

Approved February 2, 1989
Date

MINUTES OF THE Senate COMMITTEE ON Agriculture

The meeting was called to order by Senator Allen at
Chairperson

10:06 a.m./~~p.m.~~ on February 1, 1989 in room 423-S of the Capitol.

All members were present except: Senator Harder (excused)

Committee staff present: Raney Gilliland, Legislative Research Department
Lynne Holt, Legislative Research Department
Jill Wolters, Revisor of Statutes Department

Conferees appearing before the committee: Warren Parker, Kansas Farm Bureau
Bill Hoeffner, Kansas Aerial Applicators Assoc.
Charlene Stinard, Kansas Natural Resource Council
Chris Wilson, Kansas Fertilizer and Chemical Assoc.
Sam Brownback, Secretary, State Board of Agriculture
Dale Lambley, Director, Plant Health Division
State Board of Agriculture

Senator Allen called the committee to order and called on staff to review SB 2 for the committee.

Staff explained that SB 2 resulted from study of the Kansas Chemigation Safety Law by the 1988 Special Committee on Agriculture and Livestock. Since 1985 the state has regulated the operation of chemigation in the state which is the application of pesticides and fertilizers through irrigation water. Assignment of responsibility of the Chemigation Safety Law for administration has been through the Plant Health Division within the State Board of Agriculture. Currently there is one person that does the inspections of the chemigation sites throughout the state. They have one-half person staff in the office that issues permits. In fiscal year 1988 they had a total expenditure of \$93,987.00 for the chemigation program. Permits issued raised revenue of a little over \$20,000.00. The first part of SB 2 pertains to the definition of chemigation and now includes animal waste in that definition. The bill also states that an animal waste lagoon is not to be considered as a water source. In lines 58 thru 63 there is a new definition of "Point of diversion". Line 84 states that fees for a permit shall be \$50.00 plus \$10.00 for each additional point of diversion. The deleted parts of Section 2, lines 64 thru 83 and lines 88 and 89 are technical clean up changes. Section 3 includes modifications for the technical equipment that is required, the anti-pollution device that is required for chemigation safety permits. The summer committee learned that most of the chemigation sites that were inspected were found to be technically out of compliance. Some of the provisions of this bill are to clarify the types of equipment that are to be used and will help to permit those people that have permits to become in compliance with the act. New sections 4 thru 7 are provisions that pertain to violations; the new Section 4 provides for a \$5,000.00 maximum fine that a court may impose for noncompliance with the Chemigation Safety Law. New Section 5 includes civil penalties that could be imposed by the agency for noncompliance with the Chemigation Safety Law.

The Chairman called on the following to testify as proponents with some suggestions for the bill.

Warren Parker gave copies of his testimony to the committee (attachment 1).

Bill Hoeffner expressed need for SB 2 to prevent problems from taking place and gave copies of his list of concerns and needs in order to have safe chemigation sites in the state (attachment 2). Mr. Hoeffner stated that he felt an inspection should be completed before certification is given; also that wells should be checked every ½ year or at least once a year. Mr. Hoeffner suggested inspections could be done by the private sector after

Unless specifically noted, the individual remarks recorded herein have not been transcribed verbatim. Individual remarks as recorded herein have not been submitted to the individuals appearing before the committee for editing or corrections.

CONTINUATION SHEET

MINUTES OF THE Senate COMMITTEE ON Agriculture,
room 423-S, Statehouse, at 10:06 a.m./~~p.m.~~ on February 1, 1989

the state has issued certification. Mr. Hoeffner explained that he feels back-cycling has contaminated about six wells in the state.

When asked, Mr. Hoeffner stated he felt someone should be on the site all the time chemigation is taking place. It was stated that that cost would be prohibitive for small operators.

Charlene Stinard gave copies of her testimony to the committee (attachment 3).

Chris Wilson gave the committee copies of testimony and articles about chemigation (attachment 4).

Sam Brownback reported that the State Board of Agriculture is very interested in the Chemigation Safety Law and that a lot of work has been done by the board. Mr. Brownback explained that 200 chemigation wells have been tested over the past two years and have found six wells that contained some pesticide but were at a level acceptable by EPA.

Dale Lambley provided the committee with copies of his testimony (attachment 5). Mr. Lambley explained that one man, which is what he has to inspect chemigation sites, can inspect 350 sites per year and that there are 2,000 sites in the state.

The Chairman announced that the hearing for SB 2 would continue on the following day; he then called attention to committee minutes.

Senator Sallee moved the committee minutes for January 31 by approved; Seconded by Senator Karr; motion carried.

The Chairman adjourned the committee at 10:57 a.m.

GUEST LIST

COMMITTEE: Senate Agriculture

DATE: February 1, 1989

NAME	ADDRESS	ORGANIZATION
Warren Fecker	Manhattan	Kansas Farm Bureau
Kenneth M. Wilke	Topeka	KSBA
Alex Hawkins	"	"
Joe Lieber	Topeka	Ks Coop Council
Hazel Gibbs	Wichita	Leg. Intern.
Mike Bohanoff	Topeka	Div. of Budget
Ken Baker	Topeka	NACA
John Nutter	Topeka	NACP
JOE R. KAHNIGLI	Topeka Ks	Ks Livestock Assn
Sam Brownback	Topeka	KSBA
Freeman Biery	Topeka	
HOWARD M. FEE	ELLSWORTH	KAWB
DALJIT SINGH JAWA	TOPEKA	KWO
J. E. Bliss	Longden	KSBA
Alvin Epler	Hallamwell	KSBA
Dale Lambly	Topeka	KSBA
Marc R. Anderson	Scott City	KSBA
Chris Wilson	Topeka	KFCA
Wayne Weatherly	ELLSWORTH	KAAA
Bill Hoffman	Ellinwood	KAAA
John Strickler	Topeka	Governors Office



PUBLIC POLICY STATEMENT

Senate Committee on Agriculture

RE: S.B. 2 - A bill relating to the Chemigation Law

February 1, 1989
Topeka, Kansas

Presented by:
Warren A. Parker, Assistant Director
Public Affairs Division
Kansas Farm Bureau

Mr. Chairman and Members of the Committee:

I am Warren Parker, Assistant Director of Public Affairs for Kansas Farm Bureau. I appreciate the opportunity to present remarks on S.B. 2. As the agriculture industry demonstrated in 1985 when it was instrumental in developing, recommending, and supporting S.B. 330, which became the original Chemigation Law, we realized the responsibility agriculture has in protecting our environment and natural resources. That is one reason we are here representing agriculture producers in support of the equipment and guideline components of S.B. 2.

On the whole, this is a good bill. Through study completed and testimony heard by the Special Interim Committee on Agriculture and Livestock, we believe the Committee has produced an adequate plan for protection of the state's water supply used by chemigators. The additions in this bill that deal with equipment changes, placement, and definitions coincide with the agriculture industry's own desire to protect this important natural resource.

*Senate agriculture
2-1-89
attachment 1*

We do have a couple of suggestions. As stated in the Interim Committee report enforcement of the Chemigation Law is a problem. The State Board of Agriculture is not presently staffed at a level even close to the needs of monitoring the chemigation systems in the State of Kansas. To avoid the creation of an additional bureaucracy, we believe this is an obvious case where privatization should be applied. The State Board of Agriculture has used the private sector in scale and meter inspection processes in the state with great success. This would be economically prudent and raise the enforcement level of the Chemigation Law substantially. If there is a justification that additional funds are necessary to administer the law, we would agree that the \$50 permit fee plus \$10 for each additional point of diversion would be a reasonable and more equitable way to acquire resources.

The other issue we bring before you today is the degree of penalties provided for in S.B. 2. A tenfold increase in penalties seems excessive. Penalties for violations of the law are reasonable and necessary, but we believe with the law being relatively new and with the strong potential for increase in enforcement, the current penalties now in the Chemigation Law are adequate.

That concludes our testimony Mr. Chairman. I thank you for the Committee's time. I would be glad to attempt to answer any questions.

CONCERNS

- #1 That chemical is being directly connected to a groundwater source.
- #2 That chemicals are going to be handled near a wellhead where the potential for groundwater contamination from an accidental spill is very probable.
- #3 That, considering the time it takes to chemigate (approximately 30 hrs.), the potential of drift from winds is increased.
- #4 That the people who are chemigating are not required to have specific certification, which would lead one to believe that there will be a tremendous lack of education involved in the chemigation process.
- #5 That, due to a lack of enforcement personnel, any legislation that is drawn up for chemigation will lack the necessary enforcement to ensure the requirements are being met.

We feel there is a need for:

- #1 A break in the system to safeguard our water.
- #2 Full-time on-location monitoring that would allow for instant shut down in the case of malfunction or winds in excess of label limits.
- #3 A rule that would place all chemical inputs to an irrigation unit at a lower elevation than the wellhead in order to eliminate the possibility of chemical entering down the side of the well casing.
- #4 Certification - including a testing of mathematical skills and knowledge of chemigation systems and safety valves.

KANSAS AGRICULTURAL AVIATION ASSOCIATION
BOX 827
St. Francis, Kansas 67756
(913) 332-2251

*Senate agriculture
2-1-89
attachment 2*

PROP & ROTOR

Chemigation may seem a strange topic for a column written for aerial applicators, but perhaps it's not so strange. Setting aside the fact that this practice has caused a 75 percent drop in the business of many of our fellow applicators in the Plains states, chemigation is potentially the most damaging method of applying agricultural chemicals. And as such, it should be tightly regulated and monitored, or banned altogether.

Groundwater is touted as **the** issue of the decade for our industry. When researchers can detect parts per trillion and the environmental extremists seem to be able to make the general public believe this is tantamount to a mouthful at every meal, we are going to have trouble.

And among all the potential sources of groundwater contamination, the practice of chemigation should turn your hair whitest.

Most of the Great Plains states are situated over the Ogallala Aquifer. This aquifer is the largest single underground reservoir of fresh water in the United States and it supplies nearly all of the agricultural, municipal, industrial and domestic needs of that vast area.

The farmers who irrigate in these states set their wells directly into this aquifer. Consider carefully the possibilities when these farmers connect a chemical line to those pivot systems.

Although health and environmental damage may result from virtually any method of chemical application, chemigation differs from other methods in that the irrigation system and associated plumbing serve as direct conduits between the chemicals and the water source.

Another serious problem with chemigation involves drift and direct off-target application via the



Rick Reed

end nozzles or guns. Drift is something we all contend with on a daily basis, but it presents a unique problem to chemigators who need approximately 30 hours for a complete injection.

A common application of chemicals in Nebraska is for the first generation European corn borer; this application usually falls between June 20 through July 14. A study of the wind readings taken at the National Weather Service in North Platte, Nebraska, was made to determine how often during that time frame a 30-hour injection could have been accomplished with the wind below 10 mph. Over a span of five years, only nine times proved possible. In 1981, **no** dates were possible.

Consider also the problems associated with using an end nozzle. Typical center pivot systems utilize end guns which overspray the sides of the irrigated fields to minimize the amount of "dead space" at the corners of the field which would not otherwise receive water.

Although some systems are equipped with timers to shut the guns down once past the corner, routine observation indicates that either the devices routinely fail or are not installed at all. This typically results in chemical application onto adjoining fields and roads.

An operator who shuts down his end guns and claims no overspray sacrifices 22 percent of the field. It is unlikely that chemigators are giving up this much of each field.

Is chemigation an effective, efficient way to deliver chemicals to a crop? Studies indicate that only 80 to 90 percent of foliar applied products are retained in the canopy. This means that 10 to 20 percent of the product is washed to the ground.

If it weren't for the large volume of water associated with chemigation, this would not be particularly troublesome as a possible entry into underlying groundwater. With the volume of water used in chemigation, however, that product which reaches the ground can be expected to percolate into the underlying soils. And with a sufficiently high water table, there could be entry of this percolated material into the groundwater.

Where do the chemical companies stand on the issue of chemigation? Several are attacking the market in earnest and ignoring the aerial applicator in the process.

The motive is unclear. The ultimate goal of any marketing scheme should be increased sales. Chemigation does not, in itself, accomplish this since the products were already being applied by aerial applicators before chemical injection became the rage. Perhaps the key now is whose advice is being taken by the farmers and whether chemical application is always justified.

A quick look at the facts tells us that the farmers believe they can save money by applying their chemicals through their pivot systems rather than paying a custom applicator to do the job for them. A more detailed investigation shows, however, that if chemigation is conducted responsibly and

in adherence to all applicable regulations, it is actually more expensive than aerial application.

With chemigation becoming the standard method of application in many areas, one would believe that there must be a lot of sloppy application going on, com-

pounded by a serious lack of responsible enforcement of the label.


The product label itself is part of the problem. Regulation does not prohibit a method of application of a product unless it is expressly stated on the label. Consequently, many products being used in chemigation units today are being applied with no use direction from the label since it is not even mentioned.

Another problem is responsible enforcement of the label, regardless of the status of the applicator. Bureaucrats simply don't like to regulate farmers; apparently, it is un-American. The discrimination against commercial applicators is obvious at both the federal and state levels and is easily documented.

It is time to demand responsibility of private applicators equal to that of commercial applicators.

If that causes a hardship for the farmer, so be it. The laws governing pesticide use are designed to protect the public and our environment, and they should consequently be equally administered.

Those of us not having pivot systems and chemigation at our back doors have been doing an injustice to the rest of our industry by not taking a stand here. We all suffer the consequences when pesticide misuse results in environment damage and the removal of even more chemical products from the market.

It is essential, if we are to continue to use chemicals in food production, that those chemicals be used responsibly by **all** who handle them. And if a method of application is found wanting, it should be improved or banned. This should be our stand on chemigation. 

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Testimony presented before the Senate Committee on Agriculture
SB 2: Relating to Chemigation

Charlene A. Stinard, Kansas Natural Resource Council

February 1, 1989

My name is Charlene Stinard, and I represent the 700 members of the Kansas Natural Resource Council, a non-profit organization committed to sustainable natural resource policies for the state of Kansas. I appear today as well on behalf of the 2200 members of the Kansas Chapter of the Sierra Club, who share our concern about water resources.

SB 2 is the result of a great deal of discussion, during the last legislative session and during the interim, about the adequacy of the Kansas Chemigation Safety Law. We applaud the efforts of the Interim Study Committee in developing this bill to improve the current law.

The real question before us is, "How safe do we want to be?"

SB 2 proposes some technical changes in the law which improve equipment requirements. The proposed increase in fees to include additional points of diversion makes the law more equitable, as well as providing new funding for the program.

There are several omissions of significance, however.

SB 2 fails to deal with a certification process that would include training and testing to insure informed use of this potentially dangerous process.

SB 2 fails to provide for the possibility of more frequent inspections. Annual inspections of equipment by Board of Agriculture staff, as discussed in interim hearings, would provide minimal assurance that wells are in compliance. Without increased funding from the Legislature, annual inspections cannot be carried out. To date, enforcement of the Chemigation Safety law has been inadequate because too few resources have been committed.

In addition, it seems a minimal safety precaution to require that fields under chemigation be identified by signs posted on their perimeter.

Monitoring data and water quality analyses to date are insufficient to assure that the chemigation process does not adversely affect surface and groundwater supplies. It is clear that once widespread contamination of groundwater by pesticides has occurred, it is likely to be too expensive, if not impossible, to clean up. Even to test wells involves such costly lab analysis that it is not realistic to monitor all wells routinely. The only effective strategy is to prevent groundwater contamination in the first place.

We therefore ask you to consider requiring 1) training/testing/certification, 2) annual equipment inspections, and 3) posting fields under chemigation.

*Senate agriculture
2-1-89
attachment 3*

When we know that wells used to chemigate are all permitted and applicators are trained and certified, when we have more sampling data indicating that the required equipment does prevent groundwater contamination, then we will be able to say, "This is safe enough."



KANSAS FERTILIZER AND CHEMICAL ASSOCIATION, INC.

816 S.W. Tyler St. P.O. Box 1517 A/C 913-234-0463 Topeka, Kansas 66601-1517

STATEMENT OF THE
KANSAS FERTILIZER AND CHEMICAL ASSOCIATION
TO THE SENATE AGRICULTURE COMMITTEE

SENATOR JIM ALLEN, CHAIRMAN

REGARDING S.B. 2

FEBRUARY 1, 1989

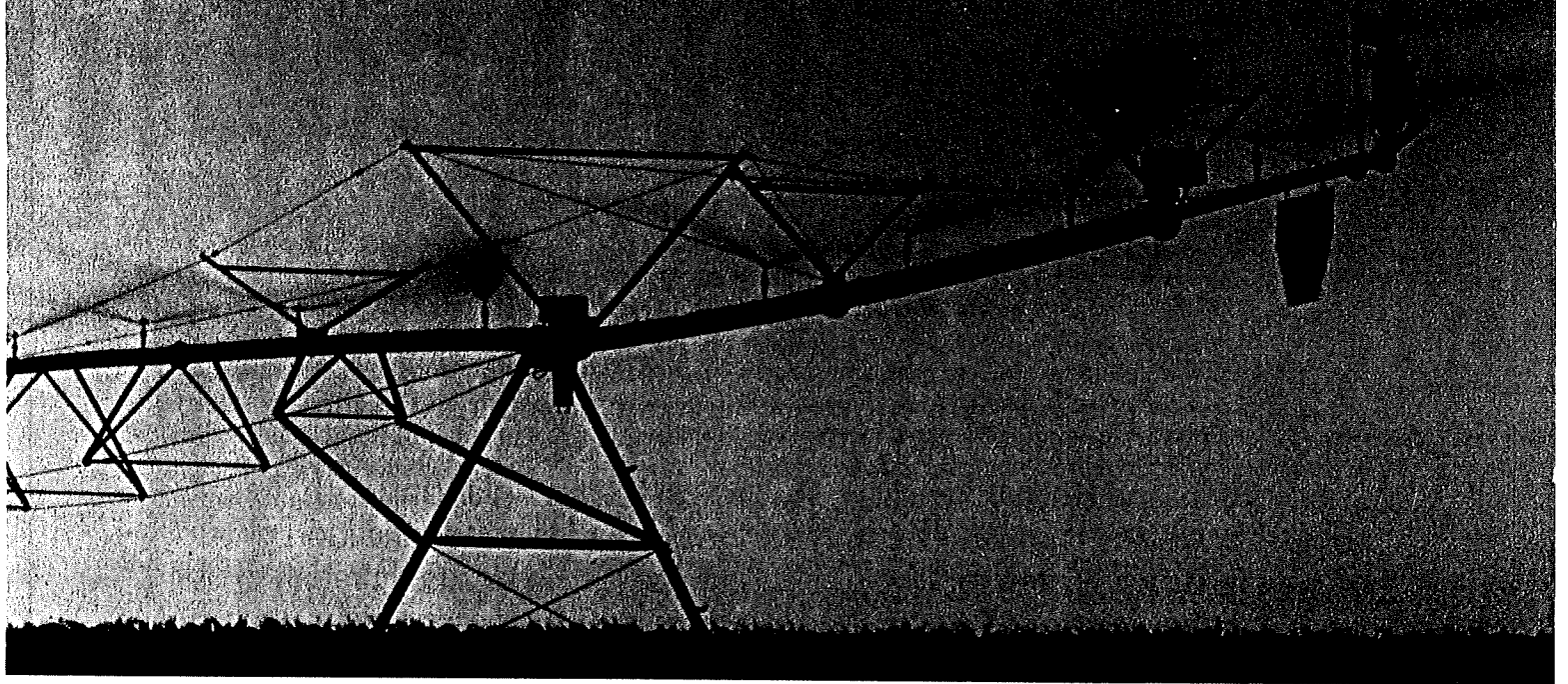
Mr. Chairman and Members of the Committee, I am Chris Wilson, Director of Governmental Relations of the Kansas Fertilizer and Chemical Association (KFCA). KFCA is the professional trade association of the Kansas agrichemical industry, with over 500 member firms. We appreciate the opportunity to comment on S.B. 2, amending the Chemigation Safety Act.

We support the bill as prepared by the interim agriculture committee which makes technical changes in terms of the chemigation safety equipment required. These changes need to be made to accurately reflect the present technology.

Since chemigation is a relatively new farming practice and used regionally, we have attached to this statement some information on chemigation for your interest, including a statement by Jerry Doop, a member of the KFCA Board of Directors and nationally recognized expert on chemigation and an article from the Wheat Grower magazine. The article describes the lead that Kansas took in passing a chemigation safety law, and we can

be proud of this leadership.

As the article says, "Advances in irrigation system design and the availability of chemical injection equipment have led to the development of a wealth of new technology. Chemigation can offer several advantages over conventional ground or aerial application. Among them are excellent uniformity of product application, reduction of soil compaction and mechanical damage to crops, easy incorporation, prescription application of chemicals and potential cost reductions." As Jerry Doop points out in his statement, "Chemicals applied through chemigation have less exposure to runoff and leaching. The equipment used in the chemigation process gives the producer protection from chemicals being sucked into the water supply, thus producers are able to grow crops in a controlled environment and be mechanically assured their and our water supply is protected. Chemigation is man in harmony with his environment for the best production of food and fiber for all."



A NEW ERA FOR IRRIGATION

'Chemigation' Provides Increased Accuracy, Control

Although "chemigation" is a word you won't find listed in Webster's Dictionary, it's a term that frequently is being mentioned in every avenue of agriculture.

By definition, chemigation includes any process whereby chemicals are applied to land or crops, in or with water, through an on-farm irrigation system.

From the onset, the idea of chemigation was basically a simple one. If you were going to irrigate a crop anyway, why not add plant nutrients to the water flowing through the system? So that's exactly what the innovators did 25 years ago when

they established the concept of applying commercial fertilizer through a sprinkler irrigation system.

A lot has changed, though, since those early days of experimentation. Today, chemigation can be broken down into newly created terms like fertigation, herbigation, fungigation, insectigation and nemagation. In other words, chemigation now includes the application of chemicals to both soil and foliage in a wide variety of formulations.

A Growing Concept

"In practice, it's a concept that is growing all across the country," says Dale Threadgill, professor and head of the department of ag engineering at the University of Georgia Coastal

Reprinted with permission from Case IH Farm Forum magazine.

Plain Experiment Station. As part of his role there, Threadgill has been extensively involved in chemigation research for more than 11 years.

"Even though the term chemigation is relatively new, the concept of fertigation likely began hundreds of years ago when farmers simply dumped animal manure into irrigation canals," he says. "However, the advances in irrigation system design and the availability of chemical injection equipment have led to the development of a wealth of new technology."

Benefits And Trade-Offs

According to Threadgill, chemigation can offer several advantages over conventional ground or aerial application. Among them are excellent uniformity of product application, reduction of soil compaction and mechanical damage to crops, easy incorporation, prescription application of chemicals and potential cost reduction.

But for all the benefits, there also are trade-offs, including safety considerations and additional capital outlay. Chemical injection equipment and tanks can range in price from \$1,000 to \$5,000.

Nevertheless, the benefits and economics of chemigation prompted its acceptance on more than 10.6 million acres of U.S. cropland by 1983, with many of those acres being chemigated more than once a year.

Center Pivots And Fertilizer

"Out of that total, over 84 percent of the acreage was chemigated with sprinkler irrigation systems," Threadgill adds. "On another perspective, chemigation was practiced on 43 percent of the total sprinkler-irrigated acres, 61 percent of the trickle-irrigated land and only 3.5 percent of the surface-irrigated area.

Fertigation was the most widely used form of chemigation, followed by the application of herbicides,

insecticides, fungicides and nematocides in decreasing order."

Considering that costs may be only one-third to one-half of any other application technique, it's little wonder the number of chemigated acres increases each year. An analysis conducted by Threadgill, which included both fixed and variable costs, indicated that chemigation is most cost effective when two or more applications are made annually on each field. But unless the chemical requires incorporation, single applications often are cost prohibitive due to the fixed cost of tanks and injection equipment.

A Learning Process

"Over the last eight to ten years, we've acquired a lot of knowledge about what works and what doesn't," Threadgill continues. "For example, we have found you can put a chemical on the foliage, on the soil surface or beneath the surface simply by altering the water volume, chemical formulation or the manner in which the product is injected.

"We are just beginning to develop enough information to improve the design of current irrigation systems," he says. "Up to this point, irrigation systems have been designed to apply water, not to apply chemicals."

Likewise, chemical companies, as a rule, have not looked specifically at chemigation when formulating new products. Some chemicals work well, while others do not in their present formulation.

Threadgill says that adding oil to the formulation sometimes helps it stick to the foliage, while emulsifiers have solved other problems. In both cases, he and other scientists on the chemigation research team at Georgia's Coastal Plain Experiment Station have served as consultants to a number of chemical manufacturers.

New Labeling Ahead

Until formulations are adapted to chemigation, though, the label is not

always a good place to look for help.

Because the practice of chemigation is relatively new, the Environmental Protection Agency (EPA) did not consider irrigation application during the registration process for the products in current use. Consequently, if the product label does not prohibit its application through irrigation systems, its use in that manner is permitted. Those products that are registered for chemigation have been tested and labeled per the manufacturer's decision.

But that is likely to change by 1988, as the EPA develops new requirements which address precautions, use directions and limitations unique to irrigation practices.

Legislative Action

At the same time, the practice of chemigation is being addressed in state legislatures across the country as concerns arise about human and environmental safety. In many cases the people most involved with its use are the ones calling for more regulation.

Lewis Entz, from Hooper, Colorado, is a good example. In addition to being a state representative from Colorado's 60th District, Entz farms approximately 1,000 acres of potatoes, barley and wheat in the heavily irrigated San Luis Valley. Most of his crops also are chemigated several times per year. Still, the Colorado farmer has been the driving force behind new legislative bills which call for stiff regulation of chemigation within the state by 1990.

Like the laws in effect in several other states, Entz's primary focus is on the use of safety equipment to prevent the spill or backflow of chemicals into a well.

"My main concern is that we don't pollute the underground water," he says. "It's too vital, and I don't want agriculture to be the culprit if it does happen."

For both safety and liability reasons, Entz has already retrofitted the
(Continued on page 16)

majority of his wells with safety equipment. "I'm a firm believer that if we are going to chemigate, it should be done right, or we shouldn't do it at all," he continues.

Although Entz insists there is a time and place for chemigation, he also stresses that a producer has to know what he is doing if it is to be effective. Otherwise, he believes sticking to conventional application practices is better.

Longtime Use In Nebraska

DeLynn Hay, Extension specialist in water resources and irrigation at the University of Nebraska, is one who echoes those thoughts.

Noting that chemigation already is practiced on more than 50 percent of Nebraska's 25,000-plus center pivot irrigation systems, Hay says, "Chemigation can be an effective technique if the chemical is suited for this method of application and the irrigation system is properly designed and operated."

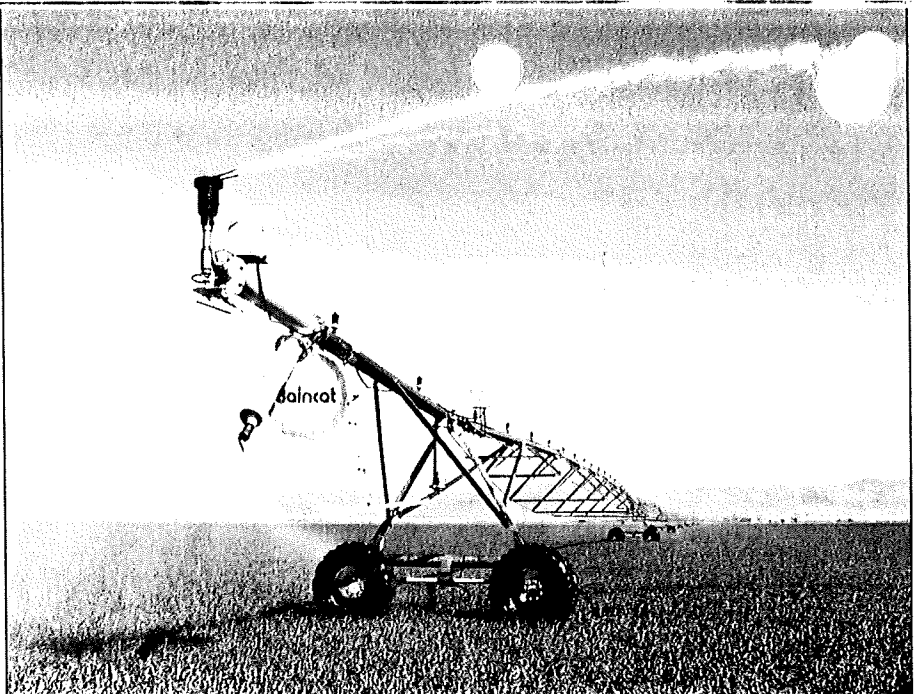
According to Hay, Nebraska irrigators have been applying nitrogen fertilizer with irrigation water since the late 1950s, primarily because nitrogen leaching could be reduced in the state's sandy soils by "spoon feeding" it to the crop as it was needed. The use of herbicides in the water followed about 10 years later.

Rules And Regulations

It was the increasing use of irrigation systems for applying insecticides in the early 1980s, however, that led to the greatest concern for groundwater safety.

As a result, Nebraska followed the lead of Kansas, Georgia, Florida and Wisconsin and passed a series of laws specific to chemigation. In each case, the minimum requirements involve the use of check valves and interlocks.

"Nebraska's new law went into effect January 1, 1987," says Hay. "As of that date, no person may apply or authorize the application of chemi-



cals through the use of chemigation without an annual permit issued by the appropriate Natural Resources District."

Before a permit application can be approved, Hay says, the irrigation system must be equipped with an irrigation pipeline check valve, a vacuum relief valve, an inspection port, an automatic low pressure drain between the main check valve and the irrigation pump and a simultaneous interlock device between the power system for the injection unit and the irrigation pumping unit.

In addition, all chemigation applicators are required to attend a chemigation safety training session and pass a written examination. Other provisions call for posting of fields in certain instances and prompt reporting of any spill.

More Research And Regulation Needed

Despite the acceptance of the practice, there are countless questions which remain to be answered—so research continues. Passing laws and taking precautions is not enough, according to most experts. Because groundwater contamination has already occurred, there is an emphasis to find out how contaminants move through the underground aquifer and how pollutants might be removed.

Perhaps the largest study being

conducted in this area is the Burlington Northern Foundation Water Quality Project. Sponsored by Burlington Northern Railroad, it is being conducted by the University of Nebraska at the South Central Research and Extension Center in Clay Center. The \$1 million project is actually an umbrella for five main research areas. These include excursion and cleanup from chemigation backflow, nitrogen cycling and movement in soil, a herbicide-irrigation-tillage study, insectigation and research and evaluation of injection and anti-pollution equipment for irrigation.

By the time the project is completed in 1989, those involved hope to have answers to such nagging questions as: "Are pesticides equally effective when applied by chemigation in comparison to conventional methods? How much chemical residue does chemigation leave on or in grain as compared to conventional methods? How do we go about cleaning up groundwater pollution?"

There is no doubt that chemigation works. If it didn't, it would not have caught on so rapidly. The question is, is it feasible and cost effective in your operation?

As Georgia's Threadgill so aptly concludes, "Like any new technology, the more you learn, the more you discover there is to learn. That's both frustrating and exciting for the future of chemigation." ☘

4-5

CHEMIGATION AND OUR ENVIRONMENT

BY
JERRY N. DOOP

Chemigation is the practice of combining an application of irrigation water and agricultural chemicals. These chemicals are the same type as those used around the home. The producer uses chemigation to create an environment conducive for growing food and fiber, much the same way people control the environment in and around their homes with chemicals. The majority of chemigation is done through sprinklers with fertilizer (primarily nitrogen, some potash, sulfur, and trace elements). A few producers also use chemigation with pesticides (insecticides and herbicides). Chemigation is a relatively new farming practice, starting in Kansas in the 1960's. The feasibility of chemigation came with the development of the sprinkler system and the even distribution of water.

Sprinkler systems allowed the producer to develop lower cost, marginal land into high producing land. Marginal land can best be described as having no stomach, no holding capacity, one inch of water can wet twelve inches of soil. Because the developed land was marginal, it became necessary to spoon feed the crop its major requirements of water and nitrogen fertilizer. This practice was so water efficient and labor saving that land which was irrigated by other methods (flood, ditch and pipe) was converted to sprinklers. This allowed the producer to diversify his crops and make more efficient use of water, chemicals, labor and farm machinery.

The producer does not apply chemicals every time he irrigates. The quantity of water which is applied varies greatly. Sprinklers can be regulated for each revolution to apply as little as 1/8 inch or as much as 2 inches of water per acre. The crop grown, the weather, and outside pressure from weeds and insects all play a part in the decision to chemigate. The majority of chemigation in Kansas is done in the western third of the state. Because of the limited rain in that area, irrigation is necessary and the producer can plan his chemigation. The most intensely chemigated crop will be corn. The western Kansas corn producer may have as many as 35 revolutions of water with his sprinkler. This could include as many as five applications of fertilizer plus one for herbicide and two for insecticides. A less complete chemigation program for corn, and closer to the average, would include only two chemigations of fertilizer. A western Kansas irrigated wheat producer could have 16 revolutions of water which might include two or three revolutions with fertilizer. Hay in that part of the state would have approximately 30 revolutions and usually none would be chemigation. If there was an infestation of weevil he might have 2 or 3 revolutions with an insecticide. Grain sorghum in the west could have 20 revolutions of water, and again, most will not plan any chemigation.

The use of chemigation does not mean more chemicals are used to

CHEMIGATION AND OUR ENVIRONMENT

The equipment on the well consists of five items. They are designed to keep any water and chemicals from draining back down the well when the well shuts down. The flapper valve, located on the discharge pipe, is closed by gravity when the water pressure is no longer exerted against it. The vacuum breaker is placed between the flapper valve and the water well. A vacuum is created by the water in the well falling back into the well when the pump is shut down. The vacuum breaker allows the vacuum pressure to be released. When the vacuum is released, the low pressure drain, which is also placed between the well and the flapper valve, will drain any water in the discharge pipe. The fourth item is on the discharge pipe beyond the flapper valve. It is a fitting where the chemicals are injected into the water flow. This fitting has a check valve on it to stop a gravity flow of chemical into the discharge pipe. The last item on the well is a pump interlock. It ties the injection pump and water pump together. When the water pump shuts down, the injection pump shuts off simultaneously. Each of these mechanical devices are designed to keep chemicals out of the water in the well and together they give multi protection.

The second group of equipment used in chemigation is chemical pumping units. There are basically two types. One group is used for pesticides and the other is used for fertilizer. The equipment is similar, except the pesticide equipment is smaller. The pesticide pump is designed to accurately put out lesser quantities of chemicals, and consequently, the storage tank for the pesticides is smaller. Both fertilizer and pesticide equipment consists of a positive displacement chemical pump interlocked with the water well, a storage tank with a mechanical shut off valve, and a calibrated tube for determining the correct pump setting. With the exception of the fertilizer storage tank, this equipment is portable and is normally at the well site only when it is being used. This equipment is designed to accurately meter the very expensive chemicals into the system when the water well is in operation.

This total chemigation system is used to apply chemicals evenly to the crop at a time when the crop can utilize and benefit from the application. This means the chemicals applied through chemigation have less exposure to runoff and leaching. The equipment used in the chemigation process gives the producer protection from chemicals being sucked into the water supply, thus the producers are able to grow crops in a controlled environment and be mechanically assured his and our water supply is protected. Chemigation is man in harmony with his environment for the best production of food and fiber for all.

CHEMIGATION AND OUR ENVIRONMENT

grow a crop. Chemigation is merely a method of applying the chemicals in a timely, efficient, and economical manner. The University of Georgia has test results showing some pesticides applied through chemigation at rates below the manufacturers recommended rates have had as good or better results as those applied in a conventional manner. An example is a herbicide that requires water to be activated. When it is applied through chemigation, the herbicide goes to work immediately controlling weeds. Several universities have also shown that split applications of nitrogen are more efficient.

The largest quantity of any chemical used in agriculture is fertilizer. This is true of both the irrigated and the dry land producer. Fertilizer that is used for crop production is manufactured the same way as that used by the homeowner on his lawns. Fertilizer can have three major elements in it, nitrogen (N), phosphorus (P), and potash (K). The analysis will always be shown as a percentage of each in this order (N, P, K). There can be other secondary and trace elements in or added to fertilizer. These include sulfur, zinc, iron, manganese, magnesium, and copper. The secondary and trace elements are used in small quantities. Many of these elements can be found in vitamin pills taken by humans.

Of the three major elements in fertilizer, nitrogen is used in the largest quantity for crop production. Nitrogen is 70% of the 8- to 9- hundred thousand tons of the three major elements sold in Kansas. Nitrogen, in fertilizer, is produced from natural gas. Nitrogen produced by Mother Nature comes from thunderstorms and decomposing organic matter. Each crop and soil type will require different amounts of nitrogen for maximum crop production. Wheat will require between 40 - 100 pounds of actual nitrogen per acre. Grain sorghum will need between 80 and 150 pounds per acre. Hay and soybeans are legumes and require little or no nitrogen. Corn will require between 150 to 250 pounds of actual N per acre. One of the largest recommendations for nitrogen is for lawns. It is from 3 to 6 pounds per 1,000 square feet. This equates to 130 to 260 pounds of nitrogen per acre.

A great concern of the general public is the contamination of the ground water with chemicals. There are basically three ways agricultural chemicals can contaminate the ground water--water running off soil which has had a recent application of chemicals, chemicals leaching through the soil into subsurface water, and chemicals spilled directly into a water supply. Generally speaking, most agricultural chemicals will break down into basic elements and become inactive given enough time, heat, moisture, and soil bacterial action.

One exception is nitrate. All forms of nitrogen will eventually become nitrate nitrogen in the soil. Nitrate is the form of nitrogen that growing plants can use. However, nitrate is very water soluble and easily moves with the soil moisture if not used by plants. There are several State and Federal agencies working on

CHEMIGATION AND OUR ENVIRONMENT

regulations which will mandate application practices for agriculture. These types of regulations will deal with the amount of nitrogen that can be applied in a single application for each soil type. The regulations will be designed to reduce the amount of nitrates in the soil at any one time, thereby reducing the possibility of their leaching through the soil, especially in the marginal soils. Chemigation can help producers meet these regulations. The EPA's and Kansas' guidelines for nitrogen in drinking water is 10 PPM or less. Dr. Dennis Hardwick of the Fertilizer Manufacturers Association says, "There is no evidence to support claims that nitrates in the human body is carcinogenic or that nitrate by itself causes blue babies." Kansas being a natural grass land area causes us to have higher than normal naturally formed nitrogen levels in our ground water.

A real problem can be caused by chemicals applied to lawns. Water running off lawns goes directly into a concrete storm sewer system. This excess water has little chance of coming in contact with or being retained by other soil which might utilize the chemicals. Water from storm sewer systems is usually dumped directly into a body of surface water. This water will carry any nonabsorbed lawn chemicals with it. The soil where crops are grown is prepared to hold moisture, thereby creating less chance of water runoff. The majority of fields have other soil around them where any runoff is retained. This is not to say that chemical runoff from a field cannot happen, however, it is less likely than lawn chemicals to get into water supplies.

*David S. Powlson, UK agronomist, in answer to a question concerning the nitrate leaching associated with organic farming, cited an interesting study. Nitrate derived from organic manure is not safe from leaching. We recently monitored the nitrate content of soils that have received either farmyard manure or inorganic fertilizers since 1852. During the winter of 1986/87, 90 lbs/acre of nitrate-N was leached from the farmyard manure plot--twice the loss from the inorganic plot. Pointing to a second study involving plowed in clover and winter wheat, Powlson noted last year 180 lbs/acre of nitrate-N was leached during the winter from a sandy loam soil after the clover was plowed in. Farmers Weekly, April 1988.

With the concern about ground water, it is easy to see why chemigation is suspect. Therefore, let's examine the mechanics of chemigation. First, the producer must register each well he will use for chemigation. When he registers, he declares the safety equipment, required by a 1986 Kansas law, is in place. All of the equipment is subject to State Inspection. The injection equipment, which includes the required safety equipment, can be separated into two groups--the permanent equipment on the water well's discharge pipe, and the portable equipment used for injection.

*SOLUTIONS, July/August 1988, p. 11

T E S T I M O N Y

SENATE BILL 2

PRESENTED TO

SENATE COMMITTEE ON AGRICULTURE

BY

Dale Lambley, Director
Plant Health Division
Kansas State Board of Agriculture

February 1, 1989

*Senate agriculture
2-1-89
attachment 5*

TESTIMONY

SENATE BILL NO. 2
Senate Committee on Agriculture
February 1, 1989

by

Dale Lambley, Director
Plant Health Division
Kansas State Board of Agriculture

Senate Bill No. 2 was submitted through action of the Special Committee on Agriculture and Livestock following an interim study held upon the Kansas Chemigation Safety Law during late summer and early fall of this last year. The bill contains many items which are a direct response to recommendations which the Plant Health Division made to the interim committee and it is these toward which I would like to direct my remarks this morning.

During our work with the chemigation program, the division became aware that some feed yards in the state are utilizing the chemigation process to apply feedlot sludge to fields. We believe it to be the intent of the Chemigation Safety Law that anti-pollution devices should be included upon the irrigation systems applying feedlot sludge as with any other chemical. However, the wording is not clear in this area and the fertilizer law exempts animal dung from the fertilizer classification. Consequently, we requested clarification of the actual status of feedlot sludge to the chemigation program. The proposed inclusion of the words "animal wastes" in line 23 effectively makes the clarification.

The division also asked for inclusion of one additional definition so as to pinpoint the actual site referred to as the water source. The language included in lines 58 through 63 does this by adopting the standard definition used under current Kansas water law.

Language in line 54 would increase the current application fee for a chemigation user's permit from \$50 to \$50 plus \$10 for each additional point of diversion used for chemigation. From best recollection, this change developed from recognition that the same permit fee was being assessed to each individual regardless of the number of chemigation systems that were operated under the individuals permit. Kansas State Board of Agriculture regulations limit the number of chemigation systems which may be supervised by any one person to 10, but this does not limit the number of sites which may be operated under one permit. Consequently, there were suggestions that charging an additional, per well, fee would more equitably distribute the costs. Also the committee recognized that additional inspections were needed in the field. To date, we have been trying to operate the program with one field staff person. This is Marc Anderson, Chemigation Safety Specialist with the division. Marc can inspect approximately 350 chemigation sites in a year's time, but there are 2,054 chemigation sites known to occur within Kansas. The increased fees were to aid in supporting additional field personnel for the program. A general breakdown of the number of chemigation wells registered per owner is as follows:

<u>No. of Chemigation Wells</u>	<u>% of Chemigators</u>
1	16.7%
2	18.1%
3	14.4%
4	11.5%
5-10	30%
11-20	4.9%
21-30	9%
31-40	2.3%
41-50	0%
51-60	3%
61-100	6%
100+	3%

Section 3 contains a number of amendments requested by the division in the technical equipment requirements of the current law. Basically, there are certain devices essential to safe chemigation operations and which are necessary to prevent back-siphoning of chemicals and contamination of the groundwater supply. However, there are others included in the current language which apply primarily to insuring that the proper mix is obtained and applied to the field. The latter group are items which we might like to recommend as a good management practice, but we do not feel belong as statutory requirements. Further, they have nothing to do with prevention of back-siphoning and in one case are not practical. Consequently, we would like to recommend adoption of the amended language. Finally, language in lines 108 and 109 is amended to specify the actual location where one is to install the vacuum relief device.

New Section 4 would increase the penalty for violation of the chemigation safety law up to \$5,000 per violation. The current fine is fixed at \$500.

New Section 5 grants civil penalty authority to the agency and provides for penalties in an amount not less than \$100 nor more than \$5,000 for each violation. The Board has not taken a formal position on penalty provisions of the chemigation safety law since we usually try to work with the statute for a period, then come back to the Legislature with history to show that we are experiencing a problem if one does exist. However, I believe that this committee is also cognizant of the fact that we feel that civil penalties are a valuable adjunct to each of our pesticide programs. In effect, civil penalties provide us with a range of options between a simple letter of warning and revocation of the permit to operate. The penalty provisions proposed in this bill are identical to ranges recently established for the Kansas Pesticide Law and are similar to that used by the U.S. Environmental Protection Agency (0 to \$5,000).

In final analysis, we support this bill. We appreciate the fact that the interim committee felt that the recommendations made by the division were practical and appropriate. We hope that this committee will also look upon them favorably.