

Approved: 2-9-98
Date

MINUTES OF THE HOUSE COMMITTEE ON ENVIRONMENT.

The meeting was called to order by Vice-Chairperson Joann Freeborn at 3:30 p.m. on January 22, 1998 in Room 526-S of the Capitol.

All members were present except: Rep. Steve Lloyd - excused

Committee staff present: Raney Gilliland, Legislative Research Department
Hank Avila, Legislative Research Department
Mary Torrence, Revisor of Statutes
Mary Ann Graham, Committee Secretary

Conferees appearing before the committee: Dr. Bill Hargrove, Director, KS Center for Agricultural Resources & Environment, KS State University, 044 Waters Hall, Manhattan, Kansas 66506
Dr. Pat Murphy, Professor, Dept. of Biological & Agricultural Engineering, KS State University, Durland Hall
Dr. Lakshmi Reddi, Assoc. Professor Civil Engineering Dept., KS State University, Durland Hall
Dr. Jay Ham, Assoc. Professor, Agronomy Dept., KS State University, Throckmorton Hall
Dr. Chuck Rice, Assoc. Professor, Agronomy Dept., KS State University, Throckmorton Hall
Jim Shantz, High Plains Development, N. Hwy 283, PO Box 1066, Laverne, OK 73848
Tom Stinson, Development, N. Hwy 283, PO Box 1066, Laverne, OK 73848

Others attending: See attached list

Chairperson Joann Freeborn called the meeting to order at 3:30 p.m. in Room 313-S. She appointed a sub-committee for **HB 2435: An Act concerning watershed districts; concerning election of directors; relating to exercise of eminent domain; amending K.S.A. 24-1211 and repealing the existing section.** Rep. Becky Hutchins, Chairperson; Rep. Dan Johnson, and Rep. Marti Crow.

The Chairperson asked if anyone had a bill request, which they did not, at this time. She welcomed Dr. Bill Hargrove, Director, KS Center for Agricultural Resources and Environment, KS State University, to the committee. Dr. Hargrove gave a summary of the November 1997 report to KDHE on the Evaluation of Lagoons for Containment of Animal Waste. (See attachment 1) The report contains results from research conducted over the past year by K-State Research & Extension to evaluate the effectiveness of lagoons for waste containment. The overall purpose for doing this work is to provide to producers, state agencies, and all Kansas citizens the best science-based information possible regarding the effectiveness of lagoons to contain waste. Dr. Hargrove introduced Dr. Pat Murphy, Professor, Dept. of Biological & Agricultural Engineering, KS State University.

Chairperson Freeborn welcomed Dr. Lakshmi Reddi, Associate Professor, Civil Engineering Department, KS State University; Dr. Jay Ham, Associate Professor, Agronomy Department, KS State University; and Dr. Chuck Rice, Associate Professor, Agronomy Department, KS State University, respectively. They briefed the committee on the objectives of the study and the report. (See attachment 1) One objective was to evaluate

CONTINUATION SHEET

MINUTES OF THE HOUSE COMMITTEE ON ENVIRONMENT, Room 526-S Statehouse, at 3:30 p.m. on January 22, 1998.

the efficacy of different soil materials as liners for lagoons. A second objective was to measure the seepage rate for several functioning lagoons, and third, although the study was not designed to answer the question, what the amounts and fate of chemicals and/or microorganisms leaving lagoons are. It was announced that a full report is expected to be completed by April 1998. Questions by the committee followed.

Chairperson Freeborn thanked Dr. Hargrove and staff for their presentation. She announced there was a bill request at this time.

Rep. David Huff made a motion to introduce a bill, KSA 65-165. Permit for discharge of sewage; general permits; revocation or modification of permit. Seconded by Rep. Dan Johnson. Motion carried.

The Chairperson welcomed Jim Shantz, Murphy Family Farms, pork producers, to the committee. Mr. Shantz is a development specialist for the High Plains, Laverne, OK. He briefed the committee on the history and operations of Murphy Family Farms. The business was started by Wendell Murphy and his father with a feed mill. They expanded by contracting with local farmers and came to the Midwest in 1986. They are now in seven states, with possible development in North Central Kansas, and still completely family owned.

Tom Stinson, Murphy Family Farms, was welcomed to the committee. Mr. Stinson is a Development Manager for the Midwest. He along with Jim Shantz briefed the committee on the Murphy Family Farms operation. (See attachment 2) They used transparencies to show how Murphy Family Farms are environmentally, socially, and economically responsible. Also a sample of a synthetic liner was distributed which is used to line lagoons for ground water protection. Questions by the committee followed.

Chairperson Freeborn thanked Murphy Family Farms for their presentation. She announced that minutes for January 14, 15, and 20, committee meetings, had been distributed. If anyone has corrections they need to contact her office by January 26.

The meeting adjourned at 5:20 p.m.

The next meeting is scheduled for January 26, 1998.

HOUSE ENVIRONMENT COMMITTEE COMMITTEE
GUEST LIST

DATE: 1-22-98

NAME	REPRESENTING
Chuck Rice	KSU
Donald Whittemore	Kansas Geological Survey
Lee Gerland	" " "
Wilynda Holmes	Legislative Staff
Michaela Jacobs	Legislative Intern
Craig Volland	Spectrum Technologists
Noreen L. Connolly	Regislative intern
Beverly Ainal	Intern (Schwartz)
Blythe Ridemour	Intern for Rep Johnson
Donna Voth	Atty General
LeAnn Schmitt	legislative Division of Post Audit
Steven Graham	KSU
Edward C. Rome	League of Women Voters / KS
Wendy Harms	KAPA
Carole Jordan	KS Dept of Ag
Derenda Mitchell	KS Dept. of Agriculture
Steve Painter	Wichita Eagle
James P. Murphy	KS State Univ.
Cathy Tucker-Vogel	KS Water Office

**BRIEFING TO THE ENVIRONMENT COMMITTEE
KANSAS HOUSE OF REPRESENTATIVES**

22 January, 1998

Evaluation of Lagoons for Containment of Animal Waste

Participating from Kansas State University:

Dr. Bill Hargrove, Director, KCARE

Dr. Pat Murphy, Professor, Department of Biological and Agricultural Engineering

Dr. Lakshmi Reddi, Associate Professor, Civil Engineering Department

Dr. Jay Ham, Associate Professor, Agronomy Department

Dr. Chuck Rice, Associate Professor, Agronomy Department

*House Environment
1-22-98
Attachment 1*

Introduction

This brief report contains results from research conducted over the past year by K-State Research and Extension to evaluate the effectiveness of lagoons for waste containment. Our overall purpose for doing this work is to provide to producers, state agencies, and all citizens of Kansas the best science-based information that we possibly can regarding the effectiveness of lagoons to contain waste. As a public-supported institution, dedicated to research and information dissemination, our intent is to be both responsive to the research and information needs of the citizens of Kansas and responsible as scientists to disseminate scientifically valid results.

Several important points should be made regarding the objectives of our study and this report:

- 1) One of the objectives of this work is to evaluate the efficacy of different soil materials as liners for lagoons. We present here our results from laboratory evaluation of the characteristics of different soil materials with respect to their suitability as lagoon liners.
- 2) A second objective of our work is to measure the seepage rate for several functioning lagoons. Our field results for measurement of the seepage rate of whole lagoons is still very preliminary. We have studied only one lagoon over a relatively short period of time. Scientifically valid studies must be replicated before the results are generalizable, and a sufficiently large number of cases and conditions must be studied in order to have a complete understanding of natural phenomena. We plan to evaluate several more lagoons in the coming year.
- 3) We are aware that a burning question is, "What are the amounts and fate of chemicals and/or microorganisms leaving lagoons?" Although our study was not designed originally to answer that question, we did conduct a review of KDHE data on water quality from well surveys. We provide a summary of that review here. Although the data base is still small, no evidence of contamination by animal waste lagoons was found.

Although our review of KDHE well data provides no direct evidence of contamination of groundwater by animal waste lagoons, gaining a complete understanding of the functioning of lagoons and the fate of chemicals leaving lagoons is a long-term venture. This is due to the complexity of these systems and of transport phenomena. With funding proposed in the Governor's budget, we plan to expand our efforts in addressing these issues, and to initiate additional research to evaluate the amounts and fate of chemicals and microorganisms leaving lagoons. We will continue to keep producers, decision and policy makers, and the public informed of the results of this and any future work in this critical area of inquiry.

Summary (from 11/97 Report to KDHE)

Animal wastes often are collected in large lagoons in an effort to separate the liquid from solid phase and to reduce the quantity of solids through a digestion process. Questions recently have arisen concerning whether these lagoons adequately protect drinking water supplies from contamination by phosphorus, nitrogen, organic carbon, and bacteria. This study was executed to address these issues.

The soil materials and compaction criteria used to prepare lagoon liners in the field were studied in a Civil Engineering laboratory to determine if design recommendations are adequate to meet the current 0.25 inch/day standard. Three soils from western Kansas that are typically used in lagoon liners were tested, including a very sandy soil amended with 6% bentonite clay. Given a compacted soil liner 3 ft thick and a water depth of 20 ft, the calculated leaching rates ranged from 0.0013 to 0.13 inch/day. The majority of soils tested produced a leaching rate less than 0.0075"/day. The addition of bentonite to a sandy soil at the relatively low rate of 6% by weight had minimal impact on seepage rate. This aspect of the laboratory study suggests that the recommended procedures for liner preparation are adequate to meet the maximum leaching standard currently used by Kansas Department of Health and Environment.

The quantity of leachate is only one environmentally relevant measurement for lagoons; the quality of the effluent also is important. Therefore, the laboratory study was extended to analyze leachates for nitrate, ammonia, phosphorus, and bacteria when a suspension from a swine lagoon was used as the influent. Nitrate concentrations were very small (<2 mg/L) for the entire experiment. Ammonia concentrations continued to rise during the leaching, approaching the concentrations found in the influent waste suspension. Dissolved phosphorus was undetectable during the first few days of leaching, but approached 2 mg/L with time. Bacterial counts were consistently near 10^8 colony forming units/mL for the entire experiment (species of bacteria were not determined). From the laboratory study, we conclude that recommended construction parameters will achieve the desired 0.25 inch/day leaching rate, but the liner has a minimal impact on the composition of the water that passes through it. The potential impact of lagoon leachates on groundwater quality will depend upon site specific parameters, such as the chemical and physical properties of the soil and the depth to the water table.

A field study was designed to measure leaching rates under typical environments. Instrumentation was developed to measure simultaneously the evaporation, seepage, and total change in depth from two lagoons. Measurements were obtained using custom-designed floating platforms that were tethered in the lagoons being studied. Each platform measured evaporation using a floating lysimeter and the Bowen ratio energy balance technique. The water levels in the lagoons and the lysimeters were continuously monitored with ultrasonic ranging transducers. The equipment was deployed on a cattle feedlot in October, 1997 to test and refine the instrumentation. The lagoon under study, constructed in the late 1970s from native clay loam soils, was approximately 3 ha with an average water depth of 1.2 m. The new measurement system measured seepage to within 0.2 mm/day (0.0078"/day) after only a few days of operation (providing weather conditions are adequate). Seepage from the test lagoon was 2.38 mm/day (0.09"/day), which was below the suggested design standard of 0.25"/day. Average evaporation was 2.46 mm/day, and the change in depth was 4.84 mm/day. Although the data are preliminary, seepage from an older established facility was still within design standards after many years of use and varied management (i.e., cleaning, drying, etc.). Equipment developed for the field study will be used for future research on swine, cattle, and dairy lagoons. Data will help determine relationships between lagoon construction protocols, site management, and actual seepage rates.

Kansas Department of Health and Environment records were used to document concentrations of nitrate in wells across the state, with particular attention to wells in the vicinity of lagoons. Very high nitrate concentrations in groundwater have been recorded in two instances near beef packing plants. Although the nitrate contamination plumes included the region beneath the waste lagoons, it was impossible to determine the exact source of the contamination. In a small survey of lagoons associated with beef feedlots, nitrate concentrations in groundwater were not impacted by the presence of lagoons. Although some dissolved constituents from the waste (chloride and calcium) migrated from the lagoon to the groundwater, the liner was able to attenuate the nitrates, probably through denitrification.

Data presented here cannot be used to determine or imply if Kansas lagoons are affecting groundwater quality. Conclusions on the fate and transport of lagoon effluent must include research on physical filtration, chemical transformations, and microbial decomposition, processes that often help purify water as it moves through the soil. These factors, in combination with subsurface hydrology, ultimately determine the chemical nature of the soil solution under the lagoon. Additional research is planned to study the concentrations of nutrients in the soil profile within and under lagoon liners. These data will be analyzed in combination with laboratory studies and measured seepage rates to better understand the relationship between lagoon construction protocols and nearby groundwater quality. Given the diverse nature of lagoon systems, soil types, and geology in Kansas, a long-term, comprehensive, research program will be required to reach sound conclusions on this issue.

Laboratory Investigations

Objectives

Short-term (1st year):

Are current KDHE regulations of 0.25 inch/day met?

- Evaluate suitability of Kansas soils as lagoon liner materials
- Determine seepage quantities/qualities using sample-scale experiments

Long-term:

Can the KDHE regulations and liner construction standards adequately protect groundwater resources?

- Evaluate the effect of variability in soils and waste streams on lagoon liner performance
- Forecast field performance of liners based on laboratory observations
- Evaluate the impact of leachate quality on groundwater resources
- Recommend liner construction protocols, alternative liner materials and designs

Laboratory Investigations (Contd.)

Experimental Methods (Short-Term Studies)

- Three different types of soils from Southwest Kansas were acquired and were tested for their physical properties to assess how they fit in the USDA grouping.
- The soils were compacted (one of the three was amended with bentonite) in steel columns in accordance with engineering standards and seepage experiments were conducted under representative field conditions.
- The seepage from the soil columns was analyzed for Nitrate, Phosphorous, and Ammonia concentrations, and microbial counts.

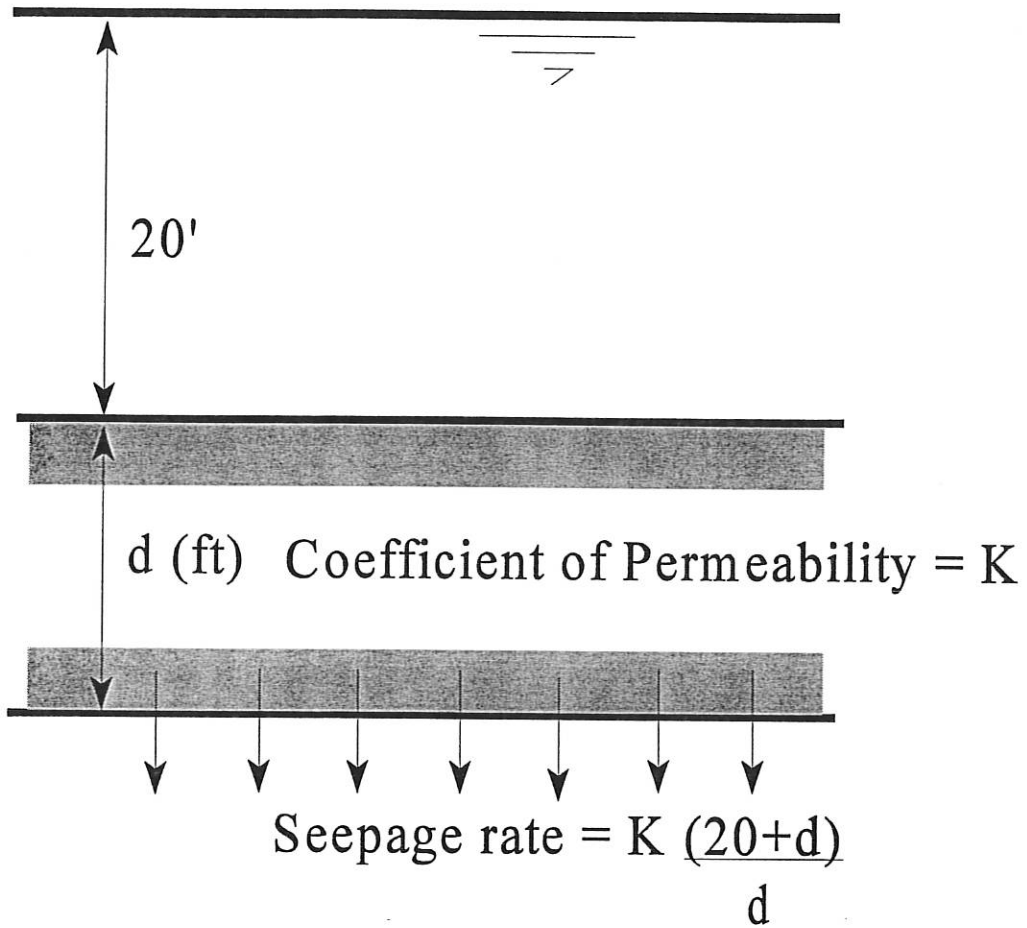


FIGURE 4.

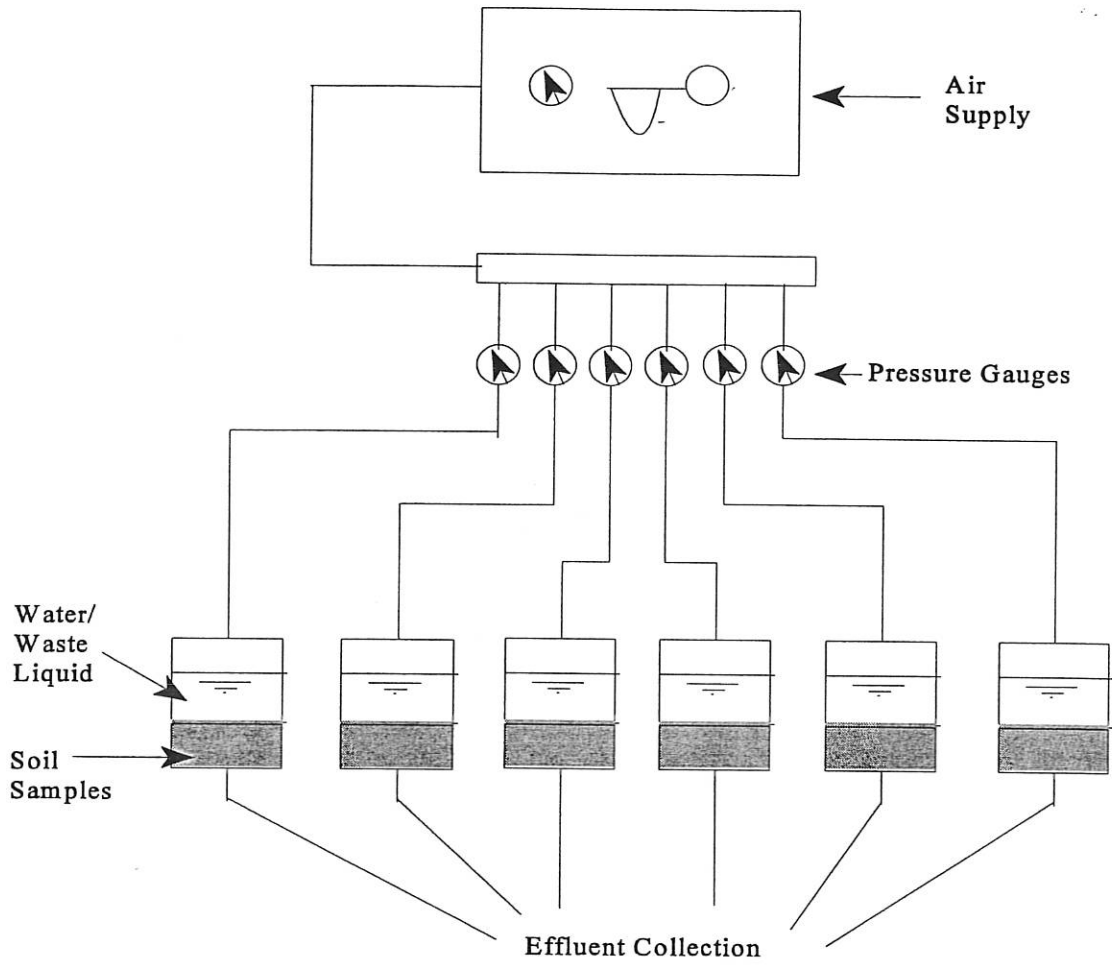


FIGURE 3.

Laboratory Investigations (Contd.)

Preliminary Results (Short-Term Studies)

- For the soils examined and for one type of animal waste studied, it was found that the KDHE regulation of 0.25 inch/day could be met if standard field construction practices are followed. The calculations assume that the lagoons are filled with animal waste to a maximum height of 20 feet and the thickness of the liner ranges from 1 to 3 feet.
- It is possible to use coarse soils of Southwest Kansas as liner materials provided they are amended with about 6% bentonite.
- Soils available in Kansas generally belonged to USDA Groups II, III, and IV.
- For the animal waste studied, chemical analyses on seepage indicated presence of Ammonia in high concentrations.

Seepage Rate vs. Permeability for Depths 1', 2', & 3'

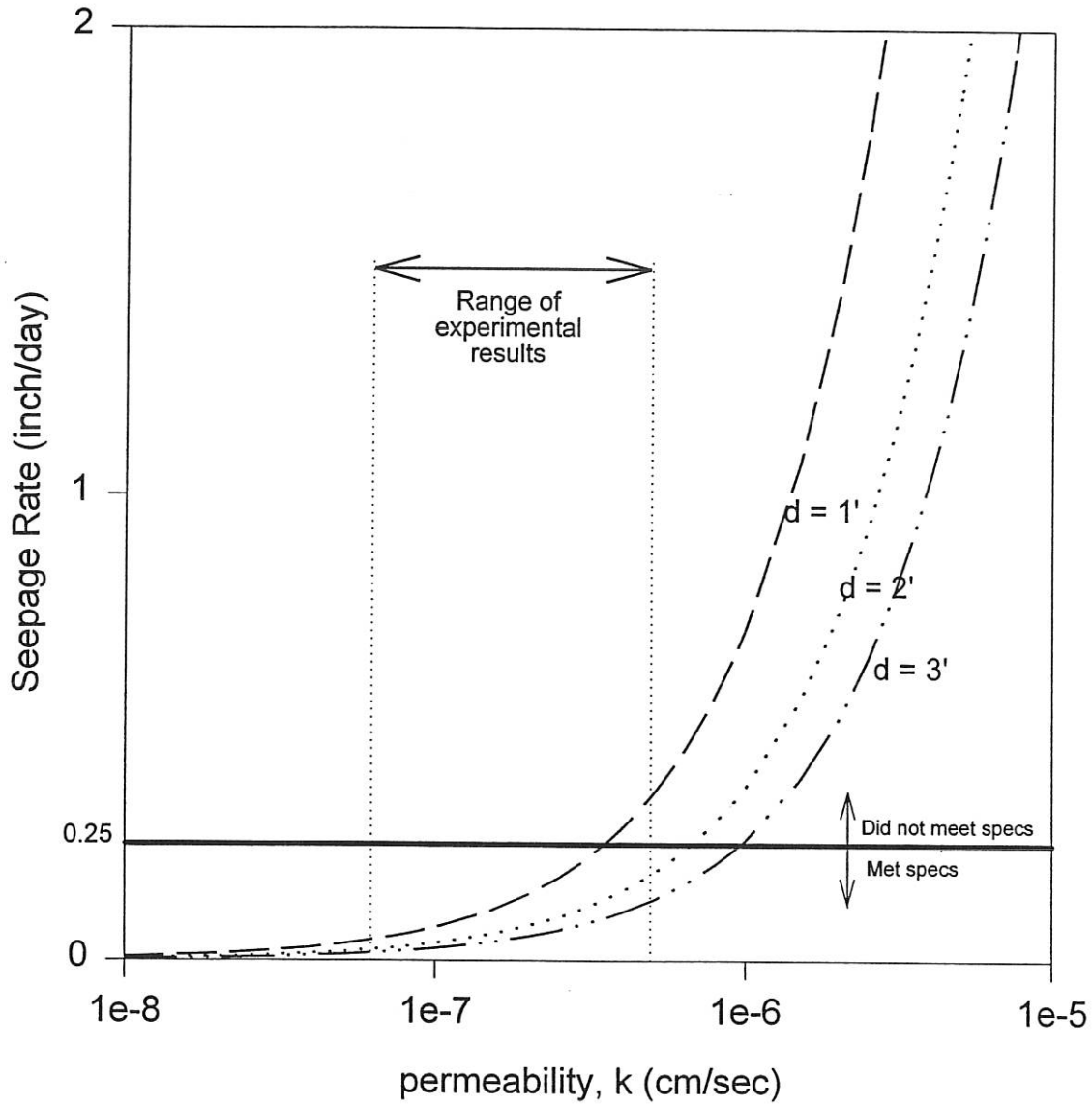


FIGURE 5.

Laboratory Investigations (Contd.)

Ongoing Studies

- Continue experiments to look at the effects of soil and waste variability on seepage quantities and qualities.
- Assess the long-term qualities of seepage from soil columns.
- Use laboratory data to forecast field performance of either existing or new lagoon liners.
- Assess the impact of seepage quantities and qualities on groundwater resources and answer the ultimate question: *Can the KDHE regulations and liner construction standards adequately protect groundwater resources?*
- Provide recommendations to the KDHE on liner material selection, designs, and construction standards.

Main Objectives

Short Term

- √ Determine if lagoons built and managed under existing guidelines will keep seepage rates below the recommended level of 0.25"/day.
 - Construction/Engineering
 - Soil Properties/Self-sealing
 - Site History (management, species)

Long-term

- √ Quantify Relationships between Seepage rates and groundwater quality
 - Geology/Hydrology
 - Soil Chemistry/ Microbiology
 - Site History (Species)

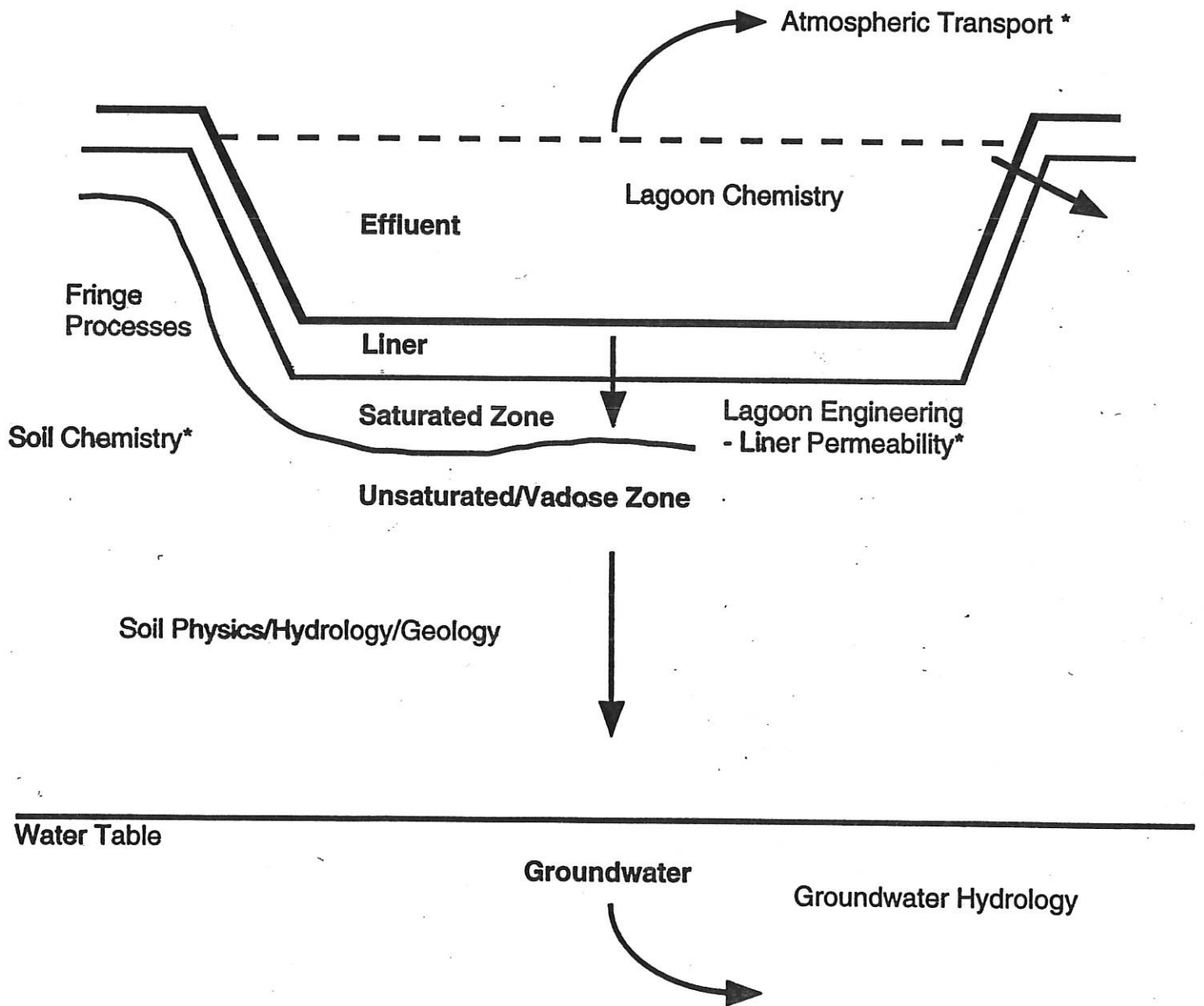
Research Thrusts and Priorities

- ✓ **Field Research**
Experimentation on existing and new lagoons
- ✓ **Laboratory Analysis**
Permeability of Kansas soils
- ✓ **Water Survey**
Well-water quality near animal waste lagoons

Lagoon Seepage $\xrightarrow{?}$ Groundwater Quality

Quantity Quality Transport Processes

Site Specific



1-15

Measuring Seepage from a Waste Treatment Lagoon by the Water Balance Method

Jay M. Ham

Associate Professor

Department of Agronomy, Kansas State

University

Objectives

Develop technology to accurately measure whole-lagoon seepage rates

Measure seepage rates (inches per day) from several existing wastewater lagoons in SW Kansas

Evaluate relationships between the observed seepage rates and lagoon construction methods

Test computer models of lagoon evaporation to improve and simplify the measurement of lagoon seepage

Methods

Water Balance Approach (conservation of mass)

Detailed measurements of inflow, outflow, and the change in storage will allow the determination of seepage

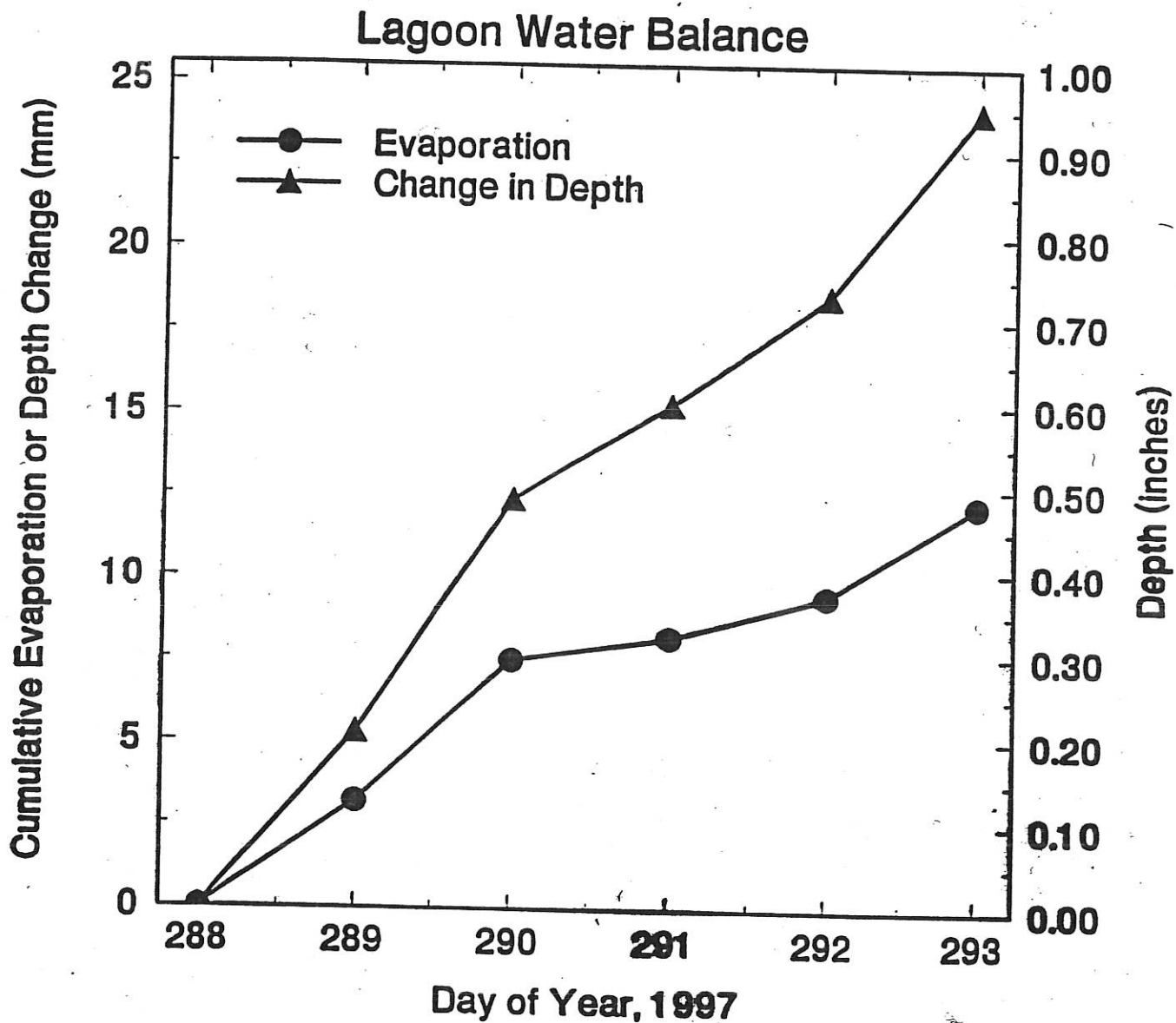


Figure 3. Cumulative evaporation and change in water level over a 5-day period at the test lagoon. Data were recorded by ultrasonic ranging transducers positioned over the lagoon and a floating lysimeter.

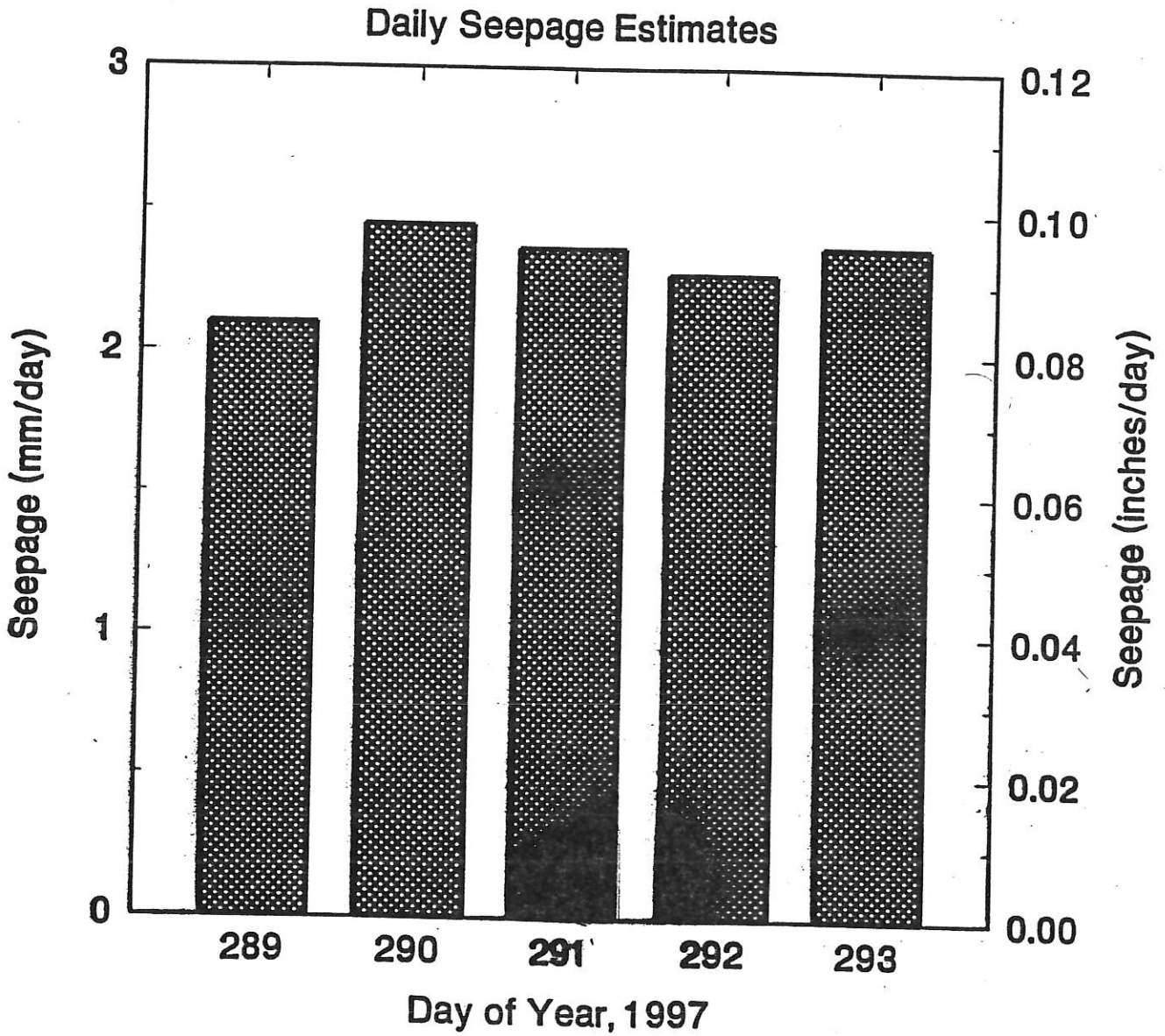


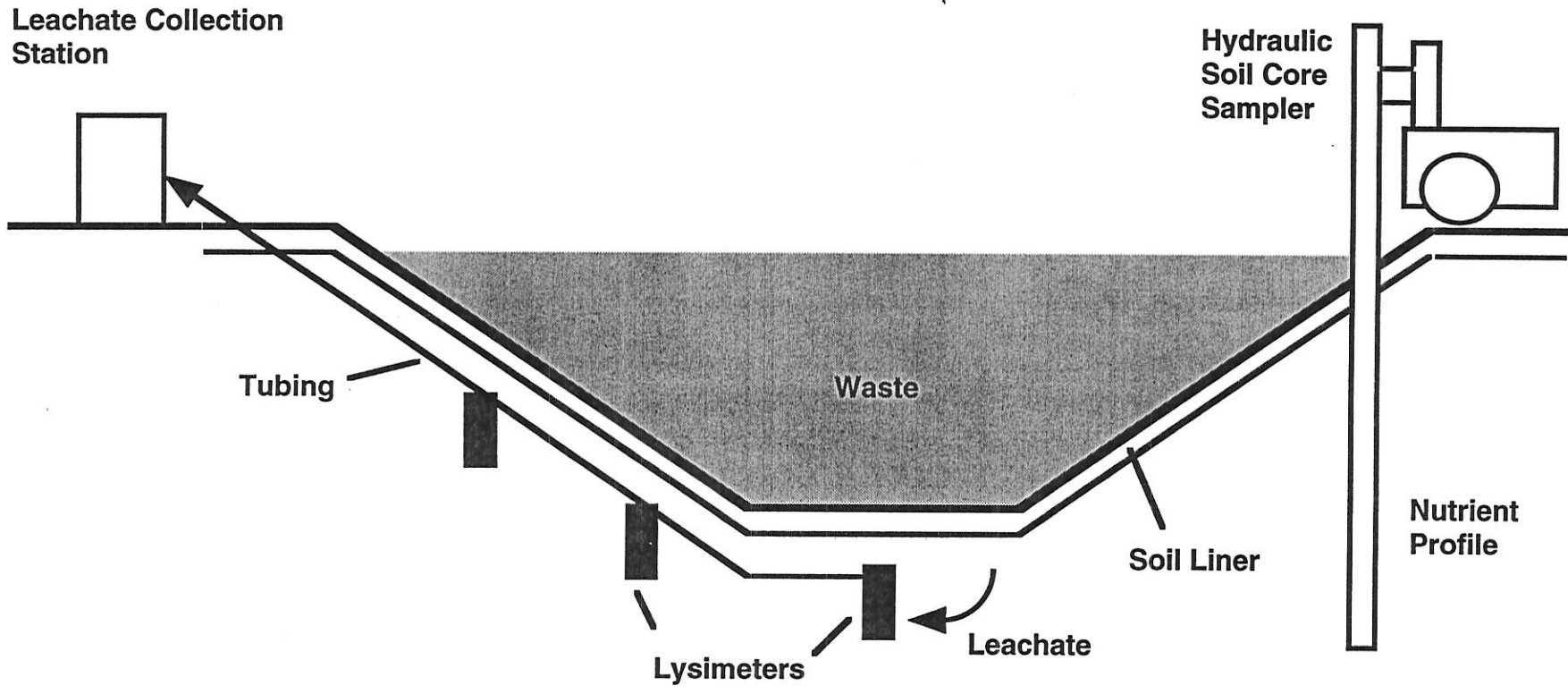
Figure 4. Daily seepage measurements from the lagoon over a 5-day period as determined from evaporation and water level measurements (see Fig. 3).

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New Research Opportunities

Installation of suction lysimeters beneath a new swine lagoon

Soil cores from 20-year old swine lagoon



Leachate Collection Station

Hydraulic Soil Core Sampler

Tubing

Waste

Soil Liner

Nutrient Profile

Lysimeters

Leachate

KDHE Groundwater Quality Monitoring Network

Data collected reported for 1991-1995

250 wells sampled (~125 wells sampled per year some more than once per year)

- ▶ 71% Public water supply wells
- ▶ 14% Irrigation wells
- ▶ 10% Rural domestic water supply wells
- ▶ 1% Livestock watering wells
- ▶ 1% Industrial wells
- ▶ 3% Multiple use wells

681 samples for 1991-1995

- ▶ State-wide
 - 12% of wells > 10 mg NO₃⁻-N/L
 - Range 0-65 mg NO₃⁻-N/L
- ▶ Region 7 (North Central Kansas) had the highest percentage of wells exceeding the Maximum Concentration Load (MCL); 20-30%
- ▶ Percentage of wells exceeding the MCL has not changed since 1976.
- ▶ Contaminated wells predominately in areas with sandy soils and shallow water tables.

Documentation of wells located near livestock waste lagoon facilities

Hobson (1991) published a M.S. Thesis to examine livestock operations on groundwater contamination.

Four feed yard lagoon sites were selected with shallow depths to groundwater (4 to 12 feet below bottom of the lagoon).

Down-gradient wells contained less NO₃⁻ than the up-gradient wells.

11 to 14 mg NO₃⁻-N/L compared to 14 -17 mg NO₃⁻-N/L.

The conclusion was that the lagoons was not a source of NO₃⁻ contamination in the shallow groundwater.

KANSAS GROUNDWATER QUALITY MONITORING NETWORK

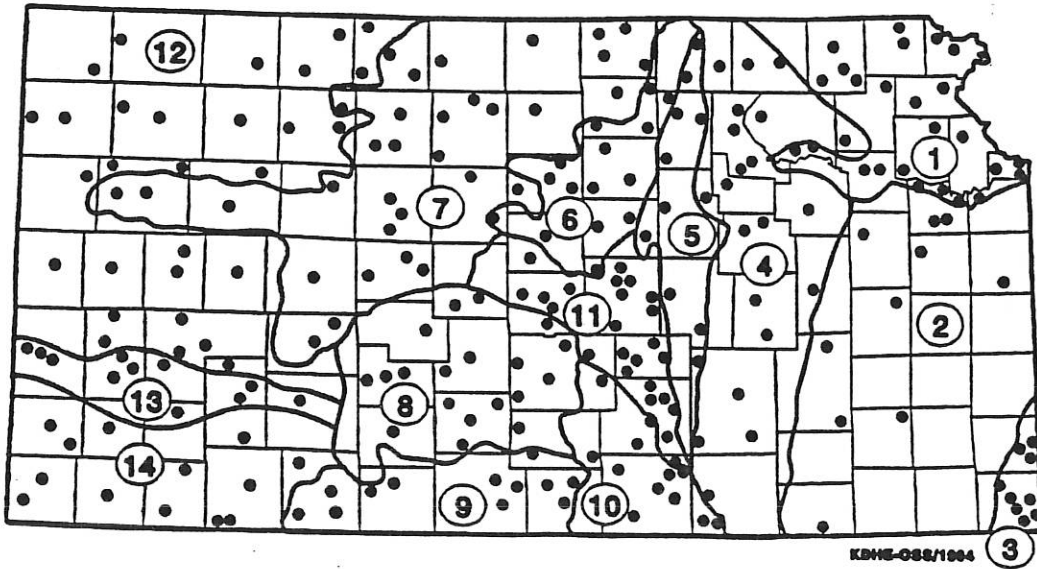
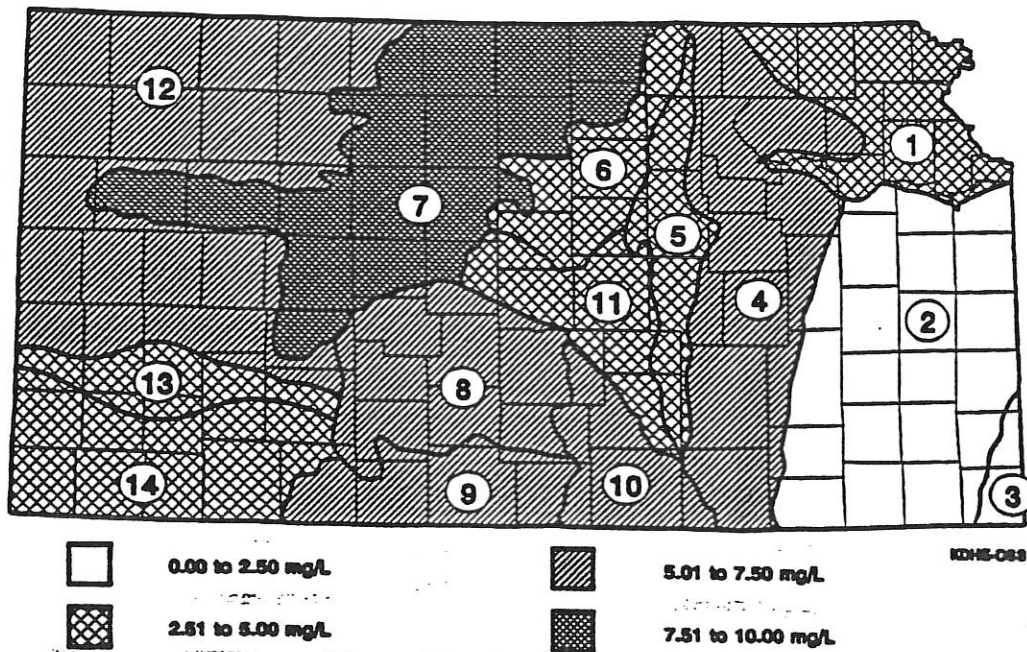
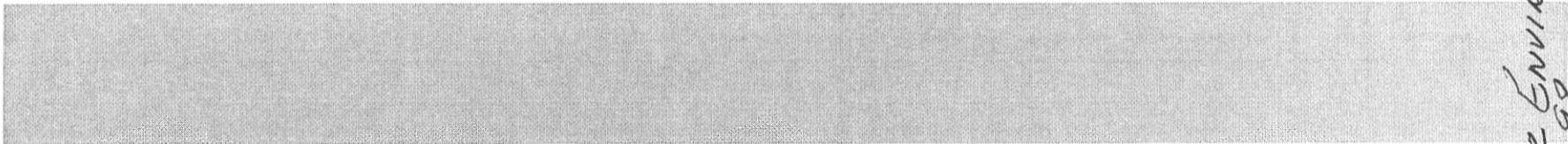


FIGURE 13: Geographic distribution of sites and groundwater regions.

FIGURE 20: MEAN DISSOLVED NITRATE CONCENTRATIONS (1992-1993).



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*House Environment
1-22-98
Attachment 2*

Thank You



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Introductions

- Tom Stinson
 - Development Manager for the Midwest
- Kay Stinson
 - High Plains Operations Manager
- Jim Shantz
 - Development Specialist for the High Plains



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Murphy Farms History

- Started by Wendell Murphy and his father.
- Began with a feed mill
- Expanded the business by contracting with local farmers
- Came to the Midwest in 1986
- Now in NC, IA, MO, IL, SD, OK, and TX
- Still completely family owned



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Murphy Family Farms is

Committed to being:

A. Environmentally Responsible

B. Socially Responsible

C. Economically Responsible



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Environmentally Responsible

- **Water Quality**

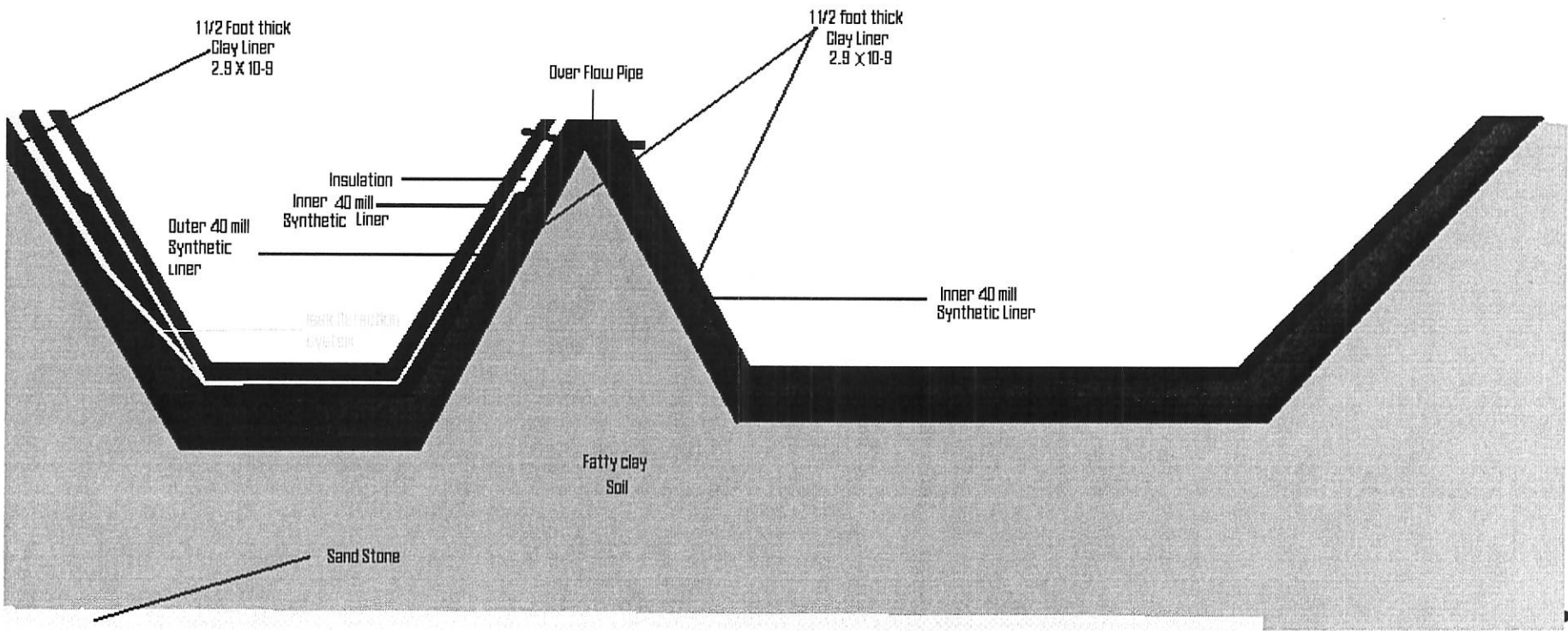
- MFF meets or exceeds all state and federal requirements
- Voluntary monitoring of on site wells
- Detailed nutrient management program
- Company owned lagoons lined with clay and synthetic liner.



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Ground Water Protection

WILDCAT SOW SITE



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Environmentally Responsible

- Water Quantity
 - Each sow unit uses only 80 acre feet of water.
 - This would be equivalent to 40 acres of corn.



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Environmentally Responsible

Dead Disposal Unit



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Socially Responsible

- Odor
 - Major issue to our industry
 - MFF engaged in continual odor reduction research
 - Odor abatement techniques implemented on every company site
 - Currently using digesters, lagoon additives, covered lagoons and barrel filters



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Socially Responsible

Methane Digester

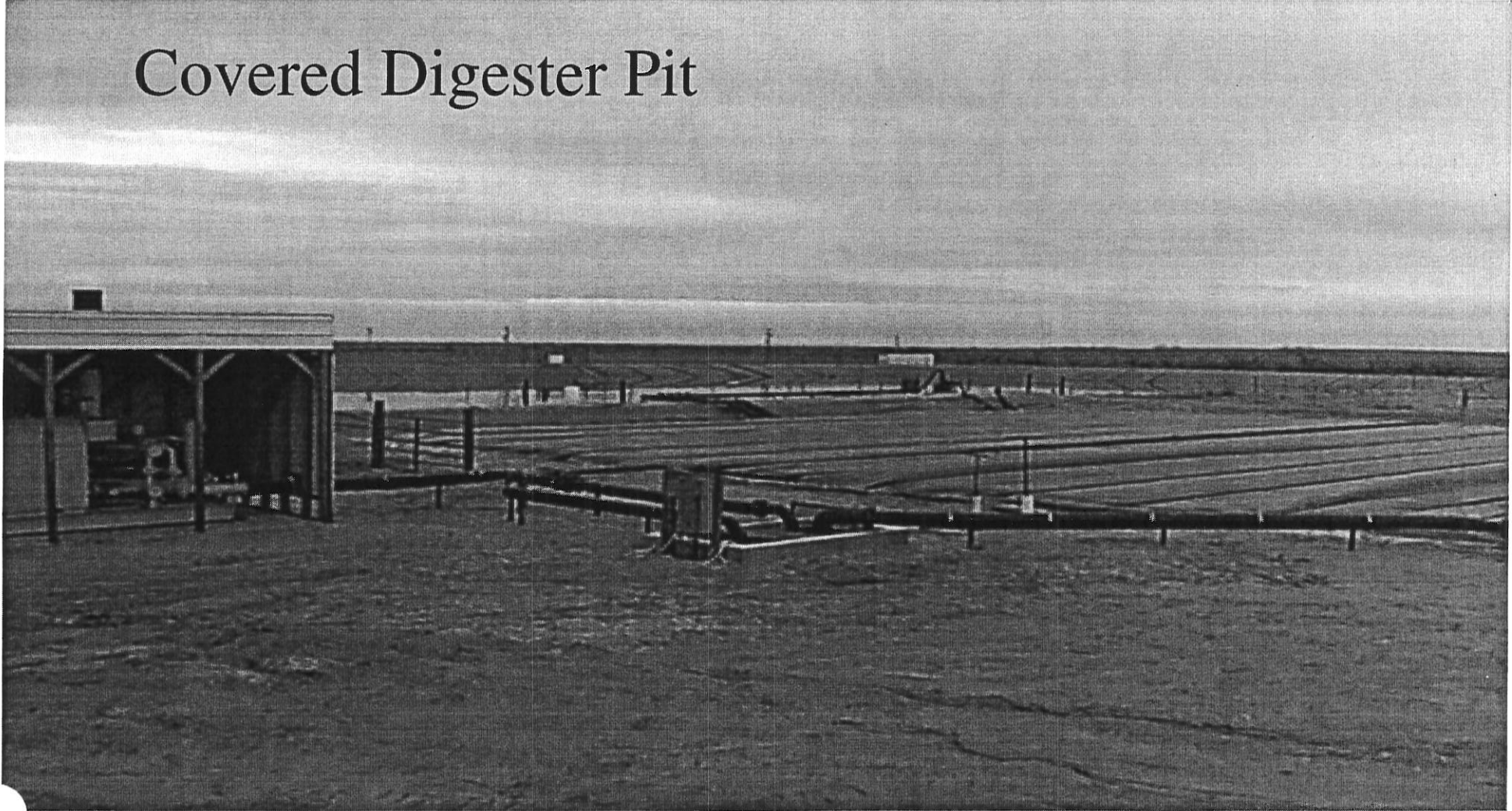


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Socially Responsible

Covered Digester Pit



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Plans for Kansas

- Company owned sow units
 - 11,000 head of sows
 - \$6.7 Million in capital investment per sow unit
 - 50 full time jobs (most from local area)
 - 13,520 tons of feed purchased per sow unit per year
 - No tax incentives or abatements that neighbor farmers don't receive



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Kansas Plans Cont.

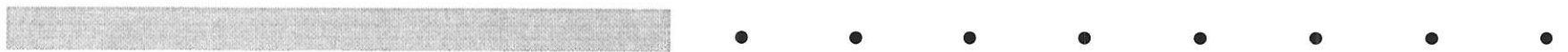
- **Contract Finishing**
 - Possible development in North Central Kansas
 - Close to available feed and markets (processing)
 - 10 year payoff with 10 year contract
 - Lowered risk



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Kansas Plans Cont.

- Contract nursery units
 - 10 for each sow unit
 - Contracted to independent producer
 - 10 year contract, 10 year payoff
 - \$2.5 Million in capital investment per sow unit
 - Proven track record (35 year history)





MURPHY

FAMILY FARMS

WHO IS MURPHY FAMILY FARMS?

We at Murphy Family Farms are dedicated to long term profitability through the efficient production of high quality pork for consumers worldwide. We are committed to the continuous improvement of our organization through the growth, development, and prosperity of our employees and producers. We will accomplish these goals by applying our values of integrity, animal care, environmental protection, safety, business relationships, and community well-being.

A BRIEF HISTORY

Wendell Murphy began his working career as a Vocational Agriculture instructor. Driving through the area one day, he and a friend saw a feed mill and decided that a similar operation could benefit their community.

In the mid-1960's, with some cash of his own and some assistance from his father, Wendell acquired the property and equipment needed to open the feed mill . . . keeping his job as a teacher for additional security.

As business progressed, Wendell began to establish contract arrangements with local farmers to manage the feeder pigs he purchased. Since then, the business has evolved, as has agriculture in general. In 1979, the company began producing their own pigs, and today, Murphy Family Farms operates a three-site production system: sow farms; off site

nursery partnerships, and off-site finishing partnerships.

Today, Murphy Family Farms has operations in North Carolina, Iowa, Missouri, South Dakota, Oklahoma, Texas and Illinois. At this time, about 400 staff members operate sow farms in our Midwest operations.

Director of Midwest Farrowing operations, Stephen Summerlin states, "Everyone is invited to tour our facilities near Nevada, MO, or Laverne, OK between 8 a.m. and 5 p.m., Monday through Friday. To schedule an appointment, please contact our Missouri office at 800-566-7675 or our Laverne office at 1-800-586-2019."

Myth vs. Fact

Murphy Family Farms' expansion plans generally create a number of questions and occasionally some misinformation. The following is an effort to clarify any misunderstandings.

MYTH: Murphy Family Farms (MFF) does not hire any local people. **FACT:** As of January 1, 1998, over 70% of our labor comes from within a 40 mile radius of the farms.

MFF employees will include college graduates and high school graduates; men and women; first-job employees and those with a good deal of work experience; employees with "pig knowledge" and those that are new to livestock production. The cross-section of applicants will be reflective of the community. Our employment base is generally directly related to the demographics of the community as a whole.

MYTH: Murphy does not spend money locally. **FACT: MFF spends 50% of construction dollars locally in MO, and 90% of our Oklahoma construction dollars are spent within an 80 mile radius of Laverne OK, plus significant dollars for regular operations.** The remaining % is spent on specialty items generally not available in the area.

Area vendors have the opportunity to bid on MFF Projects.

MYTH: Murphy's operations will negatively impact the environment. **FACT: MFF has a proven track of being environmentally responsible, and is setting the pork industry standard in natural resources protection programs at our farms and in surrounding communities. MFF was the 1996 Environmental Stewardship Award winner for the Mid West Region.**



Modern Pork Production

Gone are the days when Wendell Murphy began contracting with local farmers to raise feeder pigs; providing the farmer with pigs, feed, feeders and hog wire fencing. In 1979, Murphy began its first sow operations with a goal of disease control and an increase in the overall quality of feeder pigs.

Additional refinements brought about MFF's current three-site production process:

- Sow farms
- Off-site nurseries
- Off-site finishers

In the Midwest, Murphy has built sow farms that house from 2,400 to

11,000 sows and contracted off-site nurseries with local farmers. At the current time, all Midwest off-site finishers are located in Iowa and South Dakota, where local farmers grow the hogs to market weight.

Here's how the production process works:

- The farm is stocked with gilts produced at our multiplication unit.
- On the Commercial Sow Farms, gilts and sows are bred through artificial insemination, monitored and farrowed. Pigs are weaned at three weeks and sent to the off-site nursery.
- Off-site nursery partners provide the day-to-day care for the pigs for six to seven weeks.
- In Iowa and South Dakota, the feeder pigs are fed to market weight and sent to packing plants.

The required employees for an 11,000 head sow farm generally include a farm manager, two team leaders, an on site trainer, 23 technical people and 22 team members. Organization is critical to an effective sow farm. Processes are monitored and data is collected daily throughout the operation.

EMPLOYMENT STATISTICS

The following reflects the employee base of MFF's Oklahoma operations, as of 1/1/98:

- 75% from 40 mile radius of Laverne operations
- 7% from surrounding area
- 18% from Missouri and North Carolina Operations

MFF and the Environment

The environment is an issue that is in the forefront of the minds of many people these days. We at Murphy Family Farms understand the importance of protecting natural resources. The following information will help provide a view of Murphy Family Farms and our role in being responsible stewards of the environment.

Water Quality Protection

State and federal regulations direct the design and construction of effluent lagoons that must be followed by all large-scale animal producers. At MFF, we go one step further. Not only do our design and construction standards meet or exceed state and federal requirements, we also perform semi-annual voluntary monitoring of on-site wells. Testing is done to collect data and confirm that no lagoon water has leached to the ground water table. We work closely with agronomists and soil scientists to determine the best time and location to spread nutrient water on our land, assuring no off-site runoff.

Odor Research

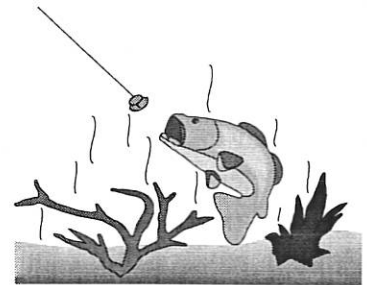
On an independent basis, and as a member of the National Pork Producers Council, Murphy Family Farms is actively engaged in odor research. MFF invests thousands of dollars annually in the development of new technologies and funds for extensive odor management research at Duke University. In addi-

tion, Murphy uses the latest odor management steps, including:

- Changes in lagoon management to lessen exposure of wastes into the atmosphere. As most lagoons mature, odor begins to abate as the natural breakdown of wastes takes place.
- Increase landscaping around lagoons to contain odor and improve screening.
- Use of setbacks that exceed federal guidelines.
- Changes in feed to produce less odor in waste.
- Improvements in management within the barns to reduce the waste volume.
- Chemical treatment of lagoons.
- New experimental fences designed to trap odor before it leaves the lagoon areas.

Wildlife Protection

Murphy Family Farms, with the help of resource professionals throughout the country, has implemented an Environmental Stewardship Program. This policy of wildlife protection and enhancement has been implemented on all MFF farms. The



program concentrates heavily on the improvement of wildlife habitat---through the establishment of certain types of vegetation that is beneficial to wildlife. Where appropriate, the program also includes provisions for opening Murphy's lakes and ponds to fishermen, and other steps for making Murphy's facilities a showcase for those interested in learning about wildlife protection and habitat enhancement.

Flexibility for Mom to Stay Home

Joanne Scotten enjoyed her job working as a manager for a travel agency in Nevada, but

there was one major drawback she shared with many mothers who work outside the home--not enough time to spend with her three young sons. In 1994, Joanne and her husband, C.D., saw an opportunity for Joanne to make money while staying at home with her sons.

Joanne and C.D., who own 300 acres east of Nevada, were interested in Murphy Family Farms' nursery partner program and contacted the Vernon County office.

Joanne is responsible for the nursery but she finds her sons want to help. After 2 1/2 years as a nursery partner, Joanne said, "It has been easier than I imagined and I have learned a lot. The best part is the flexibility of earning a good income while spending time with my family." Joanne joins 17 other women who have the primary responsibility to manage their family's nursery.

Change . . .

"Times are changing. Can you change in time? Changing with the times doesn't just mean adapting new technologies. It means adapting those technologies effectively Innovations in nutrition, management, genetics, and environment . . . make the most of your time . . .

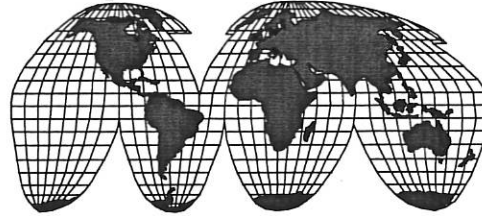
(Copied from a Nutrena Feeds ad in the January/February, 1996, issue of Pork Report)

. . . the pork industry

Pork Report, January/February, 1996, taken from an article entitled "Passport . . ."

For the first time since 1952, the U. S. became a net exporter of pork this past year What factors have spurred this growth explosion?

- A New Global Ball Game. In 1994, barriers began falling off with the passage of the North American Free Trade Agreement and the General Agreement on Tariff and Trade to level the playing field in the world marketplace



- U.S. Develops Market Niche. Pork checkoff dollars have focused on the development of foreign markets as well as domestic markets
- Competing on Price. The U.S. pork product has differentiated itself on safety, color, quality, consistency, availability and on price issues.

. . . food production

According to Bruce Bullock, a professor in the University of Missouri College of Agriculture, Food and Natural Resources, Clinton Daily Democrat, December 28, 1995, ". . . the food industry is rapidly being converted from a producer-driven to a consumer-driven system. . . . To be successful in these markets in the future, the U. S. food system will have to be geared to what the consumers want to buy, rather than to what American farmers want to produce."

Bullock listed five characteristics of new technology and its impact on society:

1. New agricultural technology is productivity-enhancing

2. New technology is management-intensive
3. New agricultural technology is capital-intensive
4. New technology is not scale-neutral
5. New technology is more beneficial to high-quality inputs

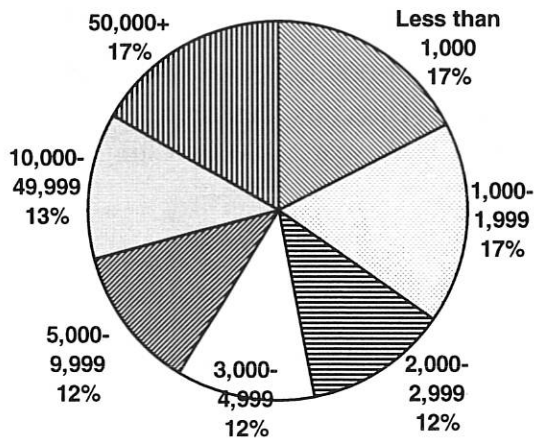
Bullock says industrialization of agriculture has been occurring for the past 75 years in America . . . “We have now entered the post-industrialized stage . . .”

. . . pork producers

“Independents Have A Place In The Future” Pork '95, October, 1995 by Marlys Miller provides the following information:

“The key is still management,” contends Ron Plain, University of Missouri

Pork Production Market Share, based on animals marketed per year



agriculture economist. “. . . size is not as important as a lot of people think it is. These numbers tell us small producers can compete, but you can’t do things the way you did last year. You’re going to have to change.”

“That doesn’t mean you have to have 5,000 sows or get out. It means you need to

look at the way you’ve raised hogs and adopt technologies . . . things that work and are effective.”

According to the article, finding someone to eventually take over the operation remained as a limitation for 17 percent of the Pork’95 respondents. “Independent producers who are willing to change the way they do things and continue to improve will have a place,” says Plain.

. . . summary

The crises in American agriculture may be recognized in the aging American farmer. For a variety of reasons, young people are not seeking ownership of the family farm as they did 20-30 years (and longer) ago.

Are there opportunities for young families in agriculture? Yes there are -- but what are the limitations?

Capital is one of the biggest drawbacks that keeps young couples from farming as their primary income. Over the past 20-30 years, land values have increased (a blessing to the retiring farmer; a curse to the young farmer); equipment costs have risen sharply; and interest rates have been volatile.

Risk is a large concern for any young couple starting out. Financing may be available, but the risks of weather, markets, etc. remain a heavy burden.

Other opportunities challenge one’s choice as well. College graduates with degrees in animal or plant science could effectively manage the family farm -- but at what risk, and with whose capital? Career opportunities in agri-business can be

rewarding with no capital requirements, limited risk, and employee benefits.


Murphy Family Farms is a family owned operation that started with a small investment in the early 1960's. The family has been successful based on hard work, by reinvesting capital into the operation, and developing programs and systems based on scientific and business management principles.

We at Murphy Family Farms are proud to be recognized as a leader in environmental, land nutrient, and pork production technological standards.

Murphy Family Farms Employee Benefit Summary

Following is a summary of benefits offered to full-time employees of Murphy Family Farms (MFF). Detailed explanations of these benefits and other company policies are available by referring to the Company Handbook or contacting the Human Resources Department.

Health Insurance



- Employees are covered, at MFF's expense, insurance may be purchased for family members
- Major medical coverage, health, and hospitalization are included

- Coverage includes conventional deductible and co-insurance standards
- Blue Cross/Blue Shield coverage

Life Insurance

- Employees and their immediate family members are eligible for life insurance coverage provided by Murphy Family Farms

- Employee coverage is for 1.5 times their annual salary
- Spouse coverage is set at \$2,500; children under 6 months are covered for \$200, over 6 months for \$2,500

Dental Insurance

- Dental insurance coverage, with a variety of options, is available for the employee and family members at the employee's expense to cover cleanings, x-ray's, etc

401(k) Retirement Program

- Following one year of employment, staff members are eligible to contribute to a self-directed 401(k) retirement program
- Before-tax contributions can range from 1% to 15% at the employee's option
- MFF matches 100% up to a maximum match of 4% (the match is 100% vested)

Profit Sharing - Retirement

- Regular employees are eligible to participate in the profit sharing plan following their first employment anniversary (must have worked at least 1,000 hours in the plan year). The Board of Directors determines company contributions each year. 100% vesting after 5 years.

Paid Leave

- Paid leave may be taken after it is earned
- ANY absences from a scheduled work day is considered a paid leave day
- Leave days may be accumulated
- Accumulation schedule:

1st year	.66 days/month
2nd - 4th years	1.16 days/month
5th - 11th years	1.58 days/month
12+ years	2 days/month

Holidays

- Paid holidays are as follows:

New Year's Day	Labor Day
Thanksgiving Day	Easter
Memorial Day	Christmas Day
Independence Day	

Long Term Disability Insurance

- MFF provides managerial/supervisory payroll employees with long term disability insurance coverage

Probationary Period

- All new employees are subject to a 60 day probationary period and become eligible for all benefits following the completion of their probationary period.

Our doors are open.

Murphy Family Farms continues to develop plans to expand operations. Occasionally the press has focused on negative events associated with hog farms. In any business, be it manufacturing, row crops, or cattle farms, there are good and bad producers. Murphy Family Farms understands all aspects of our business, we operate responsibly, and we can prove it. We ask only that your opinion of Murphy Family Farms be based on facts.

We make the following invitations to any interested citizen:

1. **Visit our farms in Missouri or Oklahoma.** We welcome individuals or groups, schools, churches, civic organizations, etc. All areas of our farms are open and visitors who meet our bio-security measures will be allowed to enter the hog buildings.

2. **Send technical specialists** (individuals or teams) to our farms in Missouri and/or Oklahoma to evaluate our overall management procedures.

3. **Call the Missouri Department of Natural Resources.** The DNR approves farm designs and monitors and regulates day-to-day operations. Ask DNR about pork producers in general and specifically about Murphy Family Farms.

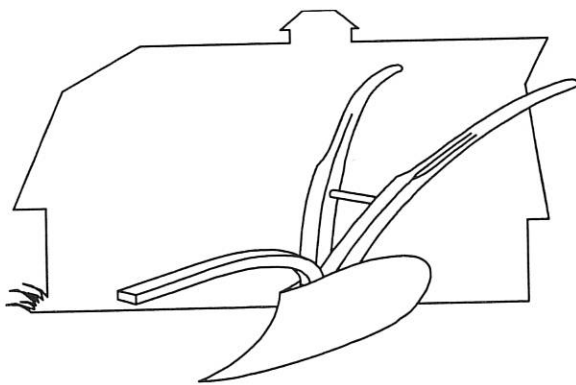
4. **Call lenders and contract partners who have worked with MFF.** Contract partners and lenders who have been involved in our programs can provide a wealth of knowledge and insight.

5. **Encourage your friends and neighbors to follow-up on their issues and concerns.**

We offer you the opportunity to judge us not as an industry but as a company, to form opinions based on facts, and to get to know us as individuals.

EMPLOYEE PROFILE

Adam Weigand was born and raised on a diversified crop and livestock operation in East Central Kansas. His parents still live there, where his father farms and serves as a county commissioner and his mother is a legal secretary. Adam saw an opportunity to remain in agriculture and have an impact on food production at its core level. (production agriculture) Adam joined Murphy Family Farms in June of 1994 after graduating from Kansas State University. Adam worked for three years in our Missouri operations, near Nevada, Missouri. Two of these years were spent managing a 3600-head commercial sow farm, which was one of the farms in the pyramid recognized nationally for environmental stewardship. Adam chose an opportunity to help start up our High Plains expansion and is scheduled to manage our Wildcat sow farm near Jetmore, Kansas. Currently, Adam is filling a role in our High Plains Development team while we wait to receive our Wildcat permit.



AGRICULTURE

Tours for individuals, groups, specialists:
 Murphy Family Farms
 Missouri 1-800-566-7675
 Oklahoma 1-800-586-2019

Employment Information:
 Darra Johnson 800-566-7675

Missouri Department of Natural Resources:
 Mr. David Shorr, Director 314-526-6627
 George Parsons, Inspector 417-895-6950

Financial Institutions:
 Ray Tubauch, Mercantile Bank 417-682-5502
 Dennis Markham, First National Bank 417-667-3057
 George Cooley, Farm Credit Services 417-451-6084

Nursery Contract Growers:
 Ronnie Means 417-682-5874
 Wayne Jeans 417-927-3480
 Jeannie Petit 417-667-6876

SHARED PRIDE

As part of Murphy Family Farms, employees and contract growers are members of a team who share a common goal: producing a high-quality food in an environmentally responsible way. It's a kindred group that participates in providing good jobs and economic security--and shares the company's pride in doing so.

- ⇒ The truck driver hauling the grain that feeds the pigs.
- ⇒ The accountant who translates all the activity into meaningful numbers.
- ⇒ The purchasing agent who ensures that we have needed farm supplies and equipment.
- ⇒ The office professional storing important data into the computer.

All staff members and contract growers are as much a part of the farming operation as the worker who nurses a piglet in its first few minutes of life. It's hands-on involvement that makes the difference -- whether those hands scoop out grain, shift gears, or tap a keyboard.

As part of this effort, MFF team members provide a vital link in the pork production chain and are an integral part of agri-business. Our team members are proud of their dedication through their support and participation in programs to increase their knowledge and skills. We have a kinship born in professional co-operation --and collective pride.



Murphy Family Farms

FACTS ON FILE

Murphy Family Farms was founded in 1962 in North Carolina by Wendell Murphy. The company's long history of contracting began with local farmers to finish out feeder pigs. Originally owned by Wendell Murphy and his father, the company continues to be family owned by Wendell, his brother, his sister and his son. The company continues to raise only hogs.

Midwest Overview

Murphy Family Farms has operations within the Midwest in **Oklahoma, Iowa, Missouri, South Dakota and Illinois** with expansion planned for Texas and Kansas.

The company uses three types of facilities: sow farms, nurseries, and finishers. These may be company owned or owned and operated under contract by local farmers. We own several feed mills, but we do not own packing plants.

Oklahoma Operations

Hogs are raised here for market (commercial production) and for breeding stock. Commercial farms hold 11,000 sows and breeding stock farms hold 3,650 sows.

We contract with local farmers. The farmers provide the facility, the day-to-day management and environment management. **We have a contract sow farm and several contract nurseries in Oklahoma.**

A new feed mill is projected for the region. At full capacity, **the mill will use 19 million bushels of grain annually**, with some of the grain purchased from local farmers.

Community Investment

Murphy has committed to **more than \$ 20 million capital investment in Northwest Oklahoma with no tax break or incentives** taken by the company.

More than **\$2.3 million** were spent in **Harper, Ellis and Woodward Counties** in 1997 (excluding salaries and feed).

One out of every four construction dollars are spent locally.

In 1997, Murphy Family Farms will pay more than \$14,500 in real estate and property taxes.

Murphy Family Farms continues its **long history of donating to the communities** in which it operates. Cash and hog donations were made to local, civic, school and not-for-profit groups. Our employees are actively involved in community organizations such as local Chamber of Commerce, Lions, Laverne Booster Club and local churches.

Employment and Training

Murphy Family Farms added 89 new jobs in 1997 to the Laverne, OK economy. 70% of all employees are from the local area.

The company maintains an **aggressive training and promote-from-within program.**

Technical training teaches employees what to do, how to do it, and why, with a goal of proficiency..

Murphy's Continuous Quality Improvement program emphasizes statistics and Deming and Covey management principles.

Competitive benefits equal to 26.5 percent of salary

- Health and dental insurance
- Life insurance (100% paid by Murphy)
- 401(k) retirement plan with 100 percent match up to 4 percent contribution
- Profit sharing retirement program
- Paid leave days (combination of sick and vacation days)

FACTS ON FILE

Murphy Family Farms takes very seriously its role as a Steward of the land. As a leaders in the pork industry, Murphy Family Farms chooses also to be a leader in the role of wise land use. Sound management of our natural resources are accomplished through the use of proven scientific methods, and through the dedication of employees and contract partners alike.

Responsible Land Use

All facilities undergo a detailed permitting process. **Sites are designed by professional engineers to meet or exceed state and federal regulations.**

Preliminary soils evaluations, including compaction and permeability tests, are completed to determine a site's suitability for construction.

Lagoons are lined with compacted clay or, on larger farms, approved synthetic liners.

The company requires a minimum of one mile setback from an occupied residence for sow farms locations.

Annual soil sampling is conducted to **monitor 11 soil constituents**, including potassium and phosphorus.

Cropping and irrigation plans are designed by professional agronomists to match soils' characteristics and needs.

Thorough record-keeping tracks nutrient application on fields to ensure proper fertilization.

Best management practices are followed to optimize nutrient application to farm fields.

Odor Control and Manure Treatment

Murphy Family Farms participates in odor research with North Carolina State, Iowa State, and other universities.

The company's **two methane digesters in Oklahoma control odor and treat manure** by using technology from municipal waste treatment systems.

MFF is testing technology to treat manure and control odor which have proven effective on dairies and other agricultural operations.

The company's costs for **voluntarily implementing new technology** can add over \$300,000 cost to a site.

Environmental Stewardship

Conservation of topsoil and protection of water quality are chief goals.

Use of riparian setbacks and establishment of field borders preserve natural vegetation, reduce erosion, and protect water quality.

Erosion control methods, such as conservation tillage, terracing, and establishment of windbreaks are **practiced across the company.**

The company encourages the creation of wildlife habitat through vegetation plantings and establishment of unique areas such as wetlands and ponds.

Farms are open to the public. MFF establishes demonstration farms to explain environmental practices.

1996 Midwest Winner of Environmental Stewardship Program sponsored by National Pork Producers Council, National Hog Farmer and Pfizer for the Ozark Pyramid, which includes four sow farms, located near Sheldon, Missouri.

For more information, please call our Laverne, Oklahoma office at (580) 921-1569.

Murphy Family Farms and Our Water

Water is a valuable resource to all of us. It is especially important to farmers. It is our lifeblood. As livestock producers, we depend on reliable, clean water for our operations.

The two issues that must be addressed are water **Quality** and water **Quantity**.

Water Quality

Protection of our water from contamination is not just a goal, it's a necessity. State and federal guidelines direct the design and construction of effluent lagoons that must be followed by all large-scale animal producers. At Murphy Family Farms, the protection of ground water starts before we ever have a pig on the property, or any construction underway. As part of our site evaluation process, we conduct soil sampling by drilling test holes. The analysis of the soil from these holes tells us the type of soil on the site, whether there is adequate material for a clay liner, and if the water table is too close to the surface. We also go a step further. Not only do we construct our lagoons to meet or exceed state and federal laws, we also perform semi-annual voluntary monitoring of on site wells. Testing is done to collect data and confirm that no lagoon water has leached into the water table. We work closely with soil scientist and agronomists to determine the best time and location to apply nutrient waters.

On top of the measures taken above to protect the ground water, we have chosen to line our lagoons with a synthetic liner. This plastic liner is professionally installed and tested to insure against leaking.

Water Quantity

Water conservation is also taken very serious at Murphy Family Farms. We are continually looking for ways to lower our water usage. Today, an 11,000 head sow unit is approximately 80 acre feet of water per year. This would be the equivalent to 40 acres of irrigated corn. A contract nursery facility will use only 5-8 acre feet per year.

On many of our sites, we have a net decrease in water usage than before we were there. Here's how it works. We buy a portion of a farmer's land, and then lease his remaining land for application of nutrient water. When we change the water from agricultural use to livestock, there is a loss of 30%. For example, to get 70-acre feet of water for animal use, the farmer will lose 100-acre feet available for agriculture use. So the amount of water available for use has been decreased. The water is used on the farm for drinking water, and wash water. When the water leaves the farm, it goes to a lagoon and from there back onto the farmer's field. Only now it is a value added water.

Murphy Family Farms and Water Usage

Size and type Of Facility	What we use	Other terms
11,000 head sow unit	80 acre feet	40 acres of corn
3400 head nursery unit	3-5 acre feet	4 acres of corn
3300 head finishing unit	8 acre feet	4 acres of corn