

# **Economic Synergism Between Agriculture and Bioenergy/Biobased Industry**

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# *Acknowledgments*

- The basic modeling work was a joint effort between DOE's *Oak Ridge National Laboratory*, USDA's *Office of Energy Policy and New Uses*, and the *Agricultural Policy Analysis Center* of The University of Tennessee. The original reference is:

De La Torre Ugarte, Daniel G., Marie E. Walsh, Hosein Shapouri, and Stephen P. Slinsky. "The Economic Impacts of Bioenergy Crop Production in U.S. Agriculture." (2000)

# *Introduction*

- Brief background on the Ag Sector
- Performance of the Ag Sector
- Synergism with Bioenergy/Biobased Industry
  - Feedstock
  - Traditional Crops vs Dedicated Crops
  - Closer look at dedicated crop
- Final Remarks

# *Pre-1996 Farm Bill*

## *Background*

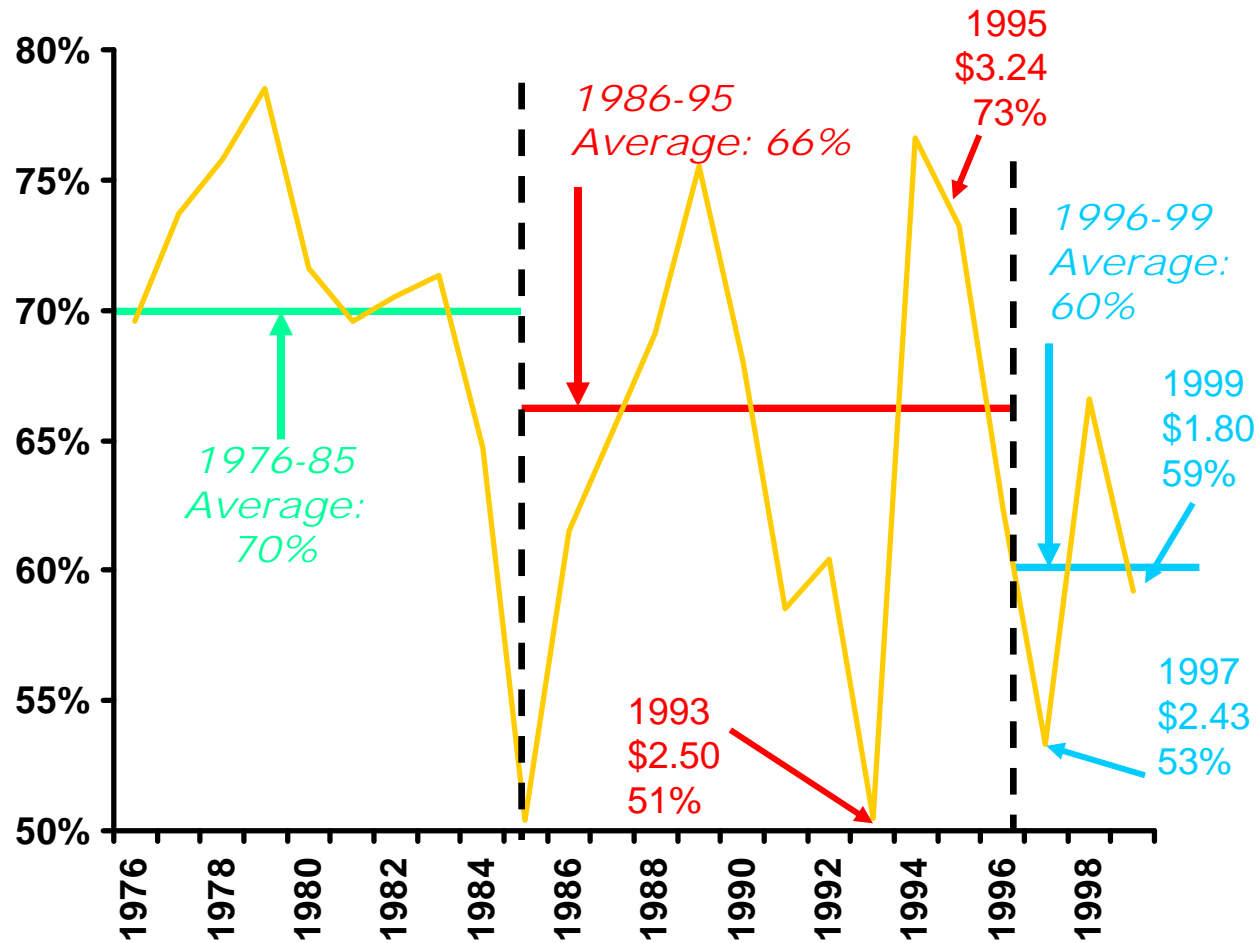
- Government Stock Management
  - Loan rate a floor price.
  - Price will not go as high due to govt. released stocks
- Mandatory Set Asides:
  - Limits planting when stock-to-use ratio is high
  - Reduced exportable surplus
- Limited Planting Flexibility
  - Farmers had limited ability to decide which crops to plant and how much acreage
- Direct Government Payments

# *Expectations on 1996 Farm Bill*

- “High” Prices and Incomes of 1995/1996
- Because:
  - Rapid Per Capita Income Growth in China/Asia
  - With Planting Flexibility & Decoupled Payments  
Farmers Would Plant for the Market – Reduce  
Production When Needed
  - With No Brake on Prices, Importers Will Import More  
From the U.S. When Prices Decline –Increase  
Consumption & Reduce Production When Needed
  - With Marketing Loans, Competitors Would Not Be  
Under U.S. Price Support Umbrella –Reduce  
Production When Needed

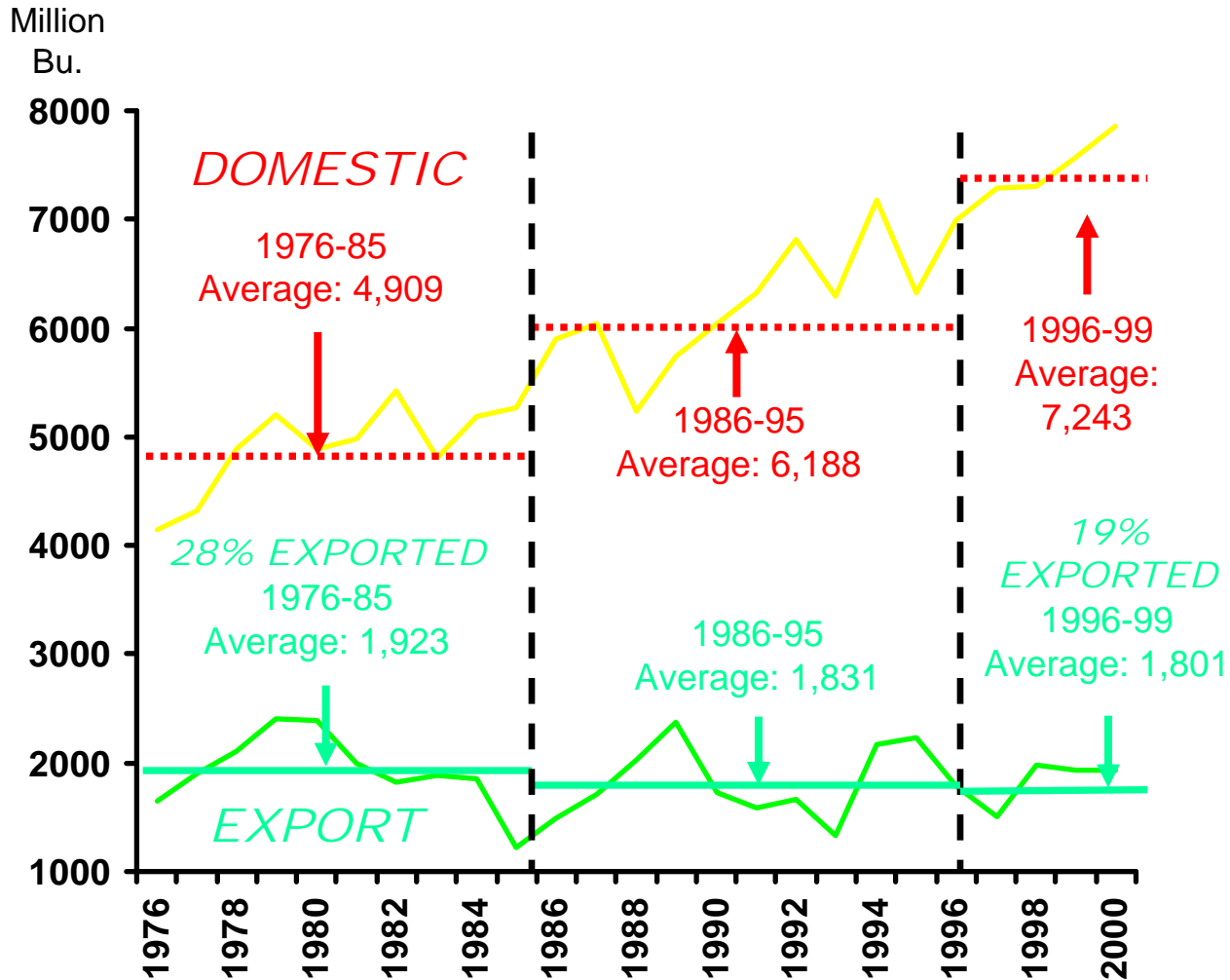
# CORN

## U.S. Share of World Exports

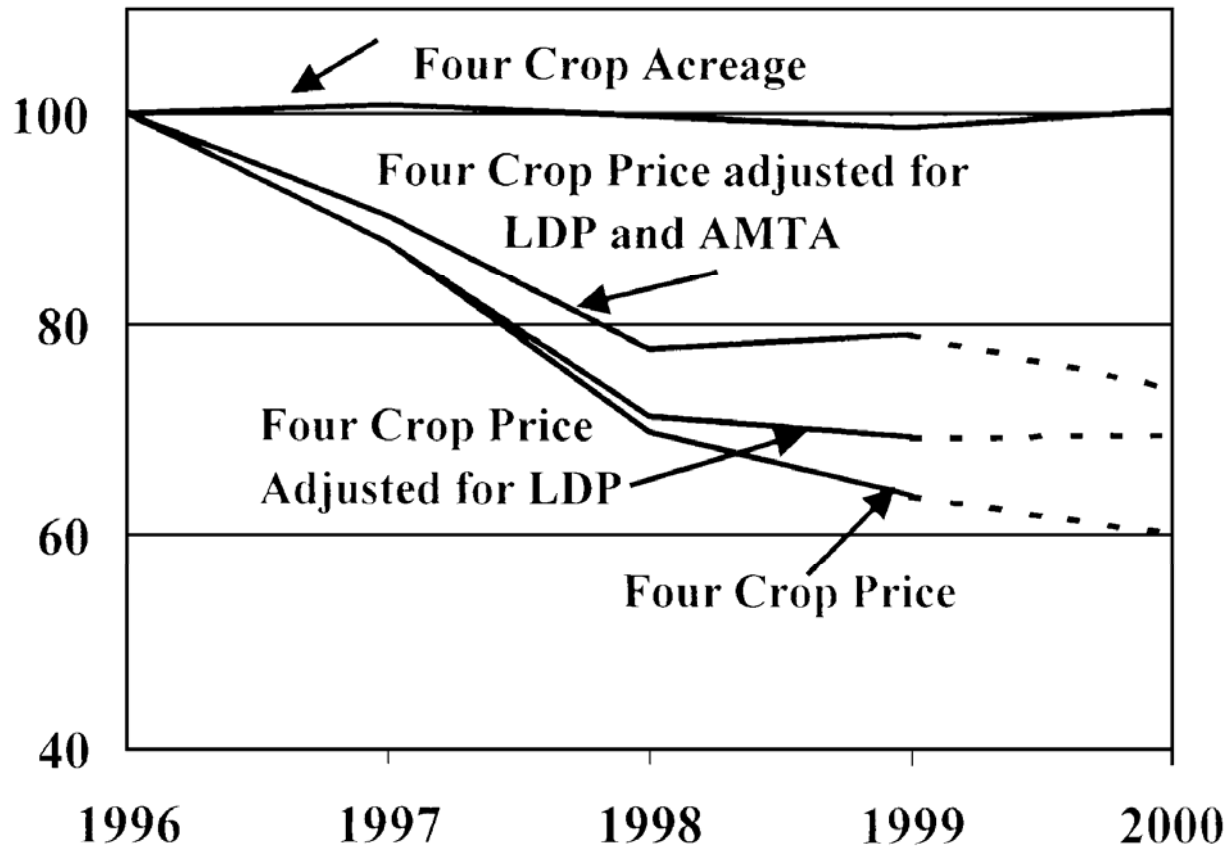


# CORN

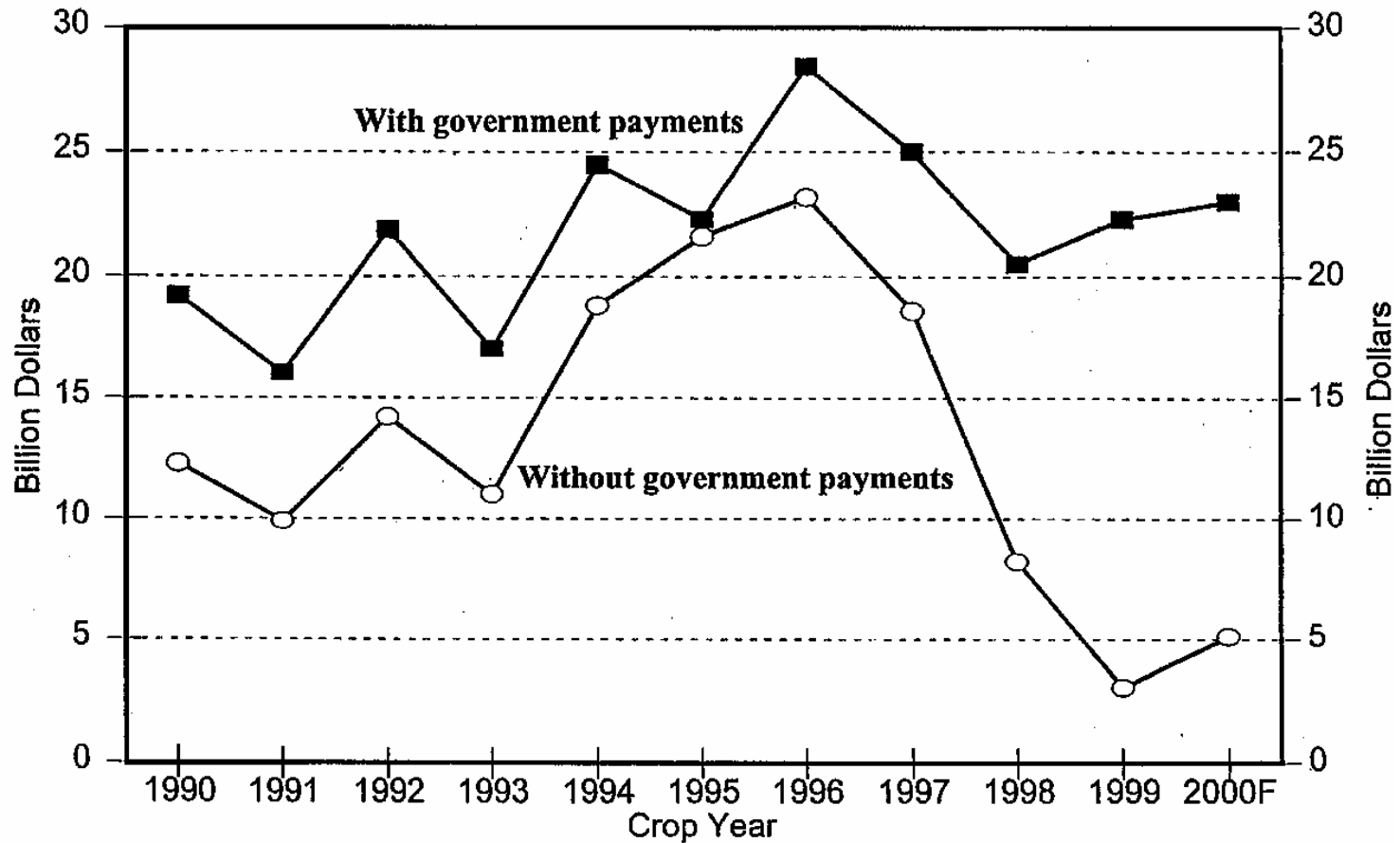
## U.S. Domestic and Export Demand



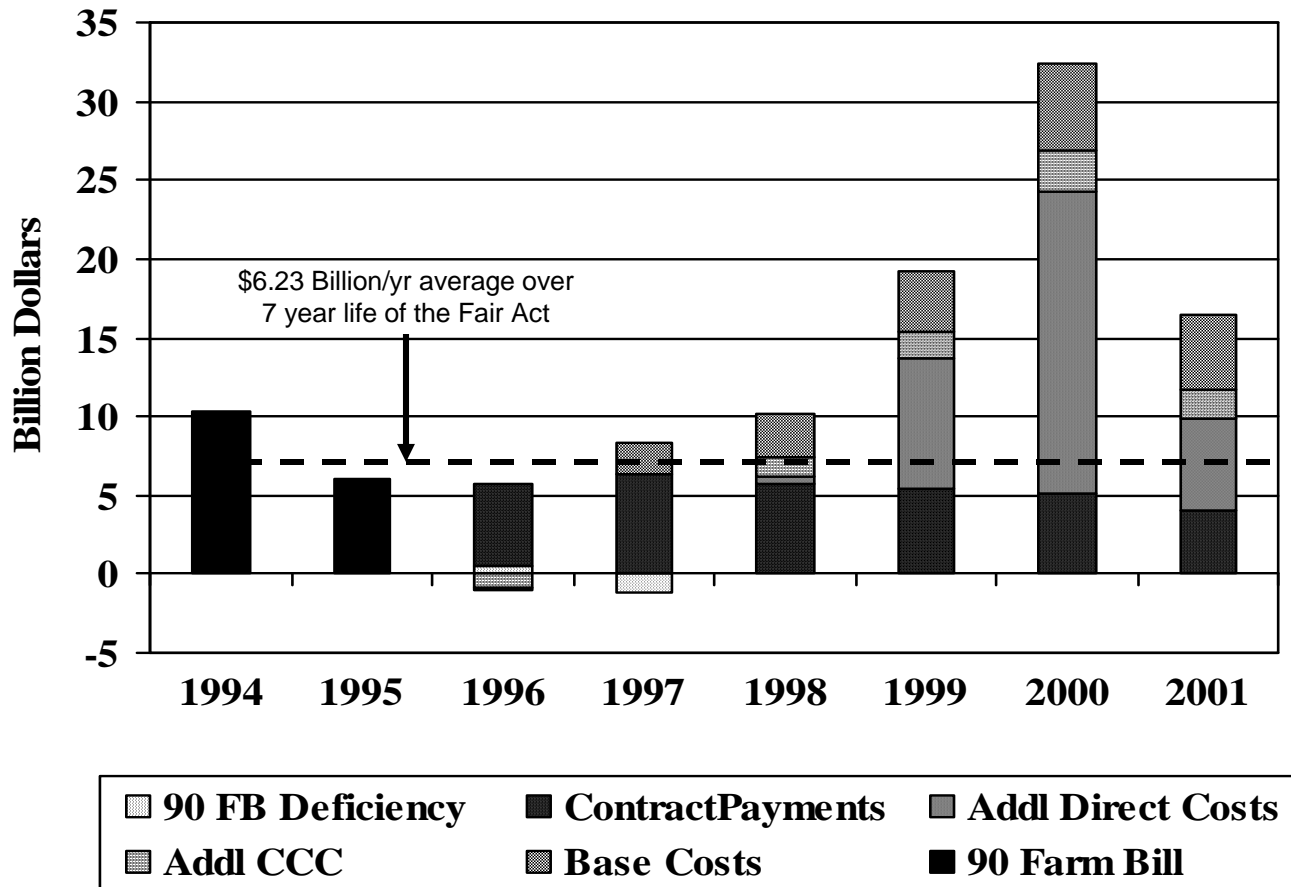
# *Indexed Crop Acreage and Price with Adjustments*



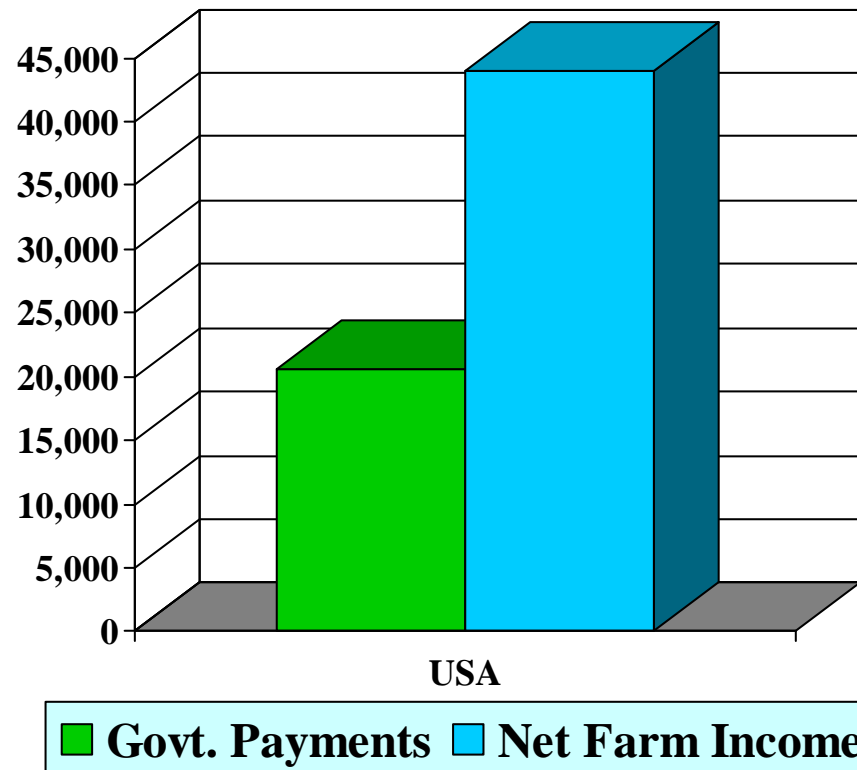
# *Net Cash Income for 8 Major Crops*



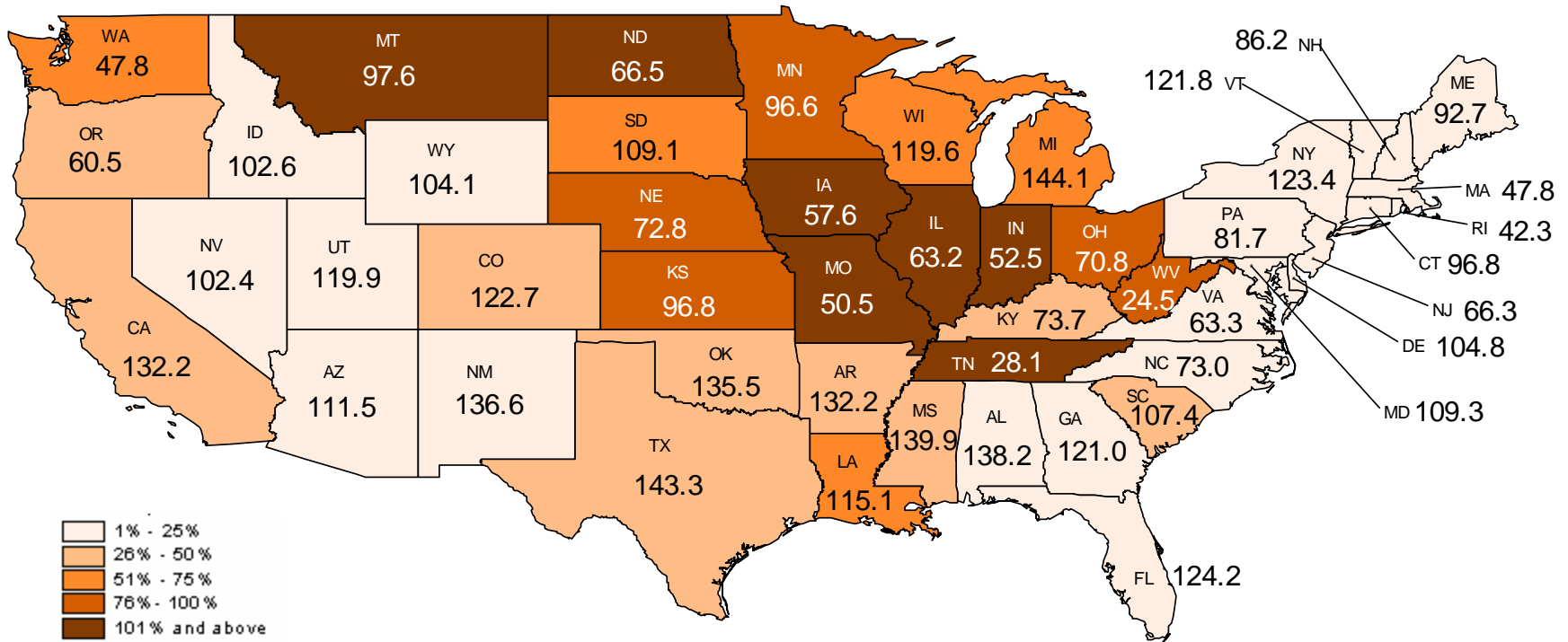
# Government Outlays by Source 1994-2001



# *1999 Net Farm Income and Government Payments*



# 1999 Government Payments as a Percent of Net Farm Income



- payments

# *Linkage with Bioenergy/Biobased Industry*

- Source of :
  - Increase Demand for a Specific Commodity
  - Increase Revenues for a Specific Crop
  - Increase Demand for Cropland Use

# *Increasing Revenues for a Crop* *(crop residues)*

- **Pros:**
  - Generates additional income for farmers growing the crop
  - Already available on the ground
- **Cons:**
  - Environmental concerns and regulations limit availability
  - Does not have an agricultural wide impact

# *Increasing Demand for a Crop* *(corn, soybeans)*

- **Pros:**
  - Increases crop price/farm income/govt.savings
  - If corn-ethanol, industry already developed
- **Cons:**
  - Direct competition with traditional uses
  - May not have a positive agricultural wide impact (by-products)
  - Limited geographic impact

# *Increasing Demand for Cropland*

## *(switchgrass, poplars, willows)*

- **Pros:**

- Wider geographic impact
- Price and income benefits across crops
- Alternative use of cropland
- Indirect competition with traditional uses

- **Cons:**

- Industry is not developed/unknown business environment
- Institutional inertia

# *Developing the Synergism*

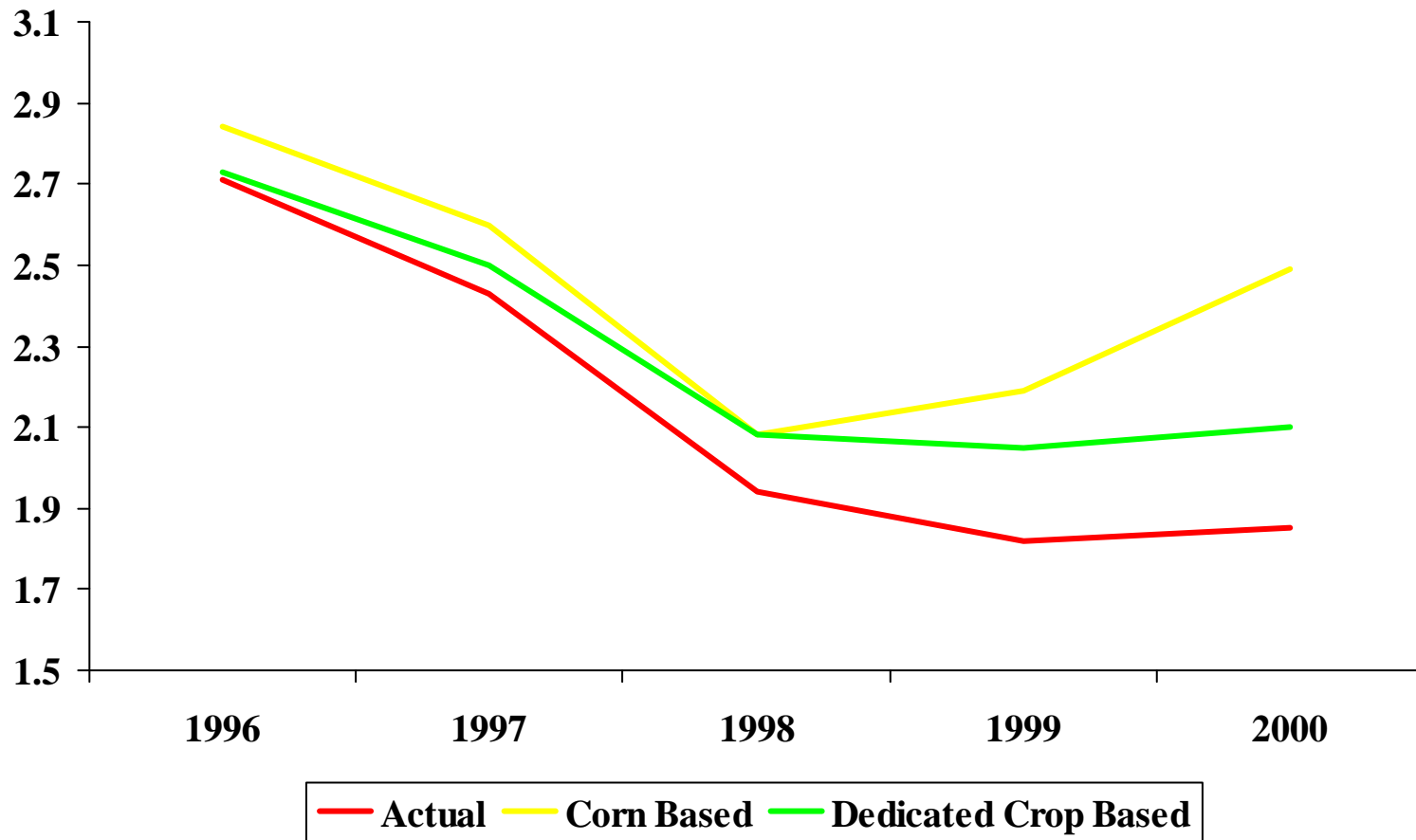
- Increase demand for use of traditional crop (corn) and increase demand for cropland (dedicated crop) offer larger possibilities.
- Use of residues, while generates additional farm income, has a limited sector wide impact.

## *What if...*

- Pursued higher ethanol production for the 1996-2000 period.
- Hypothetical Target: by 2000 7.6 billion gallons.
- Two alternative strategies:
  - **Based on Corn**
  - **Based on Dedicated Crop ( Switchgrass)**

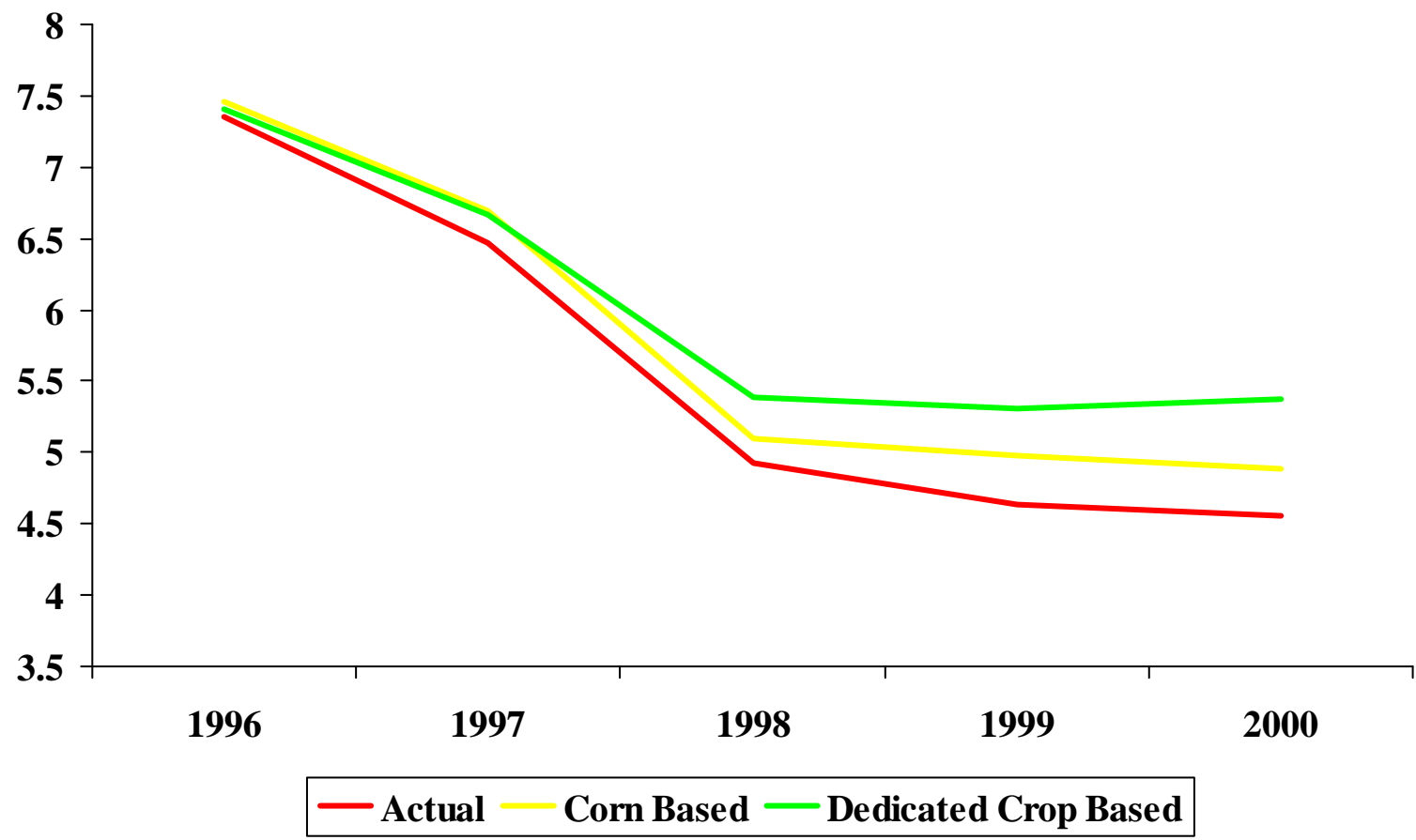
# *Corn Price*

## Actual vs Simulated



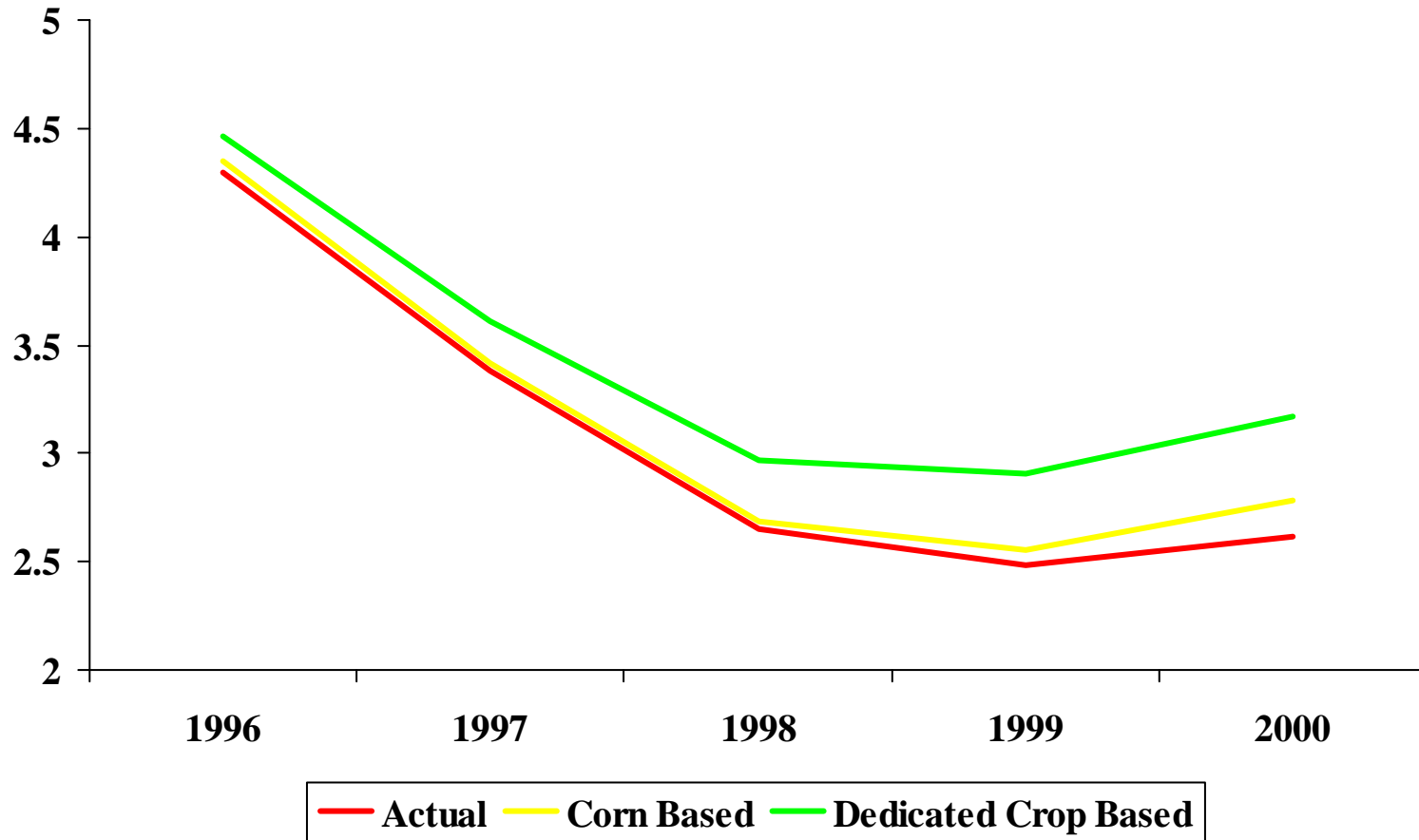
# *Soybeans Price*

## Actual vs Simulated



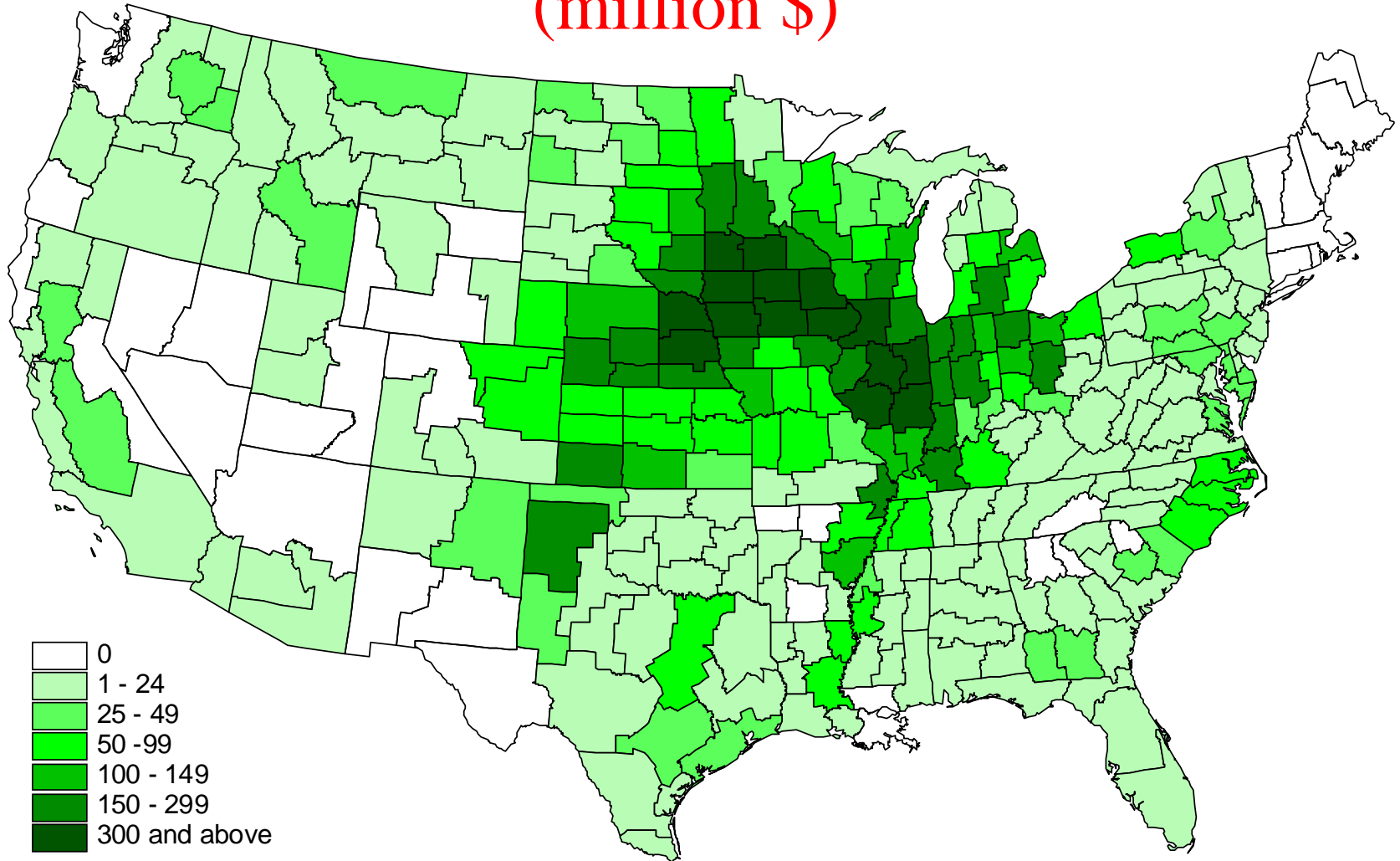
# *Wheat Price*

## Actual vs Simulated



# *Corn Based*

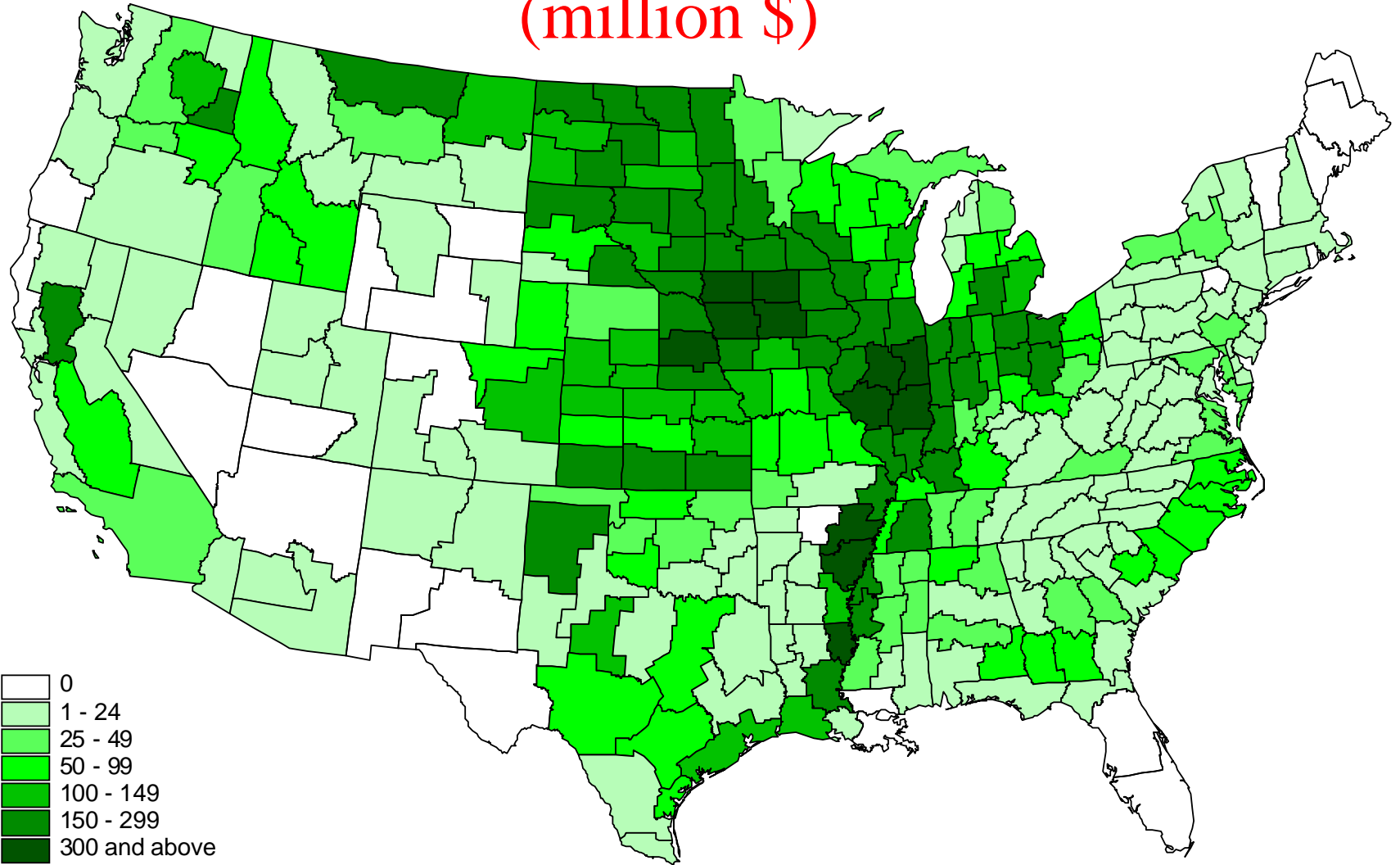
Change in Market Returns, 1996-2000  
(million \$)



# *Dedicated Crop Based*

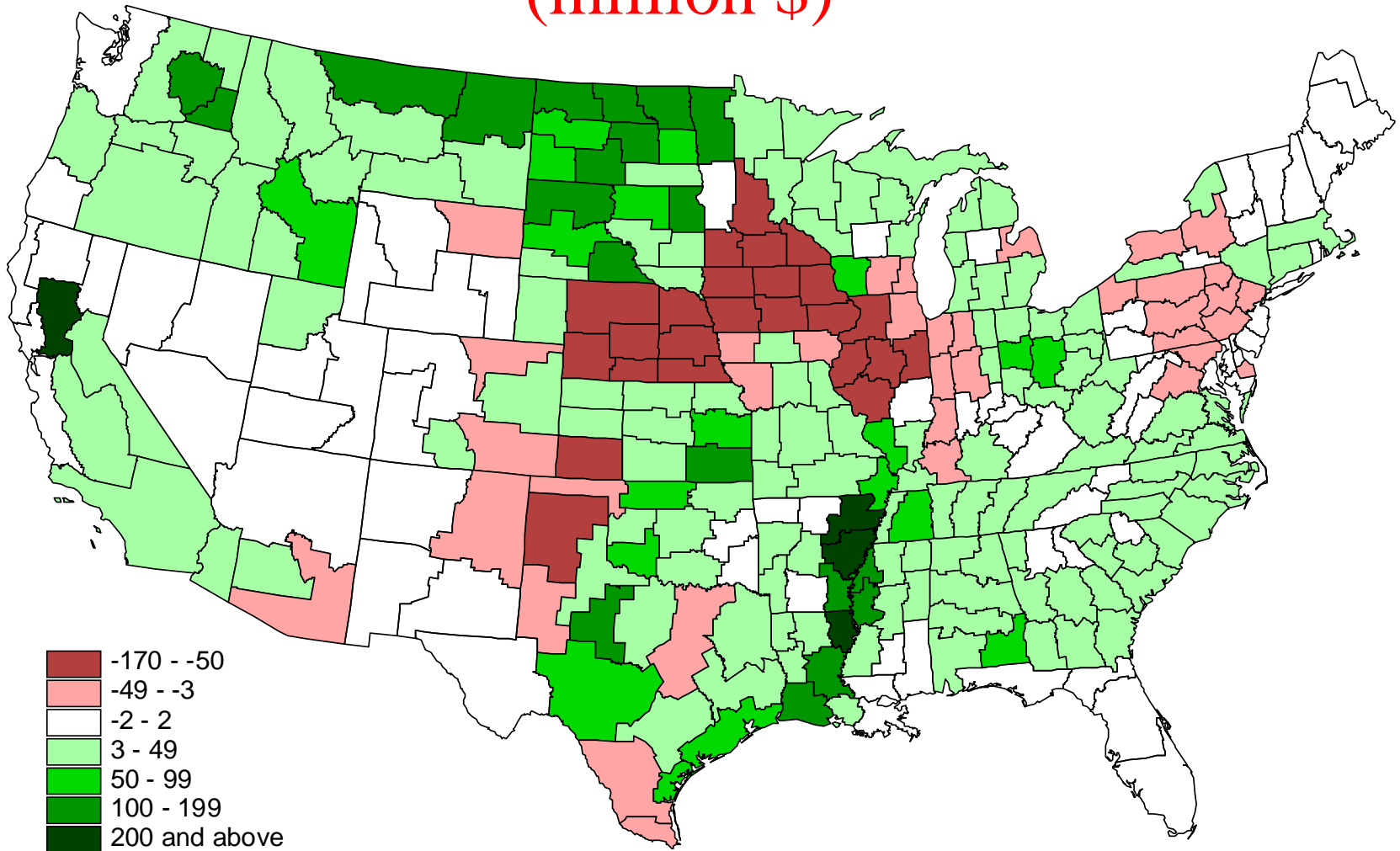
Change in Market Returns, 1996-2000

(million \$)



# *Dedicated Crop vs Corn*

Difference in Market Returns, 1996-2000  
(million \$)



# *Cost of Producing Ethanol*

\$ x gallon

	<i>Corn</i> 2.44 \$/bu	<i>Corn</i> 2.86 \$/bu	<i>Switchgrass</i> 50 \$/dt
<i>Feedstock</i>	0.86	1.00	0.64
<i>Processing</i>	0.49	0.49	1.12
<i>By-Products credit</i>	-0.25	-0.25	-0.11
<i>Production Cost</i>	1.10	1.24	1.65

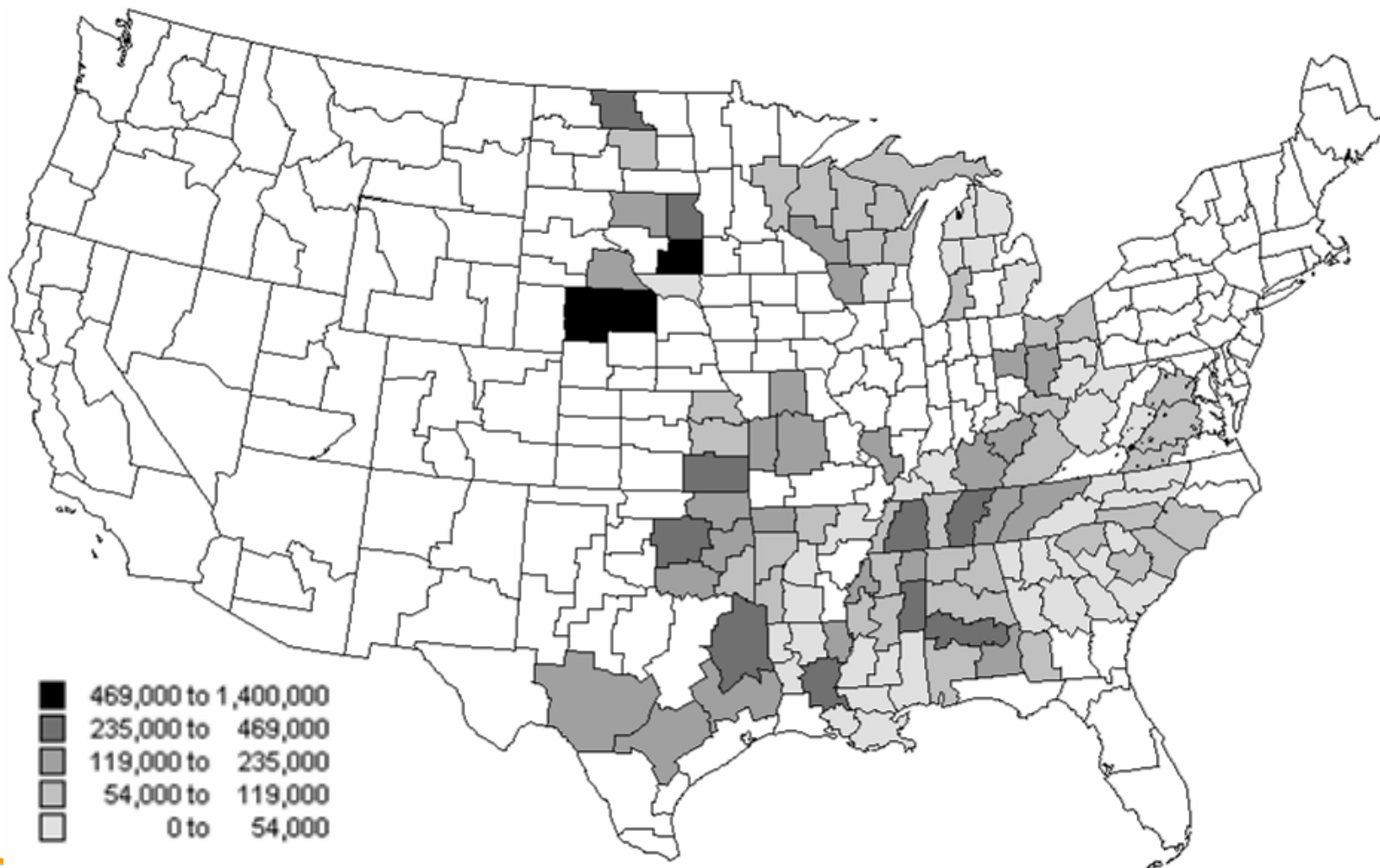
K. Ibsen, A. McAloon, F. Taylor, R. Wooley, and W. Yee, *Determining the Cost of Producing Ethanol from Corn Starch and Lignocellulosic Feedstocks*, NREL/TP-580-28893, Golden, CO: U.S. Department of Energy, National Renewable Energy Laboratory, 2000.

# *Focusing on Dedicated Crops*

- Selected Switchgrass for geographic coverage
- Considered farm gate prices at \$30 and \$40 per dry ton
- Continued with 1996 – 2000 period of analysis

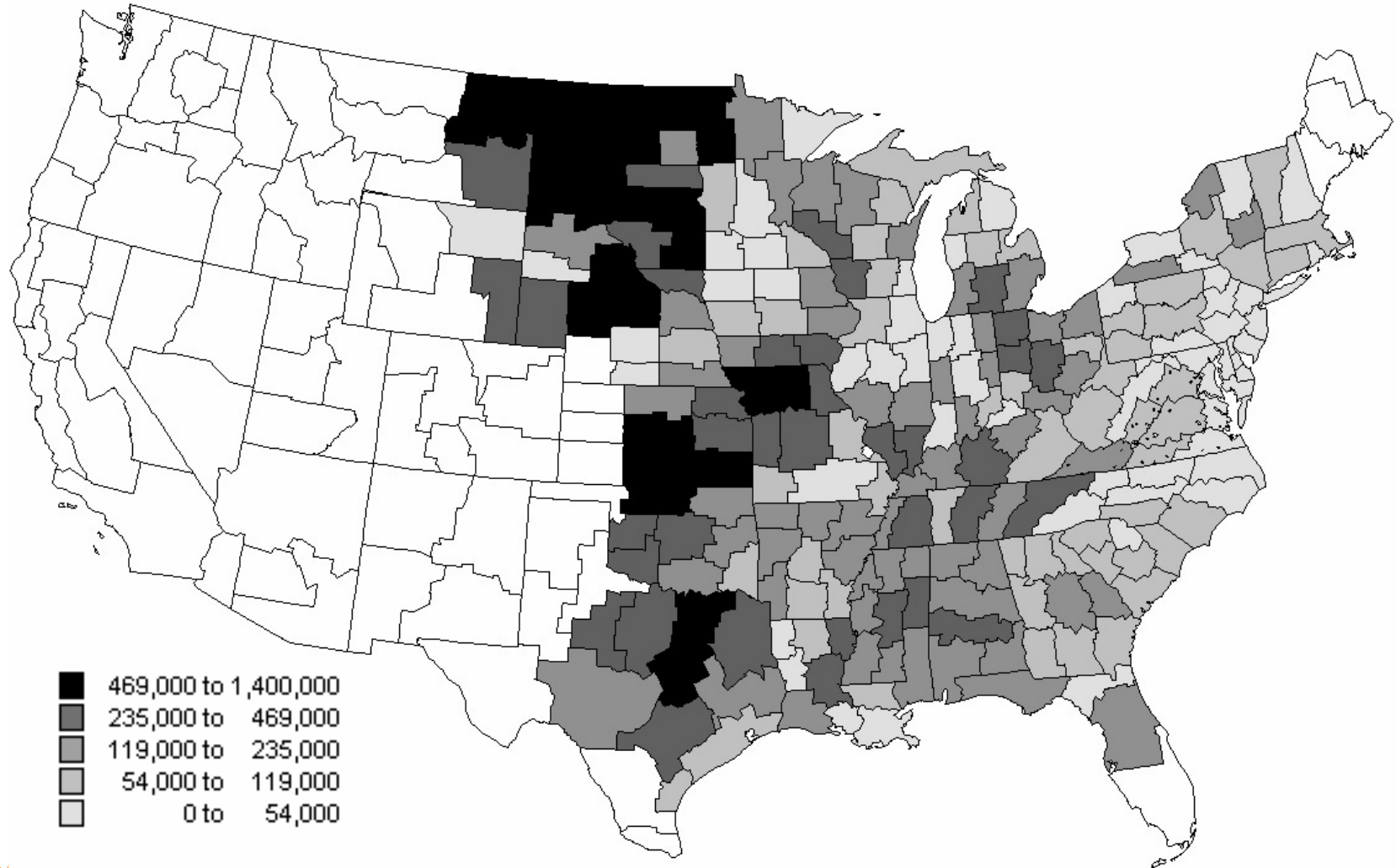
# *Dedicated Crops*

**Scenario \$30 / dt : Acres Planted to Switchgrass, 2000**



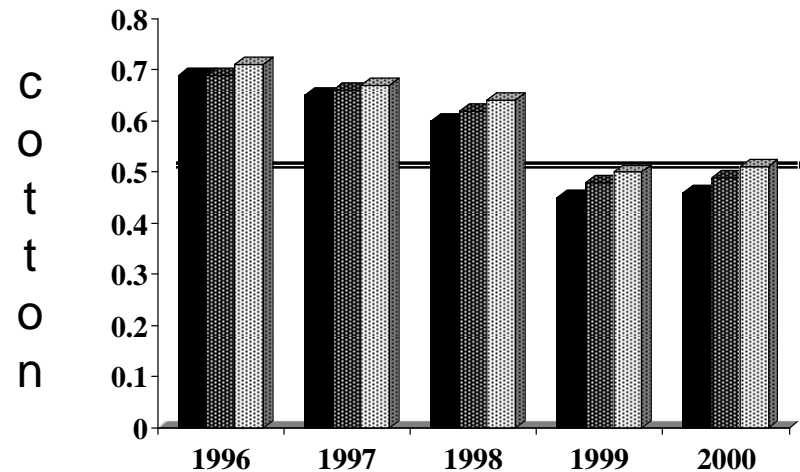
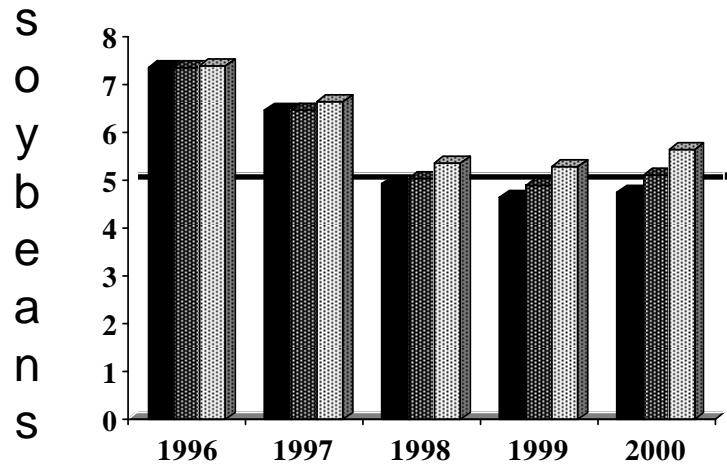
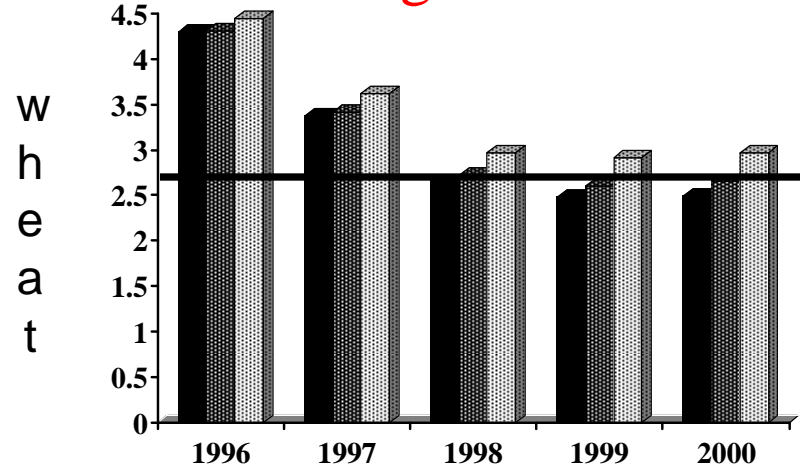
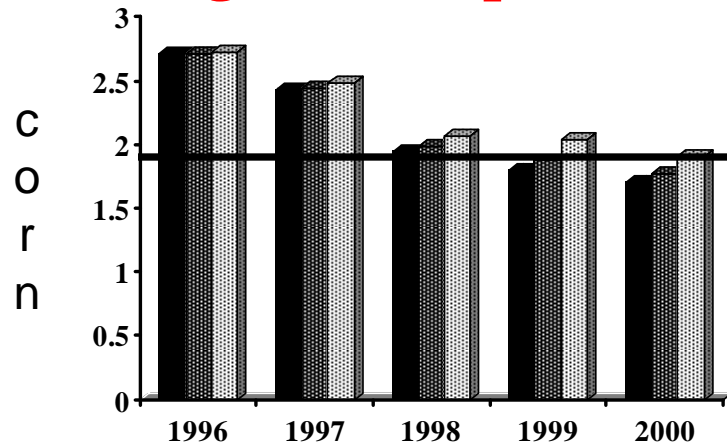
# *Dedicated Crops*

**Scenario \$40 / dt : Acres Planted to Switchgrass, 2000**



# Dedicated Crops

## Changes in Crop Prices: Historical & switchgrass scenarios



# *Dedicated Crop*

## Comparing Actual vs. What If Annual Average 1996 -2000

		<b>Actual</b>	<b>Switchgrass \$30/dt</b>	<b>Scenario \$40/dt</b>
Switchgrass Acreage	mil. acres	-	9.42	22.23
Market Returns	mil. \$	21,547	22,579	25,102
Loan Deficiency Payments	mil. \$	1,888	952	206
Emergency Payments	mil. \$	3,903	3,903	3,903
Total Returns	mil. \$	27,338	27,434	29,211

# *Dedicated Crop*

## Bottom Line

Annual Average 1996 -2000

		<b>Bioenergy Scenario</b>	
		<b>\$30 / dt</b>	<b>\$ 40 / dt</b>
Government Savings	mil. \$	936	1,682
Change in Total Returns	mil. \$	(96)	1,873
Potential Switchgrass Subsidy	\$ / dt	56.5	50.6

# *Cost of Producing Ethanol*

\$ x gallon

	<i>Corn</i> <i>2.44 \$/bu</i>	<i>Corn</i> <i>2.86 \$/bu</i>	<i>Switchgrass</i> <i>50 \$/dt</i>	<i>Switchgrass</i> <i>40 \$/dt</i>
<i>Feedstock</i>	<b>0.86</b>	<b>1.00</b>	<b>0.64</b>	<b>0.53</b>
<i>Processing</i>	<b>0.49</b>	<b>0.49</b>	<b>1.12</b>	<b>1.12</b>
<i>By-Products credit</i>	<b>-0.25</b>	<b>-0.25</b>	<b>-0.11</b>	<b>-0.11</b>
<i>Feedstock “subsidy”</i>	<b>0</b>	<b>0</b>	<b>-0.64</b>	<b>-0.53</b>
<i>Production Cost</i>	<b>1.10</b>	<b>1.24</b>	<b>1.01</b>	<b>1.01</b>

K. Ibsen, A. McAloon, F. Taylor, R. Wooley, and W. Yee, *Determining the Cost of Producing Ethanol from Corn Starch and Lignocellulosic Feedstocks*, NREL/TP-580-28893, Golden, CO: U.S. Department of Energy, National Renewable Energy Laboratory, 2000.

# *Concluding Remarks*

- Agricultural Impacts
- Consumer Impacts
- Synergism
- Research Agenda
  - Price variability
  - Environmental impacts
  - Logistics/institutional arrangements
  - Limits of agriculture as source of feedstock

# For More Information ... [www.agpolicy.org](http://www.agpolicy.org)

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The screenshot shows a Microsoft Internet Explorer browser window displaying the APAC website. The address bar shows <http://apacweb.ag.utk.edu/>. The website header includes the APAC logo and the text "AGRICULTURAL POLICY ANALYSIS CENTER online". The main content area is divided into several sections:

- Agricultural Policy Analysis Center**: Contact information for the University of Tennessee, including the address (310 Morgan Hall, Knoxville, TN 37996), phone number (865) 974-7407, and fax number (865) 974-7298. It also includes a link to the APAC Listserv and a request for user comments.
- Weekly Agricultural Policy Articles by Darryl E. Ray**: A featured article titled "Are we courting disaster?" dated January 18, 2002.
- Projects and Research**: A section describing special projects and primary research interests, including the TnFARMS project, the POLYSYS model, the APAC Budgeting System (ABS), and tobacco research.
- Presentations**: A section listing presentations from the 2002 Tobacco Workers Conference. Two presentations are highlighted:
  - Expectations vs. Experience: Use of Tobacco Settlement Payments in Major Tobacco States** by Kelly H. Tiller, presented on January 16, 2002 in Pinehurst, NC. Links to the presentation and associated paper are provided.
  - Impacts of Tobacco Program & Production Changes on Tennessee's Economy** by Kelly H. Tiller, presented on January 16, 2002 in Pinehurst, NC. Links to the presentation and associated paper are provided.
- Publications**: A section for browsing or downloading full copies of all APAC publications, including research reports, summaries, professional papers, congressional testimonies, and others.