International Symposium on Synergistic Approaches to Food and Water Security

Meeting Report

The International Symposium on Synergistic Approaches to Food and Water Security was held on October 17 – 19, 2012 at George Mason University (GMU), hosted by GMU, College of Science (COS) and the World Meteorological Organization (WMO). The symposium was co-sponsored by Riverside Technology, Inc., USDA, NASA, NOAA and USGS. The meeting brought together about 110 participants, including international experts from seven countries and the WMO, and scientists and decision makers from universities, companies and government agencies to share information and perspectives on food and water security issues. The symposium included plenary session presentations, a concurrent technical session, and a poster display session.

The primary objectives of the symposium were to:1) Discussinternational and institutional perspectivesthat emphasize multi-disciplinary research applications and academic programs insupport offood and water resources; 2) Promote the technologies and training needed to enable decision makers to improve the adoption and management of local sustainable technologies; 3) Promote water as a key natural resource for sustainable national development through the transfer of best local practices; and,
4) Establish an effective inter-connected network of global academic centers of excellence to collaborate and communicate on issues of mutual and timely interest.

Many of the participants were available for a group photo on Wednesday, October 17, 2012.

The session was opened by **Vikas Chandhoke**, Dean of GMU COS, followed by welcoming remarks from **Robert Stefanski**, WMO, **and Byong-Lyol Lee**, President of the WMO Commission for Agricultural Meteorology, an introductory speech from **Jack Kaye**, Associate Director of NASA's Earth Science Division, and an introductory welcome by **James Turner**, Director, NOAA Office of International Affairs.

During the first plenary session(**Ray Motha**, Chair), speakers introduced the main themes for the symposium. The first speaker, **Roger Stough**(GMU Vice-President for Research and Economic Development)discussed different types of leadership characteristics,based on functional and regional analyses, with international organizations providing crucial resources for local leadership response to food and water security**. Fred Branski**(President, WMO Commission for Basic Services and NOAA/IA) defined synergism and discussed the role of global information and technology for building service delivery to the user communities.**Tom Lovejoy**(GMU/COS)emphasizedthe need to think in terms of the agro-eco systems to ensurestewardship and future sustainability of our resources. **Jerry Bange**(USDA Chairperson, World Agricultural Outlook Board) presented an overview of the significant impact of severe drought on global crop production and its consequences on commodity markets and ultimately food security. **Jerad Bales**(USGS Chief Scientist for Water) highlighted the complex perspective offive major water uses: energy, food and agriculture, industry, drinking and sanitation, and ecosystems; and, key inter-linkages. **James Turner**(NOAA Director, Office of International Affairs)reviewed NOAA's mission of science, service and stewardship as it relates to the attributes and stresses of food and water security, and,noted thatfood and water are national security issues.

Concurrent technical sessions followed on Wednesday afternoon. Session 2.1 (**Harlan Shannon**, Chair) focused on Climate and Natural Hazards. **David Fleisher**(USDA/ARS) discussed agricultural modeling tools for characterizing food security risks, adaptive capacity in developing countries and developing risk management options using these tools. **Brad Rippey**(USDA/WAOB) reviewed the enormous impact severe drought had on U.S. crop production in 2012, the response to this disaster,and the likely consequences of this drought on commodity prices in 2013. **Mark Brusberg**(USDA/WAOB) highlighted the significant relationship between ENSO and crop production in Argentina and Brazil, emphasizing three important aspects of the study: forecasting, impact assessments, and education and outreach. **Robert Stefanski** (WMO)presented an extensive overview of the WMO's drought activities and programs, including coordination of drought indices, national drought policy and integrated drought management.**Wassila Thiaw** (NOAA/CPC) discussed the use of climate models for enhanced decision support and noted how a better understanding of long-term ocean variability and land surface andvegetation feedbacks improved estimates of soil moisture for monitoring and predictive capabilities; and, more comprehensive greenhouse gas study and interagency cooperation could benefit these decisions.**Di Wu**(GMU/ESTC) presented the results of a comprehensive study which demonstrated the use of MODIS remote sensing data in agricultural drought monitoring in the central U.S. Thus, session 2.1 provided a broad overview of drought severity and its impact on global markets; tools and methodologies to better monitor and understand future drought conditions; and, insight into drought management and policy implications.

Session 2.2 (**Al Powell**, Chair; **Xiwu Zhan**, co-Chair) addressed remote sensing applications as an integrated technology.**Scott Rudlosky**(NOAA/NESDIS) discussed spaceborne precipitation estimates, noting that precipitation is both of societal and scientific importance and satellite technology is evolving to create an increasing number of beneficial products for hydrological and agricultural applications.**Xiwu (Jerry) Zhan**(NOAA/NESDIS) reviewed the importance of soil moisture data, the current limitations, the potential use of satellite data products, and the comprehensive drought monitoring concept which

would merge or blend all available data sets together.**Martha Anderson**(USDA/ARS) presented an overview of monitoring anomalous water use patterns related to agricultural drought and land surface temperatures which convey warnings of vegetation stress through the evaporative stress index for food and water security applications**. Xiaoyang Zhang**(NOAA/NESDIS) demonstrated the use of satellite data to monitor crop phenology and drought-induced vegetative stress. The technical presentations in session 2.2 illustrated the critical importance of integrating evolving technologies with ground measurements and modeling tools to establish a comprehensive approach to agriculture and water resource management.

Session 2.3 (**Keith Ingram**, Chair) concentrated on applications and outreach. **Robert Stefanski**(WMO)discussed the successful implementation of roving seminars on weather, climate and farmers in West Africa to provide planting advice for farming communities based on rainfall, and, mobile weather alerts for community fisherman on Lake Victoria. **Roger Stone**(USQ, Australia) discussed the relative importance of climate information for decision making by farmers, making a basic premise that it has no value unless it changes a management decision and the case studies demonstrating value of a virtual framework and the need to take a participatory approach.**Clyde Fraisse**(U. Florida) reviewed the successful applications of AgroClimate Tools, Advisory System, and Agricultural Reference Index for Drought (ARID), and discussed the vision of the AgroClimate Systems as they relate to the entire continuum of short-term weather monitoring and one crop season to climate change scenarios and multiple cropping seasons**. Keith Ingram** (Southeast Climate Consortium, U. Florida) discussed risk management tools, including AgroClimate and crop management tools, climate insurance products (including ENSO index insurance), and risk transfer instruments for improved productivity and food security.**Chad McNutt**(NOAA) discussed the National Integrated Drought Information System (NIDIS) and highlighted some of the education and outreach that NIDIS has developed through Climate Outlook Forums and Webinars on various drought topics, including La Nina, flash drought, water resources, cattle industry, seasonal forecasts, wildfires, U.S. Drought Monitor, and wildlife. This session emphasized not only the importance providing valuable tools and services to the user community, but also ensuring the user community was engaged in a participatory process to promote active involvement and communication between providers and users of information.

Session 2.4 (**George Smith**, Chair) dealt with water security, the fundamental issue related to food security.**David Toll**(NASA/GSFC) provided a comprehensive overview of NASA's water resources programs, including The Global Precipitation (GPM) Mission, The Soil Moisture Active Passive (SMAP) Mission, and international partnerships for disaster monitoring, ecological forecasting and capacity building. **Bill Cunningham**(USGS) reviewed the extensive national ground water monitoring network of the U.S. Geological Survey, noting the increasing percentage of ground water withdrawal in the latter half of the 20th century from the major U.S. aquifers. **David Green**(NOAA) gave a presentation on NOAA Collaborations in the International Water and Climate Arena. **Yongqiang Liu**(USDA/FS) discussed the increasing hydrological threats to the forest ecosystem services due to stressed or degraded forest water conditions, with climate variability (drought) increasing wildfire trends and climate change enhancing the potential drying trend.**Christian Holmes (**USAID/Global Water Coordinator) presented a fundamental talk on saving lives. The key points include more than a billion people do not have access to

safe water; more than 2 billion people live without adequate sanitation; more than 4 billion cases of diarrhea cause 2.2 million deaths, mostly children under the age of 5; and, about one billion people go to bed hungry every night. The emphasis should be on creating synergies between water, food and health which meet multiple needs. **Tim Martin**(Riverside Technology, Inc.) summarized these points: In 2025, two-thirds of the world's population could be living under water stress and most of the countries are economically challenged to mitigate water scarcity. The main challenges for the future: all people should have access to safe and sufficient water and sanitation; equitable allocation of water resources for food production; protection of ecosystems; ensure peaceful cooperation in water-sharing countries; and, manage risks with floods, droughts and pollution.

The poster session was organized and chaired by **William Sommers**.

On Thursday morning, the second plenary session, Session 3 (**Federica Rossi**, Chair), opened with the Bureau of Hydrology, Ministry of Water Resources, China presenting a brief overview of hydrological information and forecasting in China, which include a discussion of hydrological operational systems, flood forecast technology, and flood information services. **Sue Walker**(U. of the Free State, South Africa) discussed the issues, challenges and needs related to food and water security in southern Africa.**Mannava V.K. Sivakumar**(WMO) emphasized that the time is ripe for more effective use of agrometeorological applications to cope with food and water security, by promoting strong collaborative research and extension education through a global network of centers of excellence.**Kamalesh Kumar Singh**(India Meteorological Department, India) followed by illustrating the extensive integrated agro-meteorological advisory service system in India, which include a collaboration of agencies, services and modes of information dissemination and public outreach.**Zhiqiu Gao** (Nanjing U., China)presented a study of record-breaking high and low temperatures in China during the past 50 years, and projected the climate scenario in the future. **Kwang-Soo Kim**(Seoul National U., Korea) discussed the status of food security on the Korean peninsula and noted the increasing challenge for improving food security due to changing climate as well as the collaborative work between the two Koreas.**Orivaldo Brunini** (Institute of Agonomy, Sao Paulo, Brazil) discussed the importance of crop phenology, crop zoning, and crop adaptation to food and water security; and noted that it is imperative to have a good weather and climate monitoring network for analysis of information. **Roger Stone**(U. of Southern Queensland, Australia)presented similar perspectives of food and water security issues in Australiaand highlighted the massive issues associated with extreme levels of climate variability in Australia and consequent food and water security. Additionally, it was pointed out that Australia's near neighbours in Asia were becoming very aware of the likely need for Australia to provide agricultural outputs that would be needed to fulfill their own food requirements in the future.**Simone Orlandini**(U. of Florence, Italy) noted several issues of the future for Europe: shrinking agricultural land; climate change; competition with bioenergy crops; and, the energy incognita (fertilizers, pesticides etc.). EU Common Agriculture Policy (CAP) is a system of subsidies and programs promoting food security and supporting investments to conserve water. The presentations revealed that many countries around the world have common issues related to food and water security; however, each region has unique applications and focus issues that must be addressed at their regional and local levels.

The third plenary session, Session 4 (**John Qu**, Chair) focused on some institutional perspectives on food and water security. **Robert Stefanski** (WMO)elaborated more on the responsibilities of the World Meteorological Organization (WMO) in facilitating secure food and water supplies. Its efforts to promote better monitoring and forecasting systems, education and training programs, and information, communication and dissemination outreach are among the major priorities.**Federica Rossi (**Institute of BioMeteorology, Bologna, Italy) discussed the specific WMO related programs, World AgroMeteorological Information System (WAMIS) which currently is a web server for hosting bulletins and advisories and is transitioning to a web portal for serving as a resource hub for agrometeorological services, and, the International Society of AgroMeteorology (ISAM), a web forum. **Keith Ingram**(SECC) discussed some of the unique food and water issues of the Southeastern U.S., but emphasized that food and water security depends upon multi-disciplinary efforts that engage stakeholders during all phases of the research and development processes. In summary,the solutions to food and water security threats require modern science to be: multi-disciplinary; multi-institutional; team-oriented; and, end-user focused.

The new Global Institute at George Mason University, College of Science,was discussed during the plenary meeting, Session 5 (**M.V.K. Sivakumar**, Chair), and, during the final plenary session, Session6 (**Robert Stefanski**, Chair), outlining the institute's vision, mission, collaborating partnerships and structure.