

Approved January 30, 1990
Date

MINUTES OF THE Senate COMMITTEE ON Agriculture

The meeting was called to order by Senator Jim Allen at
Chairperson

10:10 a.m./~~p.m.~~ on January 25, 1990 in room 423-S of the Capitol.

All members were present except: Senator Doyen (excused)

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

Conferees appearing before the committee: Dean Walter R. Woods, Director, Kansas Cooperative Extension Service, Kansas State University
Dr. Don D. Pretzer, Assistant Director of Extension, Agriculture and Natural Resources, Kansas State University
Dr. Danny Rogers, Irrigation Engineer, Department of Agricultural Engineering, Kansas State University
Dr. Michael H. Bradshaw, Health and Safety Specialist, Human Development and Family Studies, Kansas State University
Dr. Hyde S. Jacobs, Assistant to the Dean of Agriculture, Director, Kansas Water Resources Research Institute, Kansas State University

Senator Allen called the Committee to order and then called on Dr. Woods to introduce the conferees to present a review of Extension.

Dr. Woods gave the Committee copies of a pamphlet (attachment 1) on "Water Quality Educational Programs" by the conferees and then introduced the following to comment on some of the ways Extension is addressing water quality with educational programs.

Dr. Pretzer stated that quality water is the most challenging issue before us. Dr. Pretzer explained that the counties help choose water research issues and that the most important issue extension needs to be providing information for is domestic water quality. The number two water issue is non-point source pollution.

Dr. Rogers reported that a notebook of information on water quality and non-point source pollution was prepared for county agents to use and that other states have requested to use the notebook. A manual on the safe use of chemicals is being reviewed and then crop production schools will be held to teach the impact of fertilizers.

Dr. Bradshaw stated that we all should be able to assume that our drinking water is safe to drink but that 37% of the wells surveyed did not meet EPA safety regulations. Dr. Bradshaw explained that after the testing of wells that meetings are held with those involved to discuss ways to correct their water problem. Information has been given to county agents so that they are able to help persons in their county who have water problems. Dr. Bradshaw stated that the Department of Health and Environment had helped with the preparation of the water information. A school pamphlet has been prepared on how to protect our environment for use with students in grade 3 through grade 8. Dr. Bradshaw stated that people are encouraged to have their water tested.

In answer to Committee comments, Dr. Bradshaw stated that wells in Eastern Kansas have more unsafe levels of nitrates and bacteria than wells in Western Kansas and that too many nitrates and bacteria in the water are harmful to young persons and young animals. Dr. Bradshaw answered that

CONTINUATION SHEET

MINUTES OF THE Senate COMMITTEE ON Agriculture,
room 423-S, Statehouse, at 10:10 a.m. ~~XXX~~ on January 25, 1990

drought had been considered as having something to do with water quality but that in testing a nitrate level stays about the same year after year.

Dr. Jacobs reported that Extension cooperates with other state, federal and local agencies in the preparation of educational materials. Materials have been prepared addressing pesticide application, and conservation tillage which slows erosion and slows the loss of nutrients and pesticides. Dr. Jacobs stated that 60% of our farmers now use conservation tillage. Dr. Jacobs explained that in using drip irrigation only half as much water is needed for irrigation and also less pesticide is needed.

Senator Allen thanked the conferees and called for action on Committee minutes.

Senator Daniels requested that the 's' be changed to 'c' in the word 'recent' in the second line of paragraph four and that the 'd' be removed from the last word in paragraph five of the January 24 minutes and then moved that the minutes be approved as corrected. Senator Frahm seconded the motion. Motion carried.

The Chairman adjourned the Committee at 11:00 a.m.




E WATER QUALITY
EDUCATIONAL
Programs



.....
A Report
to the
Kansas Legislature

.....
by
Kansas Cooperative Extension Service
Kansas State University



Senate agriculture Committee
1-25-90
attachment 1



CONTENTS

SUMMARY	1
INTRODUCTION	3
OVERVIEW	4
EXTENSION THRUSTS IN WATER QUALITY	6
NON-POINT SOURCE POLLUTION	8
ENVIRONMENTAL QUALITY	10
DOMESTIC WATER QUALITY	12
WATER QUALITY EDUCATIONAL DEVELOPMENTS	14
Safe and Effective Use of Pesticides	14
Non-Point Source Pollution	16
Pesticide Applicator Training	16
Forestry Management	17
Horticulture	17
Water Education for Teachers	18
Environmental Engineering	19
Water Quality Programs	20
County Water Quality Programs	20
Extension Communications	21



Cooperative Extension Service

Office of the Director
Umberger Hall
Manhattan, Kansas 66506
913-532-5820

January 22, 1990

To Members of the Kansas Legislature

Dear Friends:

Because of local concern, the Kansas Cooperative Extension Service has identified water quality and natural resource conservation as system wide issues. Those concerns are heightened by reports of detectible amounts of pesticides in both surface and groundwater.

It is my personal conviction that adequate supplies of good water quality are essential to future growth in agriculture, municipalities, and industry throughout the state. The following steps have been taken to strengthen Extension programs in water and environmental quality.

- * Designated an Environmental Quality Coordinator
- * Organized Program Development Teams for Water Quality, Non-Point Source Pollution, Safe Use of Chemicals, and Soil and Water Conservation
- * Designated Agency Liaison Representatives to Enhance Communication

This report provides an overview of selected educational programs in water and environmental quality. We want to insure that those educational needs are promptly addressed and fully coordinated with other agencies and interest groups.

We invite your comments and suggestions on these or any other Extension programs.

Sincerely,

Walter R. Woods
Director

EXECUTIVE SUMMARY

Water and environmental quality: This report to the Kansas Legislature highlights educational programs in water and environmental quality conducted by the Cooperative Extension Service.

Program planning: Extension programs are implemented through a system of county Extension councils, citizen-based program development committees, county agents, and Extension specialists. Program development teams in (1) non-point source pollution, (2) domestic water quality, and (3) safe use of chemicals (chemical task force) provide leadership for educational programs in water and environmental quality. Responsibility for program coordination — between Extension program development teams and between Extension and water resource agencies — has been delegated to a newly appointed environmental coordinator.

Safe and effective use of herbicides: Kansas farmers apply about \$125 million worth of pesticides annually. However, only one in four applications will likely be within plus or minus 5 percent of the intended application. Many Extension programs are directed at safe and accurate application by ground and aerial applicators.

Non-point source pollution: County Extension agents and district conservationists were provided training to help them (1) understand environmental impacts, (2) conduct educational meetings, and (3) evaluate and encourage adoption of water protection plans. The 3-day training sessions focused on best management practices, minimizing environmental degradation and maintaining profitability. More than 300 individuals attended.

Pesticide applicator training: To enhance environmental quality, all private or commercial applicators of restricted use pesticide must pass an exam and be certified. As a result, about 30,000 private and 4,500 commercial applicators have received basic training in the proper use of pesticides.

Forestry management: Properly managed woodlands, particularly those close to streams or on erodible land, exert a positive influence on stream and environmental quality. Extension foresters provide technical assistance to landowners and advice concerning conservation plantings and filter strips.

Horticulture: Extension horticulturists have developed a series of demonstrations on water and environmental quality. The demonstrations involve intensive vegetable production, nutrient management, drip or trickle irrigation, plastic mulches, minimizing pesticide use, and turf management.

Environmental engineering: Kansas State University was recently named one of five national centers for hazardous substance research by the Environmental Protection Agency. Educational and technical assistance is provided to minimize the production of



hazardous wastes, in hazardous waste technology and in measuring and mitigating radon gas.

County Extension programs: Many counties encourage water testing as part of their water quality education programs. In several cases, individuals found water of impaired quality and took remedial measures including chlorination, drilling new wells, and plugging old wells.

INTRODUCTION

Mission: The mission of the Kansas Cooperative Extension Service is to provide practical and useful information to the people of Kansas through informal, out-of-school, non-credit educational programs — programs based on scientific knowledge, applied principles, and recommended practice.

Cooperative Extension helps organize educational programs in every county in the state. The objective is to identify priority educational needs and meet those needs with research-based educational programs.

Responding to issues: Cooperative Extension has adopted a statewide planning process involving county Extension agents, specialists, county Extension councils, and county program development committees. This comprehensive planning effort resulted in interdisciplinary, issue-based programs focused on seven priority areas:

- Agricultural Profitability and Competitiveness
- Economic Revitalization
- Water Quality
- Conservation of Natural Resources
- Human Health and Well-Being
- Youth at Risk
- Developing Human Resources

The true wealth of Kansas is its people and its soil and water resources, and much of that wealth is connected with agriculture. Farmers use organic wastes, fertilizers, and other agricultural chemicals to supply essential nutrients for crop and livestock production, control weeds and insects, reduce costs, and increase profitability. However, agricultural practices and environmental quality are interdependent and directly affect human and animal health and safety and plant growth.

In Kansas, most groundwater meets the state's drinking water standards and most surface water can be readily treated for drinking. However, detectible amounts of pesticides are found in several Kansas reservoirs and lakes and in some farmstead wells. Warning signs are evident and water quality is a growing concern. Concerted action is required to protect this essential resource, now and for the future.

This report summarizes Extension educational efforts targeted to water and environmental quality.

Water and environmental quality: Education will play a key role in protecting our water resources.

Protection strategies that are technically and environmentally sound will be the key to preserving the resource base and to assuring water and environmental quality. Cooperative Extension has

1-4

1-6



taken several steps to assure that educational programs in water and environmental quality are adequately addressed and fully coordinated with other agencies and groups. Those actions include:

- **Administration:** Extension administrators meet monthly to consider water and environmental quality programs and needs.
- **Environmental quality coordinator:** An Extension environmental quality specialist and coordinator has been appointed to coordinate Extension educational thrusts and facilitate inter-agency cooperation.
- **Program development teams:** Program development teams (PDTs) have been organized to provide leadership in:
 - Non-point pollution
 - Domestic water quality
 - Safe use of chemicals (chemical task force)
- **Agency liaisons:** Liaison representatives have been designated for state and federal agencies and private groups to maintain and enhance inter-agency relationships.

OVERVIEW

Walter R. Woods

Director, Kansas Cooperative Extension Service

Introduction

The Cooperative Extension Service has adopted a planning process that is responsive to statewide educational issues. The priority issues most directly impacting agriculture include: agricultural profitability and competitiveness, economic revitalization, water quality, and conservation of natural resources.

This report focuses on education developments in water and environmental quality in the Cooperative Extension Service.

Meeting the Challenge

I'm personally convinced that good quality water will be the economic lifeblood that sustains agricultural, municipal, and industrial growth throughout the state. It is clear that protection strategies will be key in preserving our soil and water resource base and in assuring long-term water and environmental quality.

Cooperative Extension has implemented a number of actions to strengthen educational programs in water and environmental quality, including:

- Monthly water quality coordination meetings
- Designating an environmental quality coordinator
- Organizing program development teams for water quality, non-point source pollution and safe use of chemicals
- Designated agency liaison representatives

We want to assure that educational needs in water and environmental quality are adequately addressed and fully coordinated with other resource agencies and interest groups.

Soil and Water Conservation

Today, water and environmental quality concerns are center stage and high priority, as they should be. Those challenges will grow and must be met with sustained effort. However, in the long term, agriculture faces another critical problem which will also grow in importance. Agriculture is the state's largest withdrawal user of water. Farmers, ranchers, and irrigators withdraw about 85 percent of the state's water. We believe that soil and water conservation should be a companion priority with water and environmental quality. At K-State, our research and Extension efforts to improve water and environmental quality are closely tied to programs to conserve soil and water resources.

Reports and Programs

Today's report concerns:

- Extension thrusts in water quality
- Non-point pollution
- Environmental quality
- Domestic water quality

Nineteen multi-disciplinary program development teams have been organized as part of Extension's issue-based program initiatives. Nine program development teams address agricultural profitability and competitiveness initiatives; three, water quality; two, economic revitalization; and two, human health and well being. Soil and water, youth at risk, and developing human resources initiatives are each addressed by a single program development team.



EXTENSION THRUSTS IN WATER QUALITY

Don D. Pretzer

Assistant Director of Extension, Agriculture & Natural Resources

Introduction

The Kansas Extension educational water quality plan of work is divided into three basic sections: (1) non-point source (NPS) pollution; (2) domestic water quality; and (3) chemical task force (pesticide registration and pesticide application training).

Non-Point Source Pollution


Clean water supplies and continued agricultural production are important to Kansas and to the nation. The use of agricultural chemicals is a potential NPS pollution risk. Sediment and suspended solids are a major surface runoff problem. A recent survey of NPS pollutants in streams, lakes, and groundwater indicate instances of sediment, fertilizer, and pesticide contamination (Table 1).

Table 1. Non-point source pollution by nutrients, pesticides, and suspended solids, Kansas.

Pollutant	Streams	Lakes	Groundwater
Percent of sites impaired			
Nitrate N	21	—	14
Phosphorus	92	50	0
Pesticides	42	13	2
Suspended solids	70	13	0

Without use of agricultural fertilizers and pesticides, U.S. food production could decline by 50 percent, causing significant food price increases. The risk of NPS pollution to Kansas water supplies can be minimized through the use of sound agricultural management practices. Water quality protection has been identified as the most pressing environmental objective for the 1990 farm bill.

The Kansas Department of Health and Environment is administratively responsible for the state's assessment and management



plans in regard to the Clean Water Act. The Kansas Cooperative Extension Service will help review the assessment and management plan and will assist in developing best management practices.

Domestic Water Quality

The 1980 census showed 126,000 private water supplies in Kansas. About a half million people (20 percent of the state's population) depend on private water supplies. A recent Kansas farmstead well survey showed 28 percent of our wells contain nitrates above the safe drinking water standard.

Pesticides and volatile organic chemicals (VOCs) were found in 10 percent of the wells. Recent Kansas Department of Health and Environment data show about 25 percent of private water tested is considered bacterially unsafe. When inorganic, organic, and bacteria-contaminated water is combined, over half of our private water supplies do not meet safe drinking water standards.

Many people using private water supplies are uninformed and unaware of the conditions and possible health implications of their water. A small percent of these wells are tested each year. Almost none are tested regularly. Extension can play a vital role in encouraging water testing and in selecting proper treatment.

Chemical Task Force

Pesticide registration and re-registration at both the federal and state levels is a dynamic process. New data and re-evaluation of "old" data used to support pesticide registration often require that the pesticide be placed in a special review to resolve questions on environmental concerns, human health, applicator safety, and risks and benefits of the use of the pesticide. The purpose of the USDA/State National Pesticide Impact Assessment Program (NAPIAP) is to provide objective data for evaluating the benefits and risks of selected pesticides. The National Pesticide Information Retrieval System (NPIRS) is used in Kansas to provide computer-accessible information relative to NAPIAP requests and the safe and legal use of pesticides.

Program Development Teams

Multi-disciplinary program development teams play an important role in planning, implementing, and evaluating Extension initiatives. The development team takes the lead in: (1) providing visionary leadership, (2) identifying priority educational issues, (3) planning and coordinating the plan of work, (4) marketing and implementing the program, and (5) reporting program impact.



Water quality program development team
program development teams, including:

- Beef profitability
- Swine profitability
- Dairy profitability
- Grazinglands profitability
- Horticulture food crops
- Crops profitability
- Sheep profitability
- Sustainable agriculture
- Ornamentals and turf
- Soil and water conservation
- Economic and business development
- nutrition and health
- Food quality

NON-POINT SOURCE POLLUTION

David L. Regehr

Extension Specialist, Weed Science, Department of Agronomy

Non-Point Pollution Program Development Team

A non-point pollution program development team has been organized by Cooperative Extension to support its system-wide water quality and soil and water conservation initiatives. Members of the non-point pollution team provide leadership in planning, implementing, and evaluating county, area, and statewide programs in non-point source pollution. The object is to help Kansas farmers and ranchers use agricultural systems that enhance profitability, protect water quality, and prevent non-point source pollution.

Training County-Based Staff

A major activity for this program development team in 1989 was planning and presenting area training sessions for county Extension agricultural agents and district conservationists. The planning committee, composed of K-State, Soil Conservation Service, Kansas Department of Health and Environment, and State Board of Agriculture staff, focused the sessions on safe and effective use of fertilizers and pesticides. Environmental quality and groundwater protection were recurring themes.

More than 300 Extension agents and district conservationists attended one of the five 3-day training sessions held across the state in the fall of 1989. Each participant received a complete set of conference proceedings. This included subject matter presentations and graphs, charts and other reference material.



Non-Point Pollution Educational Themes

Pesticide characteristics: Extension meetings in non-point source pollution are designed to help producers cope with the environmental implications of fertilizer and pesticide use. For example, weed control herbicides are traditionally selected on the basis of the weed specie, crop, soil type, and cost. Farmers and ranchers are being encouraged to build groundwater and environmental protection characteristics into each farm plan and each agricultural practice. The USDA Agricultural Research Service is developing a data base characterizing the leaching and surface runoff potential of pesticides. Critical characteristics include the pesticide's solubility in water, adsorption to soil colloids, and longevity in the soil environment. This data base allows the use of environmental quality as a criterion for pesticide selection. Information on potential environmental impact is being incorporated into Extension's weed management recommendations and publications.

Best management practices: Atrazine is probably the most widely used herbicide for corn and sorghum production in Kansas. Although it is an effective herbicide, traces of atrazine are now found in several large and small water impoundments. In some locations the concentration approaches the "human lifetime health advisory" (HAL). Consequently, educational efforts focus on the use of best management practices for atrazine and other agricultural chemicals — practices that minimize use and reduce the potential for loss either by runoff or leaching.

Coordination

The non-point pollution team serves as a focal point for integrating non-point pollution principles in all Extension programs related to agricultural production, protection, and marketing. Special attention is focused on tillage, erosion and runoff control, safe use of agricultural chemicals and water and environmental protection.

Cooperative Extension's mandate is to serve as the educational link between agricultural research and the farmer/producer. Through cooperative efforts and effective coordination, the non-point pollution team also strives to serve the educational needs of other state and federal agencies.



ENVIRONMENTAL QUALITY

John S. Hickman

*Extension Specialist & Coordinator,
Environmental Quality, Department of Agronomy*

Introduction

Underlying the quality of life and economic viability of Kansas is a wealth of natural resources: water, soils, grasslands, forests, agricultural crops, livestock, and wildlife. In the last year, there has been a dramatic increase in public awareness and concern over the quality of our natural resources. During this same period, the Kansas legislature funded the State Water Plan and Congress passed the Clean Water Act. Each of those actions has far-reaching environmental implications.

Natural systems are highly interdependent. Costs and benefits of management decisions are distributed among resource owners and their neighbors, and between present and future generations. To address the relationship of resource management and environmental quality requires integration of science, technology, sociology, and economics. The Cooperative Extension Service at Kansas State University is developing and delivering educational programs to address these basic issues.

Coordinating Environmental Programs

The environmental quality coordinator is a new position in the Cooperative Extension Service to facilitate and coordinate programs addressing environmental quality. The object is to plan, implement, and evaluate Extension educational programs with emphasis in surface and groundwater quality and point and non-point source pollution. Environmental quality issues will be coordinated with other Extension specialists as well as relevant state, local and federal agencies.

Interagency Cooperation

Coordination among state, federal and local agencies involved in environmental quality is essential. The Kansas Cooperative Extension Service has appointed staff members to enhance communication with other agencies. In addition, two committees have been developed to help coordination with various agencies. The Cooperative Extension Service will also help review best management practices, regulations, and other issues related to environmental quality. For example, Extension assisted in the review of a pesticide data base and soil pollution potential ratings for the Soil

Conservation Service (SCS). Extension also assisted in reviewing the rules and regulations for the Non-Point Source Pollution Control Fund. In the near future, we expect to review best management practices written by the Kansas Department of Health and Environment and the Soil Conservation Service.

Extension also will play a role in implementing the State Water Plan. Some of the programs funded from the State Water Plan, such as the Non-Point Source Pollution Control Fund and the Local Environmental Protection Grants Program, involve information and education at the local level. Extension at the state, area, and local level can deliver information and educational programs in these areas.

Environmental Quality Programs

The primary thrust of program development teams in environmental quality include: 1) non-point source pollution, 2) domestic water quality, and 3) pesticide applicator training by the chemical task force. To foster interaction, each program development team is multi-disciplinary. We consider this essential, because we want water and environmental quality principles to be an integral part of most Extension programs. This is particularly true for programs in crop and animal production and protection, soil and water conservation, and nutrition and health. Administrators and team leaders meet monthly to foster interaction and keep abreast of current activities.

Many related programs also will address environmental quality issues. For example, publications have been and are being developed for public distribution through meetings, Extension offices, and by cooperating agencies. Information on how pesticides reach groundwater and surface waters was incorporated into seven commercial pesticide applicator training sessions last year. Environmental quality issues will also be addressed in a series of 21 public policy meetings on the 1990 farm bill.

Summary

Extension programs in environmental quality will help the people of Kansas better understand the complex issues related to the quality of our natural resources and will help achieve an atmosphere of cooperation between the various interests affected by this issue.



DOMESTIC WATER QUALITY

Michael H. Bradshaw
*Health & Safety Specialist,
Human Development and Family Studies*

Introduction

Approximately 500,000 Kansans rely on private wells for their water needs. Is their water safe to drink? Does it meet EPA safe drinking water standards? We know little about the quality of private wells. What little we know leads us to believe that many people are drinking water that does not meet the same safe drinking water standards required for municipal water systems.

Farmstead Wells

In 1986, the Kansas Department of Health and Environment, with Kansas State University, conducted a statewide study to evaluate the condition of farmstead wells. The study revealed that many were contaminated. Information collected subsequently from wells tested during statewide Extension water quality clinics revealed that 45 percent of wells tested were above the EPA guidelines of safe levels of nitrate or bacteria.

Most of the private water system problems can be corrected, and further deterioration of groundwater can be prevented.

Water Quality Task Force

To address the growing concerns over the quality of our domestic water, Extension organized a water quality task force in 1985. The task force was asked to identify educational program needs which would help to address water quality issues. Several Extension educational programs, identified by the task force, have been introduced this past year to help reduce problems associated with private water systems and to prevent further contamination of our groundwater. One such activity, an agricultural best management practice program, was introduced to help protect ground and surface water. This program was incorporated into our traditional educational programs for agricultural producers. For example, in programs in which agricultural chemicals were discussed, specialists added information on the importance of best management practices to protect our surface and groundwater. This educational message on protecting surface and groundwater reached 5,890 producers this past year.

Water Quality Programs

Water quality clinics were conducted by Extension personnel to help homeowners evaluate and correct problems with private water supplies. Extension specialists taught 1,275 people who had obtained water tests, how to inspect their wells, protect their water supply, and correct water problems associated with bacteria or nitrate contamination.

County Extension agents have worked with farm families to provide educational programs which promote best management practices, health benefits of safe water, and testing of private water supplies. These programs reached 9,614 individuals across Kansas this past year.

Agent Training

Over a two-year period, 100 Extension agents participated in a special water quality training program. County agents are being trained to help rural families who have questions about their private water supplies.

Publications

Extension specialists worked with the Kansas Department of Health and Environment specialists to develop publications to help Kansans better understand private water systems, how to protect water quality, and how to correct problems. Publications completed this past years were:

- "Is Your Drinking Water Safe?"
- "Questions to Ask Before Buying Water Treatment Equipment"
- "Commercial Laboratories Certified for Water Quality Tests"
- "Understanding Your Water Test Report"
- "Plugging Abandoned Wells"

Media Program

Task force members produced a monthly question and answer newspaper series on water quality.

Extension specialists are working with personnel from the Kansas Department of Health and Environment to develop a newspaper supplement for distribution to local papers. This water quality tabloid also will be distributed to rural Kansans who have private water systems.



WATER QUALITY EDUCATIONAL DEVELOPMENTS

Safe and Effective Use of Pesticides

Pesticide application accuracy: Kansas farmers apply an estimated \$125 million worth of pesticides, but only one in four applications may be within plus or minus 5 percent of the intended rate. Extension demonstrations, sprayer workshops, and in-depth schools were organized to help private and commercial applicators with application techniques, sprayer calibration, and alternative control methods. An initial survey of commercial ground rig applicators showed an average over-application error of 22 percent. Subsequent surveys showed that the tendency to over-apply pesticides declined and overall application accuracy increased. It is estimated that one such program favorably impacted 240,000 acres.

Chemigation: Chemigation, the application of agricultural chemicals through irrigation systems, is rapidly becoming an accepted method of application. If applied properly, chemigation is a cost-effective, timely and safe method of application. However, groundwater can be contaminated if the system is not properly operated, calibrated, or equipped. Chemigation schools detailing calibration methods, operating parameters, and required safety equipment were organized by Extension agents and specialists. The farmers in attendance (approximately 300) operated about 400 center pivot systems and farmed about 55,000 acres.

Improved insect management in grain sorghum: The major recurring sorghum insects are greenbugs and chinch bugs. Seasonal losses vary widely, from none to as high as 50 percent. This educational program focused on three areas: (1) reducing unneeded planting time treatments, (2) monitoring programs to detect pests and reduce losses, and (3) non-chemical pest control alternatives. Farmers were reluctant to reduce chemical use without assurance that planting time treatments could be safely delayed. A county-by-county pre-season insect survey was conducted annually by Extension professional and survey results were reported to producers. Suppliers reported a decline in sales from more than 5 million pounds annually to less than 1 million pounds following the insect survey.


Emergency applications of pesticides frequently are needed on sorghum. Cooperating farmers in north central Kansas were encouraged to carefully monitor insect numbers and to utilize early warning services in scheduling the application of pesticides. Greenbug infestations were severe and participating producers saved an estimated 26 percent in sorghum yields on 130,000 acres. Similar savings were realized in northwest Kansas when a comparable problem arose.

Extension specialists keep abreast of the availability of greenbug-resistant hybrids and their susceptibility to change based on changes in greenbug biotypes. This enables farmers to use greenbug-resistant hybrids wherever possible and significantly reduce the use of pesticides.

Aerial application of pesticides: Starting in 1985, computerized spray deposition pattern analysis equipment was made available for use by all aerial applicators in Kansas. The objective was to provide educational materials, calibration slides, deposition measuring equipment, and technical assistance to improve application results, efficiency, and accuracy. The leader of the Kansas program organized a series of aerial applicator training programs for Extension leaders in other states and received the USDA Award of Merit for this leadership. This program has impacted about 600,000 acres of Kansas crop and range land. Most cooperating aerial operators had never had their spray deposition pattern analyzed using computerized equipment. Demand for the program, which includes instruction on protecting ground and surface water and managing load/mix sites, is increasing. Coordination with the developing National Agricultural Aviation Association (NAAA) Operation SAFE, Phase II program will be increased. The NCAA Operation SAFE, Phase I program was significantly influenced by this educational effort.

Best management practices for nitrogen: Maintaining environmental quality, particularly safe drinking water supplies, is a major objective of Extension soil fertility and soil management programs. Because nitrogen is the most widely used fertilizer in the state, best management practices for nitrogen are emphasized in Extension meetings and publications. Helping farmers apply fertilizers at the proper time, rate, and point of placement is a major educational thrust, not only for nitrogen but for all plant nutrients. When legumes or manure is used, producers are advised to adjust fertilization rates downward. The profile nitrogen test is promoted as a measure of residual available nitrogen. One producer, using the profile nitrogen test for the first time, reduced his 1989 fertilization rate by 50 pounds per acre. The result was a \$7,000 saving with no sacrifice in yield. His 1988 production was limited by dry weather, leaving unused nitrogen in the soil. In 1989, more than 6,000 producers and fertilizer dealers participated in this program.

Conservation tillage: Soil loss due to wind and water erosion continue to be above tolerance levels in much of Kansas. As defined by the Food Security Act of 1985, Kansas has 10.5 million acres of highly erodible cropland. The conservation tillage program development team has instituted numerous educational programs to help farmers retain surface residue, minimize erosion and reduce nutrient runoff through conservation tillage systems. The programs are often conducted in cooperation with SCS and soil conservation district personnel and farmers.



These cooperative efforts are making a significant impact on farming practices. For example, benchmark surveys indicate that 99 percent of Kansas producers have heard about conservation tillage and approximately 60 percent of Kansas farmers are using some form of conservation tillage on parts of their acreage. About 30 percent of the cropland in Kansas is farmed using a conservation tillage system. It is estimated that conservation tillage committees provided 3,700 hours of volunteer assistance in 22 counties and helped implement 122 demonstration plots, 223 drill demonstrations, 44 seminars/workshops and educational programs for 5,750 individuals in a single year.

Safe and proper use of herbicides and fertilizer is an integral part of conservation tillage educational programs.

Non-Point Source Pollution

The objective of non-point source pollution training programs is to provide county Extension agents and district conservationists with information to help them: (1) understand the production and environmental impact of agricultural chemicals, (2) conduct educational meetings, (3) evaluate the adequacy of water protection plans, and (4) encourage adoption of water quality protection plans by farmers and ranchers. Specifically, farmers subject to the conservation provisions of the 1985 Food and Security Act (60 percent of Kansas farmers) are encouraged to append water quality protection provisions to their farm plans. Others are encouraged to request the development of resource plans that will prevent point or non-point pollution.

Pesticide Applicator Training

Certification: To use restricted use pesticides, state and federal law requires that both private or commercial applicators be certified. The State Board of Agriculture administers the exam and pertinent regulations. Cooperative Extension publishes and provides, with help from industry and agency representatives, the technical expertise for all training materials and educational meetings. One objective is to provide 30,000 private and 4,500 commercial pesticide applicators with basic training in the safe use of pesticides. The training manuals incorporate the latest technology on pesticide storage, use, application, safety, groundwater contamination, endangered species protection, community right-to-know and waste disposal. Commercial applicators can renew certification by re-examination or by attending a 6-hour training class. Private applicators renew certification through a mail-out exam. More than 90 percent of all commercial applicators renew their certificates by attending KSU-organized training sessions. K-State specialists have developed 23 manuals to support the certification process.

Chemigation: A manual on chemigation also is being developed by K-State specialists working with appropriate state agencies. The manual addresses proper and safe use of pesticides and safety devices to protect both surface and groundwater.

Forestry Management

Riparian woodland management: Properly managed woodlands — particularly immediately adjacent to streams — have a positive effect on stream water quality. Riparian plantings and filter strips stabilize streambank erosion, trap sediment and reduce nutrient loads. Technical assistance is provided to landowners in the areas of water quality, erosion control, and wildlife habitat as well as timber production, recreation, and related areas.

Conservation plantings: Tree plantings can stabilize critical areas by reducing or trapping sediments, nutrients, and pesticides. Low-cost tree and shrub planting stock are provided to landowners for conservation purposes, including critical area and streambank stabilization, windbreaks, wildlife habitat and timber. Technical assistance is provided in developing conservation plans and for planting, maintenance, and management procedures.

Environmental coordination and review: Channel modification projects are reviewed for their potential impact on water quality and forest resources prior to the issuance of permits. State and Extension Forestry cooperates with the Division of Water Resources, State Board of Agriculture, in the review. Technical assistance is provided to permit holders for tree plantings and management.

Horticulture

Extension horticulture programs in water and environmental quality programs depend heavily on workshops, seminars, and publications to reinforce awareness of environmental hazards and the need to protect our soil and water resources. Demonstrations have proven very effective, and a few water and nutrient conservation demonstrations are listed below.

Intensive vegetable production: Based on research results, it was demonstrated that water applications could be reduced more than 50 percent (46,000 to 20,000 gallons per acre) using plastic mulch and drip irrigation systems. With drip irrigation, production often can be doubled using half as much water and fertilizer for a variety of vegetable crops.

Efficient nitrogen utilization: Producers are generally aware that large quantities of fertilizer elements can be lost by leaching in sandy soils. An effective demonstration series has been developed to show that a vigorous crop of seedling asparagus can be produced with only 7 pounds per acre of nitrogen when utilized in conjunction with drip or trickle irrigation.



Drip or trickle irrigation: When properly managed, the use of drip or trickle irrigation systems results in significant water savings. If neglected, water and nutrients may leach below the root zone and cause environmental degradation. To help alleviate this management problem, a series of water management demonstrations was instituted in commercial fields, vineyards and orchards in eastern and south central Kansas. The use of tensiometers in timing and controlling irrigation was an important part of the demonstration. Drip and trickle irrigation was demonstrated to commercial growers on two vegetable farms and at the Eastern Kansas Vegetable Research Farm at DeSoto. More than 130 growers participated.

Minimizing pesticide use: Excessive use of pesticides and subsequent run-off in orchards is a potential hazard where a spray schedule is used to prevent disease and insect problems. The following techniques were demonstrated to help producers achieve effective control while minimizing the use of pesticides.

- **Precision calibration of sprayers to prevent over- or under-application of pesticides.** For one grower, proper calibration plus shutting off two nozzles reduced pesticide use by 6 pounds per application and 48 pounds per season.

- **Use of pheromone traps and heat unit accumulation for timing treatments for codling moth infestations.** Nine cooperators based their spray schedules on adult moths caught in sticky traps using codling moth lures. Using this method, insecticide applications were reduced from 1 to 3 applications per grower.

- **Landscape and turf:** Nearly 50 percent of the water used by households, businesses, and public grounds is for landscape plantings, particularly grass. Because of recent droughts and increased awareness of water availability, renewed emphasis has been placed on xeroscaping. Xeroscaping denotes the use of natural resources to create a quality living environment using limited amounts of water. Extension programs in turf are directed toward: (1) conserving water and resource inputs while maintaining quality turf through species selection and management, particularly water management, (2) use of run-off or water of non-drinking quality for irrigation on golf courses or large turf areas, and (3) use of turf as a filter strip to reduce surface water contamination.

Water Education for Teachers (WET)

Extension specialists in 4-H and youth and agricultural engineering cooperated to develop a Water Education for Teachers (WET) curriculum. It is designed for 4th through 8th grade teachers and for 4-H volunteers to use with elementary and middle school students, 4-H clubs, and others. The lessons are hands-on, experiential, and help youngsters gain new ideas and behavior patterns about water resources. The curriculum contains more than 60 lessons on the water cycle, water supply, water and waste water treatment, conservation and pollution.

Approximately 100 teachers received "hands-on" training with curriculum materials at the Kansas Teachers of Science and Kansas National Education Association meetings. In addition, 49 county agents and four area Extension specialists received specialized training. The WET curriculum has been requested by other states. It has gained national prominence and is scheduled for a national workshop for agents and specialists in March, 1990. A summer, 1990 workshop also will be held at the Kansas National Education Association Summer Leadership Conference.

Environmental Engineering

The following programs are supported with federal funding:

Hazardous waste technical assistance: In this program, administered by the Kansas Department of Health and Environment, EPA funds support a joint program at the University of Kansas and Kansas State University. The education objective is to minimize hazardous substance production by small quantity generators. The University of Kansas provides training in compliance requirements for state regulators and regulated industries. K-State's responsibility is technical assistance to small quantity generators through education and individual assistance. Target audiences include metal finishers, automotive equipment and heavy equipment repair, dry cleaners, analytical laboratories, etc.

Technology transfer: Kansas State University was recently named one of five national centers for hazardous substance research by the Environmental Protection Agency. KSU is responsible for EPA-supported research in ten states in EPA Regions 7 and 8. K-State is responsible for transferring new technology resulting from this research to other laboratories in the two regions as well as industries who are privately developing new hazardous substance management techniques. Technology transfer methods in use range from technical conferences to electronic data bases and specialized information repositories.

Radon measurement and mitigation: In cooperation with the Universities of Minnesota and Michigan, Engineering Extension at Kansas State University was recently named an EPA radon training center, one of only three in the country. The purpose of the center is to train contractors in proper methods of measuring and mitigating elevated radon levels in buildings. Educational conferences and certification testing will be conducted as part of this program. Extension engineers also provide technical assistance to small energy consumers throughout Kansas in a program administered through the Kansas Corporation Commission. This program focuses on energy conservation for the residential, business, institutional, and industrial sectors, and radon mitigation in homes. On a global scale, energy conservation programs help to minimize the "greenhouse effect" and slow the depletion of ozone through reduced use of chlorofluorocarbons.



Water Quality Programs

Domestic water quality task force: The task force conducted ten day-long training sessions for county Extension agents and community health professionals. The training acquainted participants with known water quality problems in the state; probable, causes and remedial actions; water testing and certified water test laboratories; water sources and safe well construction; home water treatment devices and procedures; and simple water tests that can be performed by non-professionals.

A second effort concerned public awareness and included: (1) a water quality display at four metropolitan home and garden shows and six rural county health fairs (Extension specialists distributed literature and answered questions); (2) a monthly news column, "Questions and Answers About Water Quality"; and (3) ten 30-minute radio tapes for Kansas stations on topics including water quality and human health, nitrates and where they come from, safe wells and well plugging, water tests, and radon.

A handbook, "Household Water Quality," was developed prior to training sessions for agents and community health professionals as a comprehensive ready reference. Numerous fact sheets have been and are being developed on a variety of water quality problems. The subject matter is coordinated with the Kansas Department of Health and Environment, which helps with funding.

The domestic water quality task force also appointed subcommittees to address specific needs, including: impact of agriculture on water quality, household water quality, solid waste and hazardous waste, water planning and school enrichment. A one-week short course on private water systems is also developed and may be taken for credit.

Memorandums of understanding: Memorandums of understanding related to water quality protection and non-point pollution have been executed with the U.S. Soil Conservation Service and the Kansas Department of Health and Environment. It is expected that efforts related to water quality and non-point pollution will increase, especially in the areas of solid waste and hazardous waste. A number of cooperative programs are planned, particularly in non-point source pollution.

County Water Quality Programs

Several counties conducted programs to heighten awareness of the need to test private wells for drinking water quality. Two such programs are summarized below:

Harper County: Beginning in October, 1988, the Harper County Commission allocated \$1,000 to assist in testing 200 water samples. This reduced the cost to residents by nearly half. Articles explaining the importance of water testing were published in county newspapers. KSU specialists were scheduled for a water quality program to

discuss the meaning of water quality test results for humans and livestock, as well as the effectiveness of shock chlorination for wells high in bacteria, the effectiveness of filtration devices and the utility of reverse osmosis in nitrate removal. Seventy people participated in the meeting.

A regular monthly testing schedule was established. Residents purchased test bottles, returned samples to the Extension office, and had them forwarded for testing. Test results were returned to the county office for distribution to cooperators. Residents were assisted in interpreting test results and mapping the location of high-nitrate wells. A total of 151 samples were processed in this manner. Subsequently, 21 residents obtained shipping tubes and ice packs for test bottles and sent the samples directly to the lab for testing. This speeded information return but limited the mapping of high-nitrate wells because test results were not returned to the county office. Based on water quality tests, 27 residents chlorinated their wells to alleviate bacteria problems.

Reno County: Development of an educational program on water quality was suggested by the economic development program development committee. The program was promoted and implemented through news stories, publications and individual consultation. A series of water quality and pesticide information meetings was presented to employees or public groups at Cargill Salt Company, Extension election mini-workshops, Haven Co-op meeting, nurses training seminar, and horticultural service personnel. About 260 people participated and 60 wells were tested. Thirty-six homeowners obtained individual assistance with water quality problems. As a result of this educational thrust, several Reno County residents have chlorinated and re-tested wells or plugged and then relocated wells.

Reno County Extension personnel also cooperated with the Soil Conservation District and a watershed board in planning programs that stress non-point source pollution. The county Extension director served on a committee to write a county sanitation code.

Extension Communications

Communication specialists, in cooperation with the water quality task force, prepare articles for use by county agents in newspapers and newsletters. Portions of this series have appeared in such widely distributed publications as "Kansas Country Living" magazine. The material alerts families to potential water contamination problems, urges use of certified water testing laboratories for testing their water supplies, and reminds them to seek guidance from unbiased sources, such as Extension agents or university specialists, before investing in costly and possibly unneeded household water treatment devices. County agents are also assisted with promotion materials for well testing, pollution abatement and other programs.



COOPERATIVE EXTENSION SERVICE, MANHATTAN, KANSAS

All educational programs and materials are available without discrimination on the basis of race, color, national origin, sex, age, or handicap.