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Farmer's Willingness to Grow Biomass for Energy Production: The Kentucky Case

Austin Pace Jacobs

Mentor: Dr. Tyler Berkley Mark

Morehead State University



<http://www.bluebluegrass.com/wp-content/uploads/2009/12/switchgrasspellets.jpg>

Abstract:

Agricultural producers across Kentucky are going to have to change farming practices to meet 21st Century needs. By 2025, Kentucky's goal is to derive 12% of its motor fuels demand of 775 million gallons per year, from biofuels. One area targeted for expansion is the Appalachian region of Kentucky. Biomass has numerous potential uses in the bioenergy area such as the production of ethanol or burn for heat. The primary focus is assessing the potential producers understanding of biomass production, processing, and willingness to produce. To ascertain the willingness of Kentucky farmers to diversify their operation and include biomass feedstocks in their rotations a survey is used. This research is supported by the Center for Regional Engagement.

Background:

- In 2005, the Department of Energy (DOE) released the Billion Ton Study. This study concluded that one billion tons of biomass could be produced annually in the US. In 2011, this study was updated and confirmed the results. Figure 1 shows some results from this study for biomass production by price and type of biomass.
- Biomass has a numerous potential uses in the bioenergy area for the production of liquid fuels or combustion.
- There are several hurdles impeding the further development of biomass production in the US and Kentucky.
 - Lack of infrastructure needed to transport and process biomass.
 - Knowledge level of potential producers for new energy crops.
 - Scalability of technology needed for processing biomass into cellulosic ethanol (bottom right corner)

Objective:

- The primary focus of this research is to assess the understanding of biomass production, processing, and willingness to produce biomass in Central and Eastern Kentucky.
- To do this a survey has been created to ascertain the willingness of Central and Eastern Kentucky farmers to diversify their crop production to include biomass production.
 - One key question asks about what price processor must pay to entice producers to produce biomass.
 - Demographic questions about their operation and questions meant to elicit their knowledge and interest in biomass and bioenergy production make up the remainder of the survey

Potential Biomass and Energy Crops:



<http://www.theenvironmentalblog.org/wp-content/uploads/2010/10/woody-biomass-2.jpg>



http://australia.pioneer.com/Portals/0/Australia/images/products/sorghum/graze_site_16.jpg



<http://www.nwfloodnews.com/wp-content/uploads/2011/02/Beet-roots.jpg>



http://www.aesl.usc.edu/news/News_Photos/Miscanthus/content/Miscanthus%20x%20giganteus%20Aug%202010%20N%202.jpg

Figure 1: Planted Acres in Perennial Grasses, Woody Crops, and Annual Energy Crops for Selected Years and Prices in Baseline Scenario

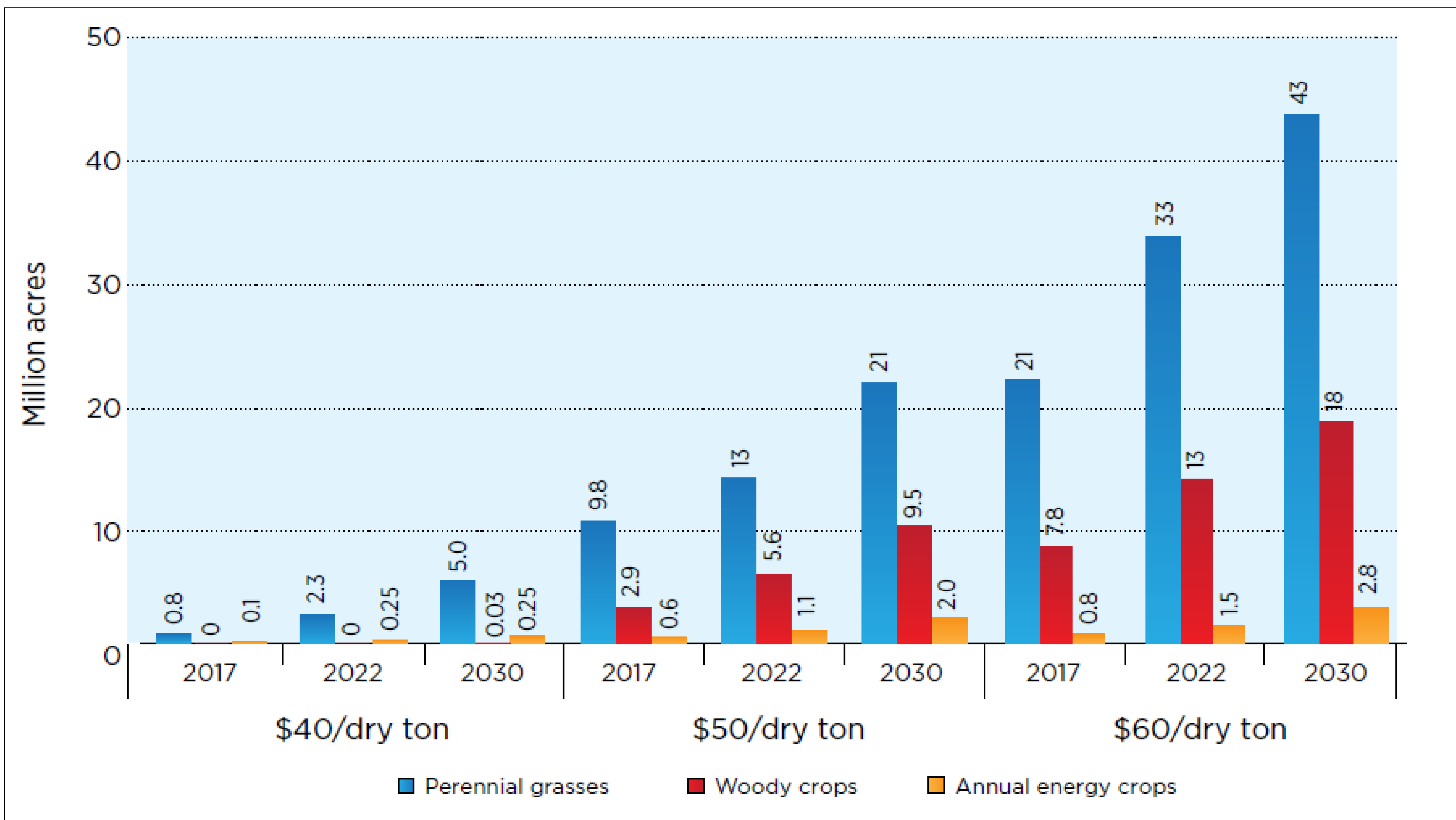


Figure 2: 2015 Estimated Perennial Grass Production at \$55/dt

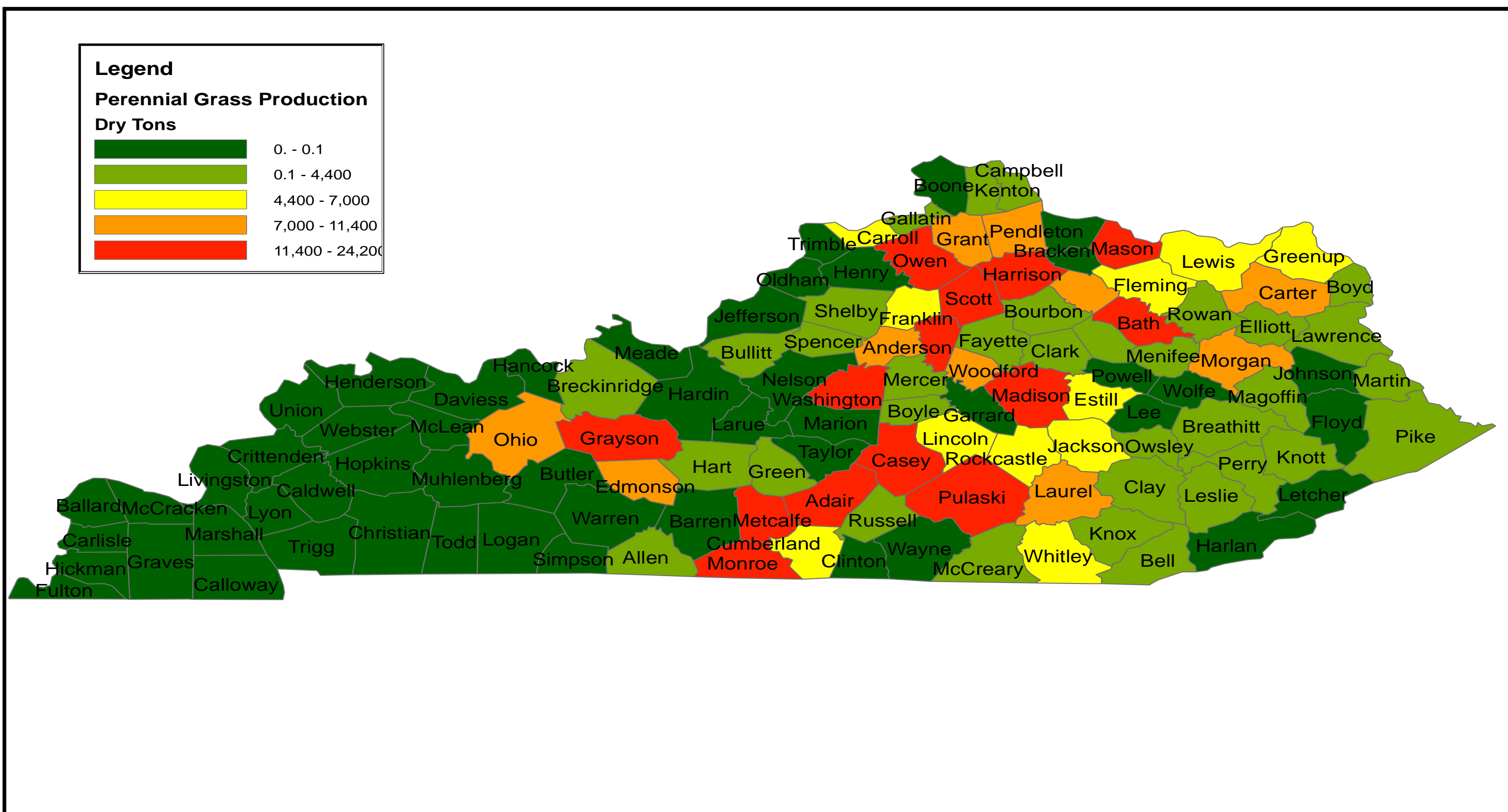
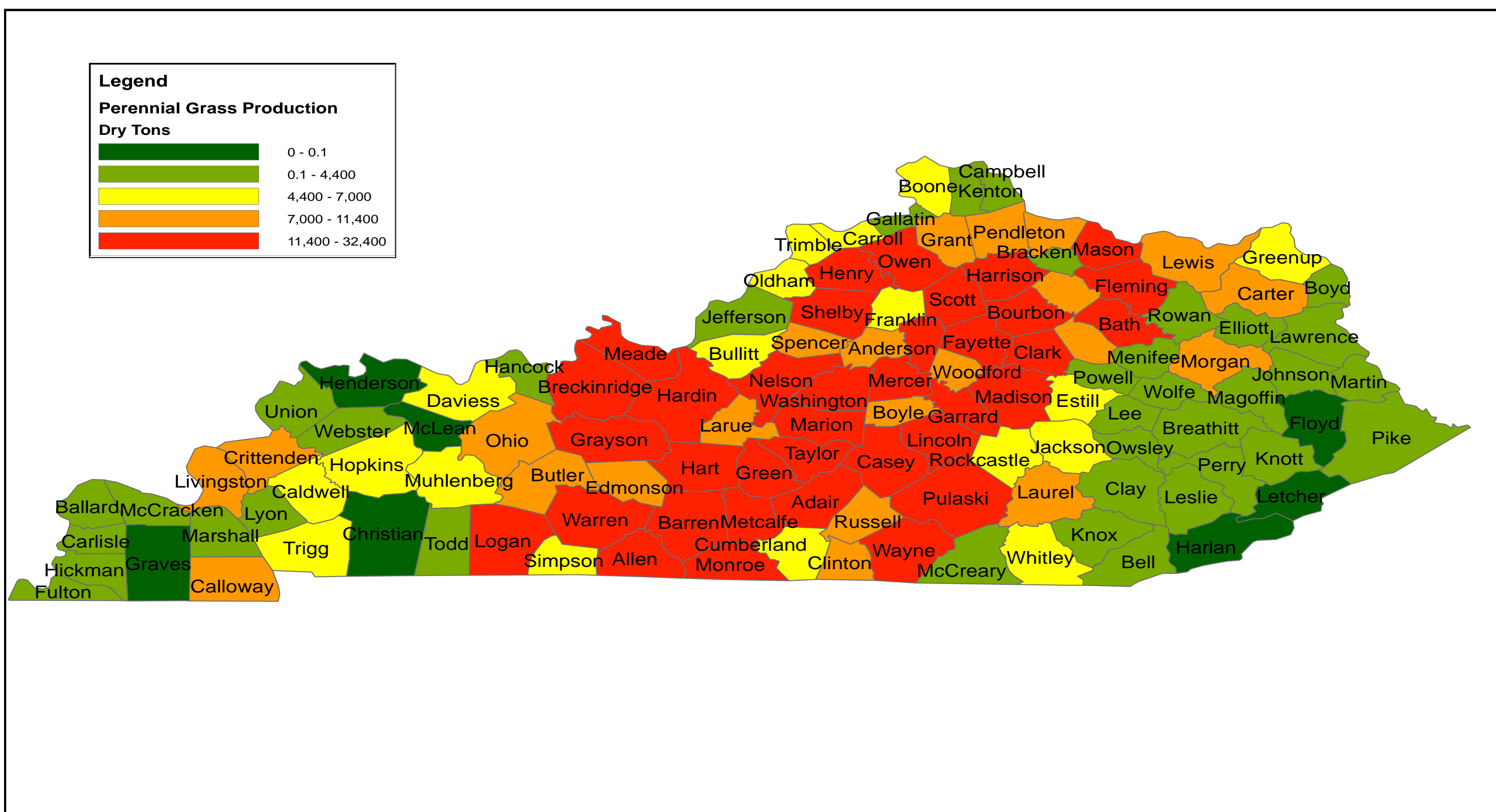


Figure 3: 2015 Estimated Perennial Grass Production at \$65/dt



Data and Methods:

- Preliminary data used to determine the number of producers in the 48 counties east of I-75 was collected from the 2007 Census of Agriculture. In Kentucky, there are approximately 55,500 farms that are 50 acres or larger. Approximately 16,500 of these farms are located in the 48 counties east of I-75.
 - With the help of Kentucky office of National Agricultural Statistics Service we are selecting a stratified random sample of these 16,500 to sample. The total sample size surveyed will be approximately 1,000.
 - Qualitative choice models are appropriate when trying to determine the characteristics of an individual that influence their decisions. Furthermore, probit models are a type of qualitative choice model based on utility theory, or rational choice prospective on behavior (for more detail see McFadden 1973). Given that producers maximize their expected utility of profits, subject to constraints imposed by the characteristics of their marketing and production environment and that this is true as it relates to producers determining their preferences for bioenergy production, a probit model is a logical choice for modeling producer decisions (Goodwin, 1993). Characteristics that can influence these preferences are the traits of the producer, type of farm, traits of the farm, and knowledge of bioenergy production.

Results

Of the 1,000 producers surveyed 227 responded with usable data from 199 responses, from 42 of the 48 counties. There was 19.9% return rate with the usable responses. Responses indicate the average number of years owning agricultural land in Kentucky is 28.93 years. Seventy-nine of the responses indicate that the producers would be willing to grow biomass for energy. Of the respondents 165 were male and 28 stated being female, 181 Caucasians, 5 Native Americans, 1 African American, and 6 others. Of the 227, 11 had little to no high school, 74 had graduated high school, 37 had some college, 38 were college graduates, and 35 had a Master or Doctorate.

Discussion:

- According to the December 10, 2009 Final Report from the Executive Taskforce on Biomass and Biofuels Development in Kentucky, potential biomass production capabilities by 2025 are estimated at 25 million tons per year
 - This would involve land use changes of approximately 2 million acres, or 15 percent of Kentucky farmland.
- Approximately 20 percent of this volume is expected from forestry and woody biomass production, 60 percent from energy crop production, 10 percent from forest waste, and 10 percent from agricultural waste (Kentucky, 2009).
- Figures 2 and 3 display the amount of perennial grass biomass that could potentially be produced in each county dependent upon the price per ton paid for biomass in 2015, according to DOE (2011).
 - Perennial grass biomass would come from sources such as switchgrass, miscanthus, big bluestem, etc.
- Given this information along with the US movement toward renewable fuels it is going to be evermore important that we have a basic understanding of potential biomass producers and know what education needs to be provided

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