Approved: 2-17-99
Date

MINUTES OF THE SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES.

The meeting was called to order by Chairperson Senator David Corbin at 8:14 a.m. on February 16, 1999 in Room 254-E of the Capitol.

All members were present except:

Committee staff present:
Raney Gilliland, Legislative Research Department
Lila McClaflin, Committee Secretary

Conferees appearing before the committee:
Bill Hargrove, Director of Kansas Center for Agricultural Resources and The Environment (KCARE), Kansas State University
Alan Schlegel, Professor, Southwest Research-Extension Center, Kansas State University

Others attending:

See attached list.

Chairperson Corbin welcomed Marc A. Johnson, Dean and Director, Steven M. Graham, Assistant to the Dean and Director and the presenters, Bill Hargrove and Alan Schlegel all from the Kansas Center for Agricultural Resources and the Environment from Kansas State University.

Bill Hargrove, Director of KCARE, Kansas State University, said they were present to provide information in response to Kansas HB 2950. He said they have identified nine areas for K-State Research and Extension to look at in meeting their obligations and in response to legislative, state agency and citizen concerns over the issues related to swine waste management and application to land Update and Summary of Research and Extension Programs in Animal Waste Management and Utilization (Attachment 1).

Mr. Hargrove said the extension offices have planned four extension programs to educate the public on the Kansas Swine Environment Laws and implementing the procedures on the farm. The seminars will be held in Linn, Garden City, Newton and Seneca they expected to have around 250 in attendance at the four seminars. Mr. Hargrove responded to questions.

Jay M. Ham, Associate Professor, Department of Agronomy discussed the area on seepage losses from animal waste lagoons, and potential impacts on groundwater quality. He showed slides of lagoon management. More detailed information regarding this issue is on file in the office of Legislative Research or in the office of the Chairperson. Dr. Ham responded to questions regarding abandon lagoons and the Dekalb site at Dodge City. In discussing how long it might take for the nutrient laden soil under a lagoon to pose a significant risk to groundwater Mr. Ham said it would be hard to determine as it is a slow process, they are bit sure how much of the nitrogen might be lost to the atmosphere, there is thought if certain crops were planted over the abandon site it might absorb large portions of the nitrogen. Additional research was needed to determine if this nitrogen will affect groundwater. Responding to a question he said a lagoon usually will need to be cleaned out every 10 to 20 years and that the clean out process is not new. It has been around.

Alan Schegel, Professor, Southwest Research-Extension Center, discussed animal waste being used on agricultural soil as fertilizer. At the present time there has been no research on hog waste but there has been several studies on cattle waste. He said in recent years there has been a great deal of environmental concern with phosphorus runoff and nitrates, and protecting the groundwater

Senator Corbin thanked the Kansas State Presenters for their informative presentation.

MINUTES OF THE SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES, Room 254-E Statehouse, at 8:14 a.m. on February 16, 1999.

The minutes of February 12 were presented. With a motion from Senator Biggs and a second from Senator Morris the minutes were approved as written.

The meeting adjourned at 8:56 a.m.

The next meeting will be held on February 17, 1999.

SENATE ENERGY & NATURAL RESOURCES COMMITTEE GUEST LIST

DATE: 2/16/99

NAME	REPRESENTING
Bill Hargrove	KCARE / K-State
Alan Schlegel	SWREC / K-State
Garry Keeler	KDA
Jon K Myles	KEC
Laurie Ann Brown	KS Govt Consulting
Dave Freise	KDHE - BOW
Marc Johnson	K-State Research & Extn
Lee Gerhard	KS Geol. Survey
Karl Mueldener	KDHE
Dave Freise	"
Rich McKee	KLA

KSTATE
Kansas State University

REPORT TO THE ENERGY AND NATURAL RESOURCES COMMITTEE, KANSAS SENATE

16 February, 1999

Update and Summary of Research and Extension Programs in Animal Waste Management and Utilization

Marc A. Johnson, Dean and Director
Steven M. Graham, Assistant to the Dean and Director

Presenters
Bill Hargrove, Director of KCARE
Jay Ham, Associate Professor, Department of Agronomy
Alan Schlegel, Professor, Southwest Research-Extension Center

Kansas Center for Agricultural Resources and the Environment
K-State Research and Extension
Kansas State University
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KCARE

Senate Energy & Natural Resources
Attachment: 1
Date: 2-16-99

Animal Waste Management and Utilization - 1999

Table of Contents

I. EXECUTIVE SUMMARY

K-State Research & Extension Response to HB2950:
An Animal Waste Management Research & Extension Initiative

Bill Hargrove, Director of the Kansas Center for Agricultural Resources and the Environment (KCARE)

In response to Kansas HB2950, we have identified the following tasks for K-State Research and Extension in meeting our obligations and in responding to legislative, state agency, and citizen concerns over the issues related to swine waste management and application to land:

1. Conduct a literature review on land application of animal wastes focused on Kansas and similar environments, and prepare a summary of technical information on land application of animal wastes, especially related to the potential for contamination of groundwater.

2. Assist KDA in developing guidelines for nutrient utilization plans and related regulations through meetings and providing technical information and review, as requested by KDA.

3. Assist KDHE in designing a training/certification program for waste managers and personnel applying animal waste to land.

4. Conduct the necessary lab/field research to support the guidelines for "agronomically appropriate application rates" and conduct an educational program on land application of animal wastes.

5. Investigate wastewater recycling through irrigation systems.

6. Conduct "deep sampling" on fields where swine waste has been applied in order to determine the potential for groundwater contamination.

7. In ongoing lagoon evaluations, focus on determining the amount and fate of chemicals "seeping" from lagoons. This should include direct measurement of concentrations of solutes below lagoon liners by deep coring and modeling the fate of water and solutes leaving lagoons.

8. Design and evaluate "best management practices" for closing facilities and associated lagoons in environmentally safe ways.

9. Expand our educational efforts in odor management and control.

Of these tasks, #1,2,3, and 6 are more short-term in nature and #4,5,7, 8, and 9 are more long-term in nature. We have developed a unified Plan of Work that describes our objectives and plans for accomplishing the above tasks. It is presented as Attachment I. We summarize in the following pages our progress and key findings in several important areas over the past 12 months.

Seepage Losses and Nitrogen Export from Animal-Waste Lagoons - Dr. Jay Ham, Leader

We have now measured seepage rates on a total of nine lagoons (7 swine and 2 cattle). The seepage rates for the nine lagoons ranged from <0.01 to 0.10 inch/day with a mean of 0.05 inch/day (the KDHE maximum is 0.25 inch/day). Sludge that accumulates on the bottom of the lagoon plays a role in reducing the permeability of the liner and reducing the seepage rate at least over the first year of initial use. Most of the nitrogen leaving the lagoons via seepage is in the ammonium form, a relatively

immobile form in soil. Though the total amounts of N leaving lagoons as ammonium can be large (1 to 6 tons of ammonium-N/yr), we hypothesize that most of this ammonium will be held by soil below the lagoon liner as long as the soil texture is medium to fine (silt loam to clay). Results from coring beneath a lagoon show this to be the case. Most of the ammonium is held by the soil to a depth of about 10 feet below the clay liner. When a facility is closed or a lagoon is no longer in use, exposure of the ammonium-saturated soil to air will result in conversion of the ammonium to nitrate, posing a significant environmental risk. For more information, see Attachment III.

Assistance to KDHE and KDA in Developing Regulations, and Nutrient Management Planning - Prof. Pat Murphy and Dr. Dave Whitney, Leaders

We provided technical information and input to new regulations drafted by KDHE and KDA as required by HB2950. The requirements for nutrient management plans can be found in Attachment IV. We are in the process of developing and planning the certification training program in collaboration with KDHE. The plan is to begin offering those training sessions in summer, 1999. We have also developed an educational program in nutrient management planning; a brochure is attached, outlining the program and identifying the dates and venues for the programs. See Attachment IV.

Literature Review: Environmental Impact of Land Application of Animal Wastes - Dr. Alan Schlegel, Leader

Over 100 scientific journal articles from around the country and relating to all livestock manure, not just swine, were reviewed. The important environmental issues related to land application of animal waste include: nitrate leaching, phosphorus in surface runoff, salt accumulation and leaching, and heavy metal accumulation, especially zinc and copper.

There has been no reported research from Kansas that evaluates application of swine waste with respect to nitrate leaching. However, there have been several reported studies of beef cattle waste application and nitrate leaching. From research around the country and on a variety of types of animal manure, the risk of significant amounts of nitrate leaching is a function of the rate of manure application, regardless of manure type. Applications that result in nitrogen amounts exceeding the crop requirement result in nitrate leaching. When manure applications are limited to the crop N requirement, there is no indication of nitrate leaching or a threat to groundwater, regardless of manure type.

With respect to phosphorus losses in runoff, not only is rate of application important, as with Nitrogen, but also the timing of manure applications is very important. The major portion of P loss in runoff generally results from one or two intense storms. Thus, the length of time between manure applications and the first runoff-causing storm is important. Phosphorus loss can be minimized by incorporation of manure through tillage or injection. Data from Oklahoma shows that soil test P levels of 200 ppm resulted in 1ppm P in runoff, while results from Arkansas showed soil test levels of 100 ppm resulted in 1ppm P in runoff. Applying manure based on crop N requirements alone results in P accumulation in the soil. Thus, most states are using P as the basis for manure application.

Salt content of manure or wastewater can sometimes be high enough to cause crop damage when applied to land. However, no reports of a human health threat or environmental damage other than crop injury were found. There are published reports of plant injury form Zn or Cu in situations where municipal sludge have been applied to cropland, but no reports of damage from animal waste.

The complete literature review is presented as Attachment V.

Impact of Land Application of Animal Wastes on Soil Chemical, Biological, and Physical Properties - Dr. Alan Schlegel, Leader

Soil chemical properties were measured in irrigated fields in western Kansas with a history of animal waste applications. The fields varied in the type of waste applied (solid cattle manure or effluent water from swine or cattle wastewater lagoons) and the duration of application (from 3 to 30 years). At most

sites, soil phosphorus (P) levels were increased (up to 150 ppm) by waste applications, indicating that application rates exceeded crop P demands. The highest P concentration was 200 ppm Bray-1 P in the surface soil (0 to 6 inch depth), which is the maximum level established for continued application of swine waste. Soil nitrate levels were also increased (as much as 100 ppm) by waste applications. At some sites, considerable nitrate (30 to 50 ppm) had leached past the crop root zone to a depth of at least 10 feet. To determine the extent of nitrate movement, deeper soil cores (up to 50 ft) will be taken at selected sites. Soil chloride (Cl) was higher following manure application but, in most instances, Cl content was less than 35 ppm and would not be considered a problem (the drinking water standard is 250 ppm Cl). Extractable copper was about 2 ppm in fields receiving swine waste compared to about 1 ppm in non-manured fields. Extractable zinc was less than 2 ppm at sites receiving swine wastes compared to less than 1 ppm in the non-manured sites. The complete report is presented as Attachment VI.

Use of Subsurface Drip Irrigation with Lagoon Wastewater - Dr. Freddie Lamm and Dr. Todd Trooien, Leaders

Use of subsurface drip irrigation (SDI) with water from animal waste lagoons has many potential advantages, including less human contact with wastewater, no runoff, no surface accumulation of immobile nutrients like phosphorus, greater application uniformity, fewer climatic application constraints, and less irrigation system corrosion. A pilot study was conducted by K-State Research and Extension at Midwest Feeders, Ingalls, KS, to measure the performance of a filtering system and five different dripline types for delivering beef feedlot runoff lagoon water to a cornfield. Of the five dripline types tested, the three largest emitter sizes (0.4, 0.6, and 0.92 gal/hr/emitter) showed little sign of clogging. The two smaller emitter sizes (0.15 and 0.24 gal/hr/emitter) showed some signs of emitter clogging. The disk filter and automated backflush controller operated well in 1998. These results show that SDI has potential for use with lagoon wastewater. It appears that the smaller emitter sizes normally used with groundwater in western Kansas may not be appropriate for use with lagoon wastewater. These smaller emitter sizes may be prone to clogging when used with wastewater. The results of this study, while very encouraging, should be considered preliminary. A full report is presented as Attachment VII.

Future Work: Issues that Need Expanded Efforts - Prepared by Bill Hargrove

Three topics need expanded efforts and are identified for future work. These include: 1) Modeling transport of water and solutes from animal waste lagoons; 2) Odor control and air quality; and 3) Facility closure protocols. We present proposed ideas for work on modeling and odor control in Attachment VIII. We plan to work with KDHE to develop some plans for evaluating remediation of abandoned lagoon sites and closure protocols.

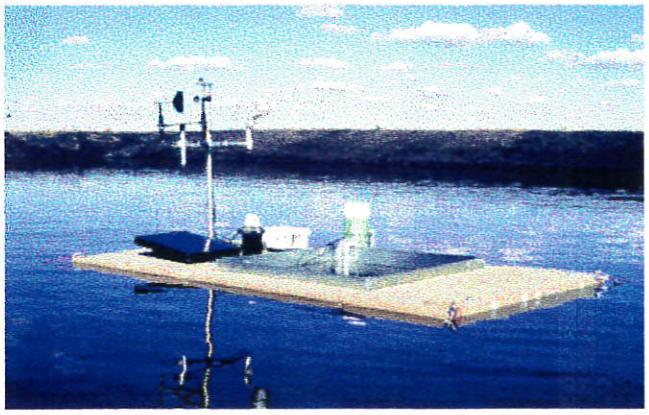
98/99 BUDGET - Special Appropriations for Animal Waste Management

	Personnel	Equipment	Total
Allocations	**$237,225**	**$237,500**	**$474,725**
Obligations To Date	-----	-----	-----
Land Application	-----	-----	-----
Lit Review	$6,054	$0	$6,054
Survey Sampling	$12,750	$26,775	$39,525
Rates of Application	$27,625	$20,000	$47,625
Lagoon Evaluation	-----	-----	-----
Modeling	$51,484	$19,794	$71,278
Seepage & Contaminant Loading	$37,714	$170,931	$208,645
Facility Closure	$27,000	$0	$27,000
Total	**$162,627**	**$237,500**	**$400,127**
Non-Obligated	**$74,598**	**$0**	**$74,598**

Proposed Budget 1999/2000 - Animal Waste Management Initiative

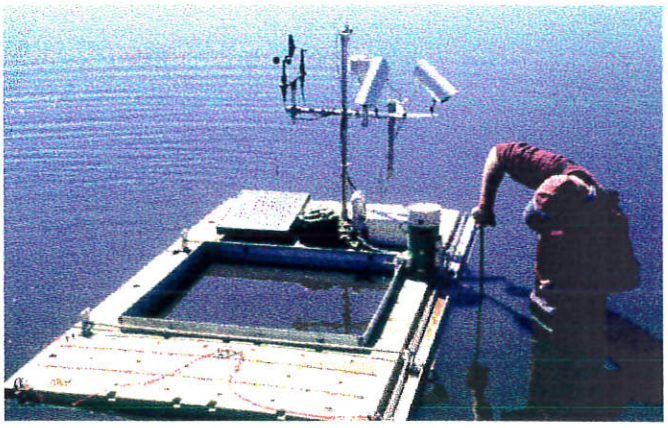
	Personnel	Operating	Total
Proposed Allocation	**$189,780**	**$47,445**	**$237,225**
Waste Lagoon Evaluation	-----	-----	-----
(1) Research Assistant (.5) Lab Assistant (1) Grad Student (1) Technician	$93,750	$20,000	$113,750
Land Application of Manure	-----	-----	-----
(1) Field Assistant (.5) Lab Assistant (1) Grad Student	$69,030	$27,445	$96,475
Facility Closure	$27,000	-----	$27,000
Total	**$189,780**	**$47,445**	**$237,225**

Animal Waste Lagoons



Left: A floating lysimeter and meteorlogical station used to measure evaporation from lagoons

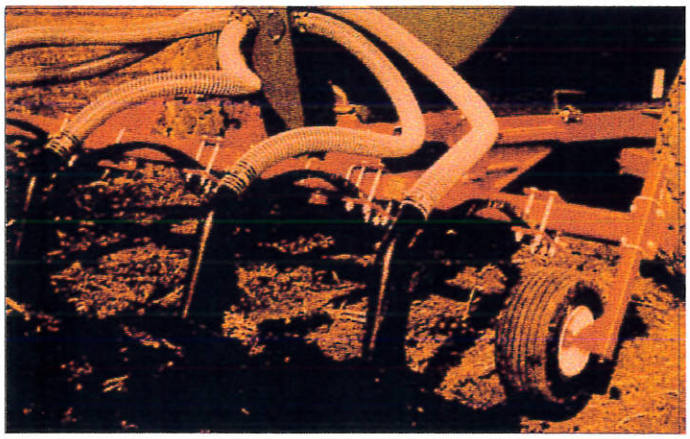
Below: A research assistant adjusts instrumentation to measure subsurface water temperatures.



Above: Organic sludge layer that has been deposited along the sides and bottom of a cattle feedlot runoff lagoon. Photo taken when lagoon was emptied for cleaning.

Right: Collecting soil cores from an 11-year-old lagoon using a direct-push soil probe. The lagoon had been dried and sludge removed prior to sampling.

Applying Animal Waste to Land



Above: Tractor applying liquid manure through a rubber hose to underground injectors.

Left: Tank wagon with soil injectors for liquid manure.

Right: A tractor pulls a traditional manure spreader.

Use of Subsurface Drip Irrigation with Lagoon Water

The experiment site as viewed from across the lagoon. Electrical controls are located on the reverse side of the mounted white panels. The floating pump is shown in the lagoon. Water is pumped up the hose on the left. A booster pump adds pressure. Excess wastewater volume returns to the lagoon in the middle hose. The hose on the right is also return flow to the lagoon and is used only for testing. After wastewater passes through the disk filter (red), it enters a manifold and is directed to individual corn plots in the background. The blue and white injection pumps and tanks for acid and chlorine are shown on the right.