



NO-TILL GRAIN DRILLS TO IMPROVE WATER QUALITY IN LAFAYETTE AND ST. MARTIN PARISHES

Draft Final Report

Capital Resource Conservation and
Development Council



2017

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Project Overview

Project Title: No-Till Grain Drills to Improve Water Quality in Lafayette and St. Martin Parishes

Project: No-Till Grain Drill Equipment: reduce soil erosion and fertilizer runoff on pastures

Goal: Purchase two no-till grain drills for use throughout Lafayette and St. Martin parishes in Louisiana

Objective: To reduce soil erosion and the amount of fertilizer applied in an effort to improve water quality in areas affected by livestock.

Project Timeline: 16 months

Project Area: Watersheds in Lafayette and St. Martin Parishes

Grant Number: FFY 2012; C9-996102-19; project 25

Grant Source: Section 319 Federal Funds

Initiation Date: June 1, 2016 *Expiration Date:* September 30, 2017

PROJECT COST:

Categories	Federal	Match	Total
Purchase of two no-till grain drills	\$61,209.19	\$37,006.05	\$98,215.24
Administration	\$829.58	\$0.00	\$829.58
Outreach	\$300.00	\$0.00	\$300.00
Quarterly Reports	\$3,190.81	\$0.00	\$3,190.81
Final Reports	\$300.00	\$0.00	\$300.00
Total	\$65,829.58	\$37,006.05	\$102,835.63

Table 1 Expenditures for "No-Till Grain Drills to Improve Water Quality in Lafayette and St. Martin Parishes"

Introduction

Lafayette and St. Martin parishes in southeast Louisiana consist of significant cattle and horse farms that clean-till for winter pasture production. Figure 1 illustrates the locations of Lafayette and St. Martin Parishes in Louisiana. Clean-till disking means to cultivate by stripping the soil clean of weeds and other growth to prepare for planting. These soils consist of highly erodible lands that are normally disked in the winter for preparation of rye grass and wheat crop in this area. Approximately 130 producers disk close to 20,000 acres of pasture in the winter months. The disking of highly erodible soils has contributed to excessive soil erosion and runoff of soil sediments, nutrients, and pesticides. Clean-till disking of these soils is contributing to nearby streams, lakes, and rivers being placed on Louisiana's list of impaired waterbodies. Using no-till grain drills would be beneficial to producers in these areas; therefore, the grain drills were purchased to aid cattle farmers in converting conventional clean tillage seedbed methods to drilling into ground cover. The farmers use bermuda and bahia for permanent pasture establishment. Winter crops for cattle include ryegrass and winters oats, while sorghum is usually used as the summer crop, for grazing. In addition, the producers used the no-til grain drills on native crops such as switchgrass, little bluestem, big bluestem, and love grass. In the summer of 2016, a rental program was established, allowing farmers access to the drills. In a little over one year, the program had resulted in 24 participating producers and no-till demonstrations that were applied to approximately 589 acres.

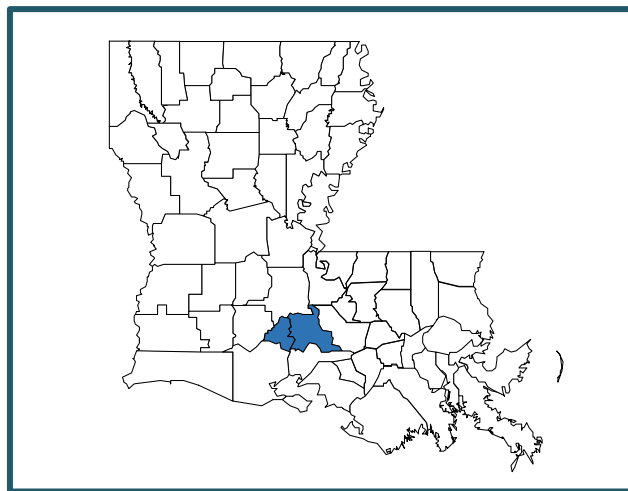


Figure 1 Location of Lafayette and St. Martin parishes, in Louisiana

Goals and Objectives

The goal of the project was to use Clean Water Act (CWA) Section 319 federal funds to purchase and utilize two no-till grain drills. Figure 2 illustrates a tract of land before the use of no-till grain drill equipment. The drills were placed at Bayou Vermillion District in Lafayette, and Durand Farms in St. Martin, LA. By demonstrating no-till grain drills throughout the parishes, the objective was to reduce soil erosion; the amounts of fertilizer applied, and improve water quality in the aforementioned parishes. The use of these drills allowed for direct seeding into permanent pastures, thus resulting in reducing sediment, pesticides, and nutrients from reaching nearby streams; therefore, improving water quality in the selected watersheds.



Figure 2 Tract of land before the use of no-till grain drill equipment

Water Quality Impairments

According to the Louisiana 2014 Integrated Report (IR), there are five subsegments within these parishes that are currently not meeting the standard for their designated uses. Table 2 provides information for each of the waterbodies not meeting the standard for its designated use support. In an effort to improve water quality across the two parishes, the Louisiana Department of Environmental Quality Nonpoint (NPS) section and the Capital Resource Conservation and Development Council (Capital RC&D) partnered on the project, “No-Till Grain Drills to Improve Water Quality in Lafayette and St. Martin Parishes”, on June 1, 2016. The use of the no-till grain drills allowed producers to directly seed their pasture sod without tilling the landscape, which reduced the amount of sediment, pesticides, and fertilizer runoff from entering Lafayette and St. Martin Parishes waterways.

Louisiana’s 2014 Integrated Report		
Subsegment	Description	Impairment(s)
050501	Bayou Queue de Tortue-From headwaters to Mermentau River	Fipronil, Mercury in Fish Tissue, Nitrate/Nitrite, Dissolved Oxygen, Phosphorus (Total), Turbidity
060301	Bayou Teche-From headwaters at Bayou Courtableau to Keystone Locks and Dam	Carbofuran, Fecal Coliform
060801	Vermilion River-From headwaters to LA-3073 bridge	Carbofuran, Fecal Coliform, Nitrate/Nitrite, Dissolved Oxygen
060802	Vermilion River-From LA-3073 bridge to ICWW	Carbofuran, Nitrate/Nitrite, Dissolved Oxygen, Total Dissolved Solids and Fecal Coliform
060901	Bayou Petite Anse-From headwaters to Bayou Carlin (Estuarine)	Carbofuran, Nitrate/Nitrite, Dissolved Oxygen, Phosphorus (Total), Turbidity, Fecal Coliform

Table 2 Waterbodies in Lafayette and St. Martin parishes not meeting the standard for their designated uses, as listed in Louisiana's 2014 Integrated Report

Introducing the Program: working towards the project goal

On August 4, 2016, a press release (Appendix A) was issued explaining the opportunity for local producers to reduce the amount of runoff of pesticides, fertilizer, and sediment through the use of no-till grain drill equipment (Figure 3). The RC&D also conducted an opening ceremony on August 4, 2016 to introduce the program. The opening ceremony was held at the Bayou Vermilion District in Lafayette, LA. Those who attended were members of Capital RC&D, Lafayette/St. Martin Soil and Water Conservation District, Natural Resource Conservation Service (NRCS) and LDEQ-NPS. Potential users were educated on the many benefits of using the no-till grain drill equipment as a conservation measure. Once the grain drills were purchased and placed at Durand Farms and Bayou Vermilion District, a rental program was put in place to cover the maintenance and storage of the equipment and also to ensure their availability to the producers. Capital RC&D was the principal lead for the project. Together, with Durand Farms, and the Bayou Vermilion District, the progress of the rental program was monitored. In-kind match was provided by the producers as a result of the costs associated with project demonstration (Table 3).



Figure 3 Seven foot No-till grain drill located at the Bayou Vermillion District, Lafayette, LA



Figure 4 No-till grain drill opening ceremony, August 4, 2016, at Bayou Vermillion District, Lafayette, LA

Cost	Activity
\$250	Pick-up and delivery fee
\$200	Co-op service fee for handling and maintenance
\$135 per hour	Tractor rental fee to pull the no-till grain drill
\$15 per hour	Labor fee to drive the tractor
\$28 per hour	Fuel fee to power the tractor
\$178 per hour	Total cost for use of the no-till grain drill (excluding pick-up, delivery and service fee).
\$44.50 per acre	Estimated cost planting 4 acres per hour

Table 3 Activities and associated costs used as in-kind match

How it Works

Why No-Till?

According to *Conservation Currents*, County of Fairfax Virginia's online website, advances in farming practices have brought about methods to control weed growth without relying on the plow. One of the most advanced and effective of these new methods is called no-till agriculture. As the name implies, no-till agriculture allows a farmer to plant the crop and control weeds without turning the soil. While traditional plowing is effective for weed control, it generally reduces a farm's long-term productivity by exposing the organic-matter-rich top soil to the surface and breaking up the clods that slowly and naturally form in soil.

A high organic matter content and good clod formation are both crucial aspects of fertile soil. Organic matter attracts and holds onto water, thus ensuring proper hydration for plant roots, even during dry periods. The slow breakdown of organic matter in the soil releases vital nutrients, such as nitrogen, phosphorous and potassium, which are essential for plant growth. Organic matter also causes the soil to clump into the tiny granules that are the basis of soil clods. When a soil clumps together into clods, large pore spaces form in the soil. These pores become conduits for water and air passing through the soil. Plant roots use a portion of this air and water. The remainder of the water slowly percolates through the soil and into the groundwater.

When soil is turned, the organic matter is exposed to the atmosphere and can quickly oxidize into carbon dioxide. Less organic matter in the soil means less water retention, less nutrient release and less clod formation. Along with encouraging the oxidation of organic matter, plowing physically breaks up pre-existing clods and exposes them to the direct force of rainfall. The force exerted by raindrops is enough to break up the remaining clods and form a structure-less soil "crust" on the field surface. This crust has virtually no pores and as a result, plant roots do not get the water and oxygen that they need, and surface runoff and soil erosion become a large problem. The crust can also be strong enough to make it difficult for seedlings to push through to the surface.

No-Till Method

In no-till agriculture, the farmer uses a disk or chisel plow to prepare the field for seeding. Rather than turning the field, these plows create a narrow furrow, just large enough for the crop's seeds to be injected. Tractor attachments inject a band of fertilizer in with the seeds, thus negating the need to fertilize the whole field, and close up the furrow after the seed and fertilizer have been planted. With these new plows, the farm field can be seeded with minimal disturbance of the soil.

No-Till Farming

The advantages of no-till farming are economic as well as environmental. The no-till farmer will see an increase in the organic matter of the soil, and a decrease in the amount of erosion. More organic matter and less erosion mean more fertility, less fertilizer, and higher yields.

Additionally, with the advances in cover crops and green manures, the no-till farmer can greatly reduce the use of high-cost herbicides. Given the combined environmental and economic benefits of the practice, it is easy to see why no-till agriculture is catching on across Louisiana and the country.

Benefits of No-Till Farming

The most obvious reason that soil is tilled is to loosen it so oxygen and water can reach the area where roots will grow. It seems logical that friable, loose earth would allow roots to spread evenly and to proliferate, and this is indeed the case. But using a moldboard plow doesn't necessarily produce such soil. Plowing and disking a field results in a soil with broken structure lying atop a heavily compressed plow pan (the undisturbed layer that the plow does not reach). The broken soil is prone to being compacted by rainfall. In addition, many passes must be made over the field with very heavy equipment, the wheels of which further compress the soil. Untilled ground starts off being less compacted than a heavily machine-worked field, and it stays that way. What's more, earth that has become compressed by tillage or machinery will return to a less compacted state after a few years of no-till planting (*Conservation Currents*, 2005).

According to *Mother Earth News*, studies have shown that the accumulation of surface material levels off after a few seasons of no-till practice. Utilizing the correct equipment, these ingredients can be placed directly into the planting trench during seeding. Plowing incorporates fertilizers and crop residues into the soil, making nutrients readily available to the roots of the plants. Turning organic matter under also has the benefit of preventing planters from becoming fouled with surface trash. In no-till farming, crop residues are left on the surface, where the nutrients that result from their decay can leach into the soil. Fertilizers, including anhydrous ammonia, phosphorus, and potassium, are at least as effective on the no-till fields where they have been dispersed as on the plowed plots. And with the right equipment, these ingredients can be placed directly into the planting trench during seeding. In normal tillage, the entire field is turned into a seedbed that may be mounded for planting. With no-till, one simply prepares a narrow trench of the appropriate depth. Studies have shown that plant roots develop at least as well in a no-till field as in a plowed one and that the lack of mounding exposes less of the soil to air and evaporation (*Mother Earth News*, 1984).

Conventional plowing is also performed across the contours of the land to prevent soil erosion; however, this rationale does not hold up against the results with no-till. The crop residues on a no-till field prevent runoff to an amazing extent: on slopes that are steeper than can normally be planted, no-till fields have consistently shown next to no topsoil loss after downpours of several inches per hour. The vegetative cover also makes the no-till field less susceptible to the effects of wind erosion. This type of agriculture offers a solution to the problem of topsoil loss. Figure 5 illustrates no-till farming versus conventional and conservation tillage.

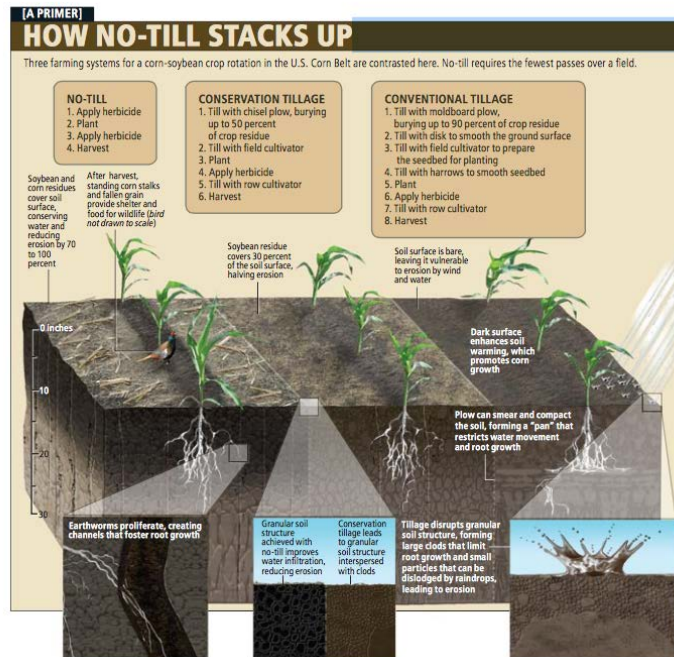


Figure 5 No-till farming versus conservation and conventional tillage

A benefit of the retention of runoff is that no-till soils remain moister than those in tilled fields. The surface residues trap water and protect the earth below from the evaporative effect of the wind. One of the main problems with conventional agriculture's heavy use of nitrogen fertilizers is the leaching of these compounds into surface water during runoff. By retaining rainfall, the untilled field also better holds the chemicals that have been applied to it, thereby decreasing their pollution potential.

The list of environmental benefits that no-till farming has over conventional practices is numerous. Beyond its ability to create a more natural soil that retains nutrients and water, prevents soil erosion, and compacts less, the no-till technique offers a number of immediate financial advantages to the farmer. In addition to saving fuel, reducing wear and tear on tractors, no-till drilling also requires fewer pieces of equipment. Plows, cultivators, and disk harrows become obsolete. Because a smaller tractor is required to drag a disk or plow to pull the no-till planter, money can be saved on the size of no-till equipment, as well.

Yields are generally as good with no-till agriculture as they are with plow techniques. The soil stays cooler until a little later in the spring, because of the insulating layer of residue, the day/night soil temperature fluctuations are smaller. A no-till field rapidly makes up its deficit in growth rate, as the weather turns warm. If the summer is hot and dry, no-till yields will nearly always exceed those of plowed ground. Since soil moisture levels can be more than 10 percent higher in late July in an unplowed piece of ground, plants thrive in a field covered with mulch. An article in *Modern Farmer* titled "No-Till Farming: What's the Deal?" highlighted additional pros for no-till farming which include: savings, water conservation, less herbicide runoff, higher

crop yields. Overtime, no-till farming can save significant money in labor and fuel, simply by cutting the added step of plowing each year. No-till farming also leaves crop residues on the surface, which absorb water and limits runoff. This water retention can be a benefit to farmers in drought-stricken areas. No-till farming is also responsible for less herbicide runoff. The lack of water runoff prevents herbicides and other pollutants from getting into nearby water supplies. Lastly, in areas with low moisture levels, no-till farming can significantly increase crop yields (Hirsch 2013). Figure 6 illustrates a farm utilizing tilled farming compared to a no-till farm.

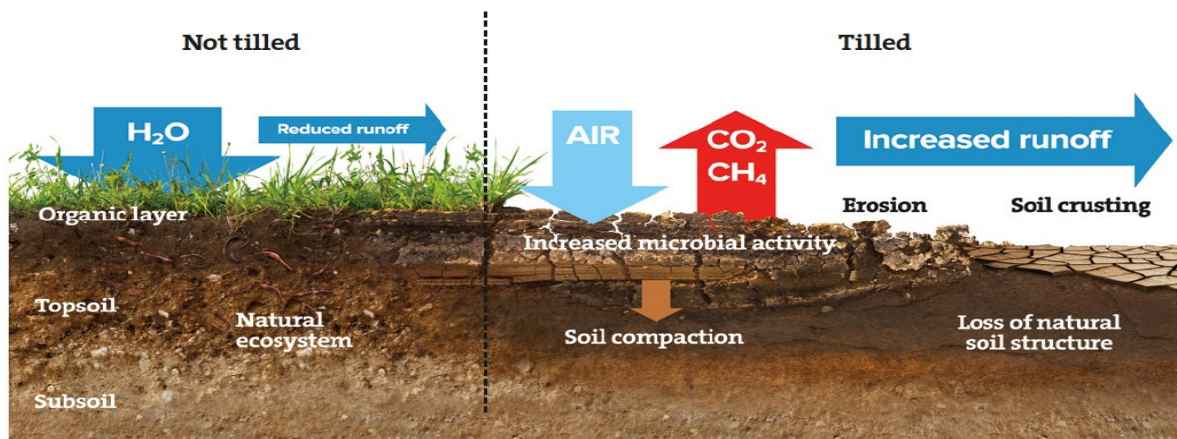


Figure 6 No-till farming compared to tilled farming

Reductions/Improvements Due to No-Till Grain Drill Demonstration: working towards project objectives

As part of the program, Capital RC&D, Bayou Vermillion District, and Durand Farms monitored the progress of the rental program to determine the effectiveness of the equipment on the soil. The number of rentals, acres planted, and estimated soil saved determined the amount of reductions accomplished (Table 4). There has been an approximate total reduction of 1,178 pounds of phosphorus, 1,178 pounds of potassium, and 1,178 pounds of nitrogen, in Lafayette and St. Martin Parishes.

Time Period	# of Rentals	# of Acres Planted	tons/soil/saved	Transportation/Reduction into Waterbodies		
				Phosphorus	Potassium	Nitrogen
7/16 – 9/16	4	114	285	228 lbs.	228 lbs.	228 lbs.
10/16 – 12/16	12	136.3 lbs.	340.75 lbs.	272.6 lbs.	272.6 lbs.	272.6 lbs.
1/17 - 3/17	2	31.6	79	63.2 lbs.	63.2 lbs.	63.2 lbs.
4/17 - 6/17	3	51	127.5	102 lbs.	102 lbs.	102 lbs.
7/17 - 9/17	3	256	640	512 lbs.	512 lbs.	512 lbs.
Totals	Total Rentals	# Acres Planted	Tons/Soil/Saved	Phosphorus	Potassium	Nitrogen
	24	588.9	1,472.25	1,177.8 lbs.	1,177.8 lbs.	1,177.8 lbs.

Table 4 No-till grain drill rentals, acres planted, tons of soil saved, and approximate reduction of phosphorus, potassium, and nitrogen to the waterbody, from July 2016 through September 2017.

The environmental benefits of the no-till grain drills project are plentiful. In an effort to illustrate how the reductions were obtained, NRCS used RUSLE2 in the soil erosion calculations. For nutrient reduction, NRCS assumed 3.5 tons of soil loss per acre/per year difference, and assuming about 50 ppm of potassium and phosphorus in a soil test, that is equivalent to a loss of about 2 pounds per acre/per year of both phosphorus and potassium. Nitrogen is at a direct loss of about 2 pounds/acre. In a clean tilled situation, there may be a loss of infiltration capacity on plowed ground, as well as soil health and function. The transport of nutrients, is often ten times the amount of what is calculated above, to nearby waterbodies. Figure 7 illustrates a tract of land after the use of a no-till grain drill.



Figure 7 Tract of land after the use of no-till grain drill equipment

According to the 2016 IR, the five subsegments referenced in “Water Quality Impairments” as not meeting their standards for their designated uses, remain listed as impaired; however, the carbofuran impairment has been removed from subsegments 060301, 060801, 060802, and 060901. Fipronil has been removed as impairment for subsegment 050501. Subsegments 060301 and 060801 are now also listed for dissolved oxygen and Mercury in Fish Tissue, respectively (Table 5). With additional persistence from community leaders for the landowners to partake in additional demonstration, using no-till grain drills, the waterbodies may eventually be restored.

Louisiana's 2014 and 2016 Integrated Report Impairments				
Subsegment	Description	2014 IR Impairment(s)	2016 IR Impairment(s)	Impairments no longer listed as of 2016 IR
050501	Bayou Queue de Tortue-From headwaters to Mermentau River	Fipronil, Mercury in Fish Tissue, Nitrate/Nitrite, Dissolved Oxygen, Phosphorus (Total), Turbidity	Mercury in Fish Tissue, Nitrate/Nitrite, Dissolved Oxygen, Phosphorus (Total), Turbidity	Fipronil
060301	Bayou Teche-From headwaters at Bayou Courtableau to Keystone Locks and Dam	Carbofuran, Fecal Coliform	Dissolved Oxygen, Fecal Coliform	Carbofuran
060801	Vermilion River-From headwaters to LA-3073 bridge	Carbofuran, Fecal Coliform, Nitrate/Nitrite, Dissolved Oxygen	Fecal Coliform, Nitrate/Nitrite, Dissolved Oxygen, Mercury in Fish Tissue	Carbofuran
060802	Vermilion River-From LA-3073 bridge to ICWW	Carbofuran, Nitrate/Nitrite, Dissolved Oxygen, Total Dissolved Solids and Fecal Coliform	Nitrate/Nitrite, Dissolved Oxygen, Total Dissolved Solids and Fecal Coliform	Carbofuran
060901	Bayou Petite Anse-From headwaters to Bayou Carlin (Estuarine)	Carbofuran, Nitrate/Nitrite, Dissolved Oxygen, Phosphorus (Total), Turbidity, Fecal Coliform	Carbofuran, Nitrate/Nitrite, Dissolved Oxygen, Phosphorus (Total), Turbidity, Fecal Coliform	Carbofuran

Table 5 Comparison of subsegment impairments in Lafayette and St. Martin parishes, according to Louisiana's 2014 and 2016 Integrated Report's

Conclusion

Capital RC&D's goal to purchase two no-till grain drills, to be rented to local producers, throughout Lafayette and St. Martin parishes was fulfilled. The education and outreach portion of the program educated land users on the benefits of utilizing no-till grain drills on their property while improving the NPS conditions in the watersheds. The RC&D aimed to rent the grain drills to 20 farmers per/year to demonstrate the drills' functionality and foreseeable positive outcomes of utilizing the drills on 350 acres per/year. The objectives to reduce soil erosion reduce fertilizer runoff and improve water quality in Lafayette and St. Martin parishes were also accomplished. Allowing the local farmers to utilize the conservation tillage grain drills has lowered the annual soil erosion rate and reduced runoff of fertilizer and pesticides from entering their local streams. At the conclusion of the project, there were 24 Rentals and 589 acres planted, resulting in approximately 1,472 tons of soil saved and sediment were stopped from leaving the fields and draining into local streams. From the demonstration of the no-till grain drills, there has been an approximate total reduction of 1,178 pounds of phosphorus, 1,178 pounds of potassium, and 1,178 of pounds of nitrogen, within the two parishes. The project was completed on September 30, 2017; however, the rental program will be self-sustaining and beneficial for many years to come.

References

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Mother Earth News, May/June 1984. *No-Till Farming Pros and Cons*. <https://www.motherearthnews.com/homesteading-and-livestock/no-till-farming-zmaz84zloeck>

The Farmer's Life. *What is No-Till?* April 2013. <http://thefarmerslife.com/what-is-no-till/>

Appendix A



RC&D

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ASCENSION, ASSUMPTION, EAST BATON ROUGE
EAST FELICIANA, IBERVILLE, LIVINGSTON
POINTE COUPEE, ST. HELENA, ST. JAMES
ST. TAMMANY, TANGIPAHOA, WASHINGTON
WEST BATON ROUGE, WEST FELICIANA

FOR IMMEDIATE RELEASE

Date: August 04, 2016

Contact: Donny Latiolais

Phone: 985-276-3000

Release No. 0006.09

SUBJECT: "NO-TILL GRAIN DRILLS TO IMPROVE WATER QUALITY"

Hammond, LA – The Hammond Capital Resource Conservation & Development Council (RC&D) secured a \$62,000 Louisiana Department of Environmental Quality 319 Grant, which will address non-point source pollution on lands in the Lafayette and St. Martin Parishes. The grant has allowed RC&D to purchase two No-Till Drills be placed at the Lafayette Parish Bayou Vermilion District and at Jeff Durand Farms, in an effort to reduce the amount of run off of pesticides, fertilizer and sediment. A rental program for the use of the drills has been set up at the two area local farm/environmental businesses in order to create an opportunity to engage livestock farmers, who will be able to use the new equipment rather than the normal clean tillage application.

"There exists a need to conserve our natural resources and improve our water quality in south Louisiana," states RC&D President, Don Ashford. "Our environmental efforts, while effective, are at times limited. More opportunities for in-depth application of Best Management Practices are needed."

A ribbon cutting ceremony for the rental program will take place at the Bayou Vermilion District, located at 300 Fisher Road in Lafayette on Thursday, August 4 at 10:00 a.m. Members of the public, especially livestock farmers, as well as the media are encouraged to attend. Also in attendance will be representatives from Lafayette Parish and St. Martin Parish Soil & Water Conservation and the Natural Resources Conservation Service.

"Our farmers will have an opportunity to plant their sloping lands that are in some cases, considered highly erodible for winter pastures, along with the possibility of introducing clover in the spring in permanent pastures, and the establishment of native grasses. This will reduce the runoff of sediment, nutrients and pesticides into our streams and rivers", states Jeff Durand, local Soil & Water Conservation board member.

The mission of the RC&D is to provide leadership in the wise use of our area resources and provide economic opportunities in Southeast, Louisiana. RC&D is a unique program that is led by local volunteer councils. RC&D is a way for people to work together to plan and carry out activities that will make their area a better place to live. Such activities lead to sustainable communities, prudent land use and the sound management and conservation of natural resources. Program objectives focus on "the quality of life" improvements achieved through natural resources conservation and community development.

-end-

"We Make Things Happen"