

- ABSTRACT -

Importance of Food-Energy-Water-Health Nexus for New Mexico

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With continuing trends in population growth and sprawl of metropolitan areas, provision of the basic human needs of food, energy, and water to the inhabitants is seen as a major challenge. For New Mexico, this challenge takes on another dimension as the population is sparsely distributed making it difficult to provide basic needs affordably without stressing renewable and financial resources. Being net consumers of food, energy, and water, infrastructure that continues to rely on old technologies to provide these basic needs is not sustainable. Development of infrastructure that can recover and recycle energy and materials within the food-energy-water (FEW) sectors is being recognized as one of the best options to improve the sustainability of agricultural systems.

The Energy Research Lab (ERL) at New Mexico State University (NMSU) is engaged in finding solutions pertaining to the nexus issues, primarily using Algal Biosystems. In this paper, we will summarize contributions to finding sustainable solutions to the nexus issues and focus on algal-based, photosynthetically driven waste-to-energy recovery system for recovering energy, water, and nutrients from wastewaters (WW). The recovered water and nutrients can be utilized for the food production. The system is capable of WW treatment, net energy production, and recovery of irrigation-quality water and high-purity crop fertilizers. The mixotrophic algal system is capable of incorporating all the C, N, and P in UWW into biomass without any energy input, without any loss of C as CO₂ in the atmosphere and with solubilized N and P in concentrated form as byproducts for recovery and use as fertilizers.