1784-80: Type I, Grade 2
ASTM-D1784-69: 12454-C
ASTM-D1784-75: 12454-C
Length 6'9-3/4"
Width 9" net
Thickness 1/4"
Interlocking
Weight per sheet 10.2 Lb. or 2 Lb./S.F.
Physical Properties.

| | | |
|---|---|---|
| Specific Gravity | ASTM-D792 | 1.46 +/- |
| Durometer "D" Hardness | ASTM-D785 | 80 +/- |
| Tensile Strength, psi | ASTM-D638 | |
| @ 70oF | | 7,300 |
| @ 32oF | | 9,000 |
| @ -40oF | | 12,000 |
| Tensile Modulus, psi (@ 70oF) | ASTM-D638 | 420,000 |
| Flexural Strength, psi (@ 70oF) | ASTM-D790 | 14,500 |
| Compressive Strength, psi (@ 70oF) | ASTM-D695 | 9,000 |
| Izod Impact (ft-lbs/inch notch) | ASTM-D256 | |
| @ 70oF | | 1.4 |
| @ 32oF | | 0.7 |
| @ -40oF | | 0.3 |
| Heat Distortion Temperature | | |
| (oF @ 264 psi) | ASTM-D648 | 160 |
| Coefficient of Linear Thermal | | |
| Expansion (in/in/oF x 10-5) | ASTM-D696 | .29 |
| Coefficient of Thermal Conductivity | | |
| (BTU/hr/ft²/inch/oF) | ASTM-C177 | 1.02 |

Available from C.I.C. P.O. Box 203, Wilson NJ 40007 0703

CONSTRUCTION NOTES

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

E.F.C. 5/90
J.D.I. & K.E.B. 5/90

SC 310 003 4

# CHICKEN COMPOSTER - DEL-MARVA
## BIN VOLUME CALCULATION SHEET

bic feet of storage needed can be determined by using the formula

$$\text{Volume (cubic feet)} = \frac{\text{Number of Birds in Flock} \times Wb \times M \times VF}{\text{Flock life (days)}}$$

Wb = Average Market Weight of Birds

M = % Mortality rate expressed as a decimal

VF = Volume Factor, 2.5

Number of Birds ________________

Flock life days ________________

Market Weight ________________

Mortality Rate ________________

_______ X _______ X _______ X _______ divided by _______ = _______ Cubic Feet Primary Storage

or determining number of bins divide cubic feet needed by cubic feet of storage bin.

Typical storage bin size is:
8 Ft. wide
6 Ft. deep
5 Ft. high

Designed storage bins

Width _______

Depth _______ _______ X _______ X _______ = _______ Cubic Ft. of Bins

Height _______

Cubic feet of Storage needed _______

Cubic Feet of Bin size _______

_______ Divided By _______ = Number of Primary Bins

Note: Secondary Treatment Volume must have same volume as Primary

# SOIL CONSERVATION SERVICE

## CONSTRUCTION SPECIFICATIONS
## (Texas)

## COMPOSTING FACILITY (DEAD POULTRY)

1. SCOPE

Work shall consist of constructing the dead bird composting facility and includes site preparation, concrete, water line, and building material to the location and elevations shown on the drawings or as staked in the field.

2. PUBLIC AND PRIVATE UTILITIES

Utilities are defined to be overhead and underground power or communication lines, and pipelines. All utilities discovered to be in the work area are shown on the drawings or sketches. However, the absence of indicators on the drawings or sketches does not assure th nonexistence of utilities in the work area. The contractor is alerted to conduct his own search and discovery for utilities in order to lessen or avoid potential damages.

3. SITE PREPARATION

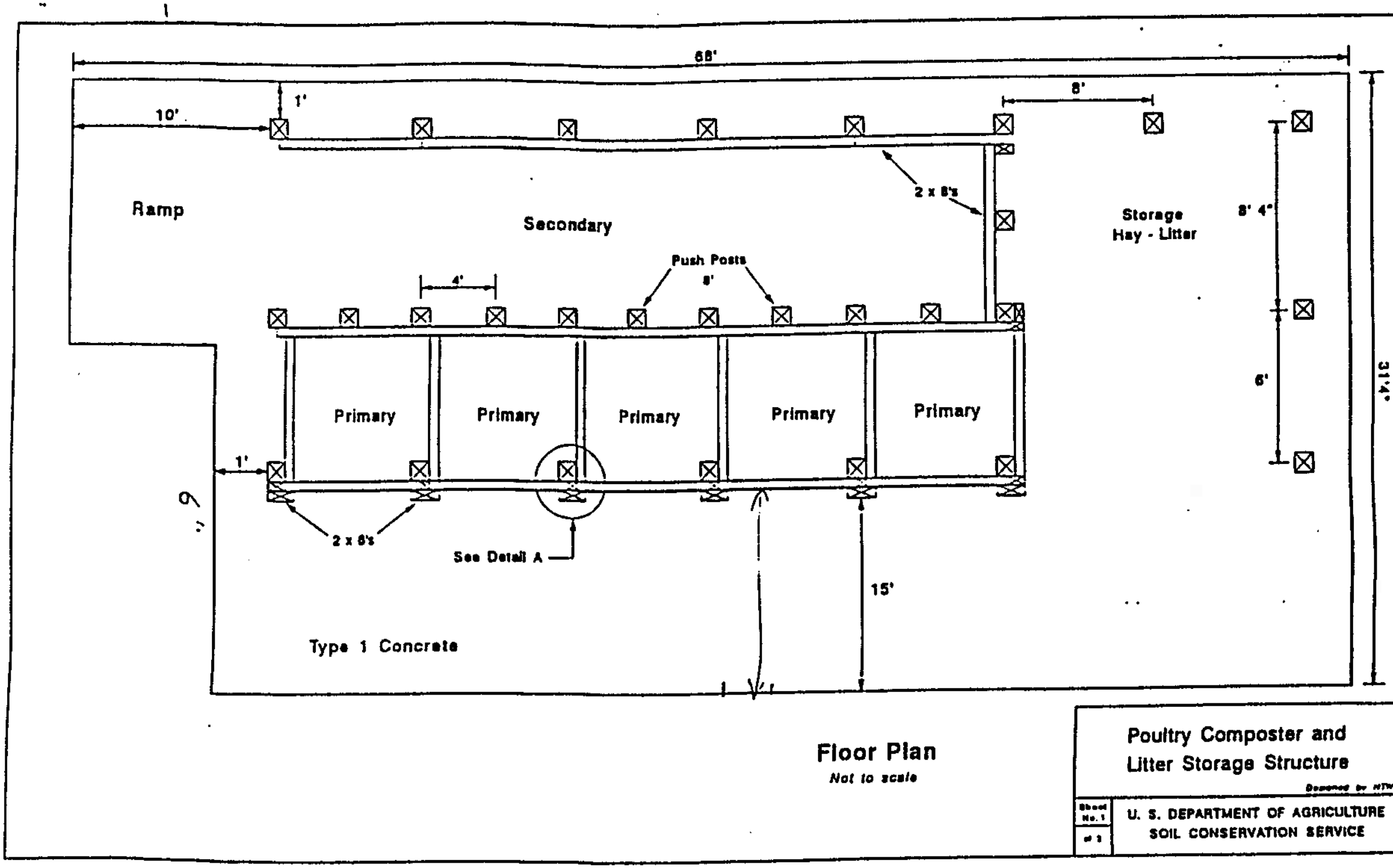
The construction site shall be cleared of all trees, stumps, roots, brush, boulders, sod and debris. All material not suitable for subgrade shall be removed from foundation areas and replaced with compacted earth fill.

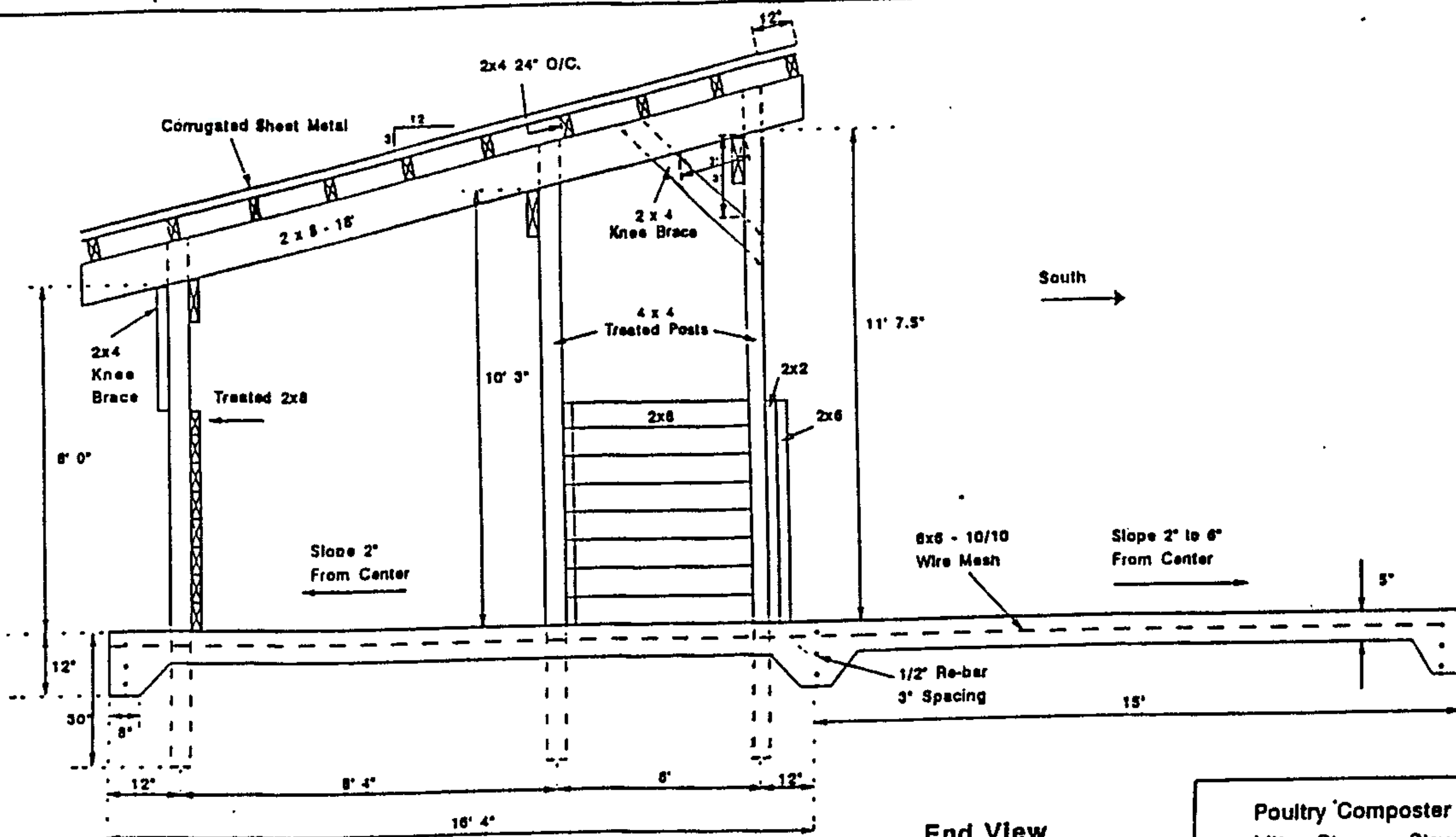
The area shall be shaped, graded, and filled, if necessary, to provide a slope away from the structure for drainage. Any fill material used shall be free from all sod, roots, frozen soil, stones over 6" in diameter, and other objectionable material. Fill material shall be compacted with at least one pass of construction equipment over the entire surface of each layer placed. Layers should be less than 12" thick.

4. BUILDING MATERIALS

All concrete materials and construction procedures shall be in accordance with reinforced concrete construction specifications. Cement shall be air entrained (Type 1A). The minimum compressive strength of the concrete shall be 3,000 psi at 28 days.

The concrete floor shall be reinforced with wire mesh and be at least 5" thick. A 12" footer with reinforcement bars shall be placed around the perimeter of the floor. Building access locations for front-end loaders and other equipment shall provide additional reinforcement as needed. Reinforcement steel shall be


68'
10'
1'
8'
Ramp
Secondary
2 x 6's
Storage
Hay - Litter
8' 4"
Push Posts
8'
4'
6'
31'4"
Primary
Primary
Primary
Primary
Primary
1'
6"
2 x 6's
See Detail A
15'
Type 1 Concrete
Floor Plan
Not to scale
Poultry Composter and
Litter Storage Structure
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE



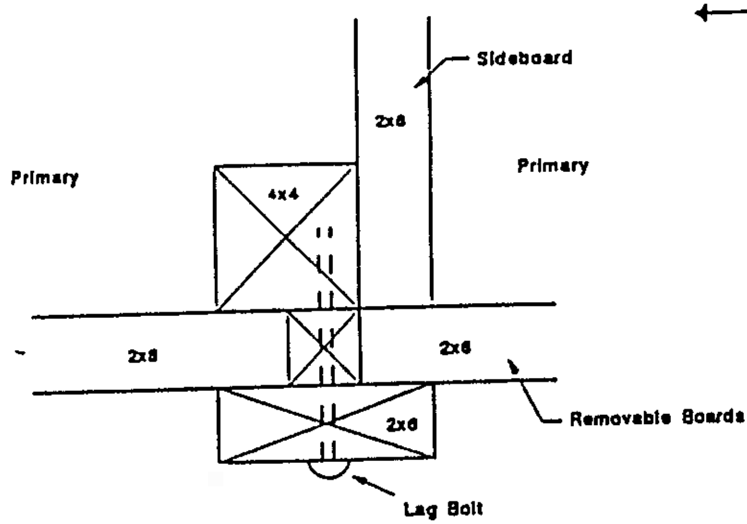

End View

*Not to scale*

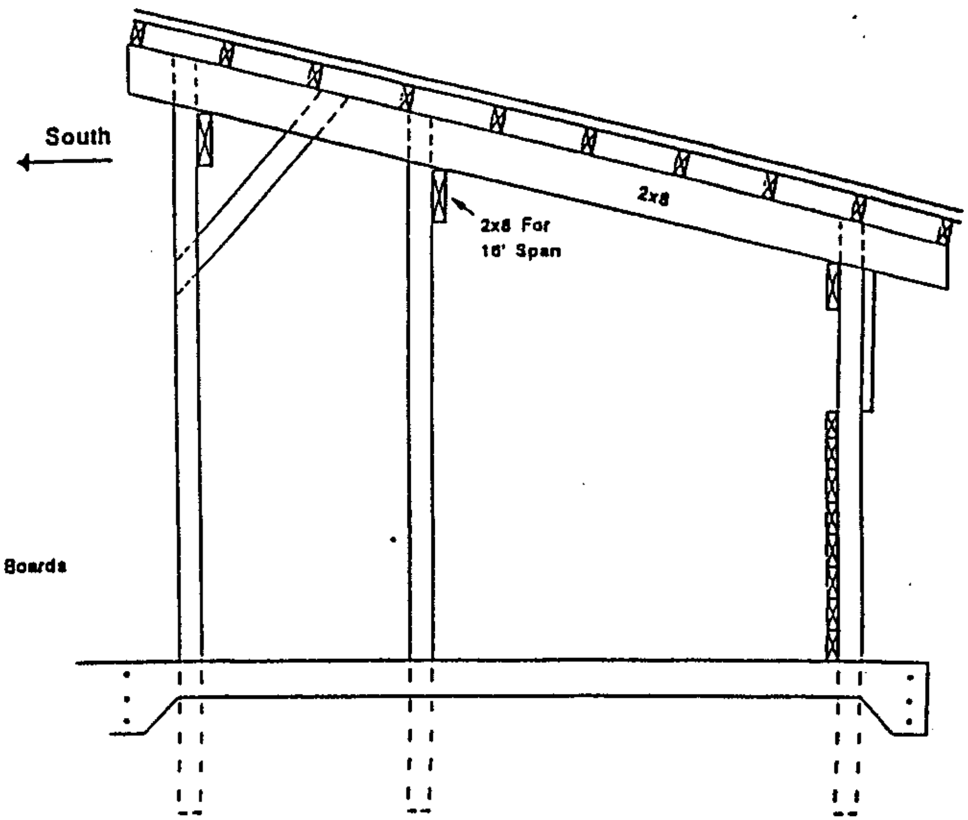
Poultry Composter and Litter Storage Structure

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Sheet No 3 of 3




Detail A




**Storage End Detail**

*Not to scale*

Poultry Composter and
Litter Storage Structure

Sheet No 2 of 3

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

# POULTRY COMPOSTING

## Loading the Primary Composter

Materials should be
ıded into the primary bins
follows:
Place 1 foot of dry
ınure on the floor of the
ı.

Add a 6-inch layer of
ıw, peanut hulls, or hay.
:s adds additional carbon
l aids aeration under the
ds.

Add a layer of carcasses.
ead the birds in a single
er keeping them at least 6
hes away from the walls.

Co e carcasses with
n veral layers of
ı birds, and manure
y be needed during a
gle day when the birds
ch maturity.

Add water by wetting the
face. Less water may be
ded as the birds reach
turity.

When the last layer of
ckens is added to a bin,
ı the pile with an extra
er of manure.

Monitor the temperature
th a 36 inch probe-type
rmometer. Temperatures
ll reach about 140 degrees
7 to 10 days after capping.
temperature does not reach
0 degrees try using less
ıter or using more of the
rbon source. Temperatures
ıst 140 to kill fly
va teria, and viruses.

## Practical Dead Bird Disposal

Disposal of dead birds has always been a problem for commercial poultry farmers. Incineration is too slow and expensive, burial in pits does not comply with state law unless the pit is lined, and rendering facilities are not available. The age-old method of composting is today's most cost-effective and cleanest way for poultry farmers to utilize and dispose of mortality.

Research and practical experience have shown that mixing a prescribed recipe of dead poultry and chicken manure as a nitrogen source, and hay as a carbon source with the right moisture content will cause microorganisms to break the materials down. It is a two stage process in which the material is moved from the primary bins to the secondary bin.

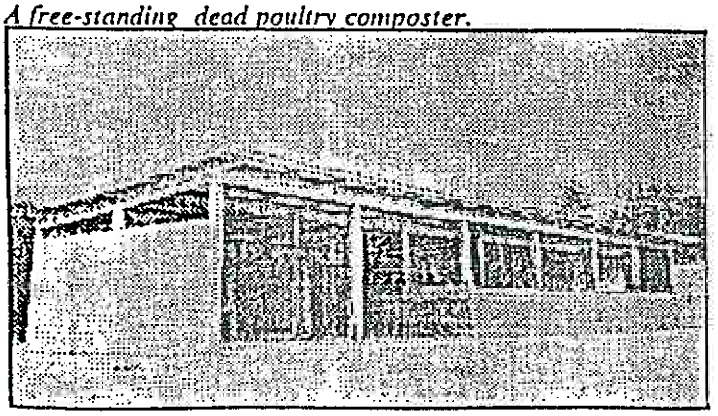
*Proportions of materials needed in composting.*

| Materials | By Volume | By Weight |
|---|---|---|
| Dead Poultry | 1.0 | 1.0 |
| Manure | 2.0 | 1.5 |
| Straw or Hay | 1.0 | 0.1 |
| Water | 0.2 | 0.3 |

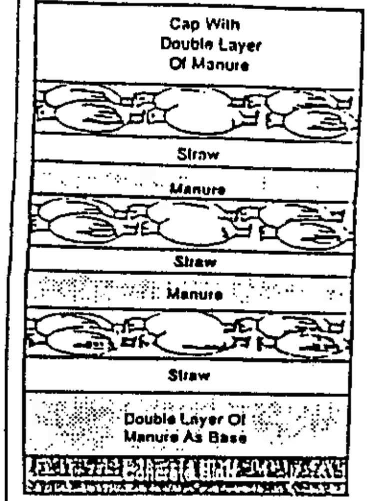
Stage 1 (Primary bin) As dead birds are collected add the correct recipe of carcasses, manure, hay, and water to the primary bin. In a few days temperatures will increase to 140 to 150 degrees F. Once the temperature drops below 130 degrees F move the material to the secondary bin.

Stage 2 (Secondary bin) Moving the material increases aeration and activates microorganism activity. When temperatures peak in a few days and drop, apply the material to the field.

*A free-standing dead poultry composter.*



*Dead poultry composter bin, showing layers.*




## Cautions

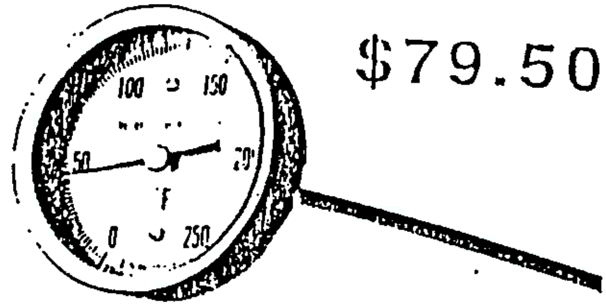
Three cautions to remember:

1. Composting dead poultry is not for everyone. Although only 20 minutes per day should be needed in loading and caring for the composter, good management is needed or the system may develop bad odors and attract flies and vermin.

2. The composter is designed for normal mortality. It is not designed for large die-offs from diseases or excessive heat.

3. Avoid getting the mix too wet. 20% moisture content seems to be ideal. Too dry and it will not heat up properly, too wet and the system becomes odorous. A little trial and error will soon tell you how best to manage your composter.

# W. H. COOKE COMPOST THERMOMETERS

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- Rugged, all stainless construction
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- Easy-to-read 3" diameter dial
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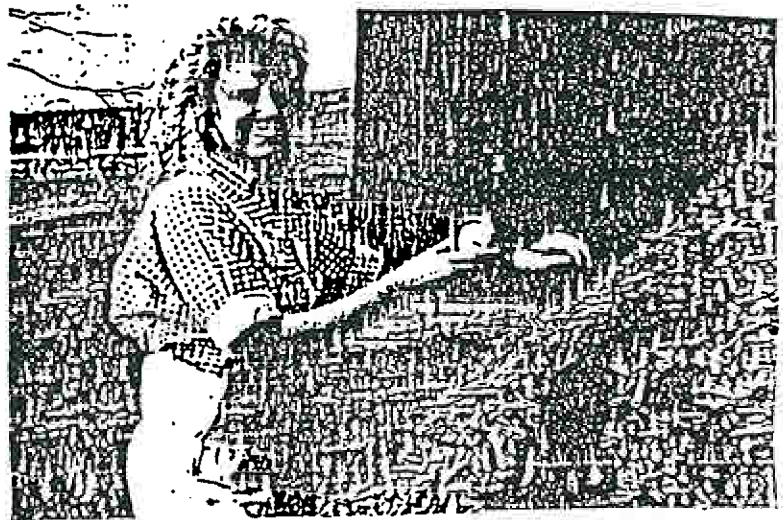
- Very accurate (+ -1% of scale)
- Standard range 0-250°F.



Composter checks interior temperatures of windrow at 24" and 36"

h… …ooke Compost Thermometer is ideally suited for monitoring interior …atures of compost piles and windrows. The clear, easy to read dial, with the ointer directly driven by the sensitive bi-metal helix in the bottom of the stem, ives an accurate reading every time. Used by composters everywhere for waste lisposal, recycling, mushroom growing, chicken and turkey composting, etc.

**Standard Model:** CT-36 (36" stem 0-250°F) with protective sheath for shipping and storage

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# CONCRETE AND STEEL PLACEMENT FOR POULTRY COMPOSTERS

Poultry business is on the rise in East Texas which is creating an increase in the number of poultry composters that will be installed to handle the waste generated by this business. One of the more overlooked components of a composter system is the proper pouring of concrete and placement of the steel reinforcement.

While the spacing of reinforcement is not important the location of the steel is critical. Concrete and steel expand at approximately the same rate and the two bond together extremely well. For foundation situations the steel needs to be placed as near the ground as possible in order to provide the maximum reinforcement strength.

Steel is extremely corrosive and when it begins to rust it rapidly deteriorates the surrounding concrete. It becomes necessary to insure that the steel is completely enclosed in concrete in order to prevent this from occurring. SCS specifications call for a minimum of 3 inches of concrete between the steel and outside conditions.

When pouring 5 inch thick foundations for poultry composters, we are presented with two problems regarding steel placement. It is impossible to insure 3 inches of concrete between the steel and outside conditions and the steel needs to be closer to the ground for maximum strength. In this situation, the steel should be placed at a depth of 3 inches ( 2 inches off the ground).

Currently, 10 gauge wire panels are used for steel reinforcement of the composter foundation. Side overhangs should not exceed one inch and the end sum of the end overhangs should equal one traverse spacing ( See attached figure) .

Lifting of the panel into place during the pouring of concrete is unacceptable. The panels should be in place and supported by approved chairs or bolsters (See attached figure). The concrete itself should not be dropped more than 5 vertical feet.

in flock × weight × ... during grow-out period × (average weight during cycle) = lbs./day mortality / daily cap. 4'X 5' bin = ______ no. 4'x 5' bins reqd

days in cycle

## 1 FOR BROILER FLOCKS UP TO 5 LBS. MARKET WEIGHT WITH NORMAL MORTALITY*

$$\frac{\text{No. in flock} \times \text{market weight}}{\text{days in cycle}} \times \underset{\text{percent mortality}}{\_\_\_\_\_} \times .5 = \frac{\_\_\_\_\_}{55} = \underset{\text{no. 4'x 5' bins req'd.}}{\_\_\_\_\_}$$

Example: $\frac{66,000 \times 5}{49} \times .05 \times .5 = \frac{168}{55}$ = three 4'x 5' bins req.-1-12'crib

(note 55 lbs/day is bin capacity with regular broiler flock cycle -starting with baby chicks; gradually increasing weight and having some composting time between cycles - all providing ample recycling capacity)

## 2 FOR BROILER FLOCKS 5 TO 7 LBS. MARKET WEIGHT WITH NORMAL MORTALITY*

$$\frac{\text{No. in flock} \times \text{market weight}}{\text{days in cycle}} \times \underset{\text{\% mortality}}{\_\_\_\_\_} \times .5 = \frac{\_\_\_\_\_}{35} = \underset{\text{no. of 4'x 5' bins required}}{\_\_\_\_\_}$$

Example: $\frac{77,000 \times 5.25}{52} \times .04 \times .5 = \frac{155}{35}$ = 4.42 bins reqd (1-12' & 1-8')

(note 35 lbs/day is bin capacity with broilers over 5 lbs. - due to higher mortality in latter weeks and need for recycling capacity)

## 3 FOR PULLETS, USE BROILER FORMULAS ABOVE

## 4 FORMULA FOR BREEDERS AND LAYERS:

$$\frac{\frac{\text{no. in flock} \times \text{weight} \times \text{mortal. \%}}{\text{days in cycle}}}{20} = \underset{\text{no. 4'x 5' bins req.}}{\_\_\_\_\_}$$

NOTE THAT FOR BREEDERS, A SEPARATE FORMULA SHOULD BE USED FOR BOTH HENS & ROOSTERS TO ACCURATELY PREDICT SIZES NEEDED.

Note 20 lbs/day is bin capacity with breeders and layers -due to birds being composted continuously for long cycles & need for recycling room.

Breeder example: (hens) $\frac{23,000 \times 8 \times .063}{301} = \frac{38}{20}$ = 1.9 bins required

(roosters) $\frac{2,300 \times 12 \times .10}{301} = \frac{9}{20}$ = 0.4

2.3 (1-12' unit)

Layer example: $\frac{70,000 \times 5 \times .085}{365} = \frac{81}{20}$ = 4 (two 8' cribs required)

*note normal mortality to be taken from Daily Mortality Sheets; not estimated

# COMPOSTER VENDORS AND SERVICES

| CONTRACTOR | | | | DELMARVA | MINI-COMP | C-MATERIAL SUPPLIERS |
|---|---|---|---|---|---|---|
| A&J Contracting<br>Al Suhor | 310 Woodhaven | Nacog, Tx 75961 | (409) 564-4214 | X | | |
| Borders Poultry<br>Fred Borders | Rt.7 Box 1740 | Center, Tx 75935 | (409) 598-6297<br>1-800-374-9553 | X | | |
| American Rice Growers | | Dayton, TX | (409) 258-2681 | | | X |
| BL Enterprizes<br>Bill LaBoyteaux | Rt. 10 Box 7700 | Nacog, Tx 75961 | (409) 564-8860 | | X | |
| Dougatt Rice Mills | | Lumberton, Tx | (409) 866-2297 | | | X |
| Forsees, Inc.<br>Wayne Allison | 1525 Airport | Hot Springs Ark 71913 | (800) 565-3531<br>(903) 889-3424 | | X | |
| [illegible] Harris, Jr. | RT. 2 Box 150 | Center Tx 75935 | (409) 598-7503 | X | | |
| Bill Hayne | | Natchitoches, La | (318) 353-2531 | | | X |
| Corley Shuttlesworth | Rt.1 Box 40 | Cushing, 75660 | (409) 326-4814 | X | | |
| Tim Sowell | RT. 3 Box 288 | San Augustine TX 75972 | (409) 275-9935 | X | | |

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# APPROVED SINGLE STAGE DEAD BIRD COMPOSTERS 1/

| Manufacturer | Composter |
|---|---|
| Foresees, Inc.<br>8015 Brandon Street<br>Little Rock, Arkansas 72204<br>501-565-3581 | "CHIC-ALL-GO" |
| BL Enterprises<br>Rt. 10, Box 7700<br>Nacogdoches, Texas 75961 | "COMPOSTALL 3 " |

***** ***** ***** *****

1/ This approval may be used on a trial basis until September 30, 1994. Each area office is to maintain a list of all dead bird composting facilities installed. The performance of installations will be monitored and evaluated by the Area Engineer with assistance from the Water Management Engineer to determine if this approval should be extended beyond September 1994.

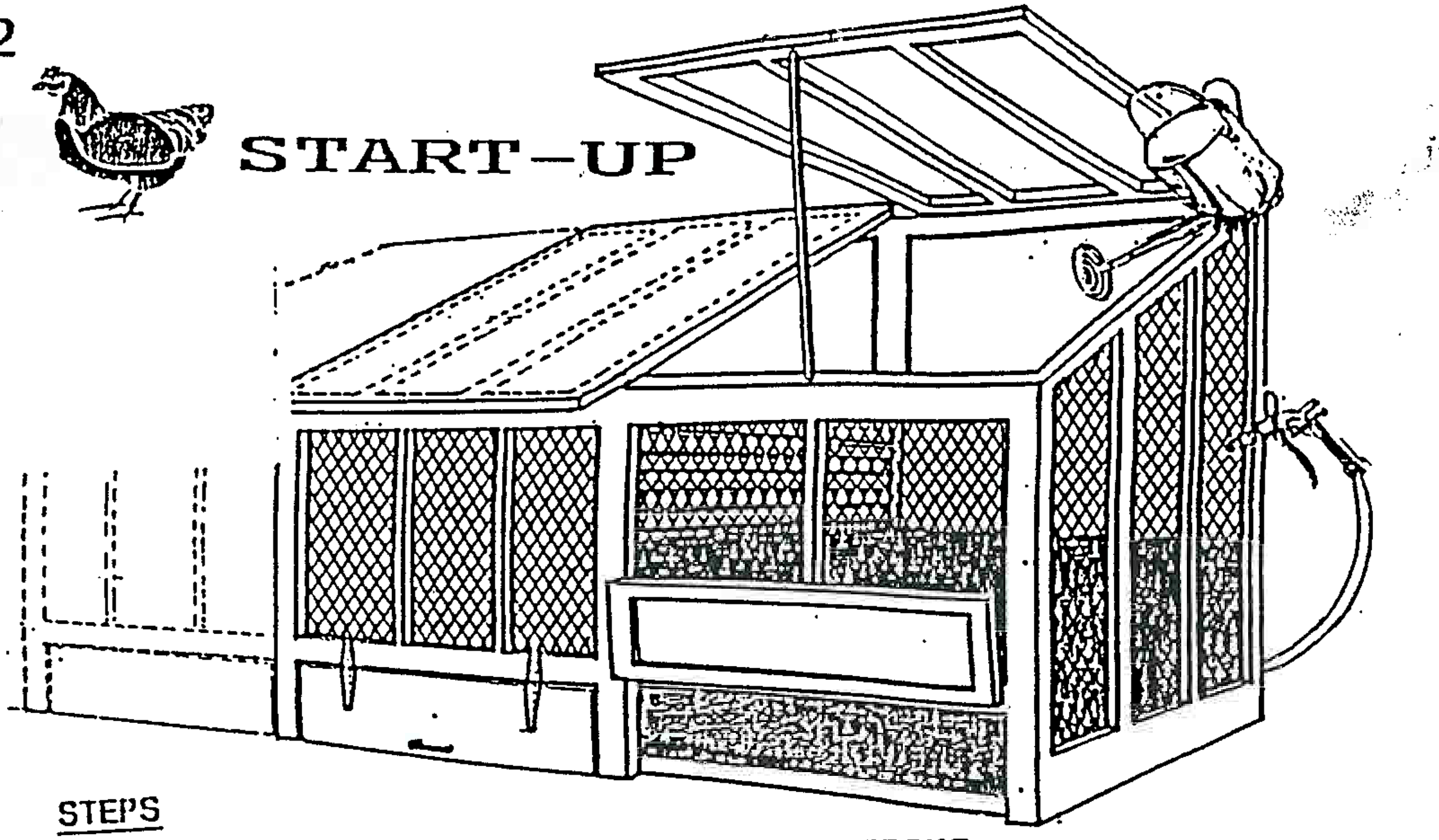
Each manufacturer is responsible for submitting to the State Conservation Engineer any structural or material changes made from the original designs submitted for SCS approval.

Each unit must be installed with the following requirements:

1. Each producer will be provided with a written operation and maintenance guide for the unit.
2. Each producer should use a thermometer and an aeration tool to assure proper operation of the unit.
3. The unit is to be constructed with ground contact CCA treated lumber (0.4 pounds per cubic foot chromate copper arsenate).
4. Each unit is to be placed on a concrete pad (minimum four inch thickness). The pad will extend at least five feet on each side and two feet on each end of the unit.
5. 2 x 4's are to be used on the sides of the structures.
6. All fasteners are to be of high quality, such as hot double dipped galvanized or stainless steel screws.

2

# START-UP



## STEPS

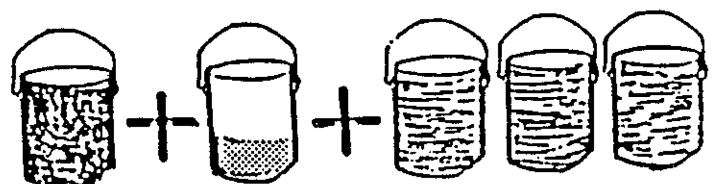
- place 3" litter, rice or peanut hulls, rotted wood chips, etc. in floor of bin to be loaded; moisten thoroughly with hose;

2 place birds as shown and

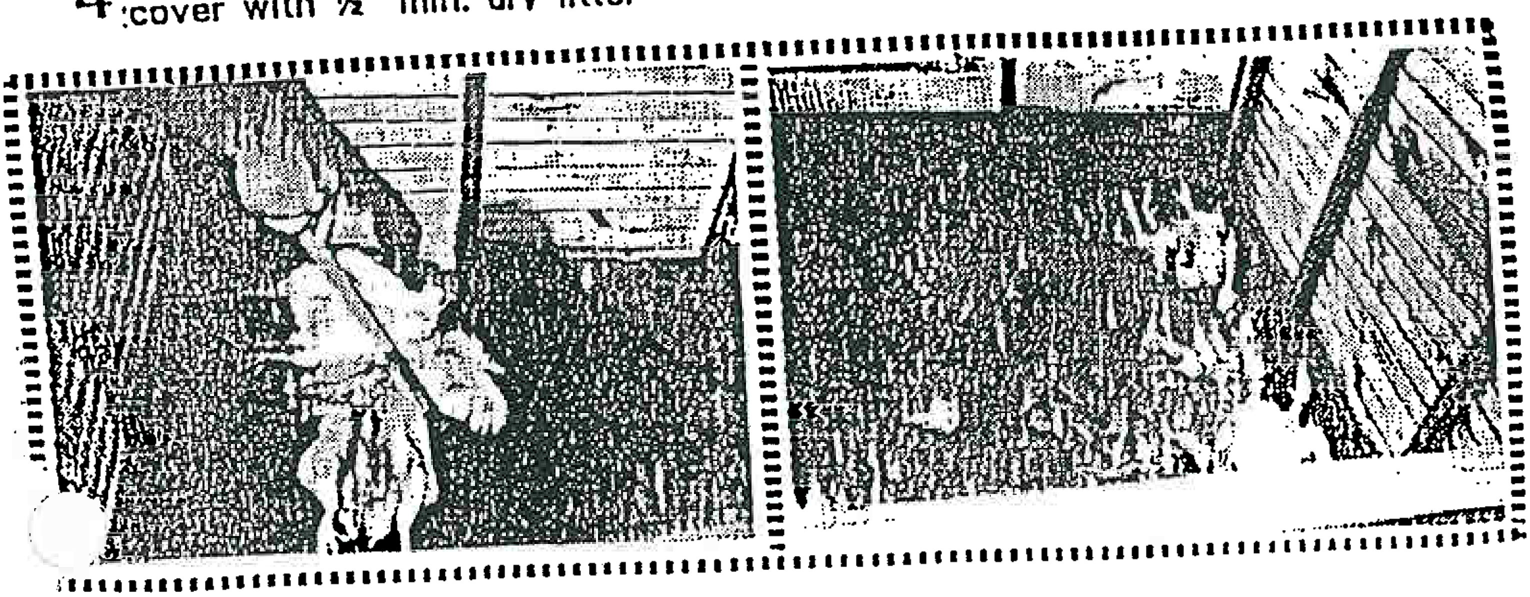
3 sprinkle enzyme over carcasses (use enzymes first loads only)

4 wet enzymes to activate then cover with ½" min. dry litter

## PROPORTIONS



1 part birds + ¼ part water + 2 to 3 parts litter to cover ½" thick



Poultry By-Product Management
AGRICULTURAL ENGINEERING
ALABAMA COOPERATIVE EXTENSION SERVICE, AUBURN UNIVERSITY, ALABAMA 36849-5626

# Dead Poultry Composter Construction

James O. Donald, *Extension Agricultural Engineer*
John P. Blake, *Extension Poultry Scientist*

Every broiler production facility is faced with the reality of farm mortalities. Sixteen million broilers are processed weekly in Alabama, generating approximately 750 tons of carcasses. Disposal of these mortalities has been identified as a serious environmental problem that, if not solved, may limit future industry expansion in Alabama.

Open-bottom burial pits are presently the most commonly used method for the disposal of poultry farm mortalities. But there is concern over the possible decline in water quality where open-bottom pits are located in certain soil types having high groundwater tables. Residue remaining in pits after years of use is recognized as an emerging reason for considering alternative methods of disposal for poultry farm mortalities.

Incineration is recognized as one of the biologically safest methods of disposal. However, it tends to be slow and expensive, and can generate nuisance complaints even when highly efficient incinerators are used. Particulate air pollution is also generated by incinerators.

Rendering is one of the best means for the conversion of poultry farm mortalities into a valued, biologically safe protein by-product meal, but the spread of pathogenic microorganisms during routine pickup and transport to a rendering facility presents a substantial threat.

Due to increasing burial or incineration costs and newly imposed local, state, and federal water and air quality regulations, alternative methods of disposal are of interest to the producer. Dead bird composting is one such alternative. This method has been approved in Alabama by the state veterinarian's office, state and local health departments, and the Alabama Department of Environmental Management. Alabama broiler growers have shown great interest in the composting technique with at least 25 full-size composters in operation in the state, and plans for many more to be in operation by early 1991.

Preliminary studies of composting as a method for the disposal of poultry farm mortalities were undertaken at the University of Maryland's Poultry Research and Education Facility (Murphy and Handwerker, 1988). For the composting of poultry farm mortalities, a prescribed mixture of poultry farm mortalities, poultry litter, straw and water is required for transformation of the mixture into compost (Murphy, 1988). Caked or used poultry litter, which can be comprised of pine shavings, sawdust, peanut hulls, or rice hulls, and manure is used as the primary compost medium, supplying ammonia nitrogen for microbial growth. Since a mixture of poultry carcasses has a disproportionately large supply of nitrogen (N), straw is added to the mixture to supply additional carbon (C) and adjust the C:N ratio.

The mixture should be composed of 1 part poultry farm mortalities, 2 parts poultry litter, 0.1 part straw, and 0.25 part water, based on weight, not on volume. Such a mixture will have a C:N ratio of about 23:1 and a moisture content of about 55 percent. Acceptable C:N ratios are between 15:1 and 35:1, while moisture content ranges are between 40 and 60 percent.

The alternatives for the disposal of poultry farm mortalities are limited, and composting presents a very desirable environmental and economic alternative. The proper design and construction of composters for the disposal of poultry farm mortalities are, however, important considerations.

## Composter Size

One of the first points to consider in construct- a composter to dispose of poultry farm mortali- ..es is proper sizing of the composting facility. On-farm dead bird composting experiences have shown that two types of composting bins are required: a primary or first-stage composting bin and a secondary composting bin (Figure 1). The capacity of the first stage composter bins is calculated by a formula based on broiler farm capacity, overall bird size at the end of the production cycle, and mortality.

$$\text{Cubic feet of first stage composter} = \text{Farm capacity per cycle} \times \text{Bird market weight} \times 0.0025$$

A minimum of one cubic foot of secondary composter bin is required for each cubic foot of first stage composter capacity. Some have indicated that the above formula provides an excessively large composter. But in Alabama, for year-round operation, the capacity determined by this calculation accommodates the broiler operation (Table 1). Ideally, the composter should be sized so that the av- ge day's mortality will accommodate a single er in the primary bin.

## Composter Design and Construction Considerations

Other points to consider for composter construction are the location, type of structure, and types of materials best suited for the structure. Raw ingredient or finished compost storage capacity must also be considered. Composters can vary considerably and still function properly; however, all good composters should incorporate some common characteristics.

**Location and Access:** While properly managed composters have minimal odor, the location of the unit should not be adjacent to neighbors or the farm residence. The site should be well drained and provide access to spreader trucks. An all-weather road and work area is desirable.

**Foundation:** An impervious, weight-bearing foundation (concrete) is critical for all-weather operation. A concrete foundation secures the composter against rodents, dogs, etc., and prevents contamination of the surrounding area. The concrete foundation should be a minimum of 6 inches thick.

**Building Materials:** Pressure-treated lumber or other rot-resistant materials are necessary to resist the biological activity of composting.

**Roof**: While some materials may be composted in the open, this method does not work well with poultry carcasses in Alabama. A roof ensures year-

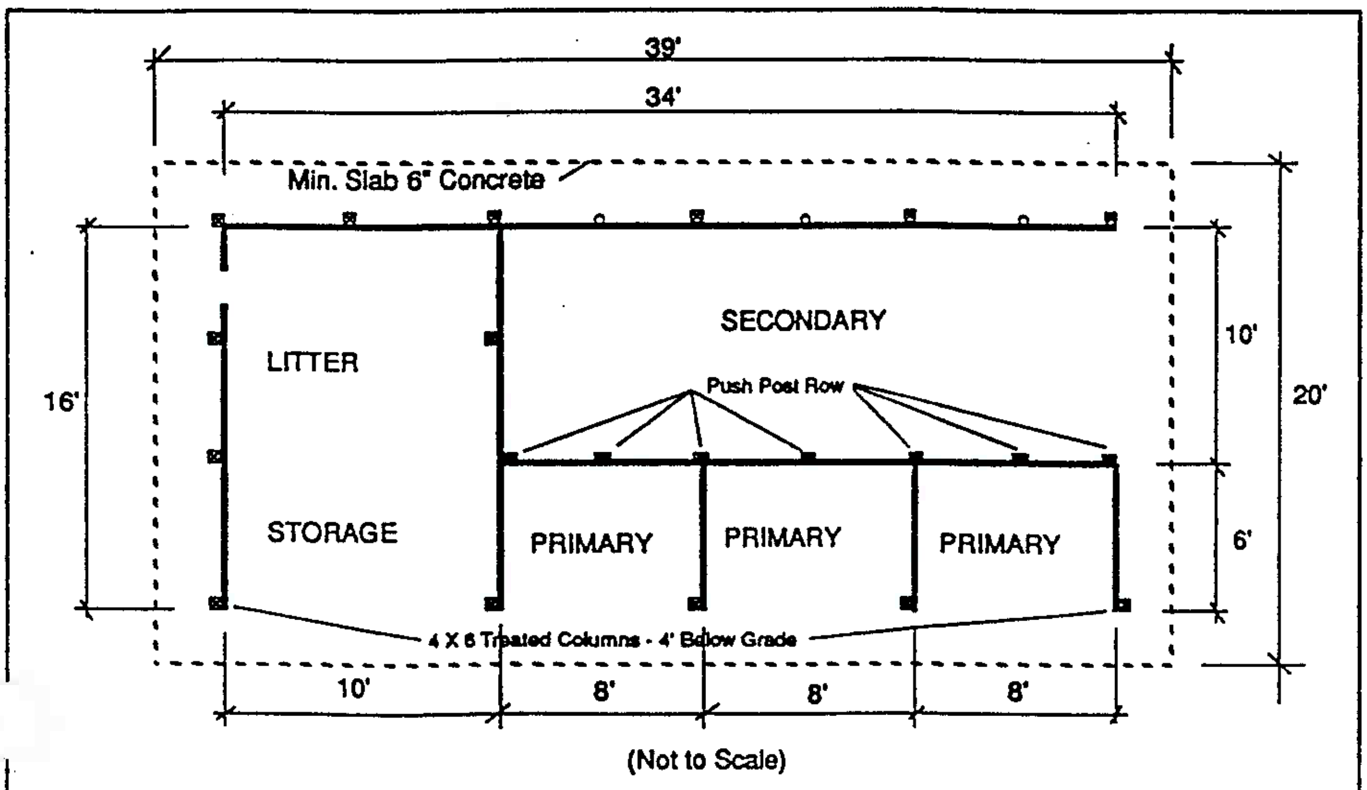



Figure 1. Primary and secondary composting bins.

Table 1. Number of First-Stage Composter Bins Required Based on Number of Broilers on Hand (based on 4.2-pound bird)

| Capacity | Required Cubic Feet for First Stage Bins | No. of First Stage Bins (5' X 5' X 8') | Required Cubic Feet for Second Stage Bins |
|---|---|---|---|
| 20,000 | 210 | 1 | 210 |
| 40,000 | 420 | 2 | 420 |
| 60,000 | 630 | 3 | 630 |
| 80,000 | 840 | 4 | 840 |
| 100,000 | 1,050 | 5 | 1,050 |
| 120,000 | 1,260 | 6 | 1,260 |

round operation and controls rain water and percolation, which can be major problems (Figure 2). Gutters may be needed to divert water away from composting bins. Composters built with excessively high eave heights to allow easy moving of equipment may expose compost and raw materials to blowing rain. This has been a problem on several large units in Alabama, and partial sidewalls or curtains have been added along with gutters to minimize this problem.

**Raw Ingredient Storage:** Some parts of the U.S. are seeing an increase in the number of manure storage barns being built in order to facilitate the flow of manure as it leaves the poultry house. Because of the limited number of manure storage barns in Alabama, most composters are being built with the capacity to hold enough manure for the composting cycle. This is imperative in light of the wet weather experienced in Alabama and the inability to acquire and transport poultry litter for

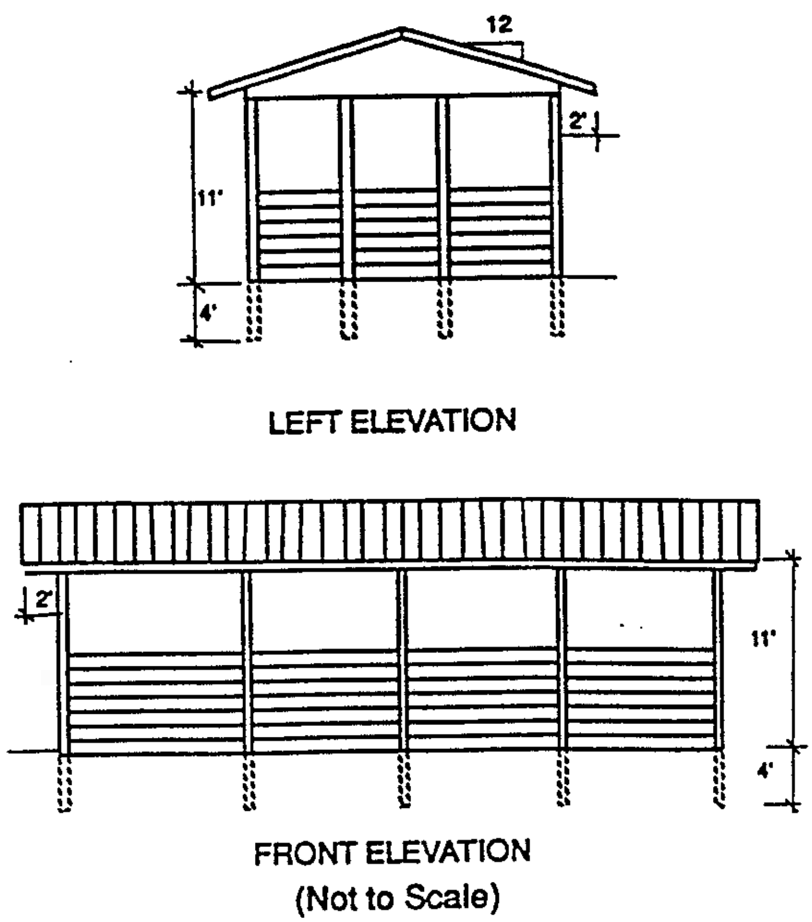



Figure 2. Elevations of free-standing farm composter.

composting at times during the winter and spring months.

**Finished Compost Storage:** Secondary compost bins provide a place for temporary storage of compost, and plans must be made to utilize or store this material as secondary capacity is filled. An all-weather manure storage barn meets this need, and it is advantageous to have such a farm structure. Finished compost can also be stored outside on a well-drained spot if properly covered with plastic to prevent saturation from rain.

**Utilities:** An all-weather water line is necessary for addition of moisture to the compost recipe and will also be needed for clean-up and wash-down of equipment, concrete, and operators. At least one 20-Ampere general purpose GFCI duplex receptacle should be installed at each composter for operation of small tools. Incandescent lights should be placed at several locations for night or predawn operation.

A design of a typical free-standing farm composter is shown in Figures 1 and 2. The estimated cost of materials for construction of the composter, including the concrete pad, will range from $3,000 to $5,000. Total costs will depend on composter size, which is based on flock size and the cost of labor to construct the unit. Composters can vary considerably and still perform well. Combining a composter with a dry-stack storage facility offers an ideal system for the temporary storage of manure and composted mortalities generated by broiler operations (Figure 3). Large quantities of manure and composted mortalities can be stored and kept dry in these structures for future land application according to seasonal crop requirements.

**References**

Murphy, D. W., 1988. Composting as a Dead Bird Disposal Method. Poultry Science.

Murphy, D. W., and T. S. Handwerker, 1988. Preliminary Investigations of Composting as a Method of Dead Bird Disposal. Proc. 1988 National Poultry Waste Management Symposium, pp. 65-72.

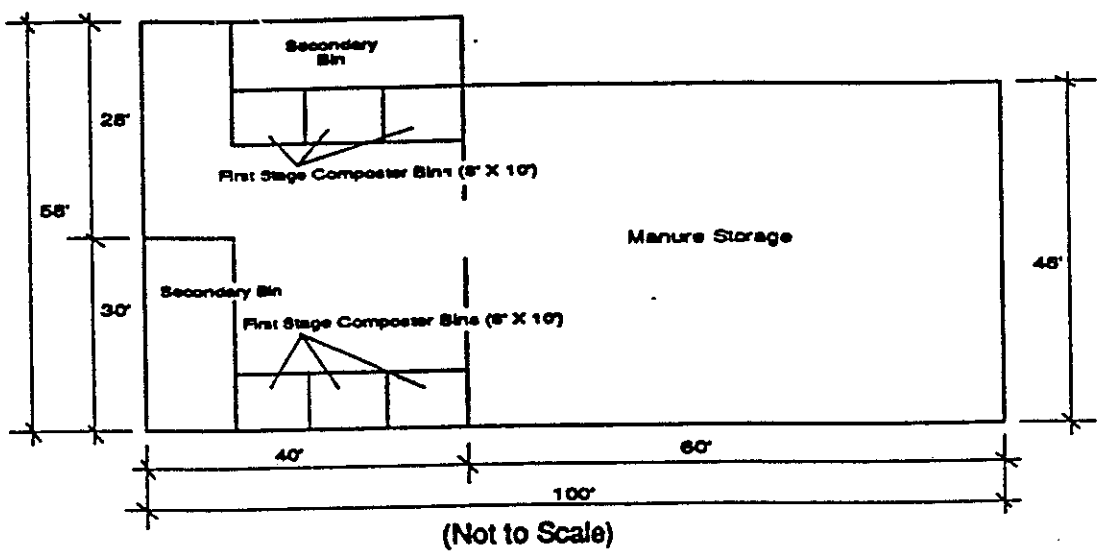



Figure 3. Composter combined with dry-stack storage facility.

The Alabama Cooperative Extension Service
AUBURN UNIVERSITY

DTP CIRCULAR 10/90-001

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# COMPOSTER DEMONSTRATION PROJECT

| BROILERS | SOILS | TOTAL # BIRDS | CONSTRUCTION | COMPOSTER COST | RECIPE |
|---|---|---|---|---|---|
| Viola Holt | Tabor fine sandy loam | 161,000 | Wood/6 Bins | $15,218.80 | Manure/straw/dead birds |
| Gus Targac | Carbengle loam & frelsburg clay | 172,000 | Concrete/6 Bins | $24,750.00 | Manure/dead birds/manure |

| Breeding Hens | SOILS | TOTAL # BIRDS | CONSTRUCTION | COMPOSTER COST | RECIPE |
|---|---|---|---|---|---|
| Allen Reiley | Benchley clay loam | 42,800 | Concrete/4 Bins | $15,920.00 | manure/wheet straw/dead birds |
| Robert Roberts | Tabor fine sandy loam | 17,000 | Wood/2 Bins | $8,300.00 | manure/dead birds/manure |

| Turkeys | SOILS | TOTAL # BIRDS | CONSTRUCTION | COMPOSTER COST | RECIPE |
|---|---|---|---|---|---|
| John Parr | Edge fine sandy loam | 49,000 | Concrete/8 Bins | $20,686.00 | manure/dead birds/manure |
| Ken Ginter | Crocket fine sandy loam | 49,000 | Concrete/8 bins | $20,686.00 | manure/oat straw/dead birds |

# 1998 Results of Agricultural Demonstrations

THE TEXAS A&M UNIVERSITY SYSTEM 1876

Texas Agricultural Extension Service

The Texas A&M University System

# Texas Agricultural Extension Service

The Texas A&M University System

320 St. Louis
Gonzales,Texas 78629
January 21,1999
830/672-8531

TO: GONZALES COUNTY AGRICULTURAL PRODUCERS
COMMISSIONERS COURT
AG LEADERS
OTHERS INTERESTED IN AGRICULTURE

Dear Friend,

Enclosed is a copy of the 1998 Gonzales County Agricultural Result Demonstration Handbook.

These demonstrations were conducted and evaluated to provide current and unbiased information for the benefits of agricultural producers. Where possible, we have used replicated treatments and other means to help insure accuracy and reliability of these demonstrations.

Additional information relative to Gonzales County agriculture is also included in this Handbook. If you have questions or wish to have additional information please let me know.

Our office is located at 320 St. Louis, Gonzales, Texas 78629 or call me at 830/672-8531.

Sincerely,

Travis Franke
County Extension Agent
Agriculture
Gonzales County

TF:jm

Texas Agricultural Extension Service
The Texas A&M University System

# Result Demonstration Report

## FOREWORD

The 1998 Gonzales County Result Demonstration handbook is prepared for the benefit of agricultural producers in our county. Its purpose is to provide reliable and unbiased information on agricultural practices. These include information on variety selection, use of agricultural pesticides, cultural practices, etc. Whenever possible, we have used replicated plots and accuracy testing to increase reliability of these demonstration results.

Producers should note however that results are generally needed for more than one year to provide a basis for reliability. Results can vary because of many factors including weather, soil types, etc.

Information given in these reports may list and names and companies. However, this is not an endorsement of these products or companies and no discrimination is implied by the authors or the Texas Agricultural Extension Service.

Educational programs conducted by the Texas Agricultural Extension Service serve people of all ages regardless of socioeconomic level, race, color, sex, religion, handicap, or national origin.

Please feel free to contact the Gonzales County Extension Office should you have questions or desire additional information on any of these reports. We are located at 320 St. Louis, Gonzales,Texas 78629, phone no. 830/672-8531.

Sincerely,

Travis Franke
County Extension Agent
Agriculture
Gonzales County

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**BEEF CATTLE DEMONSTRATION**



**POULTRY COMPOST DEMONSTRATION**

Texas Agricultural Extension Service
The Texas A&M University System

# Result Demonstration Report


## ACKNOWLEDGEMENT

The members of our agricultural commodity committee of our Extension Program Council assisted in identifying demonstration needs and areas where result demonstrations were needed.

Cooperating producers are those who are willing to provide their time, resources, and interest to enable result demonstrations to reach a successful conclusion.

We also appreciate those businesses, associations and individuals who provided materials and financial support. Without their help, many of these demonstrations could not have been carried out.

Thanks also to our dedicated Extension Specialists. They provide demonstration plans, arrange for materials, and assist with evaluation.


## AGRICULTURAL COMMITTEES

**BEEF CATTLE COMMITTEE**

David Eppright, Chairman
John Thiele
Zane Brisco
Don Brown
Terry Campion
Tommy Lindemann
Vi Holt
James Knandel
Jess Linscomb
Donald Lott
Jim Selman
Perry Smith
Alfred Spohler, Jr.
John Meador

**CROPS COMMITTEE**

Walter Kuck, Chairman
Larry Ehrig
Brian Fink
William Fink
George Fink
Billy Polasek
Donnie Tenberg
Michael Kuck
Connly Willmann

**PECAN COMMITTEE**

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Harry Schieberle,Jr.
Orval L. Wright
James Wundt

## RESULT DEMONSTRATORS

Walter Kuck
Larry Ehrig
Don Brown
Vi Holt
John Parr
Ken Ginter

Michael Kuck
Gerald Black
Luling Foundation
Johnson Ranch
Sean Roberts

## EXTENSION SPECIALISTS

Dr. Roy Parker, Extension Entomologist
Dr. Robert Lyons, Extension Range Specialist

## GONZALES COUNTY COMMISSIONERS COURT

Henry H. Vollentine, County Judge
Buddy Breitschopf, Commissioner, Pct.1
Truman DuPree, Commissioner, Pct.2
David Kuntschik, Commissioner, Pct.3
Mrs. Bernice Gibson, Commissioner, Pct.4

# 1998 WEATHER CONDITIONS

1998 proved to be a very difficult year with very unusual weather patterns. Winter rains were above normal with most rain falling in February which delayed crop plantings. Spring rains were virtually non-existant which resulted in very poor corn and milo yields on all farms.

Gonzales weather observer Freddie Marek recorded 54.07 inches of rain. Steve Holmes of Nixon recorded 44.01 inches. Joe Watson, official weather observer at Cheapside recorded 45.78 inches.

Pasture conditions also suffered in 1998. Little rain fall during the months of April through June resulting in virtually no hay being produced. Record setting temperature also occurred during this time causing severe dry up in most pastures. Good rains returned in August resulting in some hay being made.

Range conditions were equally as bad resulting in lighter calves for most area producers. Supplemental feeding was also evident.

Pecan production was very light this year due to a heavy crop load in 1997. Pecans that were produced were lost in the severe flooding that occurred in October.

On October 17th, 1998 heavy rains pounded Gonzales and surrounding counties causing severe flooding a long the Guadalupe and San Marcos rivers. Approximately 16,000 head of cattle were lost along with 2,000 miles of fence. Severe erosion and the lose of valuable top soil is also very evident.

Following are yearly rainfall reports from three areas of Gonzales County as recorded by official weather reporters.

**1998 GONZALES COUNTY RAINFALL 1/**

| MONTH | GONZALES | NIXON | CHEAPSIDE |
|---|---|---|---|
| January | 1.17 | 1.57 | 2.54 |
| February | 5.25 | 5.32 | 4.31 |
| March | 1.46 | 1.86 | .99 |
| April | .56 | .79 | 1.44 |
| May | .73 | .34 | .03 |
| June | .40 | .41 | 1.00 |
| July | 1.46 | 2.60 | .86 |
| August | 8.08 | 12.37 | 11.57 |
| September | 6.40 | 3.64 | 7.09 |
| October | 20.47 | 10.45 | 10.86 |
| November | 6.08 | 3.97 | 3.93 |
| December | 2.01 | 1.19 | 1.16 |
| | 54.07 | 48.01 | 45.78 |

1/ As recorded by official weather observers, Freddie Marek,Gonzales; Steve Holmes,Nixon; and Joe Watson, Cheapside

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# Result Demonstration Report

## GONZALES COUNTY AGRICULTURAL SUMMARY, 1998

Gonzales County is one of the leading agricultural counties in Texas with estimated gross receipts from agricultural commodities of $171, 503,820.

While the county is fairly diversified, the majority of its agricultural income is derived from poultry and beef cattle. Poultry consists of broilers, eggs and turkeys. There are three major broiler companies producing an estimated sixty nine million broilers annually. The several egg companies and independent producers produce some 65.3 million dozen eggs each year. Turkeys and growers are entirely under contract for one large company. There are approximately 2.2 million turkeys produced each year.

Beef cattle operations are primarily cow-calf. There are two larger feedlots which custom feed cattle. A few smaller feedlots also are in operation. Gonzales County ranks third in Texas in cow-calf production. Cattle is a tradition enterprise in the county with lots of history. Some of the earlier brands in Texas are recorded in the county. Cow numbers in the county are estimated at 80,000.

Pecans are another major agricultural enterprise in the county. A small cropland and severe flooding caused a complete lose this year. The Guadalupe and San Marcos river bottoms usually produce enough pecans to rank the county in the top three or four in the state.

Crops grown include corn, grain sorghum, peanuts, watermelons, wheat and hay. Very poor corn and grain sorghum yields were recorded this year on most farms. Other livestock produced in the county include hogs, sheep, goats and horses. Emu and ostrich can also be found.

The following table provides estimated gross receipts of various agricultural products in the county.

TABLE 1. Estimated gross receipts for agricultural products. Gonzales County, 1998.

| COMMODITY | ESTIMATED GROSS RECEIPTS |
|---|---|
| Broilers | $ 81,607.403 |
| Beef Cattle | 34,802,943 |
| Eggs | 30,135,950 |
| Turkeys | * |
| Hogs | 250,000 |
| Corn | 385,000 |
| Grain Sorghum | 52,500 |
| Peanuts | 187,000 |
| Pecans | 32,500 |
| Watermelons | 360,000 |
| Other(including turkeys, govt.payments,horses,hunting,others) | 23,690,520 |
| TOTAL GROSS RECEIPTS | $171,503,802 |

*Not disclosed because of individual ownership.

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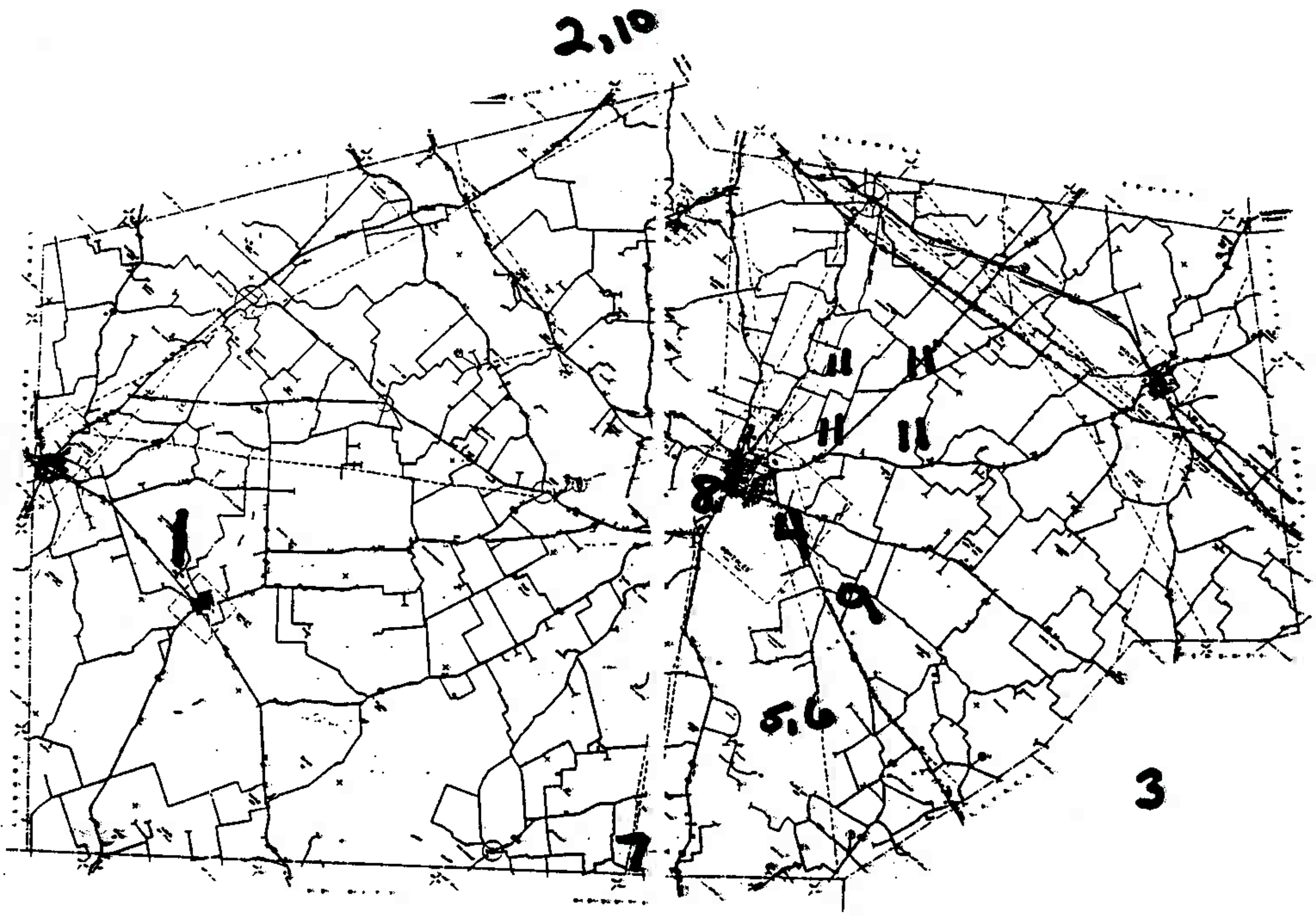
# Result Demonstration Report

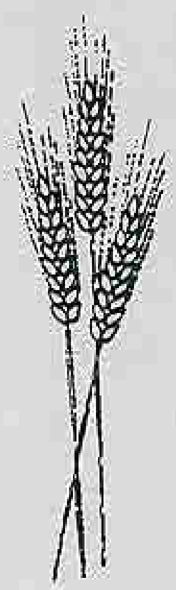
## RESULT DEMONSTRATION LOCATIONS




1) Grain Sorghum Hybrid Demonstration
2) Spring vs. Winter Wheat Trial
3) Sorghum Seed Treatment Trial
4) Corn Rootworm Control Trial
5) Mesquite IPT Demonstration
6) Mesquite Suppression Demonstration
7) Huisache IPT Demonstration
8) Hay Show Demonstration
9) Ivomec SR Bolus Trial
10) Feedlot Bull Test Demonstration
11) Poultry Composting Demonstration

# FIELD CROPS

# DEMONSTRATIONS



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# Result Demonstration Report

**GONZALES COUNTY GRAIN SORGHUM HYBRID DEMONSTRATION**
**Ehrig Bros.**
**Gonzales County Pct. 4**

## SUMMARY:

Eight hybrids were selected by the Gonzales County Crops Committee for inclusion in this years test. Since we have relatively few acres devoted to grain sorghum production (usually only about 1,500 acres) the Crops Committee decided to discontinue the much larger District standardized tests.

We employ an accuracy system to increase validity of the yield results. This involves the use of a "check" variety to help in adjusting for field differences.

Average yield in our test in 1996 was 2,117 lbs./acre. Average yield in 1997 was 6,559 with a range of 6,009 to 7,069 lbs/per acre. The 1998 plot was not harvested because weather related conditions.

## PROBLEMS:

Profit margins in grain sorghum production are generally small. It is important that growers take advantage of every opportunity to increase the chance for profitability. Variety selection is one of the factors that is important in this guest for profitability. Hybrids that have adaptability to our soils, day lengths, rainfall, temperatures, etc. and have produced consistently good yields need to be selected.

## OBJECTIVE:

These tests are conducted in order that growers may have reliable and unbiased information on grain sorghum varieties. Since we usually include these plots on our County Crops Tour, growers can see these hybrids in the field.

**MATERIALS & METHODS:**

Cooperator: Ehrig Bros.
Location: Smiley
Soil Type: Clay loam
Date Planted: March 27, 1998
Insecticide: Counter 20CR@4 oz/1000 linear ft.
Previous Crop: Corn
Planting Rate: 85.000

Plot was not harvested due to wind knock down.

**ACKNOWLEDGEMENTS:**

Thanks to participating seed companies for providing the seed for this demonstration.

Thanks also to the Ehrig Bros. For their interest, time and help in conducting this test.

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# Result Demonstration Report

## SPRING VS. WINTER WHEAT TRIAL
## LULING FOUNDATION FARM
## TREY HAMLETT, MGR.
## CALDWELL CO.


**SUMMARY:**

Three Winter Wheat varieties and seven Spring Wheats were included in this trial. All plots were replicated four times. The Winter Wheats were planted on 11/27/97 and again on 12/12/97. The average yield on the Winter Wheats was 50.67 bu/ac. The Spring Wheats were planted on 1/12/98 and again on 1/22/98. The average yield was 37.19 bu/ac.


**PROBLEM:**

Producers would like to be able to grow wheat for grain both as a cash crop and also to use in a rotational program with corn and or grain sorghum.

We often experience one or more problems which adversely affect yield and or profitability. Weather conditions including poor rainfall at or following planting reduces yield. Wheat price also is often not good enough to encourage planting. Therefore, it is important that growers take every opportunity to increase their changes for profitability. Selection of wheat varieties that have proven themselves in our area is an important step.

**OBJECTIVES:**

The objective of this test is to provide producers with information that they can use to select the best varieties to plant on their farm. To determine best suitable plating dates for Spring and Winter Wheats and to compare yields between the two is also a major objective.

**MATERIALS & METHODS:**

Location: Luling Foundation Farm
Soil Type:
Planting dates: Winter Wheats - 11/27/97 and 12/12/97
Spring Wheats - 1/12/98 and 1/22/98
Planting rates: Winter Wheats (both dates) - 75 lbs/acre
Spring Wheats (both dates) - 100 lbs/acre
Harvest date: 5/26/98
Fertility - 91-37-0
Herbicides - 1.5 pints 2-4D/acre
Plot size - 12' X 40'
Replications - 4/variety

**RESULTS:**

AVERAGE YIELD OF FOUR(4) REPLICATIONS IN BU/AC

| Planting Date | Variety | Type | Yield |
|---|---|---|---|
| 11/27/97 | Mit | Hard Red Winter | 51.12 |
| 11/27/97 | Mason | Soft Red Winter | 72.92 |
| 11/27/97 | Tam201 | Hard Red Winter | 51.62 |
| 12/12/97 | Mit | Hard Red Winter | 40.07 |
| 12/12/97 | Mason | Soft Red Winter | 61.03 |
| 12/12/97 | Tam201 | Hard Red Winter | 27.22 |
| 01/12/98 | Cim 5 | Spring | 38.17 |
| 01/12/98 | Express | Spring | 39.14 |
| 01/12/98 | Norm | Spring | 45.12 |
| 01/12/98 | Lars | Spring | 33.57 |
| 01/12/98 | Russ | Spring | 30.99 |
| 01/12/98 | Hamer | Spring | 32.03 |
| 01/12/98 | Oxen | Spring | 36.53 |
| 01/22/98 | Cim 5 | Spring | 37.52 |
| 01/22/98 | Express | Spring | 39.18 |
| 01/22/98 | Norm | Spring | 39.67 |

**ECONOMIC ANALYSIS:**

Yield differences occur due to several factors including variety, soil type, day length, temperature, moisture, planting dates and etc. Results are therefore needed over 3 years or more in order to properly evaluate varieties.

Differences do occur however and do have an affect on profitability. For example:

| | Avg. Yield | Gross returns 1/ |
|---|---|---|
| Avg. 6 Winter varieties | 50.6 bu. | 139.15 |
| Top 2 varieties | 66.9 bu. | 183.97 |
| Bottom 2 varieties | 33.6 bu. | 92.40 |
| Avg. 10 Spring varieties | 37.2 | 102.30 |
| Top 2 varieties | 42.4 | 116.60 |
| Bottom 2 varieties | 31.5 | 86.63 |

1/ Based on wheat at 2.75 /bu loan rate

## CONCLUSIONS:

Variety demonstrations continue to be a good way to evaluate wheat varieties. Producers should use these test along with other tests and observations in selecting varieties to plant. As already pointed out however, one year results are not enough to form sound opinions.

## ACKNOWLEDGMENTS:

Special thanks is given to the Luling Foundation for their interest and help in conducting this test.

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# Result Demonstration Report

## EVALUATION OF GRANULAR AND SEED TREATMENT INSECTICIDES ON SORGHUM

Michael and Walter Kuck Farm, Lavaca County, 1998

Roy D. Parker, Shannon DeForest, Anthony Netardus and Travis W. Franke
Extension Entomologist and County Extension Agents
Corpus Christi, Hallettsville, Cuero and Gonzales, Texas, respectively

**MATERIALS/METHODS:** The field study was arranged in a RCB design with 3 replications. Each plot was 6 rows (38-inch centers) by 1000 ft. Characteristics of the test site included corn planted the previous crop season, clay loam soil (40% sand, 30% silt, 30% clay), 1.7% organic matter, soil pH of 8.0, soil temperature at planting of 56°F and excellent soil moisture on the planting date (12 Mar). Pioneer hybrid 8282 seed was planted at 80,000 kernels/acre with John Deere 7100 model MaxEmerge equipment. Granular Counter was distributed with a standard John Deere bander (T-band). Gaucho was applied to the seed at the study site at the standard rate (8.0 oz formulated product/cwt seed); the 4 oz/cwt seed rate was achieved by mixing treated with non-treated seed. This mixing procedure was used since in normal field practice it is the only practical way a producer has to adjust the application rate. Fertilizer applied was 70-35-0 on 11 Mar and herbicide was Bicep II (2.4 pt/acre) in a 14-inch band at-planting.

Treatment effects were measured by (1) averaging the number of plants counted on 9 and 30 Apr from 13.75 ft row at two locations from the center two rows of each plot, (2) counting the number of yellow sugarcane aphids (YSA) and greenbugs (GB) on 20 leaves per plot on 27, 29 and 30 Apr, and (3) harvesting grain for yield analysis from 13.75 ft row at 3 locations in the center two rows of each plot on 1 Jul and thrashing grain from panicles with a laboratory machine. Sorghum weights were corrected to a 14% moisture standard. Data were analyzed by ANOVA and LSD. Dollar returns over the untreated check were calculated based strictly on numerical differences.

**RESULTS/DISCUSSION:** Results are provided in Table 1. Statistical differences were not found in plant stand but numerically the untreated check plant stand was noticeably lower. We believe the reduction was due to relatively low numbers of seed or seedling feeding insects (ants, wireworms, southern corn rootworm). Aphid data in Table 1 reflect averages of the 3 inspection dates. Significantly fewer YSA were found in Counter and Gaucho (4.0 oz/cwt rate) treatments than the remaining treatments. GB were significantly lower in all insecticide treated plots except for Sorghum Guard. Yield differences were not detected and calculated dollar returns generally reflected low insect infestation.

**ACKNOWLEDGMENTS:** Appreciation is expressed to Michael and Walter Kuck for their long-time dedication in conducting field trials. Thanks are extended to Gustafson and American Cyanamid Companies for support of this work.

Table 1. Plant population, aphid numbers, yield and dollar return in sorghum treated with granular and seed treatment insecticides, Michael and Walter Kuck Farm, Lavaca County, Texas, 1998.

| Treatment (application rate) | Plants (1000's/acre) | Number/20 leaves YSA | GB | Yield (lb/acre) | Return $[c] above untreated |
|---|---|---|---|---|---|
| Counter 20CR (3.0 lb/acre) | 63.9 a | 55.3 b | 16.2 b | 3620 a | -1.35 |
| Gaucho 480FS (8.0 oz/cwt seed) | 62.6 a | 148.8 a | 12.3 b | 3778 a | +2.78 |
| Gaucho 480FS (4.0 oz/cwt seed)[a] | 66.9 a | 82.5 b | 8.8 b | 3432 a | -5.69 |
| Sorghum Guard[b] (5.34 oz/cwt seed) | 67.7 a | 143.2 a | 17.9 ab | 3680 a | +8.46 |
| Untreated | 57.1 a | 150.6 a | 33.0 a | 3449 a | |
| LSD (P=0.05) | NS | 59.9 | 15.6 | NS | |
| P > F | .3094 | .0173 | .0521 | .1709 | |

Means in a column followed by the same letter are not significantly different by ANOVA (P=0.05; LSD).

[a] Gaucho (4 oz/cwt seed) achieved by mixing treated with non-treated seed.

[b] Sorghum Guard is a mixture of captan, lindane and graphite

[c] Sorghum value based on $4.46/cwt; costs include Counter 20CR ($2.54/lb), Gaucho 480FS ($1.50/lb seed at 6.5 lb/acre), application ($0.25/acre for Counter and $0.05/acre for mixing Gaucho treated seed for 1:1 ratio), Sorghum Guard ($0.34/acre), and harvesting/hauling extra yield ($0.65/cwt).

Texas Agricultural Extension Service
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# Result Demonstration Report

## EVALUATION OF GRANULAR SOIL INSECTICIDES FOR CORN ROOTWORM CONTROL

Ehrig Farms, Gonzales County, 1998

Roy D. Parker and Travis Franke
Extension Entomologist and County Extension Agent
Corpus Christi and Gonzales, Texas, respectively

MATERIALS/METHODS: The field study was conducted on a commercial dryland farm in Gonzales County, TX. Granular insecticides were applied at-planting on 24 Mar with John Deere model 7100 6-row equipment fitted with standard banding devices. Treatments were replicated 3 times in 6-row by 1,285 ft plots with rows spaced on 30-inch centers. The test design was RCB. Characteristics at the test site included corn planted the previous season, clay soil (26% sand, 32% silt, 42% clay), 1.5% organic matter, soil pH of 8.1 and excellent soil moisture at-planting. A severe drought followed planting for the remainder of the season. DeKalb DK64 hybrid corn seed was planted at 21,600 kernels/acre in 64°F soil.

Treatment effects were measured by (1) counting plants on 10-row ft at 4 locations in the center 2 rows of each plot and examining soil around 10 plants per plot for southern corn rootworm (SCR) and white grub (insect numbers were very low and will not be reported) on 27 Apr, (2) extracting 6 plants approximately 20 paces apart from the center two rows of each plot on 28 May for root damage rating using the Iowa State University 1-6 scale and (3) harvesting all 6 rows of each plot on 30 Jul with a commercial machine. Corn weights were corrected to a 15% moisture standard. Data were analyzed by ANOVA and LSD. Dollar returns over the untreated check were calculated based strictly on numerical differences.

**RESULTS/DISCUSSION:** Plant stands were significantly lower in the untreated corn but reasons for this reduction were not detected (Table 1). It may have been due to early presence of SCR since a few were observed during examination of plants on 27 Apr. Mexican corn rootworm (MCR) damage was low but numerically greater in untreated corn as measured by root damage rating. Yields were very low due to the long drought period. Statistically, no differences were observed among insecticide treatments but Counter and Aztec yields were significantly greater than the untreated check. The numerical increase in yield was not enough to offset treatment costs.

Table 1. Plant population, Mexican corn rootworm damage, yield and dollar return from corn treated with granular insecticides at-planting, Ehrig Farms, Gonzales County, TX, 1998.

| Treatment | Rate (oz/1000 ft) | Plants (1000's/acre) | Root damage rating | Yield (bu/acre) | Return $ over untreated[a] |
|---|---|---|---|---|---|
| Counter 15 G | 8.0 | 16.0 a | 1.55 a | 21.4 a | -6.36 |
| Aztec 2.1G | 6.7 | 16.1 a | 1.47 a | 20.7 a | -8.80 |
| Force 3G | 4.0 | 16.7 a | 1.64 a | 19.5 ab | -10.88 |
| Untreated | | 12.3 b | 1.75 a | 17.1 b | |
| LSD (P=0.05) | | 1.168 | NS | 2.80 | |
| P > F | | .0069 | .7269 | .0373 | |

Means in a column followed by the same letter are not significantly different by ANOVA (P = 0.05; LSD).

[a] Corn valué based on $2.65/bu; costs include Counter 15G ($1.83/lb), Aztec 2.1G ($2.30/lb), Force 3G ($2.70/lb). Application cost for the granular insecticide was $0.25/acre. Harvesting and hauling cost for the extra yield above the untreated check was calculated at $0.65/cwt.

# PASTURE

# AND

# RANGE

# DEMONSTRATIONS

Texas Agricultural Extension Service
The Texas A&M University System

# Result Demonstration Report

## MESQUITE CONTROL USING LEAF-SPRAY INDIVIDUAL PLANT TREATMENTS
**Oak Valley Ranch, Don Brown, Mgr.**
**Gonzales County Pct.2**

## SUMMARY

Mesquite trees were treated using the leaf-spray individual plant treatment method for control. In 1996 and 1997, demonstrations using this method were established in Gonzales County and seven other south-central Texas counties. The Gonzales County demonstration was established in 1996. In the four counties where result demonstrations were established in 1996, this treatment method provided expected control levels (greater than 75%). Average apparent plant-kill 1 year following treatment in these four counties was 92%, with a range of 76 to 98%. Average treatment cost including labor and chemicals was $0.12 per plant, with a range of $0.07 to 0.18. Lower costs occurred when most plants were less than 3 feet tall. Most mesquite in these counties are multi-stemmed which suggests that the leaf-spray method is the best choice in most situations.

## PROBLEM

Mesquite aggressively invades rangelands and competing for water and nutrients.

## OBJECTIVES

Individual plant treatments offer ranchers a viable tool for brush maintenance. These demonstrations were established to determine the effectiveness of the leaf-spray individual plant treatment method for mesquite management.

## MATERIALS AND METHODS

In the summers of 1996 and 1997, leaf-spray treatment plots were established in eight counties throughout Extension District 10. This treatment was applied by 2 to 3-person crews using an ATV equipped with spray tanks and 3 sprayguns equipped with 5500-X8 Adjustable Conjet Nozzles. Plants were treated with a mixture of 0.5% Reclaim + 0.5% Remedy + 0.25%

surfactant + 0.5% HiLite Blue Dye in water. Demonstrations were established in four counties in 1996 and four counties in 1997 for a total of 8 different locations and counties.

## RESULTS AND DISCUSSION

### *Leaf-sprays*

In the four counties where leaf-spray treatments were used in 1996, apparent plant-kill 1 year following treatment averaged 92% with a range of 76 to 98% (Figure 1). Spray costs over all eight counties (Figure 1) ranged from about 0.05 to 0.12 cents per plant, while labor costs ranged from 0.02 to 0.05 cents per plant. The lowest spray and labor costs were in

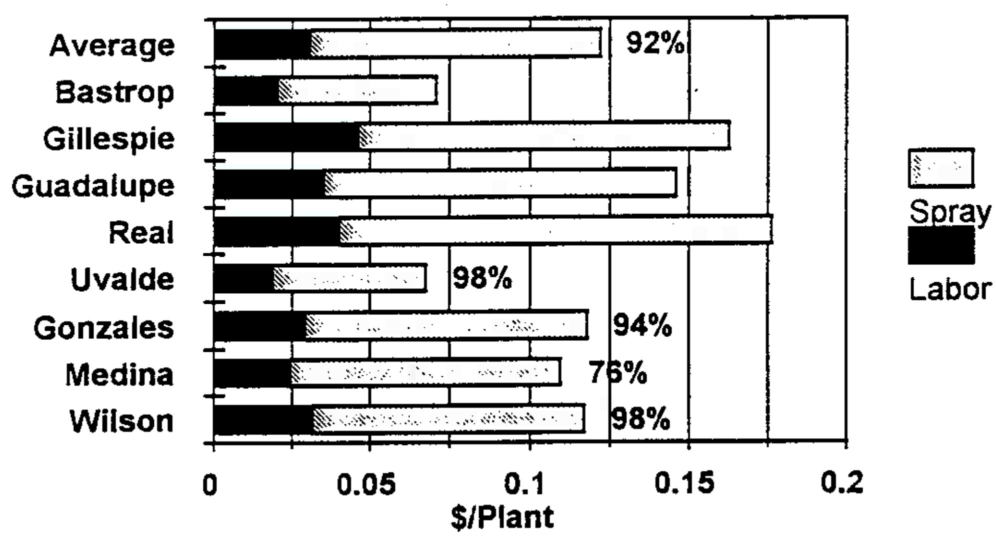



**Figure 1.** Mesquite spray and labor costs in eight counties and apparent plant-kill 1 year following individual plant treatments in demonstrations established in 1996.

demonstrations with smaller plants, mostly less than 3 feet tall. Total costs ranged from 0.07 to 0.18 cents per plant.

## CONCLUSIONS

Before choosing the individual plant treatment method, care must be taken to determine whether plants are suitable for these treatments. For all individual plant treatments, plants must be small. For basal treatments, plants should be smooth barked. For basal treatments, there are two additional considerations. First, plants should have no more than two stems. Multiple-stemmed plants increase both spray and labor costs. Second, plants should not be in dense grass. Basal treatments should be applied all the way to the ground line and dense grass makes this application difficult to impossible. Leaf-sprays are preferred if either of these requirements are not met. Even though leaf-spray treatments are preferred for multi-stem mesquite plants and plants in dense grass, care must be used in judging whether the mesquite is suitable for foliar spraying. For leaf-sprays, plants should be under 6-8 feet in height and it is best if plants are under 3 feet in height. Taller plants require more herbicide and plant coverage is more difficult. For successful leaf-sprays, mesquite must have a good leaf crop with uniform dark green color.

## ACKNOWLEDGMENTS

We wish to thank DowElanco for their support in these demonstrations efforts.

Texas Agricultural Extension Service
The Texas A&M University System

# Result Demonstration Report

## MESQUITE SUPPRESSION WITH HERBICIDES
## OAK VALLEY RANCH, DON BROWN,MGR.
## GONZALES COUNTY PCT. 2

**SUMMARY**

A mesquite suppression demonstration was begun on the Oak Valley Ranch between Gonzales and Shiner on June 17, 1993. Treatments were on repeated June 13, 1994, July 10, 1997 and May 6, 1998 . Grazon P+D and Weedmaster have provided the greatest level of mesquite suppression. Weed control was variable between years. For example, broomweed control in 1997 was poor except for the Weedmaster plot where a 74% control level was achieved. The 1998 treatment was applied earlier to obtain optimum weed control and still suppress the mesquite. This earlier application in 1998 provided excellent weed control and resulted in one pound of grass production for each pound of weed controlled.

**PROBLEM**

Mesquite is a serious problem on much of the grazing lands of Gonzales County, infesting many thousands of acres. Much of this is regrowth mesquite from previous shredding or other distrubance. This regrowth mesquite has proven to be particularly difficult to control.

Brush suppression is a brush management concept that involve putting out a higher than normal rate of a weed control herbicide. Based upon previous demonstrations conducted in Gonzales, Goliad, Karnes, Wilson, Refugio, and other South Texas counties, brush suppression can work.

Properly done, we expect excellent weed control, control of seedinlyng brush, stunting of existing brush, some control of existing brush, improved grass response, and improved carrying capacity.

A similar demonstration conducted in Gonzales on a Smiley area ranch produced an average of 71% dead plants.

## OBJECTIVES

1) Demonstrate effectiveness of three weed herbicides on suppression and degree of control of regrowth mesquite over a three year period.

2) Demonstrate some effect on range weed control.

## MATERIALS AND METHODS

Three weed control herbicides were applied to regrowth mesquite on June 17, 1993, June 13, 1994, June 28, 1997, July 10, 1997 and May 6, 1998.

Method of Application: boom broadcast sprayer
Spray volume: 20 g.p.a.
Surfactant: 1 qt./100 gal. mix
Environmental conditions May 6, 1998
Wind Speed: 0-7 m.p.h., SE
Air Temperature: $80^0$F
Soil Temperature: 76°F
Soil Type: Sandy clay loam
Soil moisture: dry

Plot size was approximately 0.5 ac. each. Herbicides and rates were:

Grazon P+D - 3 pts/ac.
Weedmaster - 3 pts/ac.
HiDep - 3 pts/ac.

The 1998 evaluation was made September 24, 1998.

## RESULTS AND DISCUSSION

Mesquite density (number per acre) in the three treatments was compared to adjacent control areas. The Grazon P+D and Weedmaster treatments produced 67 and 65% mesquite suppression, respectively, compared to control plots (Table 1). Hi-Dep produced a 45% mesquite suppression compared to control.

Weed control was evaluated by clipping grass and weeds in 3 random plots within each herbicide treatment and within the control area, separating the grass and weeds within each clipped plot, and weighing the dried grass and weed samples. Grass and weed production within treatments and the control area are shown in Table 2. Grass production among treated areas only varied by about 400 lbs/acre. Weed production within treated areas was virtually eliminated. Combined grass and weed production in the control area was 2295 lbs/acre, which was equal to grass production in the treated plots. However, grass production in the control area was less than half that of the treated areas. Weed production was 52% of the total in the control area. Weed control produced about one pound of grass for every pound of weed controlled. Applying these treatments earlier than in 1997 provided excellent weed control.

**Table 1.** Herbicide treatments, mesquite suppression, and broomweed control.

| Treatment | Mesquite suppression relative to control plots, % | Broomweed control, % |
|---|---|---|
| Grazon P+D | 67 | 9 |
| Weedmaster | 65 | 74 |
| Hi-Dep | 45 | 0 |

| Treatment | Grass Production, lbs/ac | Weed Production, lbs/ac |
|---|---|---|
| Grazon P+D | 2450 | 0 |
| Weedmaster | 2248 | 0 |
| Hi-Dep | 2605 | 30 |
| Control | 1094 | 1201 |

## CONCLUSIONS

Mesquite suppression was greatest and similar with Grazon P+D and Weedmaster. Weed control was variable among the two years of this demonstration. This variability was probably due to timing of the herbicide application. Although the 1998 spray was applied earlier than in other years, soil temperature and leaf color were still correct for mesquite control. Earlier application in 1998 provided excellent weed control and produced about one pound of grass for each pound of weed controlled.

## ACKNOWLEDGMENTS

We wish to thank DowElanco for their support in these demonstrations efforts.

Texas Agricultural Extension Service
The Texas A&M University System

# Result Demonstration Report

## HUISACHE CONTROL USING LEAF-SPRAY INDIVIDUAL PLANT TREATMENTS

**Gerald Black**
**Gonzales County Pct. 1**

### SUMMARY

Huisache trees were treated using the leaf-spray individual plant treatment method for control in 1996 in Gonzales and Maverick counties. Three different herbicide mixtures were used in Gonzales County and four in Maverick County. All herbicide mixes provided very high control levels (greater than 75%). Because of chemical costs and plant size, treatments including combinations of Remedy, Reclaim, or Tordon 22K resulted in per plant treatment costs mostly greater than $0.20. In contrast, Grazon P+D treatments costs averaged about $0.10 per plant. If these control levels are confirmed in additional demonstrations, Grazon P+D will be the treatment of choice because of lower costs.

### PROBLEM

Huisache spreads aggressively on some rangelands competing for water and nutrirents.

### OBJECTIVES

Individual plant treatments offer ranchers a viable tool for brush maintenance. These demonstrations were established to determine the effectiveness of the leaf-spray individual plant treatment method for huisache management.

### MATERIALS AND METHODS

In the fall of 1996 leaf-spray treatment plots were established in one county in Extension District 10 and one county in Extension District 12. Husiache plants averaged about 70 inches in height. Treatments were applied by 3-person crews using an ATV equipped with spray tanks and 3 sprayguns equipped with 5500-X8 Adjustable Conjet Nozzles. Four potential herbicide mixtures were used which included 1) 0.5% Reclaim + 0.5% Remedy, 2) 0.5% Reclaim + 0.5% Tordon 22K, 3) 0.5% Remedy + 0.5% Tordon 22K 0.25%, or 4) 1%

Grazon P+D. All herbicide were mixed in water with 0.25% surfactant, 0.25% HiLite Blue Dye.

## RESULTS AND DISCUSSION

Apparent plant-kill 1 year following treatment averaged 96% with a range of 86 to 100% (Figure 1). Spray costs (Figure 1) ranged from about 0.05 to 0.18 cents per plant, while labor costs ranged from 0.04 to 0.08 cents per plant. Total costs ranged from 0.09 to 0.26 cents per plant.

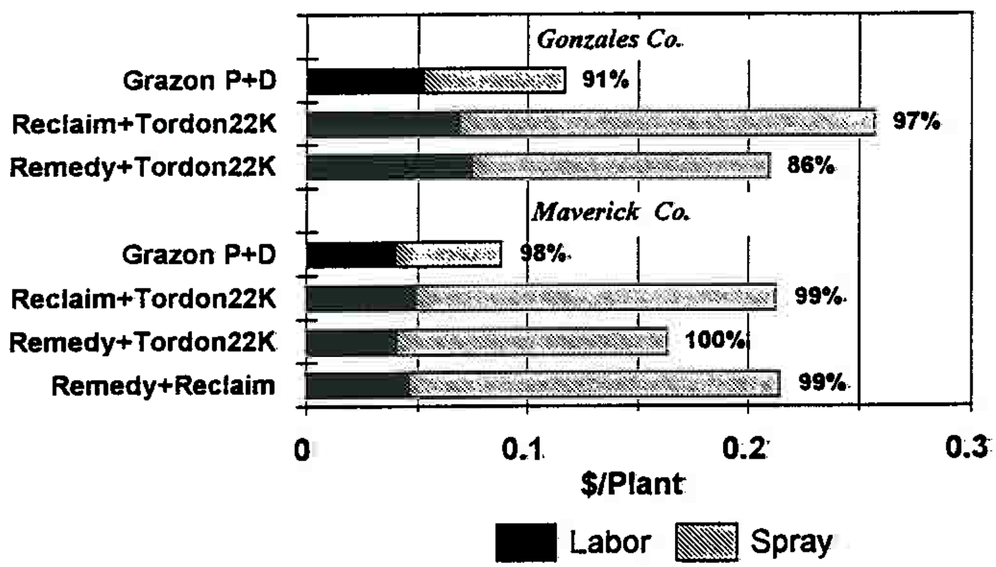



**Figure 1.** Huisache spray and labor costs in two counties and apparent plant-kill 1 year following individual plant treatments.

## CONCLUSIONS

All leaf-spray mixtures used in these demonstrations show potential for huisache control. Previous work indicates that fall is the optimum time for this method. Treatment costs for similar height mesquite plants have averaged $0.12 per plant with the Reclaim/Remedy treatment. Therefore, it appears that plant size is even more important in controlling treatment costs when dealing with huisache. Because of costs and control levels in these demonstrations, Grazon P+D appears to be the method of choice. However, additional work is being conducted to confirm these results before a treatment can be suggested.


## ACKNOWLEDGMENTS

We wish to thank DowElanco for their support in these demonstrations efforts.

Texas Agricultural Extension Service

The Texas A&M University System

# Result Demonstration Report

## 1998 GONZALES COUNTY HAY SHOW
## AN EVALUATION OF HAY QUALITY

### SUMMARY:

23 hay samples were entered in the 1998 Gonzales County Hay Show. Protein contents ranged from 7.1% to 15.7%. These results indicated a wide variety of hay quality that we have.

Average of 13 coastal bermuda samples was 11.76% compared to 10.48% in 1997. Kleingrass samples averaged 12.4%. Annuals averaged 7.5%.

### PROBLEM:

Hay is a major source of livestock feed in Gonzales County particularly during the winter months. Hay quality varies dramatically as pointed out by our county hay show and other forage tests. Differences in quality are primarily the result of harvest maturity and the fertility program of the grower.

When we consider that beef cattle may need 10% protein or better, it is apparent that hay quality is extremely important. Much of the hay grown is below the animals needs and will need to be supplemented. Following are crude protein requirements for beef cattle:

TABLE 1. Minimum crude protein requirements for various classes of beef cattle.

| CLASS | %CRUDE PROTEIN NEEDED |
|---|---|
| Steers & Yearlings | 9.60 |
| Heifer Calves | 9.67 |
| Pregnant Heifers | 9.78 |
| Dry Cows | 6.56 |
| Cows with Calves | 10.22 to 12.11 1/ |
| Bulls | 9.44 |

1/ Varies according to milking ability.

## OBJECTIVE:

1) Demonstrate factors involved in hay quality.
2) Recognize producers who grow good quality hay.
3) Promote better quality hay.

## METHODS & MATERIALS:

Hay samples were tested at the Texas A&M Forage Testing Laboratory. This test constitutes one-half of the total score awarded by the hay show judge. The other half is a physical score and is based upon his estimate of maturity, texture, leafiness, amount of foreign material present, and color.

## RESULTS:

Following are results of this years Hay Show:

## CLASS I COASTAL BERMUDA

| Sample # | Name | Physical Score | Protein % | Chem. Score | Total | Ribbon Color |
|---|---|---|---|---|---|---|
| 1-1 | [redacted] | 83 | 11.3 | 94.1 | 91 | Blue |
| 1-2 | | 87 | 14.8 | 100 | 94 | Blue |
| 1-3 | | 84 | 10.5 | 87.5 | 86 | Blue |
| 1-4 | | 85 | 7.8 | 64.9 | 75 | Red |
| 1-5 | | 74 | 8.1 | 67.4 | 71 | Red |
| 1-6 | | 93 | 13.6 | 100 | 96.5 | Blue |
| 1-7 | | 91 | 11.0 | 91.6 | 91.3 | Blue |
| 1-8 | | 92 | 14.7 | 100 | 96 | Blue |
| 1-9 | | 88 | 12.4 | 100 | 94 | Blue |
| 1-10 | | 92 | 12.1 | 100 | 94 | Blue |
| 1-11 | | 96 | 11.1 | 92.5 | 94 | Blue |
| 1-12 | | 97 | 14.9 | 100 | 98.5 | Blue (GC) |
| 1-13 | | 87 | 10.6 | 88.3 | 87.6 | Blue |

## CLASS II OTHER BERMUDAGRASSES (JIGGS)

| Sample # | Name | Physical Score | Protein % | Chem. Score | Total | Ribbon Color |
|---|---|---|---|---|---|---|
| 2-1 | [redacted] | 94 | 13.7 | 100 | 97 | Blue (RC) |

## CLASS III SUMMER PERRENIALS

| Sample # | Name | Physical Score | Protein % | Chem. Score | Total | Ribbon Color |
|---|---|---|---|---|---|---|
| 3-1 | [redacted] | 92 | 10.6 | 88.3 | 90 | Blue |
| 3-2 | | 82 | 10.4 | 86.6 | 84 | Red |
| 3-3 | | 85 | 15.7 | 100 | 92.5 | Blue |
| 3-4 | | 86 | 13.3 | 100 | 93.0 | Blue |
| 3-5 | | 83 | 12.0 | 100 | 91.5 | Blue |
| 3-6 | | 81 | 7.1 | 59.4 | 70.2 | Red |

## CLASS IV MIXED GRASSES

| Sample # | Name | Physical Score | Protein % | Chem. Score | Total | Ribbon Color |
|---|---|---|---|---|---|---|
| 4-1 | [redacted] | 82 | 9.1 | 75.8 | 78.9 | Red |

## CLASS V SUMMER ANNUALS

| Sample # | Name | Physical Score | Protein % | Chem. Score | Total | Ribbon Color |
|---|---|---|---|---|---|---|
| 5-1 | [redacted] | 85 | 7.8 | 65 | 75 | Red |
| 5-2 | | 87 | 7.3 | 60.8 | 73.9 | Red |

**CONCLUSION:**

Producers and sellers of hay really need to consider quality in hay marketing. To the uneducated hay buyer "a bale of hay is a bale of hay." Yet we know that there is tremendous difference in the actual nutrients in that bale of hay.

To get some idea of this, we can base a hays comparative value on the pounds of corn and cottonseed meal required to replace the nutrients in the hay.

We have a computer program called "HayVal" which we can use to make this value estimate.

**ACKNOWLEDGMENTS:**

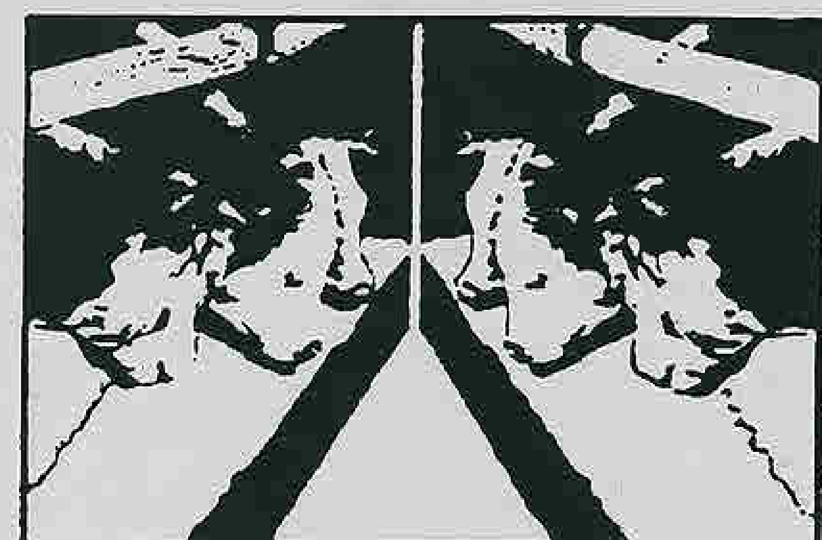
Thanks to our Hay Show supporters, Lindemann Fertilizer Service, Fehner and Son, Ehrig Bros. Ag Products and Harwood Farm & Ranch for providing funds for the protein tests.

Plaques were provided by the Gonzales Livestock Commission Company.

The Show is sponsored by the Extension Beef Committee and Gonzales Young Farmers Chapter.

# BEEF CATTLE

# DEMONSTRATIONS



Texas Agricultural Extension Service
The Texas A&M University System

# Result Demonstration Report

**IVOMEC SR BOLUS TRIAL**
**Johnson Ranch**
**Brian Barnick, Mgr.**
**Gonzales County Pct. 2**

## SUMMARY:

An Ivomec SR Bolus trial was conducted in Gonzales County on April 24,1997 through September 19,1998. Stocker calves were used to determine the effectiveness of the SR Bolus Compound to Dectomax.

The Ivomec SR Bolus group gained an average of 20 pounds more than the Dectomax group with the SRB calves gaining 2.42 160/day and the Dectomax calves gaining 2.24 160/day.

## PROBLEMS:

Profit margins in stocker operations are a concern to most Gonzales County producers. It is important that producers take advantage of every opportunity to increase the chance for profitability. Wormers selected and the amount of gain produced is a major factor affecting profitability. Wormers that have proven effectiveness at the least amount of expense should be selected.

## OBJECTIVE:

To determine the effectiveness, cost and feasibility of the Ivomec SR Bolus compared to Dectomax.

## MATERIALS & METHODS:

The stocker cattle were divided into two groups. 46 calves were injected with Dectomax at labeled rates according to their weight. 50 calves were given the Ivomec Sr Bolus using the companies bolus gun. All calves were weighed at the beginning and end of he test to determine the average daily gain. There stocker calves were ear tagged and grazed together on native pasture while receiving Purina Accuration.

**RESULTS:**

Unfortunately, many of the calves in the start up groups were shipped prior to the first weigh date. Results of the remaining cattle were as follows:

Dectomax Cattle

| Weight 4/24/97 | Weight 9/18/97 | Gain |
|---|---|---|
| 492 | 774 | 282 |
| 446 | 728 | 282 |
| 399 | 764 | 365 |
| 340 | 760 | 420 |
| 556 | 758 | 202 |
| 451 | 684 | 233 |
| 516 | 742 | 226 |
| 482 | 714 | 232 |
| 426 | 716 | 290 |
| 447 | 654 | 207 |
| 422 | 700 | 278 |
| 489 | 704 | 215 |
| 424 | 702 | 278 |
| 484 | 710 | 226 |
| 397 | 658 | 261 |
| 518 | 752 | 234 |
| 506 | 810 | 304 |
| 486 | 678 | 192 |
| Avg.Wt. | Avg.Wt. | Gain |
| 460.06 | 722.67 | 262.61 |

Ivomec SR Bolus Cattle

| Weight 4/24/97 | Weight 9/18/97 | Gain |
|---|---|---|
| 451 | 702 | 251 |
| 461 | 732 | 271 |
| 554 | 824 | 270 |
| 459 | 746 | 287 |
| 378 | 730 | 352 |
| 534 | 784 | 250 |
| 546 | 812 | 266 |
| 494 | 732 | 238 |
| 465 | 786 | 321 |
| 491 | 800 | 309 |
| 495 | 778 | 283 |
| 473 | 706 | 233 |
| 482 | 706 | 233 |
| 482 | 776 | 294 |
| 586 | 810 | 224 |
| 477 | 754 | 277 |
| 332 | 648 | 316 |
| 440 | 722 | 282 |
| 528 | 814 | 286 |
| 435 | 666 | 231 |
| 480 | 718 | 238 |
| 395 | 788 | 393 |
| 429 | 708 | 279 |
| 380 | 764 | 384 |
| 482 | 706 | 224 |
| 372 | 684 | 312 |
| Avg.Wt. | Avg.Wt. | Gain |
| 464.76 | 747.60 | 282.84 |

**ECONOMIC ANALYSIS:**

Weight gain differences do occur according to this test. The Ivomec SR Bolus calves gained an average of 20 more pounds than the Dectomax calves. Cost of the products and the results obtained should be taken into consideration.

| | Avg.Gain | Value | Expense/calf | Net Value |
|---|---|---|---|---|
| Ivomec SR Bolue | 282.84 | 169.70 | 12.00 | 157.70 |
| Dectomax | 262.61 | 157.57 | 4.00 | 153.57 |

(Prices figured at .60/pound)

**CONCLUSIONS:**

Gain tests continue to be a good way to determine product efficiency and returns. Results over only one year are not good enough. We should look at other tests conducted over several years before forming opinions.

**ACKNOWLEGMENTS:**

Thanks to Brian Barnick for his time and interest in conducting this trail. Thanks also to Susie Nugent for her help and expertise.

Texas Agricultural Extension Service
The Texas A&M University System

# Result Demonstration Report

**LULING FOUNDATION FEEDLOT BULL TEST**
**LULING FOUNDATION**
**TREY HAMLETT, MGR.**
**CALDWELL CO.**


**SUMMARY:**

Sixty-two bulls representing twelve different breeds were included in the 1998 Luling Foundation Feedlot Bull test. At the conclusion of the 105 day test, Junior Brahman Influence breeds had a group ADG of 2.96. Senior Brahman Influence breeds had a group ADD of 4.13. Junior European Influence breeds averaged 3.78 pounds per day and Senior European Influence breeds averaged 3.57 pounds per day. In the category of Senior British breeds, the group ADD was 3.79. The junior British breeds averaged 3.87.


**PROBLEM:**

Area beef cattle producers need to be aware of how their bulls perform in feedlot situations. Bull selection is very important to the commercial cow/calf producer in determining how their offspring will perform under similar situations.

**PURPOSE:**

1) To give producers an idea of how their cattle perform compared to other cattle of the same breed in feedlot situations.
2) To illustrate the importance of using tested bulls in commercial operations.
3) To give producers the opportunity to select bulls that perform the best.

**MATERIALS & METHODS:**

All bulls were vaccinated according to the test requirements prior to arrival. Bulls were separated according to breed and size and put on a gaining ration. Initial weights were taken on September 24 and 25th and an average starting weight was determined. Scrotal circumferences and hip heights were also taken. The bulls were weighed periodically throughout the test period and given any medications that may have been needed. 105 day weights were taken on January 7th and 8th and an average final weight was determined. Scotel circumferences and hip heights were also done at this time. Results were derived from the information obtained.

**RESULTS:**

Results of the bulls performance are as follows:

1998-99
FEEDLOT DEVELOPED
BULL PROGRAM

| COOPERATOR | BREED | TEST # | OWNER ID | BIRTH DATE | Sept 24 &25 1998 INITIAL WT | 1-7&8 1999 105 DAY FINAL WT | ADG | ADG RATIO | WDA | WDA RATIO | INDEX | HIP HEIGHT (INCHES) 9-25 1998 | HIP HEIGHT (INCHES) 1-08 1999 | SCROTAL CIRCUMF. (CENT.) 9-25 1998 | SCROTAL CIRCUMF. (CENT.) 1-08 1999 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EUROPEAN INFLUENCE--SR. | | | | | | | | | | | | | | | |
| [redacted] | CH | 9 | 03 | 08-03-97 | 918 | 1300 | 3.64 | 102 | 2.49 | 96 | 99.0 | 50.50 | 53.00 | 33.30 | 38.0 |
| | CH | 10 | 04 | 10-13-97 | 777 | 1132 | 3.38 | 95 | 2.50 | 97 | 96.0 | 48.50 | 52.00 | 28.50 | 29.5 |
| | BV | 21 | G408 | 10-23-97 | 811 | 1209 | 3.79 | 106 | 2.74 | 106 | 106.0 | 49.25 | 51.00 | 24.90 | 35.5 |
| | BV | 18 | G432 | 11-01-97 | 790 | 1116 | 3.10 | 87 | 2.47 | 95 | 91.0 | 48.25 | 51.00 | 24.30 | 34.5 |
| | BV | 19 | G460 | 11-30-97 | 723 | 1062 | 3.23 | 91 | 2.63 | 102 | 96.5 | 48.25 | 51.50 | 21.50 | 34.0 |
| | CH | 23 | G012 | 11-20-97 | 895 | 1288 | 3.74 | 105 | 3.11 | 120 | 112.5 | 52.00 | 54.50 | 36.90 | 46.0 |
| | BV | 14 | JTCG17 | 08-27-97 | 1058 | 1453 | 3.76 | 105 | 2.91 | 112 | 108.5 | 50.25 | 52.50 | 37.40 | 38.0 |
| | CG | 25 | 178G | 11-28-97 | 616 | 970 | 3.37 | 94 | 2.39 | 92 | 93.0 | 45.50 | 50.50 | 28.80 | 35.0 |
| | BV | 29 | 671G | 11-29-97 | 658 | 948 | 2.76 | 77 | 2.34 | 90 | 83.5 | 47.25 | 49.75 | 26.80 | 33.5 |
| | BV | 30 | 672G | 11-29-97 | 571 | 822 | 2.39 | 67 | 2.03 | 78 | 72.5 | 45.50 | 48.50 | 23.90 | 32.0 |
| | SM | 4 | G767 | 09-07-97 | 831 | 1237 | 3.87 | 108 | 2.53 | 98 | 103.0 | 48.00 | 52.00 | 32.10 | 35.0 |
| | SM | 5 | G729 | 09-15-97 | 964 | 1459 | 4.71 | 132 | 3.04 | 117 | 124.5 | 50.25 | 52.25 | 33.20 | 39.0 |
| | SM | 1 | G281 | 09-20-97 | 877 | 1282 | 3.86 | 108 | 2.70 | 104 | 106.0 | 51.50 | 54.00 | 31.00 | 37.0 |
| | SM | 2 | G763 | 11-26-97 | 666 | 1134 | 4.46 | 125 | 2.78 | 107 | 116.0 | 47.25 | 51.00 | 28.30 | 34.5 |
| | CH | 15 | 897 | 08-12-97 | 750 | 1113 | 3.46 | 97 | 2.17 | 84 | 90.5 | 47.50 | 51.25 | 26.80 | 36.0 |
| | | | | | | | GRPADG 3.57 | | GRWDA 2.59 | | | | | | |

Breeds Represented

| | |
|---|---|
| Angus | AN |
| Beefmaster | BM |
| Brangus | BN |
| Braunvieh | BV |
| Charolais | CH |
| Chiangus | CG |
| Horned Hereford | HE |
| Red Angus | AR |
| Red Brangus | RB |
| Santa Gertrudis | SG |
| Simbrah | SI |
| Simmental | SM |

**1998-99**
**FEEDLOT DEVELOPED**
**BULL PROGRAM**

| COOPERATOR | BREED | TEST # | OWNER ID | BIRTH DATE | Sept 24 &25 1998 INITIAL WT | 1-7&8 1999 105 DAY FINAL WT | ADG | ADG RATIO | WDA | WDA RATIO | INDEX | HIP HEIGHT (INCHES) 9-25 1998 | HIP HEIGHT (INCHES) 1-08 1999 | SCROTAL CIRCUMF. (CENT.) 9-25 1998 | SCROTAL CIRCUMF. (CENT.) 1-08 1999 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BRITISH BREEDS--SR. | | | | | | | | | | | | | | | |
| [redacted] | AN | 42 | 711 | 10-20-97 | 596 | 914 | 3.03 | 80 | 2.05 | 80 | 80.0 | 43.75 | 48.00 | 24.00 | 30.0 |
| | AN | 43 | 744 | 10-24-97 | 565 | 867 | 2.88 | 76 | 1.97 | 77 | 76.5 | 42.50 | 48.50 | 21.50 | 31.0 |
| | HH | 54 | | 08-03-97 | 736 | 1138 | 3.83 | 101 | 2.18 | 85 | 93.0 | 49.25 | 51.25 | 29.80 | 34.0 |
| | AN | 48 | A101 | 09-09-97 | 831 | 1238 | 3.88 | 103 | 2.55 | 99 | 101.0 | 48.00 | 51.25 | 30.00 | 37.0 |
| | HH | 55 | G11 | 10-13-97 | 928 | 1428 | 4.76 | 126 | 3.16 | 123 | 124.5 | 52.25 | 54.50 | 31.40 | 37.0 |
| | HH | 56 | G12 | 10-13-97 | 754 | 1106 | 3.35 | 89 | 2.45 | 95 | 92.0 | 46.75 | 47.00 | 30.10 | 36.0 |
| | HH | 57 | G16 | 11-17-97 | 717 | 1031 | 2.99 | 79 | 2.47 | 96 | 87.5 | 46.50 | 48.00 | 31.90 | 37.0 |
| | HH | 58 | G6 | 09-21-97 | 827 | 1297 | 4.48 | 118 | 2.74 | 107 | 112.5 | 46.50 | 52.25 | 33.20 | 41.0 |
| | HH | 59 | G3 | 09-15-97 | 738 | 1123 | 3.67 | 97 | 2.34 | 91 | 94.0 | 46.50 | 51.00 | 23.70 | 33.0 |
| | HH | 60 | G15 | 11-11-97 | 560 | 922 | 3.45 | 91 | 2.18 | 85 | 88.0 | 46.55 | 49.50 | 21.90 | 32.0 |
| | HH | 61 | G5 | 09-20-97 | 818 | 1178 | 3.43 | 91 | 2.48 | 96 | 93.5 | 48.00 | 49.00 | 31.50 | 35.0 |
| | HH | 62 | G10 | 10-06-97 | 868 | 1326 | 4.36 | 115 | 2.89 | 112 | 113.5 | 50.25 | 51.25 | 25.40 | 35.0 |
| | HH | 64 | G14 | 11-11-97 | 689 | 1021 | 3.16 | 83 | 2.41 | 94 | 88.5 | 46.25 | 49.25 | 23.20 | 35.5 |
| | AN | 45 | 116G | 09-29-97 | 1027 | 1556 | 5.04 | 133 | 3.34 | 130 | 131.5 | 49.50 | 51.00 | 34.10 | 37.0 |
| | AN | 44 | 02G | 11-26-97 | 967 | 1393 | 4.06 | 107 | 3.41 | 133 | 120.0 | 48.50 | 51.00 | 33.20 | 40.0 |
| | AN | 50 | 717 | 08-21-97 | 907 | 1320 | 3.93 | 104 | 2.61 | 102 | 103.0 | 50.00 | 52.00 | 33.90 | 36.5 |
| | AN | 49 | 718 | 08-29-97 | 806 | 1231 | 4.05 | 107 | 2.48 | 96 | 101.5 | 49.75 | 50.00 | 31.90 | 35.0 |
| | | | | | | | GRP ADG 3.79 | | GRWDA 2.57 | | | | | | |
| BRITISH BREEDS--JR. | | | | | | | | | | | | | | | |
| [redacted] | AN | 51 | 28 | 01-15-98 | 626 | 980 | 3.37 | 87 | 2.74 | 90 | 88.5 | 46.75 | 50.25 | 24.60 | 35.5 |
| | AN | 52 | 37 | 12-05-97 | 730 | 1099 | 3.51 | 91 | 2.75 | 90 | 90.5 | 44.50 | 48.00 | 29.00 | 34.5 |
| | AN | 53 | 57 | 12-24-97 | 742 | 1158 | 3.96 | 102 | 3.05 | 100 | 101.0 | 46.75 | 50.25 | 31.90 | 41.0 |
| | AR | 46 | 805 | 02-28-98 | 591 | 1010 | 3.99 | 103 | 3.22 | 106 | 104.5 | 45.25 | 51.00 | 25.00 | 34.0 |
| | AR | 47 | 802 | 02-14-98 | 672 | 1148 | 4.53 | 117 | 3.50 | 115 | 116.0 | 45.50 | 50.50 | 25.40 | 37.5 |
| | | | | | | | GRPADG 3.87 | | GRWDA 3.05 | | | | | | |

1998-99
FEEDLOT DEVELOPED
BULL PROGRAM

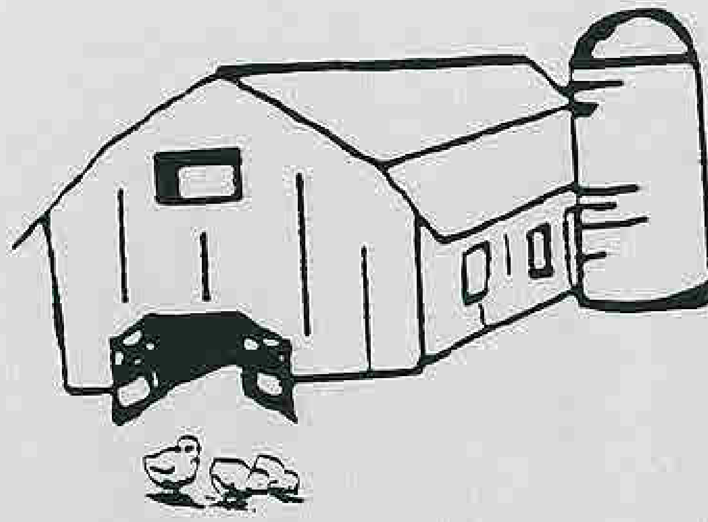
| COOPERATOR | BREED | TEST # | OWNER ID | BIRTH DATE | Sept 24 &25 1998 INITIAL WT | 1-7&8 1999 105 DAY FINAL WT | ADG | ADG RATIO | WDA | WDA RATIO | INDEX | HIP HEIGHT (INCHES) 9-25 1998 | HIP HEIGHT (INCHES) 1-08 1999 | SCROTAL CIRCUMF. (CENT.) 9-25 1998 | SCROTAL CIRCUMF. (CENT.) 1-08 1999 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BRAHMAN INFLUENCE--SR. | | | | | | | | | | | | | | | |
| [redacted] | BN | 38 | A011G2 | 10-07-97 | 1101 | 1536 | 4.14 | 100 | 3.35 | 104 | 102.0 | 53.50 | 56.50 | 38.40 | 42.0 |
| | SI | 37 | G61 | 09-28-97 | 1039 | 1433 | 3.75 | 91 | 3.08 | 95 | 93.0 | 53.75 | 55.25 | 34.70 | 38.0 |
| | SG | 40 | L1097 | 08-29-97 | 1158 | 1631 | 4.50 | 109 | 3.28 | 101 | 105.0 | 55.25 | 58.00 | 35.00 | 39.0 |
| | | | | | | | 4.13 | | 3.24 | | | | | | |
| BRAHMAN INFLUENCE--JR. | | | | | | | | | | | | | | | |
| [redacted] | RB | 41 | 63/8 | 01-24-98 | 658 | 1051 | 3.74 | 126 | 3.01 | 115 | 120.5 | 47.50 | 52.75 | 21.90 | 33.0 |
| | RB | 36 | 2/8 | 01-02-98 | 731 | 955 | 2.13 | 72 | 2.57 | 98 | 85.0 | 47.75 | 49.25 | 29.40 | 34.5 |
| | RB | 35 | 21/8 | 01-05-98 | 716 | 976 | 2.48 | 84 | 2.65 | 101 | 92.5 | 49.75 | 52.50 | 27.90 | 39.5 |
| | BM | 31 | 127/8 | 12-30-97 | 673 | 1020 | 3.30 | 112 | 2.73 | 104 | 108.0 | 47.50 | 52.50 | 24.20 | 32.5 |
| | BM | 34 | 6/8 | 02-01-98 | 547 | 868 | 3.06 | 103 | 2.55 | 97 | 100.0 | 45.25 | 48.50 | 21.80 | 30.0 |
| | BM | 33 | 38/8 | 02-01-98 | 548 | 945 | 3.78 | 128 | 2.77 | 105 | 116.5 | 46.00 | 49.00 | 19.60 | 31.0 |
| | BM | 32 | 73/8 | 02-01-98 | 490 | 722 | 2.21 | 75 | 2.12 | 81 | 78.0 | 41.00 | 47.50 | 19.90 | 29.5 |
| | | | | | | | GRPADG 2.96 | | GRWDA 2.63 | | | | | | |
| EUROPEAN INFLUENCE--JR. | | | | | | | | | | | | | | | |
| [redacted] | BV | 16 | CTH129 | 01-29-98 | 701 | 1069 | 3.50 | 93 | 3.11 | 101 | 97.0 | 47.25 | 51.00 | 31.20 | 37.5 |
| | CH | 11 | D3 | 12-14-97 | 677 | 1144 | 4.45 | 118 | 2.93 | 95 | 106.5 | 48.25 | 51.25 | 25.60 | 34.5 |
| | BV | 20 | H142 | 02-11-98 | 673 | 1125 | 4.30 | 114 | 3.40 | 111 | 112.5 | 47.25 | 50.00 | 16.70 | 31.5 |
| | BV | 17 | H150 | 02-19-98 | 458 | 801 | 3.27 | 86 | 2.48 | 81 | 83.5 | 40.50 | 45.25 | 14.40 | 27.0 |
| | BV | 22 | H159 | 02-28-98 | 549 | 903 | 3.37 | 89 | 2.88 | 94 | 91.5 | 44.75 | 49.50 | 14.50 | 25.5 |
| | CH | 24 | G017 | 12-13-97 | 820 | 1253 | 4.12 | 109 | 3.20 | 104 | 106.5 | 48.25 | 51.00 | 29.50 | 39.5 |
| | BV | 13 | JTCH22 | 02-05-98 | 694 | 1015 | 3.06 | 81 | 3.01 | 98 | 89.5 | 47.75 | 50.00 | 27.20 | 34.0 |
| | BV | 12 | JTCH23 | 02-25-98 | 672 | 1072 | 3.81 | 101 | 3.38 | 110 | 105.5 | 46.55 | 51.00 | 24.70 | 32.5 |
| | BV | 28 | JKG477 | 12-16-97 | 628 | 1012 | 3.66 | 97 | 2.61 | 85 | 9[illegible].0 | 45.50 | 50.75 | 26.40 | 33.5 |
| | BV | 27 | JKG478 | 12-20-97 | 668 | 1024 | 3.39 | 90 | 2.67 | 87 | 88.5 | 47.00 | 51.25 | 25.90 | 34.5 |
| | CG | 26 | 180G | 12-27-97 | 591 | 962 | 3.53 | 93 | 2.55 | 83 | 88.0 | 40.00 | 50.25 | 26.60 | 33.0 |
| | SM | 3 | G760 | 12-10-97 | 680 | 1111 | 4.10 | 108 | 2.82 | 92 | 100.0 | 47.50 | 52.25 | 33.20 | 41.5 |
| | SM | 8 | H1 | 02-21-98 | 730 | 1169 | 4.18 | 110 | 3.64 | 118 | 114.0 | 49.50 | 52.25 | 24.50 | 35.0 |
| | SM | 6 | H2 | 02-22-98 | 733 | 1119 | 3.68 | 97 | 3.50 | 114 | 105.5 | 48.50 | 50.50 | 22.60 | 33.0 |
| | SM | 7 | H3 | 02-23-98 | 796 | 1251 | 4.33 | 114 | 3.92 | 128 | 121.0 | 50.50 | 52.50 | 27.60 | 38.0 |
| | | | | | | | GRADG 3.78 | | GRWDA 3.07 | | | | | | |

## CONCLUSIONS:

Feedlot bull gain tests continue to be a good way to determine the performance of bulls and to help determine the performance of offsprings. The tests also aide cattle producers with bull selections.

## ACKNOWLEDGMENTS:

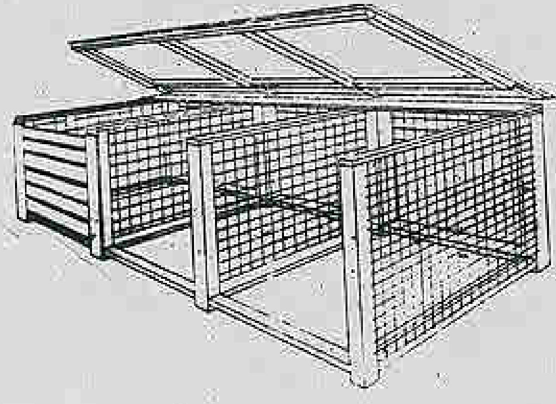
Thanks to the producers that participated in this years test. Thanks also to the Luling Foundation for their time and interest in conducting this test.



# POULTRY

# COMPOST

# DEMONSTRATION



Texas Agricultural Extension Service
The Texas A&M University System

# Result Demonstration Report

## AFFECTS OF POULTRY COMPOST ON SOIL PROFILES AND FORAGE QUALITY

Vi Holt, Sean Roberts, Ken Ginter and John Parr
Gonzales County Pcts. 2 & 3

### SUMMARY:

Five poultry composters were built in Gonzales County to study the effectiveness of composting as a means of dead bird disposal. Records have been kept on the effectiveness of this procedure as a disposal method and the affects of the compost on soil profiles have also been noted on 4 of the 5 sites.

Soil test taken before applications and after applications indicate that compost does affect soil profiles. Forage quality is also improved.

### PROBLEM:

Poultry producers are limited in the options that they have to rid themselves of dead birds. Rendering, burial, and incineration have been tried with mixed results. The impact of compost and poultry litter is also a concern. High phosphorus levels have been discovered when litter has been applied at high rates year after year.

### OBJECTIVES:

1) To determine the effectiveness of composting as a means of dead bird disposal.
2) To determine the effect of compost application on soil profiles.
3) to determine the effect of compost on forage quality.

### MATERIALS & METHODS:

Five poultry composters were built in Gonzales County in 1996. Grant funds obtained through the Gonzales Soil and Water Conservation Board and the NRCS were used to build the composters. Soil and forage samples were taken prior to application of the compost according to the specifications of the grant proposal and were sent to the Soil Testing Lab in College Station for analysis. Compost was applied according to the rates set by the NRCS. Rates were determined by the analysis of the compost on each farm and the previous soil tests. Forage and soil samples were taken again at least three months after the compost was applied and sent to the lab for analysis. Compost applications were calibrated prior to application.

## RESULTS:

The affects of the compost on soil profiles and forage quality are as follows:

SOIL PROFILES - TABLE 1

| | Before Application | | | Type | After Application | | |
|---|---|---|---|---|---|---|---|
| Farm | Nitrogen | Phos. | Pot | | N | Phos. | Pot |
| [redacted] | 1 | 121 | 135 | Broiler | 37 | 135 | 217 |
| | 1 | 68 | 115 | Breeder Hen | 5 | 98 | 133 |
| | 4 | 61 | 98 | Turkey | 14 | 110 | 153 |
| | 4 | 20 | 257 | Breeder Hen | 71 | 54 | 335 |

FORAGE QUALITY - TABLE 2

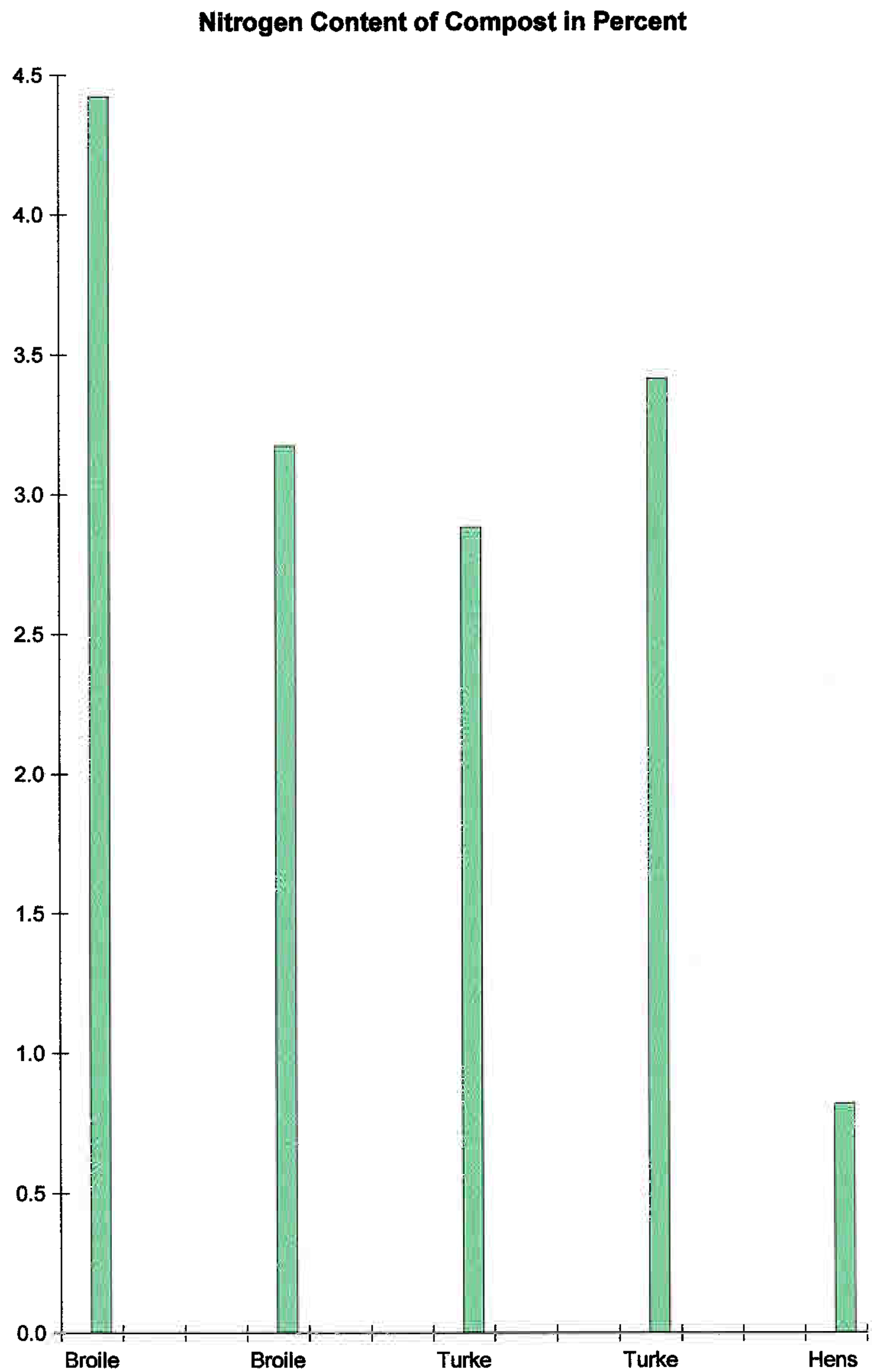
| | Before Application | | After Application |
|---|---|---|---|
| Farm | % Crude Protein | Grass Type | % Crude Protein |
| [redacted] | 10.6 | Bermuda | 17.0 |
| | 8.6 | Bermuda | 14.0 |
| | 4.7 | Bermuda | 9.5 |
| | 13.5 | Bermuda | 17.1 |

## CONCLUSIONS:

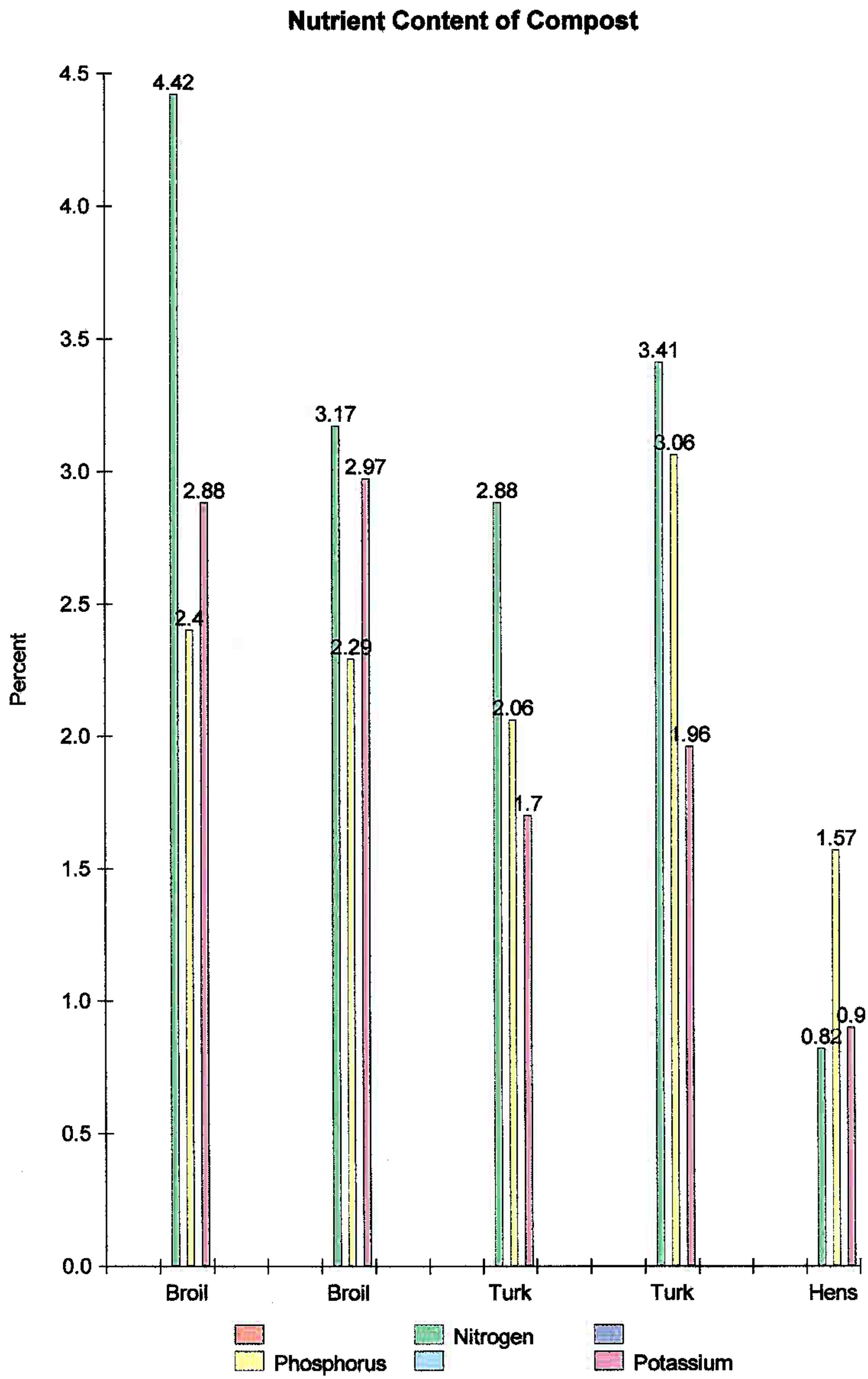
The compost definitely has an effect on soil profiles and forage quality. It is important to note that phosphorous levels can rise rather quickly. Therefore, it is important that producers have enough acreage to properly apply the compost and litter.

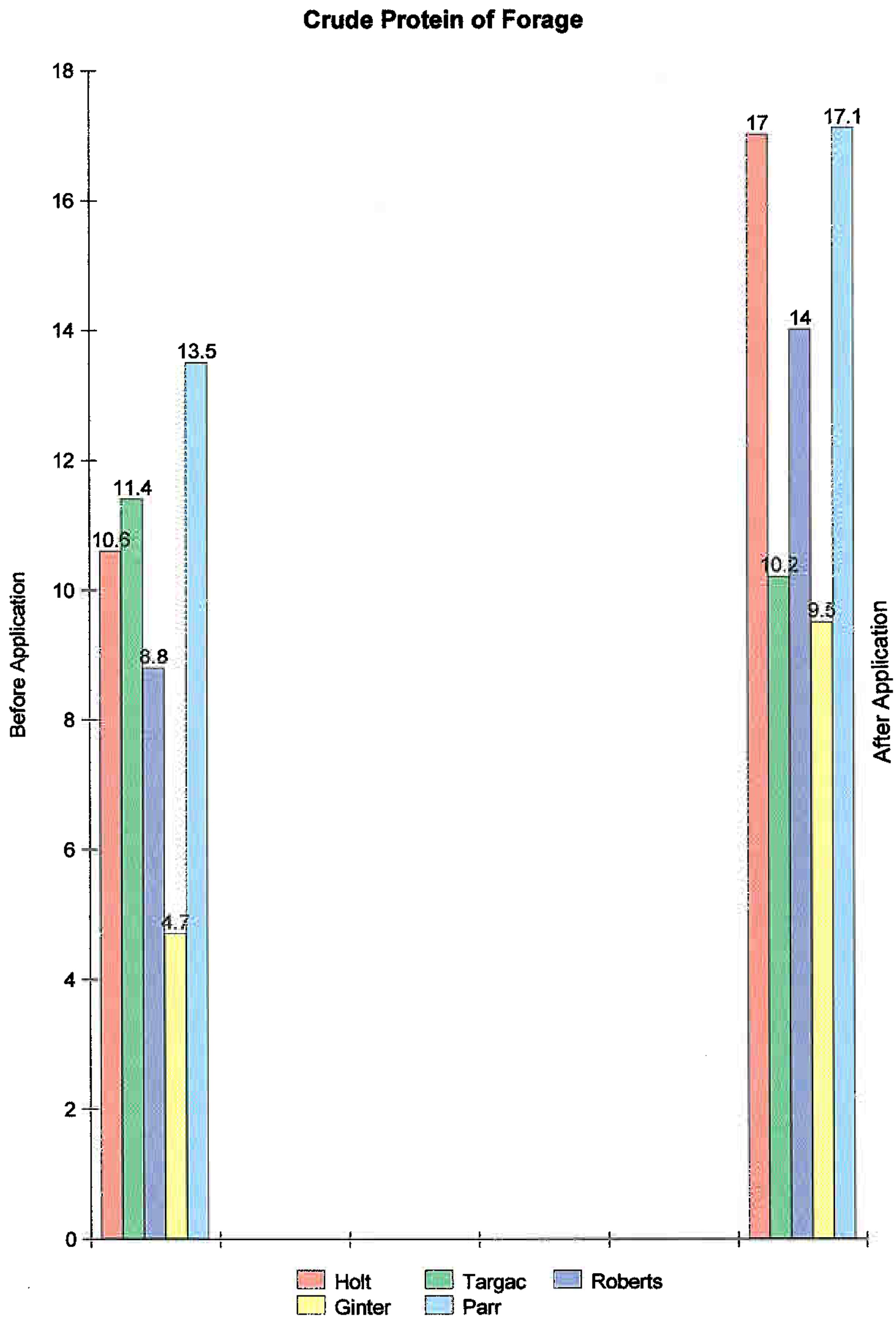
## ACKNOWLEDGMENTS:

Thanks to the producers for their time and interest in this test. A special thanks is given to the Gonzales Soil and Water Conservation District and the NRCS for their help and expertise. Dr. Sam Feagly also assisted with this demonstration.



Nitrogen Content of Compost in Percent
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Broile
Broile
Turke
Turke
Hens


Nutrient Content of Compost
Percent
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
4.42
2.4
2.88
3.17
2.29
2.97
2.88
2.06
1.7
3.41
3.06
1.96
0.82
1.57
0.9
Broil
Broil
Turk
Turk
Hens
Nitrogen
Phosphorus
Potassium


Crude Protein of Forage
18
16
14
12
10
8
6
4
2
0
Before Application
After Application
10.6
11.4
8.8
4.7
13.5
17
10.2
14
9.5
17.1
Holt
Targac
Roberts
Ginter
Parr

# 1st Annual Revision to the Quality Assurance Project Plan
**for the**
**Environmental Measurement Activities Relating to the Demonstration Project Entitled**
**"Demonstration of Composting as a Best Management Practice for Poultry Operations"**
**CWA 319(h) Cooperative Agreement No. C9-996236-02-1**

**United States Environmental Protection Agency**

Name: Len Pardee
Title: Texas Nonpoint Source Project Manager
Signature: Len Pardee Date: 1/9/98

Name: Richard Hoppers
Title: Quality Assurance Manager
Signature: Donna R. B— Date: 1-9-98

**Texas State Soil and Water Conservation Board**

Name: Byron O. Spoonts
Title: Quality Assurance Officer
Signature: James M. Moore Date: 8/25/97

Name: Justin Hester
Project Manager
Signature: [signature] Date: 8/25/97

**Gonzales County Soil and Water Conservation District**

Name: Frank M. Stockton
Title: Chairman
Signature: Date: 8/14/97

**De-Go-La Resource Conservation and Development Area**

Name: Kenneth Finster
Title: Chairman
Signature: Date: 8/4/97

Name: Rindle Wilson
Title: RC&D Coordinator
Signature: Date: 7/21/97

**This QAPP is applicable to Region 6, Quality Management Plan entitled "Quality Assurance Management Plan, Texas State Soil and Water Conservation Board", approved March, 1997 (QTRAK No. Q-97-102).**

**Section A2: Table of Contents**

**Section A3: Distribution List**

Organizations and individuals which will receive copies of the approved QAPP and any subsequent revisions include:

**UnitedStates Environmental Protection Agency**

Name:
Title: Texas Nonpoint Source Project Officer

Name:
Title: Quality Assurance Manager for Region 6

**Texas State Soil and Water Conservation Board**

Name: Byron O. Spoonts
Title: Quality Assurance Officer

Name: Deirdre Carlson
Title: Project Manager

**Gonzales County Soil and Water Conservation District**

Name: Frank M. Stockman
Title: Chairman

**Lavaca County Soil and Water Conservation District**

Name: Dennis P. Haas
Title: Chairman

**De-Go-La Resource Conservation and Development Area**

Name: Rindle Wilson
Title: RC&D Coordinator

Name: Darren Schauer
Title: Chairman

**United States Department of Agriculture, Natural Resources Conservation Service**

Name: Oren C. Remmers
Title: District Conservationist

**Texas Agricultural Extension Service**

Name: Travis Franke
Title: Gonzales County Extension Agent

**Texas Agricultural Extension Service Soil, Water and Forage Testing Laboratory**

Name: Sam E. Feagley
Title: Professor and Extension Soil Enviromental Specialist

**Texas A&M University, Department of Rangeland Ecology and Management**

Name: Robert Knight
Title: Professor, Soils Laboratory Manager

**Section A4: Project/Task Organization**
The following is a list of organizations and individuals participating in the project with their specific roles and responsibilities.

**UnitedStates Environmental Protection Agency**

Texas Nonpoint Source Project Officer
Responsible for overall performance and direction of the project at the federal level. Approves the final products and deliverables.

Quality Assurance Manager for Region 6
Responsible for determining that the QAPP meets the federal requirements for planning, quality control, quality assessment, and reporting.

**Texas State Soil and Water Conservation Board**

Byron O. Spoonts, Quality Assurance Officer
Responsible for tracking project administration and oversight of Quality Management Plan responsibilities.

Deirdre Carlson, Project Manager
Responsible for overseeing the implementation of the proposed demonstration project within federal guidelines.

Suzanne Cardwell, Contracts Manager
Responsible for tracking project progress and expenditures.

**Gonzales County Soil and Water Conservation District**

Frank M. Stockman, Chairman
Responsible for all activities in which the Conservation District is involved.

Wayne Fairchild, Technician
Responsible for performing soil and compost sampling and data storage according to guidelines outlined in the QAPP.

Elizabeth Colwell, Bookkeeper
Responsible for all billing and landowner match verifications.

**Lavaca County Soil and Water Conservation District**

Dennis P. Haas, Chairman

Responsible for all activities in which the Conservation District is involved.

**De-Go-La Resource Conservation and Development Area**

Darren Schauer, Chairman

Responsible for all activities in which the RC&D Area is involved.

Rindle Wilson, RC&D Coordinator

Responsible for coordinating cooperation between all parties involved, and for all reporting requirements and deliverables. Will act as the Project Manager for all activities.

**United States Department of Agriculture, Natural Resources Conservation Service, Gonzales Field Office**

Oren C. Remmers, District Conservationist

Responsible for all activities in which the Gonzales Field Office is involved. Will act as the Field Manager for all sampling activities and will be responsible for quality assurance in the field.

Polly Williams, Agronomist

Responsible for providing technical assistance to cooperators and to project activities.

Ace Fairchild, Technician

Responsible for providing technical assistance to cooperators and to project activities.

**Texas Agricultural Extension Service**

Travis Franke, Extension Agent for Gonzales County

Responsible for providing technical assistance to cooperators and to project activities.

**Texas Agricultural Extension Service Soil, Water and Forage Testing Laboratory**

Sam E. Feagley, Laboratory Manager

Responsible for overseeing laboratory analysis of all samples collected, and that all requirements addressed in the QAPP for laboratory analyses are met.

Sherry Perry, Laboratory Supervisor

Responsible for day-to-day activities in the lab.

**Texas A&M University, Department of Rangeland Ecology and Management**

Robert Knight, Professor and Soils Laboratory Manager

Responsible for overseeing laboratory procedures of all samples, and that all requirements addressed in the QAPP for bulk density determinations are met.

**Project Organization Chart**

- Quality Assurance Manager (**EPA**)
  - Texas NPS Project Officer
- Byron O. Spoonts (**TSSWCB**)
  - Deirdre Carlson
  - Suzanne Cardwell
- Frank Stockton (**Gonzales Co. SWCD**)
  - Wayne Fairchild
  - Elizabeth Colwell
- Dennis Haas (**Lavaca Co. SWCD**)
- Darren Schauer (**De-Go-La RC&D**)
  - Rindle Wilson
- Oren Remmers (**NRCS**)
  - Polly Williams
  - Ace Fairchild
- Travis Franke (**TAEX**)
- Sam Feagley (**TAEX-Laboratory**)
  - Sherry Perry
- Robert Knight (**TAMU-Laboratory**)

## Section A5: Problem Definition/Background

Gonzales and Lavaca counties have long been noted for the production of poultry. According to local sources, there are three distinct poultry production sectors in the area. These sectors are turkey production, broiler production, and egg production (laying hens). Inherent to these production systems is the incidence of death from among the birds (5% of approximately 55 million birds presently), and generation of fecal material. These constituents have the potential to become a water quality problem.

The Lavaca River (Segment 1602) and the Guadalupe River below San Marcus River (Segment 1803) are listed on the *1990 Update to the Nonpoint Source Water Pollution Assessment Report for the State of Texas* for the presence of fecal coliform and nutrients, potentially caused by agriculture and confined and non-confined animal feeding operations.

Efforts are currently underway in Gonzales and Lavaca Counties to address carcass amd poultry litter disposal issues before the potential becomes a problem. A driving factor behind this push appears to be recent expansion of the poultry industry in the area, and the possibility of further expansion as the market and industry matures. Many producers in the area presently dispose of flock mortality by rendering. However, the rendering plant is not in the area, service is very poor, and the cost is not economical. This leaves producers with few options for disposal, including burning and on-site burial/disposal pits. These options are not considered environmentally sound methods.

With these considerations in mind, local producers have asked for assistance in establishing demonstration compost facilities. Composting is especially beneficial as it offers producers an economical means of waste/mortality management that protects water quality by reducing nutrients and killing pathogenic organisms. This demonstration project has two primary objectives. First, composting flock mortality is a relatively new and developing technology. There is a need to adapt compost technology to local conditions. Beyond that, a need exists to encourage those producers who may be considering implementation of a compost facility, but who are simply unsure of the inputs (implementation and management costs) necessary for a successful facility.

With assistance from EPA under the Clean Water Act, Section 319, the Texas State Soil and Water Conservation Board, the Gonzales County and Lavaca County Soil and Water Conservation Districts, the De-Go-La Resource Conservation and Development organization, along with key district cooperators (e.g., NRCS) in the area propose undertaking a demonstration of compost technology, which will serve to facilitate implementation of best management practices to address water quality issues related to poultry production.

Beneficiaries of this project will include rural and metropolitan areas that depend on these water resources for domestic uses. The coordinated educational phase of the project will provide poultry operators with alternative practices to reduce the potential for water pollution. The educational lessons will be extended to other regions of the state where the poultry industry is in a growth phase, thereby providing positive effects on improvement in Texas water quality.

## Section A6: Project/Task Description

The project will utilize a logical, stepwise approach to the NPS pollution prevention demonstration. First, coordination between those offering assistance and producers wishing to cooperate will be established. Producers will be recruited from among turkey producers, broiler producers, and layer producers, and input from them will dictate in what manner the tasks will proceed. Intentions are to establish two sites for each production class, to demonstrate differences within production classes and to demonstrate differences between production classes.

Second, a knowledge of current conditions regarding waste/mortality disposal will be obtained, and soil sampling at the field level will be performed prior to facility construction. This knowledge will help ascertain what effect the implementation of the facilities will have on reducing nutrient loading on fields with improved grasses and ultimately on water quality.

Next, the actual construction will take place. Within this task, guidelines for construction (from USDA-Natural Resources Conservation Service) will be reviewed and adapted to local conditions. Once a design plan for each of the six sites is finalized, actual construction will proceed. A management plan will be developed for each site, which will provide each of the cooperating producers with guidelines for the most effective methodology to undertake in managing the compost facility.

Through the remaining life of the demonstration, soil and compost samples will be collected to assure that land application of compost is balanced with crop nutrient needs. This will serve to demonstrate that providing an environmentally sound disposal method for flock mortality combined with on-site use of compost will reduce the potential for NPS pollution from poultry operations in this area.

Technology transfer is definitely a key to the success of this project and subsequent implementation of the best management practice demonstrated. Technical assistance for construction and management of a compost facility and application of compost on-site will be provided to cooperating producers. Materials will be disseminated related to composters in general, with the targeted audience, naturally, being those involved in some facet of the poultry industry. Field days will be held to demonstrate the composters and their construction and management, and to demonstrate the proper application of compost to forage crops on-site. The targeted audience will be individuals involved in poultry production. The goal is to generate enough interest and communicate enough information through the field day events, and to foster one-on-one relationships between producers and technical personnel, to cause those individuals who have considered implementing a compost facility to proceed with the implementation. In addition, the field days may spark interest in those who are as yet uninformed.

The Gonzales County Soil and Water Conservation District (SWCD) will be the lead agency on this project. Cooperators include the Lavaca County SWCD and De-Go-La RC&D Area. This project will be administered through the State Soil and Water Conservation Board. The Board will perform its role as managing agency with regard to agricultural nonpoint source pollution, as per Section 201.026 of the Texas Agriculture Code. Under this task, the Board will be responsible for administering the project according to EPA guidelines and regulations.

The poultry industry wishes to do their part to prevent nonpoint source pollution from their operations. In addition, the timing is appropriate, as expansion of the poultry industry in Gonzales and Lavaca counties is expected to increase dramatically. Demonstration and subsequent implementation of composting as a best management practice in this area will serve to diminish the potential for water quality degradation from the inherent wastes derived from poultry production operations. A detailed procedure of the methodology involved in fulfilling the goals and objectives of this project is presented in Appendix A.

The approved workplan contains details of activities relating to this project. The major work tasks are briefly described below:

Program Element One - Project Coordination

Conduct initial meeting with cooperators and prospective cooperators to review plans and purposes of this project and to obtain feedback from cooperators and prospective cooperators. Identify an informational loop to allow cooperators to stay abreast of project activities. Use informational loop to coordinate project activities, including location of producers to cooperate in demonstration. Conduct quarterly meetings of cooperators for updates on project activities and to facilitate decision-making regarding project activities.

Program Element Two - Application of Compost to Fields and Assessment of Effectiveness

Write Quality Assurance Project Plan. Test for nitrogen and phosphorus in soil of selected fields at the six demonstration sites (to be selected by coordinating committee) prior to and following BMP implementation. Sample compost for nitrogen and phosphorus contents prior to use. Apply compost to selected fields based on soil tests and realistic crop yield goals to ensure complete utilization by crops. Prepare a report highlighting the pre-implementation waste management and field management practices at each demonstration site. Prepare a report describing proper compost application and demonstrating how this practice reduces the risk of NPS pollution.

Program Element Three - Design and Construction

Review production data for each operation involved in demonstration. Design a compost facility for each operation based on production needs. Construct compost facilities for each operation. Manage each facility.

Program Element Four - Technology Transfer and Economic Feasibility

Provide technical assistance in the implementation phase of the demonstration projects. Distribute assembled materials to target audiences. Conduct field days in conjunction with cooperators and local Soil and Water Conservation Districts. Document technology at field days for use at meetings, etc., through use of video, audio, and written articles and fact sheets. Identify implementation of new composters. Review costs and benefits to establish economics and marketability of BMP implementation and field application of compost.

Record sheet



**Table A6-1 Project Schedule**

Done

| | Task | Milestone | Start | End | Cooperating Entities |
|---|---|---|---|---|---|
| 9/27/95 | 1.1 | Conduct initial meeting | 8/95 | 895 | TSSWCB, RD&D, NRCS, SWCD, TAEX, Producers |
| 9/8/95 | 1.1A | Coordinating Comm review board | | | |
| 9/8/95 | 1.2 | Define informational loop | 8/95 | 8/95 | TSSWCB, RC&D, NRCS, SWCD, TAEX, Producers |
| 9.8/95 | 1.2A | Coor proj. activities | | | |
| 9/8/95 | | Arrange for local participation | 8/95 | 8/95 | NRCS, SWCD, TAEX |
| | 1.3 | Conduct quarterly meetings | 6/95 | 5/98 | TSSWCB, RC&D, NRCS, SWCD, TAEX, Producers |
| | 1.4 | Prepare quarterly reports | 8/95 | 8/98 | SWCD, RC&D |
| | | Annual report | 8/95 | 8/98 | SWCD, RC&D |
| | | Final report | 2/98 | 8/98 | SWCD, RC&D, NRCS |
| | 2.1 | Write compost analysis plan | 8/95 | 10/95 | SWCD, RC&D, TAEX, NRCS |
| Complete | 2.2 | Prepare a QAPP and submit to EPA | 8/95 | 10/95 | SWCD, RC&D |
| | 2.3 | Pre-implementation sampling | 11/95 | 12/95 | SWCD, RC&D |
| | | Analyze pre-implementation samples | 12/95 | 1/96 | Contractor |
| | 2.4 | Prepare pre-implementation report conditions | 1/96 | 6/96 | SWCD, RC&D |
| | 2.5 | Post-implementation sampling | 2/96 | 4/98 | SWCD, RC&D |
| | | Analyze post-implement. samples | 2/96 | 4/98 | Contractor |
| | 2.6 | Prepare field application report | 8/96 | 8/98 | SWCD, RC&D, TAEX |
| | 3.1 | Review production data | 8/95 | 10/95 | SWCD, RC&D, NRCS, TAEX |
| | 3.2 | Design compost facilities | 10/95 | 10/95 | NRCS |
| | 3.3 | Construct compost facilities | 12/95 | 1/96 | Contractor |
| | | Provide technical assistance for construction | 11/95 | 12/95 | SWCD, NRCS, RC&D, Producers |
| | 3.4 | Instruct producers about mgt. | 1/96 | 1/96 | RC&D, SWCD, NRCS, TAEX |
| | | Manage compost facilities | 1/96 | 8/98 | Producers, SWCD |
| | 4.1 | Produce/distribute materials | 9/95 | 8/98 | RC&D, TAEX |
| | 4.2 | Conduct 4 field days | 2/96 | 3/98 | SWCD, TAEX, NRCS, RC&D, TSSWCB |
| | 4.3 | Document project through video | 11/95 | 4/98 | Contractor |
| | | Preparation of fact sheets/articles | 11/95 | 4/98 | NRCS, TAEX |
| | 4.4 | Identify adoption of new technology | 5/98 | 8/98 | SWCD, TAEX, NRCS |
| | 4.5 | Cost-benefit analysis on BMP | 6/98 | 8/98 | SWCD, RC&D |

**Table A6-1 Project Schedule**

| Task | Milestone | Start | End | Cooperating Entities |
|---|---|---|---|---|
| 1.1 | Conduct initial meeting | 8/95 | 895 | TSSWCB, RD&D, NRCS, SWCD, TAEX, Producers |
| 1.2 | Define informational loop | 8/95 | 8/95 | TSSWCB, RC&D, NRCS, SWCD, TAEX, Producers |
| | Arrange for local participation | 8/95 | 8/95 | NRCS, SWCD, TAEX |
| 1.3 | Conduct quarterly meetings | 6/95 | 5/98 | TSSWCB, RC&D, NRCS, SWCD, TAEX, Producers |
| 1.4 | Prepare quarterly reports | 8/95 | 8/98 | SWCD, RC&D |
| | Annual report | 8/95 | 8/98 | SWCD, RC&D |
| | Final report | 2/98 | 8/98 | SWCD, RC&D, NRCS |
| 2.1 | Write compost analysis plan | 8/95 | 1/96 | SWCD, RC&D, TAEX, NRCS |
| 2.2 | Prepare a QAPP and submit to EPA | 8/95 | 10/95 | SWCD, RC&D |
| 2.3 | Pre-implementation sampling | 1/96[1] | 2/96 | SWCD, RC&D |
| | Analyze pre-implementation samples | 2/96 | 3/96 | Contractor |
| 2.4 | Prepare pre-implementation report conditions | 1/96[1] | 6/96 | SWCD, RC&D |
| 2.5 | Post-implementation sampling | 3/96 | 4/98 | SWCD, RC&D |
| | Analyze post-implement. samples | 3/96 | 4/98 | Contractor |
| 2.6 | Prepare field application report | 8/96 | 8/98 | SWCD, RC&D, TAEX |
| 3.1 | Review production data | 8/95 | 10/95 | SWCD, RC&D, NRCS, TAEX |
| 3.2 | Design compost facilities | 10/95 | 12/95 | NRCS |
| 3.3 | Construct compost facilities | 12/95 | 3/96 | Contractor |
| | Provide technical assistance for construction | 11/95 | 3/96 | SWCD, NRCS, RC&D, Producers |
| 3.4 | Instruct producers about mgt. | 1/96 | 4/96 | RC&D, SWCD, NRCS, TAEX |
| | Manage compost facilities | 3/96 | 8/98 | Producers, SWCD |
| 4.1 | Produce/distribute materials | 9/95 | 8/98 | RC&D, TAEX |
| 4.2 | Conduct 4 field days | 2/96 | 3/98 | SWCD, TAEX, NRCS, RC&D, TSSWCB |
| 4.3 | Document project through video | 11/95 | 4/98 | Contractor |
| | Preparation of fact sheets/articles | 11/95 | 4/98 | NRCS, TAEX |
| 4.4 | Identify adoption of new technology | 5/98 | 8/98 | SWCD, TAEX, NRCS |
| 4.5 | Cost-benefit analysis on BMP | 6/98 | 8/98 | SWCD, RC&D |

[1] QAPP sampling and data collection will begin after 1/18/96.

## Section A7: Data Quality Objectives for Measurement Data

Effectively managing nutrient loading in agricultural operations requires the creation and use of practices that prevent or diminish improper or over-use of these soil amendments. Practices involving proper and efficient use of nutrients have been developed to ensure that both surface and groundwater quality are protected from potential nonpoint source pollution while at the same time promoting efficient and economical use of nutrients. The project quality objective is to determine the appropriate application rates of compost to be applied to forage crops to improve soil structure and soil fertility, and to balance this application with crop nutrient requirements to prevent NPS pollution. Participants in the project include the Gonzales County and Lavaca County Soil and Water Conservation Districts, the RC&D coordinator for the De-Go-La RC&D Area, Natural Resource Conservation Service personnel, and the local producers involved in the project. Overall project management will be conducted by TSSWCB and overseen by EPA.

A sound soil fertility program is the foundation upon which a profitable farming business must be built. Soil amendments are a necessity for production of abundant and high quality forage crops. Using nutrient amendments in the proper amounts and applying them to minimize losses is both economically and environmentally important to long-term profitability and sustainability of crop production. The primary constituents of soil amendments that have potential to become surface or groundwater pollutants are nitrogen and phosphorous.

Generalized recommendations regarding crop nitrogen requirement often result in poor nitrogen use efficiency and an increased danger of excessive application. Soil testing is therefore important to determine nutrient needs of the crop. Soil tests to evaluate pH and nutrient status of the soil allow determination of the amounts of additional nutrients needed to reach designated yield goals and avoid excessive applications to reduce nutrient losses via leaching and runoff. The appropriate timing of applications corresponds closely with crop uptake patterns and minimizes leaching and runoff losses. Use of compost to enhance soil nutrient status also provides organic materials which improve soil tilth and water holding capacity. Determination of bulk density in soils will aid in determining the effectiveness of compost additions in improving these soil characteristics over time. These soil characteristics also provide for reduced incidence of runoff which may carry soil nutrients off-site into nearby surface waters.

Land application of compost will be made at recommended agronomic rates in accordance with Natural Resource Conservation Service standard and specifications. A sample of the computer program ("Nutrient Management Worksheet") which NRCS uses to calculate proper application rates, along with the nutrient recommendations for various crops, is presented in Appendix B. Land application will not be undertaken during rainy weather or when precipitation is in the immediate forecast, or when soil is saturated. Records will be kept by the producer as to dates, quantity, and specific sites where compost is applied. Producers will be assisted in determining proper application by NRCS personnel. In order to apply the compost properly and to determine application effectiveness, the following data need to be obtained:

1) Nitrogen, phosphorus and soil bulk density (0-6 cm) determinations on all sites prior to implementation of compost application.
2) Analysis of compost prior to each application to determine nitrogen and phosphorus content.
3) Nitrogen, phosphorus and bulk density determinations on all sites prior to each compost application and 3-months following application.
4) Estimates of forage crop uptake of targeted nutrients based on Texas Agricultural Extension Service and Natural Resources Conservation Service recommendations.
5) Sample of forage prior to compost application, analyzed for nitrogen and phosphorus content, and again during the growing season to demonstrate improved nutrient content of forage through uptake of added nutrients.

The spatial boundaries of the demonstration will include forage-producing fields (approximately 5 acres in area) on each of six producers' property where compost will be applied. A map of the area and description of soil types are provide in Appendix B. Composted materials will be applied to fields containing improved forage grasses (primarily Coastal bermudagrass). Compost will be applied at least once per year at each site, and application timing and rates will depend on amount of compost generated by composters.

The temporal boundaries of the demonstration include one sampling period prior to implementation of compost application, and sampling for up to two years following initial compost application, with sampling intervals as described above.

The objective of soil, forage and compost sampling will be to estimate appropriate compost application rates and timing to forage grass fields. Soil analyses for nitrate-nitrogen, phosphorus, pH, potassium, calcium, magnesium, sodium, sulfur, and conductivity (standard soil analysis) will be used to calculate appropriate application rates for composted materials. The Texas Agricultural Extension Service Soil, Water, and Forage Testing Laboratory will provide detailed reports which will include soil amendment application recommendations based on soil analysis. This lab was chosen to perform the required analyses because of their extensive experience and large database in Texas on which to base recommendations. Since this lab does analyses and makes recommendations for most agricultural areas of the State, the data obtained from their analyses will be highly comparable to other results obtained around the State.

Composite soil samples will be utilized to ensure that samples are representative of the fields from which they were collected. It is estimated that there will be only one composite sample taken from each field (1-5 acres in area). For each sampling period, three subsamples of selected composite samples (split samples) will be sent to the TAEX laboratory for analyses as a check on method precision. Approximately 5 soil bulk density samples will be collected from each field prior to and following application of compost. Due to inherent variability of soils, a sample precision of ± 20% will be accepted.

Compost and forage sample analyses for nitrogen and phosphorus will be used only to provide additional information and to verify proper application rates. Composite samples will be utilized to ensure that samples are representative of the populations from which they were collected. This supporting data will not be subject to statistical analyses.

The Texas Agricultural Extension Service Soil, Water and Forage Testing Laboratory will determine the precision and accuracy of their laboratory analyses. Estimated determinations for precision and accuracy for laboratory analyses, based on an extensive database, are outlined in Table A7-1.

**Table A7-1 Accuracy and Precision Limits of Measured Parameters**

| Parameter | Precision Limits | Accuracy Limits | PQL[1] |
|---|---|---|---|
| SOILS | | | |
| Nitrate-nitrogen | 4% | 30% | 0.05 mg/kg |
| Phosphorus | 4% | 5% (acid soils) | 0.05 mg/kg |
| pH | 0.3% | 1% | 4-10 |
| Potassium | 22% | 8% | 5 mg/kg |
| Calcium | 2% | 15% (acid soils) | 1 mg/kg |
| Magnesium | 4% | 6% (acid soils) | 1 mg/kg |
| Sodium | 25% | 9% | 5 mg/kg |
| Sulfate | 14% | not determined | 1 mg/kg |
| Conductivity | N/A | N/A | N/A |
| Bulk density | N/A | N/A | N/A |
| COMPOST | | | |
| Nitrate-nitrogen | 4% | 30% | 0.05 mg/kg |
| Phosphorus | 4% | 5% | 0.05 mg/kg |
| FORAGE | | | |
| Total nitrogen | 2% | 2% @ 2.25% | 0.05% |
| Phosphorus | 6% | 6% @ 0.16% | 100 mg/kg |

[1] PQL = Pratical Quantity Limits

Data collection and analysis for effectiveness (soil bulk density and soil analyses) will meet an 85 percent confidence level. These data will be presented as mean levels for evaluation. Statistical comparison of effectiveness will entail comparison of paired observations (before and after each compost application) with at least six pairs (representing each producers' field) using the Student's t test for significance (P=0.15). The objectives are to 1) determine whether soil tilth and structure improve after addition of organic material to the soil, as demonstrated by a statistically significant reduction in bulk density, and 2) determine that soil nutrient status is improved without being subject to excessive nutrient loading, as demonstrated by maintenance of soil nutrient content within recommended ranges as established by the Texas Agricultural Extension Service and the Natural Resources Conservation Service.

Although 100 percent of collected data should be available, problems in data collection and analysis must be expected. A goal of 90 percent data completeness will be required for data usage. Should less than 90 percent data completeness occur, the Program Manager will initiate corrective action. Data completeness will be calculated as a percent value and evaluated with the following formula:

$$\% \text{ Completeness} = (SV/ST) \times 100$$

where SV is number of samples with a valid analytical report and ST is total number of samples collected.

Sample precision using split samples will be determined using the following equation:

$$\text{Percent Deviation} = [(\text{Sample1} - \text{Sample2}) / ((\text{Sample1} + \text{Sample2})/2)] \times 100$$

Sample precision for bulk density determinations will be expressed as the standard deviation of samples for each field and sampling period.

Consistent sampling collection procedures as outlined in Sections B1and B2 will ensure that samples collected are representative of their respective populations. Comparability of data will be achieved through consistent sampling and analytical procedures and the committment to using only standard, acceptable methods for sample analysis.

All data will be reviewed for abnormalities or any unusual results. Any unusual results will be traced to possible error sources. In the event no error source is found, the data will be assumed normal and appropriate for decision determinations. If an error is found that cannot be resolved, the data will be discarded.

The project manager will coordinate with the laboratory supervisor, the field manager, and field technician to ensure that proper protocols are utilized.

## Section A10: Documentation and Records

Reporting will include quarterly progress reports, reimbursement requests, annual reports, laboratory analyses reports/recommendations, and a final report at the culmination of the study.

Quarterly progress reports will note activities conducted throughout the quarter, items or areas identified as potential problems, and any variations or supplements to the QAPP. Corrective Action Report Forms (CARs) will be utilized when necessary (Attachment A10-1).

Reimbursement requests for the project will be handled by the Gonzales County Soil and Water Conservation District.

Annual reports will include laboratory results with a summary of data to date, and calculations made to estimate proper compost application rates and timing. In addition, activities conducted throughout the year, items or areas identified as potential problems, and any variations or supplements to the QAPP will be discussed (a revised QAPP will be submitted as necessary to accomodate necessary changes). Variations from the QAPP and subsequent CARs will be filed by the Project Manager.

The final report will include copies of all raw data, laboratory reports and analyses, compost application calculations, document records, summary statistics, and other pertinent information. In addition, the Texas Agricultural Extension Service "Result Demonstration Handbook" which will be generated for this project will be included as an appendix to the final report. All original data, both hardcopy and electronic forms, will be retained by the Project Manager for at least 3 years.

**Attachment A10-1 Corrective Action Report Form**

EXAMPLE

## Corrective Action Report

CAR #:______________

Date:__________________ Area/Location:__________________

Reported by:__________________ Activity:______________________

State the nature of the problem, nonconformance or out-of-control situation:

____________________________________________________________

____________________________________________________________

____________________________________________________________

____________________________________________________________

Possible causes:

____________________________________________________________

____________________________________________________________

____________________________________________________________

Recommended Corrective Actions:

____________________________________________________________

____________________________________________________________

____________________________________________________________

CAR routed to:___________________________
Received by:_____________________________

Corrective Actions taken:

____________________________________________________________

____________________________________________________________

____________________________________________________________

Has problem been corrected?: YES NO

Immediate Supervisor:__________________________

Program Manager:______________________________

Quality Assurance Officer:________________________

## Section B1: Sampling Process Design

The project is designed to determine appropriate timing and rates of application of compost, generated from the on-farm composters, that is consistent with prevention of nonpoint source pollution. To accomplish this, soil, forage and compost will be sampled for the primary nonpoint source constituents, nitrogen and phosphorus, to determine the differences between the amount of nutrients needed by the forage crop, the amount of nutrients currently available in the soil, and the amount of nutrients present in the compost to be applied. Soil bulk density will also be monitored to establish whether addition of organic matter significantly improves soil structure, thereby improving infiltration and reducing the potential for nonpoint source pollution in runoff from the fields. The parameters to be measured are shown in Table B1-1.

**Table B1-1 Parameters to be Measured**

| Parameter | Summary Statistic | Status | Reporting Unit |
|---|---|---|---|
| SOILS | | | |
| Nitrate-nitrogen | Mean | Critical | Lbs/Acre |
| Phosphorus | Mean | Critical | Lbs/Acre |
| pH | Mean | Critical | pH units |
| Potassium | Mean | Non-critical | Lbs/Acre |
| Calcium | Mean | Non-critical | Lbs/Acre |
| Magnesium | Mean | Non-critical | Lbs/Acre |
| Sodium | Mean | Non-critical | Lbs/Acre |
| Sulfate | Mean | Non-critical | Lbs/Acre |
| Conductivity | Mean | Non-critical | Micromhos/cm |
| Bulk density | Mean | Critical | Grams/cubic cm |
| COMPOST | | | |
| Nitrate-nitrogen | --- | Critical | % or mg/kg |
| Phosphorus | --- | Critical | % or mg/kg |
| FORAGE | | | |
| Total nitrogen | --- | Non-critical | % Crude Protein |
| Phosphorus | --- | Non-critical | % or mg/kg |

Soil, forage and compost samples will be analyzed for nitrogen and phosphorus prior to each compost application. These data will be used in calculations to estimate proper application rates. Soil bulk density and soil nutrient levels will be determined prior to and 3 months following each application date, and these paired samples from six different sites will be analyzed for statistical differences. These data will assure that soil structure on test fields is being at least maintained or improved by compost application, and that compost application is not causing improper nutrient loading to the soil.

## Section B2: Sampling Methods Requirements

The sampling regime is outlined in Table B2-1. All samples will be collected by the field technician. One composite compost sample per composter will be taken prior to application and sent to the laboratory for analysis. Ten subsamples from well-mixed

**Table B2-1 Sampling Regime**

| Parameter | Sampling Location | Before Application | After Application | Number of Samples |
|---|---|---|---|---|
| ***SOILS*** | | | | |
| Nitrate-nitrogen | 6 individual fields | Immediately | 3 months | 1 composite[1] |
| Phosphorus | 6 individual fields | Immediately | 3 months | 1 composite[1] |
| pH | 6 individual fields | Immediately | 3 months | 1 composite[1] |
| Potassium | 6 individual fields | Immediately | 3 months | 1 composite[1] |
| Calcium | 6 individual fields | Immediately | 3 months | 1 composite[1] |
| Magnesium | 6 individual fields | Immediately | 3 months | 1 composite[1] |
| Sodium | 6 individual fields | Immediately | 3 months | 1 composite[1] |
| Sulfate | 6 individual fields | Immediately | 3 months | 1 composite[1] |
| Conductivity | 6 individual fields | Immediately | 3 months | 1 composite[1] |
| Bulk density | 6 individual fields | Immediately | 3 months | 5 per field |
| ***COMPOST*** | | | | |
| Nitrate-nitrogen | 6 individual composters | Immediately | ---- | 1 composite |
| Phosphorus | 6 individual composters | Immediately | ---- | 1 composite |
| ***FORAGE*** | | | | |
| Total nitrogen | 6 individual fields | Immediately | ± 5 months | 1 composite |
| Phosphorus | 6 individual fields | Immediately | ± 5 months | 1 composite |

[1] Split samples on selected samples will be sent to the laboratory each sampling period.

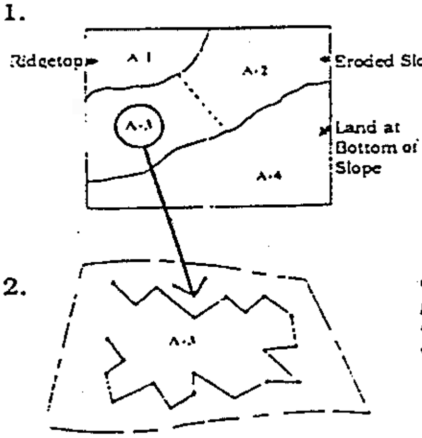
compost will comprise one composite sample. One composite soil sample will be collected from each field (approximately 5 acres in area) on each sampling date. Soil samples will be collected following recommendations made by the Texas Agricultural Extension Service (Attachment B2-1). Ten to fifteen samples will represent a composite for soil samples. Three subsamples from selected composite samples (split samples) will be sent to the laboratory for analysis each sampling period as an additional check on method precision. One composite forage sample will be collected from each field on each sampling date.

## Attachment B2-1 Procedure for Taking Soil Samples

### Procedure For Taking Soil Samples

*Soil tests can be only as accurate as the samples on which they are made. Proper collection of soil samples is extremely important. Chemical tests of poorly taken samples may actually be misleading because they do not represent the area to be cropped.*

**Step 1.**

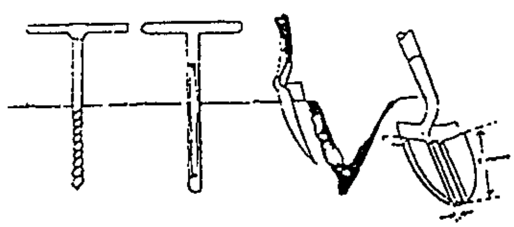



*Take one composite soil sample from each uniform area of 10 to 40 acres in a field. In areas such as East Texas, one sample should represent only 10 to 20 acres; whereas, in areas where soils are more uniform, one sample can represent up to 40 acres.*

**Step 2.**

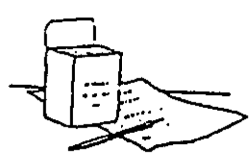
*The composite sample should be taken from each area. This can be done by taking small cores or slices from 10 to 15 different places. Place these in a clean container (plastic bucket, paper sack, etc.), mix thoroughly and take out approximately 1 pint for the composite sample.*

**Step 3.**



*When taking soil samples, use a spade, soil auger or soil sampling tube as illustrated. Scrape the litter from the surface. Make the core or boring 6 inches deep in the soil. (For permanent sod, sample to a depth of 3 to 4 inches) To use a spade, dig a V-shaped hole and take a 1 inch slice of soil from the smooth side of the hole. Then take a 1 X 1 inch core from the center of the shovel slice as illustrated. Repeat in 10 to 15 different places, put in a clean plastic bucket, thoroughly mix and remove a pint as a composite sample representing the field or area.*

**Step 4.**



*Complete the information form on the opposite side. Enclose the completed information form and payment inside the package containing samples. Make check payable to Soil Testing. DO NOT SEND CASH. Address the letter and package to one of the following addresses:*

**Extension Soil, Water, and Forage Testing Laboratory**
**Texas A&M University - Soil & Crop Sciences**
**College Station, Texas 77843-2474**
**Phone 409/845-4816**

**Soil Testing Laboratory**
**Texas Agricultural Extension Service**
**Lubbock, Texas 79401-9746**
**Phone 806/746-6101**

### Precautions

1. Avoid sampling spots in the field such as small gullies, slight field depressions, terrace waterways and unusual spots.
2. When sampling fertilized fields, avoid sampling directly in fertilized band.
3. Do not use old vegetable cans, tobacco cans, match boxes, etc., to submit samples.
4. Do not use heat to dry samples.
5. Be sure to keep a record for yourself as to the area represented by each sample.
6. Be sure sample numbers on the boxes correspond with sample numbers on the information sheet.

**For Further Details Consult Your County Extension Agent**

Educational programs conducted by the Texas Agricultural Extension Service serve people of all ages regardless of socioeconomic level, race, color, sex, religion, handicap or national origin.

**Attachment B2-2 Procedure for Taking Forage Samples**

## Available Services

Analyses are conducted on all forages including hay, pasture, cubes, silage, green chop, mixed feeds and concentrates. All samples are analyzed with the understanding that the results are **not** in any way associated with feed control regulations.

### Sample Collection

It is important that the sample sent for analysis is representative of the forage sampled. Mix several small samples of each cutting together and then send one sample of the mixture for analysis.

Collect samples from the inside of bales, large hay packages and silo containers. The Penn State or similar type forage sampler is best for collecting samples. If not available, carefully collect leaf samples by hand. Cut hay or other hay forage into stem lengths of 3 inches or less, carefully preventing leaf loss.

Approximately 1 quart (packed) is the amount of sample required. Mail in any sturdy container or bag.

Seal silage samples in an airtight Zip-loc plastic bag and place in a mailing container.

Complete the information form on the opposite side. Enclose the completed information form and **payment** inside the package containing samples. Make check payable to Soil Testing. DO NOT SEND CASH. Address the letter and package to the following address:

**Extension Soil, Water and Forage Testing Laboratory**
Texas A&M University
Soil and Crop Sciences
College Station, Texas 77843-2474
(409) 845-4816

**Please send sample, information form and payment ALL TOGETHER!**

*Educational programs conducted by the Texas Agricultural Extension Service serve people of all ages regardless of socioeconomic level, race, color, sex, religion, handicap or national origin.*

Issued in furtherance of Cooperative Extension Work in Agricultural and Home Economics, Acts of Congress of May 8, 1914, as amended, and June 30, 1914, in cooperation with the United States Department of Agriculture. Zerle L. Carpenter, Director, Texas Agricultural Extension Service, The Texas A&M University System.

Composite forage samples will consist of twenty subsamples (approximately 50 grams each, consisting of live leaf parts) collected from representative areas throughout the field. Soil bulk density will be taken using the core method (Blake and Hartge 1986). Five samples per field per sampling date will be taken with a coring device of known diameter from 0-6 cm below the soil surface. Samples will be placed in metal soil cans or clean heavy-duty paper bags (previously weighed or weighed empty following drying) and oven dried at 105° C for 24 hours. Dried soils will then be weighed using a digital scale (accuracy ± 0.01 g). Drying of soils and weighing will be conducted at the Texas A&M University, Department of Rangeland Ecology and Management Soils Laboratory. Bulk density in grams per cubic cm will be calculated as oven-dry weight of soil (in grams) divided by the known volume of the soil core (in $cm^3$).

Manual rain gauges will be set up at each site and daily rainfall recorded. In the event of unusual rainfall events, additional sampling may be initiated to determine effects of large rainfall events.

All samples for lab analysis will be placed in plastic or papar bags and shipped in boxes accompanied by lab forms. No preservation or holding time restricitions apply to forage, compost or soil samples. A log of all samples collected will be kept by the field technician. All corrective action for field sampling is the responsibility of the Field Manager. Corrective action will be documented in writing (see Attachment A10-1) and distributed to all participants at the earliest opportunity. Any CARs will be discussed and reviewed at quarterly meetings by all participants.

## Section B3: Sample Handling and Custody Requirements

Each sample will be labeled with the location, date, and replicate number at the time of collection. A log of all samples collected will be kept by the field technician. The log will contain the producers' name, field location, type of sample, replicate number (if applicable), date of sample, and comments or problems encountered. Log entries, sample labels, and shipment forms will be double-checked for accuracy prior to shipment. All samples for TAEX lab analysis will be placed in clean paper or plastic bags and shipped in boxes accompanied by lab forms (see Attachments B3-1 and B3-2). The Extension lab will be responsible for assuring the samples sent in match those listed on the accompanying form, and the lab supervisor will contact the Project Manager in case of any discrepancies. Samples sent to the Extension lab are logged in when received (see Appendix C). A sample datasheet for bulk density determination is attached (Attachment B3-3). A copy of this datasheet with sample information and soil can numbers will accompany samples delivered to the TAMU lab.

## Attachment B3-1 Soil Sample Information Form

D-494

# TEXAS AGRICULTURAL EXTENSION SERVICE
# THE TEXAS A&M UNIVERSITY SYSTEM

**Soil, Water and Forage Testing Laboratory**

## SOIL SAMPLE INFORMATION FORM FOR FIELD CROPS AND LAWN/GARDEN

Please submit this completed form and payment with samples. Mark each soil sample bag with your sample identification which should correspond with the sample identification written on this form. See mailing instructions under Step 4 on the back of this form (Please Do Not Send Cash).

**SUBMITTED BY:** Results will be mailed to this address ONLY.

Name ______________________ County ______________
Address ____________________ Phone ______________
City _______________________ State ________ Zip ________

**FOR:** (Optional)

Name ____________________________________________
Address __________________________________________
City _______________________ State ________ Zip ________

| SAMPLE I.D. | | PLANT INFORMATION | | | |
|---|---|---|---|---|---|
| Laboratory # (For Lab Use) | Your Sample I.D. | Irrigated? Yes/No | Previous Lime or Fertilizer | What Are You Growing? | Yield Goal (Field Crops) |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Circle Requested Analyses**

| | Price Per Sample |
|---|---|
| Routine Analysis (*pH, $NO_3$, P, K, Ca, Mg, Na, S, Conductivity*) | $10.00 |
| Routine + Micronutrients (*Zn, Fe, Cu, Mn*) | $15.00 |
| Routine + Micronutrients + Boron + Aluminum Lime Requirement | $25.00 |
| Routine + Micronutrients + Boron + Aluminum Lime Requirement + Organic Matter | $30.00 |
| Routine + Detailed Salinity | $25.00 |

### How Is Forage Used?

Grazing Only ______
Hay Only ______
Grazing and Hay ______
New Establishment ______
Minimum Requirement For Establishment (ASCS) ______

Describe any problems ______________________________________________

## Attachment B3-2 Forage Sample Information Form

D-1116

# TEXAS AGRICULTURAL EXTENSION SERVICE
# THE TEXAS A&M UNIVERSITY SYSTEM

### Soil, Water and Forage Testing Laboratory

## FORAGE / FEED / PLANT TISSUE SAMPLE INFORMATION FORM

**Please submit this completed form and payment with samples. Mark each sample with your sample identification which should correspond with the sample identification written on this form. See mailing instructions on the back of this form (Please Do Not Send Cash).**

**SUBMITTED BY:** Results will be mailed to this address ONLY.

Date ____________

Name ______________________ County ____________

Address ______________________ Phone ____________

City ______________________ State ____ Zip ________

**FOR:** (Optional)

Name ______________________

Address ______________________

City ______________________ State ____ Zip ________

**Check Requested Analyses**

| *Wet Chemistry* Analysis | Price Per Sample | Forage/Feed Samples | Plant Samples |
|---|---|---|---|
| Protein | $ 5.00 | ☐ | ☐ |
| Protein + Acid Detergent Fiber | $10.00 | ☐ | — |
| Protein + Minerals (P, K, Ca, Mg, Na, Zn, Fe, Cu, Mn) | $15.00 | ☐ | ☐ |
| Protein + Minerals + Fiber | $20.00 | ☐ | — |
| Protein + Nitrates | $10.00 | ☐ | ☐ |
| Sulfur + Boron | $10.00 | ☐ | ☐ |
| *NIR Analysis* Protein, Fiber, Major Minerals Bermuda, Bahia, and Legume Forages Only | $10.00 | ☐ | |

| SAMPLE I.D. | | SAMPLE INFORMATION | | |
|---|---|---|---|---|
| Laboratory # (For Lab Use) | Your Sample I.D. | Sample Is A: Feed, Hay,Forage, Silage or Plant Tissue | Sample Type: Bermuda, Bahia, Wheat, Corn, Pecan, Etc. | Livestock to be Fed: Beef, Dairy, Horse, Sheep, Goats, Etc. |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Describe any problems ______________________________________________

______________________________________________

## Attachment B3-3 Bulk Density Determination Datasheet

### BULK DENSITY DETERMINATION DATASHEET

DATE COLLECTED: ____________ SAMPLE VOLUME: ____________

FIELD LOCATION: ____________ COMMENT: ____________

| SAMPLE # | Soil Can Number or Bag Label ID | Weight of Empty Bag or Can | Weight of Filled Bag or Can | Weight of Soil | Soil Wt. Divided by Sample Volume |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |

DATE COLLECTED: ____________ SAMPLE VOLUME: ____________

FIELD LOCATION: ____________ COMMENT: ____________

| SAMPLE # | Soil Can Number or Bag Label ID | Weight of Empty Bag or Can | Weight of Filled Bag or Can | Weight of Soil | Soil Wt. Divided by Sample Volume |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |

**PROCEDURES:**

1) Using a soil coring device of known diameter, carefully take five soil samples from 0-6 cm.
2) Place each sample in a numbered soil can or labeled heavy-weight bag.
3) Keep all samples from each sampling date together in a box for shipment to the laboratory.
4) A copy of the datasheets should accompany the samples to the lab.
5) Samples will be dried and weighed at the lab and the bulk density determined.
6) Completed datasheets will be returned by the lab.

## Section B4: Analytical Methods Requirements

Soil, compost, and forage samples collected during this project will be analyzed by the Texas Agricultural Extension Service Soil, Water and Forage Testing Laboratory in College Station, Texas. There are no EPA-approved methods for these sample matrices. Accepted procedures which will be used for analyses are listed in Table B4-1. Analysis procedures used by the laboratory are outlined in the instruction manuals supplied by Elmer-Perkin (ICP) and Braun and Luebe (TRAACS) insturment companies.

**Table B4-1 Analytical Methods**

| Parameter | Method | Equipment Used | Estimated MDL[1] |
|---|---|---|---|
| SOILS | | | |
| Nitrate-nitrogen | Colorimeter, 410nm | TRAACS[2] | --- |
| Phosphorus | ICP[3,4] | Perkin-Elmer | --- |
| pH | Electometric | Orion Digital | 0.1 |
| Potassium | ICP | Perkin-Elmer | --- |
| Calcium | ICP | Perkin-Elmer | 10 ug/L |
| Magnesium | ICP | Perkin-Elmer | 30 ug/L |
| Sodium | ICP | Perkin-Elmer | 29 ug/L |
| Sulfate | ICP | Perkin-Elmer | --- |
| Conductivity | Conductivity bridge | Horizon Ecology | N/A |
| COMPOST | | | |
| Nitrate-nitrogen | Colorimeter, 410nm | TRAACS | --- |
| Phosphorus | ICP | Perkin-Elmer | --- |
| FORAGE | | | |
| Total nitrogen | Colorimeter, 410nm | TRAACS | --- |
| Phosphorus | ICP | Perkin-Elmer | --- |

[1] MDL is the Method Detection Limit.[2] TRAACS autoanalyzer by Braun and Luebe.
[3] ICP is Inductively Coupled Plasma Spectroscopy.
[4] Analysis of P using ICP has comparable results to colorimeter analysis, as per Donaho and Alto, 1992.

The bulk density samples will be sent to the Texas A&M University, Department of Rangeland Ecology and Management Soils Laboratory for drying and weighing (digital scale with accuracy of $\pm$ 0.01).

The laboratory technicians and supervisor will review the analysis results for potential problems or errors. In the event of problems or failure of the analytical system, the Laboratory Supervisor or Manager will notify the Project Manager. The Laboratory Supervisoror Manager and the Project Manager will thern determine if the sample integrity is intact, if duplicate material is available for re-analysis, if resampling can and should be performed, or if the data should be omitted. This will be recorded on the CAR form (Attachment A10-1).

## Section B5: Quality Control Requirements

The Texas Agricultural Extension Service Soil, Water and Forage Testing Laboratory will determine the precision and accuracy of their analyses. An in-house check for quality control for soil analysis is run every 30 samples. This soil sample is processed the same as all other samples. An additional in-house standard and blank are included at the beginning and end of the run. For forage and water samples, NIST standards are used and run every 20 to 40 samples. For the ICP analyses, mixed calibration standards are used as well as an instrument check. A spike sample is run on a periodic basis to check accuracy of the analyses. Any out-of-range samples are diluted and redone. Cations and anions analyzed are matched up for each sample, and if they don't match up, the sample is redone. Quality control specifications used are outlined in part in the standard operating procedures for the lab (Appendix C) and in part in the manufacturers' manuals provided with the equipment (Perkin-Elmer [ICP], Braun and Luebe [TRAACS]). Quality assurance of field sampling methods will be done by annual testing of sample collection and handling skills through field audits and split sample analyses.

The use of approved/standard sampling and analytical methods will ensure the measured data accurately represent the conditions at each site. The comparability of the data produced is predetermined by the commitment of the TSSWCB staff and the contracted laboratory staff to use only standard methods of analysis (no EPA-approved methods exist for soil or forage analysis). Table A7-1 in Section A7 lists the required accuracy limits for the parameters of interest. The completeness of the data will be affected by the reliability of the equipment, frequency of field and laboratory errors or accidents, and unexpected events. However, it will be the general goal that 90 percent data completion will be required.

It will be the responsibility of the project managers to verify that the data are representative. The data's precision, accuracy, and comparability will be the responsibility of each laboratory supervisor. The project managers will also have the responsiblity of determining that the 90 percent completeness criteria is met, or will justify acceptance of a lesser percentage. All incidents requiring corrective action will be documented through the use of CARs (Attachment A10-1).

## Section B7: Instrument Calibration and Frequency

All instruments or devices used in obtaining enviromental measurement data will be calibrated prior to use. Each instrument has a specialized procedure for calibration and a specific type of standard used to verify calibration. The frequency of calibration recommended by the equipment manufacturer as well as any instructions specified by applicable analytical methods will be followed. All records of calibration will be kept by the person performing the calibration and will be accessible for verification during either a laboratory or field audit.

Laboratory equipment and devices needing calibration and recalibration are numerous and varied. The Texas Agricultural Extension Service Soil, Water, and Forage Testing Laboratory will perform a daily calibration of analytical equipment, with recalibration as necessary. The Texas A&M University, Department of Rangeland Ecology and Management Soils Laboratory will use the same scale, and will calibrate it prior to each shipment of samples.

## Section B9: Data Acquisition Requirements (Non-Direct Measurements)

Information concerning nutrient recommendations versus crop yield goals will be obtained from the Natural Resources Conservation Service Technical Guide (January 1990, Appendix B). No other information, databases, or literature files will be required.

## Section C1: Assessments and Response Action

The committment to use accepted procedures and equipment when obtaining environmental samples must involve periodic verification that equipment and methods are utilized and employed correctly. This verification constitutes the annual field performance audit. The field technician will be observed during acutal field operations to verify that equipment and procedures are properly applied. This audit will be performed by a member of the quality assurance inspection team at the Texas State Soil and Water Conservation Board.

All laboratoy samples will have the precision and accuracy of data determined on the particular day that the data were generated. Depending on the analysis, certain methodologies require that water blanks, standards, and reagent blanks be analyzed to verify that no instrument or chemical problem will affect data quality. These verifications will be the responsibility of the Texas Agricultural Extension Service Soil, Water, and Forage Testing Laboratory.

Field measurement equipment required for the project is minimal. Backup equipment and spare parts will be readily and easily accessible as needed. Data collection and analytical results will be reviewed at least semi-annually by the Project Manager and the technical assistance cooperators to ensure that the data collection program is obtaining the desired results. During these reviews, any necessary modification to the data collection efforts will be implemented to improve the integrity, validity, and usefulness of the data.

**Section C2: Report to Management**

The field measurement and sampling for the project will be done according to the approved workplan. The Project Manager will be required to report on the proper implementation of the procedures outlined in this QAPP and thereby the status of the data quality. The QAO at the Texas State Soil and Water Conservation Board will be informed of any quality assurance problems encountered and solutions adopted through the use of CARs. This information will be provided by the Project Manager.

The annual quality assurance report to the EPA, submitted by the Project Manager, will be the main QA report for this project. However, upon completion of the project, the final report will contain a quality assurance section to address the accuracy, precision, and completeness of the measurement data used in the project's conclusions. It will also discuss any problems encountered and solutions made. This final project QA report is therefore the responsibility of the Project Manager with any assistance required from the Laboratory Supervisor/Manager, the Field Manager, and laboratory and field technical assistance personnel.

## Section D1: Review Validation and Verification Requirements

The Project Manager, Laboratory Supervisor/Manager, and technical assistance team will be responsible for reviewing, validating, and verifying the measurement and sample data and the routine assessment of measurement procedures for precision and accuracy.

Whenever the procedures and guidelines established in the QAPP fail to meet the specified levels of data quality, corrective actions in the form of CARs will be required. Corrective action may be initiated by the QAO, Project Manager, Field Manager, or Laboratory Supervisor/Manager if variances from proper protocol are discovered. The Project Manager will ensure that required corrective actions are taken. Documentation of any corrective action procedures will be provided by the Project Manager, along with the results of the implemented changes through the use of CARs.

**Section D3: Quality Objectives Reconciliation**

Data completeness in this project will be determined by comparing the number of sampling dates and sites proposed with the number of samples actually taken. Accidents in handling, shipping, and laboratory analysis may also reduce the completeness of the sampling program. It is the goal of this project to achieve 90 percent completeness. However, statistical analysis will be the final indicator of data validity.

Representativeness and comparability of data, while unique to each individual collection site, is the responsibility of the Project Manager and the technical assistance team. By following the guidelines described in this QAPP, and though careful sampling design, the data collected in this project will be representative of the actual field conditions and will be comparable to similar applications. Representativeness and comparability of laboratory analyses is afforded though use of the Texas Agricultural Extension Service Soil, Water and Forage Testing Laboratory, which  is the major lab in the State for analysis of samples for similar application; representativeness and comparability of all laboratory analyses will be the responsibility of the Laboratory Supervisor/Manager.

The Project Manager will review the final data, with concurrence from the technical assistance team, to ensure that all data meets the requirements as described in this QAPP.

## Literature Cited

Blake, R.G., and K.H. Hartge. 1986. Bulk density. pp. 363-376. IN: A. Klute. Methods of soil analysis, Part I. Physical and mineralogical methods. Agron. Monog. 9, ASA/SSSA, Madison, WI.

Donahue, and Alto. 1992. Determination of phosphorus, potassium, calcium, magnesium, maganese, iron, aluminum, boron, copper and zinc in plant tissue. Procedures for the southwestern region of the United States. Southern Coop. Series Bulletin 368, May.

# APPENDIX A

## Composting Facility Specifications and Practice Standard for Texas, Natural Resources Conservation Service

# Composting Facility (No.)

## Definition

A facility for the biological stabilization of waste organic material.

## Scope

This standard establishes the minimum acceptable requirements for design, construction, and operation of composting facilities. Waste organic material for composting may include livestock and poultry manure, dead animal carcasses, and food processing wastes where food is processed as part of normal farming operation. Municipal sludge, solid waste, and other non-farm type wastes are not included in this standard.

## Purpose

To treat waste organic material biologically by producing a humus-like material that can be recycled as a soil amendment and fertilizer substitute or otherwise utilized in compliance with all laws, rules, and regulations.

## Conditions where practice applies

This practice applies where: (1) waste organic material is generated by agricultural production or processing; (2) composting is needed to manage the waste organic material properly; (3) an overall waste management system has been planned that accounts for the end use of the composted material.

## Planning Considerations

**Types.** Three types of composting operations are covered in this standard—aerated windrows, static piles, and in-vessel. Aerated windrows are more suited to large volumes of organic material that are managed by power equipment used to turn the composting material periodically. Periodic turning re-aereates the windrows, promoting the composting process.

Organic material in static piles is initially mixed to a homogeneous condition and not turned again throughout the composting process. Static pile material must have the proper moisture content and bulk density to facilitate air movement throughout the pile. Forced air might be necessary to facilitate the composting process.

In-vessel composting in a totally enclosed structure is carried out on a blended organic material under conditions where temperature and air flow are strictly controlled. In-vessel composting also includes naturally aerated processes where organic materials are layered in the vessel in a specified sequence. Layered, in-vessel materials are usually turned once to facilitate the process. Vessel dimensions must be consistent with equipment to be used for management of compost.

**Process.** Composting is accomplished by mixing an energy source (carbonaceous material) with a nutrient source (nitrogenous material) in a prescribed manner to meet aerobic microbial metabolic requirements. The process is carried out under specific moisture and temperature conditions for a specified period of time. Correct proportions of the various compost ingredients are essential to minimize odors and to avoid attracting flies, rodents, and other small animals.

**Carbon Source.** A dependable source of carbonaceous material must be available. The material should have a high carbon content and high carbon to nitrogen ratio (C:N). Wood chips, sawdust, peanut hulls, straw, corn cobs, bark peat moss, and well bedded horse manure are good sources of carbon.

**Moisture Control.** Large amounts of water evaporate during the composting process because operating temperatures drive off water. A source of water must be available for compost pile moisture control from start-up through completion. Proper moisture facilitates the composting process and helps control odors.

**Equipment Needs.** Appropriate equipment must be available for initial mixing, turning, and hauling composted material and carbonaceous material. Appropriate long stem thermometers should be available for managing the composting material.

**Bulking Materials.** Bulking materials may be added to enhance air flow within the composting material. Piles that are too compact will inhibit the composting process. The carbonaceous material can be considered as a bulking agent. Where it is desirable to salvage carbonaceous material, provisions for removing the material, such as screening, must be made.

**Management.** Composting operations require close management. Management capabilities of the operator and availability of labor should be assessed as part of the planning and implementing process.

**Economics.** Benefits associated with the ultimate use of the composed material should be compared to the capitol expenditureand operating costs of the composting operations. In addition to cost return, benefits can include environmental protection, improved handling, disposal of dead poultry and other farm animal carcass, odor control, and reduced need for storage volume.

## Design Criteria

**Soils.** Locate composting facilities on soils having slow to moderate permeability to minimize seepage of dissolved substances into the soil profile and movement toward groundwater. Evaluate site paving needs in terms of effects of equipment operation on trafficability, soil compaction, and potential for contamination from compost and petrol products.

**Runoff.** Divert surface runoff from outside drainage areas around the compost facility. Collect runoff from the compost facility and utilize or dispose of it properly. Evaluate the effects of changed infiltration conditions on groundwater recharge, and evaluate changes in volumes and rates of runoff caused by the location of the operation. Properly manage movement of organic material, soluble substances, and substances attached to solids carried by runoff.

**Carbon-Nitrogen Ratio.** Calculate the amounts of the various ingredients to establish the desired carbon-nitrogen ratio (C:N) of the mix to be composed. The C:N should be between 25:1 and 40:1. Use the higher range of C:N for organic materials that decompose at a high rate (or are highly unstable) with associated high odor production.

Where more than two ingredients are to be blended, the two main ingredients are to be used in the analysis for the desired C:N and mixed accordingly. Adding up to 50 percent by weight of other ingredients to improve workability and air movement is permissible as long as the C:N of the added ingredient does not exceed the target C:N of the compost.

**Odor.** Select carbonaceous material that, when blended with the nitrogenous material, will result in the desired pH. The blended material should have a pH at or slightly below neutral for best odor control. Where odors do not present a problem, pH of 8 to 9 is acceptable, but strong ammonia and amine related odors will be present for up to the first 2 weeks.

Locate composting operations where movement of any odors toward neighbors will be minimized. Buffer areas, vegetative screens, and natural landscape features can help minimize the effects of odors.

**Facility Size.** Where dead poultry and other small farm animals are composted, establish the size of the composter units on the basis of locally determined animal loss rates. Composting facilities for the purpose of processing animal carcasses are to include a primary composting unit into which alternate layers of low moisture content manure (unusual poultry manure), carbon source material (straw is common), and dead animal carcasses are placed. A secondary composting unit is often necessary to complete the composting process.

**Moisture.** The moisture content of the blended material at start-up of the composting process should be approximately 60 percent (wet weight basis) and maintained between 40 and 60 percent during the composting process. The composting process may become inhibited when moisture falls below approximately 40 percent. Water used for moisture control must be free of deleterious substances.

**Pile Configuration.** Compost piles for windrowed and static piles should be triangular to parabolic in cross-sectional form with a base width to height ratio of about 2 to 1. Increased surface area favorably affects evaporation and natural aeration and increases the area exposed to infiltration from precipitation in uncovered stacks. Aligning piles north to south and maintaining moderate side slopes maximizes solar warming. Windrows should be aligned to avoid accumulation of precipitation.

**Composting Period.** The time needed for completion of the process varies with the material and must continue until the material reaches a stability level at which it can be safely stored without creating undesirable odors and poor handling features. Acceptable stability occurs when microbial activity diminishes to a low level. Stability can be obtained in about 21-28 days but can require up to 60 days to produce the desired quality. Visual inspection and temperature measurements will provide needed evaluation of compost status.

**Storage.** Provide properly designed storage facilities sized for the appropriate storage period. Protect composted material from the weather by roofs or other suitable covers. Structures must meet the requirements of conservation practice standard, "Waste Storage Structure," Code 313.

## Operation Criteria

**Temperature.** For best results, operating temperature of the composting material should be 130 F to 170 F once the process has begun. It should reach operating temperature within about 7 days and remain elevated for up to 14 days to facilitate efficient composting. The material should remain at or above 110 F for the remainder of the designated composting period.

If temperature falls significantly during the composting period and odors develop, or if material does not reach operatingtemperature, investigate piles for moisture content, porosity, and thoroughness of mixing. Compost managed at the required temperatures will favor destruction of any pathogens and weed seeds.

**Aeration.** Heat generated by the process causes piles to dehydrate. As the process proceeds, material consolidates, and the volume of voids through which air flows decreases. Materials selected for the composting mix should provide for adequate air movement throughout the composting process. Periodically turning the pile and maintaining proper moisture levels for windrows and static piles will normally provide adequate aeration.

**Nutrients.** Keep compost well aerated to minimize nitrogen loss by denitrification. Keep pH at neutral or slightly lower to avoid nitrogen loss by ammonification. High amounts of available carbon will aid nitrogen immobilization. Phosphorus losses will be minimized when the composting process is managed according to the requirements of this standard. Include compost nutrients in nutrient management plans and determine the effects of use and management of nutrients on the quality of surface water and groundwater as related to human and livestock consumption.

**Testing Needs.** Test compost material for carbon, nitrogen, moisture, and pH if compost fails to reach desired temperature or if odor problems develop. The finished compost material should be periodically tested for constituents that could cause plant phytotoxicity as the result of application to crops. Composted materials that are prepared for the retail market will require testing for labeling purposes.

## Plans, Specifications, and Operation and Maintenance.

Plans and specifications for organic composting facility shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. A written operation and maintenance plan shall be developed with full knowledge and input of the owner-operator and included with the documents provided to the owner-operator.

# SOIL CONSERVATION SERVICE

## PRACTICE STANDARD
(Texas Addendum)

## COMPOSTING FACILITY (DEAD POULTRY)

This addendum serves as an integral part to the companion Standard of the National Handbook of Conservation Practices. The contents of this addendum magnify national guidance and implement experience factors important to the installation of this practice under the range of conditions found within Texas. Criteria or guidance contained herein addresses items to be conformed to in addition to satisfying the items of the Standard in the National Handbook of Conservation Practices.

Condition Where Practice Applies: This practice applies where dead birds generated by normal mortality from poultry production facilities poses an environmental threat to soil, water, and air resources. This practice does not apply to catastrophic losses associated with atmospheric phenomena such as extremely high or low temperatures, high winds, collapse of buildings, etc.

Federal, State, and Local Laws: Those designing dead poultry composting will strictly adhere to all state and local laws, rules and regulations. The poultry producer will be responsible for securing any necessary permits to install the required structures and for properly managing the unit on a daily basis.

Planning Considerations:

1. Composting facilities should not be located on a flood plain unless protected from inundation or damage from a 25-year storm event.

2. Composting facilities should be located as near to the source of birds as practical. The composting unit may be attached or integrated into the design of a manure dry stack structure.

3. The composter will not be designed to process bird mortality from other farms.

4. Practice Effects - Water Quantity and Water Quality

   The application of compost on the land may improve soil tilth, increase water holding capacity and infiltration, and reduce erosion and peak discharge. Microbial action in the surface layer in the soil may also be increased.

   A. Water Quantity

      The quantity of available surface water may be reduced as runoff is decreased and soil infiltration is increased.

The quantity of ground water may increase with increased infiltration and percolation.

B. Water Quality

Sediment and pollutants attached to sediment which may be transported to surface waters may decrease through a decrease in runoff and increase in soil infiltration.

The increased microbial action in the soil surface layers may cause a reaction which assists in controlling pesticides and other pollutants by keeping them in place in the field.

Design Criteria: Composting is enhancing the opportunity for natural processes and organisms to break down dead poultry into a usable material. Mixing of select materials in the right proportions will speed the composting process without offensive odors. As part of the two-stage composting process, the following materials and proportions should be used:

| Materials* | By Volume | By Weight |
|---|---|---|
| Dead birds | 1.0 | 1.0 |
| Poultry manure | 2.0 | 1.5 |
| Straw or hay | 1.0 | 0.1 |
| Water | 0.2 | 0.3 |

*See Figure 1 for layering details.

Both primary and secondary composting should be operated under roof cover and on a concrete floor. The area provided should be adequate for both stages of composting as well as area for straw and manure material used in the composting layers. The floor area not under the compost bins may be left as soil if preferred. Provision for water should also be made.

Composting Volume: The total composting volume required for a farm may be estimated by the following formula:

$$\text{Volume} = \frac{B \times M \times W \times VF}{T}$$

where:
Volume = Volume required for each stage (cu.ft.)
B = Number of birds in flock
M = Mortality rate (percent loss expressed as a decimal)
W = Average market weight of bird (pounds)
VF = Volume factor of 2.5 cu.ft./lb of dead birds
T = Flock life, or number of days for animal to reach market weight

This volume formula will be appropriate for broilers, turkeys, layers, ..rnish hens, etc. Each stage of the two-stage composting process must ..ve this volume.

The total calculated composting volume is divided by the volume of the individual composting bin to determine the number of bins required. A bin is typically 5 feet high, 8 feet wide, and 5 feet deep. However, the width should be 2-3 feet wider than the loading and mixing bucket. The bin size for second stage composting should be the same as for the first stage or have area available of equal total volume. The following table provides suggested design factors for various types of birds to determine first stage volume requirements:

Table 1. Poultry data and first stage composter design factors.

| Poultry Type | Loss* Rate (%) | Flock Life (wks) | Cycles Per Year | Average Market Weight (lbs) |
|---|---|---|---|---|
| Broiler | 4.5-5.5 | 6-7 | 5.5-6 | 4.2 |
| Roaster | | | | |
| Females | 3 | 6 | 4 | 4.0 |
| Males | 8 | 10 | 4 | 7.5 |
| Laying Hens | 14 | 60-65 | 0.9 | 4.5 |
| Breeding Hens | 10-12 | 60-65 | 0.9 | 7-8 |
| Breeders-Males | 20-25 | 40-45 | 1.1 | 10-12 |
| Turkey-Females | 5-6 | 13-14 | 3 | 14 |
| Turkey-Lgt.Tom | 9 | 16-16.5 | 3 | 24 |
| Turkey Feather Production | 12 | 18-18.5 | 2.5 | 28-32 |

*Loss rate of mortality based on the entire flock life

Loading the Primary Composter: For the primary (first stage) composting, the material is place in bins in layers according to the following sequence (see Figure 1):

1. One foot of dry manure should be placed on the floor of the bin. This manure is not a part of the recipe.

2. A 6-inch layer of loose straw is placed on top of the manure to aid aeration under the carcasses.

3. A layer of carcasses is added. Place carcasses 6-inches or more from edge of bin. A 12-inch layer of manure is placed on top of carcasses.

4. Water is added according to the recipe. This completes the first batch.

5. The second and each subsequent batch starts with a layer of straw, then a layer of carcasses, then a layer of manure, with each added in accordance with recipe proportions. Finally, the water is sprinkled over the top of each batch according to the recipe proportion. Place boards across front of bin to contain layer material.

6. Partial layers for small flocks and/or young birds shall be covered with manure that day with remaining portion of layer continued the next day.

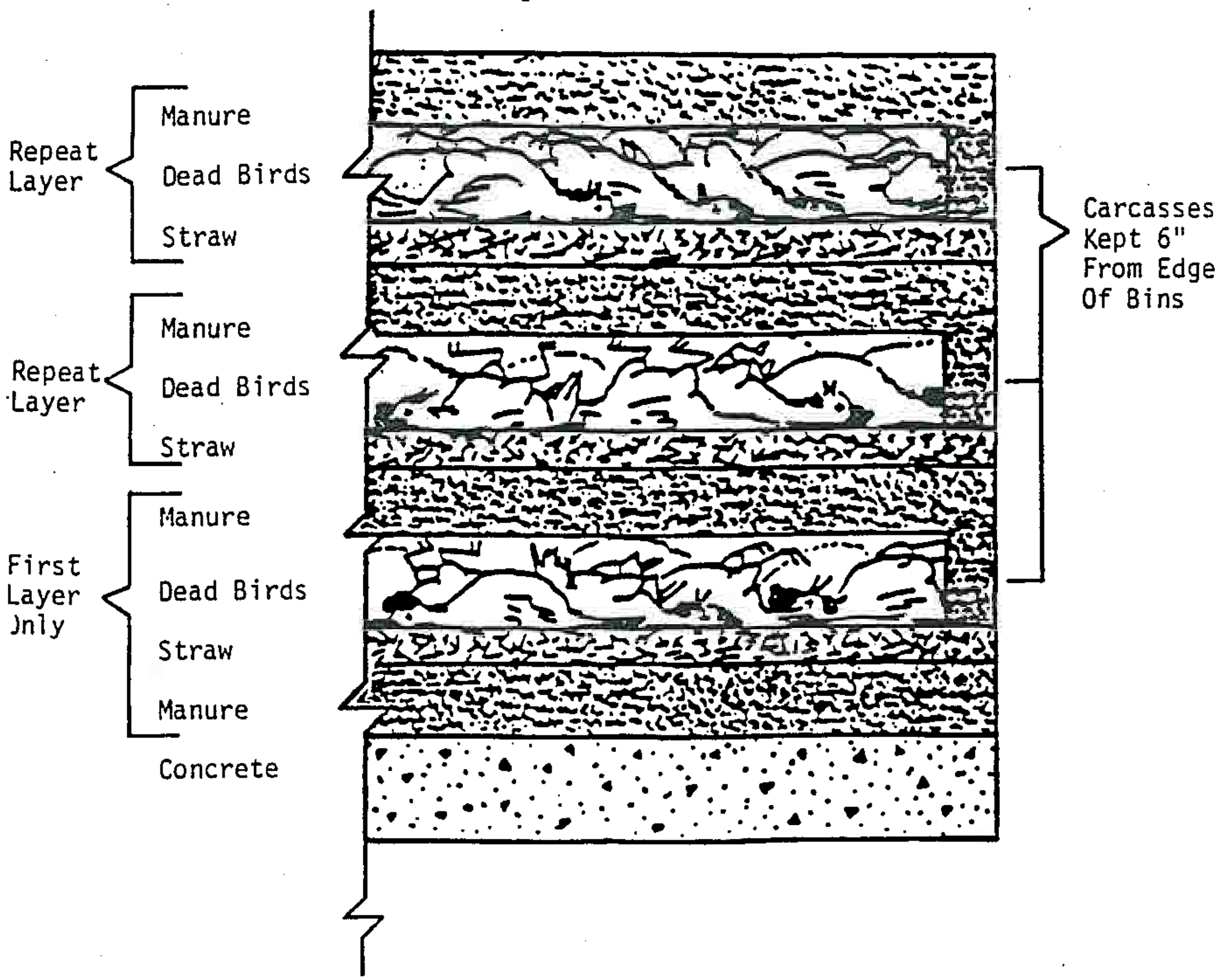



Figure 1. Cross Sectional Drawing of Compost Bin.

Operation of Compost System: The composting process uses a simple mixture of dry poultry manure, poultry carcasses, wheat straw, and water. (Other carbon sources such as peanut hulls, cotton seed hulls, etc. may be used in place of straw.) The components of the mixture must be added according to the proportions shown in Table 2 to ensure proper growth of the bacteria and fungi needed for decomposition. It must be loose enough to permit oxygen penetration. In general terms, the C:N ratio of the original mix in the primary composter needs to be 10-15. This will provide a finished compost at 20 days with a C:N of 20-25.

Once the weight of a day's poultry carcasses is determined, the other elements can be weighed out according to Table 2. The elements should be weighed in appropriate containers until volume proportions can be determined and compared with the amounts contained in the bucket of the front-end loader. Table 2 provides approximate proportions based on volume.

Ingredients:

Table 2. Recipe of material proportions for composting.

| Ingredient | Volumes | Weights | C:N Ratio |
|---|---|---|---|
| Poultry Carcasses | 1.0 | 1.0 | 5 |
| Manure | 2.0 | 1.5 | 15 |
| Wheat Straw | 1.0 | 0.1 | 85 |
| Water* | 0.2 | 0.3 | 0 |

*More or less water may be added to ensure a mixture that is moist but not saturated. Adding the right amount of water may be critical to the success of the operation (about 1.0 gallon per every 30-35 pounds of dead birds). A hose can be used to deliver the correct amount of water based on time to deliver the needed weight. The moisture content should be maintained at about 20 percent (should not be dusty or stick to shovel). Water shall be added daily with each new layer of dead birds. This is a vitally important part of the process, since a mixture that is too wet will not function properly.

Monitoring Temperatures: A 36-inch probe-type thermometer with a rigid protective covering for the probe should be used to monitor temperature within the pile. It may be possible for the temperature to rise above the normal range and create conditions suitable for spontaneous combustion. This can be avoided if (1) temperatures are monitored daily and any unusual extremes are detected early and (2) the pile kept at normal depths that do not create conditions typically found in manure stacks which spontaneously combust. If temperatures exceed the 160° F., the material should be removed from the bin, spread on the ground in an area away from buildings, and saturated with water to prevent spontaneous combustion. If temperatures of 130° F. are not achieved during the composting process, the resulting compost shall be incorporated immediately after land application.

Loading the Secondary Composter: Once the temperature peaks and begins to drop in the top layer of the first stage composter, move the entire contents of the bin to the second stage unit. Stage 2 of the composter may be a series of bins equivalent in size and number to the first stage bins. It may also be a single large bin capable of handling all of the material from the first stage bins. Unloading and loading shall be done in a manner that assures maximum mixing of the composted material.

Removing the material from the first stage composter achieves two important results. It improves the homogeneity of the mass and provides aeration needed to reactivate the bacteria. If a front-end loader is used to move the material, the bucket can be raised high enough to allow the material to drop into the secondary unit and, thus, provide the necessary aeration and mixing. The temperature in the new cell will begin to rise as bacterial activity is renewed and will peak in approximately 7-10 days. The temperature in Stage 2 should be monitored as in the primary stage.

Storing the Compost: Although the compost can be directly land applied after second stage composting, it is recommended that the material be stored under cover and be allowed to "rest" for at least 30 days. The material in dry storage should not be piled higher than 7 feet to reduce the potential for spontaneous combustion. In addition, it should not come in contact with any manure stored in the same facility. Storage will allow the compost to dry, allowing greater ease in handling.

Land Applying the Compost: Land application of compost shall be at recommended agronomic rates in accordance with SCS Standard and Specifications for Waste Utilization. The nutrient content of the compost is approximated as follows:

| Total Nitrogen | Organic Nitrogen | $NH_4N$ | $P_2O_5$ | $K_2O$ |
|---|---|---|---|---|
| (Pounds per ton of compost) | | | | |
| 40 | 30 | 10 | 20 | 25 |

In the absence of local laboratory analysis, the above nutrient content may be used to determine the land application rates. The nutrient requirements for any particular crop should be based on a current soil test.

Since 70 percent of the total nitrogen in dead bird compost is in organic form, the compost will act as a slow release fertilizer. (The nitrogen in broiler litter is mostly mineralized N and will be available more readily than the N in compost.) This characteristic of compost allows better utilization of the nitrogen by the crop and also reduces the potential for movement to ground and surface waters. Utilization of the compost material for land or other application should consider prevailing winds, neighboring dwellings, and visual effects.

Since dead bird compost is relatively moist as compared to dry broiler litter, care is needed in selecting land application equipment suitable for both dry litter and compost. Application equipment must be calibrated frequently to avoid over application.

Maintaining the Structures: The compost structure should be inspected at least twice each year when the facility is empty. Replace deteriorated wooden parts or hardware. Patch concrete floors and curbs as necessary to assure water tightness. Roof structures should be examined for structural integrity and repaired as needed.

The access road to the composting area should be maintained as an all-weather road for use during adverse weather periods. Areas in the composting structure for storage of straw and manure used in the compost layering should be readily accessible from the access road entrance.

# SOIL CONSERVATION SERVICE

## CONSTRUCTION SPECIFICATIONS
## (Texas)

## COMPOSTING FACILITY (DEAD POULTRY)

1. SCOPE

Work shall consist of constructing the dead bird composting facility and includes site preparation, concrete, water line, and building material to the location and elevations shown on the drawings or as staked in the field.

2. PUBLIC AND PRIVATE UTILITIES

Utilities are defined to be overhead and underground power or communication lines, and pipelines. All utilities discovered to be in the work area are shown on the drawings or sketches. However, the absence of indicators on the drawings or sketches does not assure th nonexistence of utilities in the work area. The contractor is alerted to conduct his own search and discovery for utilities in order to lessen or avoid potential damages.

3. SITE PREPARATION

The construction site shall be cleared of all trees, stumps, roots, brush, boulders, sod and debris. All material not suitable for subgrade shall be removed from foundation areas and replaced with compacted earth fill.

The area shall be shaped, graded, and filled, if necessary, to provide a slope away from the structure for drainage. Any fill material used shall be free from all sod, roots, frozen soil, stones over 6" in diameter, and other objectionable material. Fill material shall be compacted with at least one pass of construction equipment over the entire surface of each layer placed. Layers should be less than 12" thick.

4. BUILDING MATERIALS

All concrete materials and construction procedures shall be in accordance with reinforced concrete construction specifications. Cement shall be air entrained (Type 1A). The minimum compressive strength of the concrete shall be 3,000 psi at 28 days.

The concrete floor shall be reinforced with wire mesh and be at least 5" thick. A 12" footer with reinforcement bars shall be placed around the perimeter of the floor. Building access locations for front-end loaders and other equipment shall provide additional reinforcement as needed. Reinforcement steel shall be of the designated size, shall be placed at locations shown on the drawings, and shall be securely tied.

Water line shall be of acceptable plastic or iron pipe. Water hydrant access point(s) shall be at a convenient location, supported by a post, and be provided with a gravel drain.

All lumber, posts, and timbers shall be pressure treated. Roof truss design and support shall be in accordance with local government codes and follow manufacturer's standard dimensions.

VEGETATION

A protective cover of vegetation shall be established on all exposed surfaces of fills, borrow areas, or other disturbed areas. Newly vegetated areas shall be fenced where necessary to protect the vegetation.

CONSTRUCTION DETAILS

# Preliminary Compost Participants

[redacted]
Broilers
Tabor fine sandy loam

[redacted]
Hens
Dimebox clay

[redacted]
Turkeys
Edge fine sandy loam

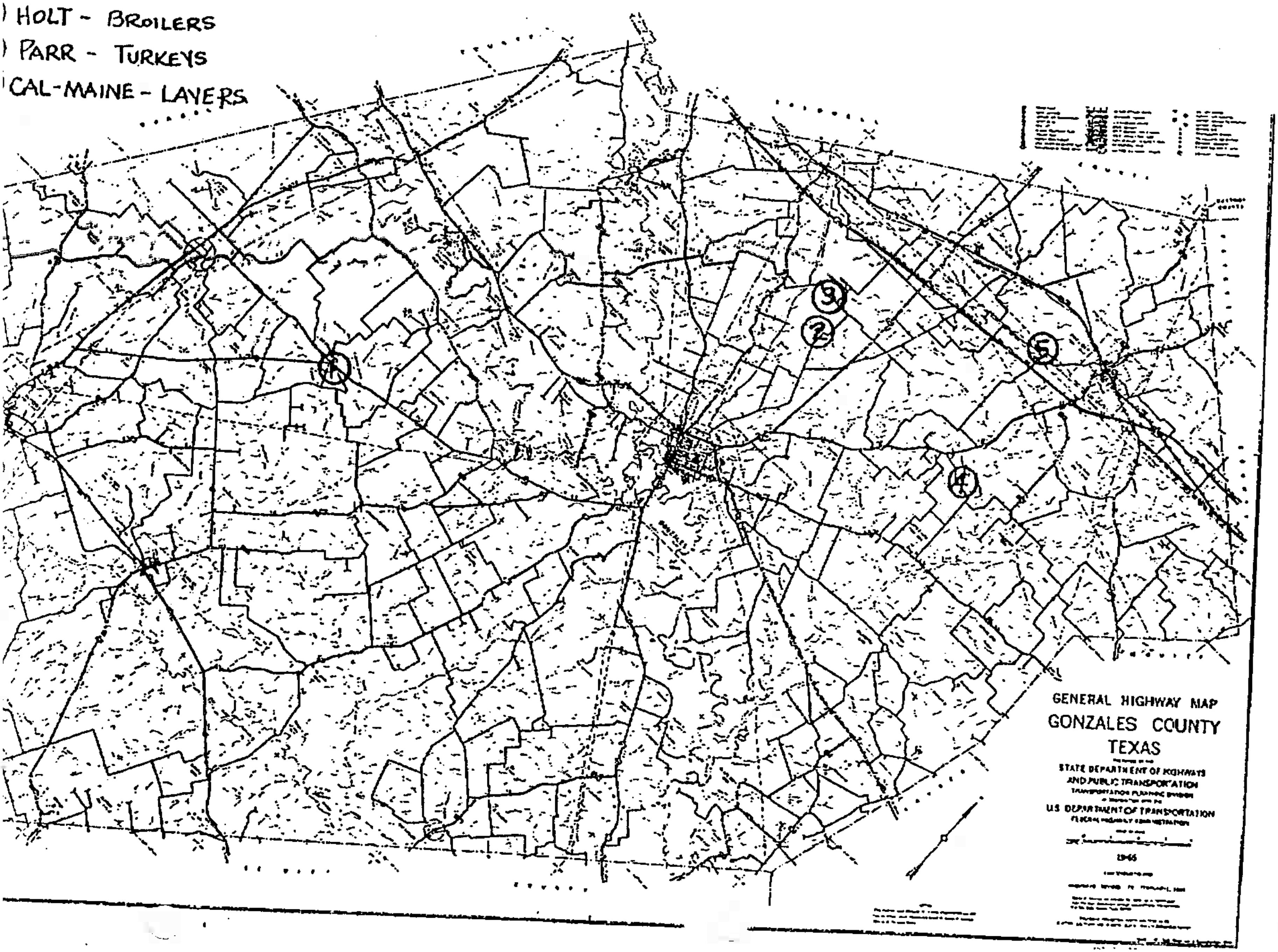
[redacted]
Turkeys

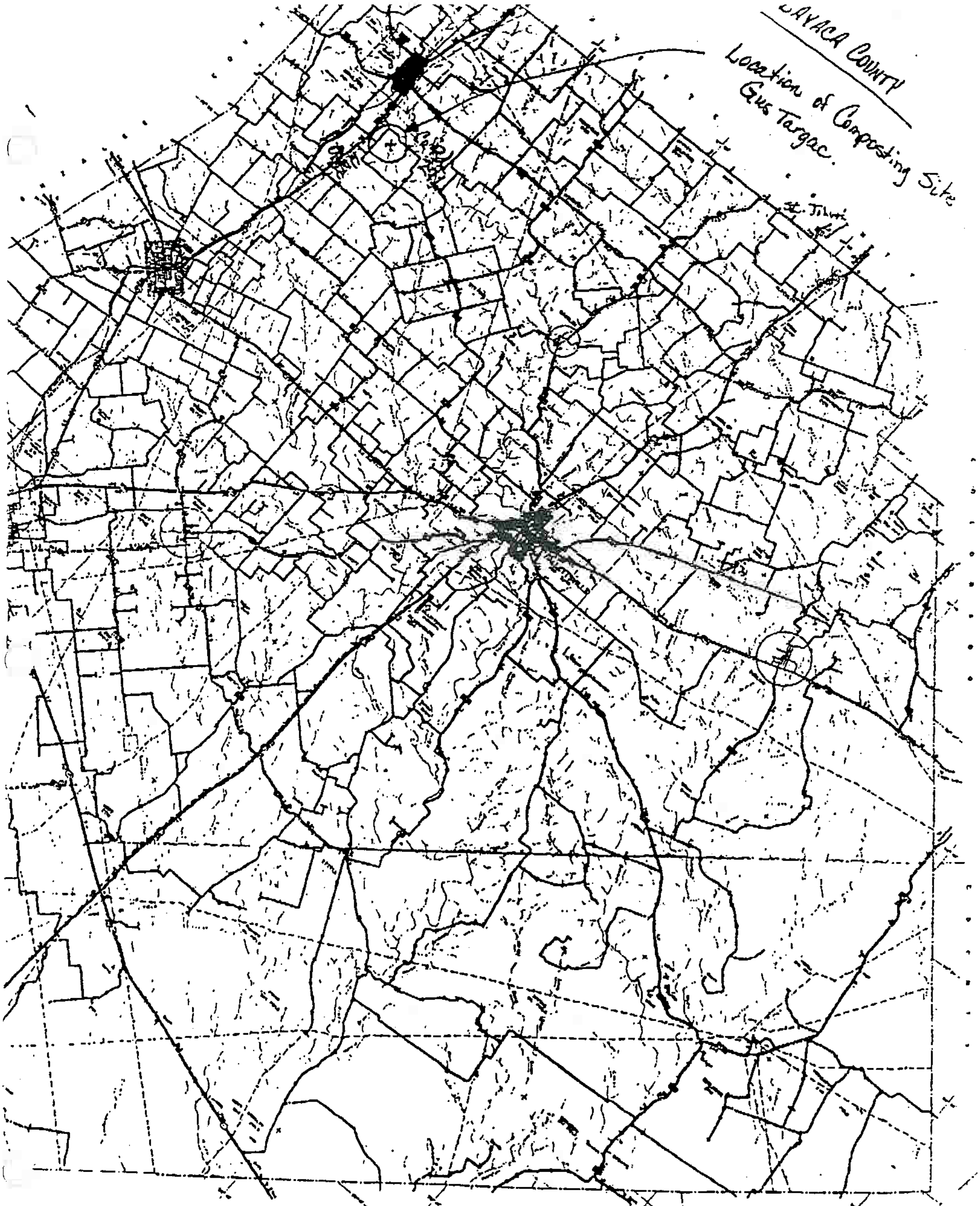
[redacted]
Hens
Benchley clay loam

[redacted]
Broilers
Carbengle loam and Frelsburg clay

Crocket fine sandy loam

) REILEY - LAYERS
) GINTER - TURKEYS
) HOLT - BROILERS
) PARR - TURKEYS
CAL-MAINE - LAYERS




LAVACA COUNTY
Location of Composting Site
Gus Targac.

# APPENDIX B

## Natural Resources Conservation Service Nutrient Mangaement Practices

# NUTRIENTMANAGEMENT WORKSHEET

PRODUCER: [illegible] DATE: 04/05/95

OPERATION (BROILER=7,ALL OTHERS=0)--) 7

## LIQUID

| | AMOUNT IN POUNDS/YR | | |
|---|---|---|---|
| | N | P2O5 | K2O |
| QUANTITY PRODUCED | 0 | 0 | 0 |
| NUTRIENTS IN POND * | 0 | 0 | 0 |
| PLANT USAGE (POTENTIAL) | 0 | 0 | 0 |
| EXCESS NUTRIENTS (LB/AC) | ERR | ERR | ERR |
| DEFICIT NEEDS (LB/AC) | 0 | 0 | 0 |

*NO TREATMENT CONSIDERED IN ONE STAGE (AEROBIC) LAGOON

## DRY MANURE

BASIS FOR NUTRIENT APPLICATION: (N=1,P2O5=2)=) 1

| | AMOUNT IN POUNDS/YR | | | MANURE/LITTER ** |
|---|---|---|---|---|
| | N | P2O5 | K2O | TOTAL TONS |
| QUANTITY PRODUCED | 26,012 | 30,635 | 21,270 | 444 |
| PLANT USAGE (POTENTIAL) | 34,842 | 0 | 1,911 | 444 |
| EXCESS NUTRIENTS (LB/AC) | 0 | 196 | 124 | 0 |
| DEFICIT NEEDS (LB/AC) | 57 | 0 | 0 | |

** Based On Nitrogen

APPLICATION RATE, TONS/AC (MINIMUM 2 TONS)==) 3

## PLANNED APPLICATION SUMMARY

| LIQUID | | | | AMOUNT IN POUNDS N | P2O5 | K2O |
|---|---|---|---|---|---|---|
| FIELD | 0 | ACRES | 0.00 | 0 | 0 | 0 |
| FIELD | 0 | ACRES | 0.00 | 0 | 0 | 0 |
| FIELD | 0 | ACRES | 0.00 | 0 | 0 | 0 |
| FIELD | 0 | ACRES | 0.00 | 0 | 0 | 0 |
| | | TOTALS | 0.00 | 0 | 0 | 0 |

| DRY MANURE | | | | AMOUNT IN POUNDS N | P2O5 | K2O |
|---|---|---|---|---|---|---|
| FIELD | 1 | ACRES | 10.00 | 920 | 0 | 0 |
| FIELD | 2-3 | ACRES | 36.00 | 10,512 | 0 | 0 |
| FIELD | 5 | ACRES | 61.00 | 8,906 | 0 | 0 |
| FIELD | | ACRES | | 0 | 0 | 0 |
| FIELD | 4 | ACRES | 49.00 | 14,504 | 0 | 1,911 |
| FIELD | | ACRES | | 0 | 0 | 0 |
| | | TOTALS | 156.00 | 34,842 | 0 | 1,911 |

REMARKS:

NOTE: Phosphorus levels should be monitored regularly by soil test and manure application should be made to fields less than VERY HIGH ((500 #/Ac) in PHOSPHATE levels. If VERY HIGH, apply only yearly plant requirements for P2O5 or make application to a new field.

04/05/95

# MANURE PRODUCTION DATA FOR CONFINED ANIMAL FEEDING OPERATIONS

TYPE OF ANIMAL (Dairy=0, Swine=1, Laying Hens=2, Beef Feedlot=3, Sheep Feedlot=4, Horses=5, Turkeys=6, Broilers=7) => 7

Feeding Facilities For: Broilers

| | Buildings, Concrete Pens & Alleys | Open Lots | Total |
|---|---|---|---|
| Number of Animals | 0 | 75000 | |
| Average Liveweight per Head, lbs/hd | 0 | 2 | |
| Total Liveweight, lbs | 0 | 150000 | |
| Confinement Period, hours/hd/day | 0.00 | 16.62 | 16.62 |
| Adjusted Total Liveweight, lbs | 0 | 103875 | 103875 |
| Wet Manure Production, lbs/day | 0 | 10180 | 10180 |
| Dry Manure Production, lbs/day | 0 | 2431 | 2431 |
| Dry Manure Production, tons/year | 0 | 444 | 444 |
| Volatile Solids (VS) Production, lbs/day | 0 | 1891 | 1891 |
| Total Nitrogen Production, lbs/day | 0 | 139 | 139 |
| Total Phosphorus (P2O5), lbs/day | 0 | 84 | 84 |
| Total Potassium (K2O), lbs/day | 0 | 58 | 58 |
| Sodium Production, lbs/day | 0 | 2 | 2 |
| COD Production, lbs/day | 0 | 3532 | 3532 |
| BOD5 Production, lbs/day | 0 | 623 | 623 |

04/05/95

LAND AREA FOR DISPOSAL OF MANURE OR EFFLUENT FROM TREATMENT LAGOONS, BASED ON PLANT-AVAILABLE NITROGEN (PAN)

| | | Buildings | | Open Lots | |
|---|---|---|---|---|---|
| Total Daily Nitrogen Production | = | 0 | more-) | 139 | lbs/day |
| Total Annual Nitrogen Production | = | 0 | more-) | 50805 | lbs/yr |
| Percent Nitrogen Loss from manure storage or treatment system* | =) | 20 | more-) | 20 | percent |
| Annual Nitrogen Loss from manure storage or treatment system | = | 0 | more-) | 10161 | lbs/yr |
| Total Annual Nitrogen Remaining | = | 0 | more-) | 40644 | lbs/yr |
| Availability of Nitrogen in Manure or Effluent, % (Normal range is 80-95% in lagoon effluent; 50-80% in fresh or pit-stored manure; or 40-50% in feed lot manure) | =) | 80 | more-) | 80 | percent |
| Annual Plant-Available Nitrogen (PAN) Applied to Soil | = | 0 | more-) | 32515 | lbs/yr |
| PAN Losses from Soil Surface Application ** | =) | 20 | more-) | 20 | percent |
| PAN Losses from Soil Surface Application | = | 0 | more-) | 6503 | lbs/yr |
| PAN Entering Soil | = | 0 | more-) | 26012 | lbs N/yr |

Land Required for Various PAN Application Rates:

| Assumed PAN Application Rate, lbs/ac/yr | | Buildings Acres | | Open Lots Acres | | Total Acres |
|---|---|---|---|---|---|---|
| 100 | = | 0 | + | 260 | = | 260 |
| 150 | = | 0 | + | 173 | = | 173 |
| 200 | = | 0 | + | 130 | = | 130 |
| 300 | = | 0 | + | 87 | = | 87 |
| 400 | = | 0 | + | 65 | = | 65 |

* Nitrogen Loss from Lagoon Surface--Normal loss is 40-65% for primary treatment lagoons with 200 days or more storage; 10-20% from liquid manure settling basins or storage pits; and 40-50% from open feedlot surface.

** Normal range of nitrogen loss from soil surface is 15-35% for surface application or, 5% for soil injection. Losses are highest in warm weather and on high pH soils.

# MANURE APPLICATION

PRODUCER:  DATE: 04/05/95

FIELDS 1 ACRES 10.00

VEGETATION: Common bermudagrass
LANDUSE: Pastureland

| | N | P205 | K20 |
|---|---|---|---|
| Plant use - lbs/acre | 100.00 | 20.00 | 60.00 |
| Less soil test | 8.00 | 621.00 | 336.00 |
| Net lbs/acre | 92.00 | 0.00 | 0.00 |
| TOTAL (lbs/acre x acre) | 920 | 0 | 0 |

FIELDS 2-3 ACRES 36.00

VEGETATION: Coastal bermudagrass
LANDUSE: Pasture/Hayland

| | N | P205 | K20 |
|---|---|---|---|
| Plant use - lbs/acre | 300.00 | 100.00 | 300.00 |
| Less soil test | 8.00 | 621.00 | 336.00 |
| Net lbs/acre | 292.00 | 0.00 | 0.00 |
| TOTAL (lbs/acre x acre) | 10,512 | 0 | 0 |

FIELDS 5 ACRES 61.00

VEGETATION: Alicia bermudagrass
LANDUSE: Pastureland

| | N | P205 | K20 |
|---|---|---|---|
| Plant use - lbs/acre | 150.00 | 30.00 | 100.00 |
| Less soil test | 4.00 | 672.00 | 442.00 |
| Net lbs/acre | 146.00 | 0.00 | 0.00 |
| TOTAL (lbs/acre x acre) | 8,906 | 0 | 0 |

FIELDS ACRES

VEGETATION:
LANDUSE:

| | N | P205 | K20 |
|---|---|---|---|
| Plant use - lbs/acre | | | |
| Less soil test | | | |
| Net lbs/acre | 0.00 | 0.00 | 0.00 |
| TOTAL (lbs/acre x acre) | 0 | 0 | 0 |

FIELDS 4 ACRES 49.00

VEGETATION: Common bermudagrass
LANDUSE: PASTURE/HAYLAND

| | N | P205 | K20 |
|---|---|---|---|
| Plant use - lbs/acre | 300.00 | 60.00 | 200.00 |
| Less soil test | 4.00 | 285.00 | 161.00 |
| Net lbs/acre | 296.00 | 0.00 | 39.00 |
| TOTAL (lbs/acre x acre) | 14,504 | 0 | 1,911 |

FIELDS ACRES

VEGETATION:
LANDUSE:

| | N | P205 | K20 |
|---|---|---|---|
| Plant use - lbs/acre | | | |
| Less soil test | | | |
| Net lbs/acre | 0.00 | 0.00 | 0.00 |
| TOTAL (lbs/acre x acre) | 0 | 0 | 0 |

Table 1 (continued)
Nutrient Recommendation verses Crop Yield Goals 1/

| Crop | Yield Goal/Acre | N | P205 | K20 |
| --- | --- | --- | --- | --- |
| Perennial grass | 2 Tons | 100 | 50 | 100 |
| (Improved | 4 Tons | 200 | 50 | 150 |
| bermudagrass, | 6 Tons | 300 | 100 | 300 |
| Switchgrass) | 8 Tons | 400 | 110 | 350 |
| (Hay) | 10 Tons | 500 | 120 | 400 |
| | 12 Tons | 600 | 130 | 400 |
| Perennial grass | 2 AUM | 50 | 10 | 30 |
| (Imp.Bermuda | 4 AUM | 100 | 20 | 60 |
| Switchgrass) | 6 AUM | 150 | 30 | 100 |
| (Grazing) | 8 AUM | 200 | 40 | 130 |
| | 10 AUM | 250 | 50 | 160 |
| | 12 AUM | 320 | 50 | 200 |
| Perennial grass | 2 Tons | 100 | 20 | 60 |
| (Common bermuda | 4 Tons | 200 | 40 | 120 |
| Imp. bluestem | 6 Tons | 300 | 60 | 200 |
| Lovegrass | 8 Tons | 400 | 70 | 250 |
| Bahiagrass | 10 Tons | 500 | 80 | 350 |
| Kleingrass | 12 Tons | 600 | 100 | 400 |
| Buffelgrass) | | | | |
| (Hay) | | | | |
| Perennial grass | 2 AUM | 50 | 10 | 30 |
| (Common bermuda | 4 AUM | 100 | 20 | 60 |
| Imp. bluestem | 6 AUM | 150 | 30 | 100 |
| Lovegrass | 8 AUM | 200 | 40 | 130 |
| Bahiagrass | 10 AUM | 250 | 50 | 160 |
| Kleingrass | 12 AUM | 320 | 50 | 200 |
| Buffelgrass) | | | | |
| (Grazing) | | | | |
| Peanuts | 1000 lbs/ac | 0 | 20 | 40 |
| | 1500 lbs/ac | 0 | 20 | 60 |
| | 2000 lbs/ac | 0 | 30 | 80 |
| | 2500 lbs/ac | 0 | 40 | 100 |
| | 3000 lbs/ac | 0 | 50 | 120 |
| | 4000 lbs/ac | 0 | 60 | 160 |

1/ Amounts are average crop requirements. Fertilizer recommendations should be based on the above crop requirements, minus soil nutrient levels identified by a soil test. Actual recommendations will be slightly to significantly lower than the nutrient levels listed.

Table 1

Nutrient Recommendation verses Crop Yield Goals 1/

| rop | Yield Goal/Acre | N | P205 | K20 |
|---|---|---|---|---|
| lfalfa | 2 tons/ac | 20 | 40 | 120 |
| (dryland) | 4 tons/ac | 20 | 60 | 240 |
| (irrigated) | 6 tons/ac | 20 | 90 | 360 |
| | 8 tons/ac | 20 | 120 | 480 |
| | 10 tons/ac | 20 | 150 | 600 |
| | 12 tons/ac | 20 | 180 | 720 |
| orn | 75 - 99 bu | 75 - 100 | 60 | 80 |
| | 100 - 149 bu | 110 - 165 | 80 | 130 |
| | 150 - 200 bu | 180 - 240 | 80 | 140 |
| otton | 1.0 bale | 40 | 40 | 30 |
| | 1.5 bales | 60 | 60 | 50 |
| | 2.0 bales | 80 | 80 | 80 |
| | 2.5 bales | 100 | 80 | 80 |
| ain Sorghum | 1500 - 2000 lbs | 30 - 40 | 20 | 20 |
| | 2000 - 4000 lbs | 40 - 80 | 40 | 80 |
| | 4000 - 6000 lbs | 80 - 120 | 60 | 100 |
| | 6000 - 8000 lbs | 120 - 160 | 80 | 120 |
| heat | 20 - 30 bu | 40 - 60 | 20 | 20 |
| Grain | 30 - 40 bu | 60 - 80 | 40 | 30 |
| and | 40 - 60 bu | 80 - 120 | 40 | 40 |
| Grazing | 60 - 80 bu | 120 - 160 | 60 | 60 |
| | 80 - 100 bu | 160 - 200 | 60 | 60 |
| heat | 20 - 30 bu | 30 - 40 | 20 | 20 |
| Grain | 30 - 40 bu | 40 - 60 | 40 | 30 |
| only | 40 - 60 bu | 60 - 90 | 40 | 40 |
| | 60 - 80 bu | 90 - 120 | 60 | 60 |
| | 80 - 100 bu | 120 - 150 | 60 | 60 |
| orghum | 1 cutting (2 Tons) | 80 | 40 | 40 |
| and | 2 cutting (4 Tons) | 160 | 60 | 60 |
| udan | 3 cutting (5 Tons) | 200 | 80 | 80 |

/ Amounts are average crop requirements. Fertilizer ecommendations should be based on the above crop equirements, minus soil nutrient levels identified by a soil test. Actual recommendations will be slightly to significantly lower than the nutrient levels listed.

Table 1 (continued)
Nutrient Recommendation verses Crop Yield Goals 1/

| Crop | Yield Goal/Acre | N | P205 | K20 |
| --- | --- | --- | --- | --- |
| Rice | 80 bu/ac | 60 | 40 | 90 |
| | 100 bu/ac | 70 | 50 | 120 |
| | 130 bu/ac | 90 | 60 | 150 |
| Soybeans | 30 bu/ac | 0 | 20 | 40 |
| | 40 bu/ac | 0 | 30 | 60 |
| Sunflower | 1000 lbs/ac | 50 | 20 | 30 |
| | 3000 lbs/ac | 150 | 60 | 110 |

1/ Amounts are average crop requirements. Fertilizer recommendations should be based on the above crop requirements, minus soil nutrient levels identified by a soil test. Actual recommendations will be slightly to significantly lower than the nutrient levels listed.

# APPENDIX C

## Standard Operating Procedures for the

## Texas Agricultural Extension Service Soil, Water and Forage Testing LaboratoryD

# SOIL TESTING PROCEDURES
March 1980

## SOIL FERTILITY

Soil Testing Laboratory
Texas Agricultural Extension Service
Texas A&M University System
College Station, Texas
Lubbock, Texas
Seymour, Texas

CONTENTS

Appendix

## INTRODUCTION

This Soil Testing program uses analytical chemical procedures for estimating the fertility status of soils and provides factual data on the supply of extractable plant nutrients. The extractable plant nutrients are believed to be a measure of the ability of a soil to provide plant nutrients in the soil solution which are "available" to the plant. The use of soil test results as a basis of an advisory service to producers for making decisions in fertilizer use is based on research data of crop responses to fertilizer applications. The analytical procedures for plant nutrients used in the Texas Agricultural Extension Service laboratories have been developed over a long period of time and have been correlated and calibrated with a great deal of research data provided by research scientists in the Texas Agricultural Experiment Station. These procedures and the fertilizer recommendations have been developed as a result of the wide diversity of soils and crops in Texas and have been found to be applicable to soils having a wide range of pH values, calcium content and clay mineralogy. The procedures for the micronutrients zinc, iron, manganese and copper developed by Dr. W. L. Lindsay in Colorado have been adopted in Texas.

The philosophy of the soil testing program in Texas can be stated briefly in the following points:

1. Assay the adequacy of the supply of each plant nutrient in the soil based on a careful and thorough soil testing program.
2. Suggest the use of plant nutrients based on two considerations:
   a. Application of plant nutrients only if the soil supply is inadequate for desired crop yield and maintenance of soil supplies. Plant nutrient use is not recommended for crops on soils that are able to supply adequate amounts for the desired crop yield.
   b. The level of production desired or yield goal. Higher levels or production require more nutrients at a given soil supply (soil test rating) than lower levels of production.
3. The predicting capability of a soil testing program is based on:
   a. Calibration and correlation of soil analysis with crop yield research programs.
   b. Thorough and careful collection of soil samples to represent the area being considered.
   c. Accurate and reproducible laboratory measurements.

Dr. C. D. Welch, Extension Soil Chemist
Dr. Carl Gray, Extension Soil Chemist
Dr. Dale Pennington, Area Soil Chemist
Dr. Meiling Young, Assistant Soil Chemist

## Preparation of Soil Samples

A. Receiving

1. Open soil samples and remove information sheets and payment.
2. Transfer soil into soil drying pan. Place information sheet and payment under pan.
3. Place an identification number in pan and write this number on information sheet.
4. Estimate texture and write on information sheet.

B. Drying and Grinding

1. Place pans in drying cabinet overnight at 80°C.
2. Grind and sieve through 10 mesh stainless steel screen.
3. Place about 50 to 100 grams ground soil in soil sample storage tray. Soil identification number is transferred with soil sample.

## Analytical Procedures

I. Readily Oxidizable Organic Matter

A. Rapid Colorimetric procedure - routine determination

1. Reagents

a. 1.0 N Potassium dichromate: Dissolve 49 grams potassium dichromate in distilled water and dilute to 1 liter.

b. Concentrated sulfuric acid.

2. Procedure

a. Measure a 1 g. scoop of soil sample into a 125 ml. Erlenmeyer flask.

b. Add 10 ml. potassium dichromate solution into each sample and into an empty flask for a reagent blank.

c. Add 10 ml. conc. sulfuric acid. Let stand 30 minutes.

d. Add 60 ml. water to flasks and filter into filter tubes through sharkskin filter paper.

e. Read % transmittance in a spectrophotometer. Use a reagent blank to set 100% T.
Phototube - blue sensitive
Wavelength - 620 nm
Cuvette - ½" dia (12.5 mm)

f. Read % O.M. from graph prepared by analyzing samples of known organic matter content as determined by the Walkley-Black titration method.

B. Walkley-Black Titration Method for Detn.[1/] of Readily Oxidizable Organic Matter in Soils.

1. Reagents

   a. Potassium dichromate. 1.0 N.
      Dissolve 49.049 g. $K_2Cr_2O_7$ in water and dilute to 1 l.

   b. Ferrous ammonium sulfate. 0.5 N.
      Dissolve 196.1 g. $Fe(NH_4)_2(SO_4)_2 \cdot 6H_2O$ in 800 ml. $H_2O$ containing 20 ml. conc. $H_2SO_4$ and dil. to 1 l.

   c. Conc. $H_3PO_4$ (85%).

   d. Na F (solid).

   e. Diphenylamine Indicator.
      Dissolve 0.5 g. diphenylamine in 20 ml. $H_2O$ and 100 ml. conc. $H_2SO_4$.

2. Procedure

   a. Transfer 0.5 g. soil (weighed) into a 500 ml. Erlenmeyer flask.

   b. Add 10 ml. $K_2Cr_2O_7$ soln. from a buret.

   c. Add 20 ml. conc. $H_2SO_4$. Swirl and allow to stand 30 min.

   d. Add 170 ml. $H_2O$.

   e. Add 10 ml. $H_3PO_4$.

   f. Add 30 drops diphenylamine indicator.

   g. Titrate with $Fe(NH_4)_2(SO_4)_2$ from deep navy blue to green endpoint.

   h. Carry a reagent blank through the procedure.

3. Calculation of % O.M. (wt/wt basis)

$$\% \text{ O.M.} = 10\left(1 - \frac{\text{ml. Fe sample}}{\text{ml. Fe blank}}\right) \times 1.34$$

$$\text{Factor } 1.34 = 1.0 \times \frac{12}{4000} \times \frac{1.72}{0.77} \times \frac{100}{0.5}$$

1.0 = $\underline{N}$ $K_2Cr_2O_7$

$\frac{12}{4000}$ = meg. wt. C (4 valence)

1.72 = factor to convert % C to % O.M.

0.77 = 77% recovery of O.M. from soil.

0.5 = wt. soil sample.

1/ M. L. Jackson: Soil Chemical Analysis. 1958.

II. pH Measurement

A. pH Determination

1. Measure 10 g. of ground soil with a scoop into 50 ml. polyethylene beakers or paper cups.

2. Add 20 ml. distilled water to each sample.

3. Stir each sample and let stand 30 minutes.

4. Standardize pH meter

   a. Measure temperature of soil-water suspensions and adjust temperature compensation dial on meter to this temperature.

   b. Place electrodes in a standard buffer solution of pH 7.0 and adjust meter to read 7.0.

   c. Repeat step 4b using buffer of pH 4.0, adjusting to pH 4.0.

   d. Repeat step 4b.

   e. Read pH of pH 4.0 buffer. It should be within .1 pH unit of standard.

5. Stir each sample briefly, insert electrodes and read pH. Allow sufficient time for reading to reach a stable value.

6. Remove sample and rinse electrodes with distilled water. Save sample for determination of soluble salts.

7. Order of pH measurement of samples.

   a. Measure pH of check sample at start and after each run of 30 samples. If pH readings of check sample vary by more than ± 0.2 pH unit, locate the trouble before proceeding with further pH measurements. Recheck standardization in buffers and inspect electrodes. See appendix Sec. VIII.

   b. Determine pH of samples in batches of 10.

   c. At the end of each batch of 10 samples, recheck first sample in batch. If reading is off more than 0.1 pH unit from first reading, take a reading of the check sample. If check sample is off by more than 0.1 pH unit, reset meter with buffer solns. If buffer readings are correct, refer to appendix Sec. VIII.

   d. If meter has to be reset recheck all of samples in the batch.

III. Water-Soluble Salts (Conductivity)

A. Measure temperature of soil sample suspension and set temperature dial on conductivity meter.

B. Turn conductivity meter on and let warm up for several minutes. (With electric eye indicator, wait until "eye" is bright and clear).

C. Fill conductivity cell with supernatant soil solution (from pH determination) or insert dip cell into supernatant solution.

D. Record conductivity reading.

E. Rinse conductivity cell between samples with distilled water.

IV. Extraction of Phosphorus, Potassium, Calcium, Magnesium and Sodium from Soil Samples

A. Reagents

1. Extracting Solution - 0.025M $H_4EDTA$ in 1.4M ammonium acetate and 1.0M hydrochloric acid, pH 4.2 to 4.3.

   a. To a 1 l. volumetric flask (in the hood) add about 400 ml. distilled water.

   b. Add 7.3 g. ethylenediaminetetracetic acid.

   c. Add 80.5 ml. glacial acetic acid.

   d. Add 96.6 ml. conc. ammonium hydroxide.

   e. Add 82.5 ml. conc. hydrochloric acid.

   f. Make to 1 l. volume with distilled water and mix.

   g. Adjust pH to 4.2 or 4.3 if necessary.

B. Procedure

1. Transfer a 1.7 cc scoop of dried, ground soil (approx. ~~2.4 g~~ 1g) to each container in a shaking tray.

2. Dispense ~~34 ml.~~ 20 of extracting solution to each soil sample. (Soil: solution ratio = 1:20 v/v)

3. Place trays on a mechanical shaker (horizontal oscillation) and shake 1 hour.

4. Filter into filter tube vials.

ICP analysis

V. Phosphorus in Soil Extracts - Ascorbic acid reduction of Mo - blue color.

A. Reagents

1. Antimony potassium tartrate solution. Dissolve 4.0 g. antimony potassium tartrate in 1000ml. distilled water.

2. Mixed Reagent

   a. To a 1 liter flask, add about 400 ml. distilled water.

   b. Add 0.5 g. ammonium Molybdate $(NH_4)_6Mo_7O_{24} \cdot 4H_2O$, and allow to dissolve.

   c. Add 5.5 ml. conc. $H_2SO_4$.

   d. Add 5.0 ml. antimony potassium tartrate soln.

   e. Make to 1 l. vol. with distilled water.

3. Color Developing Reagent. Dissolve 1.0 g. ascorbic acid in 1 l. of mixed reagent.

4. Phosphorus solutions for standard curve.

   a. Stock solution - 100 ppm P

   Transfer 0.4390 g. dried monopotassium phosphate, $KH_2PO_4$, to a 1 l. volumetric flask and make to volume with soil extracting solution.

   b. Prepare a series of standards according to the following table.

| ppm P | ml. of 100 ppm P added to 100 ml. vol. flask |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3 |
| 4 | 4 |
| 5 | 5 |
| 7.5 | 7.5 |
| 10.0 | 10.0 |

Make to volume with soil extracting soln.

V. Phosphorus in Soil Extracts (cont.)

B. Procedure

1. Transfer 1.0 ml. soil extracting soln. (or P std.) to a 1" diameter test tube (min. of 30 ml. capacity).

2. Dispense 12 ml. of color developing reagent into the samples so that the solutions are well mixed.

3. Allow blue color to develop at least 30 minutes (not over 3 hours).

4. Read color in a colorimeter.
Cuvette - ½ inch diameter
Red sensitive phototube with red filter
Wavelength - 880 nm.

C. Preparation of Standard Curve

1. Transfer 1 ml. of P standard to test tubes and develop color in same manner as for soil extracts.

2. Prepare a graph of standard curve with ppm P on the horizontal axis and colorimeter reading on the vertical axis.

D. Calculation
ppm P in soil = ppm P in Extract (from graph) X 20

V. b. Phosphorus in Soil Extracts - Stannous Chloride reduction of MO - blue color

A. Reagents

1. Molybdate reagent

   a. Dissolve 15 gms. ammonium molybdate in about 1 l. distilled deionized water.

   b. Add 300 ml. conc. hydrochloric acid.

   c. Make to 2 l. with water.

2. Stannous Chloride stock soln.

   a. Dissolve 10 gms stannous chloride in 25 ml. conc. hydrochloric acid.

3. Stannous Chloride working soln. (Prepare fresh daily).

   a. Add 1 ml. stannous chloride stock soln. to 270 ml. water.

B. Procedure

1. Transfer 3 ml. soil extract to a colorimeter tube (½" OD)

2. Add 4 ml. molybdate reagent. Mix

3. Add 2 ml. stannous chloride working soln. and mix

4. After 5 minutes, read % T in a colorimeter at 670 nm. (Red sensitive phototube).

VI. Determination of potassium, calcium, magnesium and sodium in $NH_4OAC-HCl-H_4EDTA$ soil extracts. (ICP) not AA

(These solutions for detn. of Na and K on IL flame photometer with 1:200 dilutor and calcium and magnesium on single beam AAS).

A. Solutions

1. Stock solutions

a. Potassium - 1,000 ppm K
Transfer 1.9069 g. dried KCl to a 1 liter volumetric flask and make to volume with soil extracting soln.

b. Sodium - 5,000 ppm Na.
Transfer 12.7110 g. dried NaCl to a 1 liter volumetric flask and make to volume with soil extracting soln.

c. Calcium - 2,000 ppm Ca.
Transfer 4.9956 g. dried $CaCO_3$ to a 1 liter volumetric flask. Add a little soil extracting solution to dissolve and then make to volume.

d. Magnesium - 500 ppm Mg.
Transfer 0.5000 g. Mg. (corrected for % Mg.) to a 1 liter volumetric flask, dissolve in a little conc. H Cl and make to volume with soil extracting solution.

2. Working solutions

a. Potassium - sodium. 100 ppm K - 500 ppm Na.
Transfer 100 ml. of 1,000 ppm K stock soln. and 100 ml. of 5,000 ppm Na. stock soln. to a 1 liter volumetric flask and make to volume with soil extracting soln.

b. Calcium - 200 ppm Ca.
Transfer 100 ml. of 2,000 ppm Ca. stock soln. to a 1 liter volumetric flask and make to volume with soil extracting soln.

c. Magnesium - 25 ppm Mg.
Transfer 50 ml. of 500 ppm Mg. stock soln. to a 1 liter volumetric flask and make to volume with soil extracting soln.

B. Procedure

1. Determine K and Na by flame photometer. (Set 100 ppm K to read 500 and 500 ppm Na to read 500 when using 1:200 dilutor with flame photometer).

2. Determine Ca and Mg by atomic absorption spectrophotometer. (Set 100 with 200 ppm Ca and 25 ppm Mg).

K - Reading X 4 = ppm K in Soil
Na - Reading X 20 = ppm Na in Soil
Ca - Reading X 40 = ppm Ca in Soil
Mg - Reading X 5 = ppm Mg in Soil

VII. DTPA Extraction of Zinc, Iron, Manganese and Copper from Soil Samples.

A. Reagents

1. DTPA Extraction Solution

a. Add, in order, the following items to a 5 gallon carboy.

1. About 15 liters deionized water.

2. 238.5 ml. Triethanolamine (Final conc. is 0.1 M).

3. 35.9 grams DTPA (0.005 M)
(Carboxymethyl)imino bis-(ethylenenitroso) tetra-acetic acid. (acid form)

4. 26.5 grams $CaCl_2$ (0.01 M)

5. 90 ml. conc. HCl, reagent grade. (.06 M)

b. Make to a volume of 18 liters with distilled water.

c. Adjust to pH 7.3.
(9 ml. of conc. HCl will alter pH of 18 liter volume of DTPA extraction solution about 0.1 unit).

2. Procedure

a. Transfer 1 scoop (10 grams) 10 mesh soil (ground and passed through stainless steel screen) to polythylene containers.

b. Add 20 ml. DTPA-TEA Extraction solution.

c. Shake 2 hours on horizontal rotary shaker at 150 to 170 oscillations per minute.

d. Filter through S & S 597 filter paper into 30 ml. filter tubes.

e. Determine concentrations of Zn, Fe, Mn and Cu in filtrates by AAS.

VIII. Determination of Zinc, Iron, Manganese and Copper in DTPA Soil Extracts by ~~AAS.~~ ICP

A. Reagents

1. Stock Solutions

a. Zinc - 500 ppm Zn

1. Transfer 0.500 zinc metal to a 1 liter volumetric flask.

2. Add 5 to 10 ml. conc. HCl to dissolve.

3. Make to volume with distilled water.

b. Zinc - 50 ppm

1. Transfer 10 ml. 500 ppm zinc soln to a 100 ml. volumetric flask and make to volume with DTPA soil extracting soln.

c. Iron - 1,000 ppm Fe

1. Transfer 1.000 g. iron metal to a 1 liter volumetric flask.

2. Dissolve metal in 5 to 10 ml. conc. HCl.

3. Make to vol. with distilled water. Store under a layer of mineral oil.

d. Iron - 100 ppm Fe

Transfer 10 ml. 1,000 ppm Fe soln. to a 100 ml. volumetric flask and make to volume with DTPA soil extracting solution. Store under a layer of mineral oil.

e. Manganese - 1,000 ppm Mn.

Transfer 3.0769 g. dried $MnSO_4 \cdot H_2O$ to a 1 liter volumetric flask and make to vol. with distilled water. Store under a layer of mineral oil.

f. Manganese - 100 ppm Mn.

Transfer 10 ml. 1,000 ppm Mn to a 100 ml. vol. flask and make to vol with DTPA soil extracting soln. Store under a layer of mineral oil.

A. Reagents (cont.)

g. Copper - 500 ppm Cu

1. Transfer 0.5000 g. Cu. metal to a 1 liter volumetric flask.

2. Dissolve in 5 to 10 ml. conc. $HNO_3$

3. Make to vol. with distilled water.

4. Store in a glass container.

h. Copper - 50 ppm Cu

Transfer 10 ml. of 500 ppm Cu. soln. to a 100 ml. vol. flask and make to vol. with DTPA soil extracting soln. Store in a glass container.

2. Working Standards - make all standards to 100 ml. vol. with DTPA soil extracting soln.

a. Zinc

1. 0.5 ppm Zn
1 ml. 50 ppm Zn soln. in 100 ml. vol.

2. 1.0 ppm Zn
2 ml. 50 ppm Zn soln. in 100 ml. vol.

b. Iron

1. 5 ppm Fe
5 ml. 100 ppm Fe soln. in 100 ml. vol.

2. 10 ppm Fe
10 ml. 100 ppm Fe soln. in 100 ml. vol.

c. Manganese

1. 2.5 ppm Mn
5 ml. 50 ppm Mn soln. in 100 ml. vol.

2. 5.0 ppm Mn
10 ml. 50 ppm Mn. soln. in 100 ml. vol.

d. Copper

1. 0.5 ppm Cu
1 ml. 50 ppm Cu soln. in 100 ml. vol.

2. 1.0 ppm Cu
2 ml. 50 ppm Cu soln. in 100 ml. vol.

B. Procedure

1. DTPA soil extracts are analyzed by AAS.

2. Set meter with the following solutions.

| | AAS Reading | |
|---|---|---|
| Element | 50 | 100 |
| Zinc | 0.5 ppm | 1.0 ppm |
| Iron | 5.0 ppm | 10.0 ppm |
| Manganese | 2.5 ppm | 5.0 ppm |
| Copper | 0.5 ppm | 1.0 ppm |

3. Calculation

ppm Zinc in soil = AAS Reading X .02

ppm Iron in soil = AAS Reading X .2

ppm Manganese in soil = AAS Reading X .1

ppm Copper in soil = AAS Reading X .02

IX. Extraction and Determination of Soil Nitrates.

Analyze w/ Isaacs

A. Reagents

1. Salicylic acid - Sulfuric acid soln.
5 grams salicylic acid (2½ level teaspoons), add 100 ml. conc. $H_2SO_4$ and mix to dissolve. Use a stirring rod. (Make fresh weekly).

2. Sodium hydroxide - 3.5 M
Weigh out 140 grams NaOH in a liter flask. Make to vol. with distilled water. Mix to dissolve.

3. Stock solution of nitrate - 1,000 ppm N
Dissolve 6.0676 grams dried $NaNO_3$ in a little distilled water and then make to 1 liter vol.

4. Working solution of nitrate - 100 ppm N
Dilute 10 ml. of 1,000 ppm N to 100 ml.

B. Procedure

1. Extraction of nitrates from soil samples.

a. Measure out 1 scoop (10 grams) soil and transfer to shaker trays.

b. Add 1 scoop (0.2 g) Ca $Cl_2$ (plus ¼ tsp. charcoal if extracts are colored).

c. Add 40 ml. distilled water

d. Shake 10 minutes

e. Filter into filter tray vials

2. Colorimetric determination of nitrate nitrogen in soil extracts

a. Transfer 0.5 ml. soil extract (or N standard) to a 25 ml. Erlenmeyer flask. Use 0.5 ml. $H_2O$ for the blank.

b. Add 1.5 ml. salicylic - sulfuric acid mixture, shake to mix and let set 10 minutes

c. Make to 25 ml. volume (add 23 ml.) with 3.5 M NaOH

d. Let stand 20 minutes

e. Read % T in a colorimeter at 410 nm. using a 1" diameter cuvette

f. Determine conc. of N in soil from graph or chart

IX. Extraction and Determination of Soil Nitrates (cont.)

C. Preparation of Standard Curve

Make up a series of standards as follows and develop the color as above.

| ppm N | ml. of 100 ppm N working soln. in 100 ml. soln. | PPM N in soil |
|---|---|---|
| 0 | 0 | 0 |
| 2 | 2 | 8 |
| 4 | 4 | 16 |
| 6 | 6 | 24 |
| 8 | 8 | 32 |
| 10 | 10 | 40 |
| 12 | 12 | 48 |
| 14 | 14 | 56 |
| 16 | 16 | 64 |
| 18 | 18 | 72 |
| 20 | 20 | 80 |
| 22 | 22 | 88 |

## Appendix

I. Soil Test Ratings

### Soil Extraction Method

$NH_4Ac$ - HCl + .025M $H_4EDTA$ Extraction Soln.
1.7 cc Soil + 34 cc Ext. Soln. (1:20)
Shaking time - 1 hour

**Phosphorus**

| ppm P in soil | Rating |
|---|---|
| 0-5 | VL |
| 6-10 | L |
| 11-20 | M |
| 21-40 | H |
| >40 | VH |

**Calcium**

| ppm Ca in soil | Rating |
|---|---|
| 0-250 | L |
| 251-750 | M |
| 751-2000 | H |
| > 2000 | VH |

**Potassium**

| ppm K in soil | Rating |
|---|---|
| 0-90 | VL |
| 91-130 | L |
| 131-175 | M |
| 176-300 | H |
| >300 | VH |

**Magnesium**

| ppm Mg in soil | Rating |
|---|---|
| 0-50 | L |
| 51-150 | M |
| >150 | H |

## II. Soil Test Ratings

### Soil Extraction Method

DTPA Extracting Soln.
10 g. Soil + 20 cc extn. soln. (1:2)
Shaking time - 2 hours

#### Zinc

| ppm Zn in soil | Rating |
|---|---|
| 0-0.29 | L |
| .30-0.49 | M |
| > .50 | H |

#### Manganese

| ppm Mn in soil | Rating |
|---|---|
| 0-0.9 | L |
| 1.0 and greater | H |

#### Iron

| ppm Fe in soil | Rating |
|---|---|
| 0-2.5 | L |
| 2.6-4.5 | M |
| > 4.5 | H |

#### Copper

| ppm Cu in soil | Rating |
|---|---|
| 0-0.2 | L |
| > 0.2 | H |

III. Explanation of Ratings or Levels for Soil Phosphorus

| | Phosphorus (P)* | Expected grain sorghum yield as % of maximum** (High Plains Soil) | Expected response to applied P |
|---|---|---|---|
| Very low (VL) | 0-5 | Below 55% | Very deficient - large economical response from P. |
| Low (L) | 6-10 | 55-85 | Deficient - moderate economical response. |
| Medium (M) | 11-20 | 86-97 | Slightly deficient - small occasional response. Add P for maintenance. Response may not be economical. |
| High (H) | 21-40 | 98-100 | Non deficient - no economical response. |
| Very High (VH) | 41 and above | 100 | Non deficient - no response. |

* Hcl-$NH_4$OAC-EDTA, 1:20 soil:extract ratio

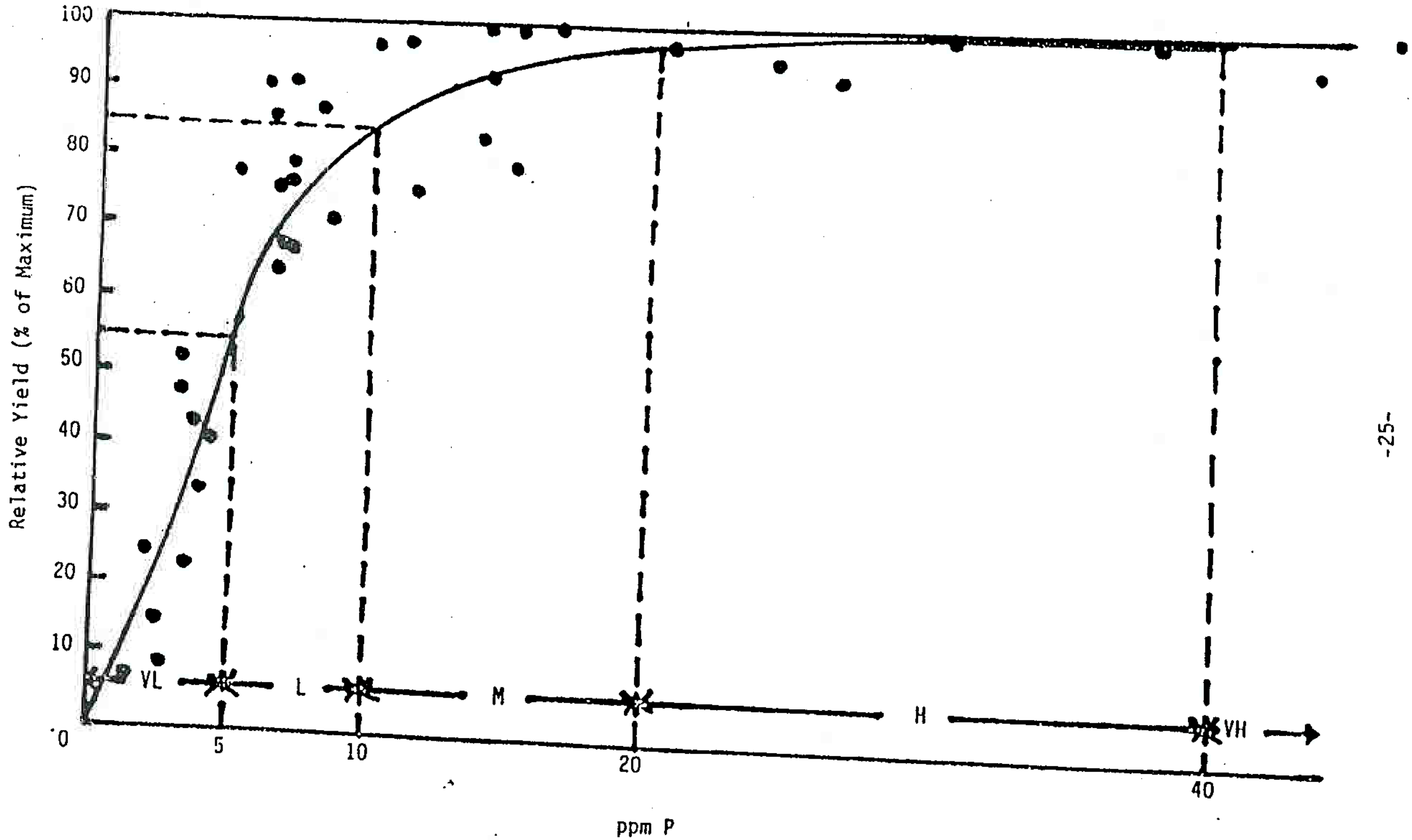
** $\% \text{ Yield} = \frac{\text{yield no P}}{\text{max yield with P}} \times 100$

IV. Correlation Data - Phosphorus Soil Test

| No. | Crop-Location | ppm P 1/ | % yield ($Y^o/Y$ max X 100) |
|---|---|---|---|
| 1 | Grain Sorghum-High Plains | 3.1 | 51.9 |
| 2 | Grain Sorghum-High Plains | 3.6 | 42.2 |
| 3 | Grain Sorghum-High Plains | 3.8 | 33.8 |
| 4 | Grain Sorghum-High Plains | 4.0 | 41.7 |
| 5 | Grain Sorghum-High Plains | 6.2 | 90.6 |
| 6 | Grain Sorghum-High Plains | 6.4 | 85.8 |
| 7 | Grain Sorghum-High Plains | 6.7 | 65.2 |
| 8 | Grain Sorghum-High Plains | 6.8 | 75.9 |
| 9 | Grain Sorghum-High Plains | 7.0 | 76.6 |
| 10 | Grain Sorghum-High Plains | 7.1 | 79.7 |
| 11 | Grain Sorghum-High Plains | 8.1 | 87.5 |
| 12 | Grain Sorghum-High Plains | 8.5 | 71.0 |
| 13 | Grain Sorghum-High Plains | 10.0 | 97.4 |
| 14 | Grain Sorghum-High Plains | 13.9 | 83.7 |
| 15 | Grain Sorghum-High Plains | 14.0 | 99.9 |
| 16 | Grain Sorghum-High Plains | 14.0 | 92.3 |
| 17 | Grain Sorghum-High Plains | 15.0 | 79.5 |
| 18 | Grain Sorghum-High Plains | 15.1 | 99.0 |
| 19 | Grain Sorghum-High Plains | 16.6 | 103.6 |
| 20 | Grain Sorghum-High Plains | 20.4 | 97.7 |
| 21 | Grain Sorghum-High Plains | 24.9 | 95.5 |
| 22 | Grain Sorghum-High Plains | 26.7 | 92.9 |
| 23 | Grain Sorghum-High Plains | 43.5 | 95.2 |
| 24 | Bahia-Troup lignite overburden I | 2.5 | 11.0 |
| 25 | Coastal Bermuda lignite overburden I | 2.7 | 8.4 |
| 26 | Klein grass-Troup Lignite overburden I | 3.3 | 20.6 |
| 27 | Coastal Bermuda lignite overburden I dem. | 1.5 | 5.5 |
| 28 | Love grass lignite overburden I | 2.0 | 24.3 |
| 29 | Soybeans-Beaumont-1978 | 11.0 | 96.5 |
| 30 | Rice-Beaumont-1978 | 7.0 | 92.5 |
| 31 | Grain Sorghum-Dallas-Plot 332 | 45.5 | 100.0 |
| 32 | Grain Sorghum-Beeville check | 6.5 | 64.0 |
| 33 | Grain Sorghum-Beeville (High P) | 30.5 | 100.0 |
| 34 | Grain Sorghum-Corpus Christi (Plot 101) | 38.0 | 100.0 |
| 35 | Corn-Uvalde | 62.5 | 100.0 |
| 36 | Coastal Bermuda-Temple | 7.0 | 67.0 |
| 37 | Coastal Bermuda-Atascosa (Beckham) dem. | 3.0 | 47.0 |
| 38 | Coastal Bermuda-Atascosa (Sanders) dem. | 5.0 | 78.0 |
| 39 | Coastal Bermuda-Atascosa (Le Blanc) dem. | 11.5 | 75.0 |
| 40 | Grain Sorghum-Calhoun Co. (Blinka) | 67.0 | 100.0 |

1/ P extracted with $NH_4OAc$-Hcl-.025M EDTA, 1:20 Soil-Extract ratio (v/v), 1 hour.

Fig. 1 Correlation of Soil P and Crop Yields



VI Calibration of Conductivity Bridge (Beckman Sol-U-Bridge SD 1251)

The conductivity bridge used in this laboratory is a Beckman Sol-U-Bridge SD1251. The outer scale reads directly in micro mhos per cm. (up to 10,000) when using a cell constant of 2.00.

If a cell constant of 1.00 is used then the outer scale must be multiplied by 2 to obtain readings in micro mhos per cm.

Cell K = 1.0

Reading x 2 = conductivity of solution in micro mhos/cm. = approximate ppm Na Cl in soil (water: soil = 2:1)

Reading = approximate ppm Na Cl in Soln.

Cell K = 2.0

Reading = Conductivity of solution in micro mhos/cm. = approximate ppm Na Cl in soil. (water:soil = 2:1)

Reading x 0.5 = approximate ppm Na Cl in solution.

VII.

## SALINITY HAZARD RATING (Sol-u-Bridge)[1]

| Bridge Reading[2] | | Approx. ppm NaCl | | Approx Salt Index[3] | Salinity Hazard |
|---|---|---|---|---|---|
| Cell k=1.0 | Cell k=2.0 | Soil Soln. | Soil | | |
| 350 | 700 | 360 | 720 | 2.0 | NONE |
| 575 | 1150 | 600 | 1200 | 4.0 | SLIGHT Tender ornamentals may show some injury, Field crops tolerant. |
| 950 | 1900 | 990 | 1980 | 8.0 | MODERATE Injurious to vegetables and ornamentals. Germination and growth of many field crops may be reduced, Leaching of salts required. |
| 300 | 2600 | 1350 | 2700 | 12.0 | HIGH Highly injurious to ornamentals vegetables and most field crops. Only a few crops such as bermuda grass yield satisfactorily, Leaching required. |
| ER 00 | OVER 2600 | OVER 1350 | OVER 2700 | OVER 12.0 | VERY HIGH Very few species of plants able to survive. Leachin required for growth of plants. |

[1] Sol-U-Bridge (Beckman SD 125I) outer scale reads directly in micro m hos/cm with a cell k = 2.0

[2] Soil - water ratio = 1 : 2 (v/v)

[3] Approximate Conductivity of saturated extract (m mho^/cm).

## VIII. Notes on pH Meter Operation and Maintenance

### A. Operation and Maintenance

1. Glass electrodes should be rinsed with distilled water and wiped with a soft paper towel after each measurement. If scratches are noticed on glass bulb, replace with new electrode.

2. Reference electrodes should have a relatively fast K Cl flow rate in soil suspensions. Electrodes with glass sleeves or large porous ceramic plugs are satisfactory. Combination electrodes usually do not work satisfactorily for more than a short period of time.

3. At the beginning of each day's work, check the reference electrode for liquid contact between the K Cl inner soln. and the external soln.

   a. Glass sleeve electrode - Loosen the glass sleeve slightly and replace. Do not twist or allow foreign particles to enter into the junction.

   b. Ceramic or fiber plugs - Force air through the plug tip with a squeese bulb.

B. Trouble Shooting

1. Instability of pH meter dial usually indicates excessive static electricity. Anti static spray on meter housing, bench top and lab coat can be tried.

2. Creeping or sluggish pH meter dial may indicate a dirty glass electrode. Clean or replace.

3. Erroneous readings of standard check sample while reading correctly in buffers usually indicates a poor K Cl junction of the reference electrode.

4. If the pH meter can not be set at or below 4.2 with a pH 4.0 buffer, it may indicate a malfunction of the glass electrode and it should be replaced. A possible problem may be the electrometer tube.

# BLOCK DIGESTION OF PLANT SAMPLES FOR ANALYSES OF NITROGEN AND MINERAL ELEMENTS

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## INTRODUCTION

Recent improvements in wet oxidation procedures using $H_2SO_4$ and $H_2O_2$ have made possible the rapid analysis of plant samples for nitrogen and mineral elements. Early work of Cotton[3], Lindner[9], Lindner and Hardy[10] and Lowther[11] with $H_2O_2$-$H_2SO_4$ digestion demonstrated that N, P, K, Ca and Mg could be determined in the same digest without a catalyst. Bradstreet[1] and Florence and Milner[5] also used $H_2O_2$ oxidation without a catalyst. Bould[2], Bradford[1], and O'Neill and Webb[12] studied the use of selenium as a catalyst. Cresser and Parsons[4] and Van Lierop[17] studying $HClO_4$ in plant digestion reported that it causes loss of nitrogen even when used in small amounts. Van Lierop[17] reported, however, that $HClO_4$ and $H_2O_2$ do not oxidize $NH_4^+$ in the presence of organic matter. Isaac and Johnson[8], Smith[14], Thomas, Sheard and Moyer[15] and Warner and Jones[18] compared the $H_2SO_4$-$H_2O_2$-Se system with conventional procedures and found it suitable for determination of N and several mineral elements with a single digest. Parkinson and Allen[13] developed a digestion solution that used $H_2O_2$, $Li_2SO_4$ and Se in small Kjeldahl flasks and found it suitable for the determination of N, P, K, Na, Ca, Mg, Zn, Fe, Mn and Cu. Gallaher et al[6] and Tucker[16] designed digestion blocks that used one inch diameter digestion tubes that enabled large numbers of samples to be processed at the same time.

Haynes[7] compared the $H_2O_2$ - $Li_2SO_4$-Se and $H_2SO_4$-$Na_2SO_4$ modified digestion solutions with the conventional $HNO_3$-$HClO_4$ wet digestion and a dry ashing procedure. Mean values for P, K, Ca and Mg by the four methods were in good agreement with quite similar precision of the data. Close agreement of N contents by the two modified procedures with a conventional Kjeldahl procedure was also obtained.

The digestion block described in this paper was patterned after that of Tucker[16] because it could accommodate a large number of tubes and be used on a hot plate that is commonly used in most laboratories. The digestion procedure described here is an adaptation of the procedure described by Parkinson and Allen so that it could be used in one inch diameter tubes. An advantage of this adaptation is that no cooling periods are required between reagent additions and that a complete digestion can be completed in 2 1/2 hours.

# DIGESTION AND ANALYSIS OF PLANT SAMPLES

I. Block Digestion Procedure

A. Equipment

1. Hot plate
   220 Volt, 2800 Watts, 11" X 19", with top cover removed.
2. Digestion block
   An aluminum metal block, 2" X 11" X 19" sits on asbestos strips in the same position over the heating elements as was the original cover. Three rows of holes with 7 holes per row are arranged over each heating element. Each hole is 1 1/16" in diameter to loosely hold digestion tubes 25 mm in diameter. The final pattern is 12 holes wide and 7 holes deep with 21 holes over each heating element for a total of 84. A small hole is drilled to hold a thermometer.

3. Digestion tubes
   Heavy walled tubes such as Pyrex or Kimax 25 X 200 mm culture tubes. Thin walled test tubes are unsatisfactory. Tubes are to be calibrated and marked at a volume of 50 ml.

4. Syringe type dispensers
   Glass barrel with teflon plunger and tip.
   A. 10 ml (to deliver 7.0 ml aliquot)
   B. 4 ml (to deliver 2.5 ml aliquot)

B. Reagents

1. Solution A
   Place a 1 liter pyrex beaker in an ice bath in the hood and add the following reagents in order:

   1.50 g. Selemium Metal
   8.00 g. $Li_2SO_4.H_2O$
   205 ml Conc.$H_2SO_4$
   415 ml 30% $H_2O_2$ (Cautiously in increments. Considerable heat and frothing is produced)

2. Solution B
   Place a 1 liter pyrex beaker in the hood and add the following reagents in order:
   35 ml Conc. $H_2SO_4$
   2.5 ml 60% $HClO_4$ (optional)
   415 ml 30% $H_2O_2$

C. Procedure for digestion of plant samples

1. Weigh 0.500 g dried, ground plant samples into 25 X 200 mm digestion tubes.
2. Turn on hot plate to highest temperature. Place 260 C thermometer in hole in block.

3. When block temperature reaches 190 to 200 C, place sample tubes in the back 2 rows of the block. (Highest tube no. in last hole).

4. With the 10 ml syringe dispenser, add 7.0 ml soln. A to each tube on the back row. (Wear face shield).

5. Add another row of tubes (third row from the back).

6. Add 7.0 ml soln. A to tubes in second row from back.

7. Continue adding rows of tubes and digestion soln. A one row at a time till the last tube on the front row has been completed.

8. About 12 to 15 minutes after the beginning of digestion frothing has ceased, solutions turn dark brown to black, most of the water vapor has been driven off and white fumes begin to form.

   Carefully add 2.5 ml solution B down the sides of the tubes (start at the back row and move forward).

9. After 10 to 20 minutes when white fumes again begin to form, add a second 2.5 ml aliquot of solution B.

10. Continue heating at maximum setting for 2 1/2 hrs. from the start of the digestion. Turn off heat and allow to cool in the hood.

11. Removed cooled tubes (handle with rubber gloves) and make to 50 ml. mark with distilled water. Shake or stir well.

12. Use diluted digests directly for analyses.

II. Determination of N, P, K, Ca, Mg, Zn, Fe & Mn in digests.

N - ~~Ammonia Electrode~~ Auto Analyzer
P - ~~Mo-V Colorimetric~~
K - ~~Flame Photometer~~ } ICP
Ca, Mg, Zn
~~AAS~~
Fe, Mn, Cu

A. Stock Solns.

1. Nitrogen ($NH_4$+) - 5000 ppm N
   Transfer 5.8962 g dried $(NH_4)_2SO_4$ to a 250 ml vol. flask, add 2 drops conc $H_2SO_4$ and make to vol. with distilled water.

2. Phosphorus - 500 ppm P
   Transfer 2.1950 g dried $KH_2PO_4$ to a 1 L vol. flask

and make to vol. with distilled water.

3. Potassium - 5000 ppm K
Transfer 9.5342 g KCl to a 1 L. vol. flask and make to vol. with distilled.

4. Calcium - 6250 ppm Ca
Transfer 1.5625 g $CaCO_3$ to a 100 ml vol. flask. Add conc. HCl dropwise till $CaCO_3$ is dissolved. Make to vol. with distilled water.

5. Magnesium - 2500 ppm Mg
Place 0.2500 g magnesium metal in a 100 ml vol. flask. Add conc. HCl dropwise till all the metal is dissolved. Make to vol. with distilled water.

6. Zinc - 1000 ppm Zn
Place 1.0000 g zinc metal in a 1 L. vol. flask. Add a few ml conc. HCl till metal is dissolved. Make to vol. with distilled water.

7. Iron - 1000 ppm Fe
Place 1.0204 g iron metal (98% purity) in a 1 L. vol. flask and dissolve in a few ml. of conc. HCl. Make to vol. with distilled water. Store under a layer of mineral oil.

8. Manganese - 1000 ppm Mn
Transfer 3.0764 g dried $MnSO_4.H_2O$ to a 1 L. vol. flask. Add 1 ml conc. $H_2SO_4$ and make to vol. with distilled water. Store under a layer of mineral oil.

9. Copper - 1000 ppm Cu
Place 1.0000 g copper metal in a 1 L. vol. flask and dissolve in a few ml of conc. $HNO_3$ to make vol. with distilled water. Store in a glass container.

B. Working solutions

| Element | Stock Soln. | ml Stock soln. in 100 ml. vol. | Final conc. (ppm) of element |
|---|---|---|---|
| N | 5000 ppm N | ---- | 5000 |
| P | 500 ppm P | ---- | 500 |
| K | 5000 ppm K | ---- | 5000 |
| Ca | 6250 ppm Ca | 10 | 625 |
| Mg | 2500 ppm Mg | 10 | 250 |
| Zn | 1000 ppm Zn | 2.5 | 25 |
| Fe | 1000 ppm Fe | 2.5 | 25 |
| Mn | 1000 ppm Mn | 5.0 | 50 |
| Cu | 1000 ppm Cu | 1.0 | 10 |

Store copper soln. in a glass container.

C. Standard solutions

| Element | Working soln. added to 50 ml digestion tubes | Final conc. of element in digest |
|---|---|---|
| N | 2 ml 5000 ppm N | 200 ppm N 1/ |
| P | 0.5 ml 500 ppm P | 5 ppm P |
| | 1.0 " " | 10 ppm P |
| | 1.5 " " | 15 " |
| | 2.0 " " | 20 " |
| | 2.5 " " | 25 " |
| | 3.0 " " | 30 " |
| | 3.5 " " | 35 " |
| | 4.0 " " | 40 " |
| | 5.0 " " | 50 " |
| K | 10 ml 5000 ppm K | 1000 ppm K |
| Ca | 2.0 ml 625 ppm Ca | 25 ppm Ca |
| Mg | 2.0 ml 250 ppm Mg | 10 ppm Mg |
| Zn | 1.0 ml 25 ppm Zn | 0.5 ppm Zn |
| | 2.0 " " | 1.0 " " |
| Fe | 2.0 ml 25 ppm Fe | 1.0 ppm Fe |
| | 4.0 ml " | 2.0 ppm Fe |
| Mn | 1.5 ml 50 ppm Mn | 1.5 ppm Mn |
| | 3.0 " " | 3.0 " " |
| Cu | 1.0 ml 10 ppm Cu | 0.2 ppm Cu |
| | 2.0 " " " " | 0.4 " " |

The standard solutions in digestion tubes are carried through the digestion procedure with blanks in the same manner as the samples. New standards should be prepared weekly.

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1/ DO NOT USE SOLN. B IN N STANDARDS.

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HAY AND FORAGE SAMPLE ANALYSIS

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Before Application** | | | | | | **After Application** | | | | | |
| | **HOLT** | **TARGAC** | **ROBERTS** | **GINTER** | **PARR** | | **HOLT** | **TARGAC** | **ROBERTS** | **GINTER** | **PARR** |
| **Moisture %** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **Moisture %** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Dry Matter %** | 100.0 | 100.0 | 100.0 | 100.0 | 100. | **Dry Matter %** | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| **Crude Protein %** | 10.6 | 11.4 | 8.6 | 4.7 | 13.5 | **Crude Protein %** | 17.0 | 10.2 | 14.0 | 9.5 | 17.1 |
| **Heat Dam. Protein %** | 1.6 | 2.3 | 2.4 | 2.7 | 1.8 | **Heat Dam. Protein %** | 2.0 | 2.5 | 1.9 | 2.1 | 1.6 |
| **Available Protein %** | 9.6 | 9.6 | 6.1 | 1.2 | 12.7 | **Available Protein %** | 16.6 | 7.8 | 13.1 | 7.6 | 17.1 |
| **Dig. Protein Est %** | 6.5 | 6.3 | 4.2 | 1.2 | 8.2 | **Dig. Protein Est %** | 10.5 | 5.1 | 8.5 | 5.2 | 11.0 |
| **Acid Det. Fiber %** | 31.3 | 28.8 | 31.6 | 29.9 | 32.6 | **Acid Det. Fiber %** | 27.6 | 30.0 | 32.6 | 34.7 | 26.0 |
| **Nuet. Det Fiber %** | 65.2 | 69.3 | 64.9 | 70.7 | 65.6 | **Nuet. Det Fiber %** | 57.6 | 70.9 | 64.6 | 68.5 | 57.8 |
| **TDN Est %** | 55.4 | 58.2 | 55.2 | 57.0 | 54.0 | **TDN Est %** | 59.6 | 56.9 | 54.0 | 51.7 | 61.3 |
| **Ene Est. Therms/Cwt** | 57.5 | 60.1 | 57.3 | 59.0 | 56.2 | **Ene Est. Therms/Cwt** | 61.4 | 58.9 | 56.2 | 54.1 | 62.9 |
| **Ne/Lact, Mcal, LB** | 0.70 | 0.73 | 0.69 | 0.71 | 0.68 | **Ne/Lact, Mcal, LB** | 0.74 | 0.71 | 0.68 | 0.65 | 0.76 |

COMPOST ANALYSIS

| | HOLT (Broilers) | TARGAC (Broilers) | GINTHER (Turkeys) | PARR (Turkeys) | ROBERTS (Hens) |
|---|---|---|---|---|---|
| Nitrogen % | 4.42 | 3.17 | 2.88 | 3.41 | .82 |
| Phosphorus % | 2.40 | 2.29 | 2.06 | 3.06 | 1.57 |
| Potassium % | 2.88 | 2.97 | 1.70 | 1.96 | .90 |
| Calcium % | 1.86 | 4.09 | 2.20 | 5.46 | 3.09 |
| Magnesium % | .58 | .62 | .47 | .75 | .35 |
| Sodium (PPM) | 8539 | 10539 | 3223 | 8145 | 2912 |
| Zinc (PPM) | 639 | 690 | 677 | 1020 | 360 |
| Iron (PPM) | 1328 | 684 | 1762 | 2935 | 7200 |
| Copper (PPM) | 1045 | 999 | 134 | 108 | 53 |
| Manganese (PPM) | 799 | 898 | 667 | 1020 | 541 |
| Sulfur (PPM) | | | | 9829 | |
| Boron (PPM) | | | | 1196 | |

SOIL SAMPLE ANALYSIS

| Before Application | | | | | | | After Application | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | HOLT | TARGAC | ROBERTS | GINTER | PARR | | | HOLT | TARGAC | ROBERTS | GINTER | PARR |
| PH Acidity | 6.5 | 7.8 | 6.0 | 6.7 | 6.7 | | PH Acidity | 6.5 | 7.2 | 6.0 | 7.1 | 6.4 |
| Nitrate | 1. | 6. | 1. | 4. | 4. | | Nitrate | 37. | 22. | 5. | 14. | 71. |
| Phosphorus | 121. | 85. | 68. | 61. | 20. | | Phosphorus | 135. | 112. | 98. | 110. | 54. |
| Potassium | 135. | 292. | 115. | 98. | 257. | | Potassium | 217. | 362. | 133. | 153. | 335. |
| Calcium | 894 | 18751 | 1117 | 1934 | 2737 | | Calcium | 1588 | 6896 | 908 | 1198 | 2534 |
| Magnesium | 90. | 119. | 122. | 83. | 184. | | Magnesium | 125. | 211. | 120. | 118. | 332. |
| Salinity | 240. | 188. | 455. | 123. | 156. | | Salinity | 390. | 182. | 123. | 143. | 273. |

TEXAS AGRICULTUI EXTENSION SERVICE
THE TEXAS A&M UNIVERSITY SYSTEM

**Soil, Water and Forage Testing Laboratory**

# FORAGE / FEED / PLANT TISSUE SAMPLE INFORMATION FORM

Please submit this completed form and payment with samples. Mark each sample with your sample identification which should correspond with the sample identification written on this form. See mailing instructions on the back of this form (Please Do Not Send Cash).

**SUBMITTED BY:** Results will be mailed to this address **ONLY.**

Date 7/9/98
Name GONZALES COUNTY SWCD County GONZALES
Address 920 ST. JOSEPH STREET, RM. 142 Phone 830-672-8371
City GONZALES State TX Zip 78629

**FOR:** (Optional) COMPOSTING AS A BMP FOR POULTRY OPERATIONS – F/95

Name [redacted]
Address
City State TX Zip 78629

**Check Requested Analyses**

| *Wet Chemistry* Analysis | Price Per Sample | Forage/Feed Samples | Plant Samples |
|---|---|---|---|
| Protein | $ 5.00 | ☐ | ☐ |
| Protein + Acid Detergent Fiber | $10.00 | ☐ | — |
| Protein + Minerals (P, K, Ca, Mg, Na, Zn, Fe, Cu, Mn) | $15.00 | ☐ | ☐ |
| Protein + Minerals + Fiber | $20.00 | ☐ | — |
| Protein + Nitrates | $10.00 | ☐ | ☐ |
| Sulfur + Boron | $10.00 | ☐ | ☐ |
| *NIR Analysis* Protein, Fiber, Major Minerals Bermuda, Bahia, and Legume Forages Only | ~~$10.00~~ 5.00 | ☒ | |

**SAMPLE I.D.** / **SAMPLE INFORMATION**

| Laboratory # (For Lab Use) | Your Sample I.D. | Sample Is A: Feed, Hay, Forage, Silage or Plant Tissue | Sample Type: Bermuda, Bahia, Wheat, Corn, Pecan, Etc. | Livestock to be Fed: Beef, Dairy, Horse, Sheep, Goats, Etc. |
|---|---|---|---|---|
| NO Compost | 1 | FORAGE | BERMUDA | BEEF |
| Compost applied | 2 | FORAGE | BERMUDA | BEEF |
| | | | | |
| | | | | |
| | | | | |

Describe any problems – COMMENTS: TSSWCB/DEMONSTRATION PROJECT
½ PRICE ANALYSIS

Rec'd 10 '96

SOIL REPORT



TEXAS AGRICULTURAL EXTENSION SERV -- THE TEXAS A & M UNIVERSITY SYSTEM
SOIL TESTING LABORATORY, COLLEGE STATION TX. 77843

DR. TONY PROVIN
LAB DIRECTOR (409)845-4816

INV# 038025
FOR: GONZALES CO SOIL &WATER
920 ST JOSEPH ST RM 142
GONZALES TX
78629
FEE : $10.00

[redacted]

DATE RECEIVED : 10/9/96
DATE PROCESSED: 10/14/96
COUNTY : GONZALES
COUNTY#: 177
LAB # : 02264

|SAMPLE ID#

SOIL ANALYSIS

|SOIL TEST RATINGS - PPM ELEMENT (AVAILABLE FORM)|

| PH ACIDITY | NITROGEN | PHOSPHO-RUS | POTASSIUM | CALCIUM | MAGNESIUM | SALINITY | ZINC | IRON | MANGANESE | COPPER | SODIUM | SULPHUR | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6.5 MILDLY ACIDIC | 1. VERY LOW | 121. VERY HIGH | 135. MODERATE | 894 HIGH | 90. LOW | 240. NONE | | | | | 2. VERY LOW | 27 HIGH | |

(PPM X 2 = LBS/ACRE 6 INCHES DEEP)

CROP AND YIELD RANGE: NO CROP GIVEN

FURTHER INFORMATION AND ASSISTANCE CAN BE OBTAINED FROM YOUR COUNTY EXTENSION AGENT :
TRAVIS FRANKE
320 ST. LOUIS STREET GONZALES TX. 78629

Before compost application

PLANT / .S REPORT

TEXAS AGRICULTURAL EXTENSION SERVICE -- THE TEXAS A & M UNIVERSITY SYSTEM
SOIL, WATER AND FORAGE TESTING LABORATORY
COLLEGE STATION, TX 77843-2474

Rec'd 10-21-96

Submitted By: GONZALES COUNTY SWCD
920 ST JOSEPH ST. RM 142
GONZALES 78629

For:(Optional)

Dr. Tony Provin
Lab Coordinator
(409) 845-4816

Date Received:10/10/96
Date Reported:10/17/96
County: GONZALES

Compost
Plant Analysis*

Plant Analysis Ratings

| Lab Number | Sample ID Sample Type | Nitrogen % | Phosphorus % | Potassium % | Calcium % | Magnesium % | Sodium PPM | Zinc PPM | Iron PPM | Copper PPM | Manganese PPM | Sulfur PPM | Boron PPM | Nitrate % | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1279 | HOLT | 4.42 | 2.40 | 2.88 | 1.86 | .58 | 8539 | 639 | 1328 | 1045 | 799 | | | | |

*Results Reported on 100% Dry Matter Basis

# SOIL TE REPORT

TEXAS AGRICULTURAL EXTENSION SERVI THE TEXAS A & M UNIVERSITY SYSTEM
SOIL TESTING LABORATORY LEGE STATION TX. 77843

DR. TONY PROVIN
LAB DIRECTOR (409)845-4816

INV# 056489
FOR: GONZALES CO SWCD
920 ST JOSEPH STREET RM 142
GONZALES, TX
78629
FEE : $5.00

DATE RECEIVED : 7/13/98
DATE PROCESSED: 07/15/98
COUNTY : GONZALES
COUNTY#: 177
LAB # : 23446

Rec'd 7-16-98 WF

SAMPLE ID# 1

## SOIL ANALYSIS

Viola Holt

SOIL TEST RATINGS - PPM ELEMENT (AVAILABLE FORM)

| PH ACIDITY | NITRATE-N | PHOSPHO-RUS | POTASSIUM | CALCIUM | MAGNESIUM | SALINITY | ZINC | IRON | MANGANESE | COPPER | SODIUM | SULPHUR | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6.5 MILDLY ACIDIC | 37. VERY HIGH | 135. VERY HIGH | 217. HIGH | 1588 HIGH | 125. MEDIUM | 390. NONE | | | | | 90. VERY LOW | 187 HIGH | |

(PPM X 2 = LBS/ACRE 6 INCHES DEEP)

CROP AND YIELD RANGE: IMPROVED AND HYBRID BERMUDA GRASS, GRAZING

SUGGESTED FERTILIZER RATE LBS/A: 0 - 0 - 0
N P2O5 K2O

BROADCAST AT SPRING GROWTH.

TOPDRESS WITH ADDITIONAL 60 LBS/A OF NITROGEN AFTER EACH 4 TO 6 WEEK GRAZE DOWN.

FURTHER INFORMATION AND ASSISTANCE CAN BE OBTAINED FROM YOUR COUNTY EXTENSION AGENT :
TRAVIS FRANKE
320 ST. LOUIS STREET GONZALES TX. 78629

after compost application

TAEX FORAGE TESTING LABORATORY
SOIL AND CROP SCIENCES BLDG.
TEXAS A&M UNIVERSITY
COLLEGE STATION, TEXAS 77843

NIR ANALYSIS REPORT

LAB NUMBER 7647
SAMPLE TYPE Grass Hay and Fresh Forage
SAMPLE ID 1
[redacted] before application

DATE PROCESSED 07-14-1998

NAME GONZALES COUNTY SWCD
ADDRESS 920 ST JOSEPH STREET, RM 142
GONZALES, TX 78629

COUNTY GONZALES

| | -ANALYSIS- AS RECEIVED BASIS | DRY MATTER BASIS |
|---|---|---|
| MOISTURE,% | 5.7 | 0.0 |
| DRY MATTER,% | 94.3 | 100.0 |
| CRUDE PROTEIN,% | 10.0 | 10.6 |
| HEAT DAM. PROTEIN,% | 1.5 | 1.6 |
| AVAILABLE PROTEIN,% | 9.1 | 9.6 |
| DIG. PROTEIN EST.,% | 6.2 | 6.5 |
| ACID DET. FIBER,% | 29.6 | 31.3 |
| NEUT. DET. FIBER,% | 61.6 | 65.2 |
| TDN EST.,% | 52.3 | 55.4 |
| ENE EST.,THERMS/CWT | 54.3 | 57.5 |
| NE/LACT,MCAL/LB | 0.66 | 0.70 |
| MINERALS | | |
| PHOSPHORUS (P),% | 0.09 | 0.10 |
| CALCIUM (CA),% | 0.14 | 0.15 |
| POTASSIUM (K),% | 2.02 | 2.15 |
| MAGNESIUM (MG),% | 0.15 | 0.16 |

TAEX FORAGE TESTING LABORATORY
SOIL AND CROP SCIENCES BLDG.
TEXAS A&M UNIVERSITY
COLLEGE STATION, TEXAS 77843

NIR ANALYSIS REPORT

LAB NUMBER 7648
SAMPLE TYPE Grass Hay and Fresh Forage
SAMPLE ID 2
[redacted] after application

DATE PROCESSED 07-14-1998

NAME GONZALES COUNTY SWCD
ADDRESS 920 ST JOSEPH STREET, RM 142
GONZALES, TX 78629

COUNTY GONZALES

| | -ANALYSIS- AS RECEIVED BASIS | DRY MATTER BASIS |
|---|---|---|
| MOISTURE,% | 2.0 | 0.0 |
| DRY MATTER,% | 98.0 | 100.0 |
| CRUDE PROTEIN,% | 16.7 | 17.0 |
| HEAT DAM. PROTEIN,% | 1.9 | 2.0 |
| AVAILABLE PROTEIN,% | 16.3 | 16.6 |
| DIG. PROTEIN EST.,% | 10.3 | 10.5 |
| ACID DET. FIBER,% | 27.0 | 27.6 |
| NEUT. DET. FIBER,% | 56.5 | 57.6 |
| TDN EST.,% | 58.5 | 59.6 |
| ENE EST.,THERMS/CWT | 60.2 | 61.4 |
| NE/LACT,MCAL/LB | 0.73 | 0.74 |
| MINERALS | | |
| PHOSPHORUS (P),% | 0.16 | 0.16 |
| CALCIUM (CA),% | 0.46 | 0.47 |
| POTASSIUM (K),% | 2.20 | 2.24 |
| MAGNESIUM (MG),% | 0.10 | 0.10 |

TEXAS AGRICULTU EXTENSION SERVICE
THE TEXAS A&M .IVERSITY SYSTEM

**Soil, Water and Forage Testing Laboratory**

# FORAGE / FEED / PLANT TISSUE SAMPLE INFORMATION FORM

Please submit this completed form and payment with samples. Mark each sample with your sample identification which should correspond with the sample identification written on this form. See mailing instructions on the back of this form (Please Do Not Send Cash).

**SUBMITTED BY:** Results will be mailed to this address ONLY.

Date 7/9/98
Name GONZALES COUNTY SWCD County GONZALES
Address 920 ST. JOSEPH STREET, RM 142 Phone 830-672-8371
City GONZALES State TX Zip 78629

**FOR:** (Optional) COMPOSTING AS A BMP FOR POULTRY OPERATIONS – F/95

Name [redacted]
Addres
City State TX Zip 77975

**Check Requested Analyses**

| *Wet Chemistry* Analysis | Price Per Sample | Forage/Feed Samples | Plant Samples |
|---|---|---|---|
| Protein | $ 5.00 | ☐ | ☐ |
| Protein + Acid Detergent Fiber | $10.00 | ☐ | — |
| Protein + Minerals (P, K, Ca, Mg, Na, Zn, Fe, Cu, Mn) | $15.00 | ☐ | ☐ |
| Protein + Minerals + Fiber | $20.00 | ☐ | — |
| Protein + Nitrates | $10.00 | ☐ | ☐ |
| Sulfur + Boron | $10.00 | ☐ | ☐ |
| *NIR Analysis* Protein, Fiber, Major Minerals Bermuda, Bahia, and Legume Forages Only | ~~$10.00~~ 5.00 | ☒ | |

| SAMPLE I.D. | | SAMPLE INFORMATION | | |
|---|---|---|---|---|
| Laboratory # (For Lab Use) | Your Sample I.D. | Sample Is A: Feed, Hay, Forage, Silage or Plant Tissue | Sample Type: Bermuda, Bahia, Wheat, Corn, Pecan, Etc. | Livestock to be Fed: Beef, Dairy, Horse, Sheep, Goats, Etc. |
| NO COMPOST | 9 | FORAGE | BERMUDA | BEEF |
| COMPOST [illegible] | 10 | FORAGE | BERMUDA | BEEF |
| | | | | |
| | | | | |
| | | | | |

Describe any problems – COMMENTS: TSSWCB/DEMONSTRATION PROJECT
1/2 PRICE ANALYSIS

SOIL EPORT

TEXAS AGRICULTURAL EXTENSION SERV... - THE TEXAS A & M UNIVERSITY SYSTEM
SOIL TESTING LABORATORY, COLLEGE STATION TX. 77843

DR. TONY PROVIN
LAB DIRECTOR (409)845-4816

INV# 039710
FOR: GONZALES CO. SWCD
920 ST JOSEPH ST RM 142
GONZALES, TX
78629
FEE : $10.00

DATE RECEIVED : 1/7/97
DATE PROCESSED: 01/09/97
COUNTY : GONZALES
COUNTY#: 177
LAB # : 07150

SAMPLE ID# 3

[redacted]

SOIL ANALYSIS

SOIL TEST RATINGS - PPM ELEMENT (AVAILABLE FORM)

| PH ACIDITY | NITRATE-N | PHOSPHORUS | POTASSIUM | CALCIUM | MAGNESIUM | SALINITY | ZINC | IRON | MANGANESE | COPPER | SODIUM | SULPHUR | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.8 MILDLY ALKALINE | 6. VERY LOW | 85. VERY HIGH | 292. HIGH | 18751 VERY HIGH | 119. MEDIUM | 188. NONE | | | | | 21. VERY LOW | 163 HIGH | |

(PPM X 2 = LBS/ACRE 6 INCHES DEEP)

CROP AND YIELD RANGE: IMPROVED AND HYBRID BERMUDA GRASS, GRAZING

SUGGESTED FERTILIZER RATE LBS/A: 50 - 0 - 0
N P2O5 K2O

BROADCAST AT SPRING GROWTH.

before compost application

TOPDRESS WITH ADDITIONAL 60 LBS/A OF NITROGEN AFTER EACH 4 TO 6 WEEK GRAZE DOWN.

FURTHER INFORMATION AND ASSISTANCE CAN BE OBTAINED FROM YOUR COUNTY EXTENSION AGENT :
TRAVIS FRANKE
320 ST. LOUIS STREET GONZALES TX. 78629

PI SIS REPORT

TEXAS AGRICULTURAL EXTENSION SERVICE -- THE TEXAS A & M UNIVERSITY SYSTEM
SOIL, WATER AND FORAGE TESTING LABORATORY
COLLEGE STATION, TX 77843-2474

Submitted
By: GONZALES COUNTY SWCD/REILLY
920 ST JOSEPH ST RM 142
GONZALES 78629

For:(Optional)

Dr. Tony Provin
Lab Coordinator
(409) 845-4816

Date Received: 1/08/97
Date Reported: 1/21/97
County: GONZALES

Plant Analysis*

Plant Analysis Ratings

[redacted]

| Lab Number | Sample ID Sample Type | Nitrogen % | Phosphorus % | Potassium % | Calcium % | Magnesium % | Sodium PPM | Zinc PPM | Iron PPM | Copper PPM | Manganese PPM | Sulfur PPM | Boron PPM | Nitrate % | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3821 | 2 COMPOST | 1.70 | 2.62 | 2.01 | 5.13 | .43 | 5793 | 581 | 3976 | 73 | 767 | | | | |
| 3822 | 4 COMPOST | 3.17 | 2.29 | 2.97 | 4.09 | .62 | 10539 | 690 | 684 | 999 | 898 | | | | |

*Results Reported on 100% Dry Matter Basis

SOIL T[illegible]ORT



TEXAS AGRICULTURAL EXTENSION SERVICE - THE TEXAS A & M UNIVERSITY SYSTEM
SOIL TESTING LABORATORY, COLLEGE STATION TX. 77843

DR. TONY PROVIN
LAB DIRECTOR (409) 845-4816

INV# 059260
FOR: GONZALES CO SWCD/GUS TARGAC
920 ST JOSEPH STREET, RM 142
GONZALES, TX
78629
FEE : $5.00

DATE RECEIVED : 1/4/99
DATE PROCESSED: 01/11/99
COUNTY : GONZALES
COUNTY#: 177
LAB # : 06527

SAMPLE ID# 1

compost applied to land

[redacted]

SOIL ANALYSIS

SOIL TEST RATINGS - PPM ELEMENT (AVAILABLE FORM)

| PH ACIDITY | NITRATE-N | PHOSPHO-RUS | POTASSIUM | CALCIUM | MAGNESIUM | SALINITY | ZINC | IRON | MANGANESE | COPPER | SODIUM | SULPHUR | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.2 MILDLY ALKALINE | 22. HIGH | 112. VERY HIGH | 362. VERY HIGH | 6896 VERY HIGH | 211. HIGH | 182. NONE | | | | | 383. LOW | 63 HIGH | |

(PPM X 2 = LBS/ACRE 6 INCHES DEEP)

CROP AND YIELD RANGE: IMPROVED AND HYBRID BERMUDA GRASS, GRAZING

SUGGESTED FERTILIZER RATE LBS/A: 15 - 0 - 0
N P2O5 K2O

BROADCAST AT SPRING GROWTH.

TOPDRESS WITH ADDITIONAL 60 LBS/A OF NITROGEN AFTER EACH 4 TO 6 WEEK GRAZE DOWN.

FURTHER INFORMATION AND ASSISTANCE CAN BE OBTAINED FROM YOUR COUNTY EXTENSION AGENT :
TRAVIS FRANKE
320 ST. LOUIS STREET GONZALES TX. 78629

after compost application

| Post-it® Fax Note 7671 | Date 2/11/99 # of pages ▸ 1 |
|---|---|
| To Wayne Fairchild | From Soil Test Lab |
| Co./Dept. | Co. |
| Phone # | Phone # 409 845-4816 |
| Fax # (830) 672-2577 | Fax # |

TAEX FORAGE TESTING LABORATORY
SOIL AND CROP SCIENCES BLDG.
TEXAS A&M UNIVERSITY
COLLEGE STATION, TEXAS 77843

NIR ANALYSIS REPORT

LAB NUMBER 7655
SAMPLE TYPE Grass Hay and Fresh Forage
SAMPLE ID 9 [redacted] *before compost application*

DATE PROCESSED 07-14-1998

NAME GONZALES COUNTY SWCD
ADDRESS 920 ST JOSEPH STREET, RM 142
GONZALES, TX 78629

COUNTY GONZALES

| | -ANALYSIS- | |
|---|---|---|
| | AS RECEIVED BASIS | DRY MATTER BASIS |
| MOISTURE,% | 4.6 | 0.0 |
| DRY MATTER,% | 95.4 | 100.0 |
| CRUDE PROTEIN,% | 10.9 | 11.4 |
| HEAT DAM. PROTEIN,% | 2.2 | 2.3 |
| AVAILABLE PROTEIN,% | 9.2 | 9.6 |
| DIG. PROTEIN EST.,% | 6.0 | 6.3 |
| ACID DET. FIBER,% | 27.5 | 28.8 |
| NEUT. DET. FIBER,% | 66.1 | 69.3 |
| TDN EST.,% | 55.6 | 58.2 |
| ENE EST.,THERMS/CWT | 57.3 | 60.1 |
| NE/LACT,MCAL/LB | 0.69 | 0.73 |

| MINERALS | | |
|---|---|---|
| PHOSPHORUS (P),% | 0.08 | 0.08 |
| CALCIUM (CA),% | 0.12 | 0.13 |
| POTASSIUM (K),% | 1.50 | 1.57 |
| MAGNESIUM (MG),% | 0.09 | 0.10 |

TAEX FORAGE TESTING LABORATORY
SOIL AND CROP SCIENCES BLDG.
TEXAS A&M UNIVERSITY
COLLEGE STATION, TEXAS 77843

NIR ANALYSIS REPORT

LAB NUMBER 7656
SAMPLE TYPE Grass Hay and Fresh Forage
SAMPLE ID 10
[redacted] after compost application

DATE PROCESSED 07-14-1998

NAME GONZALES COUNTY SWCD
ADDRESS 920 ST JOSEPH STREET, RM 142
GONZALES, TX 78629

COUNTY GONZALES

| | -ANALYSIS- AS RECEIVED BASIS | DRY MATTER BASIS |
|---|---|---|
| MOISTURE,% | 5.4 | 0.0 |
| DRY MATTER,% | 94.6 | 100.0 |
| CRUDE PROTEIN,% | 9.6 | 10.2 |
| HEAT DAM. PROTEIN,% | 2.4 | 2.5 |
| AVAILABLE PROTEIN,% | 7.4 | 7.8 |
| DIG. PROTEIN EST.,% | 4.9 | 5.1 |
| ACID DET. FIBER,% | 28.4 | 30.0 |
| NEUT. DET. FIBER,% | 67.1 | 70.9 |
| TDN EST.,% | 53.9 | 56.9 |
| ENE EST.,THERMS/CWT | 55.7 | 58.9 |
| NE/LACT,MCAL/LB | 0.67 | 0.71 |
| MINERALS | | |
| PHOSPHORUS (P),% | 0.04 | 0.04 |
| CALCIUM (CA),% | 0.36 | 0.38 |
| POTASSIUM (K),% | 1.16 | 1.23 |
| MAGNESIUM (MG),% | 0.16 | 0.16 |

TEXAS AGRICULTU EXTENSION SERVICE
THE TEXAS A&M .IVERSITY SYSTEM

Soil, Water and Forage Testing Laboratory

# FORAGE / FEED / PLANT TISSUE SAMPLE INFORMATION FORM

Please submit this completed form and payment with samples. Mark each sample with your sample identification which should correspond with the sample identification written on this form. See mailing instructions on the back of this form (Please Do Not Send Cash).

**SUBMITTED BY:** Results will be mailed to this address ONLY.

Date 7/9/98
Name GONZALES COUNTY SWCD County GONZALES
Address 920 ST. JOSEPH STREET, Rm 142 Phone 830-672-8371
City GONZALES State TX Zip 78629

**FOR:** (Optional) COMPOSTING AS A BMP FOR POULTRY OPERATIONS – F/95

Name [redacted]
Addre
City State TX Zip 78632

**Check Requested Analyses**

| *Wet Chemistry* Analysis | Price Per Sample | Forage/Feed Samples | Plant Samples |
|---|---|---|---|
| Protein | $ 5.00 | ☐ | ☐ |
| Protein + Acid Detergent Fiber | $10.00 | ☐ | — |
| Protein + Minerals (P, K, Ca, Mg, Na, Zn, Fe, Cu, Mn) | $15.00 | ☐ | ☐ |
| Protein + Minerals + Fiber | $20.00 | ☐ | — |
| Protein + Nitrates | $10.00 | ☐ | ☐ |
| Sulfur + Boron | $10.00 | ☐ | ☐ |
| *NIR Analysis* Protein, Fiber, Major Minerals Bermuda, Bahia, and Legume Forages Only | ~~$10.00~~ 5.00 | ☒ | |

**SAMPLE I.D. / SAMPLE INFORMATION**

| Laboratory # (For Lab Use) | Your Sample I.D. | Sample Is A: Feed, Hay, Forage, Silage or Plant Tissue | Sample Type: Bermuda, Bahia, Wheat, Corn, Pecan, Etc. | Livestock to be Fed: Beef, Dairy, Horse, Sheep, Goats, Etc. |
|---|---|---|---|---|
| No compost | 3 | FORAGE | BERMUDA | BEEF |
| compost applied | 4 | FORAGE | BERMUDA | BEEF |
| | | | | |
| | | | | |
| | | | | |

Describe any problems – COMMENTS: TSSWCB / DEMONSTRATION PROJECT
1/2 PRICE A. LYSIS

SOIL T 'EPORT

TEXAS AGRICULTURAL EXTENSION SERVIC - THE TEXAS A & M UNIVERSITY SYSTEM
SOIL TESTING LABORATORY, COLLEGE STATION TX. 77843

DR. TONY PROVIN
LAB DIRECTOR (409)845-4816

[redacted]

INV# 044865
FOR: GONZALES CO SOIL/WATER CONS
920 ~~290~~ ST JOSEPH ST
GONZALES, TX
78629
FEE : $10.00

DATE RECEIVED : 4/18/97
DATE PROCESSED: 04/23/97
COUNTY : GONZALES
COUNTY#: 177
LAB # : 20148

Rec'd 4/23/97

SAMPLE ID# 1

[redacted]

SOIL ANALYSIS

SOIL TEST RATINGS - PPM ELEMENT (AVAILABLE FORM)

| PH ACIDITY | NITRATE-N | PHOSPHORUS | POTASSIUM | CALCIUM | MAGNESIUM | SALINITY | ZINC | IRON | MANGANESE | COPPER | SODIUM | SULPHUR | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6.0 MODERATELY ACIDIC | 1. VERY LOW | 68. VERY HIGH | 115. LOW | 1117 HIGH | 122. MEDIUM | 455. NONE | | | | | 61. VERY LOW | 18 MEDIUM | |

(PPM X 2 = LBS/ACRE 6 INCHES DEEP)

CROP AND YIELD RANGE: IMPROVED AND HYBRID BERMUDA GRASS, GRAZING

SUGGESTED FERTILIZER RATE LBS/A: 60 - 0 - 10
N P2O5 K2O

BROADCAST AT SPRING GROWTH.

TOPDRESS WITH ADDITIONAL 60 LBS/A OF NITROGEN AFTER EACH 4 TO 6 WEEK GRAZE DOWN.

BROADCAST 10 LBS OF SULPHUR PER ACRE. IN SOME CASES, DEEP ROOTED PERENNIAL CROPS MAY NOT RESPOND TO SULPHUR APPLICATIONS DUE TO ITS PRESENCE IN THE DEEPER PROFILE.

FURTHER INFORMATION AND ASSISTANCE CAN BE OBTAINED FROM YOUR COUNTY EXTENSION AGENT :
TRAVIS FRANKE
320 ST. LOUIS STREET GONZALES TX. 78629

Before compost application

[redacted] 76



# PLANT ANA REPORT

TEXAS AGRICULTURAL EXTENSION SERVICE  THE TEXAS A & M UNIVERSITY SYSTEM
SOIL, WATER AND FORAGE TESTING LABORATORY
COLLEGE STATION, TX 77843-2474

Submitted
By: GONZALES COUNTY SWCD
920 ST. JOSEPH ST. 4M 142
GONZALES 78629

For:(Optional)

Dr. Tony Provin
Lab Coordinator
(409) 845-4816

Date Received:10/10/96
Date Reported:10/17/96
County: GONZALES

Compost
Plant Analysis*

Plant Analysis Ratings

| Lab Number | Sample ID Sample Type | Nitrogen % | Phosphorus % | Potassium % | Calcium % | Magnesium % | Sodium PPM | Zinc PPM | Iron PPM | Copper PPM | Manganese PPM | Sulfur PPM | Boron PPM | Nitrate % | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1278 | ROBERTS | .82 | 1.57 | .90 | 3.09 | .35 | 2912 | 360 | 7200 | 53 | 541 | | | | |

*Results Reported on 100% Dry Matter Basis

SOIL TE' 'EPORT

TEXAS AGRICULTURAL EXTENSION SERVIC THE TEXAS A & M UNIVERSITY SYSTEM
SOIL TESTING LABORATORY, COLLEGE STATION TX. 77843

DR. TONY PROVIN
LAB DIRECTOR (409)845-4816

INV# 056489
FOR: GONZALES CO SWCD
920 ST JOSEPH STREET RM 142
GONZALES, TX
78629
FEE : $5.00

DATE RECEIVED : 7/13/98
DATE PROCESSED: 07/15/98
COUNTY : GONZALES
COUNTY#: 177
LAB # : 23447

Rec'd
7-16-98

SAMPLE ID# 2

SOIL ANALYSIS

[redacted] After

SOIL TEST RATINGS - PPM ELEMENT (AVAILABLE FORM)

| PH ACIDITY | NITRATE-N | PHOSPHORUS | POTASSIUM | CALCIUM | MAGNESIUM | SALINITY | ZINC | IRON | MANGANESE | COPPER | SODIUM | SULPHUR | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6.0 MODERATELY ACIDIC | 5. VERY LOW | 98. VERY HIGH | 133. MODERATE | 908 HIGH | 120. MEDIUM | 123. NONE | | | | | 35. VERY LOW | 19 MEDIUM | |

(PPM X 2 = LBS/ACRE 6 INCHES DEEP)

CROP AND YIELD RANGE: IMPROVED AND HYBRID BERMUDA GRASS, GRAZING

SUGGESTED FERTILIZER RATE LBS/A: 50 - 0 - 0
N P2O5 K2O

BROADCAST AT SPRING GROWTH.

TOPDRESS WITH ADDITIONAL 60 LBS/A OF NITROGEN AFTER EACH 4 TO 6 WEEK GRAZE DOWN.

BROADCAST 10 LBS OF SULPHUR PER ACRE. IN SOME CASES, DEEP ROOTED PERENNIAL CROPS MAY NOT RESPOND TO SULPHUR APPLICATIONS DUE TO ITS PRESENCE IN THE DEEPER PROFILE.

FURTHER INFORMATION AND ASSISTANCE CAN BE OBTAINED FROM YOUR COUNTY EXTENSION AGENT :
TRAVIS FRANKE
320 ST. LOUIS STREET GONZALES TX. 78629

after compost application

TAEX FORAGE TESTING LABORATORY
SOIL AND CROP SCIENCES BLDG.
TEXAS A&M UNIVERSITY
COLLEGE STATION, TEXAS 77843

NIR ANALYSIS REPORT

LAB NUMBER 7649
SAMPLE TYPE Grass Hay and Fresh Forage
SAMPLE ID 3
[redacted] before compost application

DATE PROCESSED 07-14-1998

NAME GONZALES COUNTY SWCD
ADDRESS 920 ST JOSEPH STREET, RM 142
GONZALES, TX 78629

COUNTY GONZALES

| | -ANALYSIS- AS RECEIVED BASIS | DRY MATTER BASIS |
|---|---|---|
| MOISTURE,% | 2.3 | 0.0 |
| DRY MATTER,% | 97.7 | 100.0 |
| CRUDE PROTEIN,% | 8.4 | 8.6 |
| HEAT DAM. PROTEIN,% | 2.4 | 2.4 |
| AVAILABLE PROTEIN,% | 6.0 | 6.1 |
| DIG. PROTEIN EST.,% | 4.1 | 4.2 |
| ACID DET. FIBER,% | 30.9 | 31.6 |
| NEUT. DET. FIBER,% | 63.5 | 64.9 |
| TDN EST.,% | 53.9 | 55.2 |
| ENE EST.,THERMS/CWT | 56.0 | 57.3 |
| NE/LACT,MCAL/LB | 0.68 | 0.69 |
| MINERALS | | |
| PHOSPHORUS (P),% | 0.03 | 0.03 |
| CALCIUM (CA),% | 0.39 | 0.40 |
| POTASSIUM (K),% | 1.29 | 1.32 |
| MAGNESIUM (MG),% | 0.11 | 0.11 |

TAEX FORAGE TESTING LABORATORY
SOIL AND CROP SCIENCES BLDG.
TEXAS A&M UNIVERSITY
COLLEGE STATION, TEXAS 77843

NIR ANALYSIS REPORT

LAB NUMBER 7650
SAMPLE TYPE Grass Hay and Fresh Forage
SAMPLE ID 4
[redacted] after compost application

DATE PROCESSED 07-14-1998

NAME GONZALES COUNTY SWCD
ADDRESS 920 ST JOSEPH STREET, RM 142
GONZALES, TX 78629

COUNTY GONZALES

| | -ANALYSIS- AS RECEIVED BASIS | DRY MATTER BASIS |
|---|---|---|
| MOISTURE,% | 3.0 | 0.0 |
| DRY MATTER,% | 97.0 | 100.0 |
| CRUDE PROTEIN,% | 13.6 | 14.0 |
| HEAT DAM. PROTEIN,% | 1.9 | 1.9 |
| AVAILABLE PROTEIN,% | 12.7 | 13.1 |
| DIG. PROTEIN EST.,% | 8.2 | 8.5 |
| ACID DET. FIBER,% | 31.6 | 32.6 |
| NEUT. DET. FIBER,% | 62.7 | 64.6 |
| TDN EST.,% | 52.4 | 54.0 |
| ENE EST.,THERMS/CWT | 54.6 | 56.2 |
| NE/LACT,MCAL/LB | 0.66 | 0.68 |
| MINERALS | | |
| PHOSPHORUS (P),% | 0.13 | 0.13 |
| CALCIUM (CA),% | 0.44 | 0.46 |
| POTASSIUM (K),% | 2.16 | 2.22 |
| MAGNESIUM (MG),% | 0.11 | 0.11 |

TEXAS AGRICULTU[illegible] EXTENSION SERVICE
THE TEXAS A&M [illegible]VERSITY SYSTEM

Soil, Water and Forage Testing Laboratory

# FORAGE / FEED / PLANT TISSUE SAMPLE INFORMATION FORM

Please submit this completed form and payment with samples. Mark each sample with your sample identification which should correspond with the sample identification written on this form. See mailing instructions on the back of this form (Please Do Not Send Cash).

**SUBMITTED BY:** Results will be mailed to this address ONLY.

Date 7/9/98
Name GONZALES COUNTY SWCD County GONZALES
Address 920 ST. JOSEPH STREET, RM. 142 Phone 830-672-8371
City GONZALES State TX Zip 78629

**FOR:** (Optional) COMPOSTING AS A BMP FOR POULTRY OPERATIONS – F/95

Name [redacted]
Addre[redacted]
City [redacted] State TX Zip 78629

## Check Requested Analyses

| *Wet Chemistry* Analysis | Price Per Sample | Forage/Feed Samples | Plant Samples |
|---|---|---|---|
| Protein | $ 5.00 | ☐ | ☐ |
| Protein + Acid Detergent Fiber | $10.00 | ☐ | — |
| Protein + Minerals (P, K, Ca, Mg, Na, Zn, Fe, Cu, Mn) | $15.00 | ☐ | ☐ |
| Protein + Minerals + Fiber | $20.00 | ☐ | — |
| Protein + Nitrates | $10.00 | ☐ | ☐ |
| Sulfur + Boron | $10.00 | ☐ | ☐ |
| *NIR Analysis* Protein, Fiber, Major Minerals Bermuda, Bahia, and Legume Forages Only | ~~$10.00~~ 5.00 | ☒ | |

## SAMPLE I.D. / SAMPLE INFORMATION

| Laboratory # (For Lab Use) | Your Sample I.D. | Sample Is A: Feed, Hay, Forage, Silage or Plant Tissue | Sample Type: Bermuda, Bahia, Wheat, Corn, Pecan, Etc. | Livestock to be Fed: Beef, Dairy, Horse, Sheep, Goats, Etc. |
|---|---|---|---|---|
| No Compost | 5● | FORAGE | BERMUDA | BEEF |
| compost applied | 6● | FORAGE | BERMUDA | BEEF |
| | | | | |
| | | | | |
| | | | | |

Describe any problems – COMMENTS: TSSWCB / DEMONSTRATION PROJECT
1/2 PRICE [illegible]LYSIS

# SOIL T EPORT

TEXAS AGRICULTURAL EXTENSION SERVIC THE TEXAS A & M UNIVERSITY SYSTEM
SOIL TESTING LABORATORY, COLLEGE STATION TX. 77843

DR. TONY PROVIN
LAB DIRECTOR (409)845-4816

INV# 046801
FOR: GONZALES CO SOIL&WATER/PARR
920 ST JOSEPH ST RM 142
GONZALES, TX
78629
FEE : $5.00

DATE RECEIVED : 7/8/97
DATE PROCESSED: 07/10/97
COUNTY : GONZALES
COUNTY#: 177
LAB # : 25265

[redacted]
SAMPLE ID# 3

## SOIL ANALYSIS

SOIL TEST RATINGS - PPM ELEMENT (AVAILABLE FORM)

| PH ACIDITY | NITRATE-N | PHOSPHORUS | POTASSIUM | CALCIUM | MAGNESIUM | SALINITY | ZINC | IRON | MANGANESE | COPPER | SODIUM | SULPHUR | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6.7 MILDLY ACIDIC | 4. VERY LOW | 61. HIGH | 98. LOW | 1934 HIGH | 83. LOW | 123. NONE | | | | | 15. VERY LOW | 28 HIGH | |

(PPM X 2 = LBS/ACRE 6 INCHES DEEP)

CROP AND YIELD RANGE: IMPROVED AND HYBRID BERMUDA GRASS, GRAZING

SUGGESTED FERTILIZER RATE LBS/A: 50 - 0 - 25
N P2O5 K2O

BROADCAST AT SPRING GROWTH.

TOPDRESS WITH ADDITIONAL 60 LBS/A OF NITROGEN AFTER EACH 4 TO 6 WEEK GRAZE DOWN.

FURTHER INFORMATION AND ASSISTANCE CAN BE OBTAINED FROM YOUR COUNTY EXTENSION AGENT :
TRAVIS FRANKE
320 ST. LOUIS STREET GONZALES TX. 78629

Before compost application

PLANT ANALYSIS REPORT

TEXAS AGRICULTURAL EXTENSION SERVICE -- THE TEXAS A & M UNIVERSITY SYSTEM
SOIL, WATER AND FORAGE TESTING LABORATORY
COLLEGE STATION, TX 77843-2474

Submitted
By: GONZALES CO SWCD
920 ST JOSEPH ST RM 142
GONZALES 78629

For:(Optional)

Dr. Tony Provin
Lab Coordinator
(409) 845-4816

Date Received: 4/22/97
Date Reported: 4/28/97
County: GONZALES

Compost
Plant Analysis*

Plant Analysis Ratings

| Lab Number | Sample ID Sample Type | Nitrogen % | Phosphorus % | Potassium % | Calcium % | Magnesium % | Sodium PPM | Zinc PPM | Iron PPM | Copper PPM | Manganese PPM | Sulfur PPM | Boron PPM | Nitrate % | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5622 | 1 compost KEN GINTER | 2.88 | 2.06 | 1.70 | 2.20 | .47 | 3223 | 677 | 1762 | 134 | 667 | | | | |

*Results Reported on 100% Dry Matter Basis

SOIL ' 'REPORT



TEXAS AGRICULTURAL EXTENSION SERVI -- THE TEXAS A & M UNIVERSITY SYSTEM
SOIL TESTING LABORATORY, COLLEGE STATION TX. 77843

DR. TONY PROVIN
LAB DIRECTOR (409)845-4816

INV# 056489
FOR: GONZALES CO SWCD
920 ST JOSEPH STREET RM 142
GONZALES, TX
78629
FEE : $5.00

DATE RECEIVED : 7/13/98
DATE PROCESSED: 07/15/98
COUNTY : GONZALES
COUNTY#: 177
LAB # : 23448

Rec'd 7-16-98 WF

SAMPLE ID# 3

[redacted]

SOIL ANALYSIS

SOIL TEST RATINGS - PPM ELEMENT (AVAILABLE FORM)

| PH ACIDITY | NITRATE-N | PHOSPHORUS | POTASSIUM | CALCIUM | MAGNESIUM | SALINITY | ZINC | IRON | MANGANESE | COPPER | SODIUM | SULPHUR | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.1 MILDLY ALKALINE | 14. LOW | 110. VERY HIGH | 153. MODERATE | 1198 HIGH | 118. MEDIUM | 143. NONE | | | | | 33. VERY LOW | 14 LOW | |

(PPM X 2 = LBS/ACRE 6 INCHES DEEP)

CROP AND YIELD RANGE: IMPROVED AND HYBRID BERMUDA GRASS, GRAZING

SUGGESTED FERTILIZER RATE LBS/A: 30 - 0 - 0
N P2O5 K2O

BROADCAST AT SPRING GROWTH.

TOPDRESS WITH ADDITIONAL 60 LBS/A OF NITROGEN AFTER EACH 4 TO 6 WEEK GRAZE DOWN.

BROADCAST 15 LBS OF SULPHUR PER ACRE. IN SOME CASES, DEEP ROOTED PERENNIAL CROPS MAY NOT RESPOND TO SULPHUR APPLICATIONS DUE TO ITS PRESENCE IN THE DEEPER PROFILE.

FURTHER INFORMATION AND ASSISTANCE CAN BE OBTAINED FROM YOUR COUNTY EXTENSION AGENT :
TRAVIS FRANKE
320 ST. LOUIS STREET GONZALES TX. 78629

after compost application

TAEX FORAGE TESTING LABORATORY
SOIL AND CROP SCIENCES BLDG.
TEXAS A&M UNIVERSITY
COLLEGE STATION, TEXAS 77843

NIR ANALYSIS REPORT

LAB NUMBER 7651
SAMPLE TYPE Grass Hay and Fresh Forage
SAMPLE ID 5
[redacted]

*Before compost application*

DATE PROCESSED 07-14-1998

NAME GONZALES COUNTY SWCD
ADDRESS 920 ST JOSEPH STREET, RM 142
GONZALES, TX 78629

COUNTY GONZALES

| | -ANALYSIS- | |
|---|---|---|
| | AS RECEIVED BASIS | DRY MATTER BASIS |
| MOISTURE,% | 2.8 | 0.0 |
| DRY MATTER,% | 97.2 | 100.0 |
| CRUDE PROTEIN,% | 4.6 | 4.7 |
| HEAT DAM. PROTEIN,% | 2.6 | 2.7 |
| AVAILABLE PROTEIN,% | 1.1 | 1.2 |
| DIG. PROTEIN EST.,% | 1.2 | 1.2 |
| ACID DET. FIBER,% | 29.1 | 29.9 |
| NEUT. DET. FIBER,% | 68.8 | 70.7 |
| TDN EST.,% | 55.5 | 57.0 |
| ENE EST.,THERMS/CWT | 57.4 | 59.0 |
| NE/LACT,MCAL/LB | 0.69 | 0.71 |
| MINERALS | | |
| PHOSPHORUS (P),% | 0.00 | 0.00 |
| CALCIUM (CA),% | 0.26 | 0.26 |
| POTASSIUM (K),% | 0.64 | 0.66 |
| MAGNESIUM (MG),% | 0.14 | 0.14 |

TAEX FORAGE TESTING LABORATORY
SOIL AND CROP SCIENCES BLDG.
TEXAS A&M UNIVERSITY
COLLEGE STATION, TEXAS 77843

NIR ANALYSIS REPORT

LAB NUMBER 7652
SAMPLE TYPE Grass Hay and Fresh Forage
SAMPLE ID 6
[redacted]
DATE PROCESSED 07-14-1998

after compost application

NAME GONZALES COUNTY SWCD
ADDRESS 920 ST JOSEPH STREET, RM 142
GONZALES, TX 78629

COUNTY GONZALES

| | -ANALYSIS- | |
| --- | --- | --- |
| | AS RECEIVED BASIS | DRY MATTER BASIS |
| MOISTURE,% | 3.3 | 0.0 |
| DRY MATTER,% | 96.7 | 100.0 |
| CRUDE PROTEIN,% | 9.1 | 9.5 |
| HEAT DAM. PROTEIN,% | 2.0 | 2.1 |
| AVAILABLE PROTEIN,% | 7.4 | 7.6 |
| DIG. PROTEIN EST.,% | 5.0 | 5.2 |
| ACID DET. FIBER,% | 33.5 | 34.7 |
| NEUT. DET. FIBER,% | 66.2 | 68.5 |
| TDN EST.,% | 50.0 | 51.7 |
| ENE EST.,THERMS/CWT | 52.3 | 54.1 |
| NE/LACT,MCAL/LB | 0.63 | 0.65 |
| MINERALS | | |
| PHOSPHORUS (P),% | 0.03 | 0.03 |
| CALCIUM (CA),% | 0.31 | 0.32 |
| POTASSIUM (K),% | 1.83 | 1.89 |
| MAGNESIUM (MG),% | 0.12 | 0.12 |

TEXAS AGRICULTU EXTENSION SERVICE
THE TEXAS A&M UNIVERSITY SYSTEM

**Soil, Water and Forage Testing Laboratory**

# FORAGE / FEED / PLANT TISSUE SAMPLE INFORMATION FORM

Please submit this completed form and payment with samples. Mark each sample with your sample identification which should correspond with the sample identification written on this form. See mailing instructions on the back of this form (Please Do Not Send Cash).

**SUBMITTED BY:** Results will be mailed to this address ONLY.

Date 7/9/98
Name GONZALES COUNTY SWCD County GONZALES
Address 920 ST. JOSEPH STREET, RM142 Phone 830-672-8371
City GONZALES State TX Zip 78629

**FOR:** (Optional) COMPOSTING AS A BMP FOR POULTRY OPERATIONS – F/95

Name [redacted]
Addre
City State TX Zip 78629

**Check Requested Analyses**

| *Wet Chemistry* Analysis | Price Per Sample | Forage/Feed Samples | Plant Samples |
|---|---|---|---|
| Protein | $ 5.00 | ☐ | ☐ |
| Protein + Acid Detergent Fiber | $10.00 | ☐ | — |
| Protein + Minerals (P, K, Ca, Mg, Na, Zn, Fe, Cu, Mn) | $15.00 | ☐ | ☐ |
| Protein + Minerals + Fiber | $20.00 | ☐ | — |
| Protein + Nitrates | $10.00 | ☐ | ☐ |
| Sulfur + Boron | $10.00 | ☐ | ☐ |
| *NIR Analysis* Protein, Fiber, Major Minerals Bermuda, Bahia, and Legume Forages Only | ~~$10.00~~ 5.00 | ☒ | |

**SAMPLE I.D. / SAMPLE INFORMATION**

| Laboratory # (For Lab Use) | Your Sample I.D. | Sample Is A: Feed, Hay, Forage, Silage or Plant Tissue | Sample Type: Bermuda, Bahia, Wheat, Corn, Pecan, Etc. | Livestock to be Fed: Beef, Dairy, Horse, Sheep, Goats, Etc. |
|---|---|---|---|---|
| No compost | 7 | FORAGE | BERMUDA | BEEF |
| Compost applied | 8 | FORAGE | BERMUDA | BEEF |
| | | | | |
| | | | | |
| | | | | |

Describe any problems – COMMENTS: TSSWCB / DEMONSTRATION PROJECT
1/2 PRICE ANALYSIS

SOIL TE REPORT

TEXAS AGRICULTURAL EXTENSION SERVIC THE TEXAS A & M UNIVERSITY SYSTEM
SOIL TESTING LABORATORY, LEGE STATION TX. 77843

DR. TONY PROVIN
LAB DIRECTOR (409)845-4816

INV# 046801
FOR: GONZALES CO SOIL&WATER/PARR
920 ST JOSEPH ST RM 142
GONZALES, TX
78629
FEE : $5.00
[redacted]

DATE RECEIVED : 7/8/97
DATE PROCESSED: 07/10/97
COUNTY : GONZALES
COUNTY#: 177
LAB # : 25264

SAMPLE ID# 2

SOIL ANALYSIS

SOIL TEST RATINGS - PPM ELEMENT (AVAILABLE FORM)

| PH ACIDITY | NITRATE-N | PHOSPHO-RUS | POTASSIUM | CALCIUM | MAGNESIUM | SALINITY | ZINC | IRON | MANGANESE | COPPER | SODIUM | SULPHUR | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6.7 MILDLY ACIDIC | 4. VERY LOW | 20. MODERATE | 257. HIGH | 2737 HIGH | 184. HIGH | 156. NONE | | | | | 39. VERY LOW | 35 HIGH | |

(PPM X 2 = LBS/ACRE 6 INCHES DEEP)

CROP AND YIELD RANGE: IMPROVED AND HYBRID BERMUDA GRASS, GRAZING
SUGGESTED FERTILIZER RATE LBS/A: 50 - 30 - 0
N P2O5 K2O

BROADCAST AT SPRING GROWTH.

TOPDRESS WITH ADDITIONAL 60 LBS/A OF NITROGEN AFTER EACH 4 TO 6 WEEK GRAZE DOWN.

FURTHER INFORMATION AND ASSISTANCE CAN BE OBTAINED FROM YOUR COUNTY EXTENSION AGENT :
TRAVIS FRANKE
320 ST. LOUIS STREET GONZALES TX. 78629

Before compost application

# PLANT AN REPORT

TEXAS AGRICULTURAL EXTENSION SERVICE · .E TEXAS A & M UNIVERSITY SYSTEM
SOIL, WATER AND FORAGE TESTING LABORATORY
COLLEGE STATION, TX 77843-2474

Recd. 7-24-97 WF

Submitted
By: GONZALES COUNTY SWCD/JOHN PARR
920 ST JOSEPH STREET RM 142
GONZALES 78629

For:(Optional)

Dr. Tony Provin
Lab Coordinator
(409) 845-4816

Date Received: 7/08/97
Date Reported: 7/22/97
County: GONZALES

compost
Plant Analysis*

Plant Analysis Ratings

[redacted]

| Lab Number | Sample ID Sample Type | Nitrogen % | Phosphorus % | Potassium % | Calcium % | Magnesium % | Sodium PPM | Zinc PPM | Iron PPM | Copper PPM | Manganese PPM | Sulfur PPM | Boron PPM | Nitrate % | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7400 | 1 | 3.41 | 3.06 | 1.96 | 5.46 | .75 | 8145 | 1020 | 2935 | 108 | 1020 | 9829 | 1196 | | |

*Results Reported on 100% Dry Matter Basis

SOIL TF PORT

TEXAS AGRICULTURAL EXTENSION SERVI THE TEXAS A & M UNIVERSITY SYSTEM
SOIL TESTING LABORATORY, COLLEGE STATION TX. 77843

DR. TONY PROVIN
LAB DIRECTOR (409)845-4816

INV# 056489
FOR: GONZALES CO SWCD
920 ST JOSEPH STREET RM 142
GONZALES, TX
78629
FEE : $5.00

DATE RECEIVED : 7/13/98
DATE PROCESSED: 07/15/98
COUNTY : GONZALES
COUNTY#: 177
LAB # : 23449

Rec'd
7-16-98
WF

SAMPLE ID# 4

SOIL ANALYSIS

[redacted]

SOIL TEST RATINGS - PPM ELEMENT (AVAILABLE FORM)

| PH ACIDITY | NITRATE-N | PHOSPHO-RUS | POTASSIUM | CALCIUM | MAGNESIUM | SALINITY | ZINC | IRON | MANGANESE | COPPER | SODIUM | SULPHUR | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6.4 MILDLY ACIDIC | 71. VERY HIGH | 54. HIGH | 335. VERY HIGH | 2534 HIGH | 332. HIGH | 273. NONE | | | | | 129. LOW | 61 HIGH | |

(PPM X 2 = LBS/ACRE 6 INCHES DEEP)

CROP AND YIELD RANGE: IMPROVED AND HYBRID BERMUDA GRASS, GRAZING

SUGGESTED FERTILIZER RATE LBS/A: 0 - 0 - 0
N P205 K20

BROADCAST AT SPRING GROWTH.

TOPDRESS WITH ADDITIONAL 60 LBS/A OF NITROGEN AFTER EACH 4 TO 6 WEEK GRAZE DOWN.

FURTHER INFORMATION AND ASSISTANCE CAN BE OBTAINED FROM YOUR COUNTY EXTENSION AGENT :
TRAVIS FRANKE
320 ST. LOUIS STREET GONZALES TX. 78629

after compost application

TAEX FORAGE TESTING LABORATORY
SOIL AND CROP SCIENCES BLDG.
TEXAS A&M UNIVERSITY
COLLEGE STATION, TEXAS 77843

NIR ANALYSIS REPORT

LAB NUMBER 7653
SAMPLE TYPE Grass Hay and Fresh Forage
SAMPLE ID 7 *Before compost application*
[redacted]
DATE PROCESSED 07-14-1998

NAME GONZALES COUNTY SWCD
ADDRESS 920 ST JOSEPH STREET, RM 142
GONZALES, TX 78629

COUNTY GONZALES

| | -ANALYSIS- | |
| --- | --- | --- |
| | AS RECEIVED BASIS | DRY MATTER BASIS |
| MOISTURE,% | 3.9 | 0.0 |
| DRY MATTER,% | 96.1 | 100.0 |
| CRUDE PROTEIN,% | 13.0 | 13.5 |
| HEAT DAM. PROTEIN,% | 1.8 | 1.8 |
| AVAILABLE PROTEIN,% | 12.2 | 12.7 |
| DIG. PROTEIN EST.,% | 7.9 | 8.2 |
| ACID DET. FIBER,% | 31.4 | 32.6 |
| NEUT. DET. FIBER,% | 63.0 | 65.6 |
| TDN EST.,% | 51.8 | 54.0 |
| ENE EST.,THERMS/CWT | 54.0 | 56.2 |
| NE/LACT,MCAL/LB | 0.65 | 0.68 |
| MINERALS | | |
| PHOSPHORUS (P),% | 0.13 | 0.14 |
| CALCIUM (CA),% | 0.36 | 0.38 |
| POTASSIUM (K),% | 2.01 | 2.09 |
| MAGNESIUM (MG),% | 0.11 | 0.12 |

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NIR ANALYSIS REPORT

LAB NUMBER 7654
SAMPLE TYPE Grass Hay and Fresh Forage
SAMPLE ID 8 *after compost application*
[redacted]
DATE PROCESSED 07-14-1998

NAME GONZALES COUNTY SWCD
ADDRESS 920 ST JOSEPH STREET, RM 142
GONZALES, TX 78629

COUNTY GONZALES

| | -ANALYSIS- AS RECEIVED BASIS | DRY MATTER BASIS |
|---|---|---|
| MOISTURE,% | 7.8 | 0.0 |
| DRY MATTER,% | 92.2 | 100.0 |
| CRUDE PROTEIN,% | 15.7 | 17.1 |
| HEAT DAM. PROTEIN,% | 1.5 | 1.6 |
| AVAILABLE PROTEIN,% | 15.7 | 17.1 |
| DIG. PROTEIN EST.,% | 10.2 | 11.0 |
| ACID DET. FIBER,% | 24.0 | 26.0 |
| NEUT. DET. FIBER,% | 53.2 | 57.8 |
| TDN EST.,% | 56.5 | 61.3 |
| ENE EST.,THERMS/CWT | 58.0 | 62.9 |
| NE/LACT,MCAL/LB | 0.70 | 0.76 |
| MINERALS | | |
| PHOSPHORUS (P),% | 0.17 | 0.18 |
| CALCIUM (CA),% | 0.29 | 0.32 |
| POTASSIUM (K),% | 2.39 | 2.60 |
| MAGNESIUM (MG),% | 0.17 | 0.18 |