SWEET POTATO

LSU AgCenter Research & Extension

Sweet Potato Production

Best Management Practices (BMPs)

endorsed by

Louisiana Department of Agriculture and Forestry

USDA NRCS

Farm Bureau Louisiana

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Why BMPs Are Important to Louisiana

In Louisiana we are blessed with beautiful and abundant waters to enjoy fishing, hunting, boating or just relaxing on the shore of a lake, river or bayou. Most of the water in Louisiana's rivers and lakes comes from rainfall runoff. As this runoff travels across the soil surface, it carries with it soil particles, organic matter and nutrients, such as nitrogen and phosphorus. Agricultural activities contribute to the amount of these materials entering streams, lakes, estuaries and groundwater. In addition to assuring an abundant, affordable food supply, Louisiana farmers must strive to protect the environment.

Research and educational programs on environmental issues related to the use and management of natural resources have always been an important part of the LSU AgCenter's mission. Working with representatives from the agricultural commodity groups, the Natural Resources Conservation Service (NRCS), the Louisiana Department of Environmental Quality (LDEQ), the Louisiana Farm Bureau Federation (LFBF) and the Louisiana Department of Agriculture and Forestry (LDAF), the LSU AgCenter has taken the lead in assembling a group of Best Management Practices (BMPs) for each agricultural commodity in Louisiana.

BMPs are practices used by agricultural producers to control the generation and delivery of pollutants from agricultural activities to water resources of the state and thereby reduce the amount of agricultural pollutants entering surface and ground waters. Each BMP is a culmination of years of research and demonstrations conducted by agricultural scientists and soil engineers. BMPs and accompanying standards and specifications are published by the NRCS in its Field Office Technical Guide.

Introduction

Sweet potatoes are an important commodity in Louisiana. The total acreage planted in 1999 was approximately 24,925 acres. Most are grown in 11 parishes: West Carroll, Morehouse, Franklin, Avoyelles, St. Landry, Evangeline, Acadia, St. Martin, Rapides, Grant and Richland. The gross farm value of Louisiana-grown sweet potatoes in 1999 was about $72 million. Value added of fresh market potatoes is determined by the increase in value of the harvested potatoes that are washed, graded, packed and shipped. The estimated value added for the 1999 crop was $53 million, for a total economic value to the state of more than $125 million. Sweet potatoes are the single most important vegetable crop in Louisiana in terms of acreage planted and economic value.

The runoff from sweet potato fields can have a potential impact on the surface water quality throughout the regions where sweet potatoes are grown. The quality of water in the streams, rivers, bayous, lakes and coastal areas of Louisiana is extremely important to all residents.

The intent of Best Management Practices (BMPs) is to provide the growers of sweet potatoes some guidelines on what practices they can implement to reduce the impact these agricultural practices may have on the environment. If properly implemented, with appropriate incentives where needed, the practices described in this publication will help to improve water quality without placing unreasonable burdens on the agricultural industry of Louisiana.

References are made to specific Natural Resources Conservation Service (NRCS) production codes in this publication. These production codes are explained in the text. More detailed information about these practices can be found in the NRCS Field Office Technical Guide (FOTG). The FOTG can be found in all Soil and Water Conservation District Offices, all NRCS field offices and on the NRCS web page. Additionally, under voluntary participation by the producer, technical assistance to develop and implement a farm-specific conservation plan is available through the Conservation Districts, NRCS field offices and the LSU AgCenter parish offices.

Soil and Water Management

Irrigation Management

(NRCS Code 449)

Furrow Irrigation Systems

Crop residue cover and tillage practices play important roles in the way crops use water and also affect the ability of irrigation systems to replace that water. Tillage practices (NRCS Code 329) and crop residue management (NRCS Code 344) play important roles in the way irrigation systems perform and are managed. Tillage practices affect the way that water moves into and off of the soil (infiltration and runoff).

Many factors affect the performance of furrow irrigation systems. Physical conditions, such as soil texture, soil structure, field slope, field length, furrow shape and the amount of crop residue cover, all have some impact on the performance of the irrigation system. The way the system is managed, including the furrow flow rate, length of application time and irrigation frequency, also affects system performance. Irrigation system performance is often measured in terms of the percentage of the water applied that remains in the active root zone after the irrigation (application efficiency). Thus, deep percolation (water passing through the root zone) and runoff (tailwater)(NRCS Code 447) should be held to a minimum while supplying adequate water to the crop along the length of the furrow.

Tillage practices affect furrow irrigation systems by altering the infiltration characteristics of the soil and by altering crop residue in the furrow. Both factors affect the ability of the furrow to convey water down the field. As tillage practices become less intensive, infiltration rates often increase.

The need to match management factors with the physical conditions present at the time of irrigation is critical. In some cases, a change in tillage practice may cause changes in infiltration rates that are too severe to overcome with management factors alone. In some cases physical changes to the system may be necessary. The field slope or length of run may need to be changed or furrow packing may be used to help overcome problems associated with extreme increases in infiltration characteristics.

Center Pivot Irrigation Systems (NRCS Code 442)

Crop residues serve a largely positive role in center pivot irrigation management. Selecting a tillage system that is best suited for a particular field situation can be a very important decision. Disregard for the importance of this decision could directly affect the effectiveness of the water application system, as well as other crop production practices.

In general, concerns associated with tillage practices selection and center pivot operation are related to the potential for runoff and erosion. The potential for runoff exists whenever the water application rate of the irrigation system exceeds the infiltration rate of the soil.

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Center Pivot Irrigation

To lower pumping costs, some row crop farmers fit their machines with low to medium pressure sprinkler packages. On occasion, sprinkler packages may be improperly matched with the soil infiltration rate. Irrigation system management and tillage practices may be used to control runoff if changes in the irrigation system itself are desirable.

One option is to reduce the application depth per irrigation. In doing so, the operator reduces the potential for runoff but increases the opportunity for soil evaporation over the course of the growing season. Although crop residues can help reduce the magnitude of soil evaporation losses, repeated wetting of the soil surface will limit the water savings attributed to crop residues.

Runoff also may be generated if the soil infiltration rate is reduced over a period of time. A number of factors, such as soil texture and structure, surface tillage or water application, can reduce infiltration. For example, as the size and number of water droplets increase, fine soil particles are consolidated on the surface to form a thin crust. As the soil crust develops, the water infiltration rate tends to decrease. Soil surface crusts can result in infiltration rate reductions of up to 75 percent. One way to combat the negative effect of water droplets is to be sure crop residues are distributed evenly over the soil surface. Crop residues spread in this manner protect the soil by absorbing energy carried by falling water droplets. This limits soil crust development, resulting in a more consistent infiltration rate throughout the growing season.

Tillage practices that result in minimal soil disturbance should be used when topography is rolling. On highly erodible land, it is important to check with your local Natural Resources Conservation Service (NRCS) or Soil and Water Conservation District for compliance with conservation plans in making these decisions.

Crop residues also act like small dams for temporary soil surface storage of excess water. Water applied in excess of the soil infiltration rate will be blocked from running off the field long enough for infiltration to occur. This results in more uniform water application. In the process, soils that would have been transported with the runoff water remain near their point of origin.

Another option is to alter the operating characteristics of the irrigation system. For example, by selecting a sprinkler package based on soil type and field topography, you can match more closely the water application rate of the center pivot with the soil infiltration rate. By considering the interaction between the sprinkler package and soil, selection of an unsuitable sprinkler package can be avoided.

Sweet potato residues, which are produced in less quantity, are considerably more fragile than small grain or corn residues.

The combination of improved water application uniformity resulting from more consistent infiltration rates, less runoff and reduced soil evaporation losses make crop residues a major factor in the water conservation effort. Residue management (NRCS Code 344) also can be a crucial component to minimizing the effect of irrigation on surface water quality.

Irrigation practices that can reduce or prevent erosion include:

Manage crop residues to reduce surface water contamination (NRCS Code 344).

Living vegetation and crop residues left on the soil surface are important in:

- intercepting rainfall and reducing the impact of raindrops on the soil surface
- reducing erosion and sedimentation by decreasing runoff velocity
- increasing structural stability of soil aggregates
- increasing biological activity in the soil
- screening out soil particles from runoff water

Conservation Cropping Sequence - (NRCS Code 328) Systems in which crops are alternated.

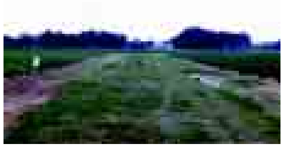
- May reduce weed pressure in sweet potatoes.
- May reduce some disease problems.
- Where erosion is a problem, high residue crops included in the rotation reduce soil loss.

Cover and green manure crops - (NRCS Code 340) Such crops are usually planted when the primary commodity crop is not growing.

- Protect soils from erosion and reduce sedimentation.
- Filter runoff waters to reduce pesticide and nutrient losses.

Precision level the land to optimize furrow slopes to reduce soil erosion (NRCS Code 462)

Treatment of Irrigation Return Flow



Install vegetative buffering (filter) strips (NRCS Code 393)

"Irrigation return flow" is that portion of water which returns to its source after being used to irrigate crops. With increasing environmental concern, the term "irrigation return flow" has been extended to include irrigation water that makes its way to any body of water after its use on a crop.

Tailwater from furrow irrigation and runoff caused by excessive irrigation or poor system design can make its way into drainage ditches which eventually lead to bayous, rivers and lakes. Water from irrigated land that is artificially drained must go somewhere, often into the same water body it was taken from.

Irrigation return flow is becoming an important issue because of its potential to be a nonpoint source of pollution. This is not the only reason sweet potato producers should use return flow management practices, however. Excessive runoff is a symptom of poor irrigation system design or poor management of irrigation water. It is also water that is wasted. Wasting water not only has immediate financial ramifications, but it also threatens the long-term availability of water for irrigation. Sound management practices can reduce irrigation return flow while ensuring the most efficient use of our water resources.

The major concern is the direct runoff that may occur from irrigated land. Many of the fertilizer nutrients and chemicals used in agriculture are easily adsorbed onto soil particles. When runoff occurs, soil particles containing these adsorbed materials are picked up and transported out of the field. Eroded sediments constitute the major potential for pollution from surface return flows. In addition, soluble chemicals are dissolved by runoff and carried with the water as it flows over the soil.

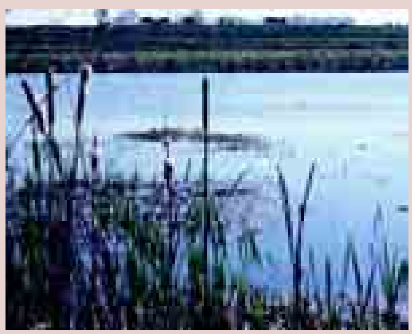
There are three basic approaches to reducing pollutants in surface return flows (NRCS Code 570):

- eliminating or reducing surface runoff
- eliminating or reducing soil loss
- reducing pollutants from irrigation return flow

The first two approaches are achieved by properly designing, operating and managing irrigation systems. Following the directions on the pesticide label will usually solve any problems associated with applying agricultural chemicals.

The third approach involves using grass buffer strips (NRCS Code 386), artificial wetlands (NRCS Code 645), settling basins and ponds (NRCS Code 350) and similar structures to reduce pollutant-bearing sediments. Treating return flow is more costly and troublesome than preventing it.

Buffer strips



Wetlands

Proper irrigation water management (NRCS Code 449) means timing and regulating water applications in a way that will satisfy the needs of a crop and efficiently distribute the water without applying excessive amounts of water or causing erosion, runoff or percolation losses. Good irrigation water management can reduce moisture extremes. The sweet potato producer should have a good understanding of the factors influencing proper irrigation scheduling and water management. The timing of irrigation and the total amount applied per irrigation should be based on both the crop's water use and the moisture content of the soil, as well as on expected rainfall.

Residue Management (NRCS Code 344)

Living vegetation and crop residues left on the soil surface are important in:

- intercepting rainfall and reducing the impact of raindrops on the soil surface
- reducing erosion and sedimentation by decreasing runoff velocity
- increasing structural stability of soil aggregates
- increasing biological activity in the soil
- screening out soil particles from runoff water.

Crop residues protect the soil surface from the impact of raindrops and act like a dam to slow water movement. Rainfall stays in the crop field, allowing the soil to absorb it. The decomposition of these residues also increases the soil organic matter. Soils with high organic matter content are less likely to erode than soils with low organic matter content.

The table below shows the effects of residue cover on surface runoff and soil loss. An increase in residue cover significantly decreases runoff and sediment from a field. Typically, 30 percent residue cover reduces soil erosion rates by 50 percent to 60 percent compared to conventional tillage practices.

Sediment directly damages water quality and reduces the usefulness of streams and lakes in many ways. These may include:

- Impaired fish spawning areas
- Reduced light penetration for aquatic life
- Increased water purification costs
- Lower recreational value
- Clogged channels and increased flooding
- Increased dredging to maintain navigation
- Reduced storage capacity for reservoirs

In addition, sediment is often rich in organic matter. Nutrients such as nitrogen and phosphorus and certain pesticides may enter streams with sediment. The detrimental effects of these substances accompanying the sediment may include:

- Rapid algae growth
- Oxygen depletion as organic matter and algae decompose
- Fish kills from oxygen depletion
- Toxic effects of pesticides on aquatic life
- Unsafe drinking water because of nitrate or pesticide content

Effects of surface residue cover on runoff and soil loss

Residue Cover %	Runoff % of rain	Runoff Velocity ft./minute	Sediment in Runoff % of runoff	Soil Loss tons/acre
0	45	26	3.7	12.4
41	40	14	1.1	3.2
71	26	12	0.8	1.4
93	0.5	7	0.6	0.3

Field border

Field Borders (NRCS Code 386) and Filter Strips (NRCS Code 393)

Field borders and filter strips are strips of grasses or other close-growing vegetation planted around fields and along drainageways, streams and other bodies of water. They are designed to reduce sediment, organic material, nutrients and chemicals carried in runoff.

In a properly designed filter strip, water flows evenly through the strip, slowing the runoff velocity and allowing some contaminants to settle from the water. In addition, where filter strips are seeded, fertilizers and herbicides no longer need to be applied right next to susceptible water sources. Filter strips also increase wildlife habitat.

Soil particles (sediment) settle from runoff water when flow is slowed by passing through a filter strip. The largest particles (sand and silt) settle within the shortest distance. Finer particles (clay) are carried the farthest before settling from runoff water, and they may remain suspended when runoff velocity is high. Farming practices upslope from filter strips affect the ability of strips to filter sediment. Fields with steep slopes or little crop residue will deliver more sediment to filter strips than more gently sloping fields and those with good residue cover. Large amounts of sediment entering the filter strip may overload the filtering capacity of the vegetation, and some may pass on through.

Filter strip effectiveness depends on five factors:

1. The amount of sediment reaching the filter strip. This is influenced by:

■ type and frequency of tillage in cropland above the filter strip. The more aggressive and frequent tillage is above filter strips, the more likely soil will erode.

■ soil organic matter content.

■ time between tillage and a rain. The sooner it rains after a tillage operation, the more likely soil will erode.

■ rain intensity and duration. The longer it rains and thus the more sediment is deposited, the less effective filter strips become as they fill with soil.

■ slope and the length of run above the filter strip. Water flows faster down steeper slopes. Filter strips below steep slopes need to be wider in relation to the cropland drained above to slow water and sediment movement adequately.

In general, a wider, uniformly shaped strip is more effective at stopping or slowing pollutants than a narrow strip. As a field's slope and/or watershed size increases, wider strips are required for effective filtering. The following table gives the suggested filter strip width based on slope. For a more accurate determination of the size filter strip you will need for your individual fields, consult your local NRCS or Soil and Water Conservation District office.

Suggested Vegetated Filter Strip Widths on Percent Slope

Land Slope, %	Strip Width, Feet
0 - 5	20
5 - 6	30
6 - 9	40
9 - 13	50
13 - 18	60

*Widths are for grass and legume species only and are not intended for shrub and tree species. Adapted from the NRCS Field Office Technical Guide, 1990

2. The amount of time that water is retained in the filter strip. This is influenced by:

■ width of the filter area. Filter strips should vary in width, depending on the percent slope, length of slope and total drainage area above the strip.

■ type of vegetation and quality of stand. Tall, erect grass can trap more sediment than can short, flexible grass. The best species for filter strips are tall perennial grasses. Filter strips may include more than one type of plant and may include parallel strips of trees and shrubs, as well as perennial grasses. In addition to potential for improving water quality, these strips increase diversity of wildlife habitat.

3. Infiltration rate of the soil

Soils with higher infiltration rates will absorb water and the accompanying dissolved nutrients and pesticides faster than soils with low infiltration rates. Parish soil survey reports include a table listing the infiltration rate group for the soils identified in each parish.

4. Uniformity of water flow through the filter strip

Shallow depressions or rills need to be graded to allow uniform flow of water into the filter strip along its length. Water concentrated in low points or rills will flow at high volume, so little filtering will take place.

5. Maintenance of the filter strip

When heavy sediment loads are deposited, soil tends to build up across the strip, forming a miniature terrace. If this becomes large enough to impound water, flow will eventually break over the top and become concentrated in that area. Strips should be inspected regularly for damage. Maintenance may include minor grading or re-seeding to keep filter strips effective.

In summary:

■ Vegetative filter strips can reduce sediment effectively if water flow is even and shallow.

■ Filter strips must be properly designed and constructed to be effective.

■ Filter strips become less effective as sediment accumulates. With slow accumulation, and/or dissolved pesticides into surface waters.

Related conservation practices:

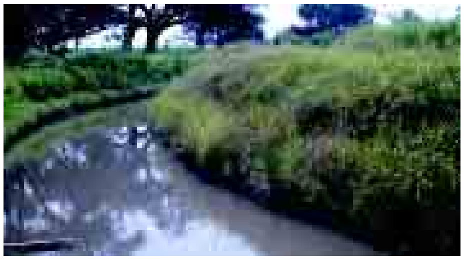
Land Smoothing (NRCS Code 466):

The removing of irregularities on the land surface by use of special equipment. This improves surface drainage, provides for more effective use of precipitation, obtains more uniform planting depths, provides for more uniform cultivation, improves equipment operation and efficiency, improves terrace alignment and facilitates contour cultivation.

Chiseling and Subsoiling (NRCS Code 324):

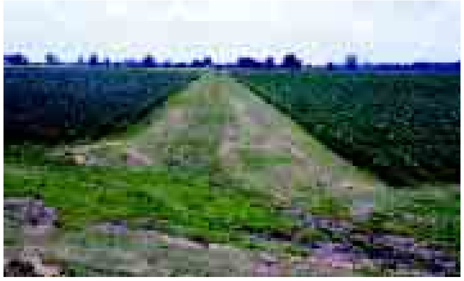
Loosening the soil, without inverting (plowing) and with a minimum of mixing of the surface soil, to shatter restrictive layers below normal plow depth that inhibit water movement or root development.

Surface Drainage - Field Ditch (NRCS Code 607):



A graded ditch for collecting excess water in a field or for irrigation water drainage. This practice intercepts or collects surface water and carries it to an outlet.

Grassed Waterways (NRCS Code 412):



Natural or constructed channels that are shaped or graded to required dimensions and established in suitable vegetation for the stable conveyance of runoff. They are designed to convey runoff without causing erosion or flooding and to improve water quality.

Buffer Zones (NRCS Code 342)

Similar to vegetated filter strips, buffer zones provide a physical separation between adjacent areas, such as between a crop field and a body of water. Unlike filter strips, buffer zones may not necessarily be designed to filter water that flows through them.

Riparian Zones (NRCS Code 644)

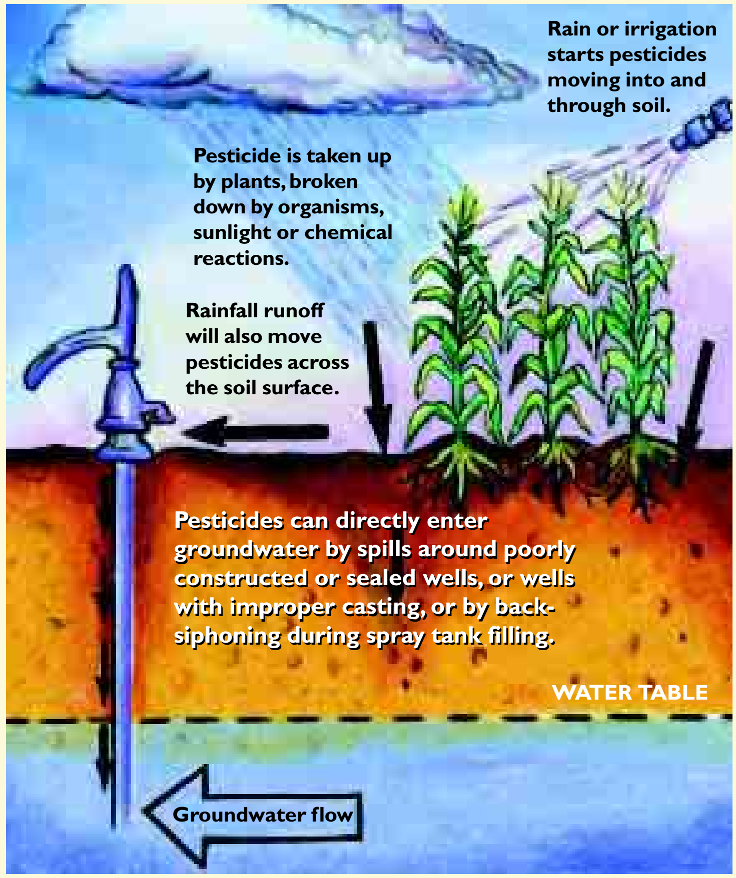
A riparian zone consists of the land adjacent to and including a stream, river or other area that is at least periodically influenced by flooding in a natural state. Similar to vegetated filter strips, plants in riparian areas effectively prevent sediment, chemicals and organic matter from entering bodies of water. Unlike filter strips, riparian zones use plants that are of a higher order, such as trees or shrubs, as well as grasses or legumes. Vegetated filter strips are often used in riparian areas as initial filtering components next to crop field borders.

For more information on these practices and how to implement them, contact your local NRCS or Soil and Water Conservation District Office or call your county agent.

PESTICIDE MANAGEMENT AND PESTICIDES

Introduction

To preserve the availability of clean and environmentally safe water in Louisiana, contamination of surface and groundwater by all agricultural and industrial chemicals must be prevented. Some sources of contamination are easily recognizable from a single, specific location. Other sources are more difficult to pinpoint. Nonpoint-source pollution of water with pesticides is caused by rainfall runoff, particle drift or percolation of water through the soil. Pest management practices will be based on current research and extension recommendations. By using these recommendations, pesticide usage will follow environmentally sound guidelines.



Pest Management Procedures

Pesticides will be applied only when they are necessary for the protection of the crop. The pesticide will be chosen following guidelines to assure that the one chosen will give the most effective pest control with the least potential adverse effects on the environment.

Water quality, both surface and ground, will be protected by following all of the label recommendations and guidelines dealing with water quality.

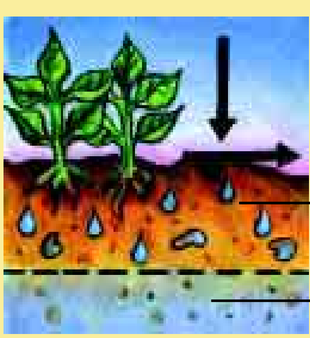
- All label statements and use directions designed specifically to protect groundwater will be followed closely.
- Specific Best Management Practices designed to protect surface water will be followed closely.
- Erosion control practices (such as pipe drops, etc.) will be used to minimize runoff that could carry soil particles with adsorbed pesticides and/or dissolved pesticides into surface waters.

Pesticide Application

Management practices such as the pesticide selected, the application method, the pesticide rate used and the application timing influence pesticide movement. Pesticides should be applied only when needed to prevent economic loss of a crop.

Using chemicals at rates above those specified by the label is ILLEGAL and an environmental hazard because more pesticide is exposed to erosion, runoff or leaching. In pesticide application, "the label is the law." Poor timing of a pesticide application also can result in pesticide movement into water sources, as well as give little control of the targeted pest.

Certain areas on your farm such as streams and rivers, wellheads, and lakes or ponds are sensitive to pesticides. You should create buffer zones around these areas where pesticide use will be reduced or eliminated. By buffering these areas, you may reduce water quality problems. Areas such as roads, off-site dwellings and areas of public gatherings should be identified. You may want to limit the use of pesticides near these types of areas, too.



The water table separates the unsaturated zone from the saturated zone (groundwater)

These practices will be followed:

- Select the pesticide to give the best results with the least potential environmental impact outside the spray area.
- Select with care and carefully maintain application equipment.

- Carefully calibrate the application equipment at the beginning of the spray season and periodically thereafter. Spray according to recommendations.
- Minimize spray drift by following the label instructions and all rules and regulations developed to minimize spray drift (the physical movement of spray particles at the time of or shortly after application).
- Before applying a pesticide, make an assessment of all of the environmental factors involved in all of the area surrounding the application site.
- Carefully maintain records of all pesticide applications, not just a record of Restricted Use Pesticides.

Pesticide Selection

When selecting pesticides, a farmer should consider chemical solubility, adsorption, volatility and degradation characteristics. Chemicals that dissolve in water readily can leach through soil to groundwater or be carried to surface waters in rainfall or irrigation runoff. Some chemicals hold tightly to, or are adsorbed on, soil particles, and do not leach as much. But even these chemicals can move with sediment when soil erodes during heavy rainfall. Runoff entering surface waters may ultimately recharge groundwater reserves. Chemicals that are bound to soil particles and organic matter are subject to the forces of leaching, erosion or runoff over a longer period, thus increasing the potential for water pollution.

These practices will be followed:

■ Selection will be based upon recommendations by qualified consultants, crop advisors and upon the published recommendations of the LSU AgCenter, Cooperative Extension Service.

■ The selection of the pesticide to be used will be based upon its registered uses and its ability to give the quality of pest control required.

■ The selection will also be based upon its impact on beneficials, other non-target organisms and on the general environment.

Pesticide Storage and Safety


Pesticide storage shed

Farmers and commercial pesticide applicators are subject to penalties if they fail to store or dispose of pesticides and pesticide containers properly. Each registered pesticide product, whether general or restricted use, contains brief instructions about storage and disposal in its labeling. The Louisiana Pesticide Law addresses specific requirements for storage and disposal. The applicator must follow these requirements carefully and ensure that employees follow them as well.

The recommended procedures do not apply to the disposal of single containers of pesticides registered for use in the home and garden, which may be disposed of during municipal waste collection if wrapped according to recommendations.

Storage sites should be carefully chosen to minimize the chance of escape into the environment. Pesticides should not be stored in an area susceptible to flooding or where the characteristics of the soil at the site would allow escaped chemicals to percolate into groundwater. Storage facilities should be dry and well-ventilated and should be provided with fire protection equipment. All stored pesticides should be labeled carefully and segregated and stored off of the ground. Pesticides should not be stored in the same area as animal feed. The facility should be kept locked when not in use. Further precautions include appropriate warning signs and regular inspection of containers for corrosion or leakage. Protective clothing should be stored close by but not in the same room as the pesticides because they may become contaminated. Decontamination equipment should be present where highly toxic pesticides are stored.

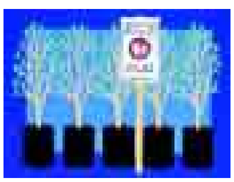
Exceptions for Farmers

Farmers disposing of used pesticide containers for their own use are not required to comply with the requirements of the hazardous waste regulations provided that they triple rinse or pressure wash each container and dispose of the residues on their own farms in a manner consistent with the disposal instructions on the pesticide label. Note that disposal of pesticide residues into water or where they are likely to reach surface or groundwater may be considered a source of pollution under the Clean Water Act or the Safe Drinking Water Act and therefore illegal.

After the triple rinse procedure, the containers are then "empty" and the farmer can discard them in a sanitary waste site without further regard to the hazardous waste regulations. The empty containers are still subject to any disposal instructions contained within the labeling of the product, however. Disposal in a manner "inconsistent with the labeling instructions" is a violation of EPA guidelines and could lead to contamination of water, soil or persons and legal liability.

Agricultural Chemicals and Worker Safety

The EPA has general authority to regulate pesticide use in order to minimize risks to human health and the environment. This authority extends to the protection of farm workers exposed to pesticides. All employers must comply with ALL instructions of the Worker Protection Standard concerning worker safety or be subject to penalties. Labels may include, for example, instructions requiring the wearing of protective clothing, handling instructions and instructions setting a period of time before workers are allowed to re-enter fields after the application of pesticides (Restricted Entry Interval).



Employers should also read the Worker Protection Standard regulations governing the use of and exposure to pesticides. The rule sets forth minimum standards for the protection of farm workers and pesticide handlers that must be followed. The regulations include standards requiring oral warnings and posting of areas where pesticides have been used, training for all handlers and early re-entry workers, personal protective equipment, emergency transportation and decontamination equipment.

The EPA regulations hold the producer of the agricultural plant on a farm, forest, nursery or greenhouse ultimately responsible for compliance with the worker safety standards. This means the landowner must ensure compliance by all employees and by all independent contractors working on the property. Contractors and employees also may be held responsible for failure to follow the regulations.

The Occupational Safety and Health Act (OSHA)

The federal government also regulates farm employee safety under the Occupational Safety and Health Act (OSHA). OSHA applies to all persons (employers) engaged in business affecting interstate commerce. The federal courts have decided that all farming and ranching operations, regardless of where goods produced are actually sold or consumed, affect interstate commerce in some respect, and thus are subject to OSHA's requirements. In general, every employer has a duty to provide employees with an environment free from hazards that are causing or are likely to cause death or serious injury.

In summary:

A. All label directions will be read, understood and followed.

B. The Louisiana Department of Agriculture and Forestry (LDAF) is responsible for the certification of pesticide applicators. All applicators of restricted use pesticides in Louisiana must successfully complete a certification test administered by the LDAF. The LSU AgCenter conducts training sessions and publishes study guides in various categories covered by the test. Contact your county agent for dates and times of these trainings.

C. All requirements of the Worker Protection Standard (WPS) will be followed, including, but not limited to:

- *Notifying workers of a pesticide application (either oral or posting of the field), abiding by the restricted entry interval (REI).*
- *Maintaining a central notification area containing the safety poster; the name, address and telephone number of the nearest emergency medical facility; and a list of the pesticide applications made within the last 30 days that have an REI.*
- *Maintaining a decontamination site for workers and handlers.*
- *Furnishing the appropriate personal protective equipment (PPE) to all handlers and early entry workers, and ensuring that they understand how and why they should use it.*
- *Assuring that all employees required to be trained under the Worker Protection Standard have undergone the required training.*

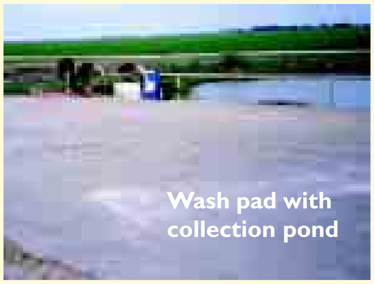
D. Pesticides will be stored in a secure, locked enclosure and in a container free of leaks, abiding by any specific recommendations on the label. The storage area must be maintained in good condition, without unnecessary debris. This enclosure will be at least 150 feet away and down slope from any water wells.

E. All uncontained pesticide spills of more than one gallon liquid or four pounds dry weight will be reported to the director of Pesticide and Environmental Programs, Louisiana Department of Agriculture and Forestry within 24 hours by telephone (225-925-3763) and by written notice within three days. Spills on public roadways will be reported to the Louisiana Department of Transportation and Development. Spills into navigable waters will be reported to LDEQ, Coast Guard, USEPA.

F. Empty metal, glass or plastic pesticide containers will be either triple rinsed or pressure washed, and the rinsate will be added to the spray solution to dilute the solution at the time or stored according to the LDAF rules to be used later. Rinsed pesticide containers will be punctured, crushed or otherwise rendered unusable and disposed of in a sanitary landfill. (Plastic containers may be taken to specific pesticide container recycling events. Contact your county agent for dates and locations in your area.)

G. All pesticides will be removed from paper and plastic bags to the fullest extent possible. The sides of the container will cut and opened fully, without folds or crevices, on a flat surface; any pesticides remaining in the opened container will be transferred into the spray mix. After this procedure the containers will be disposed of in a sanitary landfill.

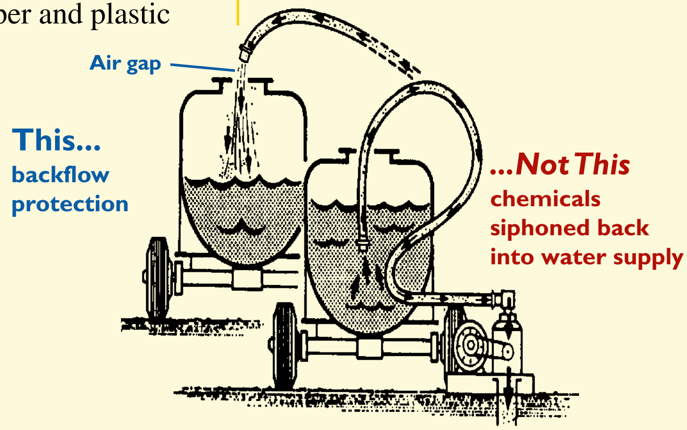
H. Application equipment will be triple rinsed and the rinsate applied to the original application site or stored for later use to dilute a spray solution



I. Mix/load or wash pads (NRCS production code Interim) will be located at least 150 feet away and down slope from any water wells and away from surface water sources such as ponds, streams, etc. The pads will be constructed of an impervious material, and there will be a system for collecting and/or storing the runoff.

J. Empty containers will not be kept for more than 90 days after the end of the spray season.

K. Air gaps will be maintained while filling the spray tank to prevent back-siphoning.



Nutrient Management

Introduction

A sound soil fertility program is the foundation upon which a profitable farming business must be built. Agricultural fertilizers are a necessity for producing abundant, high quality food, feed and fiber crops. Using fertilizer nutrients in the proper amounts and applying them correctly are both economically and environmentally important to the long-term profitability and sustainability of crop production. The fertilizer nutrients that have potential to become groundwater or surface water pollutants are nitrogen and phosphorus. In general, other commonly used fertilizer nutrients do not cause concern as pollutants.

Because erosion and runoff are the two major ways nonpoint-source pollutants move into surface water resources, practices that reduce erosion or runoff are considered Best Management Practices (BMPs). Similarly, practices that limit the buildup of nutrients in the soil, which can leach to groundwater or be picked up in runoff, and practices that ensure the safe use of agricultural chemicals also are considered BMPs. In general, soil conservation and water quality protection are mutually beneficial; therefore the BMPs described here are the best means of reducing agricultural nonpoint-source pollution resulting from fertilizer nutrients.

Nitrogen

Nitrogen (N) is a part of all plant and animal proteins. Therefore, human survival depends on an abundant supply of N in nature. Approximately 80 percent of the atmosphere is nitrogen gas, but most plants cannot use this form of nitrogen. Supplemental nitrogen must be supplied through the soil. A crop well supplied with N can produce substantially higher yields, on the same amount of water, than one deficient for N. Properly fertilized crops use both N and water more efficiently, thus improving environmental quality and profitability.

Supplemental N will be necessary on almost all non-legume crops in Louisiana for maximum profits. Rely on N recommendations based on Louisiana research. These recommendations take into account maximum economic yield potentials and soil texture. Nitrogen recommendations from the LSU AgCenter are usually ample to provide optimum economic yields.

Decomposition of organic matter results in simpler inorganic N forms such as ammonium ($NH4+$) and nitrate ($NO3-$). These are soluble in soil water and readily available for plant uptake. The ammonium form is attracted to and held by soil particles, so it does not readily leach through the soil with rainfall or irrigation water. Nitrates, on the other hand, are not attached to soil particles and do move downward with soil water and can be leached into groundwater or run off into surface waters.

Excessive nitrate concentrations in water can accelerate algae and plant growth in streams and lakes, resulting in oxygen depletion. Nitrate concentrations above a certain level in drinking water may injure some animals or human infants.

Phosphorus

Phosphorus (P), like nitrogen, is essential for plant growth. Naturally occurring P exists in a phosphate form either as soluble inorganic phosphate, soluble phosphate, particulate phosphate or mineral phosphate. The mineral forms of phosphorus (calcium, iron and aluminum phosphates) are low in solubility. The amount of these elements (calcium, iron and aluminum) present in reactive forms varies with different soils and soil conditions. They determine the amount of phosphorus that can be fixed in the soil.

The immediate source of phosphorus for plants is that which is dissolved in the soil solution. A soil solution containing only a few parts per million of phosphate is usually considered adequate for plant growth. Phosphate is absorbed from the soil solution and used by plants. It is replaced in the soil solution from soil minerals, soil organic matter decomposition or applied fertilizers.

Phosphate is not readily soluble. Most of the ions are either used by living plants or adsorbed to sediment, so the potential of their leaching to groundwater is low. That portion of phosphate bound to sediment particles is virtually unavailable to living organisms, but becomes available as it detaches from sediment. Only a small part of the phosphate moved with sediment into surface water is immediately available to aquatic organisms. Additional phosphate can slowly become available through biochemical reactions, however. The slow release of large amounts of phosphate from sediment layers in lakes and streams could cause excessive algae blooms and excessive growth of plants, thereby affecting water quality.

Algae bloom

Nutrients will be used to obtain optimum crop yields while minimizing the movement of nutrients to surface and groundwater (NRCS Production Code 590). A nutrient management plan should be developed for the proposed crop by using soil analyses from approved laboratories.

Nutrient Application Rates

Nutrient application rates will be based on the results of a soil analysis. Select only those materials recommended for use by qualified individuals from the Louisiana Cooperative Extension Service, Louisiana Agricultural Experiment Station, certified crop advisors and certified agricultural consultants and/or published LSU AgCenter data.

Soil testing is the foundation of a sound nutrient management program.

A soil test is a series of chemical analyses on soil that estimates whether levels of essential plant nutrients are sufficient to produce a desired crop and yield. When not taken up by a crop, some nutrients, particularly nitrogen, can be lost from the soil by leaching, runoff or mineralization. Others, like phosphorus, react with soil minerals over time to form compounds that are not available for uptake by plants. Soil testing can be used to estimate how much loss has occurred and

predict which nutrient(s) and how much of that nutrient(s) should be added to produce a particular crop and yield. Take soil tests at least every three years or at the beginning of a different cropping rotation.

Recommended Practices

1. Soil test for nutrient status and pH to:

• determine the amounts of additional nutrients needed to reach designated yield goals and the amount of lime needed to correct soil acidity problems

• learn the Cation Exchange Capacity (CEC) and the organic matter concentration so as to determine how much of these nutrients the particular soil is capable of holding

• optimize farm income by avoiding excessive fertilization and reducing nutrient losses by leaching and runoff

• identify other yield-limiting factors such as high levels of salts or sodium that may affect soil structure, infiltration rates, surface runoff and, ultimately, groundwater quality

2. Base fertilizer applications on:

• soil test results

• realistic yield goals and moisture prospects

• crop nutrient requirements

• past fertilization practices

• previous cropping history

3. Manage low soil pH by liming according to the soil test to:

• reduce soil acidity

• improve fertilizer use efficiency

• improve decomposition of crop residues

• enhance the effectiveness of certain soil applied herbicides

4. Time nitrogen applications to:

• correspond closely with crop uptake patterns

• increase nutrient use efficiency

• minimize leaching and runoff losses

5. Inject fertilizers or incorporate surface applications when possible to:

• increase accessibility of fertilizer nutrients to plant roots

• reduce volatilization losses of ammonia N sources

• reduce nutrient losses from erosion and runoff

6. Rotate crops when feasible to:

• improve total nutrient recovery with different crop rooting patterns

• reduce erosion and runoff

• reduce diseases, insects and weeds

7. Control nutrient losses in erosion and runoff by:

• using appropriate structural controls

• adopting conservation tillage practices where appropriate

• properly managing crop residues

• land leveling

• implementing other soil and water conservation practices where possible

• using filter strips

8. Skillfully handle and apply fertilizer by:

• properly calibrating and maintaining application equipment

• properly cleaning equipment and disposing of excess fertilizers, containers and wash water

• storing fertilizers in a safe place

Nutrient Management Plans (NMPs)

Both the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Agriculture (USDA) are encouraging a voluntary approach to handling nonpoint-source issues related to agriculture.

The implementation of Nutrient Management Plans (NMP) by all agricultural producers will ensure that fertilizers are managed in an environmentally friendly fashion.

Developing a Nutrient Management Plan

An NMP is a strategy for making wise use of plant nutrients to enhance farm profits while protecting water resources. It looks at every part of your farming operation and helps you make the best use of manures, fertilizers and other nutrient sources. Successful nutrient management requires thorough planning and recognizes that every farm is different. The type of farming you do and the specifics of your operation will affect your NMP. The best plan is one that is matched to the farming operation and the needs of the person implementing the plan.

The Parts of an NMP

An NMP looks at how nutrients are used and managed throughout the farm. It is more than a nutrient management plan that looks only at nutrient supply and needs for a particular field. Nutrients are brought to the farm through feeds, fertilizers, animal manures and other off-farm inputs. These inputs are used, and some are recycled by plants and animals on the farm. Nutrients leave the farm in harvested crops and animal products. These are nutrient removals. Ideally, nutrient inputs and removals should be roughly the same. When nutrient inputs to the farm greatly exceed nutrient removals from the farm, the risk of nutrient losses to groundwater and surface water is greater. When you check nutrient inputs against nutrient removals, you are creating a mass balance. This nutrient mass balance is an important part of an NMP and important to understand for your farming operation.

Another important part of a successful NMP are BMPs. BMPs, such as soil testing, help you select the right nutrient rate and application strategy so that crops use nutrients efficiently. This not only reduces nutrient losses and protects the environment but also increases farm profitability. BMPs may include managing the farm to reduce soil erosion and improve soil tilth through conservation tillage, planting cover crops to use excess nutrients or using filter strips and buffers to protect water quality.

The Basic Steps

NMPs consist of four major parts: evaluation of nutrient needs, inventory of nutrient supply, determination of nutrient balance, and preventive maintenance and inspection.

Evaluation of Nutrient Needs

Maps and Field Information

You will need a detailed map of your farm. The map should include:

- *farm property lines*
- *your fields with the field identification*
- *the location of all surface waters such as streams, rivers, ponds or lakes*
- *direction of surface flows*
- *arrows showing the direction that streams or rivers flow*
- *a soils map, if available*

This map will serve as the basis for the entire plan, so each field should have a unique identification. In addition to the map, prepare a list of the crops to be grown in each field with a realistic yield goal for each crop. Most of this information is available at your local USDA Farm Service Center.

Locate Critical Areas

Certain areas on your farm such as streams and rivers, wellheads and lakes or ponds are sensitive to nutrient overload. You should create buffer zones around these areas on your map where nutrient use will be reduced or eliminated. By buffering these areas, water quality problems may be decreased.

Soil Testing

Complete and accurate soil tests are important for a successful nutrient management plan. You will need soil tests every three years to determine how much nutrient addition is needed. The needed nutrients can be supplied from commercial fertilizer and/or organic sources. Be sure to take representative soil samples and have them tested by a reputable laboratory familiar with Louisiana soils and crop production. Your county agent can help you submit samples to the LSU Soil Testing Laboratory.

Determine Nutrients Needed for Each Field

Once you have set realistic yield goals and you have your soil test results, you can determine the nutrients your crops will need. The amount of nutrients needed should be based on your local growing conditions. At a minimum, the amounts of lime,

nitrogen, phosphorus and potassium should be listed in the plan for each field. Most soil and plant analysis labs will give you recommended application rates based on the soil test results. Your county agent can help you with this.

Inventory of Nutrient Supply

Many of the nutrients needed to grow your crops are already present on your farm in the soil, in animal manures or in crop residues. Knowing the amounts of nutrients already present in these sources is important so that you do not buy or apply more nutrients than needed.

Determine the Quantity of Nutrients Available on Your Farm

Supply planning starts with an inventory of the nutrients produced on the farm. This information will allow you to balance your nutrient purchases with what is available on your farm for the realistic production potential of the crops grown.

Determining Nutrient Balance

Balance Between Supply and Need

Once you have determined both the supply and need of nutrients for each of your fields, a critical aspect of NMPs is balancing the two. This can be done in several ways. Most NMPs are developed based on nitrogen, but other factors such as phosphorus or metals could control how much you can put out under certain conditions. A phosphorus index is being developed to help producers determine when nutrient management based on phosphorus would be advisable.

Preventive Maintenance and Inspections

Keeping good, detailed records that help you monitor your progress is essential to know if your NMP is to accomplish the goals you have set. You should keep all results from soil and plant and examine how they change with time with your management practices. Records should be kept on crop yields, nutrient application rates, timing and application methods. Keep detailed schedules and records on calibration of spraying and spreading equipment. When you have a major change in production, update your plan to reflect these changes.

Where Can You Obtain Information Needed for Your NMP?

The LSU AgCenter, the USDA Natural Resources Conservation Service, the Louisiana Department of Agriculture and Forestry, certified crop advisors or other private consultants will be able to assist you in developing parts of a comprehensive nutrient management plan.

An NMP is a good tool to help you use your on- and off-farm resources more efficiently and prevent future problems. A successful NMP will help you obtain the maximum profit while protecting the environment.

General Farm BMPs

Water well protection -

Farm*A*Syst/ Home*A*Syst should be used every three years to determine potential threats to water wells. Threats identified will be ranked and measured to correct the most serious.

Used engine oil, grease, batteries, tires, etc.

• Used engine oil should be stored in a waste oil container (tank or drum) until recycled.

• Empty paint cans, antifreeze containers, used tires, old batteries, etc., will be stored in a secure area until they can be disposed of properly.

Irrigation water quality

Irrigation water (surface and/or well) should be tested in the spring to determine the salinity (salt) level before irrigating fields. Take samples to an approved laboratory for analysis.

Fuel storage tanks

Above-ground fuel storage tanks in Louisiana are regulated by the State Fire Marshal and by the EPA if surface water is at risk. Above-ground tanks containing 660 gallons or more require secondary containment. The State Fire Marshal recommends that some sort of secondary containment be used with all fuel storage tanks. This could include the use of double-walled tanks, diking around the tank for impoundment or remote impoundment facilities.

These practices are to be followed:

■ Any existing above-ground fuel storage tank of 660 gallons or more (1320 gallons if more than one) must have a containment wall surrounding the tank capable of holding 100 percent of the tank's capacity (or the largest tank's capacity if more than one) in case of spillage.

■ The tank and storage area should be located at least 40 feet from any building. Fuel storage tanks should be placed 150 feet and downslope from surface water and water wells.

■ It is recommended that the storage tank be on a concrete slab to prevent any spillage from entering surface and groundwater.

■ The storage area should be kept free of weeds and other combustible materials.

■ The tank should be conspicuously marked with the name of the product that it contains and "FLAMMABLE – KEEP FIRE AND FLAME AWAY."

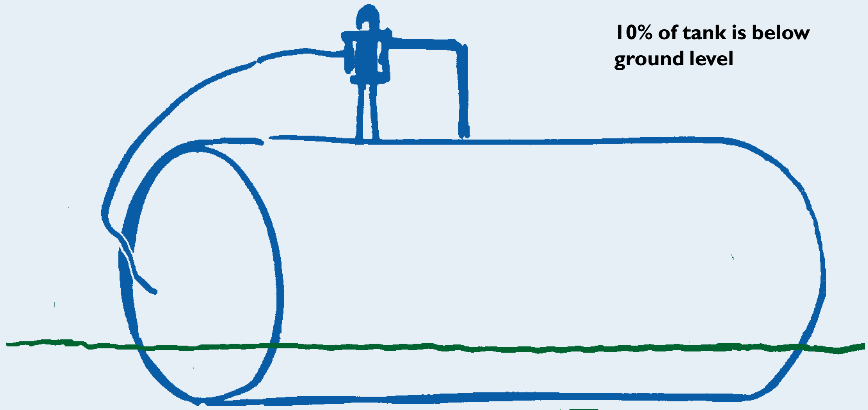
■ The bottom of the tank should be supported by concrete blocks approximately 6 inches above the ground surface to protect the bottom of the tank from corrosion.

■ If a pumping device is used, it should be tightly and permanently attached and meet NFPA approval. Gravity discharge tanks are acceptable, but they must be equipped with a valve that will automatically close in the event of a fire.

■ Plans for the installation of all storage tanks that will contain more than 60 gallons of liquid must be submitted to the State Fire Marshal for approval.

■ All tanks that catch on fire must be reported to the State Fire Marshal within 72 hours of the fire.

■ Underground storage tanks are defined as containing more than 10 percent of their total volume beneath the soil surface. Underground tanks represent more of a problem than above-ground tanks because leaks can often go for long periods without being detected. This poses a serious threat to groundwater sources in the vicinity of the tank. If you have an underground fuel storage tank, you need to contact the State Fire Marshal's Office for regulations affecting these storage tanks.



10% of tank is below ground level

This tank would be classified as an underground fuel tank.

Agricultural scientists work to sustain the environment

William H. Brown

The word "environment" means different things to different people. To some it stirs visions of clear, pristine streams and lakes; to others vistas of forests or prairies; to still others, clean, fresh mountain air. To agriculturalists, who produce food and fiber for the citizens of the United States and a substantial part of the rest of the world, a quality environment means acres of productive soil, clean air and an adequate supply of quality water for irrigation, livestock consumption and human use. All these visions are both accurate and incomplete. To complete the picture, one must appreciate the array of agricultural research conducted in Louisiana and at other agricultural experiment stations across the country. Many of these topics are not commonly thought of as environmental, yet they have a major impact on the quality of our air, soil and water resources.

Air, soil and water

Agricultural scientists were among the original environmentalists. For most of this century, agricultural researchers have recognized the importance of sustaining the natural resource base on which agricultural production relies. For example, the 1930s saw the initiation of widespread programs at land-grant universities and at the federal level to reduce soil erosion, to keep the soil covered with vegetation and to improve drainage to enhance soil productivity. Through the ensuing years, many research programs have been conducted to provide information for improving the environmental "friendliness" of food and fiber production and processing.

The stage was set for contemporary LSU AgCenter environmental research programs when "Focus 2000: Research for the 21st Century," a strategic plan for the Louisiana Agricultural Experiment Station (LAES), was adopted in 1990. One thrust of this plan was to protect the environment by " developing production systems that protect the soil and minimize the need for fertilizer, water, tillage, and other inputs." Adoption of Focus 2000 led to establishment of the Soil, Water and the Environment Research Advisory Committee (RAC), which provided researchers a forum for exchanging information on environmental programs and for forming new collaborations with colleagues.

Agricultural scientists were among the original environmentalists.

One product of the Soil, Water and Environment RAC was sponsorship of an environmental conference in 1995. This conference included LAES research presentations on land use management, waste management, forestry, pest management, water quality and conservation tillage and presentations from numerous state and federal agencies including the Louisiana Department of Environmental Quality, the Barataria-Terrebonne National Estuary Program and the Natural Resources Conservation Service. Conference participants set the stage for the LAES environmental research programs conducted since.

William H. Brown, Associate Director and Associate Vice Chancellor, LSU AgCenter

AgCenter environmental research programs can be grouped as follows: conservation tillage, management of wastes and residues for beneficial uses, water quality, integrated pest management and nutrient management.

Conservation tillage

AgCenter programs in conservation tillage for cotton production on Macon Ridge soils demonstrated not only that cotton could be successfully produced with little or no tillage, but, when combined with a winter cover crop, soil erosion could be reduced by up to 85 percent, soil organic matter could be slowly but steadily rebuilt, and that nitrogen fertilizer requirements could be stabilized at about 70 pounds or less per acre, depending on the cover crop grown. This pioneering research, along with advances in herbicide technology, paved the way for the adoption of practical conservation tillage production systems (sometimes called "stale seedbed" systems) now widely used on Louisiana cropland, resulting in major soil erosion reductions.

Another area in which AgCenter scientists have pioneered has been in the development of conservation tillage systems for rice in southwest Louisiana. Although still being developed and refined, conservation tillage promises to offer rice producers a practical way of growing rice while reducing the sediment load of the water leaving their fields.

Waste management

Waste management programs deal with the manures and residues that result from animal production and processing and the development of methods to beneficially use the solid wastes that originate from both agricultural operations and urban activities. A program is under way to determine the extent to which dairy manures and related fecal coliform indicator organisms move into water bodies when irrigated onto pastureland in “no discharge” systems. Further knowledge about how to minimize the environmental impacts of dairying is vital for Louisiana’s economically important dairy industry in the environmentally sensitive Lake Pontchartrain drainage basin.

Another area of intense research activity deals with establishing benchmarks for poultry litter disposal in north Louisiana. Poultry litter, a byproduct of broiler production, is a valuable source of nutrients for pasture and forest lands, but excessive application can overload the soil’s ability to assimilate phosphorus. And, if allowed to move into water bodies, phosphorus could cause eutrophication problems. Several studies are under way that will define safe application levels, the fertility value and alternative beneficial uses for poultry litter.

Many agricultural and urban residues can be treated by composting to reduce volume, eliminate odors and neutralize undesirable components. The resulting compost can be incorporated into the soil to enhance soil structure and plant growth. The LSU AgCenter’s Callegari Organic Recycling Center provides the facilities for both research and training in the composting process. The AgCenter has conducted 12 one-week programs which have trained more than 200 people from 29 states and five countries in the proper techniques of composting organic residues.

Water quality

Water quality research studies cut across many crops and soil types. These studies provide basic information on how precipitation moves off the land, through the soil and what it carries with it. This information is fundamental to our understanding of how water transports nutrients and chemicals through the soil and how rainfall or irrigation water can be managed to improve both crop production and the environment.

AgCenter soil scientists and agricultural engineers have teamed with USDA researchers to determine the complex mechanisms by which water moves through Louisiana’s alluvial soils, how rapidly it moves and the extent to which it transports certain nutrients and pesticides. Other studies have shown that subsurface drainage can reduce soil erosion and improve water discharges into drainage systems. Studies of corn production over five years showed that subsurface drainage reduced soil loss by 30 percent, nitrogen loss by 20 percent and phosphorus loss by 36 percent. A similar nine-year study with soybeans showed 48 percent less soil loss, 39 percent less nitrogen loss, 35 percent less phosphorus loss and 36 percent less potassium loss.

Water table management is a technology that uses underground tubes to drain excess water from fields to prevent water logging damage to crops during wet weather and also to irrigate from below the surface during drought. Cooperative studies with USDA scientists focus on how water table management can enhance crop production (sugarcane especially) while improving the quality of the water drained from the field.

Integrated pest management

Integrated pest management (IPM) refers to the integrated use of all appropriate methods to control agricultural pests such as weeds, insects, diseases and nematodes. IPM systems employ judicious use of pesticides along with cultural practices, genetic resistance and other available means to reduce dependence on pesticides. Reduced pesticide usage is based on careful scouting and precision application methods. Although most pesticides used today are much less toxic to non-target organisms and used in much smaller quantities (ounces rather than pounds per acre), the end result of IPM is that relatively fewer pesticides are introduced into the environment. Some crops are now resistant to selected herbicides or to certain insect pests because of recent advances in plant genetic engineering. The fruits of several decades of intensive molecular biology research have provided LAES entomologists and weed scientists with additional tools to develop practical production systems that use these special plants to combat competing or damaging pests while minimizing pesticide use.

Nutrient management

Nutrient management, actually one of the oldest of the agricultural sciences, determines the need for supplementing the soil's natural fertility with the appropriate types and amounts of nutrients to achieve the genetic potential of today's improved seeds. It is important, both environmentally and economically, that nutrients not be applied to producers' fields in excessive amounts.

Nutrient management research starts with LAES agronomists who determine the nutrient needs for the many crops produced on the diverse soil types of Louisiana. Soil scientists determine nutrient interactions and availability in the various soil types and textures. The Soil Testing Laboratory provides individual field analyses that determine the nutrients that need to be added and their amounts for specific crops and locations. This information is provided to extension agents so they can make specific fertility recommendations to farmers. Finally, new technologies are now being investigated, usually called "precision farming systems," that will allow variable, on-the-go precision nutrient applications within fields based on intensive soil testing, crop production history and other pertinent factors.

Taken together, today's producers are armed with an array of science-based data, sophisticated testing services and the latest technology to enable them to apply only the required nutrients in only the needed amounts at only the proper locations for optimum crop performance.

Other activities

Integrating the best science with economic constraints and environmental concerns is challenging. In 1993, AgCenter scientists and extension specialists, in cooperation with farmers representing the Louisiana Farm Bureau Federation, and representatives of state and federal agencies such as the Natural Resources Conservation Service (NRCS), Louisiana Department of Agriculture and Forestry (LDAF), Louisiana Department of Environmental Quality (LDEQ), Department of Natural Resources (DNR), Agricultural Research Service (ARS) and others launched an effort to integrate the best information available into a series of "best management practices" or BMPs. The BMPs cover all of the major plants and animals produced in Louisiana.

Two research stations, Southeast and Iberia, have operated sites for the National Atmospheric Deposition Program (NADP) since the early 1980s. This program, supported in part by state agricultural experiment stations nationwide, has provided measurements of precipitation acidity and atmospheric nutrient deposition at more than 200 sites for 20 years. The NADP is now developing a national mercury deposition network, and the AgCenter will provide two monitoring sites, the Hammond and the Sweet Potato research stations, that will be operated by the Louisiana DEQ. The AgCenter also operates a network of meteorological recording sites at the research stations called the Louisiana Agriclimatic Information System (LAIS). The LAIS provides research scientists with an extensive database of the state's recent meteorology in support of their research programs.

Future food demands

The earth's environment has never been static. It has been subject to both dramatic upheavals and slow, evolutionary changes. Our crowded cities and sprawling suburbs have environmental impacts. Likewise, the production of food and fiber for a growing world population will have environmental consequences. Agriculture and cities must co-exist, however, if society, as we know it, is to continue and to prosper. Some forecasts suggest that the world's food demand will triple over the next 40 years. To meet that demand, we must continue to invest in science and technology so that we can learn how to use reasonable and effective measures to blend sustainable economic growth with acceptable environmental impacts.

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The complex nature of nonpoint pollution means programs designed to reduce its impact on the environment will not be easy to establish or maintain. Controlling these contaminants will require solutions as diverse as the pollutants themselves. Through a multi-agency effort, led by the LSU AgCenter, these BMP manuals are targeted at reducing the impact of agricultural production on Louisiana's environment. Agricultural producers in Louisiana, through voluntary implementation of these BMPs, are taking the lead in efforts to protect the waters of Louisiana. The quality of Louisiana's environment depends on each of us.

Visit our website:
www.lsuagcenter.com

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