

Reviewer #1:

Very important work. Generally undervalued due to relatively inexpensive energy resources since mid-2000s and issues cited in the project overview. Excellent recap of challenge and opportunity for comprehensive efforts to improve the energy balance of individual farms and sustainability of distinct farming regions. A more explicit link between ag-sector resilience and the wider resilience of rural regions may be a helpful reminder of the long-term merits of this work.

Response to Reviewer #1:

Such a link could be established between the ag sector plans to generate excess power that is then delivered to local communities. This would require special partnerships between producers (farmers) and consumers (local communities). Often, on-farm energy is sold directly to the grid without the farmers being able to influence where the electricity goes (or stays). Energy resiliency is not an area we had originally intended to engage in, but could be explored if the team members see merit in this idea. This could take the form of an extension or educational program covering farm resiliency and how sustainable energy can impact resiliency (distributed generation, islanding of systems, low cost production due to energy efficiency, reduction of erosion due to sustainable farming practices). Some team members have worked on the topic of energy resilience for the farm, and there is potential to address it at a regional level, given appropriate resources. We will definitely bring this to the team and see if we can engage personnel and resources to this important topic.

Reviewer #2:

Overall the proposal is good and worthy of support. The literature cited is somewhat weak having some older references, missing references to eXtension.org, Farm Energy CoP, Work by USDA partners like NRCS, etc. The project is to address research, extension and education but there is no subsection on education. In the extension section there has been a fair amount of work done here already but things like the Farm Energy CoP could benefit greatly by some updates following the completion of research and review of recent research. While energy conservation is mentioned in one area of research, it's somewhat lightly treated in most other areas. It is not clear in the extension area whether the energy invested in farm inputs, mainly fertilizers and pesticides, will be included or not. Potential partners /stakeholders like USDA/ State Ag agencies, agri supply industries, etc seem to be missing in the outline. There is certainly limited FTE contribution at this point. Do you believe/have evidence there will be added interest as the project goes forward?

Response to Reviewer #2:

We are happy to add more evidence. Our project's Extension and education are similar, but with different audiences: farmers and college students. The book we are working (Regional Perspectives on Farm Energy) would be a good example of the combined Extension/education we plan to do. If necessary, we could propose to conduct a series of workshops/short courses (live or virtual) in combination with already established farmer meetings. In addition, we could propose to (over the course of the project) put a college course

together about farm energy. I don't think we were planning to include energy issues related to fertilizers and pesticides. We already have two college courses taught by two of our members, Renewable Energy in the College of Agricultural and Natural Sources by Dr. Lansing, and Biorenewable Systems taught at Penn State. This information will be better integrated into the Farm Energy work as we move forward.

Potential partners: We will make an effort to include energy industry partners, such partners could be invited to join an advisory board that we interact with on an annual basis. For example, we have collaborations with Quasar Energy Group in Ohio and Koppers Corporation in PA.

For FTE, we will be open to expanding the membership team to include more members and increase the collective FTE.

Ultimately, our activities are dictated by the grants we attract and the impact that we have on farmers in the energy arena. We have been successful in attracting Beginning Farmers Grant and will continue this effort as the move forward with our engaged team.

There is definitely some overlap between this project and [eXtension.org](https://farm-energy.extension.org) Farm Energy (<https://farm-energy.extension.org>). We will work with [eXtension.org](https://farm-energy.extension.org) Farm Energy to increase our efforts, including creating articles from the book that we are creating to increase the impact. This book has recent references and up to date information that can be through discrete articles on [eXtension.org](https://farm-energy.extension.org).

The topic of shared curricula, activities, course materials, and even courses is a timely topic. There is discussion of "flipping" our university courses and putting more content in online. There are modules that we could put online from our classroom content. For example, the connection of energy efficient farm production to environmental pollution can be further examined, such as better N use efficiency should leading to less groundwater nitrates and fertilizer use efficiency to reduce algae blooms. Fertilizer is the #1 use of energy in corn production. Through our work, we can investigate how farmers make energy decisions in terms of economic resiliency.

Reviewer #3:

Consider adding solar PV in the list of sustainable energy production systems in the Statement of Issues and Justification. Consider seeking funding to install promising renewable/sustainable energy production systems on one of the collaborating university farms to serve as a demonstration of potentially viable components/systems that are not yet on NE farms.

Response to Reviewer #3:

While this is a good suggestion, the challenge will be to identify sufficient funding to install and operate such a demonstration project. Rutgers University installed a 250 kW microturbine operated on landfill gas. The system generated power for a nearby greenhouse and excess power was sold to the grid. Funding for the project was provided by the state of NJ (\$750K), but the funding provided the capital cost and did not provide funding to maintain the equipment

beyond the initial project years. A challenge arose with corrosion of the equipment from landfill gas, which ultimately resulted in the end of the project. There are energy projects occurring at our partner Universities, including funding for an anaerobic digestion on-site at Penn State, and solar energy at University of Maryland farms and investigation into an anaerobic digestion system. We will continue to support our Universities in these efforts and lend our technical expertise, but this group cannot promise to make these installations on-site without funding commitment from our institutions and/or outside grant funding that we are always pursuing.