

## Abstract

Non-industrial private forest (NIPF) owners are the major forest ownership group in Michigan and own approximately 47% of the state's timberlands. Hence they play an indispensable role in the sustainability of the state's forests as well as in the continuing operation of the timber industry. Recently increased interest in bioenergy production has further emphasized the importance of this ownership group in the wood supply chain and a number of studies nationwide are being conducted to understand the harvesting behavior of NIPF owners. This study attempts to understand the perception of Michigan NIPF owners towards wood-based bioenergy and utilizes binary logistic regression to identify the factors influencing their willingness/unwillingness to supply biomass for energy. The results indicate awareness of and positive attitudes towards woody biomass energy among a majority of the landowners. Forest ownership reasons, size of forestland holdings, distance of landowner's residence from their forests, attitude towards bioenergy, and past harvesting experience were found to have a significant influence on landowners' biomass harvesting decisions. Lack of interest, concern about the ecological impact of harvesting timber and perceived low financial benefits were listed as some of the main reasons for their reluctance to harvesting biomass by Michigan landowners.

## Introduction

Increased interest in alternative energy production from woody biomass has recently been observed in Michigan due to concerns over energy security, environmental health, and economic growth. This has placed significant pressure on the state's timberlands, particularly private forests, for supplying wood fiber to meet the demands of both current forest products markets and emerging bioenergy markets. It is essential, therefore, to understand the fiber supply from the 8.8 million acres of non-industrial private timberland in the state. Predicting the harvesting behavior of NIPF owners is not simple as it includes a diverse and dynamic set of people with varying personal values, attitudes and management objectives. This study is an attempt to understand Michigan NIPF owners' opinions towards bioenergy and their willingness or unwillingness to supply biomass if markets existed for it in the future.



Fig 1. Wood as a source of energy

## Study Area

The study area includes twenty nine counties located in the north-eastern region of Michigan. These counties lie within 150 miles radius of a proposed cellulosic ethanol facility in Kinross, Michigan.



Fig 2. Study area showing the counties used for surveying in red

## Methods

A mail survey of 1,600 randomly selected landowners owning at least 20 acres of forest in the study area was conducted from November to December 2010 using the Tailored Design Method. The overall response rate after taking into account the undeliverable addresses was 39%.

## Results

### Landowners' view towards bioenergy

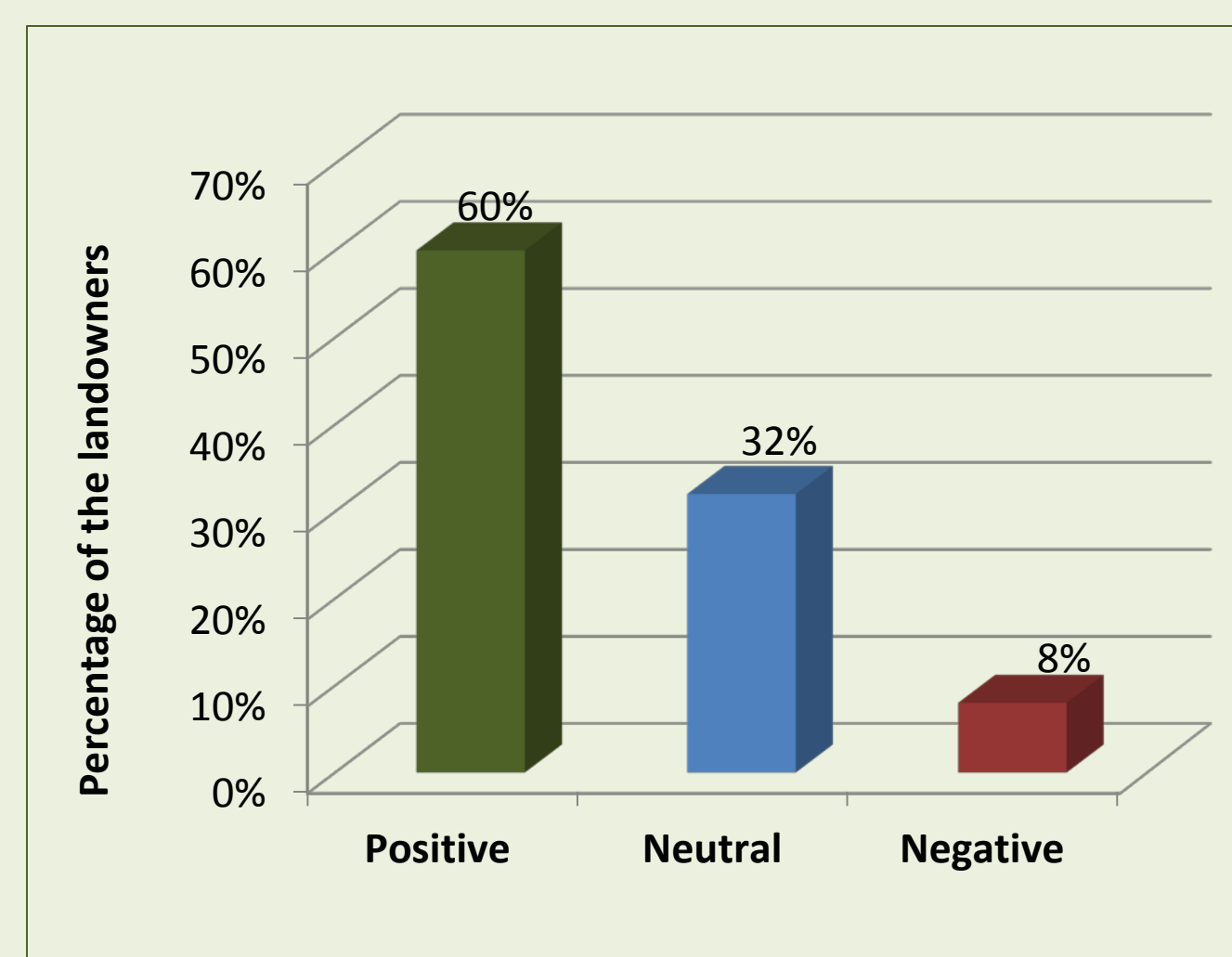


Fig 3. Landowners' perception towards wood-based energy

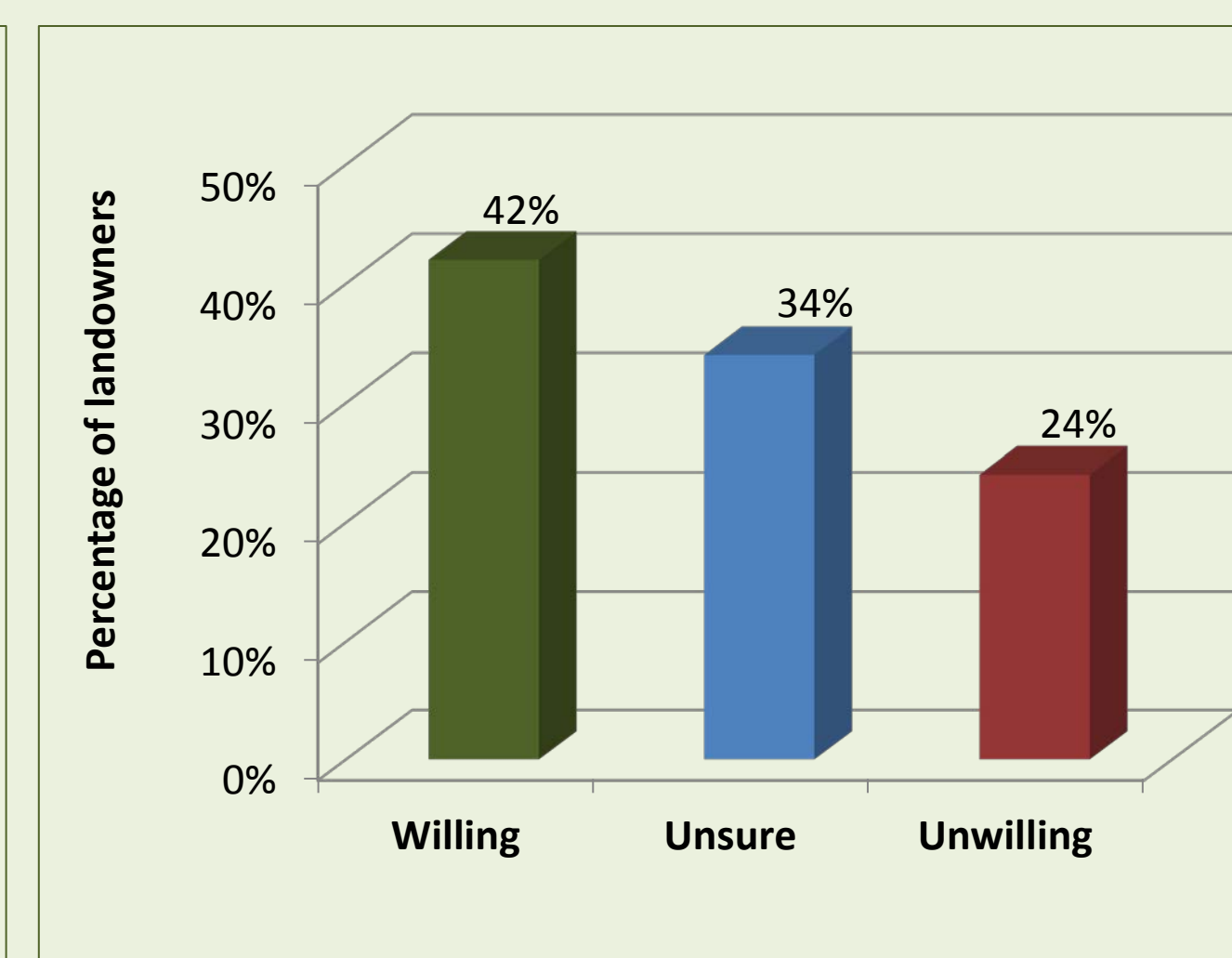


Fig 4. Landowners willingness/unwillingness to supply biomass for bioenergy

- ❖ The majority of landowners (77%) are aware of alternative energy production from woody biomass and approximately 60% agreed that alternative fuel production from woody biomass can create economic opportunities for Michigan landowners.
- ❖ On average, 42% of the landowners are willing to produce and sell timber from their forests for bioenergy purposes.
- ❖ The price of timber and low investment costs are identified as the most important factors for producing and harvesting timber for conversion to alternative energy.
- ❖ Only 18% of the landowners are willing to harvest timber for biomass at the current market price of pulpwood (\$24/cord). However, this number increased to 52% when the price was doubled.
- ❖ Approximately 33% of the landowners are willing to establish energy plantations on their land and 8% are willing to lease their property for the same.

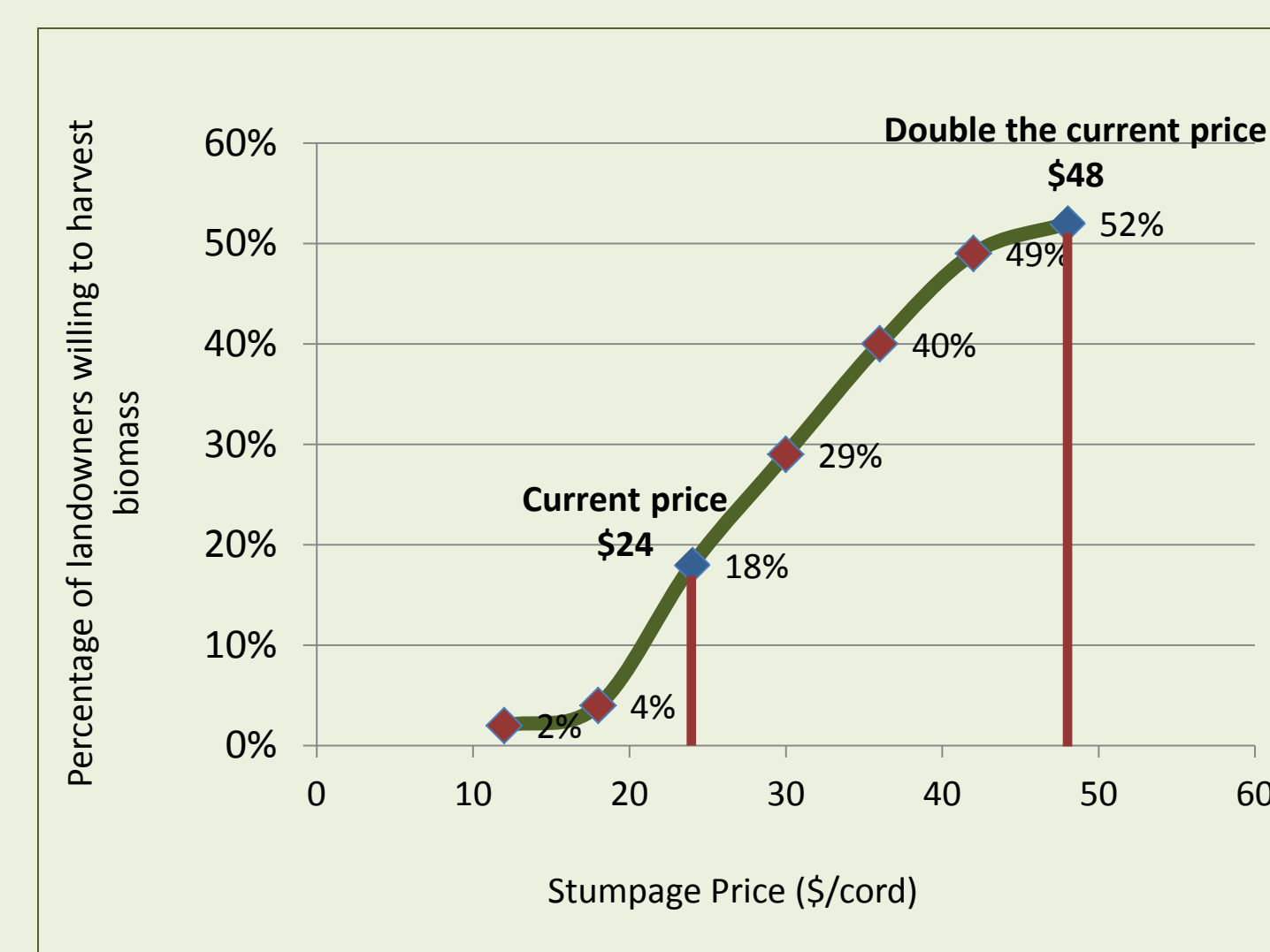


Fig 5. Landowners' willingness to supply biomass at various price levels

### Determinants of landowners' willingness/unwillingness to supply biomass

Binary logit estimates with landowners' willingness/unwillingness to supply biomass as the dependent variable and their age, income, education, forest acreage owned, distance of landowner's residence from their forests, duration of forest ownership, forest management objectives (amenity focused, production oriented, recreation oriented, and for legacy purpose), past harvesting experience, and attitude towards bioenergy as independent variables were developed. The overall model was significant at 1% alpha level and it correctly predicted 88.6% of the observations.

Table 1. Binary logit estimates of factors influencing landowners' willingness to supply biomass for bioenergy

Variables	Coefficient	Odds Ratio	Standard Error
Forest acreage	0.982*	2.671	0.574
Duration of ownership	-0.022	0.978	0.015
Residence distance	-1.093*	0.335	0.563
Amenity focused	-0.639*	0.528	0.334
Production oriented	1.098***	3.000	0.315
Recreation oriented	0.200	1.221	0.226
legacy purpose	-0.551**	0.576	0.266
Past harvest	1.124*	3.078	0.581
Age	-0.014	0.986	0.025
Attitude towards ethanol	3.685***	39.853	0.876
Education	-0.258	0.773	0.610
Income	-1.081*	0.339	0.617

\*Significant at 10%, \*\*Significant at 5%, \*\*\*Significant at 1%

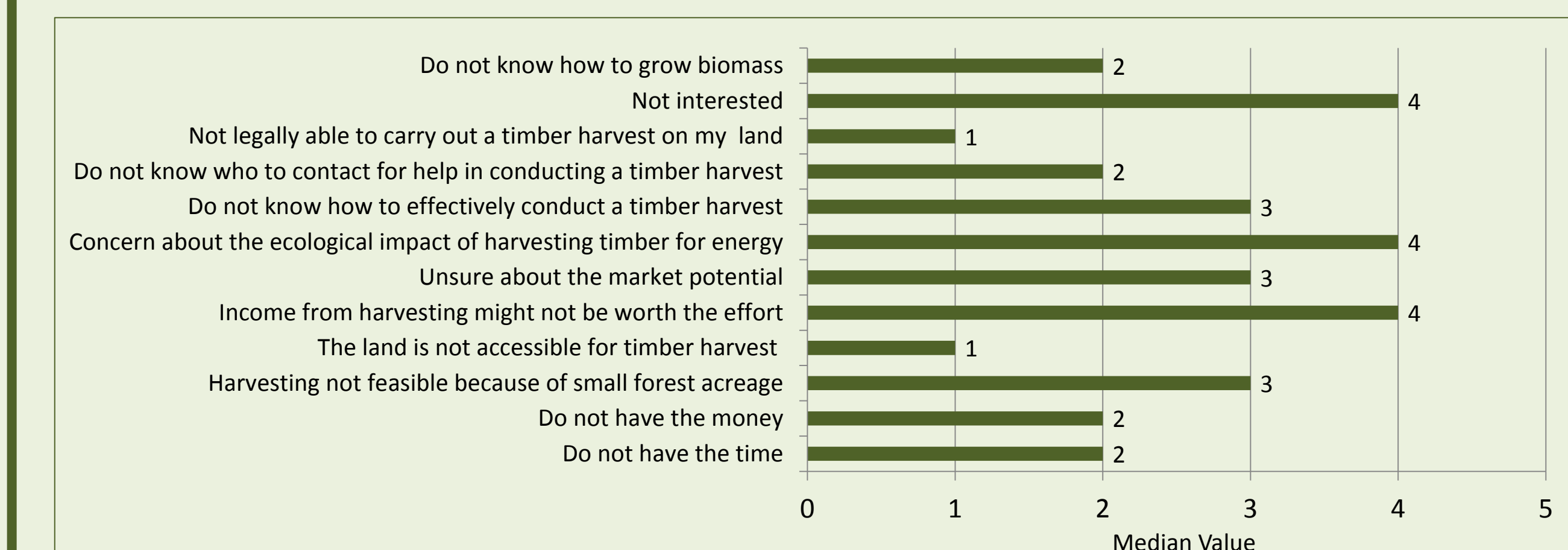


Fig 6. Reasons for landowners' unwillingness to supply biomass for energy. (Median value 5 = high importance and 1 = low importance)

## Discussion and Conclusion

Our results indicate awareness of and positive attitudes among Michigan landowners towards wood based bioenergy. The willingness to supply model revealed that the landowners having relatively larger forest acreage, those who have conducted timber harvest in the past, and those who view ethanol production from wood to benefit them economically are the ones who are more willing to supply biomass in the future. Also production oriented landowners who value their forests for consumptive benefits are more likely to harvest biomass compared to those who reside on their forests and value non-consumptive benefits (beauty, scenery, or privacy). Likewise, landowners who intend to bequeath forest land on to their children and those who have low family income are less likely to supply biomass from their forests. Demographic characteristics such as age and education of landowners was found to have no significant impact on their willingness to supply biomass for bioenergy. Many landowners in the study area seem to expect high prices for woody biomass compared to those for pulpwood. Knowledge about the types and quality of wood that can be used for bioenergy generation needs to be promoted in the study area. Since landowners are concerned about the ecological impacts of harvesting biomass, outreach efforts aimed at enhancing awareness regarding beneficial economic and ecological impacts of using woody biomass for energy could prove to be beneficial in the future.