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Agriculture Adapting to Climate Change

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Introduction

Adaptation refers to efforts to reduce the risks of climate variability and change and make a system more resilient. Adapting agriculture to climate change can better prepare farmers and producers for future conditions. One of the most critical parts of climate adaptation is having active conversations about this topic and incorporating it into decision-making. Acknowledging the importance of the situation is the first step to taking action.

Adaptation Strategies

According to the United States Department of Agriculture's report, *Adaptation Resources for Agriculture: Responding to Climate Variability and Change in the Midwest and Northeast,* there are eight main strategies found to be beneficial in combating the effects of climate change in agriculture. These strategies are not guidelines or recommendations, but express preferences and ideas. Each strategy has sub-strategies to further educate and expand upon ideas, and offer examples on how farmers can combat these issues. The following are possible adaptation resources and responses to help respond to climate change.

1. Sustain Functions of Soil and Water

Maintaining and improving soil health can ensure the agricultural system's productivity. This will provide sustained biological activity and regulate water.

- Avoid or reduce tillage to minimize soil disturbance
- Provide year-round ground cover to reduce soil exposure
- Increase soil organic matter
- Diversify crop rotations

Anticipating changes in the water cycle due to climate change is a great way to **protect water quality**. Climate change will increase the quantity of precipitation during storms and fertilizer runoff. As a result, one should anticipate more issues like excess nitrogen and other nutrients in bodies of water.

- Reassess nutrient applications to ensure nutrients used are most appropriate for climate conditions.
- Manage water to prevent ponding, running, and erosion using diversions, terraces, and waterways.

2. Reduce Existing Stressors of Crops and Livestock

Reducing competition between weeds and invasive species is a great way to minimize stressors. It decreases the fight for light, water, and nutrients and enhances a crop's ability to cope with the effects of climate change.

- Increase scouting for weedy species
- Eradicate noxious weeds
- Control or eradicate invasive species impacting plant community

Additionally, maintaining the health and performance of livestock is a great way to reduce stressors. Climate change brings higher temperatures, changes in forage, and an increase in pests and pathogens. Keeping livestock healthy will reduce the animals' vulnerability during the changing climate.

- Maintain adequate nutrition
- Maintain adequate exercise
- Prevent infectious diseases and control parasites by preventing contact with wildlife.

3. Reduce Risks from Warmer and Drier Conditions for Crops and Livestock

Managing crops to cope with warmer and drier conditions is essential, considering the extreme weather events and longer growing seasons that are to occur. These extended growing seasons will bring warmer daytime and nighttime temperatures.

- Select heat-resistant or drought-resistant varieties of crops
- Adjust the timing of planting
- Increase soil cover

Additionally, learning how to **manage livestock to cope with warmer and drier conditions** will improve their ability to adjust to the changing climate. Livestock respond to changes in climate by altering their core body temperature and behavior, which can increase stress and disrupt growth.

- Provide partial to total shelter to reduce heat stress
- Alter grazing management practices
- Make additional fresh, clean water available
- Monitor animal temperatures

4. Reduce the risk and long-term impacts of extreme weather.

Reducing the severity of flood damage and water-saturated soils is a great way to address the impacts of increasingly extreme weather due to climate change. Heavier precipitation due to extreme weather will create more flooding or standing water in low-lying and susceptible areas. Extended periods of excess water can damage crops. Wet soils can affect animal agriculture activities like grazing and exercise.

- Shift production zones away from flood-prone areas
- Shift to more flood-tolerant varieties of crops
- Use new field drainage practices

5. Manage Farm and Fields

Promoting biological diversity across a landscape can help reduce the susceptibility of the landscape's individual components to climate change. This can also assist in combating stressors and adjusting environmental conditions according to the changing climate. Natural ecosystems can increase environmental services, including water quality, wildlife abundance, and carbon sequestration.

- Increase managed habitats across a range of landscapes
- Protect at-risk species and habitats
- Create habitats for pollinators and other beneficial organisms

Enhancing landscape connectivity is important to protecting agriculture. Many species are not expected to be able to migrate at a sufficient rate to keep up with the changing climate. Increasing landscape connectivity can help species migrate more efficiently by allowing for easier movement, reducing lags in migration, and enhancing the flow of genetic materials.

- Use landscape-scale planning and partnerships to reduce fragmentation and enhance connectivity.
- Maintain and create a naturalized habitat corridor.s

6. Alter Management to Accommodate Expected Future Conditions

Diversifying crops or livestock species can reduce climate change impacts and lower economic risks. In addition to diversifying crops, **switching to commodities better suited for future conditions** can positively impact agriculture in the long term. Switching to a different variety of plants, livestock, or systems may be necessary to achieve a viable farm with incoming climate conditions.

- Use new species that match a changing climate.
- Shift to more water-efficient crops or cropping systems.
- Switch to alternative livestock.

Other diversification approaches include, but are not limited to:

- Add additional farming activities to diversify farm products.
- Diversify animal products or ages.

7. Alter Agricultural Systems to New Climate Conditions

Realigning severely altered systems toward future conditions can allow producers to "rest" their management and select new commodities or production systems. Their new systems are expected to better match current or anticipated conditions.

- Convert affected areas to plant or animal commodities that are expected to be suitable for future conditions.
- Shift agricultural production spatially, matching commodities to areas with more favorable or consistent conditions.

Assessing the suitability of land for agricultural production and altering land use may be advantageous. Some lands may become unsuitable for agriculture, particularly in hotter or drier areas.

- Shift agricultural production, matching commodities to areas with better climate conditions or water availability.
- Add lands to agricultural production, recognizing the potential negative impacts on natural ecosystems or environmental benefits.
- Remove lands from agricultural production and consider the appropriateness of using that area for conservation or other resilience goals.

8. Alter Infrastructure to Match New and Expected Conditions

Expanding or improving water systems to match water demand and supply is one way to improve upon climate-affected infrastructure. Increased temperatures with variable precipitation can result in moisture stress and droughts. Since cost is correlated to these practices, efforts to increase the capacity or efficiency of these water systems are beneficial for less water-intensive commodities.

- Construct ponds, dig wells, or collect rainwater.
- Expand water storage, irrigation, and drainage using deeper wells or farm ponds.
- Installation of enhanced drainage systems.

Developing structures that reduce animal heat stress is another positive way to adjust infrastructure to a changing climate. Some structure examples include:

- Build new barns with adequate cooling capacity for future heat loads
- Improve climate control in facilities using fans, misters, and soakers
- Enhance energy efficiency in facilities using light-emitting diode (LED) lights and other features to reduce additional heat sources.

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