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# Diesel Fuel Consumption During Chisel Plowing

## **Abstract**

Direct energy expenses (diesel, gasoline, propane, electricity) total more than \$1 billion annually for Iowa farmers. Farm management techniques such as adjusting tractor gear and throttle settings or reducing tillage depths can reduce diesel fuel consumption for row crop production. This study is being conducted over multiple years to measure the effects of energy management techniques on tractor fuel consumption during spring and fall field operations.

## **Keywords**

Agricultural and Biosystems Engineering

## **Disciplines**

Agricultural Science | Agriculture | Bioresource and Agricultural Engineering

## Diesel Fuel Consumption During Chisel Plowing

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### Introduction

Direct energy expenses (diesel, gasoline, propane, electricity) total more than \$1 billion annually for Iowa farmers. Farm management techniques such as adjusting tractor gear and throttle settings or reducing tillage depths can reduce diesel fuel consumption for row crop production. This study is being conducted over multiple years to measure the effects of energy management techniques on tractor fuel consumption during spring and fall field operations.

### Materials and Methods

A small auxiliary 12-gallon fuel tank was mounted on a John Deere 7410 tractor. Plumbing was added for diesel fuel to be supplied and returned from the engine via either the main or auxiliary fuel tank, depending on the setting of a single flow control valve. A load cell under the auxiliary fuel tank measured the net (supply minus return) weight of fuel used. Most fieldwork on the farm is done in smaller plot areas. One objective was to measure fuel use in areas of 0.7 to 1 acre when possible; the auxiliary tank measures fuel use within 0.1 lb increments. Another objective was to obtain multiple replications if land area and timing of trials allowed. Small plots or farm scheduling

frequently conflicted with these objectives, limiting the ability to measure statistical significance beyond overall trends in data.

Fuel consumption was measured as gallons per acre (gal/acre). Although larger equipment consumes fuel at higher rates, fieldwork is also completed at a faster rate (acres/hr). Gallons per acre generally remains consistent and is a common, useful measure for farmers.

### Results and Discussion

Initially, single fuel measurements during chisel plowing were made at three different travel speeds (Table 1). Increasing tillage speed generally increases fuel use. A trend toward decreased fuel use at the mid-travel speed was unexpected and may have been due to becoming familiar with the instrumentation and equipment, as chisel plowing at other locations generally requires about one gallon per acre.

### Conclusions

Results are only from the first year of study. The farm staff plans to continue further fuel consumption comparisons next year.

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**Table 1. Chisel plowing at different travel speeds.**

Operation	No. of replications	Trt travel speed, mph	Gal/acre
Chisel plowing	3	4.6	0.91
	3	5.1	0.69
	3	5.5	1.10
LSD $\alpha=0.05$ <sup>a</sup>			NS <sup>b</sup>

<sup>a</sup>Least significant difference between treatments at a 95% confidence level.

<sup>b</sup>No significant difference at the 95% confidence level.