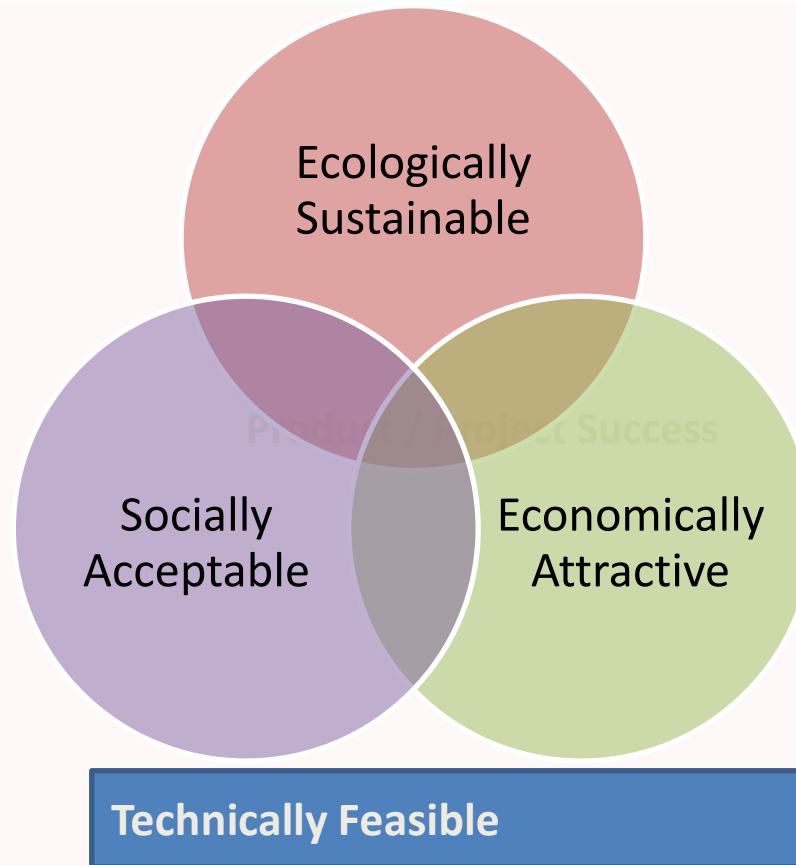


Societal Motivations and Barriers in Bioenergy

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*North Carolina State University
December 11, 2013*

Factors Affecting Product Success



Past Studies on Bioenergy

- **Majority** of studies **focus** on **technical barriers**
- **Socio-Economic barriers** are important: “...**economic issues** include market forces such as **consumer acceptance** that will affect demand [of bioenergy]” (Monroe, 2010)
- **Few** comprehensive studies **focus** on **social barriers**
 - Fragmented studies
 - Limited geography
 - Limited stakeholder involvement
 - Small sample sizes used with convenience sampling
 - Integrated social, economic, environmental and political aspects not studied

Objectives

- Measure key stakeholder perceptions of bio-based energy (environment, feedstocks, economics, impact on society, policy, etc.)
- Determine information gaps and determine content for development of educational and communication tools by targeting specific stakeholder segment

Southeastern Partnership for Integrated Biomass Supply Systems

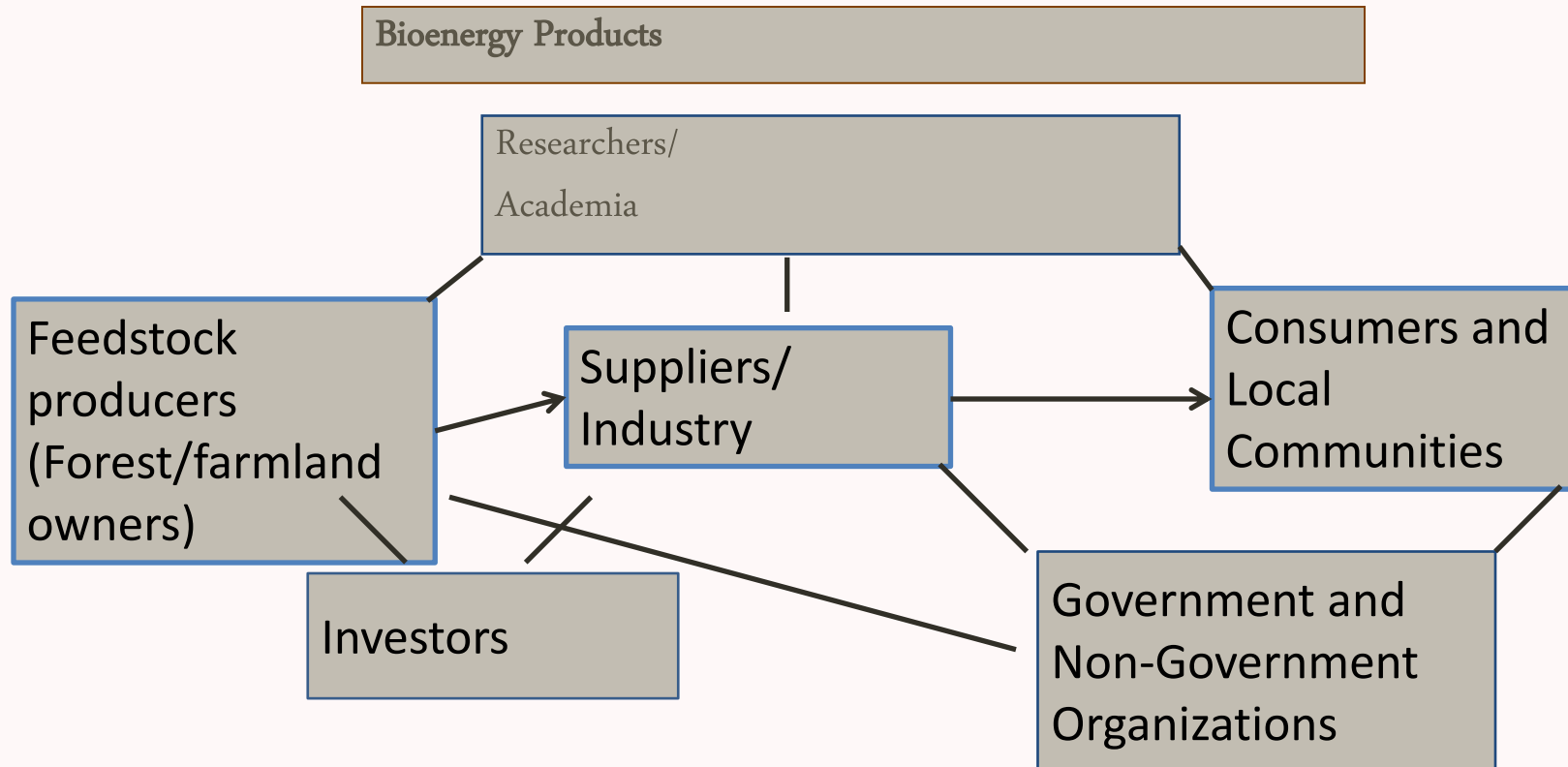


Lessons Learned from Past Studies on Bioenergy Perceptions

- Perception depend on stakeholder group, area, time, market maturity**
- Price sensitivity affects market acceptance**
- Potential resources and expected market affects are local**
- Lack of social measurement standards**
- Market acceptance requires innovation in education**

Approach

Stakeholders



Data Collection

Stakeholders

- Data collection using surveys (current: for consumer and landowner stakeholder groups)
- Pilot testing of surveys (32 consumers/general public and 19 forest and farm landowners)
- **305** completed surveys of general public in NC and currently collecting data in TN
- **238** completed surveys of forest and farm landowners in NC and currently collecting data from TN

Consumer Surveys

- Instrument: Electronic Survey
- Sampling: Randomly Selected
- *Completed surveys: 305*
- Response rate: 0.66%

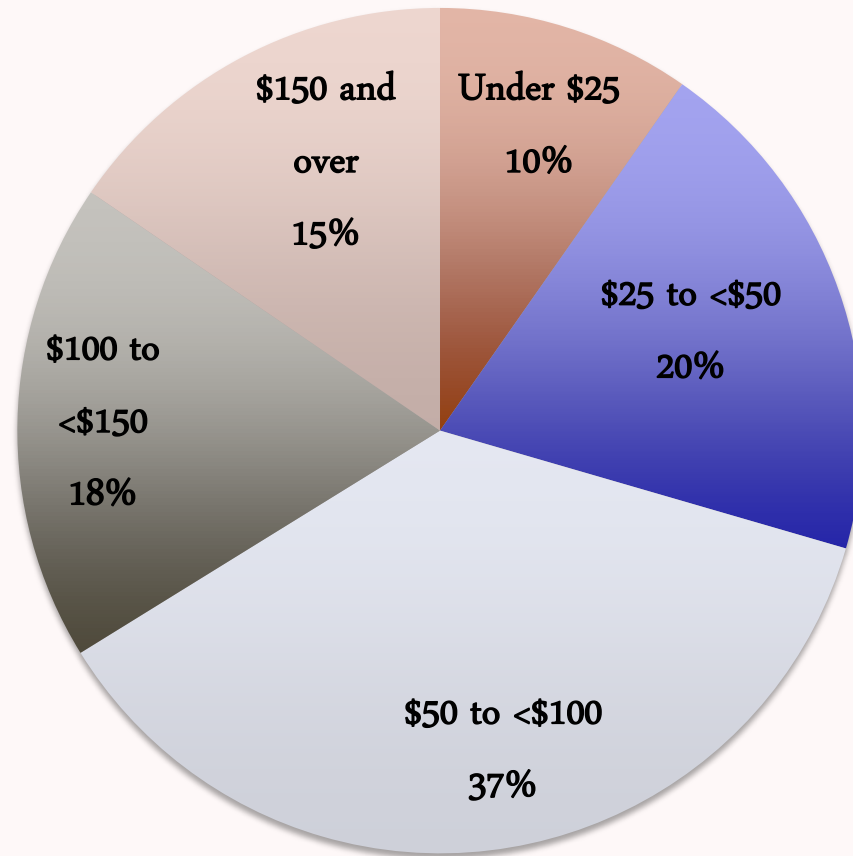


Consumer Surveys

Demography

Male=55% Female=45%

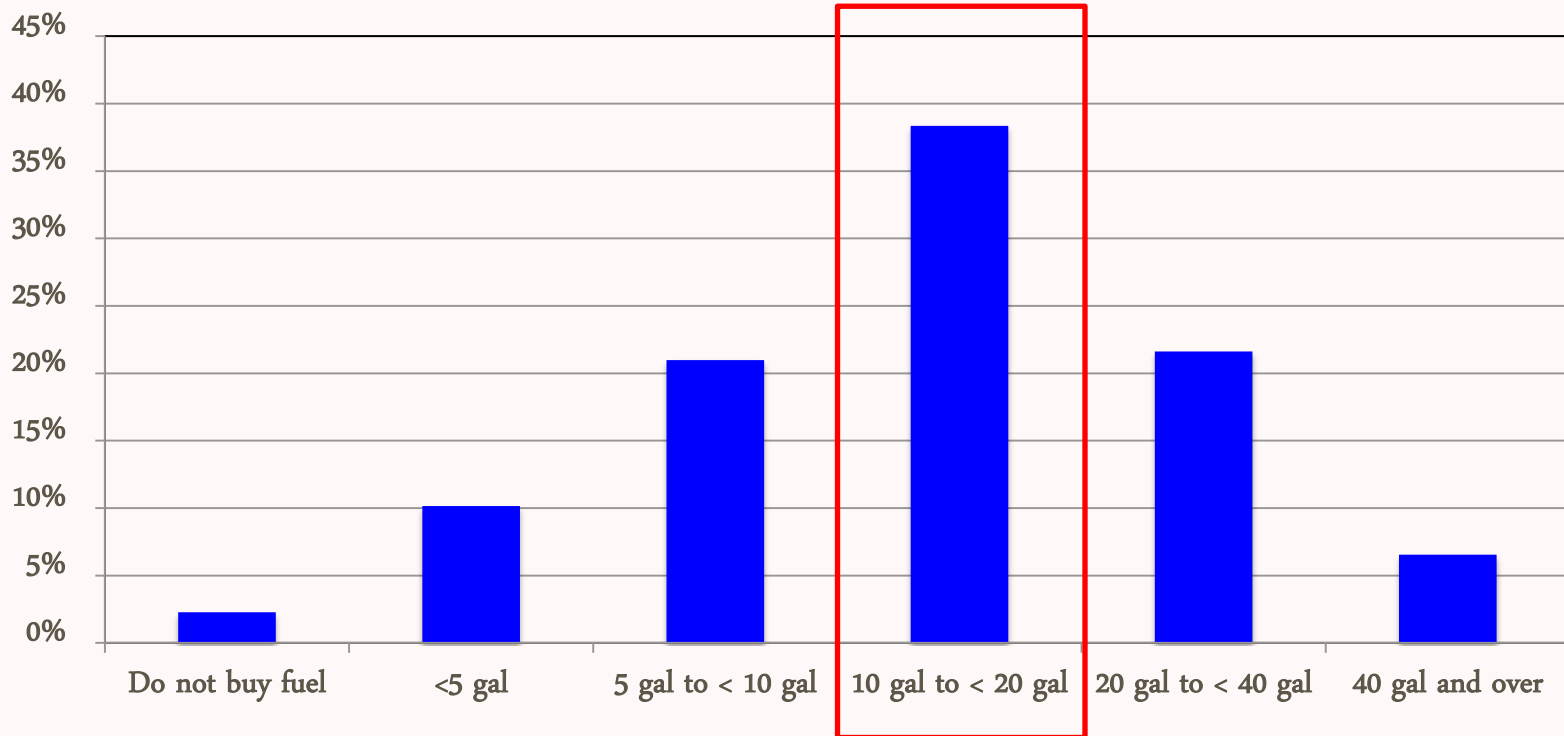
Income Distribution (1000s)



Consumer Surveys

Gallons of Fuel Purchased (per week)

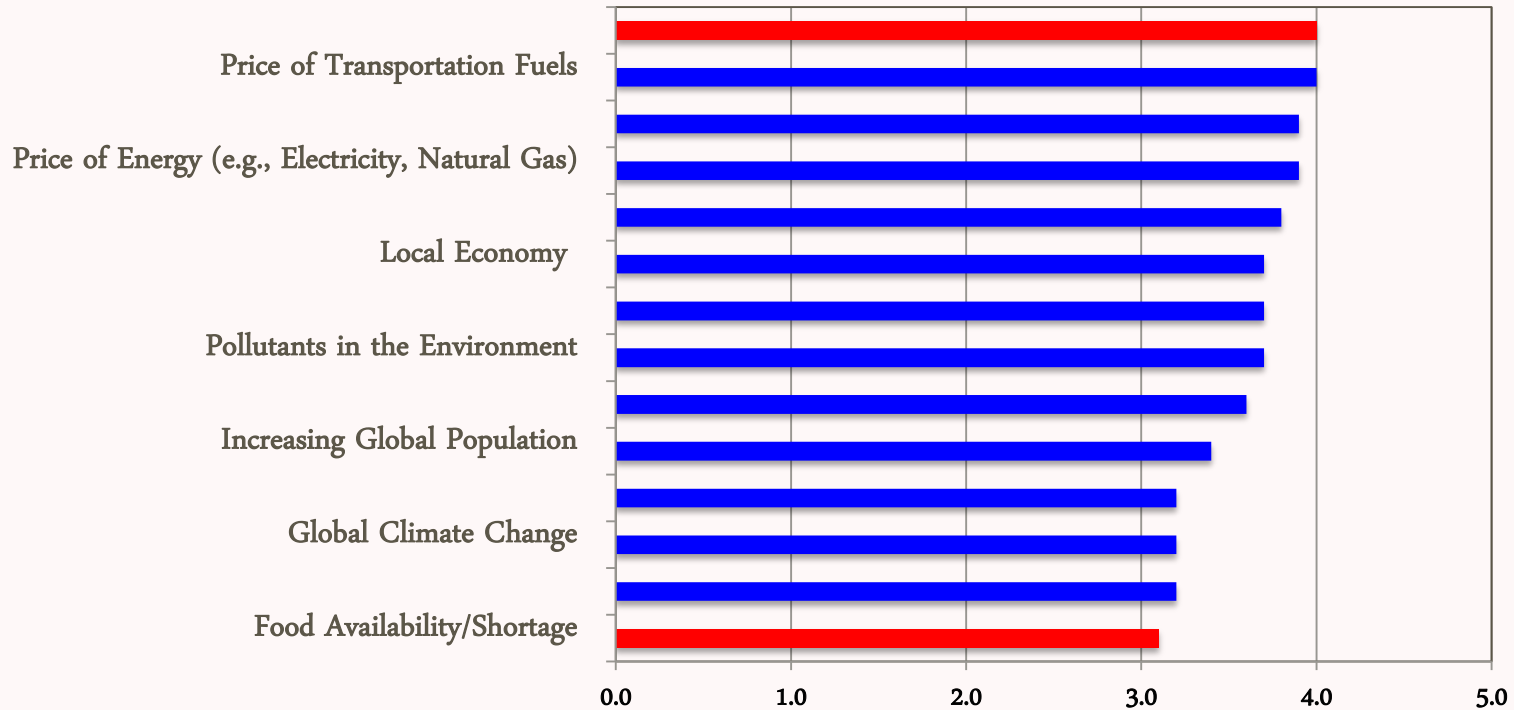
■ % of Respondents



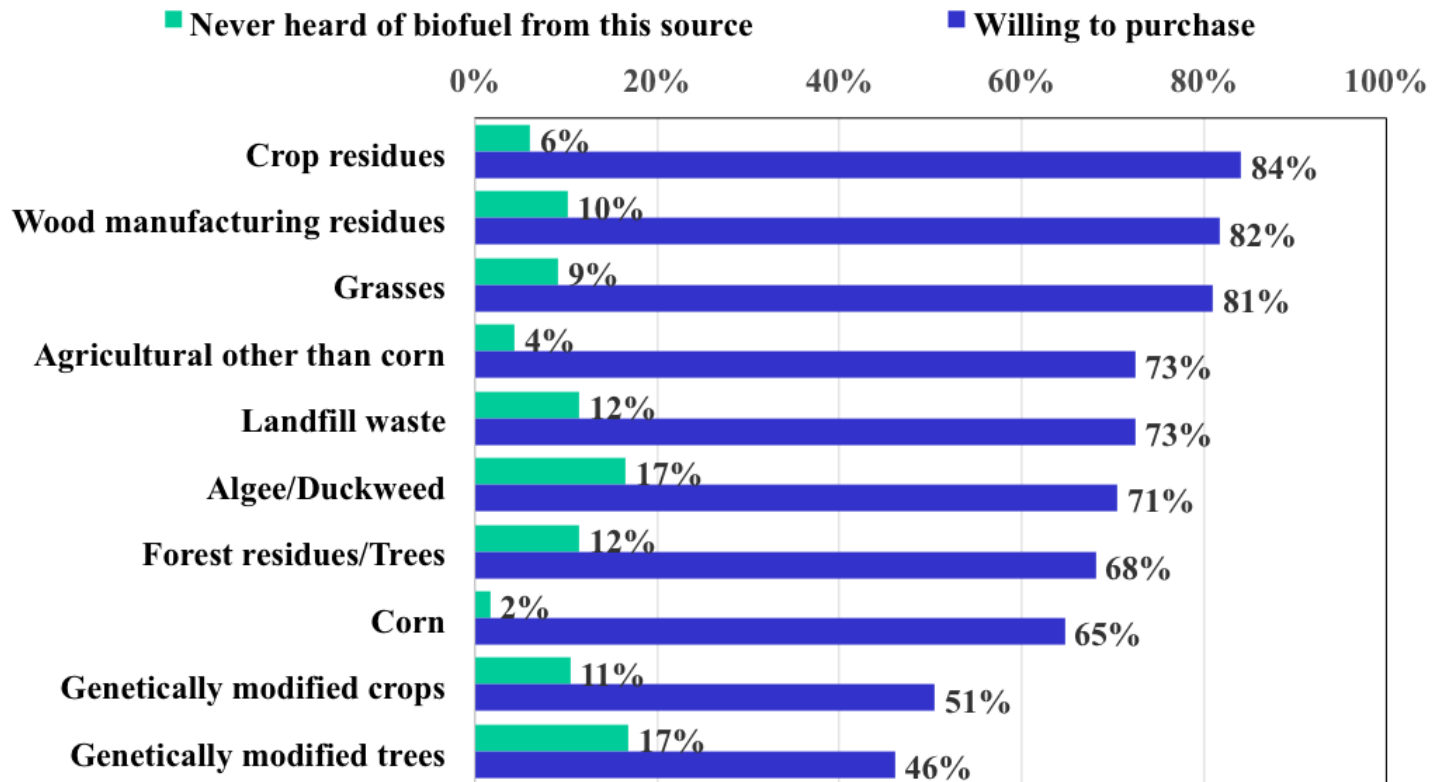
Respondent Concerns

Respondent Concern with General Topics

(1=Not at all Worried, 2=A Little Worried, 3=Neutral, 4=Worried, 5=Extremely Worried)



Feedstock Preference

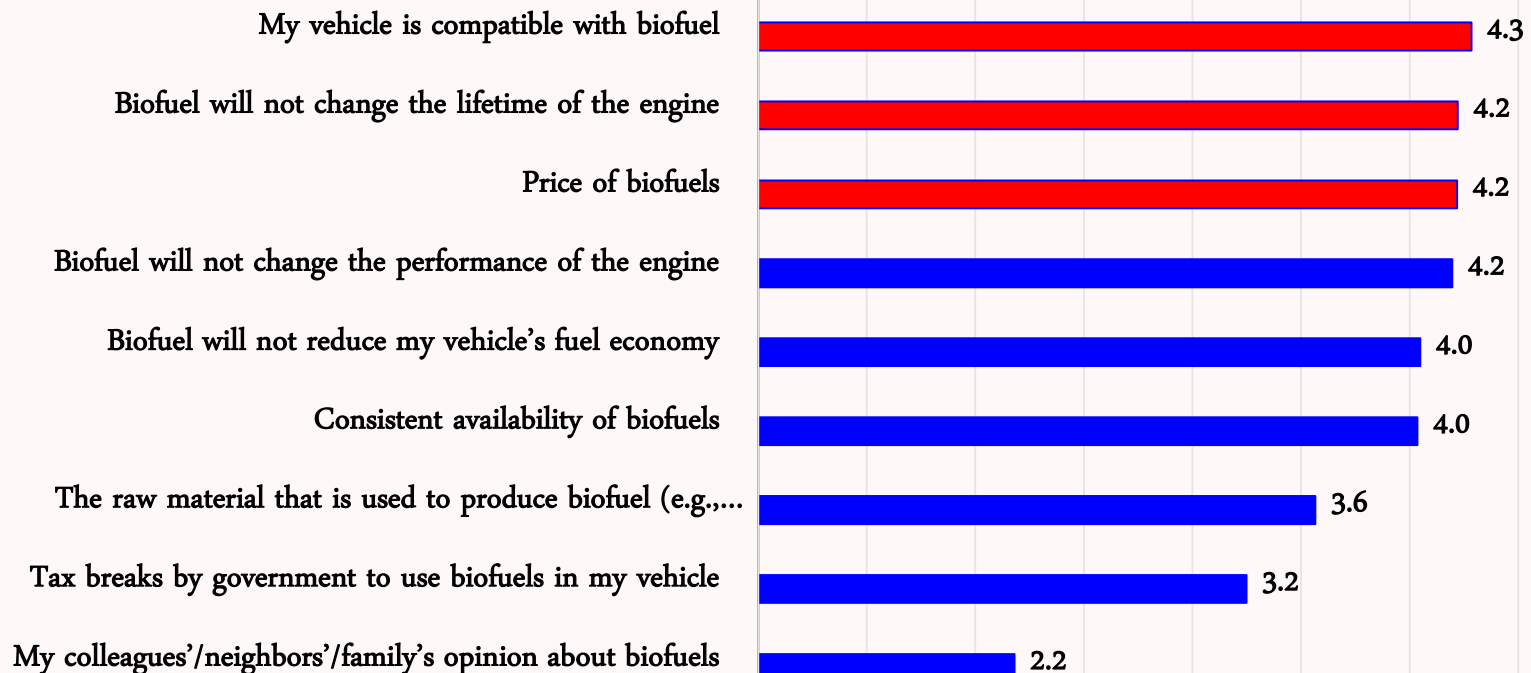


Consumer Surveys

Factors Influencing Choice of Biofuel

1=Extremely Unimportant; 2=Unimportant; 3=Neutral; 4=Important; 5=Extremely

1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
Important

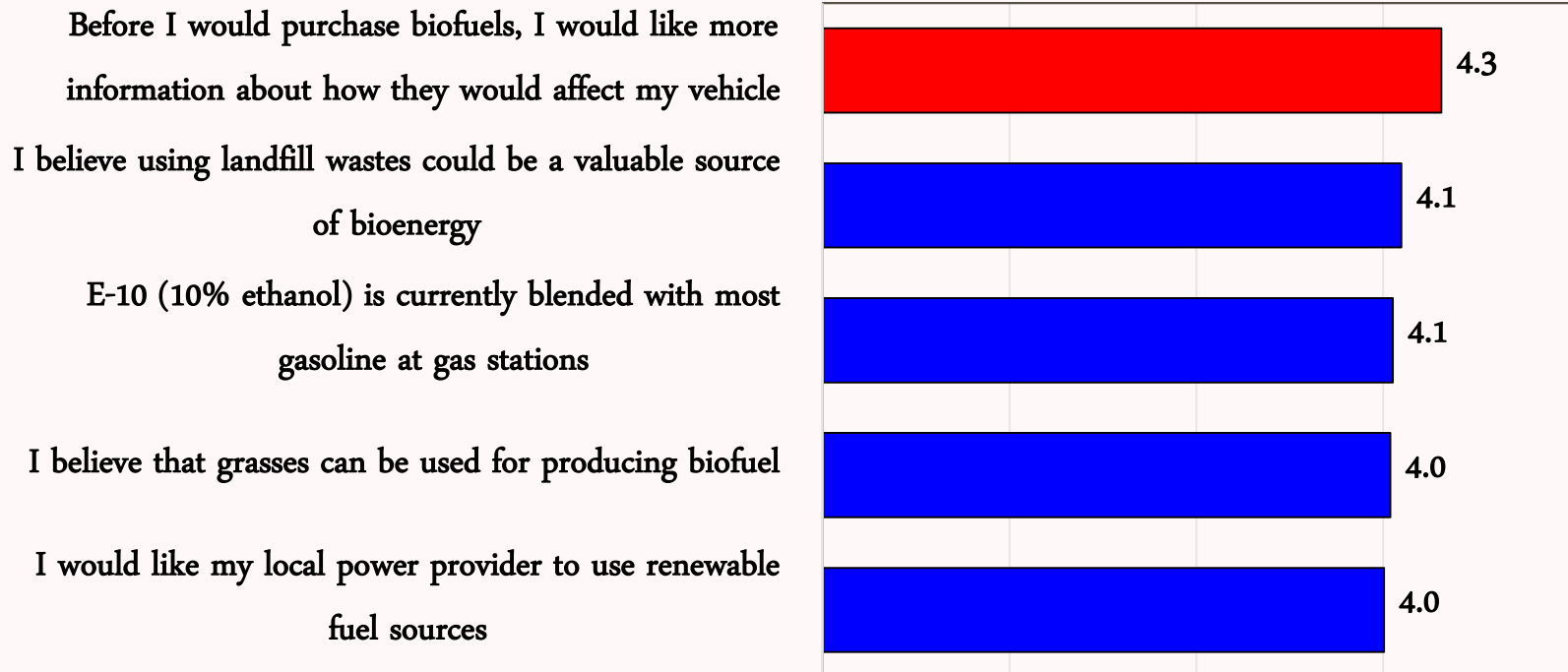


Consumer Surveys

Agreement with Biofuel Statements

1=Strongly Disagree; 2=Disagree; 3=Neutral; 4=Agree; 5=Strongly Agree

1.0 2.0 3.0 4.0 5.0



Consumer Surveys

Agreement with Biofuel Statements

1=Strongly Disagree; 2=Disagree; 3=Neutral; 4=Agree; 5=Strongly Agree

1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

I would purchase biofuels even if it is a little more expensive than gasoline



I will not be concerned if higher blends (more than 10% ethanol) was used with gasoline at gas stations



I think biofuels made from grasses will cause groceries to be more expensive



I trust the government to give me credible information about biofuels



I believe that the government will provide me more credible information about biofuels than the...



Consumer Surveys

Selected Open Ended Comments

“Great ideas for wind, solar, biodiesel : will reduce need for Arab oil.”

“I think if it is cheaper than gas and your car runs the same, people will buy it.”

“I have older cars. 10% Ethanol is all they can handle without damage. Using corn increases food prices

“I strongly oppose taking up land used for agricultural purposes to grow biofuel. I support using waste and non-food plants (but not trees-we need them to pull CO2 from atmosphere).”

“Need to reduce the dependence on oil and CO emitting fuels or future generations will suffer.”

“Education is key for the understanding of what this process is about and why it is necessary for the US.”

“We have oil. A lot of oil. Drill it and use it! Sell it to the world.”

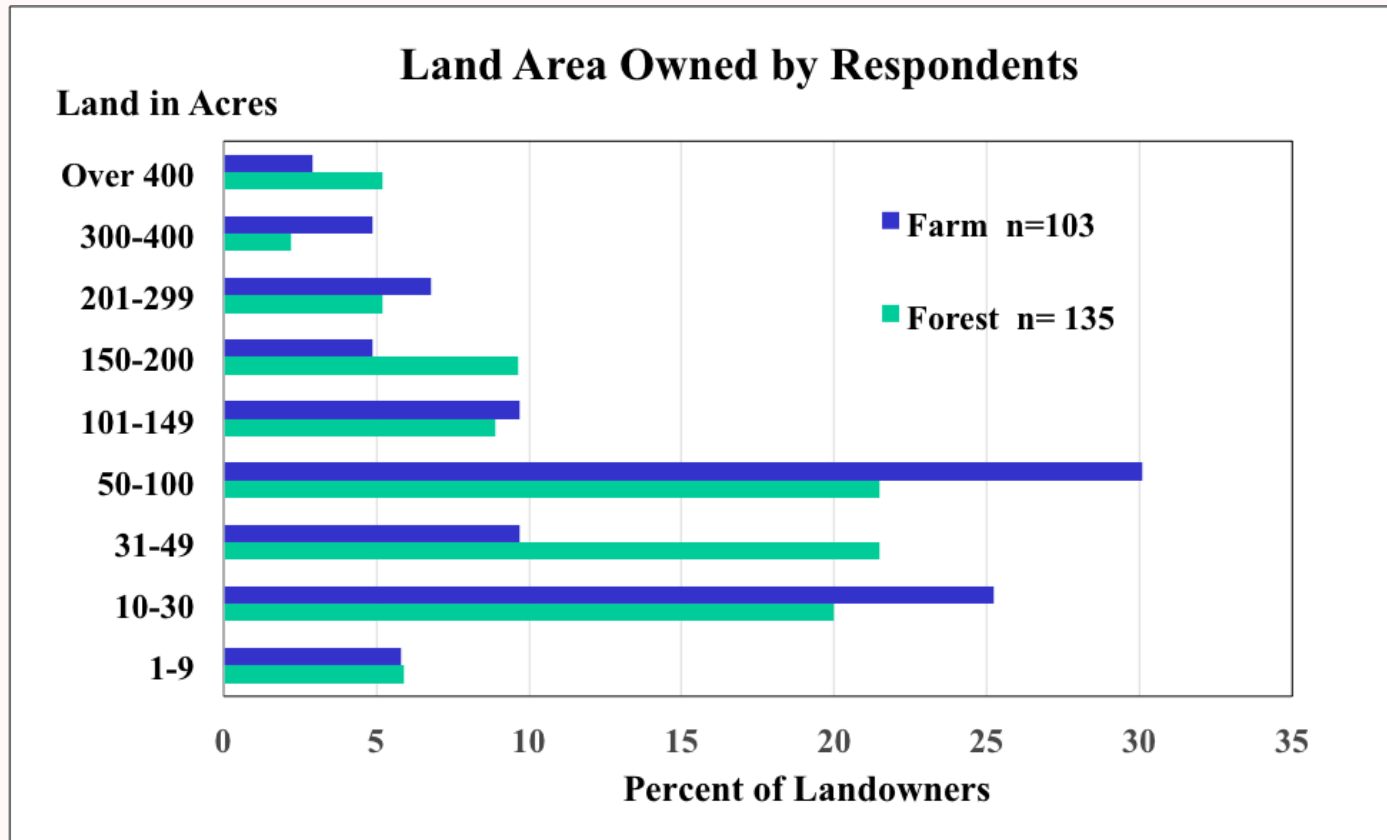


Forest and Farm Landowner Surveys

- Instrument: Mail Survey
 - Sampling: Randomly Selected
- Landowners (25 counties in NC)
- Completed surveys: 135 forest, 103 farm
 - Response rate: 9.4% forest, 7% farm



Forest and Farm Landowner Surveys

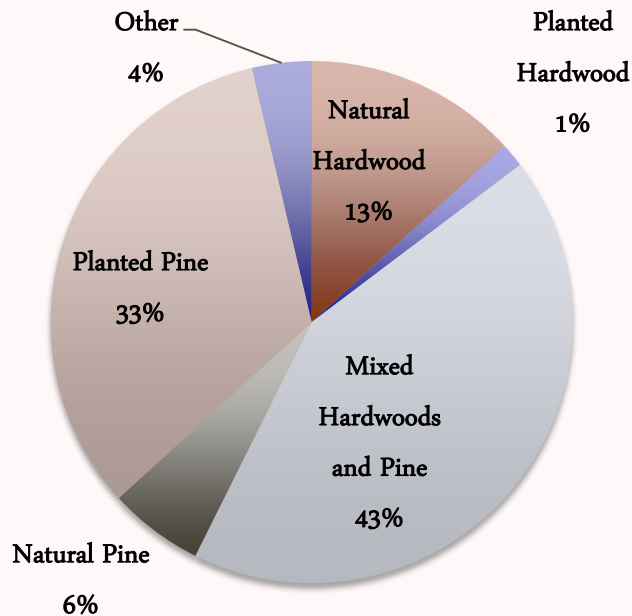


Forest and Farm Landowner Surveys

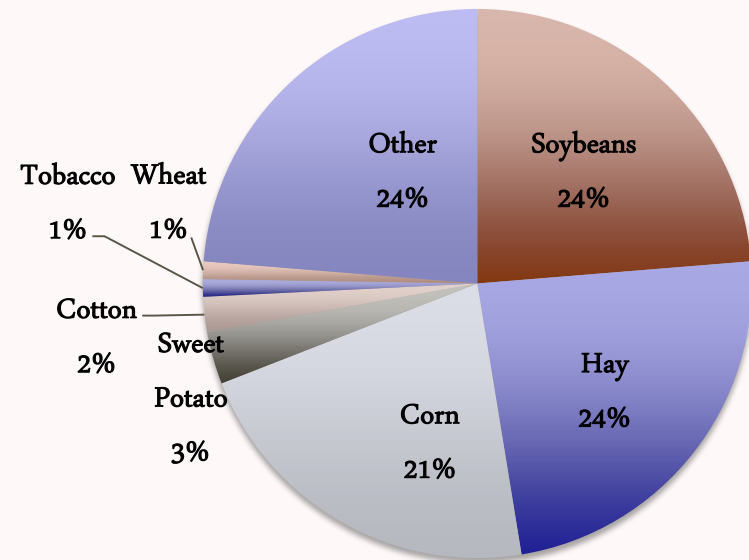
Landowner Demographics

Primary Type of Forestland

(n=135)



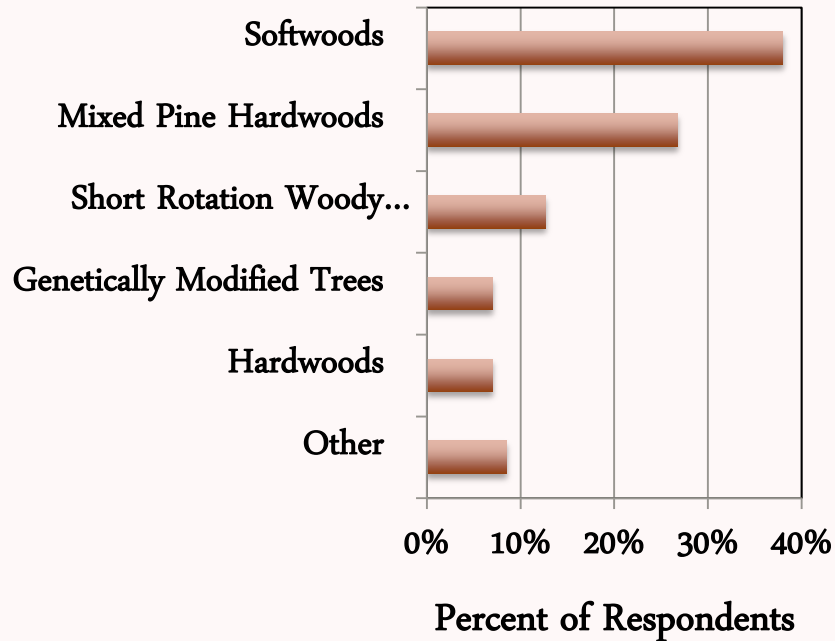
Primary Agricultural Crops Grown (n=103)



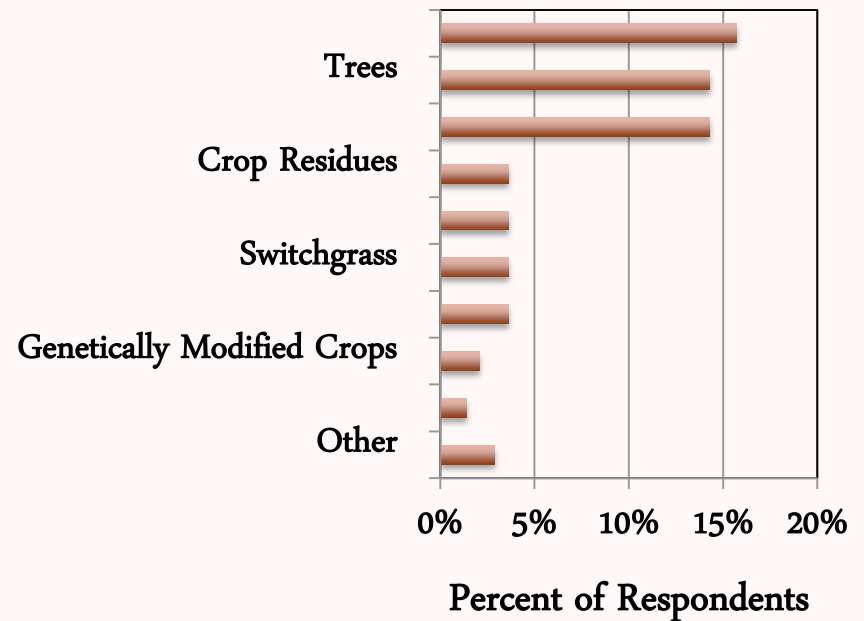
Forest and Farm Landowner Surveys

Crops Interested to Grow/Supply for Bioenergy

Forest Landowners (n=135)

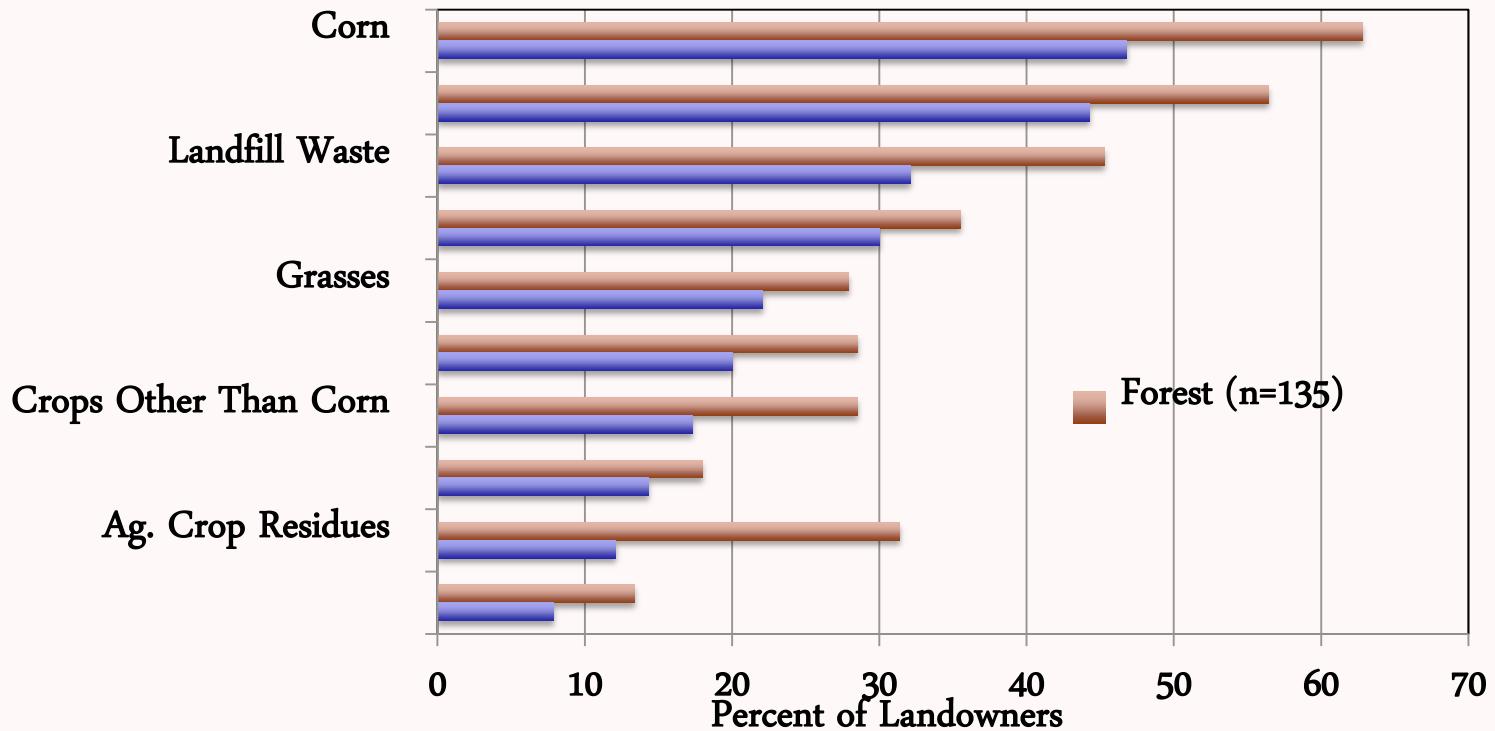


Farm Landowners (n=103)



Forest and Farm Landowner Surveys

Awareness of Selected Bioenergy Sources



Forest and Farm Landowner Surveys

Forest Landowner Agreement

Bioenergy and Biofuel for Transportation Statements		Mean*	Std. Dev
1	In my opinion, biofuel production could increase the demand for wood	4.16	0.65
2	In my opinion, using pre-commercial thinning in forestlands for energy is a potential income opportunity	4.06	0.71
3	A local bioenergy plant/ facility will improve the employment in my local region	4.03	0.75
4	In my opinion, domestically produced fuel is critical to the national security	4.02	1.09

33	I believe harvesting timber for energy will be detrimental to the site's productivity	2.75	1.20
34	I am worried that bioenergy produced from wood will have a negative environmental impact	2.63	1.29
35	I have sought professional advice about growing woody biomass for energy	2.15	0.87

*Agreement Scale: 1: Strongly Disagree, 2= Disagree, 3= Don't Care/Neutral, 4= Agree, 5= Strongly Agree

Forest and Farm Landowner Surveys

Farm Landowner Agreement

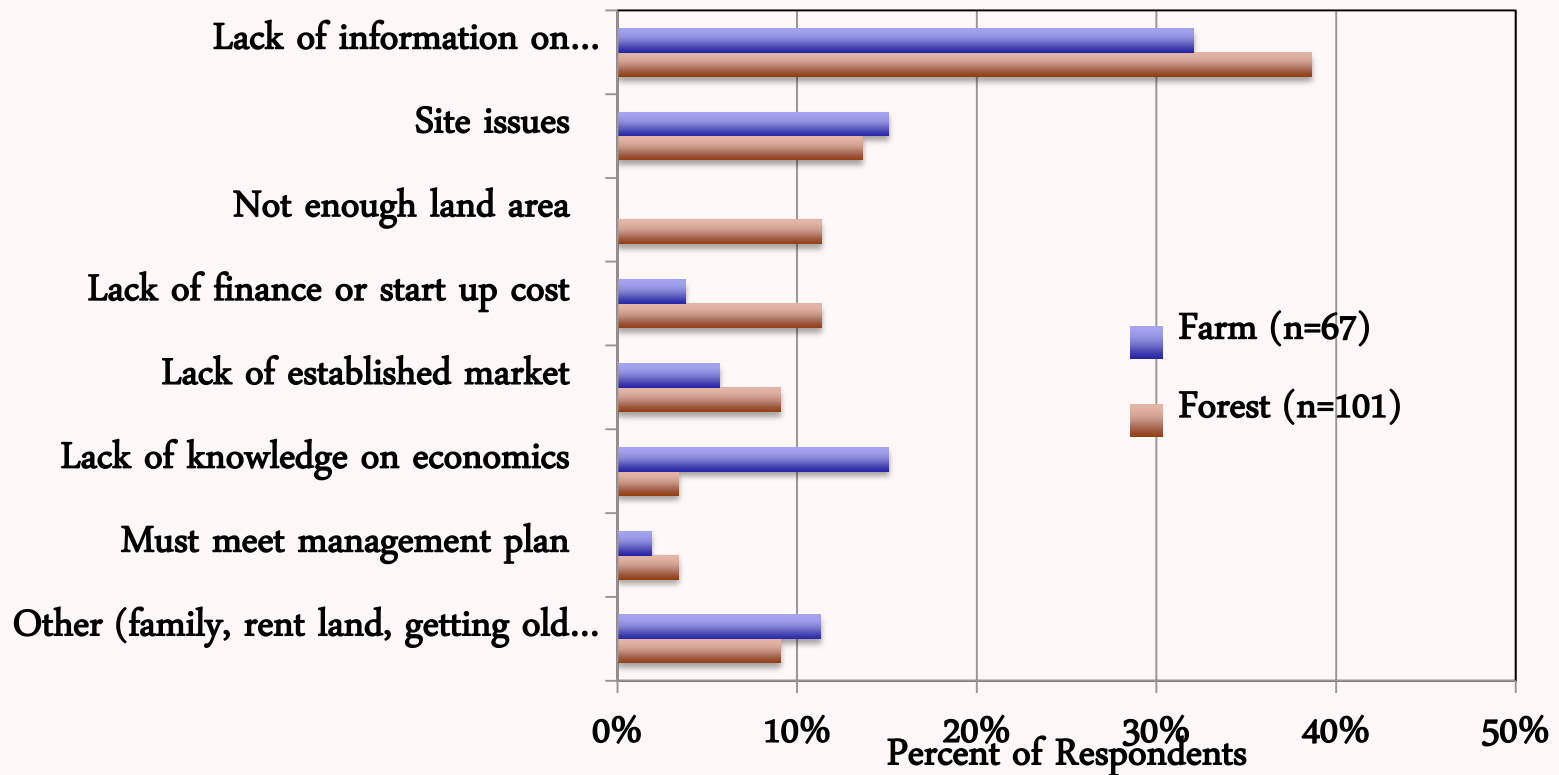
Bioenergy and Biofuel for Transportation Statements		Mean*	Std. Dev
1	In my opinion, biofuel production could increase the demand for agriculture crops and residues	4.04	0.84
2	In my opinion, domestically produced fuel is critical to the national security	4.01	1.08
3	The cost of growing biomass for energy purposes is more than the returns from the market (not profitable)	3.94	0.61
4	Current government regulations/policies are not helpful to me for growing & supplying agricultural crops/residues for the bioenergy	3.92	0.62

25	I believe that it is more profitable to grow and sell crops for the biofuels industry vs. other agriculture markets	2.51	0.97
26	I have sought professional advice about growing agriculture crops for energy	2.26	0.83
27	I am worried that bioenergy produced from agriculture crops will have a negative environmental impact	2.16	1.00

*Agreement Scale: 1: Strongly Disagree, 2= Disagree, 3= Don't Care/Neutral, 4= Agree, 5= Strongly Agree

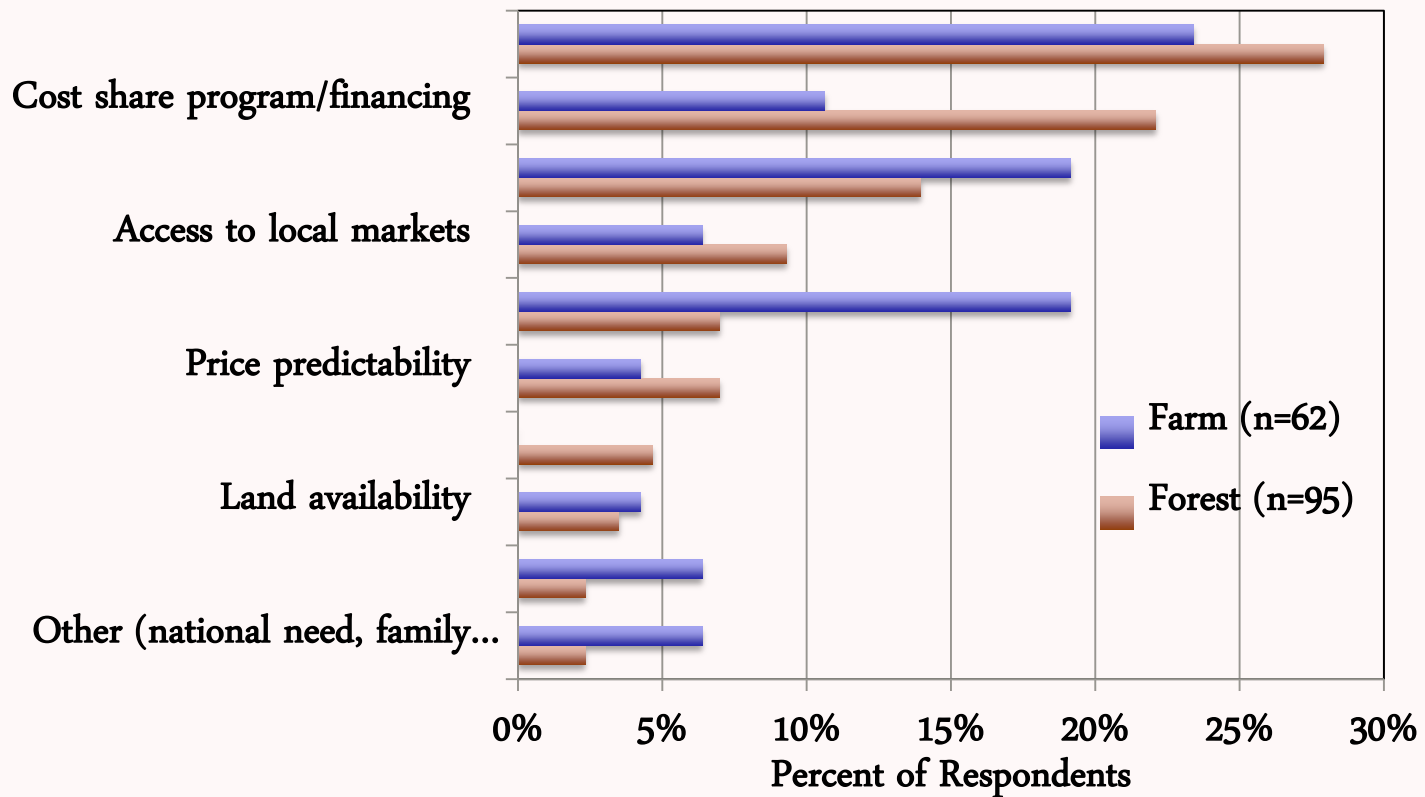
Forest and Farm Landowner Surveys

Barriers for Producing Feedstocks



Forest and Farm Landowner Surveys

Incentives to Grow/ Produce for Bioenergy



Conclusion

- General public
 - Most concerned about how biofuel affects their vehicle and price of biofuels
 - Distrust of government sources of information
 - Bipolar in their opinion of bioenergy industry (from comments)
- Landowners
 - Believe domestic fuel production is critical for national security
 - Believe government policies are not conducive for growing and producing crops (from comments)
 - In addition to better economics, interested in cost share programs and tax incentives in order to participate

Acknowledgement



- IBSS partners
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- NC Forestry Association and Loggers Association
- Graduate students, Forest Biomaterials
- Survey respondents