



## Maximizing On Farm Bioenergy Crop Production Potential

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### INTRODUCTION

On farm bioenergy crops have the potential to increase farm profits, produce low cost energy, reduce carbon emissions compared to traditional fuels, and reduce environmental impacts associated with other types of agriculture. A successful bioenergy crop production enterprise requires careful management, which includes applying best practices to keep production costs low, developing markets for the product and value added co-products, and, when possible, taking advantage of government policy mandates, grants, and subsidies. Another characteristic of a viable bioenergy crop production enterprise is that it is part of a value chain in which profit or another benefit is derived for all parties involved—from the landowner to the end user.

Because corn ethanol is the most developed bioenergy fuel market, analyzing the experience of corn ethanol production is useful for determining how other bioenergy crops can be successful. For corn ethanol, the government Renewable Fuel Standard RFS mandate was a key driver in developing the market. Alternative traditional markets for corn kept prices high when ethanol prices were low. Value added co-products including distillers grains, carbon dioxide, and corn oil add to the profitability of the process. Good returns from corn production led to increased markets for farm equipment, seeds, and other crop inputs. Land rents increased as well. Farm input suppliers, landowners, and rural economies benefited as well from the use of corn for ethanol and the associated higher crop prices. Corn growers initially had held the cost of production down, but with increased commodity prices, the cost of production rose, increasing the breakeven price for the commodity. These increased production costs have resulted in the additional revenue from ethanol to be distributed more broadly in the industry- to landowners, seed companies and machinery companies for example.

Some of the same tactics that worked for corn ethanol development could be applied to other bioenergy feedstock production systems to aid in their market development. In this factsheet, we will discuss examples of how these approaches could be used to expand the potential for emerging bioenergy feedstock production.



Figure 1. Custom operators can perform activities such as baling and reduce ownership costs for bioenergy producers.)

## REDUCING COSTS OF PRODUCTION

To control production costs, start with developing a sound budget and controlling both fixed and variable costs. A key budget area to limit is the cost of renting land. Rental cost control can be accomplished by targeting production on land for which alternative uses for higher value crop production are limited or undesirable. Land having limitations such as poor drainage, steep slope, shallow depth, or stoniness might not be suited for grain or forage production, but could be utilized for bioenergy production at negligible rental rates. Another approach to minimizing land rental costs is to seek landowners who have no interest in grain or forage production and who support the concept of bioenergy production. Government entities such as the state, counties, and school districts or mining companies with land that is undergoing reclamation are good candidates.

To control costs for nutrients, in some cases, bioenergy crop production can be supported with the application of biosolids, animal manures, or industrial byproducts such as paper mill sludge or the ash from biomass boilers.

It is important to maximize the yield per acre through good management or other practices to manage production costs. Practices might include increasing nitrogen fertilization on some species, or adjusting harvest timing to maximize crop removal. In the case of corn cobs, Poet has developed strategies (Wirt, 2013) to harvest some of the upper amounts of stover along with the cobs to increase the yield per acre and reduce production cost.

On small to medium farms, another tactic to reduce costs is to employ custom operators to perform planting or harvest operations where the cost of equipment ownership might be high and unjustified. For some biomass crops, harvest timing is not as critical as forage harvesting and the harvests occur outside of the normal forage harvesting timeframe. Thus there may be opportunities to negotiate for lower custom rates during these periods when operators may be looking for work.

## MARKET DEVELOPMENT

One of the principles of bioenergy feedstock development is to establish a market before you grow the material—either with a centralized bioenergy provider or with an on-farm use of the feedstock for energy. Examples of the latter could be for oilseeds for biodiesel production or for woody biomass for on-farm or local heating or co-firing projects. The best returns from bioenergy feedstock production are likely to be found when it is used to replace higher cost energy sources like diesel or propane. Some firms have found that the best markets for bioenergy feedstocks are in European countries where there is a premium for renewable energy feedstocks.

Another aspect of bioenergy feedstock development is often to identify other markets for the feedstock to provide higher returns while the bioenergy market develops. Examples of other markets for biomass include animal bedding, mushroom compost, and mulch. Some bioenergy feedstocks are sold to the natural gas industry as mulch or adsorbents.

## DEVELOPMENT OF VALUE ADDED CO-PRODUCTS

Co-products from bioenergy production can often add significant value to the enterprise. In the case of oilseeds, the co-product is a high protein meal that, in some cases, can be more valuable than the bioenergy feedstock. For smaller operations, you can increase the value of this protein meal by marketing it as



**Figure 3. Stored switchgrass bales that will be used for animal bedding.**

retail feed to small animal producers, rather than selling it on the wholesale market. In the case of woody biomass feedstocks, the co-products are more limited. Depending on the process, the main co-products might be ash or lignin or mineral nutrients recovered from the processing. Woody biomass co-products could be recycled by spreading on production areas to reduce the cost of production or sold to maximize value.

Landowners may receive the highest benefits from biomass feedstock co-products. For cob or stover harvest, one co-product might be the reduced need for tillage to incorporate corn stalks and, hence, a slight yield increase in subsequent crops. Switchgrass fields can provide wildlife habitat and can often be used as game farms or hunting preserves. Switchgrass can also be used for buffer areas to minimize runoff from crop or livestock production enterprises. It can also be used as an emergency feed in some situations. With Miscanthus, some of the production area could be devoted to rhizome production for future plantings. For shrub willow, some production can serve as windbreaks to prevent snow drift or provide protection around animal production facilities.

## GOVERNMENT MANDATES AND PROGRAMS

Taking advantage of government incentives for bioenergy can be a critical part of bioenergy feedstock production. Biofuel mandates associated with the RFS mandate for biodiesel and cellulosic ethanol are contributing to development efforts in this area. Other government programs such as the Biomass Crop Assistance Program can provide funding to reduce risks associated with bioenergy feedstock production. A USDA report summarizes some of the attributes of successful BCAP projects funded prior to 2013. (USDA, 2013)

## SUMMARY

Bioenergy feedstock enterprises can be successful, but they require more management than the typical commodity crop enterprise. Growing bioenergy feedstocks requires diligence to reduce and understand production costs and to understand potential alternative markets for the feedstock and co-products. When considering bioenergy feedstock production, it pays to understand government policies and available incentives.

## REFERENCES

USDA. 2013. BCAP: Biomass Crop Assistance program: Energy feedstocks from farmers and foresters. USDA-Farm Service Agency [http://fsa.usda.gov/Internet/FSA\\_File/bcap\\_documentation.pdf](http://fsa.usda.gov/Internet/FSA_File/bcap_documentation.pdf).

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