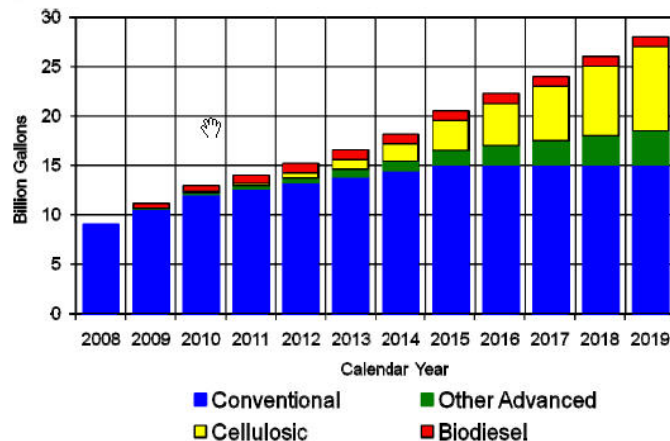


Potential Economic Impacts if Environmental Services from Agriculture are Recognized

Burton C. English, Professor



RES

Climate Policy
&
Potential Offsets

An Economic Impact Analysis of Potential New Markets and Opportunities for Agriculture resulting from a Federal Renewable Portfolio Standard with Four Case Studies: Colorado, Florida, Kansas, and North Carolina



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Agricultural Economics



This Study

- Provides an economic analysis of the economic costs and benefits from a Federal renewable energy standard (RES) policy to agricultural counties in Colorado, Florida, Kansas, and North Carolina.
- Addresses some key questions:
 - Impact of RES policy on farm revenue?
 - Potential of new markets for biomass and how much revenue could biomass sales generate at the farm level?
 - Direct employment opportunities that result from building out new electric generating facilities?
 - Job growth on the farm supported by increased biomass production?

RES Policies Considered

- Federal RES policies in the 111th Congress:
 - 20 percent Federal renewable energy standard (Bingaman)
 - 25 percent Federal renewable energy (Markey)
 - Energy savings assumed at maximum allowable levels
- Existing state RES policies:
 - Colorado Renewable Energy Standard
 - North Carolina Renewable Energy and Energy Efficiency Portfolio Standard

Driving Forces

- State differences:
 - Energy use
 - Natural resources
 - Energy and environmental policy framework
- Federal RES legislation
 - Interstate crediting of renewable electricity
 - What qualifies as a renewable electricity source
 - Consistency of environmental and energy goals

Renewable Sources

- Linked to Agriculture
 - Bioenergy dedicated crops
 - Agricultural / Crop residues
 - Animal waste
 - Forest waste and residues
 - Wind power
- Non-Linked to Agriculture
 - Solar energy
 - Municipal Waste

Method of Analysis

- Number and type of renewable energy facilities selected based on:
 - Engineering cost data
 - Announced plans for facility construction
 - Resource availability in the region
- The Impact Analysis for Planning (IMPLAN) model, a regional input/output modeling framework, was used to project:
 - Economic impacts resulting from expenditures on renewable energy technology and feedstock both statewide and at the regional level.
- **Next set of slides: Study Highlights...**

Value of Biomass Feedstock Production

- **Table 1: Value of Direct Agricultural and Forestry Sector Biomass Feedstock Production in 2025, Million Dollars**

	North Carolina	Florida	Colorado	Kansas
State RES	\$ 382.4	-	\$ 127.9	-
20% RES	\$ 760.7	\$ 447.1	\$ 208.4	\$ 36.6
25% RES	\$ 848.1	\$ 447.1	\$ 248.9	\$ 36.6

- RES policy is anticipated to create new market opportunities for biomass in the agricultural sector.
- Size of this new market varies by state and by stringency of the RES target, with higher targets typically resulting in a larger market for biomass.

Gross Receipts per Farm

- Table 2: Change in Gross Receipts per Farm in 2025**

	North Carolina	Florida	Colorado	Kansas
NC RES	\$ 7,228	-	\$ 8,995	-
20% RES	\$ 14,376	\$ 9,421	\$ 10,517	\$ 43,229
25% RES	\$ 16,028	\$ 9,419	\$ 11,283	\$ 43,229

- RES policy has a positive effect on farm income.
- Income tied to RES targets, with higher targets producing greater income.

Agricultural Sector Employment

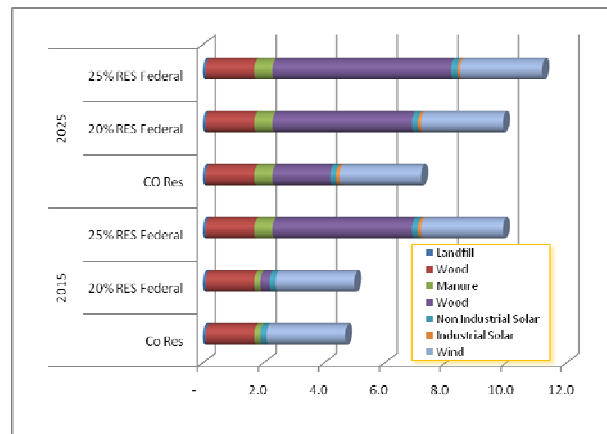
- **Table 3: Increase in Direct Employment from Biomass Feedstock Production in 2025**

	North Carolina	Florida	Colorado	Kansas
State RES	1,266	-	585	-
20% RES	2,506	2,296	948	139
25% RES	2,781	2,296	1,130	139

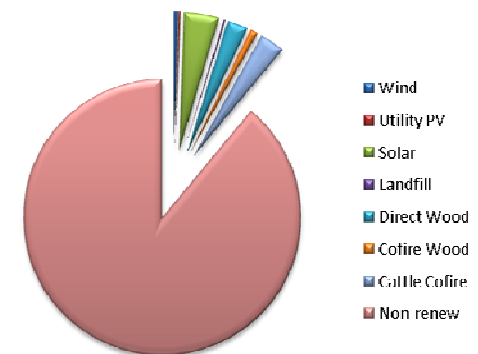
- Employment projected to increase as a result of increased agricultural activity.
- Relationship between job creation and RES policy was positive, with more jobs created in scenarios with stronger RES targets.

Colorado

By 2025, an estimated 7.2 to 11.3 billion kWh will be generated by renewables under an RES scenario . Statewide, the projected 2025 Total Industry Output (TIO) from operating additional renewable facilities is \$1.9 billion under the Colorado RES, \$3.0 billion under the 25% Federal RES, and just under \$2.6 billion under the 20% Federal RES. Under the Colorado RES the largest economic impacts are projected to be derived from wind, followed by direct fire of wood residues and co-fire of wood residues with coal. Under the 25% RES and 20% RES's, the largest impacts are projected to accrue from direct fire of wood residues, followed by wind and co-fire of wood residues with coal. Under the Colorado RES for 2025, the Denver BEA Region is projected to experience the largest economic gains, while under the 25% RES and 20% RES's, the Grand Junction BEA Region is projected to receive the largest economic gains.



	CO Res	20% RES Federal	25% RES Federal
Impacts on Total Industry Output (Million \$):			
Operating:	1,962.9	2,636.2	2,975.1
Household:	(217.9)	(287.4)	(322.2)
As a Result of Agriculture:			
Direct	127.9	208.4	127.9
Total	237.5	385.1	237.5
Investment	10,052.8	18,130.9	20,139.0
Number of Additional Jobs			
Operating	11,102.0	19,311.0	21,091.0
Investment	64,810.0	115,410.0	127,965.0
Projected change in energy price	0.0042	0.0083	0.0096



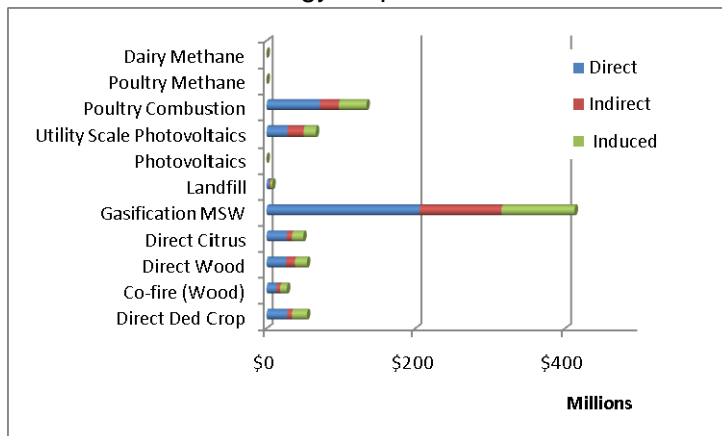
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Florida

. In 2015, the projected requirements under the 25% RES are 11.9 billion kWh and and 14.7 billion kWh for the 20% RES. For 2025, the projected requirements under the 25% RES are 48.6 billion kWh and under the 20% RES are 42.9 billion kWh. The projected net generation from renewable energy in the state is 11.52 billion kWh in 2015 and 24.79 in 2025 . Statewide, the projected 2025 Total Industry Output (TIO) from operating additional renewable facilities is \$11.2 billion under the federal policy proposals . The Miami Region is projected to experience the greatest addition to economic activity, with the Orlando Region second, and the Sarasota Region third. The largest annual operating economic impacts are projected to be derived from gasification of metropolitan solid waste followed by direct fired dedicated energy crops.

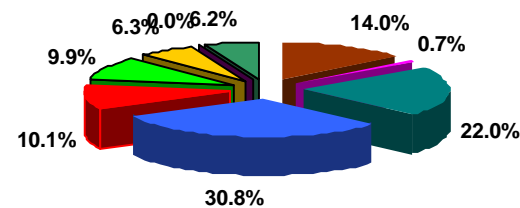


Variable	2015		2025	
	25% RES	20% RES	25% RES	20% RES
million dollars				
Total Industry Output:				
Operating	4,939.5	4,941.0	11,173.6	11,174.1
Household	(967.1)	(1,042.5)	(2,961.0)	(2,806.0)
Agriculture and Forestry:				
Direct	204.1	204.1	447.1	447.1
Total	373.6	373.6	818.9	818.9
Investment Impacts ^b	16,660.7	16,662.8	5,277.4	5,277.4
Employment Impacts:				
Operating	19,025.0	19,027.0	42,800.0	42,802.0
Investment	103,444.0	103,457.0	29,724.0	29,724.0
Projected change in energy price (cents/kWh)				
	0.0044	0.0047	0.0115	0.0109

^a Does not include cost impact on price of energy saving technologies

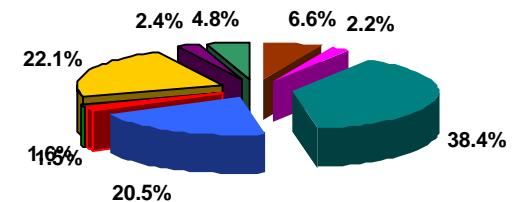
^b Investment impacts are one time impacts and for 2015 take place during the 2010-2015 time period and for 2025 take place between the 2021-2025 time period

Total Industry Output from Operating



Gainesville
 Orlando
 Sarasota
 Jacksonville
 Panama City
 Tallahassee
 Miami
 Pensacola
 Tampa

Total Industry Output from Investment



Gainesville
 Orlando
 Sarasota
 Jacksonville
 Panama City
 Tallahassee
 Miami
 Pensacola
 Tampa

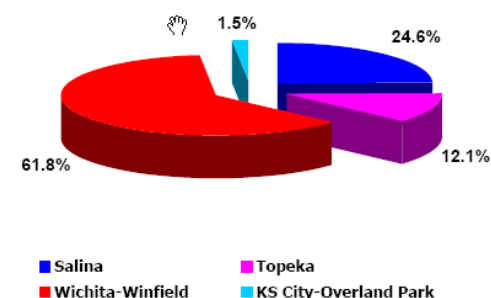
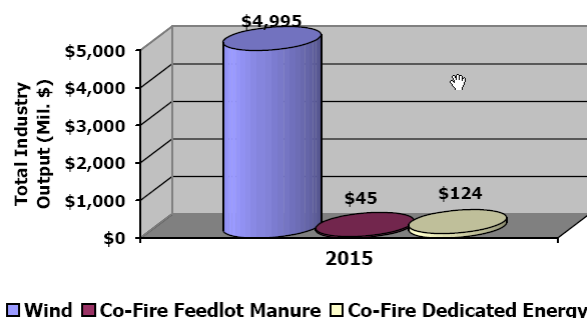
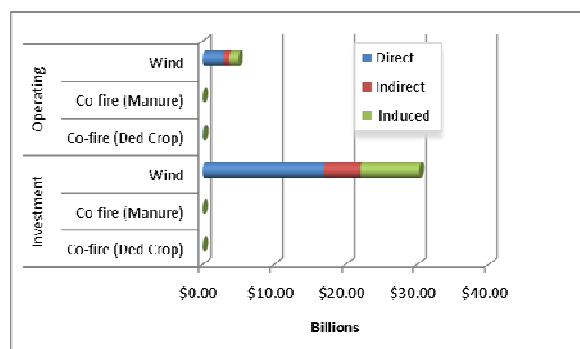
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Kansas

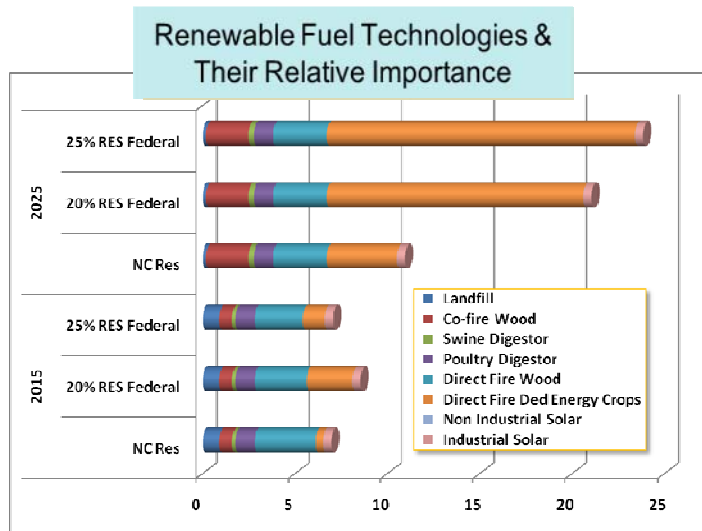
Extensive wind energy projects are already planned in Kansas. The requirements for Kansas under either of the two federal energy proposals could be easily met with the planned wind energy. However, co-firing in existing coal-fired plants under 200MW is also considered as part of this study. The renewable energy produced with projections of wind and co-firing would exceed the requirements under either proposal, so the projected economic impacts are the same under either scenario. The Kansas agricultural sector averaged over \$11 billion in receipts during 2000 to 2007. With \$9.5 billion in expenses, the agricultural sectors realized net farm income has average slightly more than \$1.5 billion over the same period. Economic activity from either RES could increase by \$2.8 billion by 2015 or \$53,537 per farm if the planned wind and potential co-fire projects are undertaken



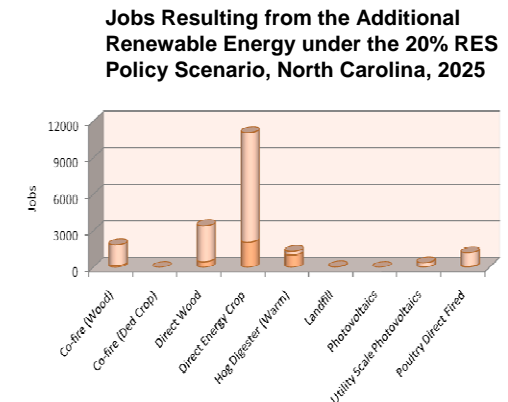
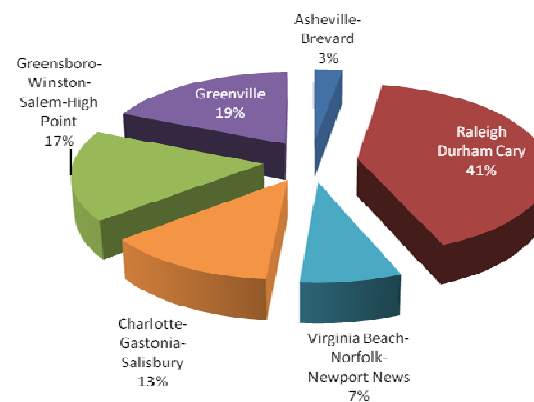
	20% RES	25% RES	20% RES	25% RES
	2015		2025	
Total Industry Output:	Million Dollars		Million Dollars	
Operating	5,164	5,164	5,164	5,164
Household ^b	-56	-43	-189	-219
Agriculture and Forestry:				
Wind Leases	20	20	20	20
Feedstocks	67	67	67	67
Investment Impacts ^c	30,377	30,377	30,377	30,377
Employment Impacts:	Jobs		Jobs	
Operating	21,046.00	21,046.00	21,046	21,046
		208,876.0		
Investment	208,876.00	0	208,876	208,876
	Dollars/kWh		Dollars/kWh	
Projected change in energy price	0.0018	0.0024	0.0088	0.0076

North Carolina

Statewide, the projected 2025 total industry impact total from operating is \$2.7 billion under the current North Carolina RES, \$5.4 billion under the 25% RES, and \$4.9 billion under the 20% RES. Under each policy scenario, the Raleigh-Durham-Cary Region is projected to experience the greatest addition to economic activity, with the Greenville Region second, and the Greensboro-Winston-Salem-High Point Region third. The largest annual operating economic impacts are projected to be derived from direct fire of dedicated energy crops and wood wastes. This is followed by co-fire of wood and poultry wastes.



	NC Res	20% RES Federal	25% RES Federal
Impacts on Total Industry Output (Million \$):			
Operating:	2,663.8	4,913.8	5,425.0
Household:	(421.1)	(831.9)	(957.8)
Direct	382.4	451.2	848.1
Total	691.9	1,441.3	1,622.8
Investment	10,052.8	18,130.9	20,139.0
Number of Additional Jobs			
Operating	11,102.0	19,311.0	21,091.0
Investment	64,810.0	115,410.0	127,965.0
Projected change in energy price	0.0042	0.0083	0.0096



Concluding Remarks

- **RES** instruments creates new opportunities for agriculture and rural development
- **Federal RES** should allow States to enhance the value of their natural resources
- Impact in **cost of electricity** is less than 1%

Full study available at
www.21stCenturyAg.org
beag.ag.utk.edu/pub.html

Analysis of the Implications of Climate Change Legislation to the Agricultural Sector

**To be released on November 11, 2009
In Kansas City at the
American Farm Broadcasters Meeting**

Research Team

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Objective

- The objective is to estimate the impacts of key features of cap and trade proposals in the agricultural and forest sector and the national economy.
- Phase I focused on agriculture and will be released Nov 11.
- Key Indicators
 - Economic returns
 - Climate benefits
 - Feedstock prices
 - Regional impacts

Scenarios Defined

Scenario	Meet EISA	Carbon Price	Offsets	Crop Residues Constrained	Fertilizers Exempt
1. Baseline	Yes	None	None	Soil erosion	Not Applicable
2. Ag Carbon Regulated (EPA Led)	EISA+	High of 160	None	Not applicable	No
3 Multiple Offsets	EISA+	High of 27	<ol style="list-style-type: none"> 1. Conservation Tillage 2. Bioenergy Crops 3. Afforestation 4. Grasslands 5. Methane capture 	Soil erosion	Yes
4. Multiple Offsets / RCN	EISA+	High of 27	<ol style="list-style-type: none"> 1. Conservation Tillage 2. Bioenergy Crops 3. Afforestation 4. Grasslands 5. Methane capture 	Soil carbon neutral	Yes
5. Limited Offsets	EISA+	High of 27	<ol style="list-style-type: none"> 1. Conservation Tillage 2. Afforestation 3. Methane capture 	Soil erosion	No

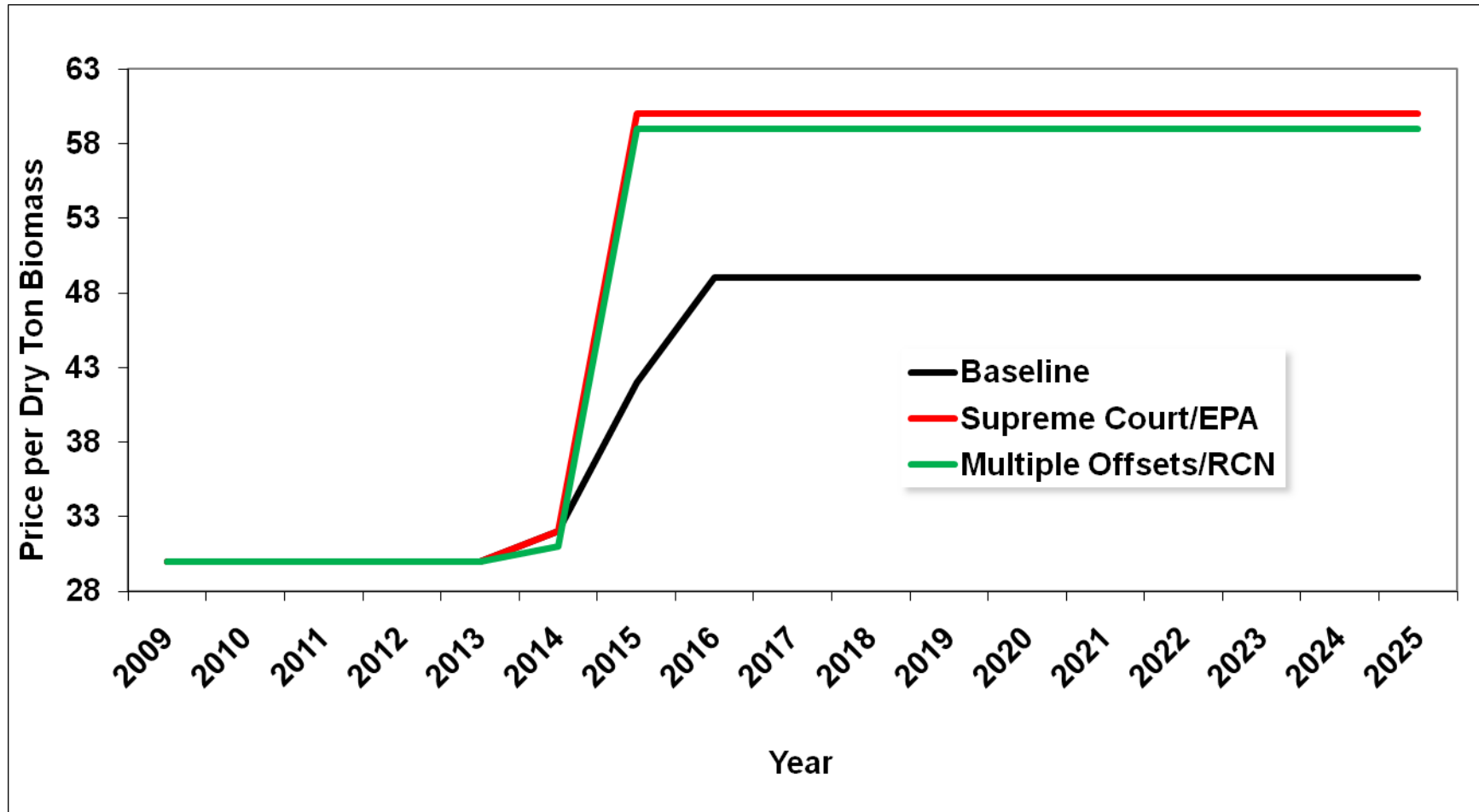
EISA = Energy Independence & Security Act Renewable Fuel Standard

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Biomass Prices



Drivers of Model Outcomes

- **EISA Demand**
- **Carbon Credit for Dedicated Energy Crops**
- **Offset Price and transaction costs**
- **Carbon Costs: Fertilizers exemption**
- **Constraints on harvesting of crop residues**

Thanks !



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Agricultural Policy Analysis Center
<http://agpolicy.org/>



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