IOWA STATE UNIVERSITY
Digital Repository

Iowa State Research Farm Progress Reports

2003

Tillage Effects on Corn and Soybean Production

H. Mark Hanna
Iowa State University, hmhanna@iastate.edu

David Rueber
Iowa State University, drueber@iastate.edu

Follow this and additional works at: http://lib.dr.iastate.edu/farms_reports

 Part of the Agricultural Science Commons, and the Agriculture Commons

Recommended Citation
Hanna, H. Mark and Rueber, David, "Tillage Effects on Corn and Soybean Production" (2003). *Iowa State Research Farm Progress Reports*. 1513.
http://lib.dr.iastate.edu/farms_reports/1513

This report is brought to you for free and open access by Iowa State University Digital Repository. It has been accepted for inclusion in Iowa State Research Farm Progress Reports by an authorized administrator of Iowa State University Digital Repository. For more information, please contact digirep@iastate.edu.

Tillage Effects on Corn and Soybean Production

Abstract
Primary tillage systems differ in their impact on soil and crops as well as the amount of time and resources they require. Tillage may loosen soil, incorporate nutrients, warm or dry soil, manage weeds, bury residue, or level the surface for subsequent operations. Variable soil and weather conditions may result in different decisions about the need for tillage even within similar soil types. A three-year experiment compared corn and soybean yields among subsoil, chisel plow, striptill, and no-till systems on Webster silty clay loam soil.

Disciplines
Agricultural Science | Agriculture

This northern research and demonstration farm is available at Iowa State University Digital Repository: http://lib.dr.iastate.edu/farms_reports/1513

Tillage Effects on Corn and Soybean Production

H. Mark Hanna, extension ag engineer
David Rueber, superintendent

Introduction

Primary tillage systems differ in their impact on soil and crops as well as the amount of time and resources they require. Tillage may loosen soil, incorporate nutrients, warm or dry soil, manage weeds, bury residue, or level the surface for subsequent operations. Variable soil and weather conditions may result in different decisions about the need for tillage even within similar soil types. A three-year experiment compared corn and soybean yields among subsoil, chisel plow, strip-till, and no-till systems on Webster silty clay loam soil.

Materials and Methods

The experimental layout was a randomized complete block in both corn and soybeans. The four tillage treatments were subsoil (fall subsoil, spring field cultivate, plant), chisel plow (fall chisel, spring field cultivate, plant) strip-till (fall strip-till, plant), and no-till. The subsoil implement was a V-frame ripper with shanks mounted on 30-in. centers. Each shank had a straight point at the tip and small wings were mounted on the shank near the soil surface. Fall strip-tillage was done with an anhydrous ammonia knife operated at the 4-in. depth behind a leading coulter and row cleaner combination. Fertilizer for all treatments was broadcast applied in the spring in an effort to evaluate tillage effects rather than fertilizer application. Each of the four tillage treatments was replicated four times. Dates of planting and harvest are listed in Table 1.

Results and Discussion

Yields of corn and soybeans as affected by tillage are shown in Table 2. Soybean yields were not affected by tillage. Corn yields were slightly higher with full-width tillage and to a lesser extent strip-tillage than with no-till over the three-year period. Yields were not statistically different in any single year. Production costs for primary and secondary tillage passes based on custom charges from the annual ISU survey are $20, $19, and $7 per acre, respectively, for the subsoil, chisel plow, and strip-till systems. Considering costs for additional tillage operations and assuming other costs for fertilizer, weed control, seed, land, etc. to be the same, profit potential for corn production among the systems is equal. Slightly increased corn yield of systems in which seed is planted into tilled soil may indicate favorable early growth response in a warmer soil for this latitude in glacial-till soils. Because profit potential was not improved, however, and erosion hazard increased, producers should carefully consider benefits of extra tillage passes. Cornstalks were moderately lodged at harvest in one year. Soybean yield was unaffected by tillage, and profit potential increased by using no-till and avoiding extra tillage passes.

Establishing adequate corn population is an occasional problem in some reduced tillage systems. In this experiment, however, final corn populations were somewhat greater in reduced tillage treatments than in full-width tillage treatments one of three years and as averaged over three years (Table 3) despite planter adjustment for equal seed drop.

Table 1. Planting and harvest dates of tillage experiment at Kanawha.

	Planting		Harvest	
Year	Corn	Soybean	Corn	Soybean
2000	May 1	May 1	September 29	September 21
2001	May 16	May 16	October 24	October 1
2002	April 26	May 8	October 14	October 1

Table 2. Yields (bu/acre) of corn and soybeans as affected by tillage at Kanawha.

	Corn				Soybean			
Tillage	2000	2001	2002	Avg	2000	2001	2002	Avg
Subsoil	164	157*	190	170	58.0	52.5	53.7	54.7
Chisel plow	163	150†	196	170	60.0	51.4	52.8	54.7
Strip till	166	142	184	164	58.3	52.9	51.9	54.4
No till	158	141	185	161	61.6	52.8	54.3	56.2
$LSD_{0.05}$‡	NS§	NS	NS	7	NS	NS	NS	NS

*Cornstalks were moderately lodged in two blocks.
†Cornstalks were moderately lodged in one block.
‡Least significant difference at P=0.05 level.
§Differences are not statistically significant.

Table 3. Final corn populations (plants/acre) as affected by tillage at Kanawha.

Tillage	2000	2001	2002	Avg
Subsoil	26,400	27,500	28,300	27,400
Chisel plow	26,600	27,500	27,900	27,300
Strip till	28,600	28,900	30,600	29,400
No till	25,900	29,300	29,600	28,300
$LSD_{0.05}$*	NS†	NS	1,000	1,000

*Least significant difference at P=0.05 level.
†Differences are not statistically significant.