AGRICULTURAL LAW Fact Sheet



Center for Agricultural and Shale Law

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Energy Crop Breeding

Energy crop breeding is a specialized agricultural practice that involves the selective breeding of plants to enhance their suitability for bioenergy production. Unlike conventional food crops, many energy crops are grown solely for the purpose of supplying energy. Energy crop breeding offers a sustainable source for generating renewable energy, producing biochemicals, and creating innovative materials, such as bioplastics. The practice has significant potential to support the global transition towards renewable energy sources.

How are Energy Crops Created?

Biofuel production is a process that relies entirely on sufficient plant biomass, an organic material that comes from plants. Plants use photosynthesis to capture sunlight and convert it into chemical energy. This energy is stored in the form of complex sugars called polysaccharides within their cell walls. These polysaccharides in plant material or biomass become the fuel source production. Increasing for energy polysaccharide production in plants is key to extracting more energy; however, it presents a difficult challenge.

There is continued research for improving enzyme production within plant cells and producing more easily convertible forms of sugars. Researchers are investigating effective solutions for storing enzymes for post-harvest activation. This would minimize damage to the plant and preserve the quality of the enzymes, which are sensitive to some environmental factors, such as heat.

Benefits and Challenges of Energy Crops

On a large scale, energy crops support the global initiative to combat climate change. Biofuels derived from these crops emit significantly fewer areenhouse gas emissions fuels, compared to fossil contributing reductions carbon to in emissions.

However, the use of energy crops and bioenergy remain a subject of controversy.

Energy crop production can drive up food prices as these crops compete for cultivation areas with commodities such as corn and cane sugar. Furthermore, the expansion of bioenergy production can also counterproductively increase greenhouse gas emissions if it results in deforestation or the conversion of agricultural land.

Dedicated energy crops such as switchgrass and miscanthus, which are not intended for human consumption, are emerging as alternatives to traditional commodity crops. However, these alternatives do not fully address the concerns related to land use and deforestation.

Another issue with dedicated energy crops is their limited versatility and marketability compared to traditional crops, such as corn and sugarcane. Dedicated energy crops are grown exclusively for bioenergy production, which presents a distinct market challenge



unlike that of traditional crops that serve dual purposes for both food and biofuel production.

Intellectual Property and Energy Crops

Intellectual property (IP) law plays a pivotal role in the development of energy crops by offering legal protections for new crop varieties. Crop developers often seek patent protection or rely on the Plant Variety Protection Act (PVPA) to secure exclusive rights to their genetically improved crops. These protections grant breeders the authority to control the use, sale, and reproduction of their varieties.

Due to the robust intellectual property (IP) laws in the United States, farmers must navigate licensing agreements, royalty structures, and other legal requirements when using patented crop varieties.

Impact of Energy Crops on U.S. Energy Consumption

The U.S. Energy Information Administration (EIA) reported that biomass provided 5% of the nation's total energy consumption in 2022. While this percentage might seem modest, it is significant to note that biomass accounted for 37% of U.S. renewable energy consumption during the same year. Additionally, in 2022, biofuels, particularly corn-based ethanol, made a significant contribution to biomass consumption, accounting for nearly half of the energy derived from biomass.

Energy Crops & the Renewable Fuel Standard

The Renewable Fuel Standard (RFS) is a federal initiative aimed at reducing greenhouse gas emissions and promoting energy independence. This is achieved by integrating biofuels, such as ethanol from corn, into the national fuel supply. The RFS is responsible for ethanol being in nearly 98% of U.S. gasoline, and it poses both

opportunities and challenges for farmers and energy crop growers.

The government's interest in expanding the RFS provides a continuing opportunity for farmers to diversify their income and for rural economies to develop. However, there are substantial input costs associated with energy crop production that may act as a barrier for many. If farmers can undertake the infrastructural and logistical costs associated with energy crop breeding, it represents a significant opportunity for additional income while simultaneously contributing to reductions in greenhouse gas emissions.

Federal Programs to Incentivize Energy Crop Breeding

The U.S. Department of Agriculture (USDA) offers a range of federal programs and incentives specifically designed to support farmers and stakeholders engaged in energy crop breeding. The Biomass Crop Assistance Program (BCAP), for example, extends up to 50% financial support for the cultivation of biomass feedstock crops, such as sugar cane and switchgrass.

The BCAP is a program specifically designed to support landowners and operators of agricultural land or non-industrial private forest land by offsetting the costs associated with researching and growing these crops. Eligible participants can receive matching payments to cover the delivery of qualifying biomass materials to biomass conversion facilities. The program also offers annual payments to producers who contract with the Commodity Credit Corporation to produce biomass crops on qualifying land.

More broadly, in support of the transition towards renewables, the Rural Energy for America Program (REAP) provides vital loans for implementing renewable energy systems.



Furthermore, the Advanced Biofuel Payment incentives Program provides to fuel producers to increase their production of advanced biofuels. This program requires participants to produce or sell biofuels that meet the RFS definition of advanced biofuels; excluding corn-based thus, ethanol. Eligible producers can receive payments based on the quantity of advanced biofuels they produce each quarter.

The USDA offers additional programs to improve the market for biofuel production, such as the Feedstock Flexibility Program (FFP). The FFP encourages domestic biofuel production by allowing the USDA to buy surplus sugar from loan recipients; thus, stabilizing prices. Another example is the Higher Blends Infrastructure Incentive Program (HBIP), which facilitates capital investments into the infrastructure needed to produce ethanol and biodiesel blends. Finally, the Biorefinery Assistance Program offers funding for the development of commercial-scale biorefineries and other advanced biofuel technologies.

These programs are part of the government's stated commitment to advancing sustainable energy sources, such as biofuels.

Conclusion

Energy crop breeding offers a promising towards sustainable bioenergy path production. While land-use considerations and intellectual property hurdles exist, government support programs are available to facilitate new renewable energy sources. Success in energy crop breeding and biofuel production depends on а aood understanding of intellectual property rights, land-use regulations, and renewable energy standards.

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Energy Crop Breeding, Federal Programs: <u>Biomass Crop Assistance Program</u>; <u>Rural Energy for America Program (REAP)</u>; <u>Advanced Biofuel Payment Program</u>; <u>Feedstock Flexibility Program</u>; <u>Higher Blends Infrastructure Incentive Program</u>; <u>Biorefinery, Renewable Chemical, and Biobased Product Manufacturing Assistance Program</u>.

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The Center for Agricultural and Shale Law conducts research and educational programs to serve a wide variety of stakeholders including agricultural producers, landowners, mineral interest and royalty owners, business professionals, judges, attorneys, legislators, government officials, community groups, and the general public. Center programs are funded in part by the Commonwealth of Pennsylvania through the Pennsylvania Department of Agriculture. The Center for Agricultural and Shale Law is a partner of the National Agricultural Law Center (NALC) at the University of Arkansas System Division of Agriculture, which serves as the nation's leading source of agricultural and food law research and information.

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