Michigan Agriculture Climate Readiness Assessment

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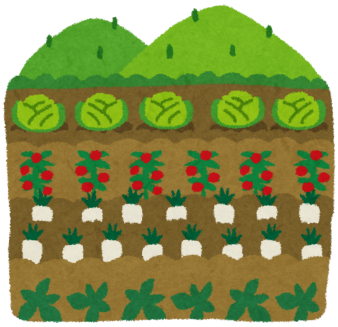
Executive Summary: The state of Michigan is making its first steps in trying to address climate change in agriculture but lacks key policy to change current farmer's practices. Current policy in Michigan strongly supports research funding for various agriculture issues in relation to climate change. Diversification of crops, creation of irrigation systems, pollinator protection and extreme weather protection is absent in policy. It is recommended that a commodity committee in MDARD works to solve the unique issues of individual crops in their relation to climate change and compile all future and past research. To inform future policy makers on intricacies and the current situation of agriculture policy in Michigan. Policies that are Michigan's blind spots are addressed with future policies to shore up weaknesses in the agriculture industry.

Around the globe nations work to build resilient food systems especially in the wake of the global covid-19 pandemics. Food systems were strained in their distribution and production. In addition, the rise of inflation made food less affordable for families across the globe. The European Commission in 2020 released the Farm to Fork strategy to create a sustainable food system in the European Union with a focus on a wide range of issues hampering the agriculture industry. If Michigan and the broader United States want to create a more resilient food system agriculture needs support in its fight against climate change. The U.S. Global Change Research Program held that "No strategies currently are available for maintaining historical trends in commodity agriculture production to cope with increases in spring rainfall and summer heat waves projected for mid-century."[5] The current federal 2017 farm bill does little to address the concerns of climate change in the United States with current production practices. State governments have taken the responsibility left by the federal government for major developments in climate resiliency policy.

Michigan currently has an above average increase in annual temperatures of three degrees Fahrenheit since the beginning of the 20th century.[4] Furthermore, from 1951, 2050, and 2100 there will be an increase of 2.3, 3 to 6 and 6 to 11 degrees Fahrenheit increase of temperatures in the Great Lakes Region.[2] The increase of annual temperatures can reduce crop yields throughout the growing season. Photosynthetic

enzymes are less effective in higher temperatures. This has a profound effect on Michigan's C3 crops soybeans and wheat, since their growth through carbon assimilation can be adversely affected. Crops have an optimum temperature for growth and if the temperature is exceeded then growth and seed rates can decline. Changes in temperature from climate change cause warmer and drier conditions requiring changes in timing for crop operations. Lastly plants require more water to grow in high temperatures, increasing water use in Michigan.

The amount of precipitation in the U.S Great Lakes Region has increased by 13.6% since 1951.[2] Although there is an increase in precipitation, rising temperatures will reduce soil moisture and increase evaporation making draughts in Michigan more common. "Thus, summer droughts, a natural part of Michigan's climate, are likely to be more intense in the future."[3] While winter and spring will have more precipitation increasing the risk of flooding during the spring for farmers delaying planting for some crops. [2]In the winter reduced lake cover will rise temperatures increasing precipitation and evaporation to create rain rather than snow. Lake water levels are mostly driven by precipitation, evaporation, and runoff. [2]The lakes have risen since 2014 and have contributed to major flooding, especially Lake Ontario. An increase in extreme precipitation can lead to more floods is projected. "The frequency of extreme precipitation events has increased. Multiyear averages for 2-inch extreme precipitation events for the 2010–2014 and 2015–2020 periods are the highest on record."[3] Lastly an increase in storms creates a higher likelihood for runoffs from farms fertilizers and sewage overflow causing nutrient overloads in waterways.[2]



Research was found through MDARD documents and their website for information on the various laws and grants used in Michigan in relation to climate change. In addition to some federal research with United States Agriculture Department in which many agriculture grants and policy are tied between the state and federal government.

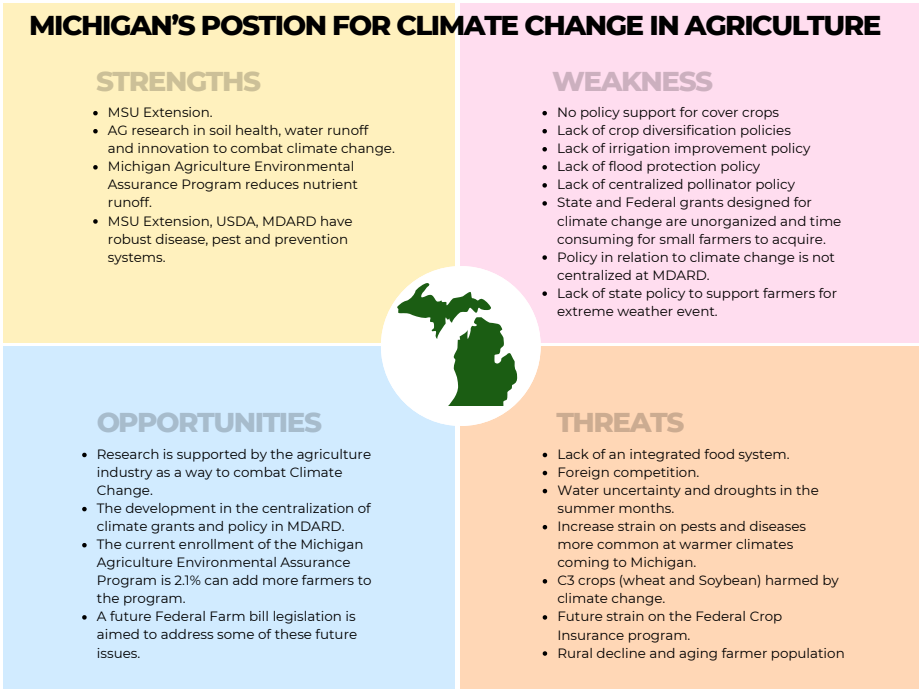
Starting off with strengths MSU Extension provides trusted information and specialized client services for their crops. Furthermore, services include agricultural research, and extension agents are prominent policy advisors on various commissions and committees in MDARD. MSU Extension is a great resource for education and research into climate change in the state of Michigan. If a new policy is being created to combat climate change, MSU extension will be part of any new policy. Michigan policy has strong research funding towards climate change. MSU Extension is a frontrunner in plant disease research in the nation. Strong research institutions and education will be paramount in creating a climate strategy.

The weaknesses for Michigan agriculture include no policy to support cover crops which can be used to help regenerate fields or restore nutrients to farm fields after major flooding. There is no policy incentive for the diversification of crops on farms to create industry wide resiliency. Furthermore, supporting diverse crops as a resilience tactic against climate change has yet to be implemented. There is

also no disaster relief that could include cover crops to prevent soil degradation after major climate events. Flood protection for farmers is nonexistent with no strives being made in prevention or research to assuage farmers concerns.

Opportunities in Michigan are new research on climate change resilient crops and soils. Farmers are willing to improve and protect their farms against these new threats and a policy allowing farmers to take less risk in their field will be supported. Michigan Agriculture Assurance Program, even though it has low enrollment reduces fertilizer use and pollutants in Michigan waterways. Further implementation and enrollment in the program can support more climate resilient soils. Future federal farms bills are likely to look at current problems in agriculture and invest more on climate resilience. Allowing for compounding impact with state funding.

Ending with threats one is the heavily diverse nature of farming in Michigan. The issues of one farm may greatly differ from another so coordinating these entities is going to be a challenge. The food system has been strained as in the recent Covid-19 global pandemic local farmers and distribution systems are not meant for local farms to go straight to local neighborhoods and supermarkets. Foreign competition reduces Michigan farmers ability to sell at higher prices. Farmers need to make a livable profit to continue the work they do. Black swan events can harm the agricultural industry. Future summer months are more likely to be hit by droughts in Michigan and increase in temperatures can lead to more pests and crop harming diseases. Monoculture farms can be damaged when a specific pest or disease targets them, destroying the farm. C3 crops are going to be harmed by climate change as an increase in temperatures will negatively affect crop yields. Economic Research Service analysis on the Federal Crop Insurance program stated "climate change could lower domestic production of major commodities, leading to higher prices, higher premiums and, consequently, higher FCIP subsidies. Without adaptation actions on the part of farmers, these potential cost increases are likely to be even greater."[1] Problems with rural decline and the farming population aging is a concern for the ongoing enterprise of agriculture in the state of Michigan. Climate change will likely exacerbate rural decline if policy is not put in place to prevent this.



The following sections will go over policy recommendations addressing Michigan's climate weaknesses. The creation of a new department or commission with a team of advisors of a respective

commodity with the sole purpose of reporting the woes of climate change on their farms. Every commodity requires different support in relation to climate change and industry conditions. An example would be cherry trees affected by the increase in temperature of the Great Lakes' buds begin to bloom earlier in the spring. Cherry trees become vulnerable to late frosts. In 2012, a major frost decimated much of the cherry production in Michigan. Cherry farmers with lessons learned from 2012, diversified more of their crops and some changed to business models with You Pick and agricultural tourism, implemented tarps, and wind turbines to protect against early frosts. The advisors of the cherry industry can create a list of high priority needs in relation to climate change. Cherry farmers for example can ask for research developing the technology for turbines or tarps to better protect against frosts. The high priority goal can help set policy funding, and this information can be valuable for policymakers, MDARD, and fellow cherry farmers to rally around solutions for their respective industry. In addition, to general state funding to implement these innovations to create resilience on commodity farms. Federal and state funding from farm bills can be divided up among commodities in Michigan and given out based on commodity needs rather than nonindustrial specific blanket polices. Currently the Agricultural Commodities Marketing Act holds a 5-to-13-person committee dedicated to the marketing of a commodity. Expanding the committee to include climate change advisory members may be more seamless to implement than a whole new committee and could benefit from each other's proximity. Marketing can work with climate advisors to market commodities and their plans to create more resilient farms could be a good marketing strategy.

An issue of MDARD's current grant system is without the help of state and local officials' small farmers may struggle with finding grant opportunities that apply to them. The likely addition of new climate grants in the future makes this concerning. A solution could be the new commodity committee's climate change branch create a website that lists all the steps and available grant funding for their commodities farmers. The site could act as a one stop shop for commodity news and grant funding. The collective of all climate change committees may also want to put together a site for general information on the impacts of recent legislation and climate trends that would affect farmers.

Pollinator policy is decentralized in Michigan with various education, conservation and policy making it is difficult to equate the success of one policy over another. Future policies targeting an increase in pollinator colonies will need further coordination with existing polices and evaluation techniques to ensure the policy is implemented as intended. The Michigan Pollinator Initiative develops research, education, and policy in protection of pollinators in the state and would be a strong partner with MSU Extension in any new developments. Cherries, blueberries. apples and cucumbers in the state of Michigan need pollinators to grow. The Managed Pollinator Protection Plan in Michigan works to build communication between beekeepers and farmers to prevent harmful pesticides on pollinators. A policy outlined by the EPA alongside prevention of winter deaths in bee colonies to support stronger colonies. Michigan has a good foundation to build upon its work and partnerships in the Michigan Pollinator Initiative and the Managed Pollinator Protection Program to create policy. Michigan beekeepers are mostly reliant on federal farm bill and USDA programs for funding, neither of which have targets to

increase or stabilize pollinators in Michigan. Climate change for pollinators can affect their ability to obtain food, mate, emergence time, find proper habitats, and are adversely affected by extreme weather events can put major strains on pollinator populations. The state of Michigan can create new incentives to further conservation and program outreach for the protection of native pollinating plants.

Farmers who seek to diversify crops on their farms have a high learning curve to embrace new crops. The need for new equipment, seeds, time, and education to embrace the benefits of diversification is a spot the State of Michigan can support. Financial support for new equipment, seeds, and educational courses through MSU Extension could be made to support farmers to pursue diversification. Most of the farms in Michigan are monoculture based as they are profit maximizing. The State of Michigan being able to show the benefits or close the gap from monoculture farms profit would improve resilience in the farm sector. Creation of a diversification crop policy can reduce climate change risks for farmers through a arrange of crops, spreading out the risks of pests, disease, wildlife, extreme weather. Cover crops can be used to help build up the nutrients of farm fields and diversify fields. Initiatives aimed more to improve soil health and structure than financial gains are an option through federal and state conservation plans. The farmer and their family may have different plans for farming after the term of conservation is over or have found new economic opportunities. Cover crops are beneficial after extreme weather events as some cover crops can help fill in fields after major damage and prevent further damages. The state of Michigan can provide or help pay for seeds of cover crops to help farmers implement them.

The state of Michigan has no support for the creation of irrigation systems or water storage for water stressed seasons in Michigan especially in the drier summer months. Crops without water suffer much in their yield rates and too little water can lead to crop loss. Michigan is a water rich state, but further concerns of water conservation and usage rates might need to be addressed at current values in the future. Climate Change will increase droughts in Michigan starving the water resources of farms. The state could move in with policies to fill in the gap and help fund projects to retain and store water.

Michigan should protect its second largest industry the food and agriculture industry which contributes $104.7 billion annually to the state's economy and is one of the largest employers. Total employment from agriculture is approximately 805,000, which accounts for about 17 percent of the state's employment.[6] The state needs resiliency policy in agriculture and work with farmers to help maintain their livelihoods against the growing threat of climate change.

Note

1. “ACTION PLAN FOR CLIMATE ADAPTATION AND RESILIENCE.” United States Agriculture Department, Aug. 2021.

2. Climate Change in Great Lakes Region References.” *GLISA*, NOAA Cap/RISA Team, glisa.umich.edu/climate-change-in-the-great-lakes-region-references/. Accessed 14 Feb. 2024.

3. Frankson, R., K.E. Kunkel, S.M. Champion, and J. Runkle, 2022: Michigan State Climate Summary 2022. NOAA Technical Report NESDIS 150-MI. NOAA/NESDIS, Silver Spring, MD, 4 pp.

4. Gerig, Martha. “NOAA Releases Updated Climate Summaries for All U.S. States. What Will Happen in Michigan?” *Michigan Sea Grant*, Michigan State University, 22 Aug. 2023, www.canr.msu.edu/news/noaa-releases-updated-climate-summaries-for-all-u-s-states-what-will-happen-in-michigan.

5. Lewis, K.L.M., D.R. Reidmiller, and C.W. Avery, 2018: Information in the Fourth National Climate Assessment. In Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 1410–1412. doi: 10.7930/NCA4.2018.AP2

6. “Michigan Agriculture Resources.” *Facts about Michigan Agriculture*, MDARD,www.michigan.gov/mdard/about/mi-agriculture/michigan-agriculture-resources#:~:text=Facts%20about%20Michigan%20Agriculture%201%20Agricultural%20Diversity%20Michigan,4%20Exports%20...%205%20Farms%20%26%20Farmland%20. Accessed 9 Dec. 2023.