

# SUSTAINABLE FOOD, ENERGY, AND WATER SYSTEMS (SFEWS)

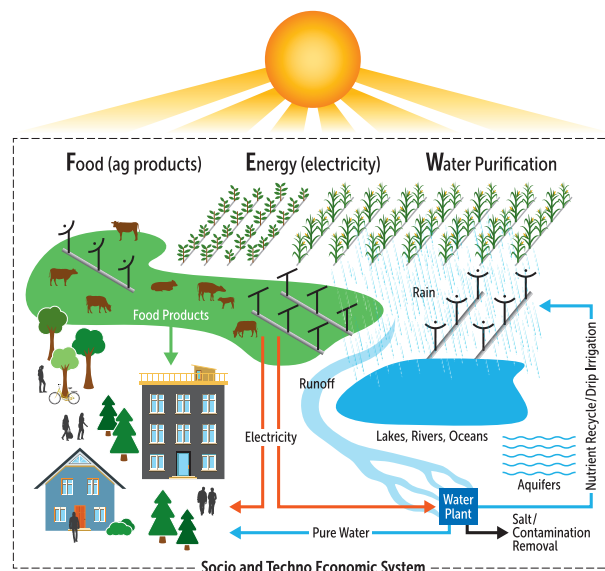
## NSF RESEARCH TRAINEESHIP PROGRAM



### ABOUT SFEWS NRT

**Sustainable Food, Energy, and Water Systems (SFEWS) NSF Research Traineeship (NRT)** is creating a sustainable system framework comprised of the analyses, fundamental scientific knowledge, technological development, and creative solutions required to synergistically harness solar energy for all three needs of Food, Energy and Water (**FEW**), and enable its implementation through much-needed interdisciplinary training of a next-generation workforce. We envision that all basic human needs can be produced from elements of nature—solar energy, land, air, and water—within the time scale that is commensurate with the use period.

Within the next two to three generations, our world is expected to grow from seven to more than ten billion people for a 'full earth.' This increase in population, coupled with rising per capita income and consumption habits, will create unprecedented stress on FEW demand and supply. A daunting question before us is: how can humans sustainably meet their current as well as full earth FEW needs with renewable resources? Solar irradiation is the only locally available and sustainable energy resource, and the only resource with potential to meet the entire FEW needs for the full earth at any time in the future. However, even to meet current demand levels in most population centers around the globe, the dilute and intermittent nature of solar irradiation leads to critical competition for land between food and energy.



Graduate students are developing SFEWS concepts with respect to novel photovoltaic (PV) module design and their methods of operation, and conducting experiments at Purdue's agriculture farmland to harmoniously use solar spectrum to generate electricity and manage water without any decrease in yield of major crops such as soybeans and corn grown underneath the PV modules. SFEWS NRT provides integrated interdisciplinary education along with research and professional development training to be a successful researcher, teacher, entrepreneur, and leader in a sustainable solar economy.

### ABOUT THE SFEWS NRT TEAM

The team consists of experts across independent disciplines who previously have contributed to different aspects of FEW elements but have now converged to create holistic research and education concepts to address urgently needed interdependencies to tackle FEW challenges. The SFEWS NRT is a collaboration of agricultural scientists and practitioners, engineers, economists—at two U.S. academic institutions (Purdue University) and Florida A&M University, one U.S. national lab, three companies and two international institutions—to form an interdisciplinary traineeship program that will provide human resources critically required to enable sustainable supply of FEW for any foreseeable future.

Led by Director Rakesh Agrawal and Co-Director Mitch Tuinstra at Purdue and Director Aavudai Anandhi Swamy at Florida A&M, core participants represent outstanding complementary skills in Science, Technology, Engineering and Mathematics (STEM) disciplines for an innovative and inclusive SFEWS education and traineeship program.

#### SFEWS NRT Team



**Rakesh Agrawal**  
Director  
Chemical Engineering



**Mitch Tuinstra**  
Co-Director  
Agronomy



**Aavudai Anandhi Swamy**  
Director  
Agricultural  
& Food Sciences,  
FAMU



**Peter Bermel**  
Thrust Lead  
Electrical & Computer  
Engineering



**Sylvie Brouder**  
Thrust Co-Lead  
Agronomy



**Nathalie Duval-Couetil**  
Thrust Lead  
Entrepreneurship  
& Innovation



**Margaret Gitau**  
Thrust Lead  
Agricultural & Biological  
Engineering



**Juan Sesmero**  
Thrust Lead  
Agricultural Economics

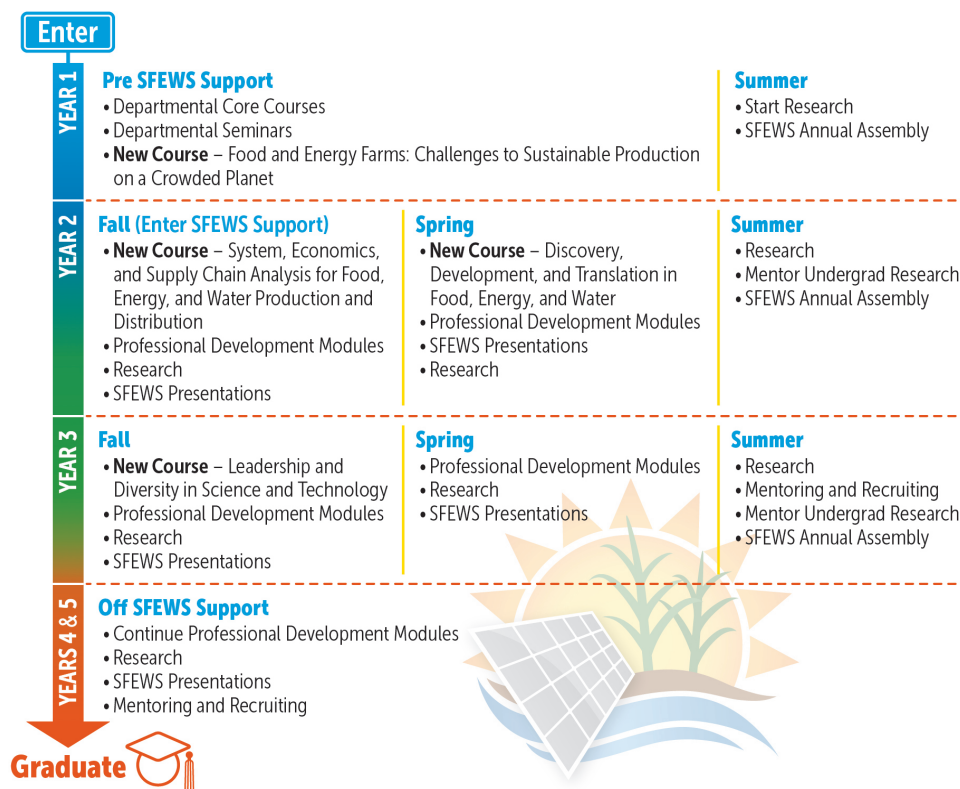
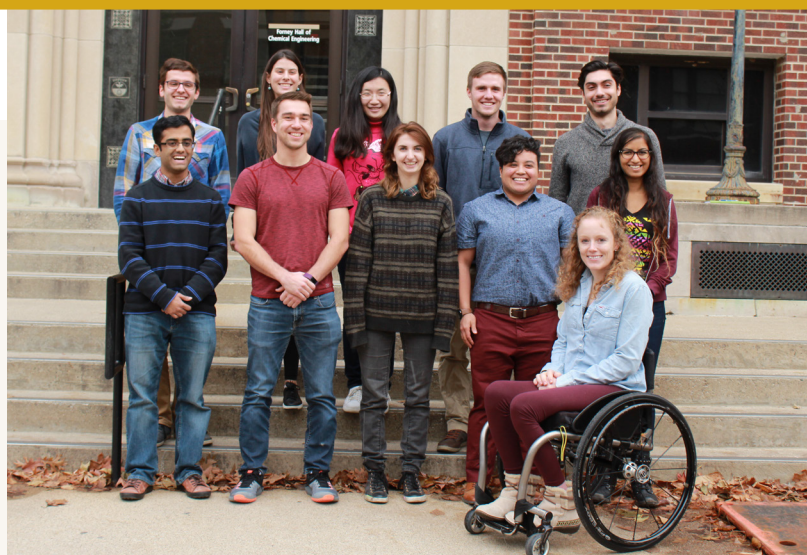
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## RESEARCH OPPORTUNITIES

SFEWS NRT has created an inclusive community of researchers and learners. Graduate students from multiple disciplines are welcome to apply, including agronomy, agricultural and biological engineering, electrical and computer engineering, chemical engineering, materials science and engineering, and agricultural economics.

Students will participate in SFEWS for a period of up to five years, with full funding for their entire PhD program. The second and third years will be funded by an NRT stipend of \$34,000/yr, with the remaining years funded by other sources.

After completing year three of the program, all trainees will also earn a SFEWS certificate.



### Year 1 Experience

SFEWS trainees will spend the first two semesters in their home departments completing departmental core courses and choosing an interdisciplinary research topic. They will begin research to explore their dissertation topic. In the first summer, trainees will focus on research and attend the two-day SFEWS annual assembly.

### Year 2 & 3 Experience

Students will complete remaining courses to meet the total credits for their PhD. They will also take a sequence of professional modules to develop key skills for graduate success. While additional development, training, and activities will continue in years 4 and 5 to further enhance SFEWS training, SFEWS trainees will receive a SFEWS certificate at the end of year 3 to celebrate their accomplishments as they exit NRT funding support.

### Year 4 & 5 Experience

SFEWS trainees will remain an integral part of the program by actively participating in SFEWS initiatives, recruiting and mentoring new participants and underrepresented groups, and contributing to translational activities and broader impacts.

## LEARN MORE ABOUT SFEWS

SFEWS NRT is recruiting graduate students in the areas of agronomy, agricultural and biological engineering, electrical and computer engineering, chemical engineering, materials science and engineering, and agricultural economics.

For more information, contact Melissa LaGuire, NRT Program Coordinator, [mlaguire@purdue.edu](mailto:mlaguire@purdue.edu).

Visit our website at <https://engineering.purdue.edu/NRT/>.