Southeast Climate Hub

U.S. DEPARTMENT OF AGRICULTURE

Adaptation Resources for Agriculture

A Case Study: J Alvin Lee Farm, LLC, Lee County, AR

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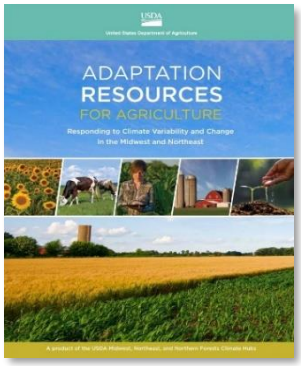

The USDA Climate Hubs and USDA NRCS jointly developed the Adaptation Resources for Agriculture Workbook to support producers, service providers, and educators managing climate change. The workbook helps producers consider both short-term adaptive management actions (<5 yrs) and long-range strategic plans (5 to 20 yrs, subject to farm type). This workbook promotes adaptation through multiple resources, including a "menu" of adaptation strategies/approaches and example tactics for cropping and forages, confined livestock, grazing, orchards, and small fruit and vegetable production systems. Recent efforts by the USDA Climate Hub NRCS Liaisons focused on increasing the number of examples and documenting them as Case Studies. These Case Studies demonstrate producers using the **5-step process** in the workbook to document their management choices to reduce climate change impacts on their operations.

J Alvin Lee Farm and the Delta Region of Arkansas

The five-step adaptation workbook process was tested for an agricultural setting using a portion of a row crop farm in the Delta Region (Lee and St. Francis Counties) of east-central Arkansas. The Delta Region makes up most of the Mississippi Alluvial Plain Section of the Coastal Plain Province, along the lower Mississippi River south of the Ohio River confluence. The landforms in the area are level or depressional to very gently undulating alluvial plains, backswamps, oxbows, natural levees, and terraces. The J Alvin Lee Farm, LLC (Lee Farm) is in the Arkansas Delta Region where most of the row crop farms are concentrated in the state. The farm has been in operation since 2008 and is 100% row crop production, including: corn, milo (grain sorghum), rice, soybeans, and winter wheat. Crops are managed under a crop rotation that typically rotates a high residue crop (corn, milo, rice, and winter wheat) with a low residue crop (soybeans), where crop residue is left in the field after harvest to help cycle plant nutrients back into the soil and protect exposed soil.

1 **DEFINE:** Lee Farm's overall goals are to maintain diverse cropping systems for both irrigated and dryland crop production, increase duck, geese, and deer habitat for hunting leases, and adopt more advanced water conservation technologies. For dryland acres that means increasing crop yields; utilizing a residue and cropping management system that improves soil health; and increasing soil organic matter to improve long-term soil productivity. For irrigated acres that means improving crop management and irrigation systems to improve irrigation water efficiency and reduce overall water usage.

2 **ASSESS:** Untimely heat spikes and excessive precipitation patterns are expected to continue. Possible impacts from these changes include reduced yield due to excessive soil water or excessive heat, increased soil erosion, and reduced water quality due to extreme precipitation. Equally as damaging are untimely excessive rainfall events, which can lead to failed crop establishment and reduced yield potentials due to excessive soil water. Low lying areas of the farm that are adjacent to creeks and rivers are more vulnerable to problematic flooding, which either delays or prevents planting of crops. Rain has often hindered the farm from planting earlier and planting higher value crops such as rice and corn. This has a negative impact on the farm's ability to generate more revenue streams.

First year: no-till was used to plant soybeans
Photo Credit: John Lee, USDA NRCS

3 **EVALUATE:** What management challenges or opportunities may occur due to climate change? In the table below, management challenges and opportunities that may occur due to climate change are recorded with the feasibility of meeting those management objectives under the current farm management objective listed.

Step 3: EVALUATE Management Objectives Given Projected Impacts and Vulnerabilities			
Land Unit	**Objectives**	**Challenges to Meeting Objective with Climate Change**	**Opportunities for Meeting Objective with Climate Change**
Entire Farm	Maintain or increase crop yields	*Increasing variability of rainfall, usually too little or at the wrong time.*	Improving the capacity to store heavier rainfall could increase recharge. Choose crops and planting dates based on current and forecasted precipitation and soil moisture levels.
Dryland	Increase residue cover and soil organic matter in order to maximize soil moisture and maintain reasonable levels of productivity during drought periods	*Warmer temperatures result in greater respiration, which could impair yields and reduce the ability to increase organic matter.*	Increase soil organic matter and infiltration and reduce soil moisture and nutrient loss using high carbon cover crops following harvest. Use no-till farming and a controlled traffic system to reduce soil compaction and structural disturbance. Choose crops that are more tolerant of warmer temperatures and heat spikes.
Irrigated	Increase acreage under irrigation	*Without proper irrigation or soil moisture, different crop varieties and rotations will be needed.*	Any drought or moisture deficiencies can easily be solved by expanding irrigation.

4 **IDENTIFY:** The fourth step of the process is to brainstorm tactics farmers can implement to enhance a farm's ability to adapt to climate change and meet management goals. Lee Farm identified two tactics and approaches: **Tactic 1:** Plant cover crop mixes with grasses that contain high carbon contents and complement the cash crops. **Approach:** Plant cover crops. **Tactic 2:** Adjust crop type, variety, and timing in response to climate change. **Approach:** Plant sorghum instead of corn during wet springs and determinant or indeterminant soybeans based on the likelihood of heat spikes.

5 **MONITOR:** As the climate changes in the Delta Region of Arkansas, Lee Farm will continually monitor their management decisions and how those decisions impact challenges and opportunities in production agriculture and farm health. Specifically, they will evaluate their crop productivity as they switch between crop types, varieties, and planting times of alternate crops that can reduce risks when weather conditions are not favorable.

Cover cropping (black oats, turnips, and crimson clovers) on Lee Farm.
Photo Credit: John Lee, USDA NRCS

The Take-Away

Too much or too little water and extreme temperature spikes are some of the major challenges faced by farmers in the Arkansas Delta Region. However, the adaptive farming practices adopted by the Lee Farm, including responding to changing climatic conditions through crop and variety selection, planting dates, cover crops, and no-till farming, are increasing the resiliency of the farm to whatever weather may occur.

For more information:
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