



No-Till Grain Drill to Improve Water Quality

[Pointe Coupee & West Baton Rouge Parishes]

Draft Final Report

Capital Resource Conservation and Development Council

2017



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Project Overview

Project Title: No-Till Grain Drill to Improve Water Quality

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

Goal: Purchase two no-till grain drills for use throughout Pointe Coupee and West Baton Rouge Parishes

Objective: To reduce soil erosion, reduce fertilizer runoff and improve water quality in areas that are affected by the livestock industry.

Project Timeline: 20 months

Project Area: Watersheds in Pointe Coupee and West Baton Rouge Parishes

Grant Information: (FFY12) C9-99610219 - Project 22

Grant Source: Section 319 Federal Funds

Initiation Date: February 1, 2016

Expiration Date: September 30, 2017

PROJECT COST:

Categories	Federal	Match	Total
Purchase of two No-Till Grain Drills	\$58,306.28	\$67,270.45	\$125,576.73
Administration	\$1,315.20	\$0.00	\$1,315.20
Outreach	\$250.00	\$0.00	\$250.00
Quarterly Reports	\$3,793.72	\$0.00	\$3,793.72
Final Reports	\$300.00	\$0.00	\$300.00
Total	\$63,965.20	\$67,270.45	\$131,235.65

Table 1 Expenditures for "No-Till Grain Drill to Improve Water Quality Project"

Introduction

Pointe Coupee and West Baton Rouge parishes in Louisiana consist of significant cattle and horse farms that clean-till for winter pasture production. Figure 1 illustrates the locations of Pointe Coupee and West Baton Rouge 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 crops in this area. Approximately 100 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-till 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. In a little over one year, the program has resulted in 32 participating producers and no-till demonstrations were performed on approximately 1,188 acres.

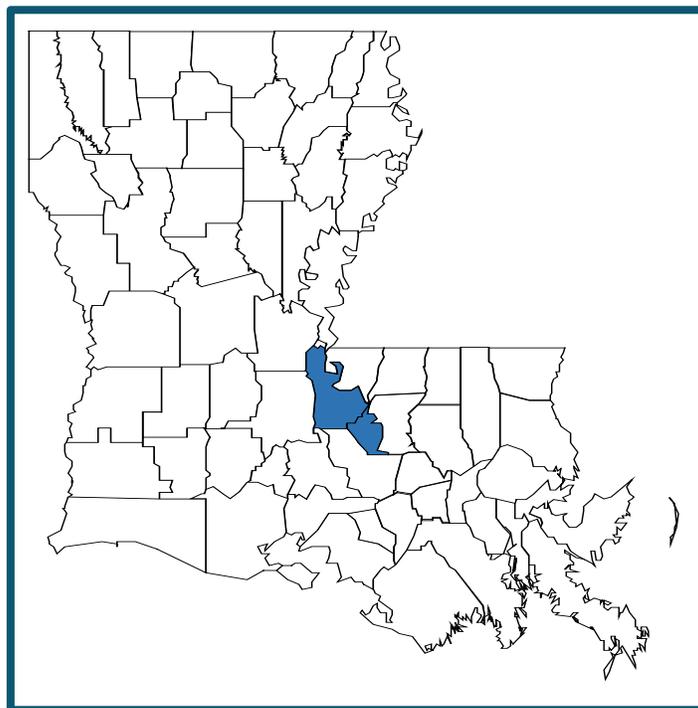


Figure 1 Location of West Baton Rouge and Pointe Coupee parishes in Louisiana

Goals and Objectives

The goal of this 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 drills. The equipment will be placed at the Farmers Feed Mill in New Roads, LA and R Schexnayder & Sons, LLC in Erwinville, LA. The objective was to reduce soil erosion, reduce fertilizer runoff and improve water quality in areas that are affected by the livestock industry by demonstrating no-till grain drills throughout the watersheds. The use of these drills will allow for direct seeding into permanent pastures, thus resulting in a reduction of sediment, pesticides and nutrients from reaching nearby streams; therefore, improving water quality in those areas.



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

Water Quality Impairments

According to Louisiana’s 2014 Integrated Report (IR), there are seven subsegments within these parishes that are currently not meeting the standard for their designated uses, due to agricultural activities. Table 2 provides information for each of the waterbodies not meeting its designated use support. In an effort to improve water quality across the two parishes, the Louisiana Department of Environmental Quality’s (LDEQ) nonpoint source (NPS) section and the Capital Resource Conservation and Development Council (Capital RC&D) partnered on the project, “No-Till Grain Drill to Improve Water Quality”, on February 1, 2016. The use of the no-till grain drill allowed producers to directly seed their pasture sod without tilling the landscape, which reduced the amount of sediment, pesticides, and fertilizer runoff from entering Pointe Coupee and West Baton Rouge Parishes waterways.

Louisiana’s 2014 Integrated Report		
SUBSEGMENT	DESCRIPTION	IMPAIRMENT(S)
010401	East Atchafalaya Basin and Morganza Floodway south of I-10 Canal	Dissolved Oxygen
120102	Bayou Poydras – From headwaters to Bayou Choctaw	Dissolved Oxygen
120103	Bayou Choctaw – From Bayou Poydras to Bayou Grosse Tete	Dissolved Oxygen
120104	Bayou Grosse Tete – From headwaters to Intracoastal Waterway near Wilber Canal	Nitrate/Nitrite, Dissolved Oxygen and Total Phosphorus
120105	Chamberlin Canal – From Chamberlin too Bayou Choctaw	Dissolved Oxygen, Turbidity
120110	Bayou Cholpe – From headwaters to Bayou Choctaw	Total Dissolved Solids, Sulfates
120111	Bayou Maringouin – From headwaters to East Atchafalaya Basin Levee	Nitrate/Nitrite, Dissolved Oxygen, Total Phosphorus and Total Dissolved Solids,

Table 2 Waterbodies in Point Coupee and West Baton Rouge parishes not meeting the standard for their designated uses, as listed in Louisiana’s 2014 Integrated Report.

Introducing the Program: working towards project goal

On April 27, 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 two no-till grain drills (Figure 3). The RC&D also conducted an opening ceremony on April 27, 2016 to introduce the program. The opening ceremony was held at the Farmers Feed Mill in New Roads, LA. Those who attended were members of Capital RC&D, Farmers Feed Mill and R. Schexnayder & Sons, LLC, along with Upper Delta Soil and Water Conservation District (Figure 4). Potential users were educated on the many benefits of using the no-till grain drill equipment as a conservation measure, such as reducing the runoff of sediment. Once the grain drills were purchased and placed at Farmers Feed Mill and R. Schexnayder & Sons, 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 Farmers Feed Mill, and R. Schexnayder & Sons Feed & Seed, LLC, the progress of the rental program was monitored. In-kind match was provided by the producers as a result of the cost associated with project implementation (Table 3).



Figure 3 Ten foot No-till grain drill purchased with Section 319 funding



Figure 4 No-till grain drill opening ceremony, April 27, 2016, at Farmers Feed Mill, in New Roads

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.

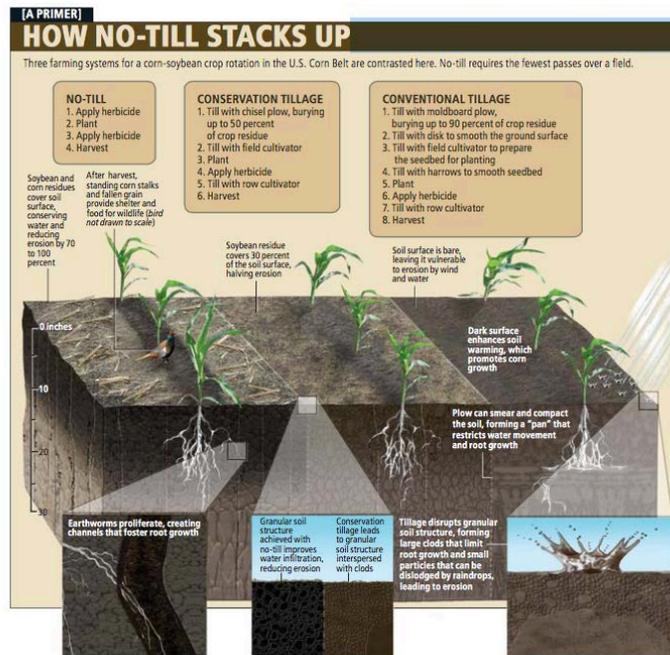


Figure 5 No-till farming versus conservation and conventional tillage

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. And because a smaller tractor than is required to drag a disk or plow can 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 how a farm utilizing tilled farming compares to a no-till farm.

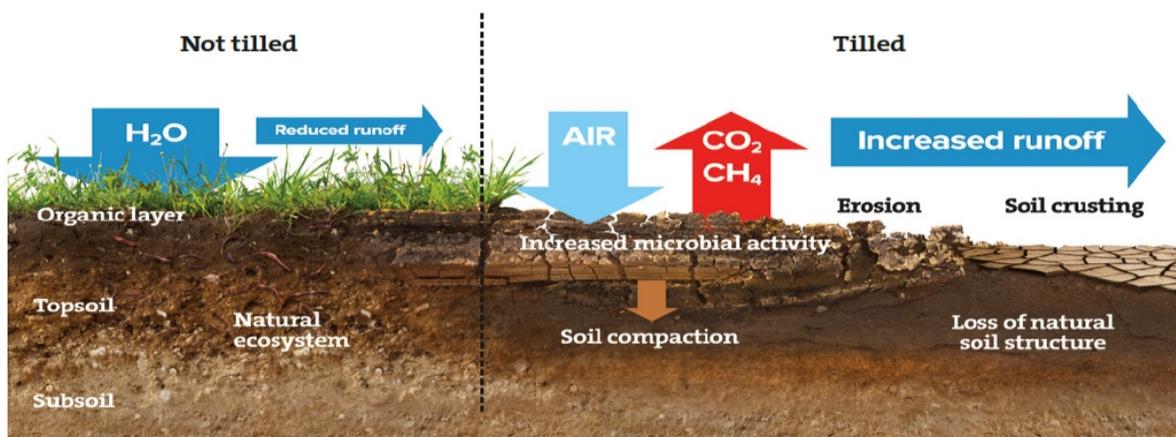


Figure 6 No-till farming compared to tilled farming

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

As part of the program, Capital RC&D and the co-ops 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 4,990 pounds of phosphorus, 2,495 pounds of potassium, and 1,188 pounds of nitrogen, in West Baton Rouge and Pointe Coupee Parishes.

Time Period	# of Rentals	# of Acres Planted	tons/soil/saved	Transportation/Reduction into Waterbodies		
				Phosphorus	Potassium	Nitrogen
7/16 – 9/16	2	110	216.7	462 lbs.	231 lbs.	110 lbs.
10/16 – 12/16	19	854.7	1683.8	3589.74 lbs.	1794.9 lbs.	854.7 lbs.
1/17 - 3/17	2	51.4	101.26	215.88 lbs.	107.94 lbs.	51.4 lbs.
4/17 - 6/17	4	70	137.9	294 lbs.	147 lbs.	70 lbs.
7/17 - 9/17	5	102	200.94	428.4 lbs.	214.2 lbs.	102 lbs.
TOTALS	Total Rentals	# Acres Planted	Tons/Soil/Saved	Phosphorus	Potassium	Nitrogen
	32	1,188.1	2340.60	4,990.02 lbs.	2,495.04 lbs.	1,188.1 lbs.

Table 4 No-Till grain drill rentals, acres planted from July 2016-September 2017

The environmental benefits of the no-till grain drills project are plentiful. In an effort to illustrate how the reductions were obtained, Natural Resource Conservation Service (NRCS) used RUSLE2 in the soil erosion calculations. For nutrient reduction, NRCS assumed 2 tons (4000 pounds) of soil loss per acre/per year difference, and assuming about 50 ppm of Potassium (P) and Phosphorus (K) in a soil test, that is equivalent to a loss of about 0.6 pounds per acre/per year of P₂₀₅, K₂₀ loss is about 0.3 pounds per acre/per year. Nitrogen is at a direct loss of about one pound/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

According to the 2016 IR, the seven subsegments referenced in “Water Quality Impairments” as not meeting their standards for their designated uses, remain listed as impaired, due to agricultural activities (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 2016 Integrated Report		
Subsegment	DESCRIPTION	IMPAIRMENT(S)
010401	East Atchafalaya Basin and Morganza Floodway south of I-10 Canal	Dissolved Oxygen
120102	Bayou Poydras – From headwaters to Bayou Choctaw	Dissolved Oxygen
120103	Bayou Choctaw – From Bayou Poydras to Bayou Grosse Tete	Dissolved Oxygen
120104	Bayou Grosse Tete – From headwaters to Intracoastal Waterway near Wilber Canal	Nitrate/Nitrite, Dissolved Oxygen and Total Phosphorus
120105	Chamberlin Canal – From Chamberlin too Bayou Choctaw	Dissolved Oxygen, Turbidity
120110	Bayou Cholpe – From headwaters to Bayou Choctaw	Total Dissolved Solids, Sulfates
120111	Bayou Maringouin – From headwaters to East Atchafalaya Basin Levee	Nitrate/Nitrite, Dissolved Oxygen, Total Phosphorus and Total Dissolved Solids

Table 5 Louisiana's 2016 Integrated Report for impaired waterbodies in Pointe Coupee and West Bayou Rouge Parishes

Conclusion

Capital RC&D's goal to purchase two no-till grain drills, to be rented to local producers, throughout Pointe Coupee and West Baton Rouge Parishes was fulfilled. The education and outreach portion of the program educated the land users on the benefits of applying conservation tillage 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 Pointe Coupee and West Baton Rouge 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 32 rentals, and 1,188 acres planted, resulting in approximately 2,340 tons of soil saved and sediment prevented from washing into local waterways. Approximately 8,666.16 pounds of fertilizer, nutrients, and pesticides, 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 4,990 pounds of phosphorus, 2,495 pounds of potassium, and 1,188 of pounds of nitrogen, in West Baton Rouge and Pointe Coupee 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

Conservation Currents, Northern Virginia Soil and Water Conservation District, September 2005. *No-Till Agriculture: Good for the Soil and the Bottom Line*. <https://www.fairfaxcounty.gov/nvswcd/newsletter/notill.htm>

Hirsch, Jesse. *Modern Farmer*. *No-Till Farming: What's the Deal?* August 2013. <https://modernfarmer.com/2013/08/7-facts-till-farming/>

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

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

CAPITAL RESOURCE CONSERVATION & DEVELOPMENT COUNCIL, INC.
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FOR IMMEDIATE RELEASE

Date: April 27, 2016

Contact: Donny Latiolais

Phone: 985-543-6570

Release No. 0006.09

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

Hammond, LA – The Hammond Capital Resource Conservation & Development Council secured an \$59,000 Louisiana Department of Environmental Quality 319 Grant. The grant will address Non-Point Source Pollution on Lands in the Pointe Coupee and West Baton Rouge Parishes in an effort to reduce the amount of run off of pesticides, fertilizer and sediment through the use of No-Till Drills. The grant was made available to purchase two No-Till Grain Drills to be placed at Farmer's Feed Mill and R Schexnayder & Son LLC. The equipment will create an opportunity to engage livestock farmers to use these drills instead of the normal clean tillage application. A rental program for the use of the drills has been set up at the two area Farm Businesses. Our farmers will have an opportunity to plant their sloping lands that are some cases, considered highly erodible for winter pastures along with the possibility of introducing clover in permanent pastures in the spring, reducing the runoff of sediment, nutrients and pesticides into our streams and rivers, states Chip Vosburg, local Soil & Water Conservation board member. "There exists a need to conserve our natural resources and improve our water quality in south Louisiana," states Capital Resource Conservation & Development President, Don Ashford. "Our environmental efforts, while effective, are at times limited. More opportunities for in-depth application of Best Management Practices are needed," says Ashford.

The mission of the Capital 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.

"We Make Things Happen"