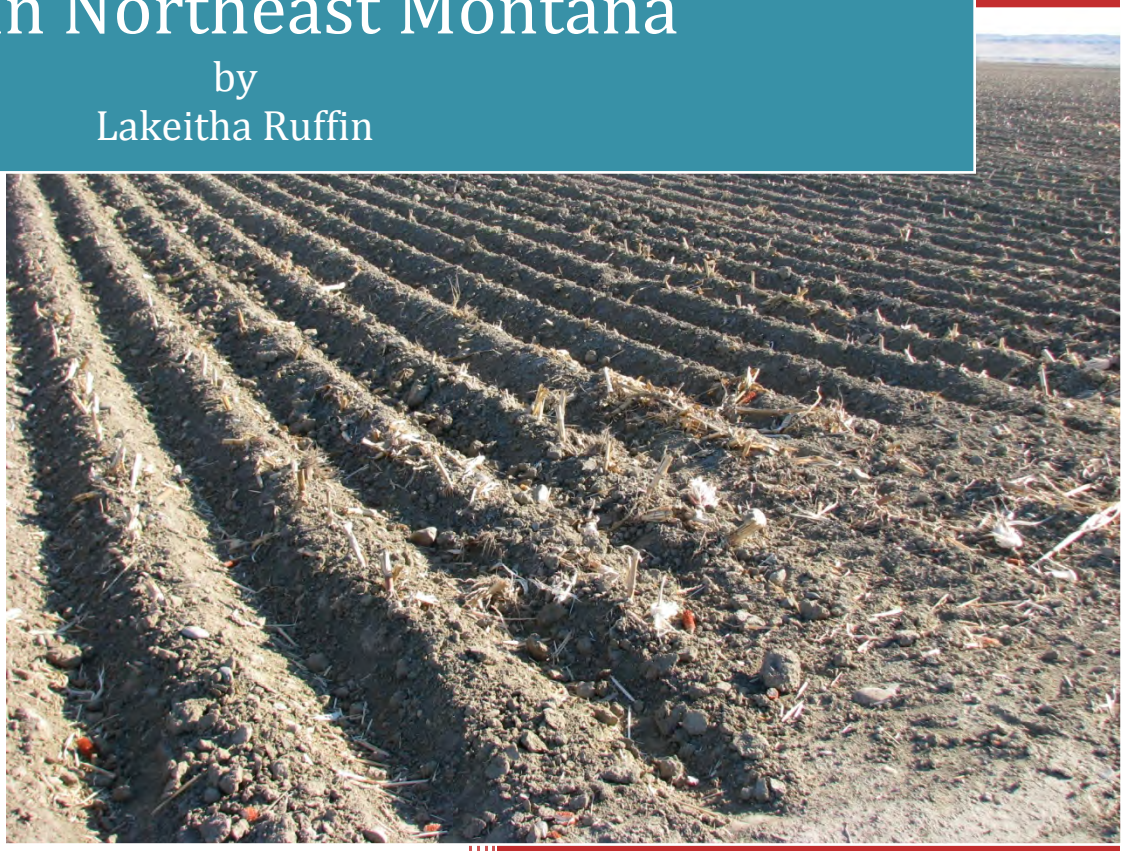
United States Department of Agriculture
NATURAL RESOURCES CONSERVATION SERVICE
Economics Technical No. MT-11
July 2012

Conservation Pays: Minimal Till Sugar Beets in Northeast Montana

by
Lakeitha Ruffin



Introduction

Historically, sugar beet production has been linked with high tillage sequences for many years. However, in recent years, producers and researchers are discovering beet production can be maintained with less tillage. Using less tillage operations can result in machinery, fuel, labor, and energy savings, as well as a reduction in soil erosion and an increase in soil quality or soil health. To showcase such benefits, a ridge till producer in Northeastern Montana was interviewed.

Ridge till is a type of conservation tillage that aids in managing crop residue. In terms of soil disturbance, this tillage method is said to be in the middle of no-till and conventional till. Crops are planted on ridges and remain in the same location year after year. Ridge till leaves crop residue on the soil's surface, aiding in erosion reduction and reducing runoff.

A comparison between a typical conventional till sugar beet operation and a ridge till sugar beet operation, in the same area, was conducted to evaluate various savings. Capturing savings on machinery, labor, and fuel was evaluated by using crop budget software, developed at Montana State University. The budget software is an excel spreadsheet designed to allow producers to enter all their input data (fuel cost, implements, acreage) as well as yield and price. Based on that information, cost per acre and returns for each crop is calculated.

The other form of evaluation is on the soil quality or soil health. A Soil Tillage Intensity Rating (STIR) is a value used to determine the severity of soil disturbance. This value can range from 0 – 200, lower numbers reflecting less disturbance to the soil. A Low STIR value may also indicate a reduction of sheet and rill and wind erosion. Low STIR values may represent an increase in organic matter contents of the soil. Another evaluation tool, the Soil Condition Index (SCI) is also used. SCI calculates a value predicting soil organic matter levels. A negative rating shows a decline in organic matter and a positive value indicated an increase. An increase in soil quality can potentially lead to increased yields and profits.

Assumptions

The producer interviewed is operating a barley, corn silage, and sugar beet rotation on 490 acres. Conventional till producers will assume the same number of acres for each crop. See Table 1 for details of crops per acre. Soil type is a Cherry silty clay loam with a 0 – 2 percent slope.

Table 1. Ridge and Conventional Till Acreage

Acres
Sugar Beets = 159 acres
Barley = 168 acres
Corn = 163 acres

Machine Usage

Implements used on the operation are all owned and pull–type. There are four tractors owned and used in the operation as well. Fuel costs are averaged at $4.00 per gallon of diesel. Tractor horsepower, fuel usage, and annual hour usage are listed in the table below. Conventional till producers are assumed to have the same machinery usage data.

Table 2. Tractor Usage

	Horsepower	Fuel Use (Gallon/Hour)	Annual Use (Hours)
Tractor 1	220	5	600
Tractor 2	200	3	600
Tractor 3	150	4	1200
Tractor 4	100	2	200

The primary producer's operation incorporates several pull-type machines. Listed in the table below are the implements, tractors associated with each, and acres per hour. Conventional till producers will use all machinery listed except the ridger.

Table 3. Implements for both Ridge Till and Conventional Till Operations

	Tractor	Acres per Hour
Ridger	Tractor 3	1
Tool Bar	Tractor 2	8
Surface Cultivator	Tractor 1	10
Ditcher	Tractor 3	7.5
Planter	Tractor 3	6.2
Plow	Tractor 1	9
Harrow	Tractor 2	10
Disk	Tractor 2	8.5
Leveler	Tractor 1	10
Dike	Tractor 4	10
Additional Implement for Conventional Tillage Operation		
Cultivator	Tractor 3	7

Sequence of Operation

Operation sequences for both ridge till and conventional till is listed below in Table 4.

Table 4. Ridge and Conventional Till's Operation Sequences

Crop	Ridge Till Operation Sequence	Conventional Till Operation Sequence
Sugar Beets	Ridge Plant Ditch Harvest	Plow Harrow Level Plant Cultivate (2 times) Ditch Harvest
Barley	Ridge Plant Harvest	Dike Harrow Plant Harvest

Table 4. Ridge and Conventional Till's Operation Sequences (continued)

Crop	Ridge Till Operation Sequence	Conventional Till Operation Sequence
Corn	Toolbar Cultivate (Surface) Ridge Plant Ditch Harvest	Disk Tool Bar Harrow Level (1/2 the acres) Plant Cultivate Ditch Harvest

Results

Less tillage machinery needed among the ridge till producer resulted in operating machinery savings. Machinery operating cost and the savings for ridge and conventional till are listed in Table 5. With a conventional till producer, operating cost for machinery is $76.82 per acre, and for ridge till it is $48.29 per acre. There is a savings of $28.53 per acre in operating machinery. Under conventional till, barley costs $62.79 per acre and by converting to ridge till there is a savings of $19.47 per acre. Corn had a savings of $16.39 per acre, under the ridge till; a conventional till producer may have had a cost of $76.28 per acre for machinery operating costs.

Table 5. Machinery Operating Savings per Acre

	Ridge Tillage	Conventional Tillage	
	Operating Cost per Acre	Operating Cost per Acre	Difference per Acre
Sugar Beets	$48.29	$76.82	$28.53
Barley	$43.32	$62.79	$19.47
Corn	$59.88	$76.28	$16.39

SCI and STIR data was provided for the ridge till producer interviewed, strictly based on his operation. The SCI rating for the ridge till operation is .62. This number indicates soil organic matter is more likely to increase in this type of operation. With a high tillage system, the SCI rating will be a negative number. Under a conventional till operation, the STIR rating will be over 100 because of the amount of tilling sequences a producer will use. However, as a ridge till producer the STIR rating was 54. A lower number is expected when using less tillage sequences in the operation.