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The Sun Grant Program is a regional multi-institutional research, extension and education program to support the development of bioenergy, biomass, and bioproduct technologies across the United States. The program targets market-driven biomass production, products and processes that provide economic development in rural areas while also sequestering carbon in the soil, in ecosystems, in products, and through geologic sequestration. The potential for carbon negative bioeconomies puts this approach at the forefront of climate mitigation, developing scalable and cost effective climate solutions for the decades to come. Every year plants take up ten times more carbon from the atmosphere than all fossil fuel emissions combined, and humans already manage roughly half of all that photosynthetic carbon capture. Currently almost all that photosynthetic carbon returns to the atmosphere through decomposition of crop and forest residues, and as municipal and industrial organic wastes. Carbon negative bioeconomies create new markets to capture that carbon in products for economic growth.

In a world that already is suffering from too much carbon in the atmosphere, managing photosynthetically captured carbon in ways that keep it from returning to the atmosphere is by far the most cost-effective near-term option for reversing climate change. For context, the US Department of Energy's Carbon Negative Shot has a ten year goal to reduce the cost to $100/ton of CO_2, and to that end plans to invest approximately 12 billion dollars in direct air capture technologies that currently cost upwards of $500/ton. In contrast, today there are several bio-based technologies that sequester carbon for well below $100/ton, with many more on the horizon that can be developed and scaled with investments in scientific research, technology innovation, and market development.

This carbon negative potential is key to differentiating bioeconomy products and processes from non-biobased energy, chemicals and materials that can at best be net-zero with respect to carbon, and from direct air capture and other carbon negative strategies where no marketable products are involved. There are water quality, biodiversity, soil health, and many other benefits from producing sustainable biomass feedstocks in forests and agroecosystems, and the opportunities for sequestering carbon through biomanufacturing are much greater than it is possible to store in ecosystems. These include long lived wood products and other biomaterials, bioprocess waste streams such as carbon dioxide that can be sequestered in products or geologic reservoirs, as well as fermentation residues, biochar and other byproducts that can be converted into products or returned to soils. These innovative new products and processes, supported by the Sun Grant Program, take the concept of a circular economy as a starting point, but go far beyond circularity to create positive climate solutions. Carbon negative bioeconomies are not only environmental solutions: they also jobs solutions, offering rural economic development in concern with sustainable agricultural and forest management.

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