Bosque River Newsletter

"A Cooperative Effort Among Federal and State Agencies and Producers to Maintain and Improve Water Quality in Texas."

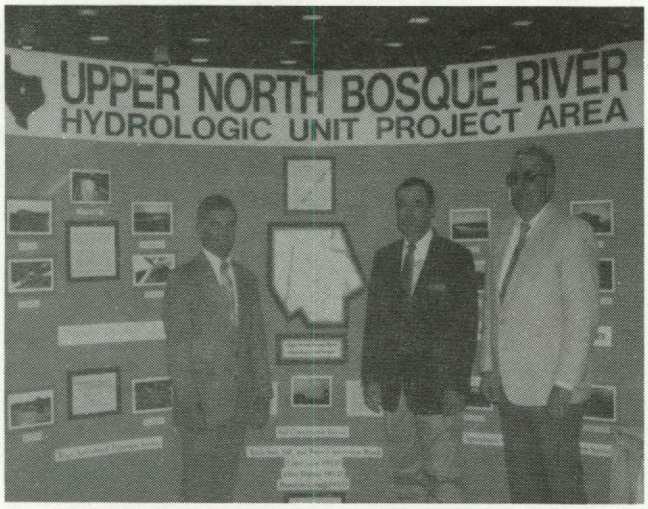
Volume 3, No. 1 • April 1992

Bosque Project Highlighted at National Meeting

The Upper North Bosque River Hydrologic Unit Project Area was selected to present an exhibit at the National Association of Conservation Districts (NACD) convention to represent the 75 Hydrologic Unit Project Areas across the nation. More than 2000 Soil and Water Conservation District officials and guests were in attendance as the National Association of Conservation Districts held their 46th annual convention in Reno, Nevada, February 2-6. The 1992 theme, "America's Conservation Districts - Bringing out the Best in the Land," celebrated the effort of local conservation districts to protect and enhance our nation's precious natural resources, as well as the fact that the conservation district movement brings out the best in dedicated and talented local, state and national leaders.

The exhibit at the convention informed attendees of the joint cooperative efforts of USDA agencies to address water quality activities occurring across the country. The Upper North Bosque River Project was one of the first 37 projects selected in the United States in 1989, and the first one in Texas to address the USDA - Water Quality Initiative.

The three USDA agencies, along with the Texas State Soil and Water Conservation Board, Cross Timbers SWCD, Upper Leon SWCD and Hamilton-Coryell SWCD are the lead agencies in providing financial, technical, information and education and program support to address the water quality objectives of the project area.



Representing the USDA agencies from the local level were: Joe Pope, Erath County Extension Agent; Mike Maedgen, Erath County Executive Director, Agricultural Stabilization and Conservation Service; and Kenneth Schrank, District Conservationist, Stephenville Field Office, Soil Conservation Service.

Texas*Farm*A*Syst

Rural residents across the U.S. are looking for ways to help keep their water supplies clean. A new program that can help meet this urgent need is Farm*A*Syst, a voluntary farmstead groundwater pollution potential assessment program. The Farm*A*Syst program uses easy, step-by-step assessments of each farmstead activity or structure that could cause contamination. The assessment also rates soil and geological features of the farmstead and gives an overall picture of the potential water quality problems at the evaluated site. The information gathered from the assessments is used to recommend actions for protecting rural groundwater on the particular site. The program also provides information on the financial, educational and technical support available.

This program was developed by the Universities of Wisconsin and Minnesota and is being expanded nationally so all states can start their own programs. The Texas

version, called **Texas*Farm*A*Syst**, is currently being developed and should be available later this year.

Many every day farm activities involve chemicals that could cause groundwater contamination. Routine use of these necessary farm chemicals sometimes makes it easy to forget the impact they could be having on rural groundwater. But proper handling, storage and disposal techniques can reduce or eliminate the risk of groundwater contamination.

To illustrate the pollution potential of many farmsteads, ag experts have developed a hypothetical 2-acre farm model. This typical farmstead includes 100 dairy animals (50 cows and 50 replacement heifers) and is the base of operation for 200 cropland acres and a family of five. The aquifer (the underground area where water is found) under the farmstead is 100 feet thick and is about 30 percent porous, or water permeable. Approximately 19.5 million gallons of groundwater are under the farmstead. The following estimates are based on the number of pounds of materials that may be handled in a typical year at a hypothetical 2-acre farmstead.

Pesticide Storage

If atrazine is used at 2 pounds per acre, about 200 pounds of active ingredient may be handled and stored at the farmstead in a typical year. A "small spill" of 2 pounds on a 1- to 50-sq. ft. area can concentrate the active ingredient normally applied to an entire acre (43,560 square feet). If this area is close to the well, it could directly contaminate it. This same 2 pounds can cause 80 million gallons of water to exceed the drinking water national health advisory level of 3 parts per billion.

Most farmers who apply their own pesticides will use several types of herbicides and insecticides to effectively control pest problems. When pesticides are custom-applied or mixed and loaded in the field, there is little risk that they will contaminate the well. But for convenience, pesticide mixing and loading areas are often close to farm wells. And in many cases, no backflow prevention devices are used. These situations create a significant groundwater and drinking water pollution risk, but can be easily avoided.

Pesticide storage areas can be sites of major contamination problems when accidental spills or catastrophic events such as fires occur. If fire departments are unaware of where hazardous materials are stored and use large volumes of water to control fire in these areas, significant contamination problems can result, along with extensive cleanup costs. Proper identification of storage areas can prevent this problem.

Petroleum Storage

In the same farmstead used as a model, about 1,200 gallons of gasoline, 2,500 gallons of diesel fuel and 600 gallons of fuel oil are used in a year. Storage tanks for these substances have become a significant source of groundwater contamination. Underground storage tanks, in particular, are of concern, especially if they are older than 15 to 20 years. Since these tanks are underground, leaks are often undetected until the petroleum product contaminates the groundwater.

Toluene, xylene, benzene and some additives found in petroleum products may pose significant health risks. The groundwater standard for benzene is 5 parts per billion (PPB), so 1 gallon of gasoline containing 1 percent benzene can contaminate about 2 million gallons of groundwater.

One part per million can be imagined as 1 red marble mixed in with 999,999 blue marbles. **One part per billion** is the same as 8 drops of water in an Olympic-sized swimming pool. Although such small numbers may seem insignificant, even 1 part per billion or less of certain chemicals can be dangerous to your health.

Household and Farmstead Hazardous Waste

Studies have shown that the average household produces about 7 pounds of hazardous waste per year. Little has been done to quantify groundwater problems caused by the wide range of toxic chemicals used in homes. Drinking water standards allow only a very small ratio of chemicals in drinking water for safety, meaning that very small amounts can contaminate a large volume of groundwater.

Some building and vehicle maintenance products containing organic solvents can, if improperly disposed of, contaminate groundwater. These products may contain toluene, xylene, benzene and trichloroethane, or "petroleum distillates."

Household and Farmstead Waste Disposal

Many areas of the country are closing local dumps or landfills because of improper design and groundwater problems. This has spawned another dilemma, since rural landowners have often resorted to using other waste disposal sites, sometimes located dangerously close to wells.

Toxic compounds, when disposed of in septic systems, may also move to groundwater and contaminate it. Some states classify agricultural waste as industrial waste, making it illegal to bury these wastes on the property. However, well-engineered landfill sites and effective collection systems that adequately serve the rural community can reduce inappropriate waste disposal.

Well Vulnerability to Contamination

Numerous factors influence a well's vulnerability to contamination. These factors include the distance between the well and the source or sources of contamination; the amount of contaminant which has been dumped, spilled or improperly disposed of; the design of the well including the age, depth of casing and integrity of the grout seal around the well casing; the pollution vulnerability of the soil and bedrock at the well site; and the presence of direct channels of flow from the contamination source to groundwater (such as abandoned wells and sink holes).

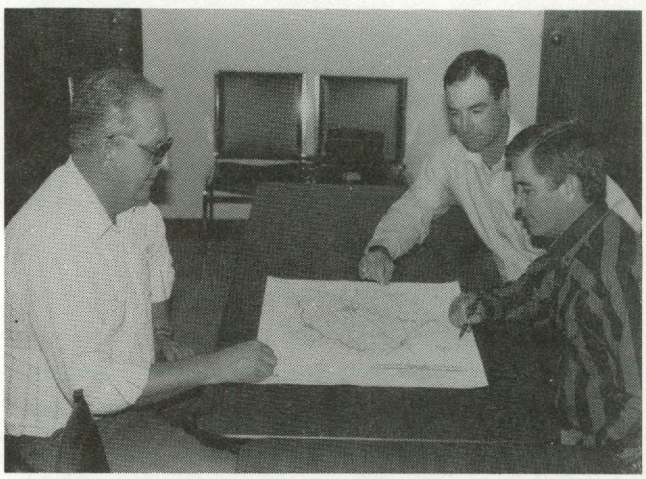
Once most contaminants have moved below the normal rooting zone of plants, they will break down quite slowly because of the reduction in microbial organisms, cooler soil and water temperatures, and the absence of light. Even if wells currently test as contaminant-free, spills that occurred a long time ago could eventually show up in these wells if the contaminants had to travel some distance. In other words, we may not know for many years the full impact of the contamination we may have caused.

Project Area Expanded

The area included in the Upper North Bosque River Hydrologic Unit Project Area was recently increased from 229,760 acres to 290,040 acres. The additional 60,280 acres in southeastern Erath County flows into the Bosque River. Major tributaries of the Bosque River within this area are Turkey Branch, Little Duffau Creek, Duffau Creek, Cox Creek, Camp Branch and Flag Branch.

By this action, the additional acres will be eligible for technical and financial assistance as provided under the President's Water Quality Initiative. The principal goal of hydrologic unit areas is to assist farmers and ranchers in voluntarily applying conservation practices that will help protect or improve water quality.

Joe Pope, chairman of the local coordinating committee said, "The primary objective of the UNBR project is to assist dairy owners and managers in installing animal waste management systems and applying best management practices that will significantly reduce or prevent the potential for pollution of surface water and groundwater. However, the scope of the project also encompasses other potential sources of nonpoint source pollution, including fertilizer nutrients, pesticides, rural sewage treatment systems and wellhead protection. The overall goal of the project is to accomplish rapid, voluntary producer adoption of recommended practices and systems through extensive and focused educational, technical and financial assistance programs."



(l-r) Kenneth W. Schrank, District Conservationist, Soil Conservation Service; Mike Maedgen, County Executive Director, Agricultural Stabilization and Conservation Service, and Joe Pope, Erath County Agricultural Extension Agent, members of the local coordinating committee of the Upper North Bosque River Hydrologic Unit Project Area, review a map of the Upper North Bosque River Hydrologic Unit Project Area.

In addition to the SCS, ASCS and Extension Service, the Texas State Soil and Water Conservation Board is one of the lead agencies in the joint USDA-State Program. Local soil and water conservation districts involved in the effort are the Upper-Leon, Cross Timbers and Hamilton-Coryell SWCDs. For more information, contact one the following offices: Soil Conservation Service in Stephenville (817-965-5093), Dublin (817-445-2276) or Hamilton (817-386-3218); USDA ASCS Office in Stephenville (817-965-3715); or the county Extension office in Stephenville (817-965-1460) or Hamilton (817-386-3919).

Waste Management Systems

Dairy operators are very interested in protecting the environment. There are a variety practices they can use,

many of which are being planned on the Sta-Lyn Dairy near Selden. The Texas State Soil & Water Conservation Board has initiated a one-time cost share contract that will assist Sta-Lyn with adopting the practices. The Soil Conservation Service will assist with design and installation of equipment and facilities.

The practices include the use of waste storage ponds, waterways, diversions and pipelines. Other practices include the use of a solids separator; use of several grass species such as switchgrass and eastern gama on filter strips and contour buffer strips; farmstead and living screen windbreaks; grassed waterways; grass planting and water flow protection into the lagoon.

Liquid and solid manure will be tested for nutrients and land application rates will be based on nutrient needs of the disposal fields. Stanley Haedge, owner of Sta-Lyn Dairy, will receive sampling and interpretation assistance from the State Soil & Water Conservation Board.

Conservation Reserve Program

The Food, Agriculture, Conservation and Trade Act of 1990 made some changes in the Conservation Reserve Program (CRP). The new CRP allows the Secretary to target land contributing to water quality problems. Cropland located in a state designated "319" area, such as the Upper North Bosque Hydrologic Unit Area, is considered to be contributing to a water quality problem and will be given extra consideration when the CRP bids are evaluated.

Producers will bid for participation in the CRP at the ASCS office during an announced signup period. The bids will be evaluated at the national level as opposed to having local area pools with a maximum limit. The bids will be evaluated for reasonableness when compared to cropland rental rates on comparable farms, and environmental benefits for the cost when compared to all other bids submitted for evaluation.

Cropland eligible for enrollment in the CRP is that which is planted or considered to be planted to produce an agricultural commodity, including alfalfa and other multi-year grasses and legumes grown in rotation in 2 of the 5 years from 1986 to 1990. The cropland must be highly erodible, established to filterstrips, or contributing to a water quality problem. The Soil Conservation Service will determine the erodibility of the cropland and write the conservation plans for accepted bids.

The cropland must be established to a permanent vegetative cover and cannot be hayed or grazed for the life of the contract. ASCS will pay an annual rental payment in the amount of the accepted bid. Contracts will be for 10 years and in some instances can be for 15 years.

Signup periods will be announced by the ASCS. The next signup period will be June 15 through June 26, 1992. More information about CRP can be obtained from the county ASCS office or SCS Field Offices.

PL-556 Water Quality Plan Being Developed

The Soil Conservation Service Planning Staff is developing a PL-556 Water Quality Plan to protect and improve the Upper North Bosque River Watershed. The plan is being developed under authority of the Watershed Protection and Flood Prevention Act (Public Law 83-556). The water quality plan will provide needed additional technical and financial assistance. The PL-556 funds will be used in conjunction with Agricultural Stabilization and Conservation Service and Great Plains Conservation Program funds for cost-share assistance to land-users in installing conservation best management practices related to water quality.

Soil Testing Makes Good $ense

Soil testing is a simple and inexpensive way to determine how much fertilizer is needed to grow a particular crop. It is one of the most important factors in developing annual nutrient management plans.

Pollution of surface and groundwater by fertilizer nutrients, particularly nitrates, is a major problem which must be considered by all individuals who use them. This is true not only for farmers, but also for homeowners who fertilize their lawns and gardens. Soil tests can provide recommendations for the proper types and rates of fertilizer nutrients so that they are not applied in excess amounts. Soil sampling requires a minimal amount of time, effort and money, but can improve the environmental and economic soundness of your operation. However, soil test results can only be as accurate as the samples from which they are made; therefore, proper collection of the sample is very important.

In the last edition of the Bosque River Newsletter (Vol. 2, No. 2), we described proper techniques for collecting soil samples for testing. Refer to that issue, or contact your

local county Extension office for a Soil Sample Information Sheet and any assistance you need in your soil testing program.

Evaluation of Hydrocyclone Solids Separation for Dairy Manure

by B.W. Auvermann and J.M. Sweeten

Waste treatment structures must be properly managed to minimize pollution from concentrated livestock feeding operations. Texas' no-discharge rule for stormwater runoff and process-generated wastewater from those operations (31 TAC 321.31-321.42) places a premium on the maintenance of lagoon and holding pond capacity by requiring that all runoff from the 25-year, 24-hour storm, and all other contaminated water, be retained on-site for treatment and eventual disposal on agricultural land.

Manure treatment lagoons and holding ponds are typically designed with a sizable allowance for settled solids and sludges. However, the settleable-solids content of dairy waste is high enough that sludges tend to accumulate rapidly, filling the design allowance for settled solids and subsequently reducing the liquid storage capacity of the pond over the span of a few years. When the liquid capacity of lagoons or ponds is reduced below the design capacity due to settled solids accumulation, treatment efficiency is reduced because waste water can't be retained as long, and the threat of illegal point-source discharge and pollution increases beyond acceptable levels. (Alternatively, the dairy operator must de-water his pond more frequently in order to maintain reasonable stormwater capacity. In that instance, the operator risks over-application of nutrients and wastewater, which can lead to nonpoint source pollution.) Restoration of the original liquid capacity then requires expensive and time-consuming draining/dredging or agitation/pumping.

The accumulation of waste sludges and sediment in lagoons can be slowed by intercepting settleable solids before they reach the lagoon or holding pond. Several technologies exist for that purpose: (1) sedimentation basins; (2) settling channels; (3) static screens; (4) hydrocyclones; (5) vibrating screens; and (6) screw-press augers. The cyclone separator is widely used in many other industries, but only recently has the technology been applied to the removal of solids from dairy wastewater, thus little data exists for evaluating its applicability in the dairy industry.

The purpose of this study was to evaluate the efficiency of the hydrocyclone for removing solids and nutrients from liquid dairy manure at a typical dairy in Erath County, Texas. The objectives were:

1) Obtain and replicate inflow and outflow wastewater samples from the hydrocyclone separator and analyze them for nutrient and solids concentrations;
2) Evaluate the separation efficiency of the hydrocyclone relative to inflow and outflow concentrations of nutrients and solids; and
3) Construct a mass balance to determine percentages of the inflow liquid that are a) passed through to the lagoon, and b) retained with the settled solids.

Operation of the hydrocyclone separator is based upon the application of centripetal forces to solid particles in a flow stream. The flow stream from a slurry pump is accelerated by forcing a high flow rate through a relatively small inlet opening on the cyclone. The stream then enters the conical separation chamber, creating a high-velocity vortex. Those solid particles, which are denser than water, are forced to the outside of the vortex, against the inclined cyclone wall, and finally through the free-air (0 gage pressure) discharge at the bottom of the cone. The clarified effluent passes through the opening at the top of the cyclone.

Three water samples each were taken at locations A, B and C. The sample bottles were refrigerated and transported directly to the Agricultural Engineering Department Waste Water Laboratory at Texas A&M for the COD, TKN and solids-fractions analyses and to the Department of Soil and Crop Sciences' Soil and Water Testing Lab for the nitrate and salinity analyses.

Reductions in total solids, fixed solids, volatile solids, suspended solids, chemical oxygen demand and total kjeldahl nitrogen were 34.1, 41.5, 26.5, 45.5, 35.0 and 7.2 percent, respectively. Of all solids fractions analyzed, the highest reduction was 60.3 percent for suspended fixed solids. The hydrocyclone did not significantly reduce inorganic nitrogen, nor salinity, but showed potential for extending anaerobic lagoon life by intercepting process-generated waste solids, especially suspended fixed solids, which will accumulate in the lagoon.

Southwest Dairy Field Day Planned

Dairymen need to reserve the date of May 14 and plan to be in Erath County for the Southwest Dairy Field Day. This field day is for producers in Texas and surrounding states. The event will take place on the George DeVries Dairy, west of Stephenville. The day will be filled with

demonstrations and exhibits of products related to the dairy industry. For example, producers will have the opportunity to see the different mixer trucks that are presently on the market operating side by side, and demonstrations of solids separating equipment being used for waste management. The major feed mixing equipment companies will participate in a demonstration using George DeVries' mixing ration. Each truck will be loaded with the same ingredients, mixed and unloaded. This will allow side by side comparisons of the various pieces of equipment and show how well they perform.

Questions are arising concerning the best way of separating and handling solids from dairy wastewater. Many producers use two-stage lagoons, others use settling basins, and still others some form of mechanical separation, such as static screen separators or AgKone separators. Mr. DeVries has graciously agreed to allow us to modify his waste facility to demonstrate each of these types of solids separation. Also, various companies will be present to discuss factors such as cost, maintenance requirements, etc., and to answer questions.

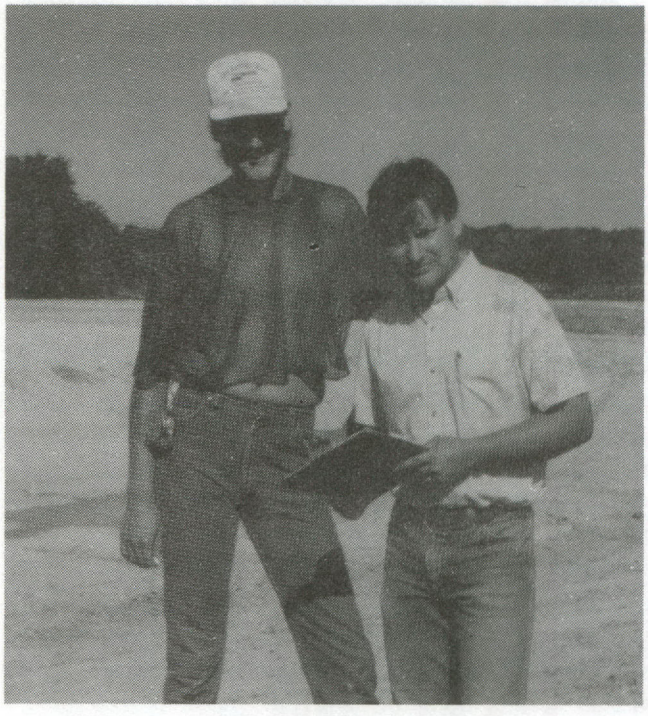
A large number of exhibits will be on hand, showing products for animal health, equipment and supplies. After a free lunch, there will be a short educational program. Dr. Woody Pankey from Vermont will discuss lowering somatic cell counts and improving overall milk quality.

This is just a sampling of the main activities that will be taking place on May 14. Exhibits will open at 9:00 a.m., with mixer demonstrations beginning at 10:00 a.m. The waste separating equipment will be demonstrated in the afternoon, and the day's activities will conclude by 4:00 p.m. To get to the DeVries dairy, take Highway 377 south of Stephenville toward Dublin approximately 2 miles. From 377, follow the signs beginning at the sanitary landfill road to the DeVries dairy.

Developing A Long Term Agreement

Postma Dairy, owned and operated by Liena Postma, is one of many dairies located in the Upper North Bosque watershed. Ms. Postma's dairy is located off FM 914 on the eastern boundary of the project area. In cooperation with the Upper Leon SWCD and the ASCS, the SCS developed a Long Term Agreement (LTA) with the Postma Dairy. Maximum cost-share which can be received through an LTA is $17,500 and is limited to $3,500 per year.

Ms. Postma's contract encompasses the dairy operation, pastureland and cropland. This LTA includes best management practices for capturing and disposing of dairy wastes and for managing the items for pastureland and cropland. Components of the contract include construction of a waste storage pond and liner to contain wastes, construction of diversion terraces and blocks to direct wastes into the pond and outside water away from the pond, establishment of vegetative cover to protect disturbed areas and fencing to protect the waste storage pond from cattle.



(l-r) Chris Postma of Postma Dairy and John Jackson, Soil Conservation Service Technician, review information for the waste storage pond constructed on the Liena Postma Dairy.

Ms. Postma uses her pastureland and cropland as waste disposal fields. Waste utilization is planned, which limits the amounts of wastes applied to these areas. Non-disposal buffer zones are planned around property lines, water courses, ponds and wells. Pastureland will be managed to restrict overgrazing and excessive grass harvesting and to require fertilization and weed control on 21 acres of bermudagrass overseeded with wheat. Planned cropping sequence is forage sorghum and small grain, with 30 percent crop residue kept on the soil surface until final seedbed preparation.

Ms. Postma has installed her system in a timely and efficient manner and the system is functioning as expected. In this way, she has become part of the solution to the nonpoint source water pollution problem.

Cropping Systems for Utilization of Dairy Waste

by E.S. Chasteen, G.D. Alston, M.A. Sanderson and M.L. McFarland

Dairy waste is a potential source of nonpoint source pollution to surface and groundwater. When the area available for land application is limited, leaching of nitrate into groundwater and/or movement of nitrogen and phosphorus in runoff to surface water can occur. Several demonstration projects currently underway as part of the Bosque River Project are evaluating best management practices for using dairy wastes. The primary objective is to develop year-round cropping systems to utilize dairy wastes via land application for growing quality forages and crops while protecting water resources.

Forage Production Systems

Two dairy sites were chosen within the Trinity Group Aquifer in Erath County. Both pastures contain fully established coastal bermudagrass sods. Site 1 is on a shallow fine sandy loam soil (Windthorst series) and received solid drylot manure. Site 2 is on a clay loam soil (Blanket series) and received dairy lagoon effluent.

Coastal and coastal overseeded with wheat were the cropping systems used. Dairy waste treatments were 0, 100, 200 and 400 lb. N/acre/year applied as split applications. Primary lagoon effluent was applied by drip irrigation and solid manure was applied manually. Dairy waste samples were analyzed for nutrients to determine application rates. Coastal was harvested monthly during the growing season and wheat was harvested in April. Forage was clipped with a sickle mower to determine yield (dry weight basis) and subsamples were analyzed for N, P, K, Ca and Mg. Soil samples were collected in 6- or 12-inch increments to 4 feet before waste application and following harvest for nutrient analysis.

Solid manure treatments did not significantly affect coastal yields. On solid manure treatments, yields were greatest on the 100 lb. N/acre plots (3617 to 4341 lb./acre/cutting). When effluent was applied, the 400 lb. N/acre rate produced the greatest dry matter in August (4133 lb./acre) and September (2819 lb./acre). Wheat overseeded in coastal reduced coastal yields by about 1 ton/acre/year, although poor emergence and rescuegrass invasion caused poor wheat stands. However, nitrogen uptake may still be greater in the coastal-wheat system.

Peanut Production Systems

In a separate study, application of solid dairy drylot manure was evaluated for peanut production on a fine sandy loam soil (Waurika series) at the Texas A&M Research Center at Stephenville. Manure rates were 0, 5, 10 and 15 tons/acre/year which equates to 0, 122, 244, and 366 lb. N/acre/year. Spanish ('Starr') and Runner ('Florunner') peanuts were planted May 24, 1991 in dryland and irrigated (wheel roll) plots. Seedling emergence counts were made 3 weeks after planting. Harvests occurred on October 1 for Spanish peanuts and November 1 for Runner peanuts. Yields were determined on a forced air dry basis and samples were graded using standard quality procedures.

Emergence was not significantly affected by manure application although there was a trend for slightly lower seedling densities in the highest manure rate (15 tons/acre). There was no evidence of increased incidence of disease, but high manure rates did tend to increase native weed populations. Overall, peanut yields and grade were not affected by rate of manure application (see Table below).

Both of these field studies are being continued in 1992, and results from the second year will provide more information on safe and effective use of dairy wastes.

1991 Peanut Yields

Manure rate	Irrigated			Dryland		
	lb/ac	$/ton	$/ac	lb/ac	$/ton	$/ac
Runner						
0	4218	697	1470	2869	636	913
5	4088	686	1402	2771	600	839
10	3981	668	1330	2890	630	910
15	3910	692	1354	2618	622	814
Spanish						
0	2890	659	952	1201	608	367
5	3201	636	1019	1371	620	424
10	3180	638	1017	1384	631	438
15	3419	625	1069	1167	625	366

Calendar of Events

May 14	The Southwest Dairy Field Day will be held on the George DeVries Dairy in Erath County. Contact the Erath County Extension Office at 817-965-1460 for information.
June 10	The Cross Timbers spring fish stocking program is being sponsored by the Cross Timbers Soil and Water Conservation District. Orders will be taken until June 6. For information call 817-965-5093.
June 15	The 12th Conservation Reserve Program signup period will be conducted June 15-26. Contact your local SCS office for information.

The Bosque River Newsletter is a news and information outlet for the U.S. Department of Agriculture and State of Texas cooperative Upper North Bosque River Water Quality Project and will be published on a quarterly basis. Individuals wishing to be included on the mailing list should write or call:

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