

# WATER

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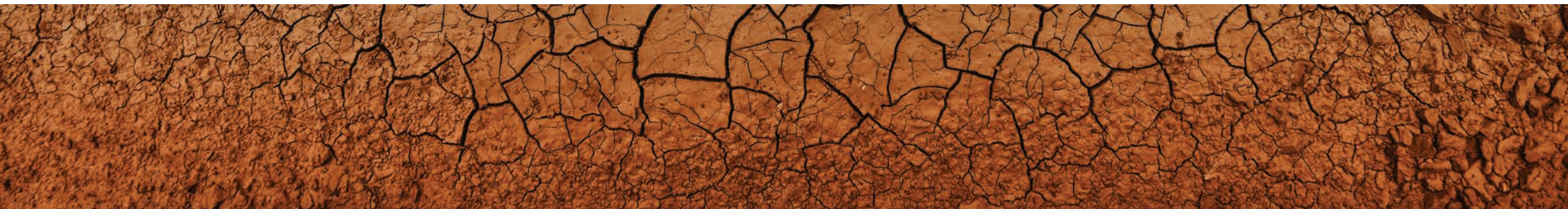
## *AGRICULTURE'S WATER ECONOMY*

*Federal Reserve Bank of Kansas City Agricultural Symposium / July 11-12, 2016*



***AGRICULTURE'S WATER ECONOMY*** has demonstrated growing signs of strain. Recent and persistent extreme weather-related events have highlighted the vulnerability of food and agricultural production to substantial variations in water availability. Consistent water availability is critical to agricultural production everywhere, and intensifying scarcity presents global agriculture with a formidable long-term challenge. Agricultural production has evolved, to a significant extent, on the basis of available water resources, both surface water and groundwater. However, there are growing concerns about the long-term trajectories of water availability and the potential implications for global agriculture.

The 2016 Agricultural Symposium, "Agriculture's Water Economy," will explore the dynamic link between agriculture and water, the role of markets and institutions and the path forward. The first day of the symposium will discuss how the outlook for agriculture depends on long-term water availability, and how the challenges of water scarcity might extend beyond the farm gate. The second day will discuss how the agricultural sector might adapt through investment, and the role of markets and institutions in addressing issues of long-term water scarcity.



## MONDAY, JULY 11, 2016

- 1:00 p.m. Welcome**  
Nathan Kauffman, Assistant Vice President and Omaha Branch Executive, Federal Reserve Bank of Kansas City
- 1:10 p.m. Keynote Presentation**  
The keynote presentation will describe recent trends surrounding water scarcity, including a discussion of factors driving global demand for water and key areas of supply concerns.
- Speaker:** Mark Rosegrant, Director, Environment and Production Technology Division, International Food Policy Research Institute
- Moderator:** Nathan Kauffman, Assistant Vice President and Omaha Branch Executive, Federal Reserve Bank of Kansas City
- 2:00 p.m. Session 1: Long-Term Trajectories**  
This session will discuss the likely outcomes for global agriculture over the long term stemming from issues surrounding water scarcity.
- Speaker:** Kenneth Cassman, Emeritus Professor of Agronomy, University of Nebraska
- Discussant:** Patrick Westhoff, Professor and Director, Food and Agricultural Policy Research Institute, University of Missouri
- Panelists:** Christopher Hartley, Deputy Director and Senior Environmental Markets Analyst, U.S. Department of Agriculture  
Guillaume Gruère, Senior Policy Analyst, Organisation for Economic Co-operation and Development
- Moderator:** Cortney Cowley, Economist, Federal Reserve Bank of Kansas City, Omaha Branch

- 3:30 p.m. Break**
- 4:00 p.m. Session 2: Scarcity Beyond the Farm Gate**  
This session will discuss how industries beyond commercial agricultural production view the challenges of water scarcity, the implications for regional economies and how other business sectors might adapt to long-term scarcity.
- Speaker:** Bonnie Colby, Professor of Agricultural and Resource Economics, University of Arizona
- Discussant:** Bradley Udall, Senior Water and Climate Research Scientist, Colorado State University
- Panelists:** Ellen Hanak, Director of Water Policy Center, Public Policy Institute of California  
Les Lampe, Former Vice President and Director of Water Resources, Black & Veatch
- Moderator:** Craig Hakkio, Senior Vice President and Special Advisor on Economic Policy, Federal Reserve Bank of Kansas City
- 5:30 p.m. Reception**
- 6:30 p.m. Dinner and Speaker: Economic Conditions and Monetary Policy**
- Introduction:** Jim Farrell, President and Chief Executive Officer, Farmers National Co.; Federal Reserve Bank of Kansas City Board of Directors
- Speaker:** Esther George, President and Chief Executive Officer, Federal Reserve Bank of Kansas City
- Shuttle transportation to the Sheraton Kansas City Hotel at Crown Center will be available immediately following dinner.*

## TUESDAY, JULY 12, 2016

*Shuttle transportation from the Sheraton Kansas City Hotel at Crown Center to the Bank will begin at 7:15 a.m.*

7:30 a.m. *Continental Breakfast*

8:00 a.m. *Session 3: Investing in Adaptation*

This session will discuss how agriculture might respond to water scarcity, investments being made, and potential efficiency gains that might position the agricultural sector to better adapt to the constraints of long-term water availability.

*Speaker:* Susanne Scheierling, Senior Irrigation Water Economist, World Bank

*Discussant:* Qiuqiong Huang, Associate Professor of Agricultural Economics, University of Arkansas

*Panelists:* John Hamer, Managing Director, Monsanto Growth Ventures  
Robert Meaney, Former Chairman-International, Valmont Industries Inc.

*Moderator:* Nathan Kauffman, Assistant Vice President and Omaha Branch Executive, Federal Reserve Bank of Kansas City

9:30 a.m. *Break*

10:00 a.m. *Session 4: Markets and Allocation*

This session will discuss the economic and social challenges of implementing a market-based structure for allocating water use and the corresponding implications for agriculture.

*Speaker:* Mike Young, Professor and Chair, Water and Environmental Policy, University of Adelaide

*Discussant:* Nicholas Brozovic, Director of Policy, Water for Food Institute, University of Nebraska

*Panelist:* Richard Sandor, Chairman and Chief Executive Officer, Environmental Financial Products

Tom Iseman, Deputy Assistant Secretary for Water and Science, U.S. Department of the Interior

*Moderator:* Troy Davig, Senior Vice President and Director of Research, Federal Reserve Bank of Kansas City

11:30 a.m. *Lunch and Concluding Discussion*

*Speaker:* Richard Howitt, Professor Emeritus, University of California-Davis

*Moderator:* Nathan Kauffman, Assistant Vice President and Omaha Branch Executive, Federal Reserve Bank of Kansas City

1:30 p.m. *Closing Comments and Adjourn*

## ***SPEAKERS, DISCUSSANTS AND PANELISTS***

*Nicholas Brozovic, Director of Policy, Water for Food Institute, University of Nebraska*

Mr. Brozovic is director of policy at the Robert B. Daugherty Water for Food Institute and an associate professor of agricultural economics, both at the University of Nebraska. He works to ensure that the Water for Food Institute's scientific and policy research effectively informs both policymakers and decisionmakers. He also has a teaching appointment and oversees the Institute's innovation and entrepreneurship programs.

Mr. Brozovic has extensive experience in water policy worldwide. A particular focus of his research is on evaluating policies and governance structures for agricultural water management. He is a co-founder of Mammoth Trading, a company that specializes in water market design and implementation, and which established the first smart markets for groundwater trading.

*Kenneth Cassman, Emeritus Professor of Agronomy, University of Nebraska*

Mr. Cassman is emeritus professor of agronomy at the University of Nebraska where he served as Agronomy and Horticulture Department head, director of the Nebraska Energy Sciences Research Center and leader of the Global Yield Gap Atlas. Prior to Nebraska, Mr. Cassman had positions at the International Rice Research Institute in the Philippines and the University of California-Davis.

Mr. Cassman has conducted agronomic field research in nearly all of the world's most important crop production systems with a focus on raising yields while also conserving natural resources and protecting environmental quality. He is best known for his research on crop yield potential, nitrogen- and water-use efficiency, ecological intensification and global food security. He is a co-author of the textbook *Crop Ecology*. Mr. Cassman also is an agronomic consultant with international farming companies, engineering firms and environmental advocacy organizations.

*Bonnie Colby, Professor of Agricultural and Resource Economics, University of Arizona*

Ms. Colby is a professor at the University of Arizona, where she has been a faculty member since 1983 in the departments of Agricultural and Resource Economics and Hydrology and Water Resources. Her research, teaching and outreach focus on economic trade-offs in water and energy management, climate change adaptation and incentive-based agreements to improve water supply reliability for agricultural, environmental and urban needs.

Ms. Colby has written more than 100 journal articles and eight books. She has testified in her areas of expertise to state legislatures, state and federal courts and the U.S. Congress, and has taught at Harvard University's Kennedy School of Government Executive Training Programs. She works with western states, federal agencies, private firms, water districts and NGOs to develop and implement new strategies to improve water supply reliability and resolve conflicts over water.

*Guillaume Gruère, Senior Policy Analyst, Organisation for Economic Co-operation and Development*

Mr. Gruère is a senior policy analyst in the Trade and Agriculture Directorate of the Organisation for Economic Co-operation and Development (OECD), Paris, where he leads the work on agriculture and water. He recently published a report on the management of groundwater use in agriculture, based on a comprehensive survey of OECD country policies, and is now leading a project on future water risks for agriculture.

He previously was a senior research fellow in the Environment and Production Technology Division of the International Food Policy Research Institute in Washington, D.C., where he led economic research on genetic resource policies (biotech, biosafety and biodiversity) in developing countries.

*John Hamer, Managing Director, Monsanto Growth Ventures*

Mr. Hamer is managing director for Monsanto Growth Ventures, with offices in San Francisco and St. Louis. His career spans more than three decades of research, senior management and investment experience in the life sciences. Prior to joining Monsanto, he was entrepreneur-in-residence and later managing director and general partner at Burrill & Co., a life sciences merchant bank. Prior to joining Burrill, he was chief executive officer at Paradigm Genetics/Icoria, a genomics and ag-biotechnology company.

Previously, Mr. Hamer has been a visiting scientist in Dupont's Central Research and Development group and a professor at Purdue University, where his research focused on crop diseases. Mr. Hamer lectures widely on innovation, agriculture and venture capital and is a member of the board of trustees for the International Center for Tropical Agriculture and the board of directors for Golden Pine Ventures, a micro venture capital fund.

*Ellen Hanak, Director of Water Policy Center, Public Policy Institute of California*

Ms. Hanak is a senior fellow at the Public Policy Institute of California and director of the Institute's Water Policy Center. The center is a source of information and guidance for natural resource management in California. She previously was the center's research director.

Ms. Hanak has authored dozens of reports, articles and books on water policy and her research is frequently profiled in the national media; she participates in briefings, conferences and interviews throughout the nation and around the world. Her other areas of expertise include climate change and infrastructure finance. She previously had positions with the French agricultural research system, the President's Council of Economic Advisers and the World Bank.

*Christopher Hartley, Deputy Director and Senior Environmental Markets Analyst, U.S. Department of Agriculture*

Mr. Hartley is deputy director and senior environmental markets analyst with the U.S. Department of Agriculture's Office of Environmental Markets. He is responsible for the development of policy, tools and metrics to support landowner participation in ecosystem services markets.

Mr. Hartley previously worked for the Natural Resources Conservation Service in Washington, D.C., and in California, and was an agricultural extension agent with the U.S. Peace Corps in Senegal, West Africa. Mr. Hartley is a certified crop advisor and a licensed pest control advisor with active farming interests in California and Oregon.

*Richard Howitt, Professor Emeritus, University of California-Davis*

Mr. Howitt is professor emeritus in the Department of Agricultural and Resource Economics, member of the faculty of the Center for Watershed Sciences at the University of California-Davis, where he taught since 1975. He is also a principal economist at ERA Economics and is the Steyer Fellow at Public Policy Institute of California's Water Policy Center. He also is a fellow of the Agricultural and Applied Economics Association.

Mr. Howitt's research interests are in disaggregated economic modeling, market mechanisms and dynamic stochastic methods applied to water resources. He has co-authored three books on California water, and recently completed a report on economic impacts of the 2014 and 2015 drought for the California Department of Food and Agriculture and the Governor's Drought Task Force.

*Qiuqiong Huang, Associate Professor of Agricultural Economics, University of Arkansas*

Ms. Huang is associate professor of agricultural economics at the University of Arkansas. Ms. Huang's research includes natural resource economics with an emphasis on water and development issues including education, migration and labor market outcomes. Among her current projects is research on the adoption and impacts of water conservation practices in Arkansas and the impact of cognitive and non-cognitive skills on labor market outcomes.

Ms. Huang's past research has examined water pricing policy, water management institutions, water markets and the impact of irrigation on income and inequality. A large part of her research is based on household level data she has collected with collaborators in north China. Prior to joining the University of Arkansas, she was an assistant professor and a tenured associate professor at the University of Minnesota.

*Tom Iseman, Deputy Assistant Secretary for Water and Science, U.S. Department of the Interior*

Mr. Iseman is deputy assistant secretary for Water and Science in the U.S. Department of the Interior. The Office of Water and Science provides oversight for the U.S. Geological Survey and the Bureau of Reclamation. Mr. Iseman is the primary policy lead for the Bureau of Reclamation; he also coordinates the Interior Department's efforts to advance sustainable hydropower generation and leads the WaterSMART initiative.

Mr. Iseman previously was the water program director for the Western Governors' Association, which represents the governors of 19 western states on regional policy issues. He also directed the water program at The Nature Conservancy of Colorado and worked in the Office of Policy at the U.S. Department of the Interior. Mr. Iseman has experience in water resource planning and policy in the western United States and he has led projects on drought and climate adaptation, water markets and the energy-water nexus.

*Les Lampe, Former Vice President and Director of Water Resources, Black & Veatch*

Mr. Lampe, formerly a vice president and director of water resources at Black & Veatch, currently is with Lampe Water Consulting LLC. He has more than 40 years of experience in water resources, specializing in integrated water supply planning. At Black & Veatch, he had been responsible for the technical aspects of numerous river basin studies, municipal and regional water supply plans and evaluations of yield and quality for both surface and groundwater supplies.

Mr. Lampe has written and presented more than 100 technical papers at national and international venues. In addition, has chaired many committees, including the Total Water Management Task Force of the American Water Works Association (AWWA), the AWWA Committee on Water Reuse Policy and the AWWA Water Resources Division Board of Trustees. Mr. Lampe also has been a principal investigator on research projects focused on water quality, water supply and water economics.

*Robert Meaney, Former Chairman-International, Valmont Industries Inc.*

Mr. Meaney is the former chairman-international at Valmont Industries Inc. of Omaha, Neb. He joined Valmont in 1994 and for 18 years led the company's international operations and global development. In 2013, Mr. Meaney was appointed distinguished fellow at the Robert B. Daugherty Water for Food Institute at the University of Nebraska. Prior to joining Valmont, Mr. Meaney was with Continental Can Co. for 20 years.

Mr. Meaney is on the board of Infinity Property and Casualty Corp., and previously was on the boards of the Irrigation Association and the National Association of Manufacturers. He was also a 2012 Advanced Leadership Fellow at Harvard University.

*Mark Rosegrant, Director, Environment and Production Technology Division, International Food Policy Research Institute*

Mr. Rosegrant is director of the Environment and Production Technology Division at the International Food Policy Research Institute in Washington, D.C. He has extensive experience in research and policy analysis in agriculture and economic development, with an emphasis on water resources and other natural resource and agricultural policy issues. He currently directs research on climate change, water resources, sustainable land management, genetic resources and biotechnology and agriculture and energy.

Mr. Rosegrant has written or edited 12 books and more than 100 refereed papers in agricultural economics, water resources and food policy analysis. Mr. Rosegrant is a fellow of the American Association for the Advancement of Science and a fellow of the Agricultural and Applied Economics Association.

*Richard Sandor, Chairman and Chief Executive Officer, Environmental Financial Products*

Mr. Sandor is chairman and chief executive officer of Chicago-based Environmental Financial Products, which specializes in inventing, designing and developing new financial markets. He is a board member of the Clean Energy Trust, a member of the advisory board of the Center for Financial Stability and the Smithsonian Tropical Research Institute; and a senior fellow of the Milken Institute.

Mr. Sandor also is the Aaron Director Lecturer in Law and Economics at the University of Chicago Law School and a visiting fellow with the Smith School of Enterprise and the Environment at Oxford University. He has received many awards and honors for his contribution to the creation of financial futures and in 2013 became a Knight in the French National Order of the Legion of Honor for his accomplishments in environmental finance and carbon trading.

*Susanne Scheierling, Senior Irrigation Water Economist, World Bank*

Ms. Scheierling is a senior irrigation water economist in the Water Global Practice of the World Bank in Washington, D.C. She is leading a study on how to assess and improve agricultural water productivity, with insights to be applied in projects in Pakistan, Morocco and Chile. She is also organizing the next annual meeting of water economists worldwide hosted by the World Bank in September 2016.

Before joining the World Bank in 2007, Ms. Scheierling worked for seven years on the design and implementation of agricultural and water-related projects for the Asian Development Bank. She was also involved in analytical work on irrigation water economics and management as a visiting scholar at Colorado State University, as a post-doctoral scientist at the International Water Management Institute, as a research scholar at the International Institute for Applied Systems Analysis and as a consultant for the World Bank and the German Technical Cooperation.

*Bradley Udall, Senior Water and Climate Research Scientist, Colorado State University*

Mr. Udall is a senior water and climate research scientist at the Colorado Water Institute at Colorado State University. He has extensive experience in water and climate policy issues, most recently as director of the Getches-Wilkinson Center for Natural Resources, Energy and the Environment and the Western Water Assessment at the University of Colorado in Boulder.

Mr. Udall has written numerous peer-reviewed publications on water management and climate change, which have been published by the federal government and major journals. He has researched water problems on all major southwestern U.S. rivers, including the Rio Grande, Colorado, Sacramento-San Joaquin and Klamath. He also has spent six months in Australia studying its recent water reforms.

*Patrick Westhoff, Professor and Director, Food and Agricultural Policy Research Institute, University of Missouri*

Mr. Westhoff is director of the Food and Agricultural Policy Research Institute (FAPRI) at the University of Missouri in Columbia, which he joined in 1996. Mr. Westhoff also is a professor in the university's Department of Agricultural and Applied Economics.

Mr. Westhoff served in the Peace Corps from 1979 to 1981 in Guatemala and later worked with FAPRI at Iowa State University. From 1992 to 1996, he was an economist with the U.S. Senate Committee on Agriculture Nutrition and Forestry.

*Mike Young, Professor and Chair, Water and Environmental Policy, University of Adelaide*

Mr. Young is the research chair in Water and Environmental Policy at the University of Adelaide and was the founding executive director of its Environment Institute. He is a fellow of the Academy of Social Sciences in Australia and a distinguished fellow of the Australian Agricultural and Resource Economics Society.

Mr. Young's research has focused on the use and design of market-based instruments with attention to water. Prior to joining the University of Adelaide, Mr. Young spent 30 years with the Commonwealth Scientific and Industrial Research Organisation where he established its Policy and Economic Research Unit with offices in Adelaide, Canberra and Perth.



## **FEDERAL RESERVE BANK OF KANSAS CITY PARTICIPANTS**

*Jim Farrell, President and Chief Executive Officer, Farmers National Co.;  
Federal Reserve Bank of Kansas City Board of Directors*

Mr. Farrell is president and chief executive officer of Farmers National Co., an employee-owned farm and ranch management company in Omaha, Neb. He also is a member of the board of directors of the Federal Reserve Bank of Kansas City. Previously, Mr. Farrell had been chair of the Omaha Branch Board of Directors.

Mr. Farrell serves on the board of directors of the Nebraska LEAD Program, and is a member of the American Society of Farm Managers and Rural Appraisers (ASFMRA), where he has earned the Accredited Farm Manager designation. He is also a past president of the Nebraska Chapter of ASFMRA, and a current member of the editorial board of *AgriMarketing Magazine*. He is also a member of the Realtors Land Institute, the Gamma Sigma Delta Honor Society of Agriculture, the Greater Omaha Chamber of Commerce Agricultural Committee and the National Agri-Marketing Association.

*Esther George, President and Chief Executive Officer*

Ms. George is president and chief executive officer of the Federal Reserve Bank of Kansas City and a member of the Federal Open Market Committee, which has authority over U.S. monetary policy. She was appointed president in 2011 and had been the Bank's chief operating officer since 2009. She also hosts the Federal Reserve Bank of Kansas City's annual Jackson Hole Economic Policy Symposium.

Ms. George joined the Bank in 1982 and served much of her career in the Division of Supervision and Risk Management. She was directly involved in the Tenth District's banking supervision and discount window lending activities during the banking crisis of the 1980s and post-9/11. She also has participated in the Bank for International Settlement's Financial Stability Institute programs in Lima, Abu Dhabi, Beijing and Malaysia.

*Troy Davig, Senior Vice President and Director of Research*

Mr. Davig is senior vice president and director of research of the Federal Reserve Bank of Kansas City. He is the Bank's chief economic policy advisor and provides executive oversight for the Bank's Research Division. His research focuses on monetary and fiscal policy. He also has published work on inflation, labor markets and banking issues. He is a member of the Bank's Management Committee, which has responsibility for the Bank's strategic planning and policy direction.

Previously, Mr. Davig served as senior U.S. economist for Barclays Capital and as an assistant professor at the College of William & Mary.

*Craig Hakkio, Senior Vice President and Special Advisor on Economic Policy*

Mr. Hakkio is senior vice president and special advisor on economic policy at the Federal Reserve Bank of Kansas City. He conducts research on international macroeconomic policy and monetary policy. He also advises the Bank's president, who serves on the Federal Open Market Committee, the principal monetary policy making body of the Federal Reserve System.

Mr. Hakkio has written many articles in professional journals and conference proceedings. After working as an assistant professor of economics at Northwestern University, he joined the Federal Reserve Bank of Kansas City in 1984 as a senior economist. From 1987 to 1988, he was a senior staff economist at the President's Council of Economic Advisers. He was senior vice president and director of research from 1997 to 2006 and was named special advisor on economic policy in 2006.

## NOTES

### *Nathan Kauffman, Assistant Vice President and Omaha Branch Executive*

Mr. Kauffman is assistant vice president and Omaha Branch executive with the Federal Reserve Bank of Kansas City. He is the Bank's regional economist and representative in the state of Nebraska. He also recruits and works closely with the Branch's board of directors and is responsible for briefing the Kansas City Fed's president—a member of the Federal Open Market Committee—on economic and business activity in the state.

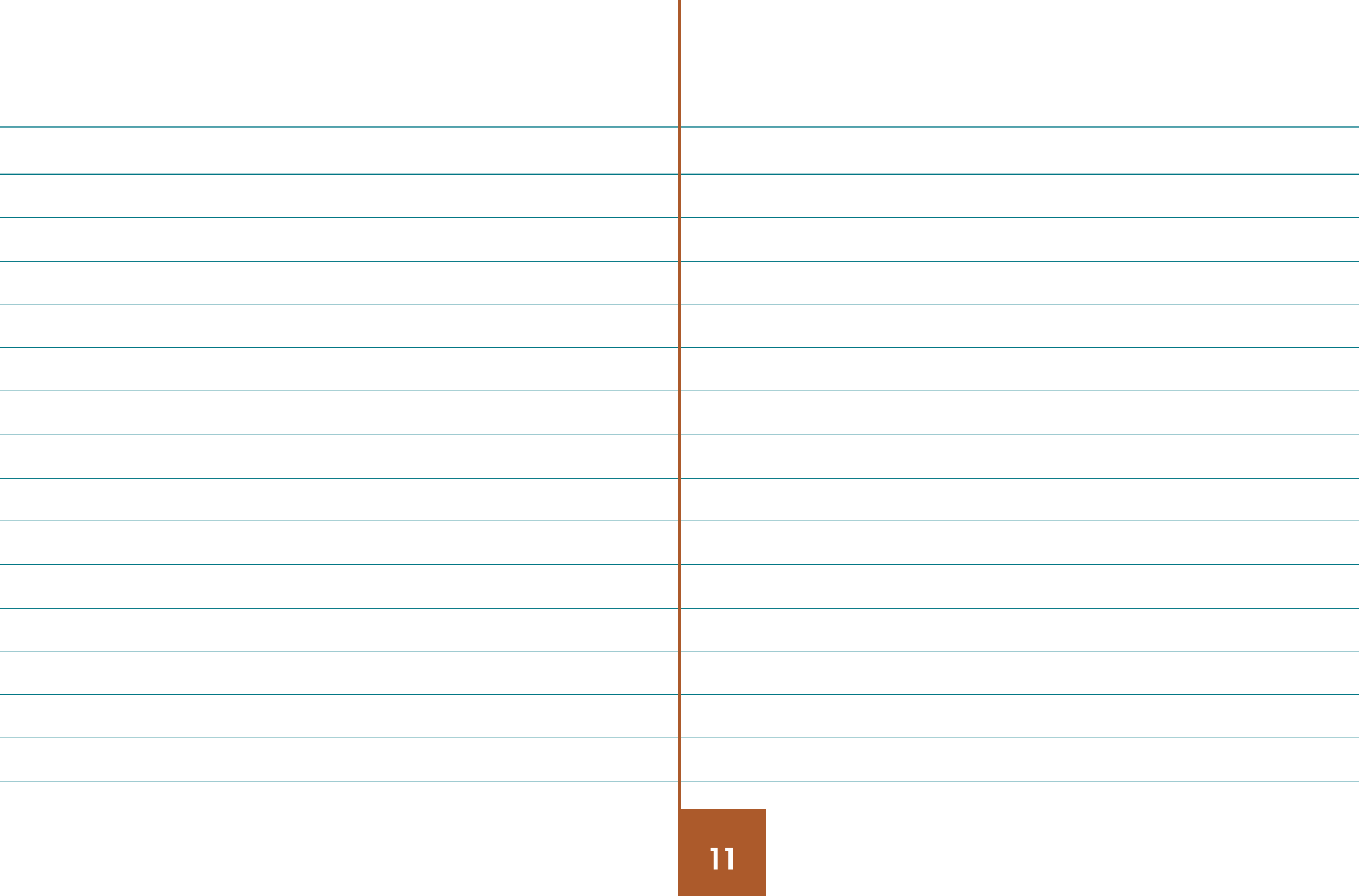
In addition, Mr. Kauffman is the Kansas City Fed's lead expert in agricultural economics. He oversees several Bank and Federal Reserve System efforts to track agricultural and rural economies, including the quarterly publication of the *Tenth District Survey of Agricultural Credit Conditions* and the Federal Reserve System's *Agricultural Finance Databook*. He joined the Federal Reserve in 2012 and served as an economist in the Regional Affairs Department at the Omaha Branch before being named Branch Executive in 2013.

### *Cortney Cowley, Economist, Omaha Branch*

Ms. Cowley is an economist in the Regional Affairs Department of the Federal Reserve Bank of Kansas City. Her current research focuses on agricultural finance, commodity markets, farm management and natural resource economics and policy. She also writes for the *Tenth District Survey of Agricultural Credit Conditions* and the Federal Reserve System's *Agricultural Finance Databook*.

Ms. Cowley joined the Bank in 2015.







FEDERAL RESERVE BANK of KANSAS CITY