Sustainable Agriculture and Energy Systems for Rural Communities

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Support of family and small farming is a strategic action for preventing depopulation in rural communities, and stimulating rural renewal. Decline in the financial soundness of small-scale-farming is one of the main issues that farmers in rural counties such as Harmon and Tillman are facing, which has led to the loss of family farms [1]. One effective solution to increase farmers' income and their ability to stay in agriculture is to improve productivity of farms. Farm productivity highly depends on the cost of energy required for agriculture [2]. To reduce energy costs in farms, increase the net farm productivity and income, and promote more sustainable farming and rural development, new energy supply strategies are needed. This project aims to study the integration of local **alternative energy resources** (AER) with agriculture in rural areas. Alternative energy and farming have the potential to be a winning combination. It not only contributes to energy cost reduction, energy efficiency, and farming productivity increase, but also provides farmers with a long-term source of income. On the power grid side, deployment of local AER addresses the capacity shortage and reliability of electricity supply to rural areas. However, due to the temporal scale differences in crop and AER energy production, the cost-effective coupling of AER and rural agriculture faces a **multi-time scale coupling** issue. To this end, prior knowledge of farming energy consumption and AER energy generation is an essential step for energy planning, energy-related advancements, and policy development in agriculture. We propose developing probabilistic models for agricultural load and AER energy generation via a joint effort by researchers, energy service providers, and farmers.