Missouri Smart Agriculture: Exploring a Path for Agricultural Resiliency in Missouri

A Solutions from the Land Facilitated Dialogue

October 2018

Missouri Smart Agriculture Work Group

Solutions from the land

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**For the purpose of this report, the general terms "Agriculture" and "Agricultural" include production and raising of commodity crops, specialty crops, livestock, dairy, forests and forest products.*

October 2018

As the nation's - and Missouri's - agriculture and forestry sectors prepare to meet the food and fiber demands of a global population expected to approach or exceed 10 billion people in 2050, crop, livestock and forestry producers will face numerous challenges. These challenges will include, among others, global market structures, changing consumer preferences and regulatory uncertainty. Many of these challenges will be exacerbated by the impacts of shifting markets, extreme weather events and changing climatic conditions.

Earlier this year, a collaboration of producer-leaders from Missouri's agriculture and forestry sectors, along with business, academic, research and government partners, were invited to come together as the Missouri Smart Agriculture Work Group. The Work Group's mission was to assess the challenges that changing climatic conditions and extreme weather events will pose to agriculture and forestry production in the state, examine basic adaptation opportunities, and determine the need and proper pathway for constructing an adaptation strategy to ensure that Missouri farms, ranches and forests remain resilient, productive and financially sound.

Over the course of two in-person meetings, multiple phone conversations and numerous electronic mail exchanges, the Work Group's farmer, rancher and forester volunteer-leaders gave generously of their time. They provided valuable advice that helped chart a path for solutions that reduce and/or mitigate the impacts of not only changing climatic conditions but that of evolving market conditions driven by consumer expectations.

Solutions from the Land is pleased to present **Missouri Smart Agriculture: Exploring a Path for Agricultural Resiliency in Missouri,** and invites you to review the information contained herein as well as follow the links to the many resources that informed the Work Group's findings.

Please join us in sharing this case study with agriculture and forestry stakeholders.

Sincerely,

Ernie Shea

President
Solutions from the Land

SOLUTIONS FROM THE LAND—is a non-profit entity focused on land based solutions to global challenges. SfL identifies and facilitates the implementation of integrated policies, practices and projects at a landscape scale that will result in land being sustainably managed to produce food, feed, fiber and energy while enhancing biodiversity, protecting and improving critical environmental resources and delivering high value solutions to combat climate change.

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PHOTO: CHARLIE RAHM OF THE MISSOURI USDA NRCS OFFICE.

MISSOURI SMART AGRICULTURE: EXPLORING A PATH FOR AGRICULTURAL RESILIENCY IN MISSOURI

A Solutions from the Land Facilitated Dialogue

Missouri Agriculture and Climate Trends

Missouri has a great agricultural tradition. According to the latest National Agricultural Statistics Service, the Show Me State is home to 97,300 farms, covering 28,500,000 of the state's total 44,613,900 land acreage and supporting many of the state's top agricultural commodities, including soybeans, corn, cotton, cattle and calves, hay, hogs and turkeys. The total value of agricultural products sold is $9.16 billion.[1] The state of Missouri boasts more than 14 million acres of forest land. Of those 14 million acres, private landowners own 85 percent. Harvesting and processing trees into wood products gives thousands of people jobs and contributes about $3 billion each year to Missouri's economy.[2]

On average, Missouri farms are about 293 acres and nearly all are family owned and operated.

Missouri is the ideal state to explore the impact of climate change because the various combinations of climate, terrain and soil in Missouri have facilitated several major types of farming. In the prairies of northern and west-central Missouri, a combination of grain and livestock is most common. In the Ozarks, forest products are prevalent and farms are usually small and quite varied in the products they produce. In the southwestern region, there are numerous dairy, fruit and vegetable-producing areas. The rich deep soil, abundant rain and warm temperatures of the Bootheel section in southeastern Missouri have made possible a highly intensive kind of farming. The major crops in this region are cotton, corn and soybeans. The area also produces a large share of the cash value of all crops in Missouri each year.[3] Missouri's varied terrain also allows the state to produce many different and unexpected crops including pecans, apples and several unique grape varieties that are used to make flavorful Missouri wines.

Over the past several decades however, a noticeable shift in climatic conditions and trends has created new challenges for managing Missouri's working lands. Missouri's State Climatologist has documented the following:[4]

- Missouri's more recent warm annual temperature trend began in the mid-1980's and most notably, since 1999, where 15 out of the past 20 years have been above normal. Missouri winters and springs have experienced the greatest warming trend.
- Summer and autumn minimum (nighttime) temperature trends have been notably warmer over the past few decades.
- Over the past 20 years, the median last spring frost date is occurring about a week earlier and the median first autumn frost date is occurring about a week later, compared to long term data.
- Since the early 1980s, an unprecedented wet period has evolved in Missouri with 22 out of 37 years

experiencing above normal precipitation. All four seasons have demonstrated above normal precipitation. Missouri has witnessed an above normal trend in heavy (>1") and extreme (>3") daily rainfall events compared to the long-term average.

- Snowfall trends have been declining.
- Extended dry and wet patterns can change abruptly. Missouri has experienced these changes.

Pathways to Enhanced Resiliency

As the state's agriculture and forestry sectors prepare to meet the food and fiber demands of a global population expected to approach or exceed 10 billion people by 2050, Missouri producers will face challenges that include, among others, global competition, changing market structures and regulatory uncertainty. Many of these challenges will be exacerbated by the impacts of extreme weather and changing climatic conditions.

Overall, climate change could make it more difficult to grow crops, raise animals and produce trees in the same ways and places as they have been produced in the past. The impact of technology changes will further challenge Missouri producers as they attempt to adjust to the effects of a changing climate.

How prepared is Missouri's agricultural and forestry sectors to meet the changes and challenges that climate scientists are forecasting for the coming decades? What tools, practices, technologies or programs are needed that would help producers adapt, manage and respond to these risks and improve the resiliency of their operations?

These are questions that a group of Missouri agricultural and forestry leaders, along with their academic, business, conservation and government partners were asked to address as part of a facilitated dialogue that Solutions from the Land (SfL) is conducting on climate smart agriculture strategies and practices across the country. Through these dialogues, SfL has been inviting leading farmers, ranchers and foresters to come together to review the impacts that increasingly erratic weather and changing climatic conditions have had on their operations and assess the degree of readiness in their states to address the challenges these changing conditions will likely create.

Operating as a self-directed Missouri Smart Agriculture Work Group, representatives of Missouri's major crops, livestock and forestry production, as well as agricultural service sectors, were joined by numerous technical experts and natural resource professionals from academia, extension, federal agencies and the private sector. These stakeholders came together to learn and discuss the latest information on what science is saying about changing climatic conditions, its impact on agriculture and forestry in the state, and adaptation solutions and strategies that will help Missouri's farms, ranches and forests achieve a resilient, productive, and profitable future. The Missouri Smart Agriculture Work Group offered a facilitated forum for discussing and evaluating adaptation measures including conservation systems, risk management tools, infrastructure modifications and research priorities, among others. The individuals who comprised the Missouri Smart Agriculture Work Group are listed in Appendix I.

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Changing Conditions

The inaugural meeting of the Missouri Smart Agriculture Work Group was held March 6, 2018, in Columbia, Missouri. The impressive turnout of Work Group participants and interested individuals demonstrated a recognition of the challenges and vulnerabilities that changing conditions are creating and the importance of identifying strategies and solutions to improve resiliency.

A presentation by Ernie Shea provided an introduction to and background on Solutions from the Land, the project facilitator. Ernie noted that the farmer-led SfL is a not-for-profit entity dedicated to advancing land based solutions to global challenges and discussed ways the nation's agriculture and forestry sectors can be

valued and someday compensated for delivering the full range of products and services that a growing consumer base/society expect: safe, affordable and abundant food, feed and fiber; clean energy; along with ecosystem services such as water filtration, flood control, enhanced biodiversity and carbon sequestration services.

The Work Group took note that many factors drive how land managers make decisions: prices; costs; markets; technology; logistics; competition; and weather. While agriculture and forestry are global industries, producers generally sell into a local market. Beyond the typical barriers and issues impacting production and profitability, changing climatic conditions was introduced as a new threat to be considered. Solutions from the Land's goal is to assist ag and forestry leaders in examining the potential impacts based on what scientific data reveals; identify the tools that can help manage new risks; outline and advocate for measures that fill gaps in research, practices, policy, etc.; and extend the conversation around adaptation practices and other measures that mitigate impacts.

USDA CLIMATE HUBS:

Providing information and tools to decision makers to build resilience to climate variability.

Dr. Dennis Todey, Director of the Midwest Climate Hub, gave a presentation on Climate Changes Impacting Missouri Agriculture. Climate data is showing:

- Annual precipitation has been increasing in the 1895-2016 time period across much of the Midwest, including Missouri, with the number of extreme precipitation (greater than 2 inches) events increasing – especially in the spring and fall timeframes. These changes in precipitation impact soil erosion and nutrient loss potential and necessitate mitigation measures.
- While the average temperature in Missouri has only slightly increased over the same period, the observed average of overnight low temperature has increased dramatically. These warmer nights increase human / livestock stress and the need for additional cooling measures. Plant stress has also been observed. In addition, the "frost-free" season length has been growing, thus increasing the length of growing season. The reduction of very cold nights and change in frost-free season could increase pressures from pests, diseases and invasive species and create "false springs" where fruit crops are lost due to frost damage during premature blooming.
- Dew points have been increasing over time.
- Increases in greenhouse gases (namely CO_2) can reduce efficacy of pesticides.

Dr. Anthony Lupo, Professor of Atmospheric Science in the UM College of Agriculture, Food and Natural Resources, spoke next affirming that the information outlined in *Missouri Climate Trends* (compiled by the State Climatologist) is an accurate summary of temperature, precipitation and other data.

Work Group members were then invited to share what impacts, stresses and/or challenges they have observed on their farms, ranches or woodlands. Participants affirmed that stress was being observed in dairy production, forest systems and soil and water quality. As an example, White Oak is experiencing high mortality rates in certain areas of the state, while Black and Scarlet Oak is also in decline. Increasing nighttime low temps are impacting pollination. While interest in soil health initiatives is increasing across the state, the added level of management needed for these kinds of practices creates challenges for farmer adoption.

Work Group members were also asked to share examples of initiatives, research activities and practices that exemplify measures capable of increasing resiliency, improving sustainability and conserving natural resources. Work Group members provided examples of sustainability actions and solution pathways that they were taking, including:

- Corn-corn rotations using no-till with cover crops are reported to sequester carbon nearing two meters in soil depth.
- Cotton Incorporated's global cotton supply sustainability project identified areas to reduce water and energy inputs and found that the agricultural production of cotton is the least greenhouse gas intensive part of the supply chain, sequester carbon in the fiber and soil.
- Smithfield Foods is working with Roeslein Alternative Energy to cover approximately 90 hog manure lagoons to capture and upgrade methane for export to the higher value transportation market.
- Successional planning is important to maintaining good practices.

- Rotational grazing is an important and valued practice to improve soil health and forage quality. During subsequent discussions, the Work Group recognized that consumers are looking for leadership in the areas of sustainability, climate response and environmental stewardship. It was also noted that corporations are making sustainability and climate action commitments and many are looking to the producers of raw materials to adjust their production systems to meet a new and growing list of "private sector" standards.

The Work Group as a whole found value in bringing the ag, forestry and livestock sectors together to examine pathways and strategies for scaling up the delivery of multiple solutions from the land – food, feed, fiber, energy and ecosystems services. They expressed a desire to learn more about supply chain sustainability standards that are being established by food and beverage corporations (the buyers of agricultural products). They also recognized that this dialogue could grow into a forum for improving policy maker and general public understanding of and support for the benefits and economic contributions that agriculture provides to the state.

Soil Health – A Solution for Agriculture (and the Climate)

Project partner, Climate Central, was invited to participate in the dialogue to help document Missouri climate trends, including their impacts on the state's agriculture and silviculture industries, and identify potential opportunities for Missouri farmers, ranchers and forest land owners to take actions that improve resilience and/or incomes, while also reducing emission of greenhouse gases.

> Participants recognized that government mandates were not the only way to drive change and that the next generation of consumers could be even more demanding for information and changes in land management.

During the dialogue, Climate Central observed significant interest in solutions that improve soil health. Practices such as cover cropping, no-till farming, improved nutrient management, conservation rotations, and rotational grazing were identified as not only measures that reduce emissions, but also contribute to and support farmers' productivity and profitability goals. A key point affirmed by the Work Group was that farmers are more likely to talk about these practices with a focus on increasing organic matter, water holding capacity and yields; and not in the context of climate change.

Armed with a new appreciation of the challenges of talking about climate change in Missouri, Climate Central committed to develop a report focused on soil heath solutions and share their report findings at the next meeting of the Missouri Smart Agriculture Work Group.

Additional Insights

Work Group members reconvened on June 28 in Columbia, Missouri, to: review the findings and observations from the March 6 meeting; examine agribusiness commitments to implement significant sustainability measures throughout their entire supply chain; discuss Climate Central's draft report on Soil Health Solutions; and explore future opportunities for the Work Group going forward.

As identified in early discussions, Work Group members expressed interest in adaptation solutions through improvements in soil health across the state. Benefits of improving soil health include low-carbon products, more resilient operations, and carbon sequestration services that could be valued throughout the supply chain.

Solutions from the Land shared information on the three pillars of climate smart agriculture [1) sustainably increasing agricultural productivity and livelihoods; 2) enhancing adaptive capacity and improving resilience; and 3) delivering ecosystem services, sequestering carbon, and reducing and/or avoiding greenhouse gas emissions] and the various solution pathways that address the three pillars while also satisfying the soil health focus favored by the Work Group.

The three pillars of climate smart agriculture are illustrated on the next page:

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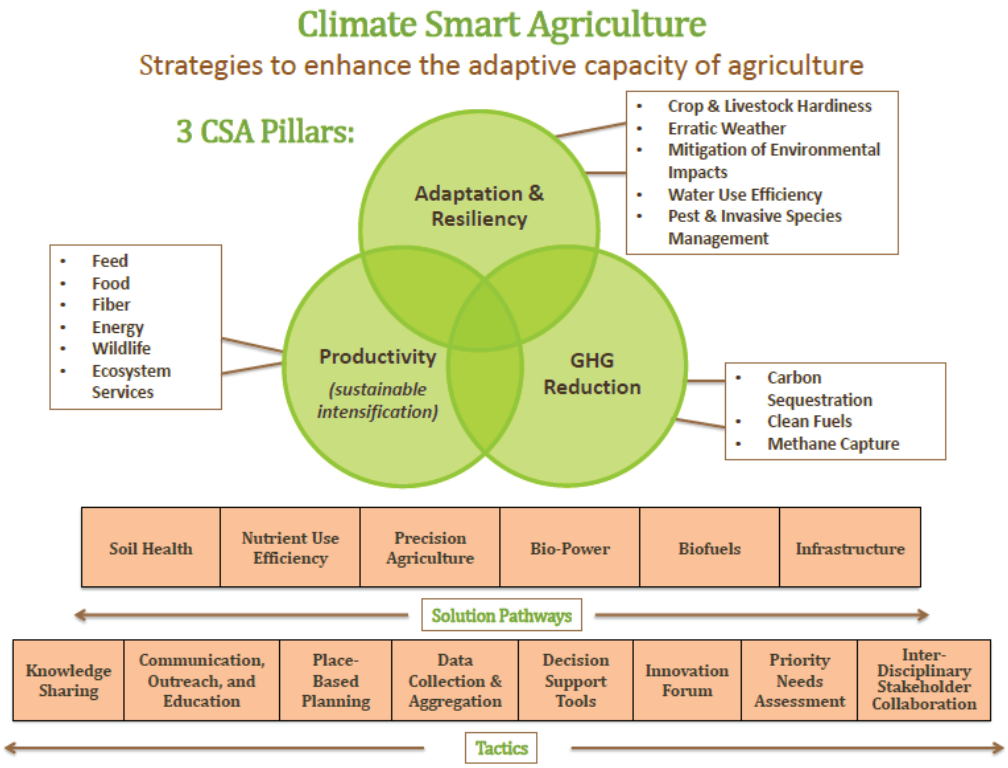

Consumer Expectations

The Work Group discussion then shifted to the increasing consumer and retailer demand for sustainability outcomes. While corporations are making sustainability commitments such as reducing their carbon footprints, those from which the corporations' products are sourced — such as the farmers who produce commodity crops — will be expected to participate in delivering sustainability solutions. Representatives of the corporate sector were invited to share their reasons for developing and implementing corporate sustainability standards.

Brent Boydston, with Monsanto (now Bayer), shared how his company is working to address nine of the seventeen UN Sustainable Development Goals and has set a goal to be carbon neutral by 2021. To get there, operational changes will be implemented internally and through the supply chain including recycling of packaging, efficiency measures and powering operations with renewable forms of energy. Bayer will also work with farmers to implement practices that sequester carbon in the soil, plant cover crops and better manage nutrients. Bayer plans to monitor these voluntary practices and verify the carbon reductions.[5] Production practice mandates will be avoided, but they could become an option if societal goals are not being achieved.

Eric Olson, with Businesses for Social Responsibility, highlighted and discussed the sustainability goals of several companies, and discussed how global and national businesses are mobilizing to achieve desired outcomes, citing the transition to low-carbon products as an example. These companies are driven by economic concerns and target different natural resource areas while engaging stakeholders at various levels of the supply chain.

It was noted that seven of the world's top ten food companies have established science-based greenhouse gas emission reduction targets. Other commitments include investing in renewable energy, reducing waste, conserving water, halting deforestation and other measures that fit within the solution sets supported by climate smart agriculture.

Global companies known to Missouri famers that have established bold sustainability goals include:

- Anheuser-Busch (ABInBev): In April 2018, Anheuser-Busch launched its U.S. 2025 Sustainability Goals. These include the goal that 100 percent of purchased electricity will come from renewable sources, and CO_2 emissions across the value chain will be reduced by 25 percent. 100 percent of facilities will be engaged in water efficiency efforts. As 98 percent of ingredients

are U.S. grown, Anheuser-Busch intends to engage all of its direct farmers to ensure that these producers are highly skilled, connected and financially empowered.[6]

- Smithfield Foods: Smithfield is working to reduce greenhouse gas emissions 25 percent by 2025 throughout its entire supply chain. By 2020, Smithfield is working to reduce energy use by 5 percent, water use by 10 percent and solid waste by 10 percent. By the end of 2018, Smithfield will work with producers to document that 75 percent of purchased grain is grown with efficient fertilizer management and soil health practices.[7]
- Kellogg's: Kellogg's has pledged to support 500,000 farmers focusing on climate-smart agriculture principles to improve production and livelihoods. By 2050, Kellogg's will reduce greenhouse gas emissions across its operations by 65 percent and help direct suppliers of ingredients reduce greenhouse gases by 50 percent. Furthermore, responsible sourcing of 10 priority ingredients will be monitored through supplier and farm-level audits.[8]

Based on the interest expressed in the March 6 meeting on the role of soil health as an adaptive management strategy, Climate Central reported on their progress in producing a report on soil-based solutions that can improve resiliency of operations, reduce erosion and sequester carbon in the soil. The authors expressed hope that their report will also help readers develop a deeper understanding of local climate trends data and the impacts that extreme weather and shifting climate conditions may have on agriculture and livestock production in the state. Climate Central provided an overview of their preliminary draft report and invited feedback from the Work Group members. Constructive comments and suggestions were offered by members of the Work Group and were appreciated by the authors.

Will agriculture drive the discussion on sustainability, soil health and adaptation, or will agriculture be shaped by others' agendas?

Near the end of the meeting, two questions were put before the Work Group: Will agriculture drive the discussion on sustainability, soil health and adaptation, or will agriculture be shaped by others' agendas? If agriculture is going to be in the driver's seat, is the Missouri Smart Ag Work Group a platform for ongoing discussion and leadership on these issues?

Work Group members pointed out that economics and financial opportunities would be the primary drivers of changes in the way land is managed. Participants acknowledged the value of getting agriculture and consumers together to analyze the concerns and expectations of consumers and share the innovation and technology underpinnings of agriculture and food production today. Consensus was reached that additional dialogue built on what had transpired over the course of the first two meetings of the Work Group would be helpful.

Work Group participants were invited to contribute via survey, to determine the future role and next steps for the Work Group. Several options were presented: 1) The Work Group could serve as a platform for an organized multi-stakeholder dialogue involving responsible agriculture, environmental and business leaders; 2) The Work Group could guide the development of an adaptive management strategy and action plan for Missouri agriculture; or 3) The Work Group could more narrowly focus on soil health as a pathway for enhancing agricultural sustainability, improving resilience, delivering ecosystem services, sequestering carbon, and reducing and/or avoiding greenhouse gas emissions in Missouri. A plurality of respondents to the survey expressed interest in a multi-stakeholder dialogue platform, although all three options received a favorable response. Ultimately, it will be up to the Work Group members to find consensus on a path forward.

Throughout the two Work Group meetings, the political influences and questions surrounding climate change were never far away. However, it was made clear throughout the discussions that decisions and actions would be based on scientific data and local observations. The Work Group managed to avoid any protracted debate on the scientific evidence of climate change; consensus was reached that whatever the cause, changing climatic conditions were being observed and felt in Missouri and that ongoing efforts to adapt and improve resiliency would be a wise strategy to pursue.

Soil Solutions

In July, Climate Central released their report, *SOIL SOLUTIONS: Climate-Smart Farming in the Show Me State.*

The report examines trends in Missouri temperature and precipitation data and estimates how much carbon could be stored in Missouri soil each year through the use of different conservation farming practices. The Work Group provided input that helped shape the understanding of the utilization of conservation practices and of the soil heath solution pathway and how soil health can provide benefits for farmers and the environment.

The report found that "conservation farming practices help build healthy, resilient soil, and give farmers a tool to help manage the more-intense weather extremes that occur more frequently with our changing climate. These climate-smart farming methods also aid in carbon sequestration, removing some of the excess carbon dioxide from the atmosphere and trapping the soil-enriching carbon in the ground."[9]

The report also found that "the potential to save carbon by applying individual conservation practices in Missouri is significant."

- For ranchers, the greatest carbon sequestration potential comes from modified grazing practices, like rotational grazing.
- For farmers, the use of cover crops demonstrates the greatest potential savings.
- The estimated total annual carbon storage potential for the state as a whole, with aggressive adoption of conservation practices, is equivalent to more than twice the annual total greenhouse gas emissions of Columbia, home to the state's flagship land-grant university.
- At the county level, New Madrid shows the highest potential for carbon savings. The county is in the southeast "Bootheel" region. Five counties with the highest-potential carbon savings are in or adjacent to the Bootheel.

Highest Carbon Storage Potentials by County in Missouri

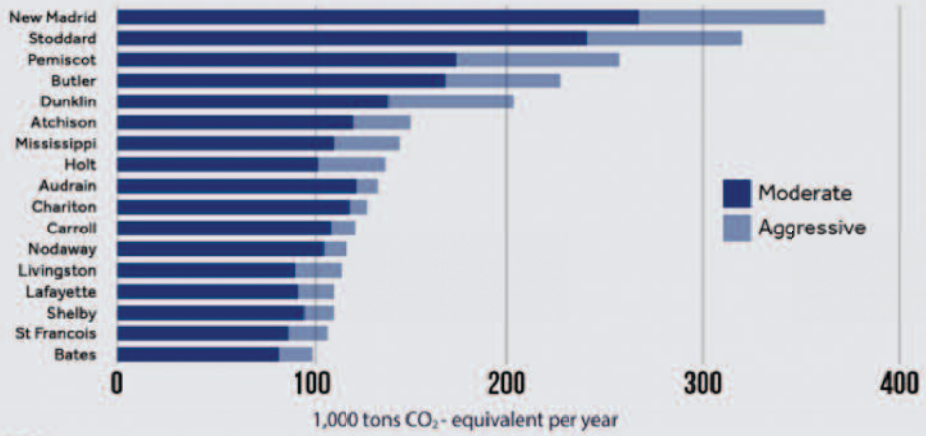

Fig 7
Source: Paustian, et al (2017)[23]

Theoretical technical potentials for carbon storage in Missouri

NRCS Conservation Practice Standard (CPS)	Soil carbon storage per acre[1,1] (lbs CO2e/acre/yr)	Maximum acres potentially available for a conservation practice[1,b] (Millions of acres)	Theoretical technical potential for carbon storage or removal from atmosphere[1,c] (Million short tons CO2e/yr)
Rangeland planting	1,100	8.08	3.89
Cover crops	815	8.864	3.28
Prescribed grazing	570	8.08	2.02
Stripcropping	530	5.109	1.35
Conventional till to no till	680	3.14	1.07
Conventional till to reduced till	440	3.14	0.69
Modified rate, timing of N application	240	3.691	0.45
Reduced till to no till	240	2.707	0.33
Conservation crop rotation	485	1.184	0.29

[1] Estimated technical potential
[b] Estimates are for CO2 equivalents (CO2e), which accounts for the global warming impacts of changes in emissions of not only CO2, but also methane and nitrous oxide emissions.
[c] See appendix for assumptions and data sources used to estimate this maximum area amenable to each practice. For these calculations, 100 percent adoption is assumed across the estimated maximum areas.

Table 2 Maximum potential carbon storage for individual conservation practices

PHOTO COURTESY OF NC STATE UNIVERSITY.

Some farmers and ranchers in Missouri are already putting conservation measures into practice and offsetting or sequestering emissions. Solutions from the Land issued a statement recognizing the contributions of the Climate Central report towards expanding the discussion around soil heath and operational resiliency.[10]

Missouri farmers and ranchers are demonstrating that conservation practices are providing a win-win-win outcome — improving soil health, financial health, and the overall health of the environment.

Conclusion

Many agronomists say that global population growth and food production methods have stressed and degraded our soil. Farmers and ranchers have responded by changing the way they farm, adding cover crops, changing up crop rotations and better managing nutrients and pasturelands. But will this be enough?

One Work Group producer-leader recommended that agriculture become even more customer-focused. He highlighted the need to pay attention to how food, feed and fiber are produced and said that it would be foolish to ignore what customers are seeking. The Work Group collectively recognized that consumers are generally supportive of the transition to a low-carbon economy. But will this be enough either?

Agriculture is recognized as a contributor to greenhouse gas emissions that many scientists say contribute to climate change.[11] However, agriculture offers nearly half the solution opportunity for global climate goals.[12] This is the untold story of climate smart agriculture, and the Missouri Smart Agriculture Work Group can be a platform for ongoing dialogue and leadership on the food, feed, fiber, energy and ecosystems services and solutions that can be delivered from the land.

Solutions from the Land thanks the members of the Missouri Smart Agriculture Work Group for their insight and leadership in engaging their peers in conversations about ways to sustainably intensify production, improve resiliency and deliver ecosystem services, by sequestering carbon and reducing and/or avoiding greenhouse gas emissions.

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PHOTO: CHARLIE RAHM OF THE MISSOURI USDA NRCS OFFICE.

Appendix I

MISSOURI SMART AGRICULTURE WORKING GROUP

PRODUCER/VALUE CHAIN PARTNER-LEADERS

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Appendix II

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Missouri Climate Trends

- Missouri's most recent warm annual temperature trend began in the mid 1980's and most notably, since 1998, where 15 out of the past 20 years (75%) have been above normal; 2012 was the warmest year on record.
- Seasonally, Missouri winters and springs have experienced the greatest warming trend; 19 out of the past 28 winters (68%) and 16 out of the past 20 springs (80%) have been above normal.
- The median last spring frost date in Missouri is occurring about a week earlier over the past 20 years compared to the long-term average.
- Summer and autumn minimum temperature trends have been notably warmer over the past few decades whereas maximum temperature trends have been cooling.
- The median first fall frost date in Missouri is occurring about a week later over the past 20 years compared to the long-term average.
- Dew point temperatures have trended above normal over the past few decades. Since 1981, 68% of the years have had above normal dew points for the Jun-Aug period.
- Beginning in the early 1980's, and since 1985, an unprecedented wet period has evolved in Missouri. Since 1981, 22 out of 37 years (60%) have had above normal precipitation.
- Over the past few decades, all 4 seasons have witnessed more above normal precipitation years in Missouri; most notably in winter where 21 out of the past 36 winters (58%) recorded above normal precipitation. Snowfall trends have been declining.
- Over the past few decades, Missouri has witnessed an above normal trend in heavy (>1") and extreme (>3") daily precipitation events compared to the long-term average.
- Recent historical trends for Missouri indicated an unprecedented multi-decadal wet period beginning in the early 1980's. Conversely, there have been multi-decadal dry periods, i.e. 1950's and 1960's.
- Extended dry and wet patterns can change abruptly and there are numerous occasions, where Missouri transitioned from one extreme to another in a short period of time.
- The 2012 drought resulted in numerous impacts, affecting many sectors in Missouri. However, it was a short-lived drought when compared to other historic droughts, i.e. 1952-56. An important question we all need to consider is how prepared are we when the next 1950's drought affects the Show Me State.

For more information on these findings, please contact:

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