Managing Climate Risk to NC Farms and Forests

*Understanding Exposure, Sensitivity, and Adaptive Capacity*

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Agricultural Risks

- Climate
- Production
- Financial
- Marketing
- Legal
- Human

Farm Performance
Climate Vulnerability

**Exposure**
Degree to which a system experiences climate-related events.

**Sensitivity**
Degree to which a system is affected by climate-related events.

**Adaptive Capacity**
Ability of a system to cope with climate-related events.
Degree to which a system experiences climate-related events

EXPOSURE

National Climate Assessment http://nca2014.globalchange.gov/
Degree to which a system is affected by climate-related events

SENSITIVITY
Ability of a system to cope with climate-related events.

ADAPTIVE CAPACITY
# Understanding Adaptive Capacity

<table>
<thead>
<tr>
<th>Community Characteristics</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Flexibility</td>
<td>Social, cultural, political, economic and environmental flexibility</td>
</tr>
<tr>
<td>Capacity to Organize</td>
<td>The capacity to establish and maintain both informal and formal community-based adaptation and recovery planning organizations</td>
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<tr>
<td>Capacity to Learn</td>
<td>The extent of adaptive learning</td>
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## Available Assets

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<tr>
<td>Natural</td>
<td>The productivity of land and actions to sustain or enhance the quality of natural resources</td>
</tr>
<tr>
<td>Human</td>
<td>The capacity of individuals to manage natural resource-based businesses</td>
</tr>
<tr>
<td>Social</td>
<td>Strength of social relationships that facilitate cooperative actions and the sharing of ideas and resources</td>
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<tr>
<td>Physical</td>
<td>Infrastructure, equipment and technologies produced by other types of capital</td>
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<tr>
<td>Financial</td>
<td>The level and diversity of income sources and access to other financial resources (credit, savings, insurance) that contribute to wealth</td>
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“the ability of a system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change”

Response Capacity
Recovery Capacity
Transformation Capacity
Key Qualities of Resilient Systems

Ecological
- Self-Regulated
- Functional Diversity
- Response Diversity
- Spatial and Temporal Diversity
- Appropriately Connected
- Coupled with Local Natural Capital
- Exposed to Disturbance

Social
- Self-Organized
- Functional Diversity
- Response Diversity
- Builds Human Capital
- Reflective and Shared Learning
- Globally Autonomous and Locally Interdependent
- Reasonably Profitable
- Honors Legacy
Tools of Agricultural Resilience?

- Natural Resource – soil quality, biodiversity
- Human – management, innovation
- Social – community networks, public policy
- Financial – profit, savings, loans, insurance
- Technological – irrigation, drainage, fertility and pest management, physical protection
Climate Resilience Practices on US Farms?

- 1000 corn and soybean producers in MS, TX, NC, WI identified crop diversity and insurance as top two
- 150 Maine producers identified physical protection, soil quality, crop diversity
- 25 award-winning sustainable producers identified soil quality, crop/livestock diversity, and high value diversified markets
Dropped “Thirsty” Less Profitable Crop, Cover Crop Cocktails

• 500 ac irrigated potatoes in high desert region
• Specialty potatoes, certified seed potatoes, fresh table potatoes to wholesale markets
• 15 year drought, declining water supplies
• Replaced barley phase of rotation with cover crops
• Increased soil quality reduced water, fertilizer and pesticide inputs
• Increased profits
Adding Annuals to Perennial Crops, Diversified Marketing

• Kole Tonnemaker, Tonnemaker Hill Farm, Royal City WA

• 126 acres irrigated orchards, vegetables, hay
• Apples, peaches, pears, cherries
• Market fresh produce and value-added products direct and wholesale
• Industry changes in 1980’s pushed Kole to add annuals and diversify markets
• Concerned about future of water supply
Dynamic Rotation, Zero Till, Integrated, Cover Crop Cocktails

Gabe Brown, Brown’s Ranch, Bismarck ND

- 5000 acres feed and food grains, cattle, sheep, poultry, pork
- Dynamic rotation, zero till
- Cover crop cocktails 7 – 20 species
- Example “8-way” warm season cover:
  - millet
  - sudax
  - soybeans
  - cowpeas
  - sunflowers
  - sunn hemp
  - radishes
  - turnips

Soil Health Improvements (20 years)
SOM from 2 to 5%
Infiltration rate from 0.5 to 8”/hr

http://brownsranch.us/
Pasture Cropping, Dynamic Rotation, Managed Grazing, On-Farm Processing

Tom Trantham, Happy Cow Creamery, Pelzer SC

- 90 cow Holstein Dairy
- 95 acres, 29 paddocks, intensive grazing
- 7 - 9 annual forage types, plus alfalfa
- On-farm creamery

This chart represents a generalized description of Trantham's grazing system. It is constantly changing as a result of climate/weather and discovery of new varieties. This should be used ONLY AS A GUIDE as you develop the system and crop mix that is best suited to your particular farm and location.

Trantham's 12 Aprils Dairy: Planting and Grazing Guide

http://www.happycowcreamery.com/
Pasture-Cropping, Multi-species, On-Farm Processing, High Value Markets

Will Harris, White Oak Pastures, Bluffton, GA

- 2500 ac, certified organic
- beef, goats, sheep, rabbits, pork and poultry
- Pasture-cropping
- On-farm processing
Ecosystem-based Adaptation: The City Region

Upland forest provides water harvesting, flood control, wildlife conservation, carbon sequestration, scenery & recreation, and timber & non-timber products.

Perl-urban & rural green wedges are biodiversity-friendly foodway corridors with multi-scale and mixed crop/livestock operations.

Farmers markets, retail & wholesale markets, food hubs, and community gardens in the urban core enable access to fresh, locally produced food resources.

Coastal resources are managed for biodiversity, scenery & recreation, storm surge protection, and aquaculture.

Riparian zones are managed for biodiversity, flood control, wildlife and pollinator movement, urban heat island control, and aesthetic & recreational benefits.

Some of the many elements of healthy and sustainable city regions. Illustration adapted from: Victoria (Australia) provincial government framework “Building healthy and resilient ecosystems across the landscape”, Chapter 6: 72-73.
New Times, New Tools: Managing for Resilience

• Assess vulnerability
• Increase reserves and redundancy in critical materials
• Use adaptive management - “learn as you go”
• Cultivate ecosystem services
• Invest in a balanced portfolio
• Take landscape perspective
RESILIENT AGRICULTURE
Cultivating Food Systems for a Changing Climate

Laura Lengnick