

The Feasibility of Improving Water Quality in the Cheney Lake Watershed

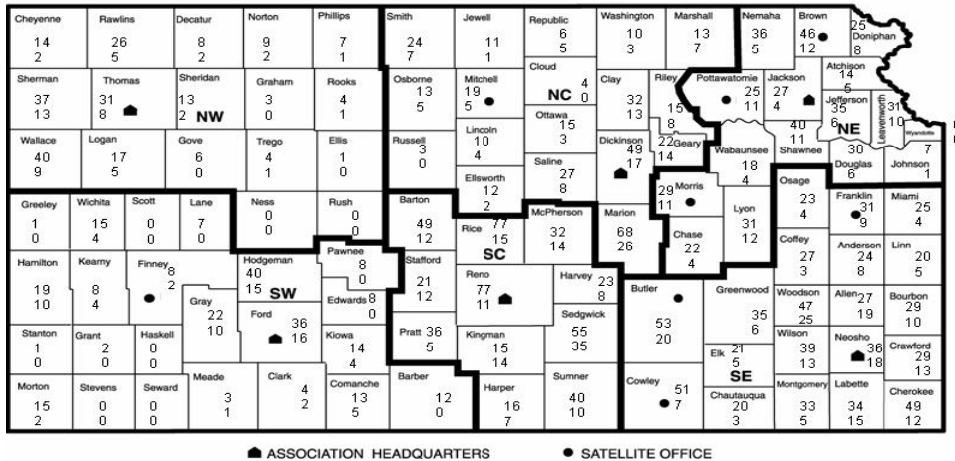
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2011 CEAP Meeting
February 7, 2011

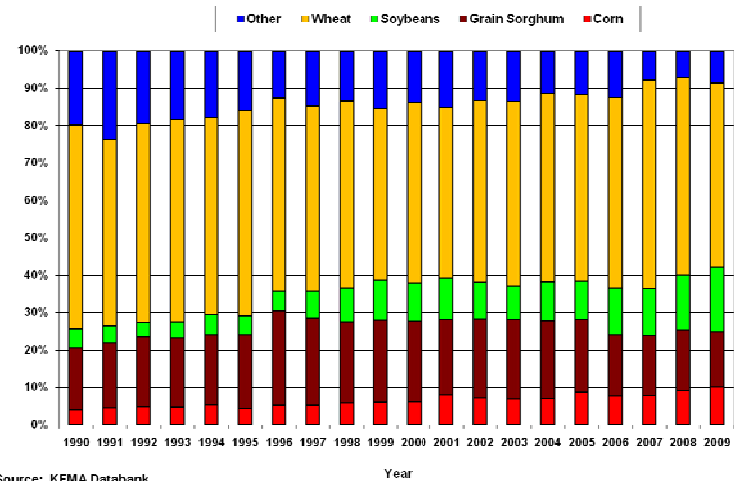
Introduction

- KFMA Data
 - Cropping Mix
 - Crop Intensity
 - No-Till versus Mixed Tillage
- Crop Rotation Analysis
 - Continuous Wheat
 - Wheat/Grain Sorghum/Soybeans
 - Tradeoff between Net Return, Risk, and Water Quality

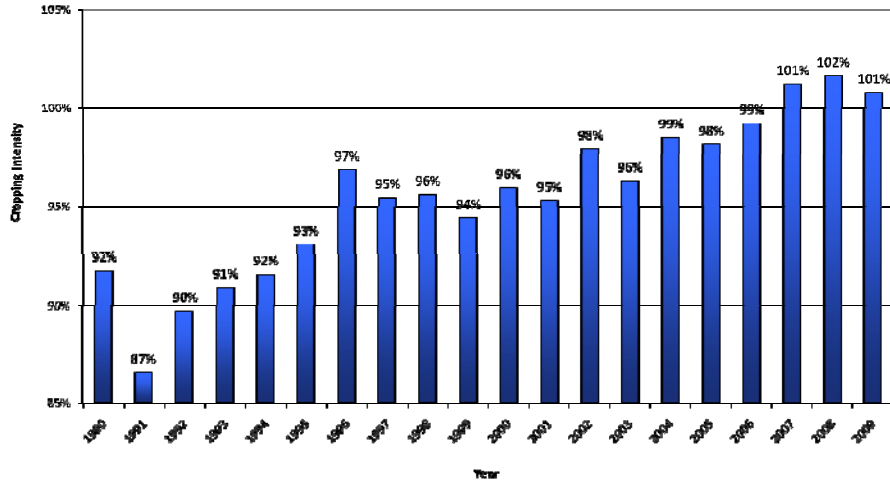
Kansas Farm Management Association



Central Kansas Crop Mix



Central Kansas Cropping Intensity



Source: KFMA Databank

KFMA Data

- Central KFMA farms with continuous data from 2005 to 2009
- Attempt to quantify cropping practices, efficiency, and financial performance gains for no-till production systems
- Farms were designated as no-till or mixed tillage
 - 280 mixed tillage farms
 - 85 no-till farms

KFMA Data

Item	No-Till	Mixed Till	Significantly Different
Crop Acres	1,724	1,303	yes
Harvested Acres	1,840	1,304	yes
Value of Farm Production (VFP)	\$485,682	\$328,414	yes
Net Farm Income (NFI)	\$121,743	\$69,244	yes
Gross Crop Value per Acre	\$303.87	\$271.18	yes

KFMA Data

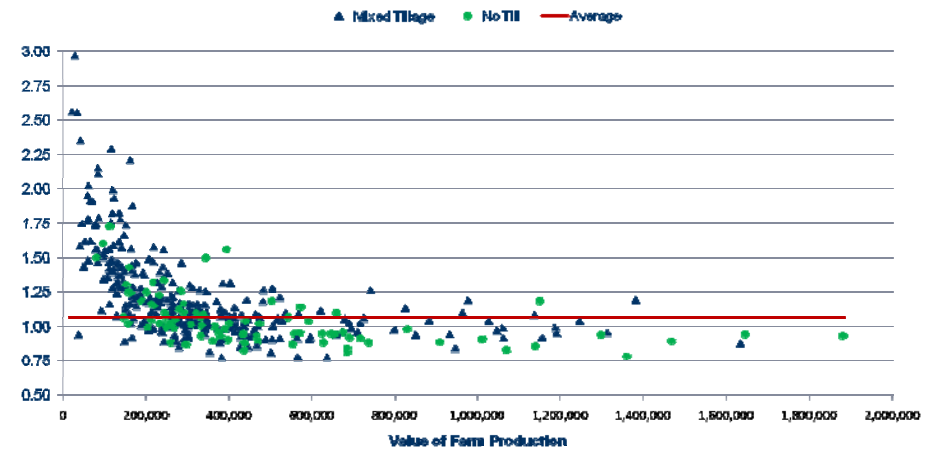
Item	No-Till	Mixed Till	Significantly Different
Crop Intensity Index	1.067	1.001	yes
% Crop Acres Planted to Wheat	41.94%	52.65%	yes
% Crop Acres Planted to Feed Grains	30.63%	23.25%	yes
% Crop Acres Planted to Oilseeds	23.84%	13.20%	yes

KFMA Data

Item	No-Till	Mixed Till	Significantly Different
Economic Total Expense Ratio (ETER)	0.987	1.098	yes
Operating Profit Margin Ratio	0.1861	0.1232	yes
Asset Turnover Ratio	0.4284	0.3365	no
Machinery Investment per Crop Acre	\$150.06	\$151.47	no
Machinery Cost per Crop Acre	\$57.25	\$66.98	yes
Labor Cost as a Percent of VFP	13.80%	17.07%	yes

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Economic Total Expense Ratio



Crop Rotation Analysis

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

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Crop Rotation Analysis

- 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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Crop Rotation Analysis

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

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Crop Rotation Analysis

- 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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Crop Rotation Analysis

- 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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Crop Rotation Analysis

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

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Continuous Wheat

	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

	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

- This study examined crop rotations in South Central Kansas.
- 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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Future Work

- Results will also be generated for additional soil types including Farnum and Funmar loams, 0 to 1% slopes; and Saltcreek and Naron fine sandy loams, 1 to 3% slopes.
- In addition to the rotations discussed above, the following crop rotations will be examined:
 - CRP
 - Switchgrass

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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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