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## Water Current, Volume 22, September 1990

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# Water Current

Water Center

University of Nebraska

September 1990

## NATO Workshop Explores World-Wide Nitrate Problems

### Czech Hydrologist Avery Lecturer on Pollution

Jaroslav Vrba, an internationally known authority on water pollution presented the Avery Lecture at the University of Nebraska-Lincoln Wednesday, Sept. 12.

The topic of his lecture was "After the Revolution, Coping and Control." Vrba, who was head of the hydrogeological department of Czechoslovakia's largest hydrogeological company for 20 years before the Czech Revolution Nov. 19, 1989, discussed water contamination in Eastern Europe at the Monday morning session of the North Atlantic Treaty Organization (NATO) Workshop at the Cornhusker Hotel Convention Center.

Since November, 1989, Vrba has been chairman of the Commission for Groundwater Protection in Czechoslovakia. He said, "In all 187 locations where Russians had been stationed, water is totally contaminated."

He said advanced cooperation with the U.S. trade and development program will begin rehabilitation programs and cleanup of ground and surface water as 30 percent of all community drinking water wells aren't safe.

Vrba discussed management strategies for control areas in Czechoslovakia, a country with 10 1/2 million people.

"Farmers don't cause deterioration of water quality consciously," Vrba said. "But no legislation forces them to control inputs of nitrogenous fertilizer

☞ (see page 6)

Fifty experts from North Atlantic Treaty Organization (NATO) countries shared the common problems of nitrate contamination at the first NATO workshop held in Nebraska Sept. 9-14.

Roy Spalding, associate director of the University of Nebraska Water Center, summed up nitrate contamination problems in the U.S. in an early workshop presentation:

"Because of the widespread nature of nitrate sources, no state is completely immune to nitrate contamination; there is a skew distribution nationally of contamination and is more developed in nitrate-contaminated groundwater areas," Spalding said.

He said that just recently California and other states have recognized that nitrate contamination causes the annual abandonment of significantly

more drinking water supplies than toxic chemical contamination.

From the National Cancer Institute in Rome, Italy, Dr. M. Crespi, reported evidence that nitrogen-nitrosos compounds contribute to causing certain human cancers. Crespi, one of several of the experts speaking on the consequences of nitrate contamination, said that gastric carcinogenesis in his research was performed with urine and gastric juice collection to establish nitrosation potential under different pathological conditions.

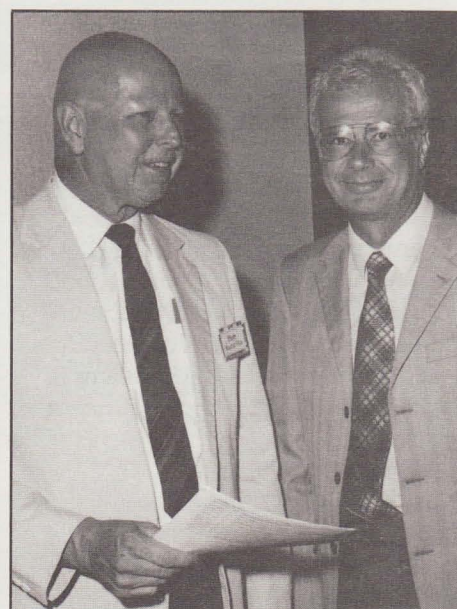
"Other cancer sites possibly correlate with environmental and occupational exposure to N-nitroso compounds," he said.

From the West Germany Institute of Water Resources at the University of

☞ (see page 2)




Jaroslav Vrba, left, Czech Hydrologist and Mohamed Dahab, UNL Civil Engineering



Bob Kuzelka (left), and Istvan Bogardi, NATO Workshop Organizers

(UNL Photo Productions)



(NATO Workshop p. 1) 

Hanover, Dr. Ing Rolf Mull reported:

"An increasing concentration of nitrate is observed in the water of many pumping wells. And this type of water pollution is from the application of fertilizers and the disposal of liquid and solid manure in rural areas."

He said that it is expected that more nitrate will intrude into pumping wells and surface water in the future.

From Turkey, Ahmet Samsunlu of the Istanbul Technical University, said in Turkey, "The nitrogen content in surface waters increases due to population growth, industrialization and the increased artificial fertilizer used in agriculture."

"This causes environmental problems, the most significant one being eutrophication that takes place in still water bodies such as lakes. The ecological balance is disturbed, the water quality becomes deteriorated, and the beneficial uses of water are constrained," Samsunlu said.

He said the most easily controlled nitrogen and phosphorous source is the one from wastewater discharge and said that this discharge must be controlled.

Timothy Amsden, from the Water Management Division of the U.S. Environmental Protection Agency in Kansas City, said, "Less nitrogen use is better than more."


He said the EPA has shifted its attention from hazardous waste sites which "have traditionally been of higher priority, but affect a smaller geographical area, to environmental management of agricultural chemicals."

"We are focusing our regulatory programs on the most valuable and vulnerable geographic areas, and stressing as our most important tools the use of demonstrations/education and economic incentives/disincentives to address the increasing problem of nitrates in surface and groundwaters," Amsden said.

This NATO workshop was sponsored by NATO, the Nebraska Water Quality Research Initiative, the National Science Foundation, the U.S. Environmental Protection Agency, the U.S. Department of Agriculture, the University of Nebraska and the Water Center.

Istvan Bogardi, UNL professor of civil engineering, was director, and Bob Kuzelka, assistant director of the Water Center, was co-organizer, of this NATO workshop.

This workshop was dedicated to the memory of Phillip Issenberg, 54, who died in July from the disease that he

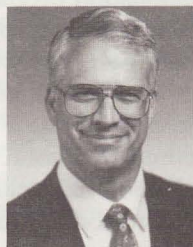
had spent much of his life researching. He was a professor and cancer researcher at Omaha's Eppley Institute for Research in Cancer and Allied Diseases. A concern of his was the high nitrate levels in water and other sources that could be cancer-causing. He will be missed. 

### ***From the Director:***

## **Priorities Set for Future Research**

The Water Center has been blessed with strong leadership for many years and I welcome the opportunity to join that management team. The Center has purposefully kept its infrastructure rather small, but efficient, to allow more research funds to be distributed to departments and faculty. This plan has worked well and I anticipate only moderate growth as the need arises.

An important and substantial addition in research funds has been made to the Water Center through the "well conceived"




**Bob G. Volk**

Nebraska Research Initiative. This Initiative provides new dollars to the Center and has allowed us to develop a multifaceted approach to expand research opportunities in the water sciences in Nebraska. With advisory committee input priorities have been set and we are moving ahead with an active research effort. New faculty have

been hired and placed in academic departments, a state-of-the-art Water Sciences Laboratory is nearing completion, graduate assistantships have been made available, equipment grants made, and special requests funded.

All of this activity puts an additional focus on water sciences and will lead to numerous problem-solving activities important to Nebraska. The Water Center believes that the national focus on efficient utilization and protection of our ground and surface water will continue to grow and we must position ourselves to be a national leader in water sciences research. We are committed to that goal.

In addition, to research other activities of the Water Center, involve educational projects to help increase the use of agricultural management techniques designed to minimize water quality degradation. Our educational program has fewer faces but is building. Furthermore, we must

 (see page 6)

**September 1990**

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# Water Conservation Theme of Tour to Texas

Water-stretching methods over a diminishing Ogallala aquifer were observed from western Kansas, Oklahoma and Texas on the 19th annual Nebraska Irrigation and Water Resources tour Aug. 5 through 10.

"Even though Nebraska is groundwater-rich sitting above the Ogallala aquifer, we still must consider ways to conserve this plentiful water supply," Bob Kuzelka, assistant director of the University of Nebraska Water Center, said.

Nebraska State Treasurer Frank Marsh said, "These annual irrigation tours are an opportunity for Nebraskans to observe conservation methods other states have developed that we can consider to prolong our plentiful water supply for crop growers in this bread-basket state."

Management techniques observed on this irrigation tour for conserving water included:

—Low Energy Precise Application (LEPA) irrigation (see story on page 7).

—Recycling all waste products at Garden City, Kan., where the Reeve Cattle Co., with a 13,000-head cattle feedlot and 4,500 acres of irrigated land, produces grain alcohol with by-product stillage replacing water in cattle feed and another by-product fed to Tilapia fish that are sold to restaurants.

—A wind energy machine, or the "Big Machine" at Bushland, Texas where the West Texas State University Alternative Energy Institute has a giant, vertical wind turbine. This giant egg beater is among the largest vertical wind turbines in the world and will generate electricity and pump water (see story p. 5).

—Tube, or drip irrigation.

A three-time tour participant, Craig Ebberson, Belden, Neb., farms 5,760 acres with 29 irrigation systems with capacity for 1,500 head of cattle. He operates a commercial elevator that is licensed for about 1 million bushels with six semi-trucks to haul grain that he buys and sells.

Ebberson said, "I didn't realize how much and how fast the water level was dropping in Kansas and Texas. If we Nebraskans can take care of our water in years to come it will certainly boost

our economy."

He recalled a progressive farmer who 20 years ago predicted a lateral irrigation system would do all farming operations except harvesting. "And we observed this on our trip to the Halfway Agricultural Research Station, Texas A & M, near Lubbock, Texas." This multi-function Tumor lateral move system seeded, deep fertilized, and irrigated.

Meanwhile, a director of the Lower Elkhorn Natural Resources District, Mrs. Barbara Greve, Wakefield, said the Northwest Kansas Research and Extension Center explained the drip irrigation experimental plots, although expensive, were interesting.


"The 12-acre plots of 106 parts are individually controlled with different water application rates and drip line spacings and fertilizer injection with plastic tubing buried 16 in. deep was a method to consider," Greve said.

Although the concept of Low Energy

Precise Application (LEPA), has existed for some time, Jim Schepers, soil scientist, USDA-ARS, at the University of Nebraska, said, "The concept is new to Nebraska because of our abundant water supply compared to other states such as Kansas and Texas."

He said the goal of LEPA is to conserve water. However, the topography in Kansas, Oklahoma and Texas where we observed LEPA was flat, he said. "Our rolling terrain in Nebraska and the runoff potential is high," Schepers said.

LEPA sprays water into the air at moderate to high pressure and distributes the water directly to the furrow at very low pressure. Drop tubes, pressure regulators and nozzles reduce evaporation losses and the costs of pressurizing a sprinkler system, according to the demonstration at the North Plains

 (see page 5)

## Ag Production Could be Revolutionized with System

Bill Lyle says another of his inventions, in addition to LEPA, (see story on page 7) could revolutionize row crop production. The 1990 Nebraska Irrigation tour participants met Lyle at the Texas A&M Agricultural Research Extension Center at Lubbock, Texas.

He said, "The introduction of a row crop planting system for moving irrigation machines brings an all inclusive system closer to reality."

His hydraulic planting system consists of:

1. A seed germination/gel mixing system with pressurized discharge capability,
2. A non-destructive seed transfer and injection system, and
3. A seed distribution and planting system located on a continuous-move irrigation system.

Imagine! Planting, fertilizing, and irrigating with one system. And it works, according to Lyle.

"In initial field-planting trials,

plant stands and yields compared favorably with those planted with a conventional John Deere Maxemerge planter."

Lyle said that preplant fertilizer application with the planting system and in the irrigation water during the growing season resulted in significantly greater yields than were obtained by conventional preplant chisel application.

He said that although his Multi-Function Tumor Lateral Move System is in testing stages, it is too early to draw conclusions concerning the performance of the mobile irrigator planting system. "There are modifications yet to be made to enhance its performance under various soil and plant residue conditions.

"However, the eventual successful installation and operation of an all inclusive agricultural production system on moving truss irrigation machines appears to be a very viable possibility," Lyle said. □





## 1990 Irrigation Tour

Cecil Regier, research scientist in charge of Etter Irrigation Research Farm near Dumas, Texas, describes LEPA.

(Upper left)

LaVerne Stetson, UNL Biological Systems Engineering, center, discusses irrigation systems with SCS and USDA experts at the Lubbock High Plains Underground Water Conservation District No. 1 in Texas.

(Center left)

Charles Schlabs, Hereford, Texas, Nebraska Irrigation Tour regular, left, Les Sheffield, tour coordinator, center, and Dayle Williamson, tour chairman, examine control valves for drip irrigation research project at Colby, Kansas.

(Lower left)

LEPA irrigation as described by Cecil Regier.

(Upper right)

Freddie Lamm, irrigation engineer at the N.W. Kansas Research and Extension Center at Colby, demonstrates installation of irrigation tubing.

(Center right)

Drip irrigation described at Colby, Kansas.

(Photos by Pat Larsen)



## Drip Irrigation — Pros and Cons

### Advantages

- More efficient water use
- Enhanced plant growth and yield
- Improved fertilizer management

- Less water quality hazards
- Limited weed growth
- Decreased energy costs

- Improved cultural practices
- Easy to automate
- Less mechanized parts


### Disadvantages

- High initial cost
- Persistent maintenance requirements
- Clean water and filtration required

- Shorter design life
- Restricted plant root development
- Tillage options may be limited

- Length of run limited
- Less developed technology
- No turnkey systems available



(Tour p. 3) 

Underground Water Conservation District at Dumas, Texas.

The group also saw a LEPA project at Southwest Kansas Research Extension Center at Garden City, Kan., where William E. Spurgeon, irrigation engineer, said, "This precision application is accomplished by nozzles which have several modes of operation. They deliver water in a gentle bubble mode, flat spray, and a spray up mode. These modes provide additional flexibility in the system."

Nearly at the end of the route, at Hereford, Texas, Charles Schlabs, a 12-time tour-goer, explained his 2,600-acre farming operation and the water levels in his area.

He said the static water levels of his wells have been checked every winter since 1955 with one of the wells used as a check well for the High Plains Water District. This well had a 124 ft. water level in 1955; 233 ft. in 1985, and 235 ft. in 1990.

"In the past five years the water level decline has slowed considerably," he said, "due to less pumpage and higher than normal rainfall in the summer." He cited government programs and poor economic conditions besides irrigation conservation practices as additional reasons.

He said that land prices in the Texas High Plains have changed very little in the last 20 years. In 1969 he and his wife, Geraldine, bought their home place for \$650 per acre without improvements. Last year they bought an adjoining farm for \$700 per acre.

"The future of irrigated agriculture in this area looks bleak, to say the least," Schlabs said. "When you consider we have used half of our water (in the Ogallala aquifer) in 35 years, it will take much longer to pump the second half because the wells will continue to yield less each year from a greater depth."


A. Wayne Wyatt, manager of the High Plains Underground Water Conservation District No. 1, at Lubbock, Texas, said, "At one time we thought we had an abundance of water here in Texas. We were losing a half of the water pumping for irrigation and now we regret it."

He said that now Texans are working hard to conserve water since we realize that yields can be increased with water reduction.

"We're learning lots of our people are running out of money since it takes twice as much energy to produce water. Start paying attention to pumping costs," he advised.

"The deeper the water, the more it costs to produce and the less the profits for the farmer." Some producers have water, but are not irrigating because they have run out of money, he said.

He told the Nebraska tour group, "Don't make the same mistakes we did."


These irrigation tours are sponsored by the Nebraska Water Conference Council and the Institute of Agriculture and Natural Resources. The Council is composed of about 100 representatives of groups interested in Nebraska irrigation and water. 

## Giant Eggbeater Generates Electricity, Pumps Water

It could be one of the answers to alternative energy sources. Although the concept is not new, its design is. Towering as a giant egg-beater above the Texas plains, 12 miles west of Amarillo at West Texas State University's Alternative Energy Institute, is the largest wind turbine in the U.S., one of the largest in the world. It is out-sized only by a similar model in Canada.


It's 164 feet tall and Nolan Clark, agricultural engineer, ARS-USDA at the Institute said it is more efficient than the wind machines that were seen by the Nebraska Irrigation Tourers to California in 1985 on Windmill Hill. The center of the "big machine's" turbine is 10 feet in diameter rotating a column that's about 16 stories high.

With a 28 mph wind, the turbine can produce 500 kilowatts of electrical power; the maximum wind speed that the turbine operates is 45 mph, however, due to its present structure, Clark said.

 (see page 6)

## Environmental Education Directory Available Now

The University of Nebraska Water Center, the Nebraska ETV Network and the Nebraska Natural Resources Commission have compiled a 1990 Nebraska Environmental Education and Information Resources Directory for distribution to teachers and others. This publication will make it easier for teachers to find and select environmentally-related organizations, programs, presentations, field trips, tours and instructional materials.

For a copy of this 33-page publication, please contact the Nebraska Natural Resources Commission, P.O. Box 94876, Lincoln, NE 68509-4876, (402) 471-2081, or the Water Center, (402) 472-3305. 


## Fifth Annual Water Policy Forum Held Oct. 2

"Water Center: Present and Future" was the topic of the fifth annual Water Policy Forum sponsored by the Water Center. Bob G. Volk, Center director, chaired the retreat at Ak-Sar-Ben Aquarium between Omaha and Lincoln Oct. 2.

Volk, director of the Center since Aug. 1, outlined his goals for the Center and small groups of water-related faculty discussed future directions for Water Center support, programs and activities and responded to Volk's goals.

Other highlights of the Forum included:

- Current research: Roy Spalding
- Extension and service: Ed Vitzthum and Bob Kuzelka
- Teaching and information: Bob Kuzelka and Pat Larsen

Volk said, "This forum was structured to allow reaction to the present and future directions of the Center. We feel this is an excellent way to involve all water-related faculty in Water Center planning." 



# NWCC Holds Fall Annual Meeting

At the annual fall meeting of the Nebraska Water Conference Council Sept. 29, Bob Volk, director of the University of Nebraska Water Center said, "The Nebraska Research Initiative has provided new dollars to the Water Center for development of a multifaceted approach that will expand research in water sciences in Nebraska."

New faculty, a water sciences research facility, and special equipment will broaden the scope of Water Center research, he said.

"We are committed to the national focus of efficient utilization and protection of our ground and surface water. We aspire to be a national leader in water sciences research," Volk said.

Other reports to representatives of nearly 100 water-related organizations or agencies included:

—The status of the disputes on water rights with Wyoming and Colorado: Michael Jess, director of the Nebraska Department of Water Resources;

—The status of low-level radioactive waste storage in Nebraska and other environmental issues: Dennis Grams, director of the Nebraska Department of Environmental Control;

—Federal legislation relating to water and natural resources: Dayle E. Williamson, director of the Nebraska Natural Resources Commission;

—Current status of negotiations relating to relicensing of hydro-electric power plants in Nebraska by: Frank Dragoun, Central Nebraska Public Power and Irrigation District; Bill Thalken, Nebraska Public Power District, and Jack Maddux, Platte River Habitat Trust;

—U.S. Bureau of Reclamation Projects in Nebraska: Robert D. Kutz, projects manager, USBR, Grand Island;

—The Nebraska Natural Resources Commission: Dayle E. Williamson, director;

—The 1990 Farm Bill and Implications for Nebraska: Roy Frederick, UNL Extension economist;


—Irrigation in Nebraska and the outlook for 1990 crops: Jack Aschwege, director of the Nebraska Agricultural Statistics Service;

—The 1990 Nebraska Irrigation Tour: Dayle Williamson (see related articles page 5); and plans for the 1991 irrigation tour July 21 or 26 to western Nebraska, Wyoming, and Colorado.

—The 1991 Nebraska Water Conference to be held at the Kearney Holiday Inn, March 12-13, Bob Kuzelka and Les Sheffield, co-chairs, the first out-state conference in 20 years.

The Nebraska Water Conference Council was established in 1972 by University of Nebraska President D.B. "Woody" Varner. And since then, in cooperation with the University of Nebraska-Lincoln and the UNL Institute of Agriculture and Natural Resources, annual Nebraska Water Conferences have been held in Lincoln each year.

The Council, according to Les Sheffield, secretary, meets in either late September or early October each year in Lincoln in conjunction with a home NU football game. Besides water conferences, irrigation tours are sponsored annually by the Council. □

(Czech p. 1) 

that was very cheap during Soviet occupation," he said.

He said the philosophy of farming policies is relatively simple: achieve the maximum profit at minimum inputs into production. "Intensity of fertilization is stepped up in many regions in order to increase yields, but also because the farmers often do not know the optimum dose of fertilizer for the optimum harvest."


He said, "The costs of establishing and operating a monitoring system that will help make the information of the necessary inputs of fertilizer more precise would probably exceed the benefits."

He summarized that farmers' ecologic thinking has so far not reached a level that would allow them, with a view to preventive protection of the environment, to damage their own standing by lower harvests through voluntary cuts of fertilizer doses.

"And legislation does not force them to control inputs of nitrogenous

fertilizer," Vrba said.


This year's Avery Lecture, sponsored by the Department of Civil Engineering in cooperation with the University of Nebraska Water Center, coincided with the NATO Workshop where Vrba presented a paper. □

(Giant p. 5) 

The concept of wind machines is not new. Windmills still dot the countryside of Nebraska and plains states to pump water for cattle. However, even before their introduction here in the 19th century that made irrigation of the Great Plains possible, windmills paid their way in pumping water and generating power.

The idea first appeared in Persia (now Iran) in about 200 B.C., to grind grain. Horizontal-axis windmills were developed and primitive types are still used throughout the Mediterranean area. In the Middle Ages, Crusaders took the concept of wind machines back home with them to northern Europe from which the large Dutch-type windmills emerged.

With the recent energy crisis and the continued dependence on imported oil, the U.S. interest to use wind as a source of electrical energy has been revived. And the Department of Energy supports research to use the inexhaustible wind as a resource in many areas including the one that was visited on this last irrigation tour. □

(Director p. 2) 

work hard to attract undergraduates and graduate students to the field of water sciences. This attraction comes through explaining job opportunities and providing quality course work in many water-related areas. The Water Center will work with academic departments to this end.

Finally, as a personal note, I find Nebraskans to be interested in maintaining a quality lifestyle in an environment that protects their natural resources. That is refreshing. Let's continue the good work underway. □



# Pesticide Regulation Issues Facing Nebraska

J. David Aiken

Associate Professor of Agricultural Economics  
(Water and Agricultural Law Specialist)

Most Nebraskans rely upon ground water as their primary source of drinking water. Yet for many rural Nebraskans, agrichemical contamination of ground water supplies is an unfortunate fact of life. Over 20 rural Nebraska municipalities violate federal drinking water standards for nitrates, in most cases the result of fertilizer overapplication. The pesticide atrazine has been detected in small quantities throughout the heavily-irrigated Platte River Valley, although drinking water standards have not yet been violated.

In some regards Nebraska has been a leader in programs to control agrichemical contamination of ground water. The special ground water quality protection area program is one of the few in the U.S. that allows regulation of fertilizer application (as well as pesticide use) to prevent ground water contamination. The ground water quality management area program is perhaps the only program in the U.S. under which fertilizer use has been restricted to protect ground water quality.

Despite these programs, Nebraska is not a leader in regulating pesticide use to protect ground water quality. While state law requires certification of those using pesticides designated by the U.S. Environmental Protection Agency (EPA) as "for restricted use only," Nebraska and Colorado are the only states that do **not** administer the federal pesticide regulation program. Nebraska currently conducts much of the program—the UNL Institute of Agriculture & Natural Resources trains pesticide applicators, although official certification is by EPA. However, the fines for violating pesticide regulations under state law are well below federal requirements. In addition, the state of Nebraska does not monitor pesticide application for compliance with label directions, so that program is administered in Nebraska by EPA.

The failure of Nebraska to assume the federal pesticide program may

have significant repercussions for Nebraska pesticide users. Under the proposed EPA Pesticides in Ground Water Strategy states will be required to prepare state pesticide management plans to: (1) identify areas vulnerable to pesticide contamination, (2) monitor ground water supplies to identify where pesticide contamination is occurring, (3) adopt pesticide use regulations to prevent pesticides from contaminating ground water, and (4) adopt more stringent pesticide use regulations, including pesticide use bans, to prevent further contamination once a pesticide is detected in ground water supplies. New legislation would be required for Nebraska to implement these requirements.

Significantly, however, states would also be required to administer the existing federal pesticide regulation program, which Nebraska does not do. Thus, once the EPA pesticide strategy is adopted, significant new state legislation would be required for Nebraska to administer the old as well as the new EPA pesticide programs.

The draft EPA Pesticides Strategy indicates that if a state does not meet EPA pesticide program requirements, EPA will administer that program, similar to EPA administration of the current federal pesticides program in Nebraska. The Pesticides Strategy also states that EPA would not have the resources to tailor pesticide regulations to local conditions. If, therefore, a pesticide were detected in a state's ground water, the Pesticides Strategy indicates that EPA would probably ban the pesticide, either in any county where the pesticide had been detected or statewide. If this approach were in fact implemented by EPA in Nebraska, atrazine could be banned in any Platte River county where it was detected in ground water, or alternatively in the entire state of Nebraska. However, if the state of Nebraska were administering the EPA pesticides program, any pesticide bans could be limited to smaller

geographic areas, such as the recharge area within individual counties for municipal or domestic wells. Alternatively, application rates could be reduced to avoid ground water contamination.

While Nebraska does have significant water quality protection legislation, additional legislation is needed for the state to administer the new EPA pesticide regulations. Such legislation was last introduced in 1989 but was not enacted, due primarily to agrichemical industry concerns. It will be interesting to see whether those industry concerns prevail again in 1991 as they have in the past. □


## Irrigation Water Stretched with LEPA Experts Say

Nebraska irrigation tour-goers saw an irrigation system in operation Aug. 5-10 in Kansas, Oklahoma and Texas that caught their fancy. Some said it's the answer to the prediction of the Ogallala aquifer shrinking. Others, that LEPA could be a retort to experts who predict the return of the Great American Desert to the Great Plains.


Low Energy Precise Application (LEPA) costs about \$9,000 to convert a \$50,000 center pivot system. Equipment for the conversion has been available since 1983 with farmer acceptance "very good," according to researchers.

The conversion consists of LEPA nozzles that hang from hoses attached to the pivot that apply the water to the plant base. Some critics of the center pivot say this would cut down on evaporation, especially in the hot, dry Nebraska winds.

William M. Lyle, Texas A&M Agricultural Research and Extension Center at Lubbock, told the tour group, "The maximization of long-term monetary benefit from a limited water supply demands a change in

 (see page 8)



(Irrigation p. 7) 

farm management techniques," Lyle, LEPA inventor, explained his brainchild:

"Rather than spraying water into the air at high pressure, a LEPA system distributes water into the furrow at low pressure with a drop tube. This system also requires less energy to apply water and results in lower operating costs for producers."

However, he said, LEPA may not be a cure-all everywhere, but it can apply water more efficiently.

In Kansas, earlier on the tour, the tour participants first saw LEPA at the Southwest Research-Extension Center at Garden City, where William Spurgeon explained their LEPA irrigation project. He said that LEPA systems will probably require smaller amounts of water per irrigation because of the higher application rate in the small wetted diameters of the nozzles."

And he reported that yield results indicated no significant difference between irrigation frequencies of 3, 6, and 9 days.

While in Oklahoma, the Nebraska tour group stopped at Goodwell at the Panhandle Research Station of the Oklahoma Agricultural Experiment Station. Mark Hodges, researcher said,

"The system is versatile and can be adapted to the conditions of the Panhandle." He said drop tubes can be as short as permitted by the particular crop being irrigated. Spray evaporation and drift is minimized by placing bubblers (spray nozzles) close to the ground.

One disadvantage to the system, one observer on the tour said, is the requirement of level land. An approximate 5 percent slope is about the maximum on which LEPA operates. He wondered how widespread this would make the system's use practical in Nebraska as "we have many agricultural areas with rolling hills." □

## Two Conferences Set for Groundwater Enthusiasts

It's a challenge to keep up with all the groundwater issues and information that's afloat. But here's an opportunity for you: A Nebraska Groundwater Foundation Symposium Oct. 17 at the Hilton Hotel followed the next day by the 35th Midwest Groundwater Conference that will continue through the 19th.

According to Susan Seacrest, president of the Nebraska Groundwater Foundation, the 1990

symposium, "will showcase groundwater quality dilemmas facing Nebraskans, as well as showcasing state-of-the-art technologies to manage the dilemmas."

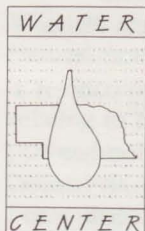
She said that this year's symposium format will again involve participants directly. "Attendees will pick the problem that most interests them, hear experts discuss possible solutions, and meld a workable action plan based on the technologies presented."

Registration is free as a membership benefit, but due Oct. 9. Membership is \$10 annually. Mail a \$10 check or money order to:

Nebraska Groundwater Foundation  
P.O. Box 2558  
Lincoln, NE 68502-0558

— — —  
The Midwest Groundwater Conference will feature international experts who will discuss governmental roles in groundwater, geophysical applications to groundwater, computer applications to groundwater, impacts of climatic change on groundwater, GIS/Remote Sensing applications to groundwater and chemical aspects of groundwater.

For more information, call the Conservation and Survey Division, UNL, (402) 472-3471. Preregistration deadline is Oct. 10, and costs \$50. After the 10th, the fee is \$65.



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