This study presents a detailed analysis of the economic and technical feasibility of utilizing existing biomass resources on the White Earth Reservation to develop a renewable energy biofuels demonstration facility. It also considers the possibility of developing, harvesting and marketing native prairie plants and seeds for bioenergy production.

The key to attracting investment in a liquid biofuels conversion plant is a sustainable and affordable supply of biomass. Biomass can be obtained from a variety of sources such as forest biomass, agricultural residues, and grasslands. However, these resources must be harvested sustainably to ensure a supply well into the future while avoiding any negative environmental or wildlife habitat impact. Forest biomass has a very long regeneration time and is also valuable and necessary to the paper and wood industries. The quantity of agricultural residue such as corn stover and wheat straw is determined by the acreage planted to these crops. Grasslands and SRWC (hybrid poplar) could be a primary crop grown specifically as feedstock for conversion to liquid biofuels. Unfortunately, the acreage planted now in grasslands or SRWC in the White Earth region is barely adequate to support a single 35 million gallon per year plant if it could all be harvested. The practicality of full harvest is very questionable since some of these grasslands are hay fields used for pasture and the plantings are not contiguous. The conclusion is that to attract investment the planting of grasslands needs to be given high priority. It may not be a *field of dreams* but it is certain that if the biomass supply is not there they will not come!

Biomass resources were quantified through gathering and analysis of extensive field data that resulted in a model for predicting biomass productivity in future managed landscapes. From these data and other agronomic data, supply curves have been developed that will predict supply response to change inthe price of biomass. The analysis shows where biomass feedstocks might be grown and how the resulting prices affect the financial performance of the biofuels plant.

Detailed economic and technical analysis of the various biomass conversion platforms to produce renewable fuels has led to several important conclusions, namely: 1) Ethanol from cellulosic biomass is not ready for commercialization and requires significant improvements to the underlying technology to become profitable; 2) Capital costs for cellulosic ethanol plants are significantly higher than those for corn ethanol plants (about 2-3 times higher per gallon of ethanol produced); and, because of the increased level of complexity: 3) Significant government subsidies to the producer will be required indefinitely to achieve even modest profitability for ethanol plants under optimistic scenarios for future technical improvements.

Ethanol, whether from cellulosic biomass or corn, should therefore be viewed as a transition biofuel that will ultimately be replaced by technologies based on converting biomass to syn gas and thence to transportation fuels such as dimethyl ether (DME), gasoline, diesel or jet fuel that are compatible with present distribution systems and usage patterns for transportation fuels. Ethanol will continue to be utilized as an oxygenate and also to supplement synthetic gasoline supplies.

For synthetic gasoline and other biofuels produced from cellulosic biomass to be economically viable and commercially sustainable requires crude oil prices to be high enough for gasoline retail prices to exceed $2.60 per gallon with current government tax credits of $1.01 per gallon on a permanent basis and for the desire to reduce foreign oil independence and carbon dioxide emissions to become national priorities backed by policy and subsidies. If gasoline retail prices exceed $3.50 per gallon then tax incentives are not necessary to achieve a sustained profitability.

The amount of biomass needed to supply either cellulosic ethanol or synthetic biofuels plants is significant. A single 50 million gallon per year plant would require 670,000 - 750,000 tons (15% moisture) yearly of biomass. This equates to the biomass that can be sustainably harvested from 418,000 - 478,000 acres. The White Earth area could support three 50 million gallon per year cellulosic conversion plants if all eligible acreage were producing biomass at sustainable levels to also provide ecosystem benefits such as soil, water and wildlife protection

The White Earth Nation can take a significant step towards energy self-sufficiency through the use of indigenous biomass resources while maintaining their commitment to stewardship of the land and providing job opportunities on the reservation by investing in a biomass fuel pellet manufacturing facility on the reservation. A business plan to achieve this has been developed. If the biomass is harvested sustainably, the land is protected and in fact is improved by the restoration of perennial prairies which sequester carbon dioxide in the root system, act as filters to mitigate agricultural run-off from polluting ground and surface water and also serve as additional wildlife habitat. A pellet manufacturing facility will provide an opportunity to develop expertise in manufacturing and a work force to form the core for potential future ventures in biofuels production. Cash flow from a pellet operation could be the source for funding of future ventures in prairie restoration as well as expansion of the initial pellet manufacturing operation as market conditions permit.

In upcoming decades the White Earth Nation can use the infrastructure and materials developed in the first decade to support a facility that converts their cellulosic biomass to transportation fuels through a syngas route. ■