

Impact of Tillage Practices on Crop Enterprise Net Returns and Water Quality

Michael Langemeier

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Introduction

- KFMA Analysis, No-Till versus Mixed Tillage
 - Acres and Income
 - Crop Intensity and Crop Mix
 - Financial Performance
- Crop Rotation Analysis, Cheney Lake Watershed
 - Continuous Wheat
 - Wheat/Grain Sorghum/Soybeans
 - Tradeoff between Net Return, Risk, and Water Quality

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KFMA Analysis

- This study examines cropping practices and financial performance for no-till and mixed tillage farms.
- Data for Central KFMA farms with continuous data from 2006 to 2010 were used.
- Analysis involved 260 mixed tillage farms and 79 no-till farms.

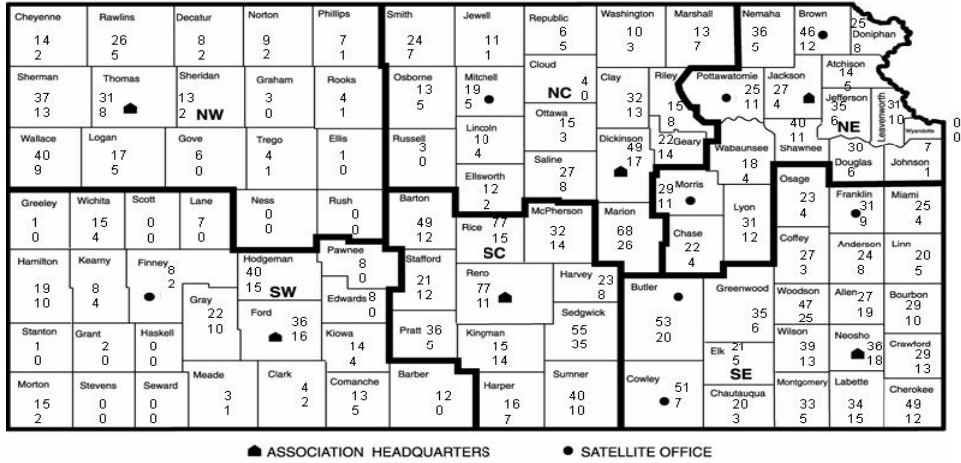
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Definitions

- For a farm to be classified as a **no-till farm**, the farm had to use no-till for all of their enterprises in 2010.
- **Crop intensity** is measured by dividing harvested acres by crop acres.
 - A ratio below 1.00 indicates that a farm fallows at least some of their acres.
 - A ratio above 1.00 indicates that a farm uses double cropping.

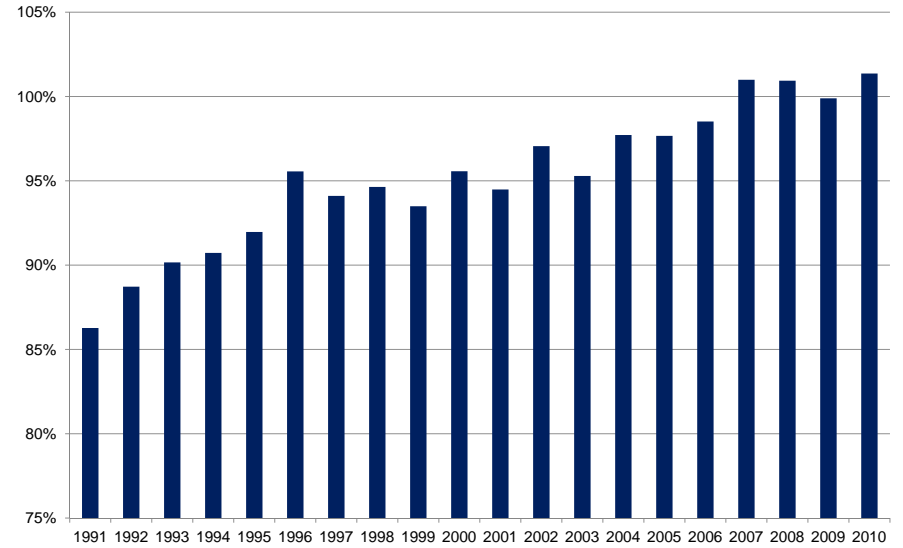
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Kansas Farm Management Association

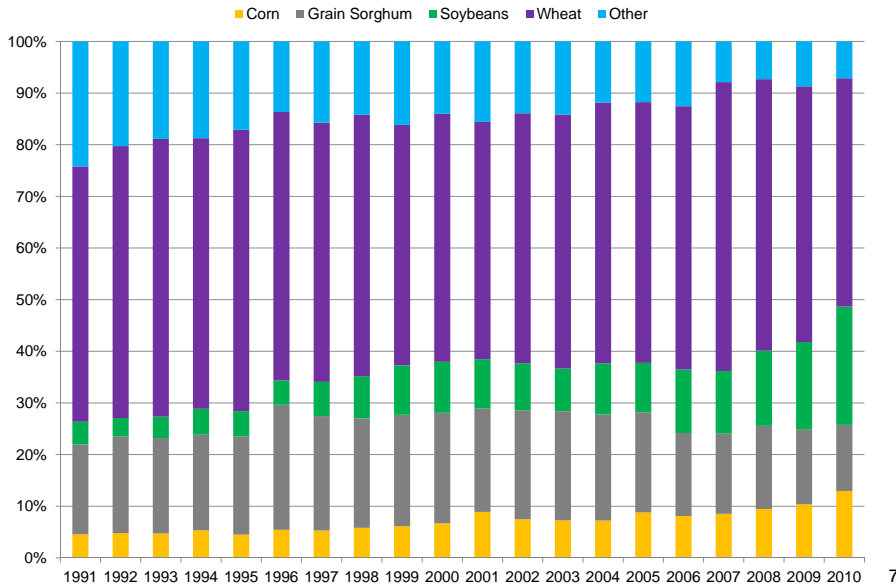


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Crop Intensity, Central KFMA Farms



Crop Mix, Central KFMA Farms



Results Acres and Income

Item	No-Till	Mixed Till	Significantly
			Different
Crop Acres	1,775	1,344	yes
Harvested Acres	1,906	1,353	yes
Value of Farm Production (VFP)	\$548,017	\$365,600	yes
Net Farm Income (NFI)	\$148,436	\$88,329	yes
Gross Crop Value per Acre	\$342.37	\$298.41	yes

Results

Crop Intensity and Crop Mix

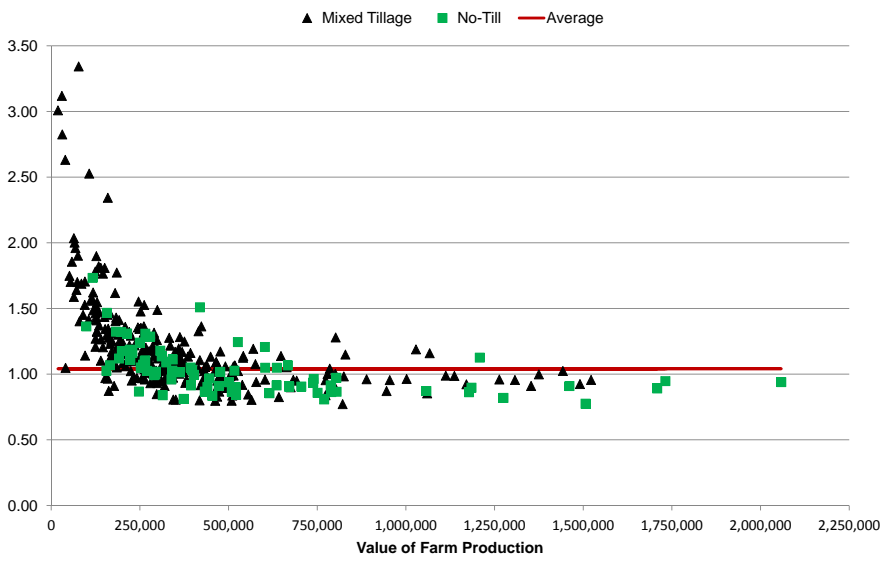
Item	No-Till	Mixed Till	Significantly Different
Crop Intensity Index	1.074	1.007	yes
% Crop Acres Planted to Wheat	39.95%	52.06%	yes
% Crop Acres Planted to Feed Grains	31.00%	22.40%	yes
% Crop Acres Planted to Oilseeds	26.65%	14.88%	yes

Results

Financial Ratios

Item	No-Till	Mixed Till	Significantly Different
Economic Total Expense Ratio (ETER)	0.968	1.074	yes
Operating Profit Margin Ratio	0.2065	0.1603	yes
Asset Turnover Ratio	0.4274	0.3355	yes
Machinery Investment per Crop Acre	\$167.28	\$159.13	no
Machinery Cost per Crop Acre	\$63.31	\$70.78	yes
Labor Cost as a Percent of VFP	13.11%	16.08%	yes

Economic Total Expense Ratio, KFMA Farms



Summary

- Results above illustrate that central KFMA no-till farms are larger, produce relatively less wheat and relatively more feed grains and soybeans, and have higher financial performance.

Crop Rotation Analysis Cheney Lake Watershed

- This study examines the tradeoff between crop rotation profitability, downside risk, and water quality.

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Crop Rotations

- Continuous Wheat
- Wheat/Grain Sorghum/Soybean
- Wheat/Wheat/Grain Sorghum/Grain Sorghum
- Corn/Soybean
- Alfalfa/Wheat

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Data for Budgets and Risk Model

- Soil Type: Nalim Loam, 0 to 1% slopes
- Water Quality: SWAT
- Crop Yields: SWAT
- Cost and Price Estimates:
 - Farm management guides
 - Agronomic publications
 - Kansas Agricultural Statistics

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Water Quality Variables

- Runoff
 - Water yield
 - Sediment yield
- Total Phosphorus
 - Organic
 - Mineral
 - Soluble

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Water Quality Indices

- To facilitate comparisons among crop rotations, the values of the three water quality variables were assigned a value of 1.0 for the base rotation, continuous wheat under a conventional tillage production system.

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Target MOTAD Model

- Objective Function
 - Maximize net return to land and management per acre
- Constraints
 - Downside risk
 - Average annual deviations below target income of \$60 per acre
 - Water quality
- Trace out risk/return frontier by changing level of allowable deviations below target income

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Results

- Risk and Return for each Crop Rotation
- Target MOTAD Frontiers
 - Profit Maximum
 - Low Risk

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Continuous Wheat Rotation Comparisons

	W-CT	W-RT
Net Return	\$92.39	\$107.75
Risk	5.98	2.43
Water Yield	1.000	0.917
Sediment Yield	1.000	0.403
Total Phosphorus	1.000	0.433

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Wheat/Grain Sorghum/Soybean Rotation Comparisons

	WGS-CT	WGS-RT	WGS-NT
Net Return	\$72.16	\$84.22	\$95.11
Risk	15.67	9.86	4.96
Water Yield	1.578	1.309	1.083
Sediment Yield	2.273	1.167	0.522
Total Phosphorus	2.085	1.150	0.655

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Target MOTAD Solutions

	Profit Maximum	Low Risk
Net Return	\$113.33	\$110.80
Risk	1.15	0.00
Water Yield	0.861	0.894
Sediment Yield	0.379	0.403
Total Phosphorus	0.408	0.452
W-RT	0.920	0.720
WGS-NT	0.000	0.200
AW	0.080	0.080

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Summary

- Adding an alfalfa rotation to the crop rotation mix improved net return, lowered risk, and improved water quality.
- In addition to alfalfa, the optimal crop rotation mixes included continuous wheat under a reduced tillage production system and wheat/grain sorghum/soybean rotation under a no-till production system.

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Contact Information

- Michael Langemeier
 - mlange@agecon.ksu.edu
 - Ag Manager Contributor Site (www.agmanager.info)
 - KFMA Newsletter
 - Recommendations for Further Reading

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