WASHINGTON STATE UNIVERSITY EXTENSION

GROWING POPLAR TREES FOR BIOFUELS:
WHAT DO LANDOWNERS IN WASHINGTON STATE HAVE TO SAY?

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Abstract

One option for reducing reliance on petroleum is to use hybrid **poplar** trees as a local, renewable source of **biofuels** and other **bioproducts** in the Pacific Northwest. It would require a mass of potential landowners interested in growing poplar as a **feedstock** when market opportunities develop. In 2014 and 2015, we surveyed 900 landowners in Washington State to better understand their perceptions and concerns about growing poplar as a feedstock for biofuels and bioproducts. Overall, we found that most Washington State landowners are not familiar with, or are not willing to grow, poplars. These landowners perceive several major challenges to poplar production, such as difficulty converting back to traditional crops and making a profit. However, the landowners would prefer growing poplar to most other **bioenergy crops**. This study can help Extension professionals and others understand the needs and concerns of Washington State landowners and, consequently, be better able to help landowners make informed decisions.

Poplar and Biofuels

The current use of unsustainable products, like petroleum and plastics, has many environmental consequences, from polluted air and waterways to emissions of greenhouse gases that contribute to change climate (NOAA 2016; IPCC 2014). The transportation sector alone accounts for over a quarter of the greenhouse gas emissions in the U.S. (EPA 2017). Using biofuels, which are fuels made from various kinds of biological material, can reduce petroleum consumption and produce more environmentally sustainable transportation fuels (Nigam and Singh 2011). While the process of creating and using biofuels still emits greenhouse gases, biofuels have a smaller carbon footprint than petroleum products, because much of the carbon emitted by the biofuel is also absorbed and stored by growing the feedstock (Budsberg et al. 2016). Poplar trees are a local and renewable resource that can be used to make biofuels and bioproducts to help replace the use of petroleum (Budsberg et al. 2016). Growing poplars for biofuels could also provide ecosystem benefits, like riparian buffers, and enhance wastewater treatment (Fortier et al. 2016; Carey 2010).

Hybrid poplars, crossbreeds between native and non-native varieties of poplar, are the fastest growing trees in the temperate region, and many parts of Washington have suitable growing conditions. The trees can be grown as a short-rotation (2–3 years) woody crop that can be converted into biofuels and bioproducts. The Advanced Hardwood Biofuels Northwest project (AHB) is aimed at supporting the development of a poplar-based **bioeconomy** in the Pacific Northwest (PNW) if market and policy conditions make it economically feasible. The AHB project has researched the growing, harvesting, and conversion techniques for poplar-based biofuels and bioproducts.

The Social Aspects of Growing Poplars

The social aspects of bioeconomies, such as social acceptance, community sustainability, or social cohesion, are understudied (Vallance et al. 2011). Additionally, given the general lack of knowledge about biofuels and the potential public concern and resistance around issues such as food versus fuel or land use change, it is prudent to research how Washington State landowners feel and think about new bioenergy feedstocks like poplar (Wen et al. 2009; Selfa et al. 2010).

By reaching out to landowners, we can better understand the concerns, constraints, and perceived benefits of growing poplar for biofuels (Figure 1).

Figure 1. Advanced Hardwood Biofuels Northwest (AHB) hosts several field visits a year at all growing stages of the project's demonstration poplar bioenergy farms.

Listening to landowners before attempting to establish a new industry can increase local support and provide opportunities to proactively diminish obstacles to poplar (or other non-traditional energy crop) adoption.

Landowner Survey Methods

In order to understand landowners' perspectives on growing poplar as a bioenergy crop, we sent surveys to 900 Washington State landowners in areas conducive to growing poplar without irrigation. The poplar-suitable land parcels were identified using a statewide geographic information system land database (Rogers et al. 2012). We used stratified random sampling to ensure that we had responses from landowners owning small (20–40 acres), medium (41–160 acres), and large (>160 acres) land properties. Additionally, we filtered out developed land, government-owned land, and forested land prior to drawing the sample. We followed the tailored design method while fielding the survey (Dillman et al. 2009). We received 156 responses, for a response rate of 17%; the low response rate, while not ideal, yielded a confidence level of 90% with a 5% margin of error. We received 11 responses from small farms, 21 responses from medium sized farms, and 124 responses from large farms. The survey was designed collaboratively with the participation of WSU's Social and Economic Sciences Research Center, WSU Extension personnel, and faculty at the University of Washington conducting research with landowners in the region of interest. Survey questions focused on current cropping practices and perspectives about bioenergy crops as well as a number of questions specifically about growing poplar trees for biofuels. The survey asked landowners about their familiarity with, and willingness, to grow

poplars for biofuels, their perceptions of obstacles to growing poplars, and which bioenergy crops, if any, they would prefer to grow instead of poplars. For more information about the survey methodology, see Gowan et al. 2018a or Gowan et al. 2018b. This study was reviewed as exempt by the WSU/IRB (OGRD No. 13684).

Willingness to Grow Poplar and Perceived Challenges

Researchers commonly find that landowners are not familiar with bioenergy crops and do not know about opportunities to supply feedstock for bioenergy production (Joshi et al. 2015). The responses from our survey support that finding for poplar (Figure 2). Well over half of our respondents said they were not familiar with growing poplar for bioenergy. Additionally, only 4.9% of respondents had grown poplar before for any purpose. The percentage of respondents who are willing to grow poplar for bioenergy follows an almost identical pattern (Figure 3). When asked to write in how many acres they would be willing to allocate to poplar production, rather than rate general willingness or unwillingness, 75.2% of respondents said they would be unwilling to allocate any acres. The next highest percentage of respondents, 6.9%, said they would be willing to allocate 20 acres.

Interestingly, familiarity with growing poplar for bioenergy was not statistically correlated with willingness to grow it, according to our results. Typically, we would expect an increase or decrease in landowners' willingness to grow a crop with an increase in their familiarity and experience. We wanted to know if perceived challenges to growing poplar might be related to willingness to grow the crop. We asked landowners to rate their level of concern over a variety of factors (Figure 4).

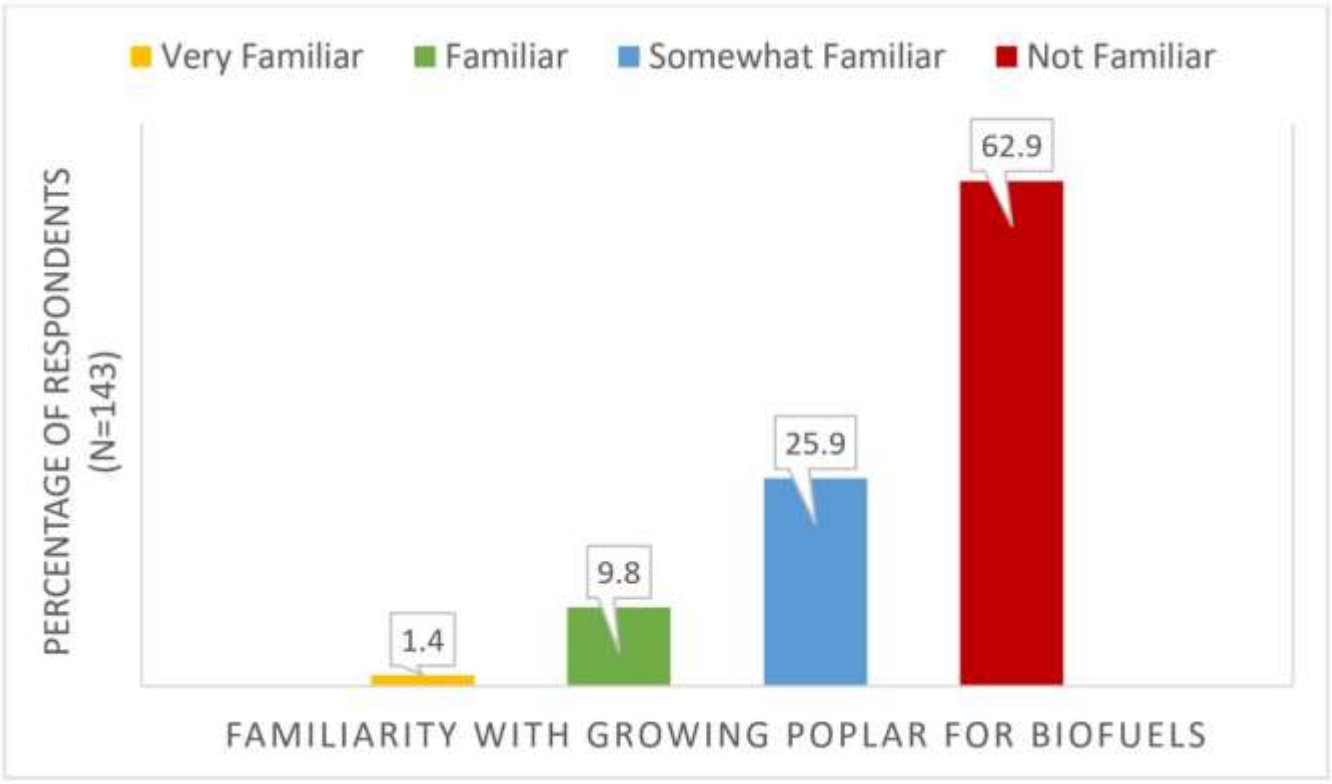

Figure 2. Washington State landowners' familiarity with growing poplar for biofuels.

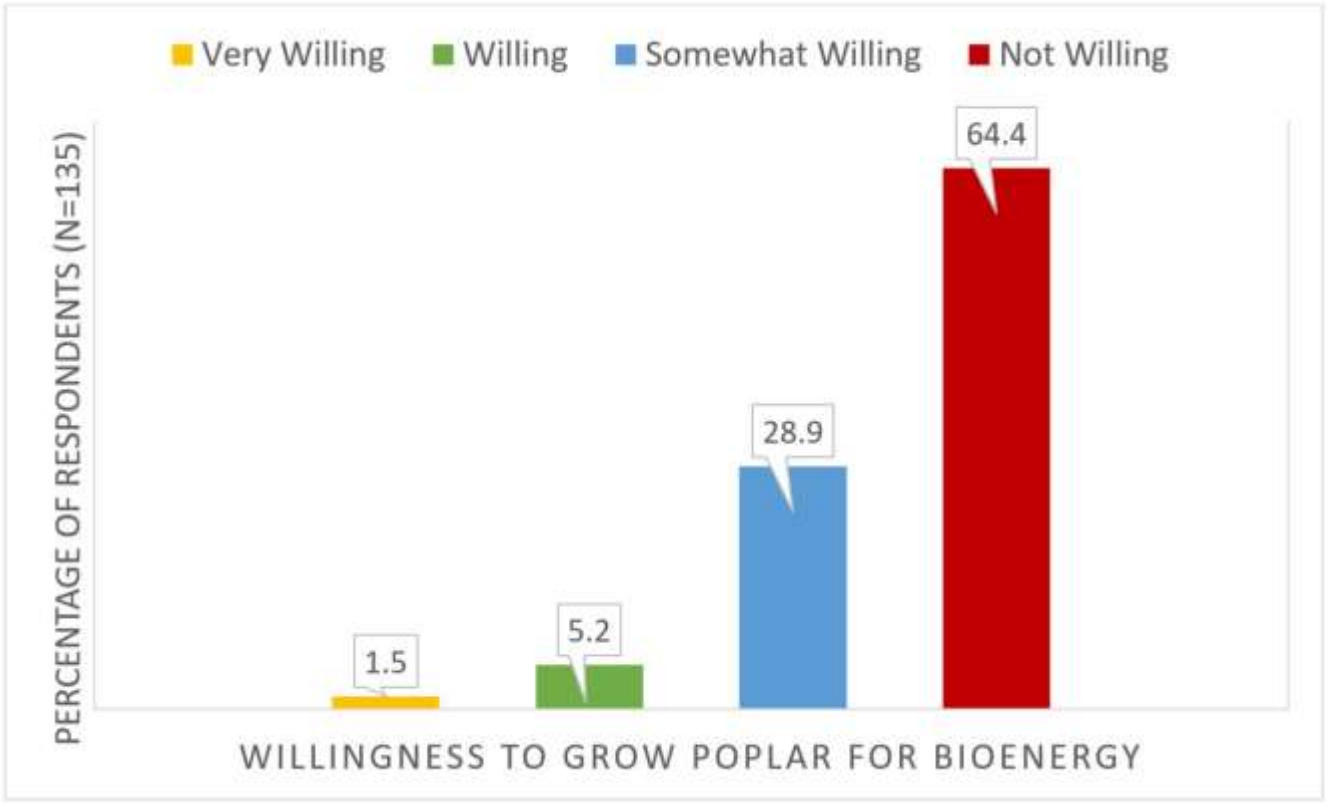

Figure 3. Landowners' willingness to grow poplar for bioenergy.

Converting back to other crops and making money from poplar were both perceived by respondents as significant challenges. Indeed, the economics of growing poplar for biofuels and bioproducts is not viable if oil prices are low and policy support is insufficient. Unexpectedly, perceptions of challenges were not statistically connected with willingness to grow poplar (increased perceived challenge was not correlated with a lower willingness to grow poplar or vice versa).

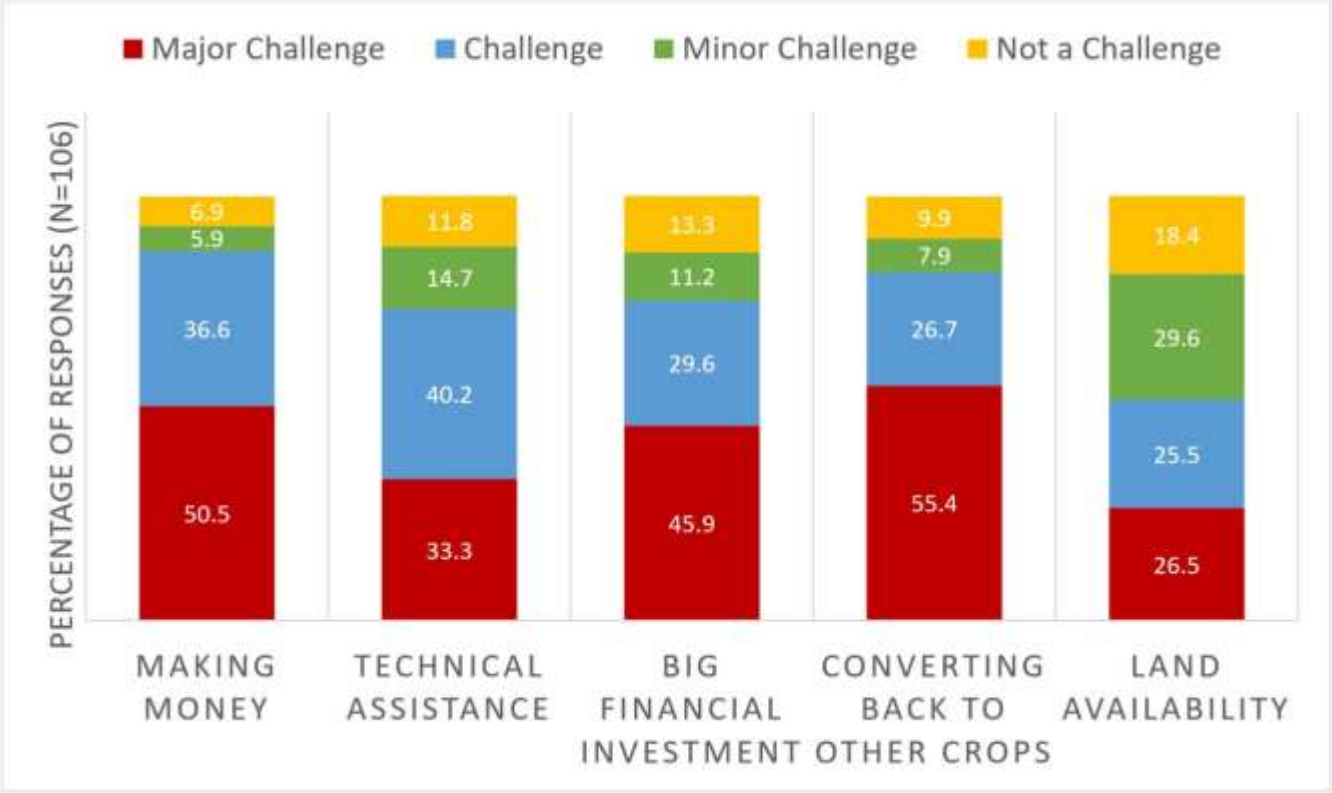

Figure 4. Landowners' perceptions of the level of challenge each factor poses to growing poplar for bioenergy.

This could indicate that respondents were willing or unwilling to grow poplar for other reasons, such as a lack of interest or other constraints.

Lastly, we wanted to explore whether respondents would prefer to grow poplar rather than other bioenergy crops (Figure 5). Poplar is far preferred to algae, corn, energy grasses, and other woody crops. However, oilseed crops, such as canola or mustard, were more appealing than poplar. Common reasons for preferring a non-poplar crop included: familiarity with the alternative, better chance of making money, better fit with their land and current crops, ease of growth, and decreased equipment costs.

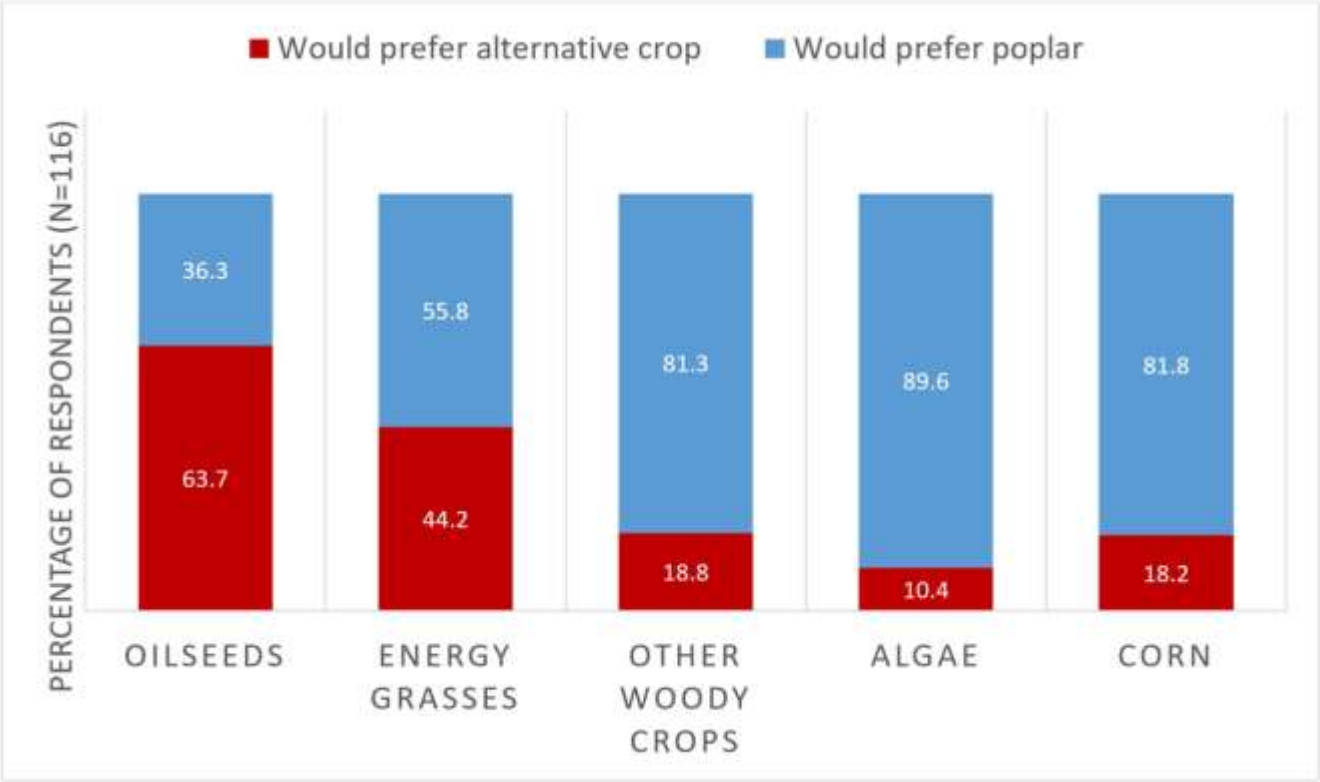

Figure 5. Landowners' preference for alternative energy crops versus poplar.

Conclusions

Adoption of hybrid poplars as a biofuel crop to reduce dependence on petroleum would require addressing several perceived and actual obstacles. Our landowner survey-based study showed that few landowners were familiar with growing poplar and there was an overall unwillingness to grow them in the areas most suited for them in Washington State. It is possible that the current unwillingness to grow poplar may stem from lack of awareness and misinformation about poplars rather than a thorough examination of the obstacles. However, while petroleum products remain inexpensive, the lack of profit from growing poplars exclusively for biofuels or bioproducts is a substantial obstacle.

To provide the most relevant information, Extension professionals should be well-informed about the attitudes and perceptions of landowners toward bioenergy crops. It would be beneficial to send a similar survey to landowners in other states in the PNW and see if these results are replicated. Additionally, landowner concerns can push research into previously unexplored areas, such as conversion of poplar farms back into food, forage, or livestock production. Extension can play a vital role in the dissemination of knowledge about bioenergy crops and provide the information and technical assistance needed for landowners to make informed decisions about trying these crops.

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Glossary

bioeconomy: The production of plant material and their conversion into bioenergy or bioproducts on an industrial scale.

bioenergy: Energy produced from organic material (from plants or animals) or wastes from recently living organisms.

bioenergy crops: Crops that can be grown and used to produce energy such as grasses (e.g., switchgrass or miscanthus), oilseed crops, corn, poplar, willow, and algae, among others.

biofuels: A fuel derived directly from biological matter or biomass.

biomass: Organic material that comes from plants or animals such as wood, animal fat, organic waste, crops, and agricultural residues.

bioproducts: Materials, chemicals, or energy produced from renewable, biological sources.

feedstock(s): The biomass (in this case poplar trees) used to create biofuels.

poplar: A tall, fast-growing hardwood tree in the temperate region.

short-rotation hybrid poplar: Crossbred, fast-growing, and high biomass-yielding poplar tree that coppices (grows back from stumps) after being harvested every three years.

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