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2016

## Working to Ensure a Water and Food Secure World Annual Report FY2016 (July 1, 2015 - June 30, 2016)

Robert B. Daugherty Water for Food Global Institute

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# Working to Ensure a Water and Food Secure World

Annual Report FY2016 (*July 1, 2015 - June 30, 2016*)



**Water for Food**  
DAUGHERTY GLOBAL INSTITUTE  
*at the University of Nebraska*

Great challenges attract

**OPTIMISTIC**

problem solvers.

# Foreword



**Jeff Raikes**

Co-founder, Raikes Foundation  
Chairman, Water for Food Global Institute  
Board of Directors



**Hank Bounds**

President, University of Nebraska  
Member, Water for Food Global Institute  
Board of Directors

We've always known water is vital for survival, but in recent decades, water has become urgently important to the world in its relationship to food security. To feed an expected world population nearing 10 billion by 2050, we will need innovative and comprehensive approaches to increasing food production while at the same time reducing stress on scarce water resources.

The challenges are many, complex and intertwined. As more people move out of extreme poverty, there is increasing demand for more food, as well as a wider range of foods, including water-intensive meat and dairy products. Problem solving is hampered by socio-political issues that vary widely from location to location. Groundwater is becoming depleted in the U.S. and many other parts of the world due to over pumping. And, climate change is triggering longer droughts, violent storms and unusual weather patterns.



But great challenges attract optimistic problem solvers. The Robert B. Daugherty Water for Food Global Institute (WFI) was founded in 2010 at the University of Nebraska to tackle these problems head-on. Now in its sixth year, the institute is making fast progress toward helping to ensure a water and food secure world for future generations. Much of this impact can be credited to Founding Executive Director Roberto Lenton, who harnessed the University of Nebraska's vast resources in water and agricultural research and brought them to the global stage.

# Foreword

Roberto's leadership accelerated the growth and international recognition of the institute during its first five-year phase. He helped the institute focus its research efforts and leverage its resources through relationships with influential public and private partners within Nebraska and throughout the nation and world.

The Executive Search Committee knew it would be difficult to fill Roberto's shoes when we announced Roberto's planned transition from WFI leadership to his faculty position within the Department of Biological Systems Engineering at the University of Nebraska–Lincoln. But, the committee found the ideal candidate in Peter McCornick, former deputy general of research for the International Water Management Institute. After accepting the position, Peter presented a plenary session at the 2016 Water for Food Global Conference and assumed leadership of the WFI in early fall. His comments are included at the conclusion of the annual report.

During the executive director search, the institute continued to make important strides. With Roberto's guidance, the WFI leadership team developed the 2015-2020 strategic plan, setting a bold course for measurable impacts and changes in knowledge, behavior and action for sustainable water and food security for future generations around the world. The institute made significant gains in attracting new revenue streams. WFI leaders developed exciting new partnerships for innovative research with Jain Irrigation Systems, U.S. Department of Agriculture, Food and Agriculture Organization of the United Nations, KickStart International and the

India Agricultural Research Institute, among others. The team greatly expanded WFI's education and communication outreach through numerous events, workshops, social media, refreshed branding and promotional activities.


The 2016 Water for Food Global Conference was an ideal reflection of the institute's growth as a catalytic organization. Its small core staff engaged researchers, national and international experts, and respected speakers to produce an exceptional event that attracted participants from more than a dozen countries to share their knowledge and find opportunities for partnerships. The institute provided the forum and framework for discussion, leading to developments in several promising areas in the water for food sector.

We invite you to take a closer look at the achievements reflected in the Water for Food Global Institute's FY 2016 Annual Report. When our world's population reaches a projected 10 billion in 2050, we believe we'll be ready.

Sincerely,



Jeff Raikes  
Co-founder, Raikes Foundation  
Chairman, Water for Food Global Institute  
Board of Directors



Hank Bounds  
President, University of Nebraska  
Member, Water for Food Global Institute  
Board of Directors



We used this infrastructure  
to fuel dynamic

# **ADVANCEMENTS**

in water and food security within  
selected areas of the world.

# Preface



**Roberto Lenton**  
Founding Executive Director,  
Water for Food Global Institute at  
the University of Nebraska

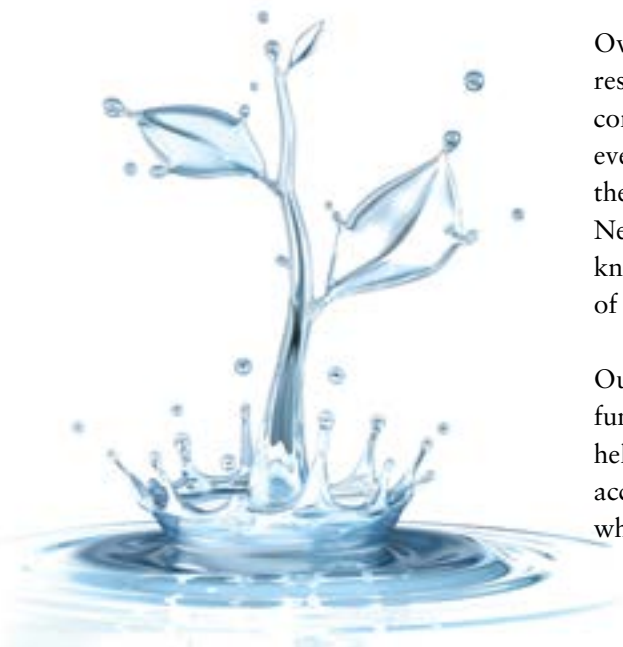
In its early years, the Robert B. Daugherty Water for Food Global Institute at the University of Nebraska established its roots through a period of aggregation and bridging. We gathered people, tools, research and partnerships we knew would help fulfill our ambitious vision to help meet the world's rising demand for food while protecting our scarce water resources.

In fiscal year 2016, we used this infrastructure to fuel dynamic advancements in water and food security within selected areas of the world, from Nebraska to the Middle East.

We struck agreements with university faculty, worked alongside farmers, scientists and communities, and forged partnerships with key national and international organizations. Some of the world's foremost experts now know of and are seeking collaboration with WFI to help them optimize water use for food production.

Over the past year, we logged measurable successes in research and policy projects, educational outreach and communication with our stakeholders. Woven through every goal we have achieved is the combined power of the Water for Food Global Institute and the University of Nebraska to advance the search for solutions using the deep knowledge and creative vision of our interdisciplinary team of scientists and practitioners.

Our greatest achievement may be something even more fundamental — the partnerships we have developed to help advance water and food security. Everything we have accomplished is due to the passion and hard work of people who truly believe this is necessary and achievable work.





# Preface

When I was studying civil engineering as an undergraduate at the University of Buenos Aires, we were asked to choose a specialty: buildings, roads or water resources. I chose water resources, with no inkling of how far this discipline would take me in my personal understanding of the world and its people. I learned from difficult experiences on the ground that water is absolutely vital to the well-being of everyone — to our lives and livelihoods, our food security, our health and our environment. My time in Nebraska has strengthened my belief that human beings have the drive and talents to overcome the many challenges we face in ensuring water and food security for all.

As I prepare to leave the institute in the capable hands of Executive Director Peter McCornick, I am filled with gratitude for those who have supported our efforts over the past six years, and I encourage my colleagues to build an ongoing network of

supporters who will passionately continue to pursue WFI's vision and mission. We must recognize the late Robert B. Daugherty, whose foresight and generosity made all of this possible. His original gift has been truly transformative.

I have no doubt that support of WFI in Nebraska and across the globe will continue to grow as the institute shows how its research and policy initiatives result in action. Action builds credibility, shows progress and inspires commitment. And therein lies the key to the ongoing success of WFI and its ability to contribute to solutions that help ensure water and food security for the people of our world.



Roberto Lenton  
Founding Executive Director  
and Robert B. Daugherty Chair





WFI reaches out to the world to  
**FIND PARTNERS AND  
SUPPORT EDUCATION**  
to fuel real change.

# Making a Difference

## Conversations & Collaborations

*From rural Nebraska to rural Tanzania, the Water for Food Global Institute is working to achieve greater food security with less pressure on the planet's scarce water resources, fueling change through conversations, collaborations and on-the-ground impacts.*

### **Leveraging Leadership, Partnerships and Resources for Global Impact**

The Water for Food Global Institute is a vehicle for collaboration, operating through a network of constituent parts that leverages the leadership, resources and rich history of experience and expertise at the University of Nebraska. In addition to our core group of staff, governed by a board of directors and with guidance from internal and external advisory bodies, WFI draws on its Faculty Fellows, a group of 84 faculty members from across all four campuses and disciplines of the University of Nebraska; Global Fellows, a group of 18 affiliated faculty and researchers external to the University of Nebraska whose geographic locations strengthen the institute's global influence; and our growing roster of postdoctoral researchers, students and interns.

Within Nebraska, WFI carries out its programs with the strong support of the Nebraska Water Center and its Water Sciences Laboratory, which became part of WFI in 2012. Mandated by the U.S. Congress in 1964 as one of 54 national water centers, NWC is a vital resource in advancing WFI's public health and ecosystems research.



*Jimmy O'Keeffe, a visiting scholar at WFI while he was a PhD student at Imperial College, London, interviews farmers in Sultana, Uttar Pradesh.*

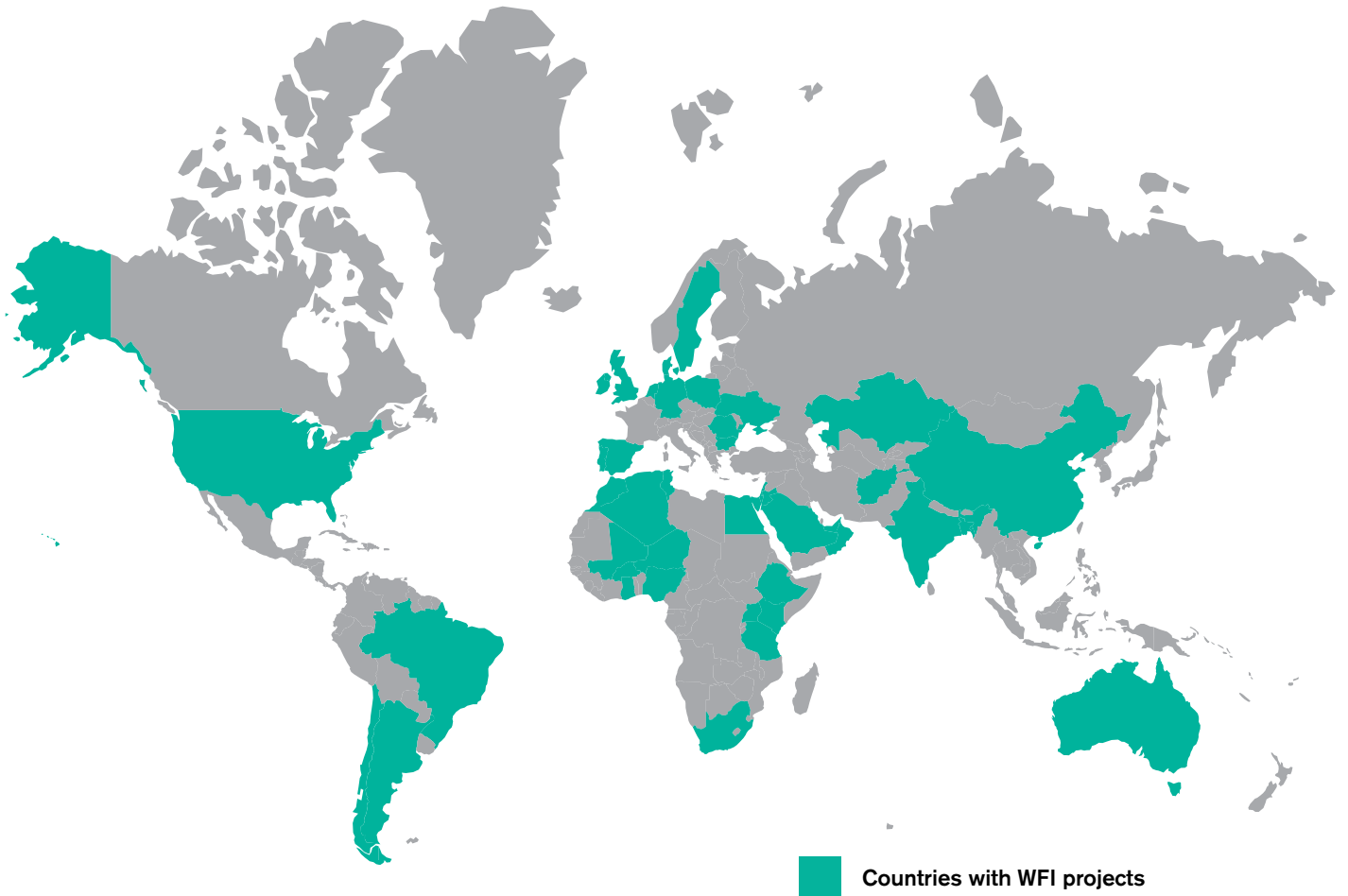
Rooted in Nebraska, one of the world's best natural laboratories for irrigation, groundwater and freshwater ecosystems, but with a network of talented partners throughout the globe, WFI makes the most of its resources to help advance water and food security around the world.

### **Turning Research into Results**

WFI has a presence now in some of the most water and food compromised regions of the world, thanks to cutting-edge satellite-based technology used by University of Nebraska researchers to create agricultural and water monitoring tools. In partnership with the Food and Agriculture Organization of the United Nations (FAO) the Middle East and North Africa (MENA) region, we are working to close water and agricultural productivity gaps through the development of a global public database that will help farmers improve yields, and at the same time help monitor drought and drive an early warning system. We are pursuing similar goals in India with the Indian Agricultural Research Institute, one of the largest and most influential agricultural organizations in the world. (Read more on page 17.)

We are advancing our understanding of Nebraska's groundwater through participation in an important study addressing the agricultural sustainability of the High Plains Aquifer through a grant from the

# WORLD MAP



 Countries with WFI projects

Afghanistan  
Algeria  
Argentina  
Australia  
Bangladesh  
Brazil  
Bulgaria  
Burkina Faso  
Chile

China  
Denmark  
Egypt  
Ethiopia  
Germany  
Ghana  
India  
Ireland  
Israel

Jordan  
Kazakhstan  
Kenya  
Lebanon  
Mali  
Morocco  
Netherlands  
Niger  
Nigeria  
Oman

Palestine  
Poland  
Portugal  
Romania  
Saudi Arabia  
South Africa  
Spain  
Sweden  
Tanzania  
Tunisia

Uganda  
Ukraine  
United Arab Emirates  
United Kingdom  
United States  
Uruguay  
Zambia

U.S. Department of Agriculture. Meanwhile, we are improving groundwater management for agricultural production by developing the inaugural Nebraska Water Productivity Report and sharing the local lessons of the state's Natural Resources Districts (NRDs) in the form of recorded interviews that can be accessed anywhere in the world. (Read more on page 24.)

With the international aid organization World Vision International and Valmont Industries, we are working to enhance high productivity agriculture in a center pivot project in Tanzania that has the potential to transform the lives of smallholder farmers, while helping the country feed its people for generations. Our collaboration in India with Jain Irrigation Systems will help us develop salt and drought resistant crop varieties, advance the education of Jain scientists and expand the use of geospatial technology to improve irrigation water management.

Farm fields are not separate from the ecosystems in which they exist or the people around them. As such, we are working in a number of ways to study and protect freshwater and agricultural ecosystems and public health - from chronicling the movement of water in the Platte River Basin to mapping watershed effects on chronic disease. In this area, we are working closely with the Nebraska Water Center, and the College of Public Health at the University of Nebraska Medical Center on projects within Nebraska and the Midwest to countries in Africa and the Middle East.

### **Fueling Change Through Conversations**

Conversations are at the heart of the work we do. If the world's water and food production specialists operated in isolation, we might never reach our mutual goal of global food security without detrimentally impacting the life-giving water resources we all depend on. Whether

informal or instructional, WFI works to engage its wide range of stakeholders in meaningful discussions that lead to changes in knowledge and behavior.

The 2016 Water for Food Global Conference served as a catalyst for international collaboration. Throughout the three-day conference, conversations among WFI leaders, partners and participants fostered ideas to advance water and food security in the coming years and decades. The theme of this year's conference was quite fitting in this regard: "Catalytic Collaborations: Building Public-Private Partnerships for Water and Food Security." (Read more on page 37.)

In May, WFI hosted its second annual research forum featuring presentations by graduate and undergraduate students. The students shared the results of their water and food security-related research projects with NU faculty, staff, students and the broader community.

Communications took place in person, in print and online. WFI staff and Faculty Fellows co-authored reports, articles and blogs. Our social media audience grew substantially this year, with many stakeholders commenting on WFI posts, photos and videos. Our conference room hosted visiting delegates from Argentina, China, India, the Czech Republic, Brazil and many other countries. And, our leadership team led more than 50 presentations, workshops and meetings with partners at conferences and research projects throughout the country and in key international locations.

Through these events and communications, WFI reaches out to the world to find partners and support education to initiate real change.



Terraced rice paddy in east Asia





Helping farmers and governments make  
**EFFECTIVE DECISIONS**  
to increase agricultural productivity.

# Closing Productivity Gaps

in Water and Food

*The Water for Food Global Institute builds on the pioneering work of the Global Yield Gap and Water Productivity Atlas, as well as the University of Nebraska's expertise in plant breeding and biotechnology development, to reduce productivity gaps in crop and livestock systems.*

## Addressing Challenges in the Middle East and North Africa

Closing the gap between actual and potential agricultural production is becoming a reality, thanks to satellite-based geospatial mapping technology developed at the University of Nebraska and funded jointly by WFI and

WFI and others are using this remote sensing technology in one of the world's most tenuous water and food security regions: the Middle East and North Africa (MENA). In a five-year project that began in 2015, the evapotranspiration data will be shared through FAO's collaborative network in the region as well as through WFI stakeholders.

The complex challenges of this project range from gaining field access and evaluating the estimates on the ground to extensive capacity building with local organizations and overcoming political and social barriers. The ultimate goal is to create a continually-



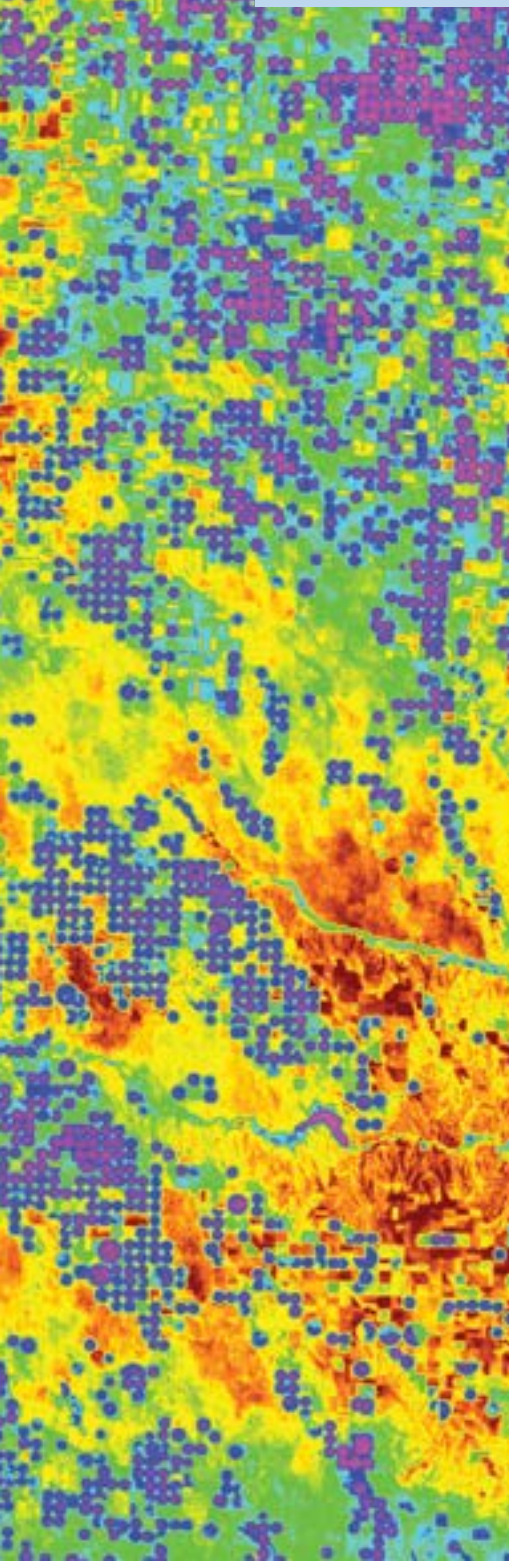
*Faculty Fellow Brian Wardlow, climatologist with the UNL Center for Advanced Land Management Information Technologies, meets with representatives from Morocco's government to discuss the Morocco Composite Drought Index. (NDMC)*

FAO with contributions from United States Agency for International Development (USAID). The tool estimates evapotranspiration, the movement of moisture from the earth's surface to the atmosphere through combined evaporation and plant transpiration. It assesses the need for irrigation and calculates potential and attainable crop yield at three levels: farm, climate zone and country.

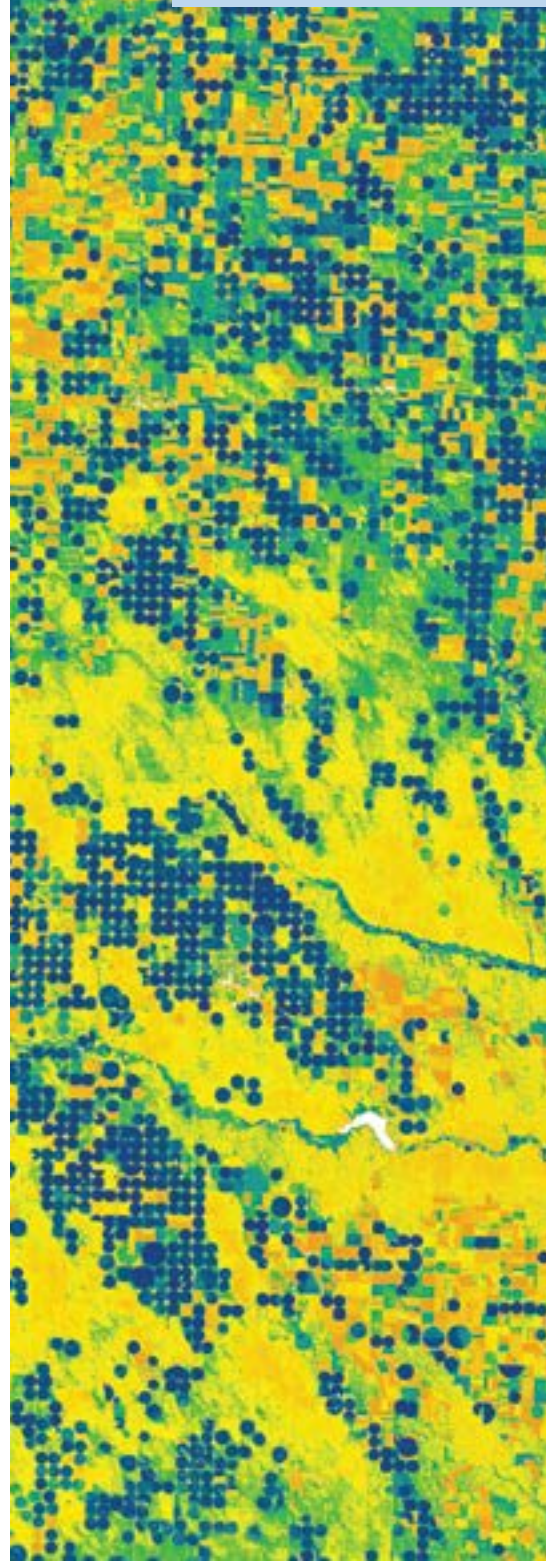
available data system used world-wide to improve water and crop management and support water and food security well into the future.

A successful kick-off meeting was held in Cairo, Egypt, in the fall of 2015 with participants from all

Temperature



Evapotranspiration



RGB-Color Composition



countries in the region. The project began in earnest last January. In March, the science working group for the project's water productivity sub-tasks met at WFI's office in Nebraska to discuss methodology and use of the evapotranspiration data.

The same remote sensing tool is being used to monitor drought in the MENA region and provide an early warning system that will help farmers and governments make effective decisions, including determining where agriculture production can be intensified without risk to water resources. WFI and the National Drought Mitigation Center at UNL are co-leading a \$1 million, one-year drought monitoring project under a sub-contract with the Dubai-based International Center for Biosaline Agriculture (ICBA).

The next steps for both crop yield improvement and drought mitigation are ground truthing in MENA fields and verifying the evapotranspiration product, downscaling for remote sensing in selected agricultural regions, and then estimating water productivity in the first selected regions in Morocco, Tunisia, Lebanon, Jordan and Egypt.

### Evolving Partnerships in India

Last year, WFI and the University of Nebraska continued work under a 2013 Memorandum of Understanding (MOU) with the Indian Council of Agricultural Research to collaborate with one of its four institutes to create solutions for Indian agriculture and natural resources management.

Our partnership with the Indian Agricultural Research Institute (IARI) is an excellent example of expanding WFI's reach through strategic partnerships, with the ultimate goal of producing impacts on the ground. India is an ideal place to study and test ideas and methodologies, because it has both a very

large population and many challenges in the supply, management and use of water to produce food. In addition, India is one of the University of Nebraska's key partners for global engagement on many fronts, including agriculture, early childhood and public health — all areas affected by water and food security.

In June, the U.S.-India Educational Foundation in Delhi approved WFI's proposal to the Indo-U.S. 21st Century Knowledge Initiative competition to support the first steps of the partnership: an agricultural drought monitoring and early warning system, satellite-based evapotranspiration estimates, and water-conserving sensor-operated irrigation systems. The grant will help advance the MOU, as well as WFI collaborative programs in India as a whole.

### Extending the Reach of the Global Yield Gap and Water Productivity Atlas

A central instrument of all of these initiatives is the USAID-funded, graphically intuitive Global Yield Gap and Water Productivity Atlas (GYGA), which was developed by an international team led by the UNL and Wageningen University in The Netherlands. WFI hosted a meeting held with its GYGA partners in

*Faculty Fellow Guillermo Baigorria (left) meets with researchers at the Indian Council for Agricultural Research – Indian Institute of Farming Systems Research at Meerut, Uttar Pradesh, India.*



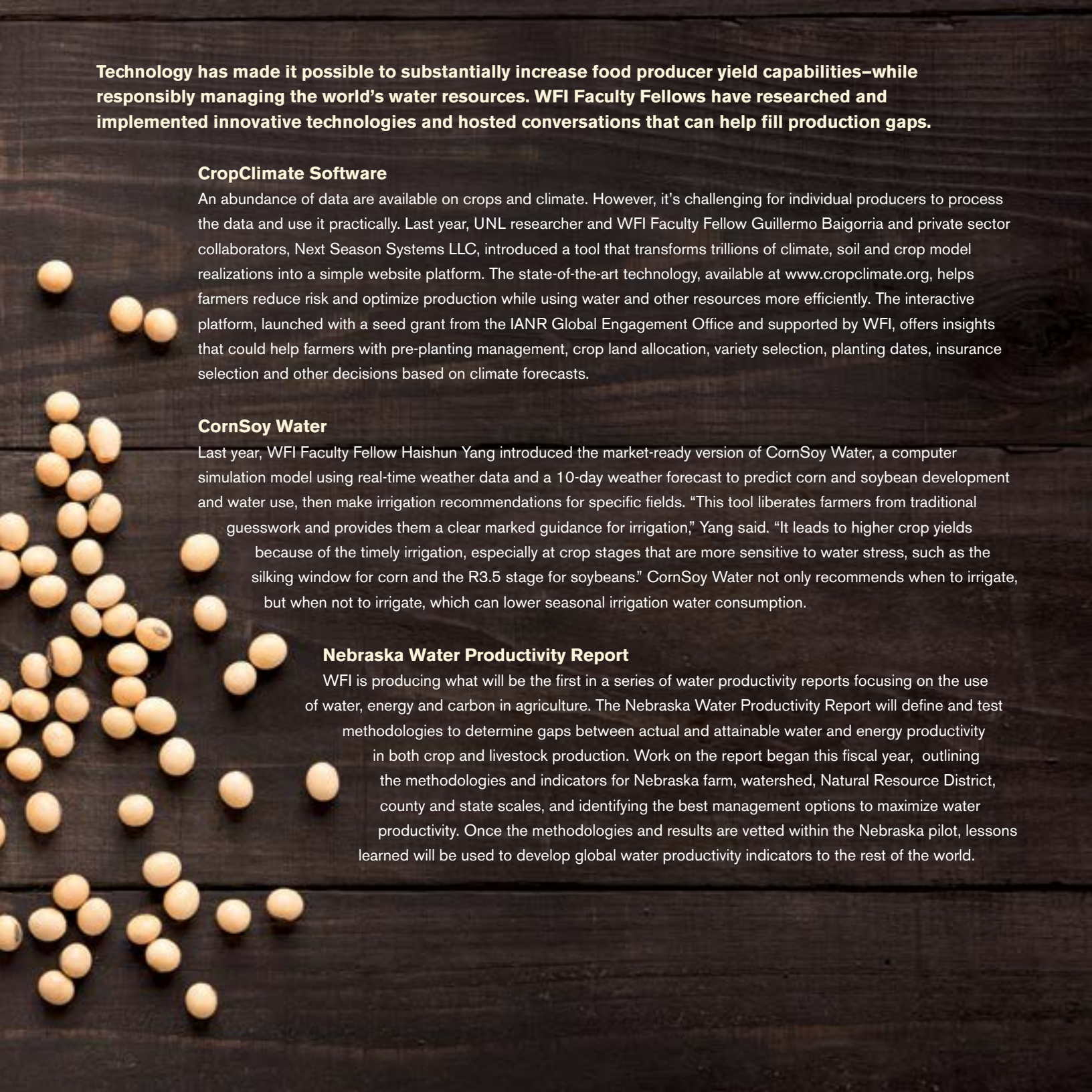
March where the group established a goal to add 20 more countries to the 30 already incorporated into the atlas.

Currently, the atlas focuses on estimating crop yield gap for eight crops at field, regional and national scales, ranging from subsistence crops in sub-Saharan Africa to high-yield irrigated corn in the U.S. More than a million visitors have viewed public data on the GYGA website ([yieldgap.org](http://yieldgap.org)). The atlas is used not only by researchers, but also by crop consultants and commercial crop producers who want to benchmark themselves against the data-backed yield gaps in their regions.



WFI and FAO co-published a global yield gap report reviewing methods for analysis and clarifying definitions and techniques to measure and model potential yield using biomass production and the FAO's harvest index. The report was widely distributed to WFI stakeholders and is available online.





**Technology has made it possible to substantially increase food producer yield capabilities—while responsibly managing the world’s water resources. WFI Faculty Fellows have researched and implemented innovative technologies and hosted conversations that can help fill production gaps.**

### **CropClimate Software**

An abundance of data are available on crops and climate. However, it’s challenging for individual producers to process the data and use it practically. Last year, UNL researcher and WFI Faculty Fellow Guillermo Baigorria and private sector collaborators, Next Season Systems LLC, introduced a tool that transforms trillions of climate, soil and crop model realizations into a simple website platform. The state-of-the-art technology, available at [www.cropclimate.org](http://www.cropclimate.org), helps farmers reduce risk and optimize production while using water and other resources more efficiently. The interactive platform, launched with a seed grant from the IANR Global Engagement Office and supported by WFI, offers insights that could help farmers with pre-planting management, crop land allocation, variety selection, planting dates, insurance selection and other decisions based on climate forecasts.

### **CornSoy Water**

Last year, WFI Faculty Fellow Haishun Yang introduced the market-ready version of CornSoy Water, a computer simulation model using real-time weather data and a 10-day weather forecast to predict corn and soybean development and water use, then make irrigation recommendations for specific fields. “This tool liberates farmers from traditional guesswork and provides them a clear marked guidance for irrigation,” Yang said. “It leads to higher crop yields because of the timely irrigation, especially at crop stages that are more sensitive to water stress, such as the silking window for corn and the R3.5 stage for soybeans.” CornSoy Water not only recommends when to irrigate, but when not to irrigate, which can lower seasonal irrigation water consumption.

### **Nebraska Water Productivity Report**

WFI is producing what will be the first in a series of water productivity reports focusing on the use of water, energy and carbon in agriculture. The Nebraska Water Productivity Report will define and test methodologies to determine gaps between actual and attainable water and energy productivity in both crop and livestock production. Work on the report began this fiscal year, outlining the methodologies and indicators for Nebraska farm, watershed, Natural Resource District, county and state scales, and identifying the best management options to maximize water productivity. Once the methodologies and results are vetted within the Nebraska pilot, lessons learned will be used to develop global water productivity indicators to the rest of the world.

# FACULTY FELLOWS

## Agriculture



**P. Stephen Baenziger**  
Agronomist and Wheat Breeder

**Guillermo Baigorria**  
Crop Simulation Modeler

**Vijendra Boken**  
Remote Sensing & Water Resources Expert

**Edgar Cahoon**  
Plant Geneticist

**Kenneth Cassman**  
Agronomist

**Dean Eisenhauer**  
Irrigation Engineer

**Roger Elmore**  
Cropping Systems Agronomist

**Roch Gaussoin**  
Agronomist

**Patricio Grassini**  
Cropping Systems Agronomist

**Amir Haghverdi**  
Irrigation/Water Management Specialist

**Derek Heeren**  
Irrigation Engineer

**Adam Liska**  
Biological Systems Engineer

**Martha Mamo**  
Soil Scientist

**Derrel Martin**  
Irrigation and Water Resources Engineer

**Teshome Regassa**  
Agronomist

**Daran R. Rudnick**  
Irrigation/Water Management Specialist

**James Schnable**  
Plant Geneticist

**Harkamal Walia**  
Plant Molecular Physiologist

**Charles Wortmann**  
Agronomist

**Haishun Yang**  
Crop and Ecosystem Modeler



## Environment

**Craig Allen**  
Wildlife Ecologist

**Tala Awada**  
Plant Ecologist

**John Carroll**  
Wildlife Ecologist

**Trenton Franz**  
Hydrogeophysicist

**Sherilyn Fritz**  
Paleoclimatologist

**Brian Fuchs**  
Climatologist

**Michael Hayes**  
Climatologist and Atmospheric Scientist

**Troy E. Gilmore**  
Groundwater Hydrologist

**Priscilla Grew**  
Geologist

**Ayse Kilic**  
Remote Sensing Expert

**Alan Kolok**  
Aquatic Toxicologist

**Jesse Korus**  
Groundwater Hydrologist

**Aaron Mittelstet**  
Watershed Hydrologist

**Francisco Muñoz-Arriola**  
Hydroinformaticist

**Robert Oglesby**  
Climate Modeler

**Patrick Shea**  
Environmental Chemist

**John (Jack) Shroder**  
Micrometeorologist

**Andrew Suyker**  
Micrometeorologist

**Mark Svoboda**  
Climatologist

**Tsegaye Tadesse**  
Climatologist

**Brian Wardlow**  
Remote Sensing Expert

**Don Wilhite**  
Climatologist

**Wayne E. Woldt**  
Environmental Engineer

**Vitaly Zlotnik**  
Hydrologist

**Art Zygielbaum**  
Remote Sensing Specialist

## Policy & Social Science



**J. David Aiken**  
Water and Agricultural Law Specialist

**Simanti Banerjee**  
Behavioral and Environmental Economist

**Jean Cahan**  
Religious and Historical Philosopher

**Judy Diamond**  
Science Literacy Educator

**Michael Farrell**  
Documentary Filmmaker

**Cory Forbes**  
Science Literacy Educator

**Michael Forsberg**  
Wildlife Photographer and Ecologist

**Lilyan Fulginiti**  
Agricultural Economist

**Peter Longo**  
Environmental Policy Analyst

**Patrice McMahon**  
Political Scientist

**Patrick McNamara**  
Political Scientist

**Sarah Michaels**  
Political Scientist

**Taro Mieno**  
Agricultural Economist

**Lia Nogueira-Rodriguez**  
Food and Agricultural Trade Economist

**Richard Perrin**  
Agricultural Economist

**Christine Reed**  
Public and Environmental Policy Analyst

**Nancy Shank**  
Public Policy Analyst

**Karina Schoengold**  
Environmental and Resource Economist

**Anthony Schutz**  
Agricultural and Environmental Law Specialist

**Alan Tomkins**  
Psychologist and Public Policy Analyst

**Mary Willis**  
Anthropologist

**Sandra Zellmer**  
Natural Resources Legal Scholar

## Health, Science & Engineering



**David Admiraal**  
Environmental Engineer

**Ozgur Araz**  
Systems Scientist and Business Analyst

**Lorena Baccaglioni**  
Epidemiologist

**Shannon Bartelt-Hunt**  
Environmental Engineer

**Ian Cottingham**  
Computer Scientist

**Mohamed Dahab**  
Environmental Engineer

**Carrick Detweiler**  
Computer Scientist and Roboticist

**Bruce Dvorak**  
Environmental Engineer

**Rolando Flores**  
Food Scientist

**James Goedert**  
Construction Engineer

**Junke Guo**  
Environmental Engineer

**Christopher Gustafson**  
Behavioral Economist

**Pinaki Panigrahi**  
Epidemiologist and Pediatrician

**Helen Raikes**  
Child Development & Early Education Specialist

**Eleanor Rogan**  
Public and Environmental Health Expert

**Elizabeth VanWormer**  
Epidemiologist

**Mehmet Can Vuran**  
Computer Scientist and Electrical Engineer

**Karrie Weber**  
Microbiologist

Indian farmer during harvest





Visitors from all over the world are  
Increasingly looking to  
**NEBRASKA**  
for effective groundwater management.

# Improving Groundwater Management

## for Agricultural Production

*The Water for Food Global Institute draws on the vast experience of Nebraska's water governance institutions and farmers, focusing on scientific and policy research to improve understanding of the human and natural dynamics of groundwater.*

### **Addressing the Sustainability of the High Plains Aquifer**

Groundwater is the unseen but significant source of water used for irrigation and animal production in the U.S., and the household water supply for millions of people living in Nebraska and parts of seven other states. More than 90 percent of the water pumped from the High Plains aquifer is used for irrigated agriculture.

This year, the institute launched new projects and completed a project to advance our understanding of groundwater management and, in particular, the High Plains Aquifer.

### **Analyzing Federal Conservation Policies for the High Plains Aquifer**

WFI is collaborating with researchers at the U.S. Department of Agriculture (USDA) and the U.S. Geological Survey (USGS) to analyze the impact of federal conservation policies on aquifer conditions across the High Plains Aquifer. Integrated hydrologic and economic modeling is being used to estimate where and how aquifer depletion will occur in the coming decades, what the impact of past policies has been, and whether policy changes can help in the future.

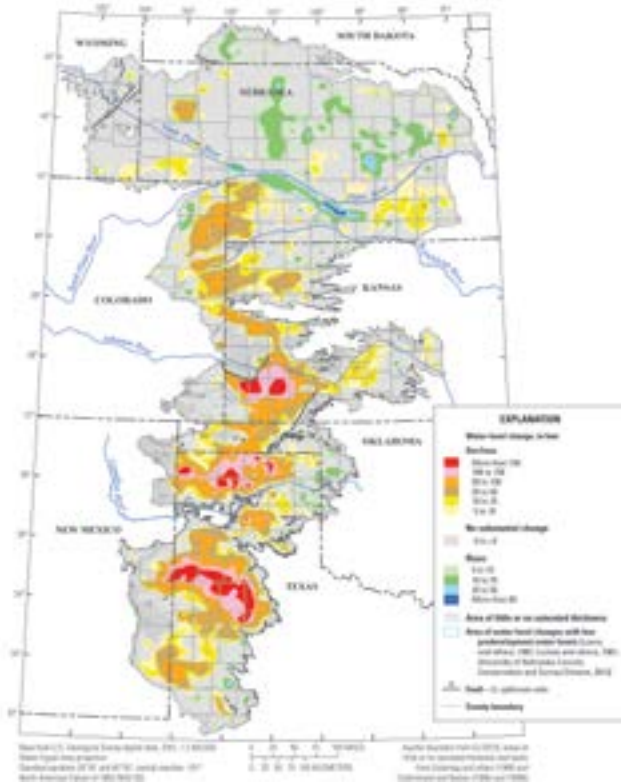
For example, the project is considering whether federal water policies and programs, such as the Conservation Reserve Program, have had unanticipated impacts on the aquifer. The Conservation Reserve Program helps farmers take highly-erodible, environmentally sensitive cropland out of production by converting it to native grasses, shelter for wildlife, windbreaks and other uses.

WFI is contributing agricultural engineers and economists to the project, while USGS is supplying hydrologic data and the USDA is delivering farm program data. Study results will inform understanding of the water-food-energy nexus as it applies to water policy and management in the region, as well as more broadly.

### **Researching Aquifer Sustainability**

In March, with UNL's Institute of Agriculture and Natural Resources, the Nebraska Water Center was awarded a \$1 million portion of a \$10 million grant from the USDA's National Institute of Food and Agriculture. The grant will be used to address agricultural sustainability of the High Plains Aquifer.

The NWC Director is co-principal investigator of the project and leader of the Nebraska team. Among other objectives, the team will gather hydrologic and crop water use data, which can be used to manage pumping rates. A comprehensive hydrologic model exists for the Northern High Plains region of the Ogallala, but an



V.L. McGuire, USGS. *Scientific Investigations Report 2014-5218*

aquifer-wide hydrologic model has never been created. An expanded model will provide an important baseline tool to estimate climate change and management impacts on groundwater levels across the region.

The regional issues and potential solutions we discover could also have far-reaching impacts on the way aquifer water is managed and used throughout the world.

### Sharing the Lessons of Nebraska’s NRDs

Because of Nebraska’s many decades of experience managing major groundwater resources, and the groundwater management methods used by the state’s Natural Resources Districts (NRDs) have been so successful, visitors from all over the world


are increasingly looking to Nebraska for methods of effective groundwater management. The NRDs, which are responsible for the state’s groundwater quality and use, are especially interesting to international visitors because the districts’ boundaries are largely based on hydrological boundaries within the state in a bottom-up management model that prioritizes the natural resources over politics. In FY 2016, WFI collaborated with the NRDs to host a number of international delegations.

WFI finished work on a project with the Nebraska State Historical Society and the Nebraska Association of Resources Districts designed to tell the story of the NRDs to help preserve the methods and policies that have made them successful. The NRD Oral History Project, now online at [nrdstories.org](http://nrdstories.org), includes more than eighty 45-minute recordings of former and current staff and leaders from all 23 districts, as well as key individuals who helped ensure their formation.

The stories share not only what the NRDs have accomplished, but also the tension and friction that come with creating a new set of rules for water use. In their own voices, architects of the NRD systems describe how they overcame those challenges, providing a roadmap for regions facing similar obstacles. The stories make it evident that achieving sustainable use of water and natural resources management takes a great deal of work by a lot of people. For newcomers to water resource management, the NRD stories provide confirmation of the importance of organized groundwater management to help ensure water and food security.



**NRD ORAL**  
HISTORY PROJECT



**Groundwater management is a discipline involving much more than the use of water resources to produce crops and livestock as efficiently as possible. WFI faculty fellows are exploring considerations of politics, policy, law and economics that are unique to this major area of emphasis for WFI.**

### **Groundwater Law: Case Studies in Management**

It's not uncommon for multiple jurisdictions to conflict when it comes to managing surface and underground water. The better we understand what has and hasn't worked in the past, the more likely we are to find successful management solutions for the future. Robert B. Daugherty Professor of Law and Faculty Fellow Sandi Zellmer, with WFI staff and interns, began a new collaboration with the Environmental Defense Fund to support a variety of current U.S. state-level groundwater initiatives, such as those in California. The research group will prepare a case study based report on the state of incentive-based groundwater management in the Western United States. The report is expected to include a variety of multimedia components, with the goal of educating readers on important lessons learned from successes and failures in innovative groundwater management.

### **Using Smart Meters to Inform Decision-Making**

With Faculty Fellow and Agricultural Economist Taro Mieno, WFI is working on a pilot project that could help improve understanding and management of water and energy components of food production. With assistance from Smart Water Metering, a manufacturer of meters that measure real-time water and energy use of irrigation pumps, WFI is designing and deploying a sensor network throughout Nebraska to gather information that can help farmers manage irrigation systems more efficiently. We will provide the data to farmers to help inform their decision-making.

Energy is often an underappreciated aspect of ag production. Farmers aren't really paying for the water they use in irrigation – they are paying for energy to pump the water. To understand how to best use water to produce food, farmers and other water managers have to understand the competing interests between water, energy and food production. Smart meters help quantify the amount of energy a farmer is using to improve our ability to conserve groundwater and energy while improving farm profits.

### **Workshop: Smallholder Irrigation in Sub-Saharan Africa**

Expanding smallholder irrigation in Sub-Saharan Africa could substantially improve crop yields, allow greater diversity of crops, and increase farmer incomes. An increase in food production in this tentative region could also improve rural economies, positively impact the environment and encourage private sector investment. Last year, WFI sponsored a workshop on this topic in conjunction with KickStart International and the Bill & Melinda Gates Foundation, in association with the Water, Land and Ecosystems Program of the CGIAR. Although there are major risks and obstacles to overcome, including water rights and the difficult transition from rain-fed farming to irrigation, workshop attendees agreed there is great potential. Plans are being made to launch an online platform for organizing and sharing data and best practices, as well as mobilizing stakeholders to turn ideas into action.

The CIRCLES project could  
**POSITIVELY IMPACT**  
much more than crop production.

# Enhancing High Productivity

## Irrigated Agriculture

*The Water for Food Global Institute at the University of Nebraska works in partnership with the private sector, NGOs and social entrepreneurial groups to provide research, technology transfer, education and outreach to further the goal of increasing water productivity in all forms of irrigated agriculture.*

### Supporting Center Pivot Irrigation in Tanzania

Tanzania is home to spectacular Mount Kilimanjaro and the Serengeti plains, attractions that draw visitors from all over the world. It is also a farm country where 75 percent of family households work in agriculture, producing food for a nation where the population has tripled in just 40 years. Like others in sub-Saharan Africa, many Tanzanian smallholder farmers are stuck in a cycle of poverty and achieve four to 10 times less yield per acre than their commercial counterparts. It doesn't help that shifting land use has decreased plot sizes, access to markets is limited, and rainfall is increasingly erratic.

Against that backdrop, a new attraction in Tanzania may soon be a center pivot irrigation system. The CIRCLES project, a WFI project in partnership with Valmont Industries and World Vision International, will test whether highly-mechanized and efficient irrigation systems already working in Africa for large food producers can be used to support smallholder farmers within a cooperative. Instead of one farmer or

company owning many pivots, as many as a hundred people will farm cooperatively under a single pivot.

The project aims to show how smallholder and subsistence farmers can use center pivot irrigation and technical support to introduce high value crops, such as fresh vegetables, and gain better access to markets with the potential to raise incomes of smallholder farmers from between one or two dollars per day to as much as \$6 per day. We anticipate that crop revenues will allow the farmers, as a group, to own the center pivot technology and operate independently within five years.



*Director of Research Christopher Neale (in hat) examines center pivot materials with CIRCLES project collaborators during a visit to Arusha, Tanzania in June.*

The CIRCLES intervention could positively impact much more than crop production. While farmers are pumping water out of a deep aquifer to supply



*CIRCLES project leaders visit a potential center pivot site in Tanzania.*

the center pivot, they can also fill a village cistern, for example, which would allow women and girls to spend less time fetching water and more time on education and nutrition, which could elevate economic, social and health indicators in the region.

Last March, a team from the University of Nebraska Medical Center's College of Public Health visited World Vision staff in Tanzania to coordinate future field activities as part of the CIRCLES project. They conducted a baseline field survey and will follow the intervention for five years to determine how the socioeconomic health indicators change.

WFI recently identified a suitable 3,280-acre tract on Tanzanian land belonging to the Nelson Mandela African Institution of Science and Technology (NM-AIST). The CIRCLES project partners and

NM-AIST are working toward a long-term agreement to support this pilot test. The WFI director of research and project partners are finalizing the site physical evaluation process, which includes digging an observation well to make sure there are enough water resources to support a large center pivot. Our hope is that the CIRCLES pilot project will be the beginning of several similar projects resulting in on-the-ground impact around the world.

Improving access to high productivity irrigation equipment and training can make a difference, not only in food production, but in quality of life, for millions of smallholder farmers.

## **Partnering with Jain Irrigation on Research and Education**

In a joint international research and education partnership, WFI and Jain Irrigation are collaborating on scientific exchanges to improve water management and crop yields, help educate future scientists, and add value for smallholders.

*Participating leaders in the launch of the joint international research and education partnership between WFI and Jain Irrigation Systems Ltd. From left: Thomas Farrell, senior advisor to the chancellor, UNL International Affairs; the late Bhavarlal Hiralal Jain, founder chairman of Jain Irrigation Systems Ltd.; and Christopher Neale, WFI director of research.*







In fiscal year 2016, a new project activity was signed under the existing MOU by the leadership of Jain Irrigation, the University of Nebraska Foundation and the WFI to focus on research in a number of areas, including improving crop water productivity and water management using geospatial technologies, as well as improving drought tolerance using accelerated plant breeding through plant phenotyping.

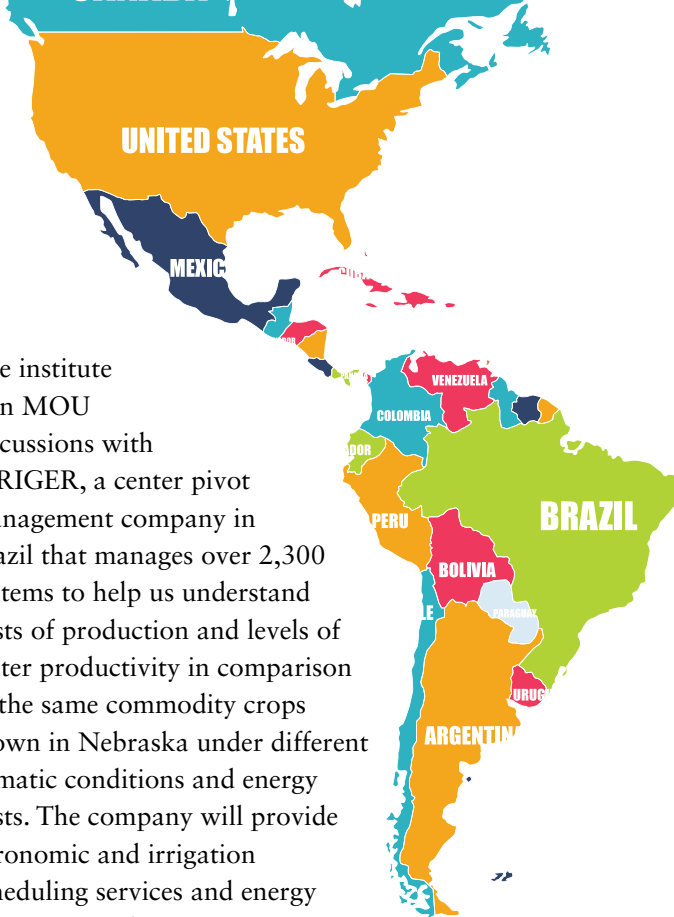


*Greenhouse Innovation Center at Nebraska Innovation Campus. (Photo by Craig Chandler, University Communications)*

Jain scientists will come to Nebraska to train at UNL's new Greenhouse Innovation Center, a state-of-the-art laboratory and ideal environment for agricultural biotechnology training. Several WFI Faculty Fellows are involved in this project and will be conducting joint research with Jain Scientists in India.

## Comparing Irrigation Systems in Brazil and Nebraska

WFI is working with partners in Brazil where the main crops are similar to Nebraska: corn and soybeans, with dry beans as a third major crop. Nebraska farmers can only produce one crop a year because of winter, but in Brazil they can plant and grow all year, producing through two and a half crop cycles.



The institute is in MOU discussions with IRRIGER, a center pivot management company in Brazil that manages over 2,300 systems to help us understand costs of production and levels of water productivity in comparison to the same commodity crops grown in Nebraska under different climatic conditions and energy costs. The company will provide agronomic and irrigation scheduling services and energy management data. In return, we will share our knowledge of satellite-based remote sensing technology for pivot irrigation systems and teach them how to use it.

Typically, center pivots and other irrigation systems are managed for maximum yield, but they also can be managed for maximum water and energy productivity. The farmer's goal is to use irrigation as effectively as possible to produce the most food with the least amount of inputs. The missing piece is the cost of energy, and this project will help us incorporate that information into other water, energy and food nexus considerations — not only as it impacts irrigation, but also other pieces of the water and food security puzzle.



**Nebraska's expertise in irrigation comes from a long tradition of research and experimentation to improve the production of food through the efficient use of water resources. The tradition continues each year with the collaboration of WFI's faculty fellows and postdoctoral researchers.**

### **Variable-Rate Irrigation Technology**

Nebraska's thousands of center pivots provide a perfect opportunity to test variable-rate irrigation technology. This technology senses moisture in the soil and then identifies zones in fields to turn sprinklers off and on, delivering only what each zone in the field needs. In FY2016, WFI worked with researchers at UNL and the University of Colorado on a USDA proposal to advance this technology. The project uses unmanned aircraft systems (UAS), remote sensing, integrated sensor systems and adaptive modeling and simulation. Benefits of this technology could include water and energy savings, erosion prevention, and decreased fertilizer leaching, which would help prevent aquifer contamination. In the summer of 2015, the group conducted the first year of experiments. However, it was a wet year, so little irrigation was required. Funding has been received, and more experiments will be conducted in 2016. Environmental Engineer and Faculty Fellow Wayne Woldt is leading the WFI team.

### **AquaCrop-OS**

In an era of Big Data, there is vast potential to improve agricultural productivity and water management using high-tech information tools. However, the tools developed in academia and by government organizations are oftentimes difficult to access and cumbersome to use. AquaCrop-OS, available at <http://aquacropos.com/>, is an open-source version of AquaCrop, a crop water productivity model that was first developed by the Food and Agriculture Organization of the United Nations in 2009. AquaCrop-OS enables rapid analysis of crop yield response to water. Farmers, policymakers, researchers and other practitioners can use the tool for real-world decision-making from the field to the basin scale. WFI's partners include FAO, the University of Manchester and Imperial College, London. AquaCrop-OS was developed by Timothy Foster, water-food security lecturer at the University of Manchester and former WFI postdoctoral researcher. "We created AquaCrop-OS to provide a free, open-source software tool that can help scientists and policymakers devise innovative solutions to real-world agricultural water management challenges," said Foster.

The WARI program works to  
**PROVIDE SOLUTIONS**  
to clean water and ecosystems that have  
become polluted and degraded.

# Freshwater

## and Agricultural Ecosystems and Public Health

*The Water for Food Global Institute works to ensure that efforts to improve water and food security also advance public health and protect ecosystem integrity, while advancing the university's expertise in natural resources management, water quality analysis and public health.*

Even as the Water for Food Global Institute works to close productivity gaps, improve groundwater management for agricultural production and enhance high productivity irrigated agriculture around the world, we realize we must also protect public health and ecosystems. The use of water to grow food is permanently intertwined with the use of water for many other purposes, including nutrition, health and hygiene, natural habitats, and recreation.

The Nebraska Water Center's research and education efforts enhance WFI's work in these areas. Highlights of the Nebraska Water Center's work last year included its annual Water Symposium at UNL, "High Plains Aquifer: Sustainability for Food Production and Water Supply." Symposium workshops addressed aquifer science, assessment, management, innovation and use — both now and into the future. In July 2015, NWC conducted its annual Water Tour where more than 70 participants explored the Republican River Basin from Nebraska into eastern Colorado, and a more than 75-year-old water compact between three states.



WARI participants discuss their research during a WFI-hosted "lunch and learn" at Nebraska Innovation Campus in Lincoln.

Many NWC projects add to WFI's efforts to make the world more aware of water and how it affects every aspect of life on our planet. One such project, backed by the U.S. Environmental Protection Agency (EPA), will produce online materials to familiarize groundwater users with water issues, including the need for conservation and protection for future generations. The immediate focus is on Nebraska and the Midwestern region of the United States, but materials are available to anyone with similar needs worldwide.

### **Developing Innovations to Monitor and Advance Water Quality**

The Water Advanced Research and Innovation Fellowship (WARI) is a three-year joint initiative of the Department of Science and Technology, the government of India, the University of Nebraska–Lincoln, WFI and the Indo-U.S. Science and Technology Forum. The program is designed to bring high-quality Indian Ph.D. students and early-career faculty to Nebraska to carry out research in water science and engineering.

At its core, the WARI program works on providing solutions to clean water and ecosystems that have become polluted and degraded. The program's participants accomplish this by analyzing health impacts of emerging contaminants, analyzing water samples for harmful compounds, engineering wastewater treatment solutions, and using tools like remote sensing to



*Faculty Fellow Alan Kolok (at left) stands with a team of student researchers from the Nebraska Watershed Network at its research station on the Elkhorn River.*

monitor water quality and quantity. Additionally, WARI students and early-career faculty use the Water Science Laboratory's state-of-the-art analytical equipment in carrying out this important research.

### **Investigating Water Quality through Citizen Science**

An important example of WFI's commitment to the protection of freshwater ecosystems and public health is our support of the Nebraska Watershed Network, led by Faculty Fellow Alan Kolok, an aquatic toxicologist at the University of Nebraska at Omaha and the University of Nebraska Medical Center (UNMC). The network participants work in conjunction with local stakeholders to advance environmental stewardship of freshwater resources and biota supported by those waterways. The network is currently involved in a number of local, national and international outreach, educational and research activities.

In addition to his watershed work, Kolok is director of the Center for Environmental Health and Toxicology within UNMC's College of Public Health. The double emphasis of Kolok's work allows him to effectively research and examine the connection between the

efficient production of food and potential adverse consequences. Much of his work involves empowering citizens, both in Nebraska and internationally, to become involved in the decision-making and data collection process — to accept a role in the protection of ecosystems and public health.

### **Following a Watershed in Motion**

The institute has provided support for the Platte Basin Timelapse project, which follows the Platte River from its source in Colorado to the mouth of the Missouri. Nearly 50 cameras along the Platte River take photos each hour, which are uploaded to a central system then produced as a timelapse video to illustrate the environmental changes of the Platte Basin. Recently, conservation photographer and Faculty Fellow Michael Forsberg and field producer Pete Stegen completed a two-month, 1,000-mile traverse of the Platte River Basin. Traveling by bike, foot and canoe through Wyoming, Colorado and Nebraska, they explored this critical water source to examine how it intersects with the lives of those who live in this 90,000-square-mile watershed in the heart of North America. Their work and other stories from the project can be viewed at [plattebasintimelapse.com](http://plattebasintimelapse.com).

*A Platte Basin Timelapse camera captures the landscape changes from atop a center-pivot irrigation system located near Phillips, Nebraska. (Michael Farrell)*



## **Healthy Nebraska and Beyond: Building Health from the Bottom-up Along Waterways**

Clean water is key to the good health of communities in Nebraska and across the world. Unfortunately, it is not always guaranteed as a human right. Water quality is often overlooked when it comes to assessing community health. In 2015, project agreements and funding were established to launch “Healthy Nebraska and Beyond,” a two-year study led by a team of Faculty Fellows designed to help communities establish a healthy environment as a human right. In collaboration with select communities, beginning with Ainsworth, Nebraska, the researchers are assessing environmental indicators that contribute to well-being, including clean water, nutrition and healthy livestock, as well as social and political factors. The project also entails developing a plan to deliver resources that will help address health deficiencies in these communities. The team includes Faculty Fellows Peter Longo, Patrick McNamara, Eleanor Rogan and Alan Kolok.

## **One Health: A New Path Forward**

Population growth, climate and land-use changes and growing international travel and trade have made it increasingly important for the world to examine links between human health, animal health and ecosystems across disciplines, stakeholders and borders. One Health is a concept that recognizes this link in global health challenges. Last year, WFI contributed to the beginnings of a One Health initiative examining the human-animal-environment interface in Nebraska by providing funding to Faculty Fellow Elizabeth VanWormer to lead the effort. The initiative will harness the expertise of researchers in the University of Nebraska Medical Center’s College of Public Health through workshops and other mechanisms, including an informative website. Next steps include preparing proposals to apply this effective concept statewide – and perhaps globally. Building public-private partnerships through a One Health approach offers a promising road to safeguarding our water and health.

## **Midwestern Watersheds and Adverse Health Outcomes**

A University of Nebraska Medical Center research team led by Faculty Fellows Alan Kolok and Eleanor Rogan is using a WFI seed grant to examine the relationship between Midwestern watersheds and adverse health outcomes – a unique approach to investigate the causes of chronic disease. Mapping incidences of specific chronic diseases as they relate to watershed networks could help reveal possible clues to causative factors. In fiscal year 2016, funding was granted, approvals were obtained and data was received from the Nebraska Cancer Registry and the Nebraska Birth Defect Registry. GIS technology was used to complete an initial map that uncovered several places in the state with particularly high incidences of pediatric cancer. Next on the docket are birth defects and thyroid cancer. Ultimately, the team will write academic papers for publication to advance research in this important area of study. The initial focus will be on Nebraska, with potential expansion of the techniques worldwide.

Education turns

**IDEAS INTO ACTION**

as people teach others  
what they have learned.

# Education and Engagement

*The Water for Food Global Institute is committed to teaching and engaging with scientists, students, faculty, farmers, policymakers, non-profits, non-government organizations, private producers, media and the general public to educate, inspire, connect and collaborate our way to greater water and food security for the world.*

WFI's research and policy work is advanced when scholars and policymakers teach others what they have learned. Ideas are turned into action as water managers collaborate with agricultural producers. Agriculture and water education creates commitment and engagement among faculty and students who could become the next generation of water for food advocates. These are just a few of the ways education and engagement connect many small conversations and combine them into big impacts.

It doesn't happen overnight, of course. During the six years of its existence, WFI has cultivated educational experiences with many individual partners and stakeholders. In fiscal year 2016, the institute engaged in conversations and collaboration with a wide variety of audiences, including the general public, engaging larger audiences and providing opportunities for everyone to contribute. WFI outreach includes conferences, workshops, international exchanges, study tours, research forums and roundtables.



*Mammoth Trading President and WFI Program Associate Richael Young speaks to participants at the 2016 Water for Food Global Conference in April.*

## 2016 Water for Food Global Conference

The institute's flagship event is the Water for Food Global Conference, held in Lincoln, Nebraska, where WFI's headquarters is located. The Nebraska location provides easy access to many water and agricultural experts, as well as private producers on the front lines of water management and food production.

Last year, more than 350 participants from around the world attended the conference, including 60 speakers who discussed various aspects of science, technology and policy, addressing one of the most urgent challenges of the 21st century: how to achieve greater food security with less pressure on water resources. Conference attendees and speakers collectively provided a 360° view of this intractable challenge.



The theme of this conference was “Catalytic Collaborations: Building Public-Private Partnerships for Water and Food Security.” The Nebraska Innovation Campus was a perfect setting for collaboration, with attendees representing both public and private enterprises: engineers, plant physiologists, corporate CEOs, researchers, entrepreneurs, students, agricultural economists, philanthropists, private consultants, leaders of distinguished foundations and many others with the credentials and desire to tackle the challenges of water and food security.

Additional collaboration took place in pre- and post-conference meetings, focusing on the role of expanding irrigation for smallholder farmers in sub-Saharan Africa and on advancing Big Data in agricultural production.

Distinguished guests attending the conference included members of the institute’s International Advisory Panel, who held their annual meeting before the conference to provide guidance to the institute’s leadership on research, policy, communication and education programs.

### **The Water Advanced Research and Innovation Fellowship Program**

In fiscal year 2016, WFI solicited applications and selected the first 10 participants from a pool of 79 applicants. The WARI participants are conducting pioneering research in water quality topics under the supervision of 17 faculty mentors. The institute hosts monthly lunch and learn events where the participants discuss and exchange research developments. A reciprocal component of the program funded by DST and UNL will allow U.S. students to visit India for collaboration with Indian water scientists.



*Ann Mills, USDA Deputy Under Secretary for Natural Resources and Environment.*

### **EPA-USDA National Workshop on Water Quality Trading**

Water quality trading is a relatively new activity that enables industries to meet regulatory obligations by purchasing equivalent or larger pollution reductions from another source. They also can meet obligations by protecting or restoring water sources to reduce the impact of pollutants.

WFI co-hosted a significant conference last year on water quality trading with the USDA and EPA that brought more than 200 state and federal government and private sector attendees to Lincoln to discuss what works, what doesn’t, and next steps. There is growing interest in market mechanisms as a means to improve water quality, but such solutions have been difficult to implement. The conference speakers and participants shared their experiences and ideas for advancing water quality trading, particularly in agricultural settings, as well as what can be learned from other environmental markets.

## UNESCO-IHE/University of Nebraska Double Degree Program

This masters-level double degree program combines the University of Nebraska's agricultural setting and expertise with the experience of The Netherlands' UNESCO-IHE Institute for Water Education in educating people of the developing world. Program candidates must have three years of professional experience to be considered for the program, and earn a master's degree from each institution.

The first two participants in the program graduated in 2015. One more has begun the process: Mumba Racheal Mwape, an irrigation engineer from the Zambia Ministry of Agriculture. Mwape began her study in Nebraska, then returned to Zambia to gather data, and will come back to Nebraska to write her thesis. She is expected to graduate in May 2017.



*Faculty Fellow Derek Heeren leads a center pivot lab for UNESCO-IHE students at UNL's Agricultural Research and Development Center near Mead, Nebraska.*

In May 2016, WFI welcomed nine UNESCO-IHE master's students, including Mwape, for a two-week field course in Nebraska. The students, experienced professionals from developing countries, visited

various sites and learned about Nebraska's agricultural production and water resources management firsthand. The course was organized and led by Faculty Fellows Dean Eisenhauer and Derek Heeren and UNESCO-IHE's Annelieke Duker and Laszlo Hayde.

## Jordan Study Tour; and, Water Security and Refugees Conference

The relative stability of the desert kingdom of Jordan defies its location. The country shares borders with Saudi Arabia, Iraq, Israel and war-ravaged Syria, and has become home to more than a half million Syrian refugees. Arid Jordan struggled with food security before the refugee crisis, so it has become a great challenge to feed its refugee population. Four undergraduate University of Nebraska students and three WFI members examined this problem in a week-long tour of the country, which included meetings with Jordanian and international stakeholders to improve their understanding of key water issues in the region. They also visited a camp sheltering more than 80,000 refugees.

Beyond issues of improving technical efficiency, the group learned how social and economic drivers – and historical cultural influences – are key to water use decisions and can limit the ability to address overuse.

Back in Nebraska, the students and staff shared their findings in a one-day conference on water security and refugees. The conference was held in partnership with the Norman and Bernice Harris Center for Judaic Studies at UNL and the International Arid Lands Consortium. The conference was sponsored by the Forsythe Family Foundation in Human Rights and Humanitarian Affairs and the UNL program in Global Studies and Department of Political Science.

## Student Research Forum

In May 2016, students and faculty working in multidisciplinary areas related to WFI's objectives were invited to present papers at a one-day student research forum. More than 10 different departments from all four University of Nebraska campuses were represented, with highly diverse expertise ranging from engineering and physical sciences to agricultural leadership and political science.

This was the second of an annual series designed to showcase WFI's research focus areas, as well as demonstrate the institute's dedication to education and the students who will become the world's next water and food security experts and world collaborators.



*From left: Faculty Fellow Mehmet Can Vuran, UNL computer scientist and electrical engineer, and Abdul Salam, graduate research assistant in the UNL Department of Computer Science, stand next to a model for wireless underground sensor networks.*

## (Re)Thinking Governance – World Water Week

The WFI co-convoked an all-day workshop at World Water Week 2015 in Stockholm on “(Re)Thinking Governance.” Other conveners were the

Stockholm International Water Institute, the United Nations Development Program, and the Water Integrity Network. The session brought together experts, practitioners, decision-makers, business innovators and young professionals from a range of sectors and countries to network, exchange ideas, foster new thinking and develop solutions to today's most pressing water-related challenges. The founding executive director provided introductions and a synthesis; the director of policy presented on “Learning from Crises and Failures of Governance.” A digital poster exhibit featured videos developed by two institute interns and the educational outreach associate that explored Nebraska water governance challenges and innovative solutions.

*Nick Brozovic, director of policy*



Za'atari refugee camp in Jordan. Photo by Morgan Spiels, program associate.



Research and policy work is  
advanced through  
**COMMUNICATION**  
that shares outputs and outcomes.

# Communication

*WFI's research and policy work is advanced through communication that shares program outputs and outcomes with stakeholders in the U.S. and around the world. Our communications work helps build relationships, using the most appropriate media and communication format, to position WFI as the preeminent U.S.-based resource for sustainable water and food system research, innovation and education.*

## Using Multimedia Channels to Reach Stakeholders in Nebraska and Around the World

Last year, WFI continued raising the profile of the University of Nebraska and awareness of the institute by sharing news and information through news releases, social media and print publications. We began using a media monitoring service to provide insight and analytics on our reach in traditional news media and social media. To support our intensified communications efforts, websites for the Nebraska Water Center and the Water for Food Global Institute were redesigned to make it easier for visitors to find information, as well as to reinforce separate, but closely related, brands.

The WFI website at [waterforfood.nebraska.edu](http://waterforfood.nebraska.edu) is the communications hub for the organization, including links to leadership and staff, publications, events and a variety of news and information, including archived editions of WFI's newsletter, the "Digest," and blogs

written by WFI staff, Faculty Fellows, students and partners.

## Branding

We reinstated the word "Global" to the Water for Food Institute's name and logo to reflect our international scope and improve the immediate awareness of WFI's global reach. The institute's official name is now the "Robert B. Daugherty Water for Food Global Institute at the University of Nebraska." The acronym remains "WFI." To reflect the name change, the institute's communications team redesigned both the WFI and NWC logos.



## Social Media

WFI's social media presence includes posts on Facebook, Twitter and YouTube. Last year, the Institute added Instagram and LinkedIn to the mix,

with key social media campaigns including coverage of the 2016 Water for Food Global Conference, World Water Day 2016, and the study tour to Jordan and subsequent Syrian conference.

Our main platforms, Facebook and Twitter, made significant gains in followers, 164% growth in Facebook and 40% growth in Twitter. More importantly, we're engaging feedback and shared posts with our followers. The 2016 Water for Food Global Conference was a regionally trending topic on Twitter and garnered 156 mentions.

Our social media investment enables us to reach stakeholders around the globe. While 67 percent of Twitter followers are from the US, a third are from countries around the globe, predominantly India, the UK, Canada and the Netherlands, but with small percentages from dozens of other countries.

## Special Events

WFI communication efforts included a partnership with KANEKO, a creativity museum founded by internationally renowned artist June Kaneko in Omaha, Nebraska, to produce a special exhibit on the many facets of water. The institute commissioned an art piece, "Lapse," by Matt Dehaemer, to exemplify the urgency of addressing water and food security in our lifetime. The exhibit also featured multisensory exhibits of research projects led by WFI directors Christopher Neale and Nicholas Brozović, as well as Faculty Fellows Trenton Franz and Alan Kolok.

The institute hosted a Transdisciplinary Conversation reception at KANEKO with Faculty Fellow Michael Farrell, who showcased the Platte Basin Timelapse project. Many faculty, staff and members of the



"Lapse" installation by Matt Dehaemer. (Photo by Ben Semisch, courtesy of KANEKO.)

community interacted at the event and stayed to view the water exhibit.

Additionally, the World Water Week convening committee selected WFI's proposed sessions "Telling Your Story to Make an Impact," co-convened with KickStart International, CGIAR-WLE and Canary and Coal; and "Role Playing How Water Markets Improve Food Security and the Environment," co-convened with Mammoth Trading and the Rockefeller Foundation, for inclusion in the 2016 conference being held in Stockholm, Sweden, in August 2016.

## News Media

Traditional news media is always an important component of sharing WFI research and accomplishments. Last year, the institute produced and disseminated more than 12 news releases on partnerships, research projects and events, which were published by several regional, national and international media outlets.

WFI's news mentions are archived on the website at <http://waterforfood.nebraska.edu/news-archives>.

# Looking Forward



**Peter G. McCornick**  
Executive Director

## Letter from Peter G. McCornick

When I learned of the opportunity to join the Water for Food Global Institute as its next executive director, I felt like my career path had led me to this opportunity. Growing up on a livestock and dairy farm in Scotland, I learned from an early age about agriculture production and managing the natural resources to sustain it. It's an interest that took me from the farm to an undergraduate degree at Newcastle in England, and graduate degrees in agricultural engineering from Colorado State University to leadership and research positions in some of the most water scarce areas of the world.

I had worked with Roberto and the directors of the Water for Food Global Institute to develop the MOU with the International Water Management Institute, which I represented as Deputy Director General of Research. I admired the assets of the institute, which included the vast resources and expertise of the University of Nebraska.

Roberto set the stage for the Water for Food Global Institute's international reputation. I appreciate the tremendous work he has done in developing a strong team and growing the institute from an idea to a fully operational research center that is truly making a difference in improving water and food security for generations to come. I hope to bring my own experiences to help lead the institute in pursuit of its mission. I look forward to working with our board of directors, the University of Nebraska leadership, faculty and staff, as well as our many partners in the U.S. and internationally, to advance the institute's achievements and impact. There is great work to be done together.

A handwritten signature in black ink, appearing to read 'P. G. McCornick'.

Peter G. McCornick  
Executive Director

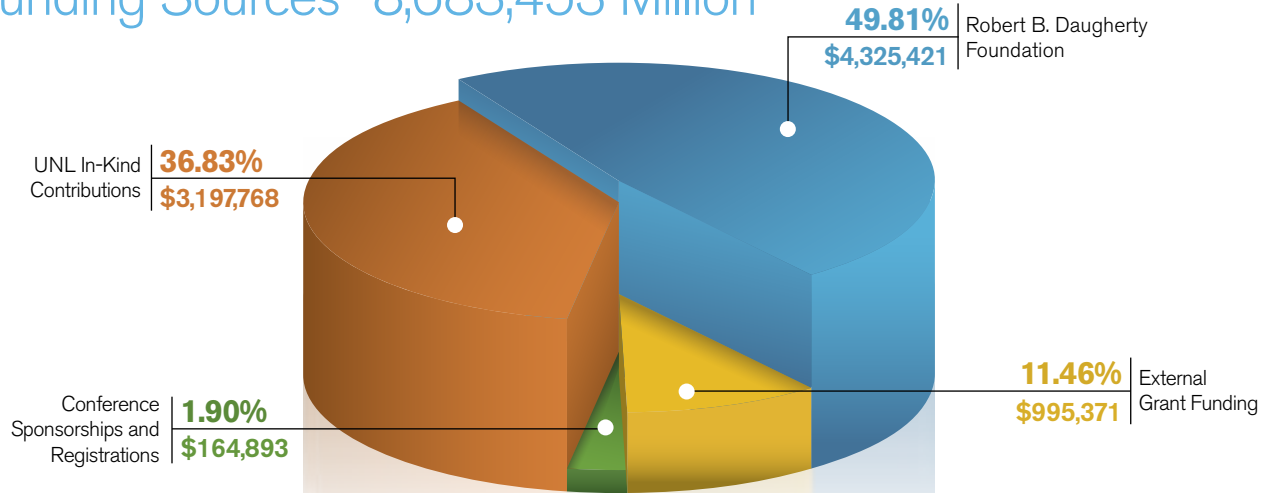




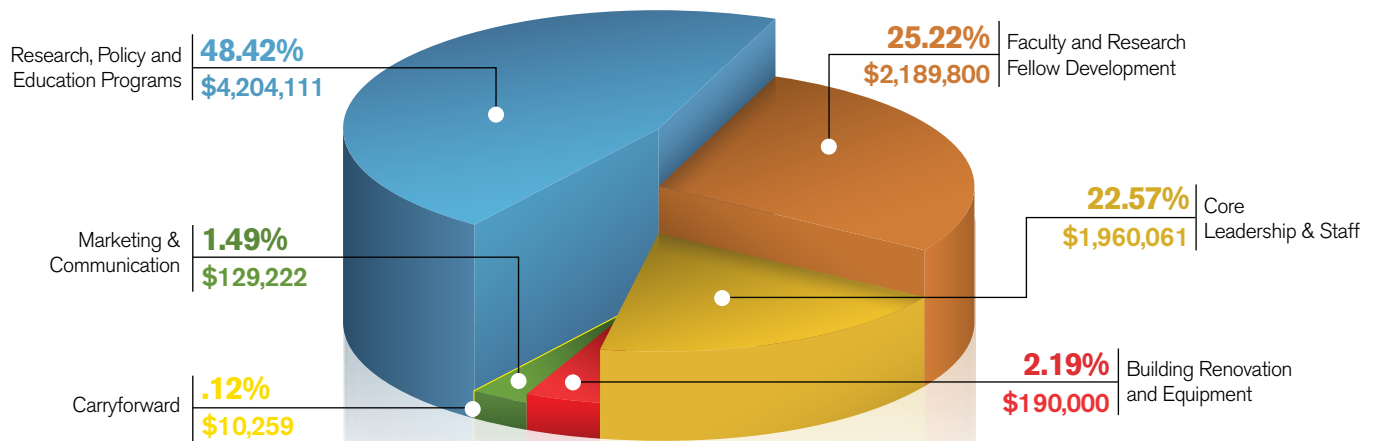
# Financials

July 1, 2015 to June 30, 2016

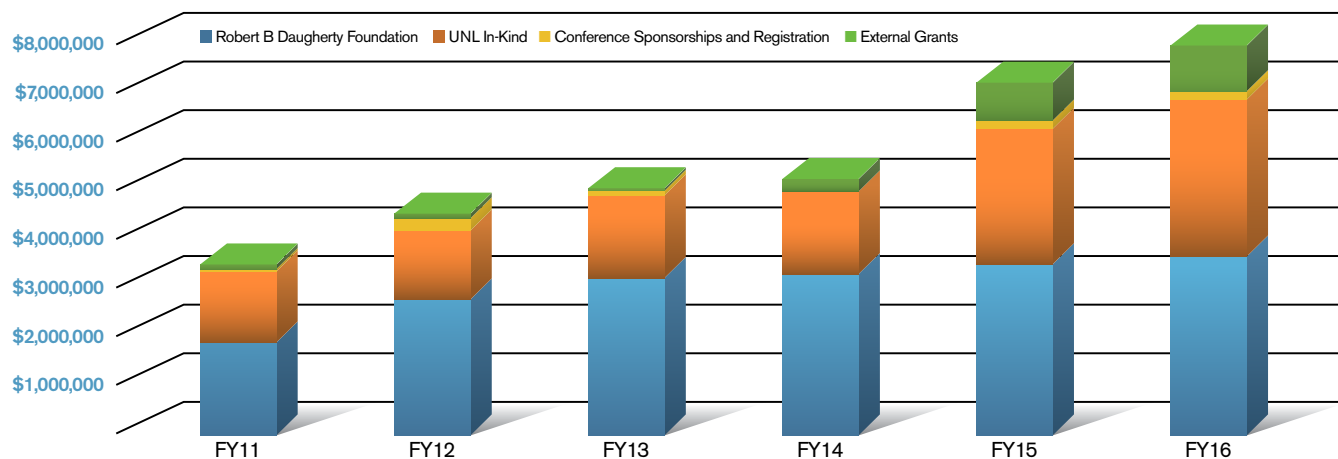
## Funding Sources \$8,683,453 Million



## Total Expenditures = \$8,683,453 Million



# Funding Sources FY2011-2016



## FY 2016

The institute received funding from several sources and allocated these carefully to advance its global mission. Of note, approximately \$68,000 of expenditures in “Research, Policy and Education Programs” was allocated to complete a \$1.5 million endowment developed from funding reserves during the past five years. This is a matching fund that can be used to maximize contributions to the institute for educational purposes.

### Foundations

- Robert B. Daugherty Foundation
- Bill & Melinda Gates Foundation

### Grant Funding

- al-Farabi Kazakh National University
- Central Platte Natural Resource District
- City of Hastings, Nebraska
- Colorado State University
- Department of Interior-Geological Survey
- Department of Agriculture-ARS
- Department of Agriculture-OCE
- Department of Interior-FWS

- ECS Federal, Inc.
- Hawaii Department of Agriculture
- International Center for Biosaline Agriculture
- Michigan State University
- National Science Foundation
- National Pork Board
- Nebraska Department of Environmental Quality
- Nebraska Department of Natural Resources
- Nebraska Environmental Trust
- University of Missouri
- University of Nebraska Foundation
- Upper Elkhorn Natural Resource District
- USDA Economic Research Service
- Zambia Ag Research Institute

### Corporate Sponsors

- Syngenta
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- Nebraska Corn Board

In addition to the funding sources listed, the institute received considerable in-kind support from partners for collaborative projects.

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