Agriculture, transportation and climate change: Considering the future of agriculture and freight transport in the Upper Mississippi River Valley

A team of University of Wisconsin–Madison researchers took a closer look at how climate change might impact grain production and transportation in the Upper Mississippi River Valley. They surveyed current freight system users and learned about 11 people across the supply chain, from private industry, state and local government, and agricultural and nonprofit organizations in this region. Their work sheds light on ways that climate change might affect agricultural production, markets and transportation in this region.

Agriculture in the Upper Mississippi River Valley is watered part of the global food trade network; the flow of food from the Illinois-centered corn belt to the Louisiana ports is the largest link, in terms of trade volume, between U.S. and global agricultural needs. In the near term, farmers in the Upper Mississippi River region will continue to export dairy, grains and specialty crops, while simultaneously combating with extreme weather. Increased volatility in natural systems may increase volatility in markets and intensity pressure on already fragile transportation systems (Patt et al. 2012). In order to continue to provide the majority of agricultural freight movement, even though GHG emissions from trucks are of concern.

Policies—both administrative and legislative— that support crop diversification as a public good may increase food system resilience. Farmers in the Upper Mississippi River Valley who integrate their production of commodity grain with more fruits and vegetables or perennial pastures for livestock may sell these crops to domestic rather than global markets. While such market shifts may enhance regional and environmental resilience, they could reduce the amount of grain available for international trade. Targeting public investment to meet changing transportation and infrastructure needs for regional food systems is needed. This will entail support for rural development to increase grain production, move grain via rail and barge, as well as rethinking truck transportation in urban and peri-urban areas. Another is to take advantage of weather predictions to reduce or avoid health risks in the food system. Supplying farmers with the right information at the right time can guide their sourcing. Several factors play into these decisions, and the type of analysis that reduces immediate risks to people and economics, while supporting long-term private sector adaptation, are key.

Federal farm policy reduces the risk of growing some crops. The 2014 Farm Bill re-linked conservation program participation to farm stability needs for erodible and lands, while reducing overall funding for conservation (Conservation Program). Conservation compliance is assessed based on USDA’s erodibility index. This index averages rainfall and other criteria over the past 30 years. Useful as it is, past weather data masks current trends toward more erratic and heavier rainfall events. The 2014 Farm Bill includes provisions supporting on-farm diversification, such as Whole Farm Revenue Insurance and planting flexibility up to 35 percent of base acres (NSAC 2014b). Supporting regional agricultural diversity both in the Midwest as well as Illinois state-level research, while driving diversified farming practices (Aguilar et al. 2015, Krupey et al. 2015, Zillman et al. 2015) and increasing vulnerability to risks associated with climate change and becomes forecast of financial speculation that work against diversification (Ikuan 2015). Global food system resilience is in how it will be able to recover from shocks and stresses. Extreme food system events due to climate change may result in a dramatic increase in soil erosion, especially from highly erodible land and fields without vegetation cover. In the Upper Mississippi River Valley, the sloping terrain of the four-state Driftless Region is vulnerable to soil erosion from extreme rainfall events (Fig. 3 above). Note that predicted warming in the region will alter precipitation patterns (Fig. 1A2) and further advance erosion in the region. For instance, if snow turns to rain in winter months, snow cover may melt leaving soil exposed, and the frozen ground will not be able to absorb rain, resulting in an erosion event. Perennial wetlands will likely increase in these conditions. Increased erosion reduces agricultural potential, negatively impacts river navigation, reduces water quality and contributes to the Dead Zone in the Gulf of Mexico. Crop diversification is proposed as a strategy to both adapt to a changing climate and mitigate GHG emissions (Agarwal et al. 2015, Blanc and Reilly 2015, Lowsawadon and Zook 2015, Lengnick et al. 2015, Zillman et al. 2015). Converting row crop acreage to perennial pasture for livestock provides soil function, water quality and biodiversity, with the potential to incorporate perennial crops into these systems can also prevent erosion.