

I. RESEARCH AND POLICY PROJECTS

WFI's research and policy projects concentrate the four subject areas identified in its strategic plan: closing water and agricultural productivity gaps, improving groundwater management for agricultural production, enhancing high productivity irrigated agriculture, and freshwater and agricultural ecosystems and public health. In addition, the WFI works on a cross-cutting subject, the management of agricultural drought, in collaboration with its affiliated center NDMC. FY16 projects in each of these areas are summarized below.

A. Closing water and agricultural productivity gaps

1. Development of a Satellite-based Global Water Productivity Product: The goal of this project is to develop a near-real time Global Water Productivity product based on seasonal estimates of crop yield and crop water use (evapotranspiration) using satellite based remote sensing approaches. The project is initiating in the MENA region in partnership with FAO MENA office in Cairo and will eventually expand to Sub-Saharan Africa and South America as additional funding becomes available. Activities during FY16 include a workshop in Cairo with MENA partner countries, identifying agricultural areas to downscale satellite products, and visiting locations on the ground. The main output during FY16 is identified agricultural areas for on the ground verification of water productivity products.
2. Nebraska Water Productivity Report: WFI has proposed to prepare an annual Water Productivity Report (WRP), which will aim to be one of the flagship publications of the WFI. The WRP will give visibility to the Institute by focusing attention on the question that lies at the core of its mission: is the world making progress in advancing food security with less pressure on water resources? The funding will be used to hire an experienced post-doctoral research scholar to aid in the analysis of necessary data and preparation of the report. Outputs during FY16 include the completion of an initial analysis of watersheds and existing data sources for Nebraska.
3. Parallel 41 Flux Network: The goals of this Nebraska-focused project are to provide real-time energy balance flux data including evapotranspiration of different crops and vegetated surfaces around the state to be used for water productivity estimates in different watersheds and agricultural systems. These data are needed to test the remote sensing based models of seasonal water productivity being developed for global application. The key WFI Faculty Fellows and partners involved are Suat Irmak and Andrew Suyker, SNR; the external partner is George Burba, LiCOR. Outputs during FY16 include functioning sensors, flux data analysis, and budget for installation of LiCOR hardware and software package at different flux stations.

B. Improving Groundwater management for agricultural production

1. Sustainable Irrigation Systems: The goal of this program is to support an interdisciplinary research team to analyze existing data and assimilate existing results to answer the question: "Are there existing or potential models for sustainable irrigated cropping systems in the High Plains region of the United States?" The findings will be published in a high impact, peer-reviewed journal that reaches a national and international audience interested in food, agriculture, natural resources and the environment. Key WFI Faculty Fellows involved are Derrell

Martin and John Carroll. The main output during FY16 is an International workshop on Irrigation Sustainability in the High Plains.

2. Advances in understanding the water-energy-food nexus in the High Plains: This project combines multiple thematically linked grants that analyze the economic, hydrologic, and ecologic impacts of groundwater-fed irrigation in the High Plains region. The project includes theoretical analysis of individual decision-making and institutions, hydro-economic modeling, and empirical analysis. USDA is the major funder. Key Faculty Fellows involved are Karina Schoengold and Taro Mieno. Activities during FY16 include a workshop on “Advances in Understanding the Water-Energy-Food Nexus for Irrigated Agriculture” held in August 2015, additional workshops in various locations, and multiple smaller research projects. The geographic focus is the High Plains.

C. Enhancing high-productivity irrigated agriculture

1. CIRCLES: Community Farming under a Center Pivot in Tanzania: This project is a collaborative initiative that aims to improve the livelihoods of 600 rural farmers in the Babati area of northern Tanzania over five years. The initiative will provide a center pivot irrigation system and the training, equipment, and infrastructure needed to optimize crop production for these farmers. Key WFI Faculty Fellows involved are Pinaki Panigrahi and Christopher Gustafson. The main output for FY16 is completion of the baseline assessment.
2. Jain Irrigation Systems Ltd. – University Of Nebraska Water for Food Research and Education Program: This India-focused project supports a collaboration on accelerated plant breeding, training in biotechnology and managing irrigation water using geo-spatial technologies, such as GIS and satellite image inputs. Key WFI Faculty Fellows involved are Harkamal Walia, and Thomas Clemente. Outputs during FY16 will include a spatial database created and installed for three sites, training initiated for two Jain Irrigation scientists, and a detailed plan of work for the 5-year project.

D. Freshwater and agricultural ecosystems and public health

1. Platte Time Lapse Project: This project provides support to assess the water quality of the Platte River where major tributaries meet with the Platte, and empower people living within the region with the necessary tools to successfully engage in environmental stewardship of the Platte River. Key WFI Faculty Fellows include Michael Farrell, and Michael Forsberg. Activities to be conducted during FY16 include installation and maintenance of Time Lapse cameras and proposal writing for scientific research. The main FY16 output is a proposal for external funding submitted.
2. Water Quality in Food Processing: This project focuses on the dairy industry as a case where a model for better water utilization can be developed. Results obtained from this study will provide significant insight to food processors about the risk associated with the use of water reconditioning in cleaning operations; as well as the reduction in operating costs that can be achieved by implementing water recycling practices in processing plants. The key faculty fellow involved is Rolando Flores. Activities planned for FY16 include completion of laboratory research and preparation of journal paper manuscripts. The main outputs during FY16 are submission of a proposal to USDA and journal papers.

3. Healthy Nebraska and Beyond: Building Health from the Bottom-up along Waterways: The purpose of this project is to help communities in Nebraska create an environment that promotes well-being. Its approach will entail collaborating with each community to assess relevant indicators, then develop a plan to deliver (free) resources to address deficiencies. The ultimate goal is to establish a healthy environment as a human right. The key WFI Faculty Fellows are Peter Longo, Alan Kolok, and Elli Rogan. The main output during FY16 is having enlisted high schools ready to participate.
4. Midwestern watersheds and adverse health outcomes: The primary objective of this project is to investigate the relationships between water quality and adverse health outcomes for regions within the Midwestern United States. In order to satisfy the overall objective, the tasks to be completed for select watersheds will include monitoring certain indicator agricultural chemical levels in water and cross-examining with data regarding cancer incidence and birth defects organized by watershed. Key WFI Faculty Fellows involved are Alan Kolok, Eleanor Rogan, Lorena Baccaglini, and Shannon Bartlett-Hunt. The activity planned for FY16 is data analysis for generating relationships in Midwestern states between surface water quality and cancer rates. The main outputs will be the initial results of analysis and a comprehensive research plan.
5. One Health: A New Path Forward for the University of Nebraska: The One Health approach engages diverse expertise to address issues of concern to public health, animal health, and the environment. Recent outbreaks of Ebolavirus in West Africa and MERS-coronavirus in the Middle East illustrate the flow of pathogens across political borders. While a primary focus is infectious disease, the One Health approach can be applied to many health issues at the human-animal-environment interface (such as obesity and exposure to chemicals or toxins). The project will harness the expertise in the NU system through workshops and other mechanisms to prepare a comprehensive concept note for the purpose of future proposal preparation. Key WFI Faculty Fellows involved are Liz VanWormer, Don Beermann, John Carroll, Pat Shea, and Charles Wood. The FY16 output will be a completed concept note that outlines needed research.

E. Management of Agricultural Drought (Joint WFI/NDMC Project)

1. Bringing drought monitoring and early warning systems to the MENA region: The goal of this USAID-funded project is to develop a drought monitoring and early warning system for the Middle East and North Africa region, based on a combination of ground based weather data and other climatic observations and indicators, along with satellite-based estimates of daily evapotranspiration (WFI's contribution). The products would be served through FAO's collaborative regional platform, while involving government institutions and regional/local water and agricultural agencies to implement and use the products on the ground. The project involves extensive capacity building and training. The key faculty fellow involved is Michael Hayes. Activities during FY16 include initiating a sub-contract with University of Maryland for production of a daily satellite-based evapotranspiration product, installation and testing of the ALEXI model on UNL supercomputer, and developing a downscaling methodology for a remote sensing based high-resolution water productivity product for the MENA region. Outputs during FY16 will include an ALEXI model running on a UNL supercomputer and a downscaling methodology established.

F. Scientific and Policy Research programmatic support: This project provides support for two postdoctoral scholars to work closely with the Directors of Research and Policy in the design,

implementation and evaluation of WFI's scientific and policy research programs. Activities during FY16 include ongoing research planning and coordination with internal and external collaborators, travel/meeting for research coordination, development of grant proposals for submission, supervision of WFI interns, graduate students, and other staff as necessary for individual research projects, data management and curation. Outputs during FY16 will include journal publications, conference presentations and posters, workshop and social media content, such as blog posts and short policy analyses, and research-related datasets.