

# Using the Concept of Multifunctional Agriculture to Transform the US Food Systems

**Dr. Kathleen Liang**

**[cliang@ncat.edu](mailto:cliang@ncat.edu) 336 285 4683**

**Kellogg Distinguished Professor of Sustainable Agriculture  
Director, Center for Environmental Farming Systems  
North Carolina A&T State University**

**Projects Funded by USDA, NSF, Kellogg Foundation, NC Department of Agriculture and Consumer Services, NC Cooperative Extension**

# Topics to Focus

- **Entrepreneurial production**
- **Niche supply chain**
- **Bioeconomy**

# CEFS



NCSU | NCA&T | NCDA&CS

*The Center for Environmental Farming Systems is a partnership of North Carolina State University, North Carolina Agricultural and Technical State University, and the North Carolina Department of Agriculture and Consumer Services.*



## Why wait for the future we envision?

[DONATE TO CEFS](#)

## What We Do

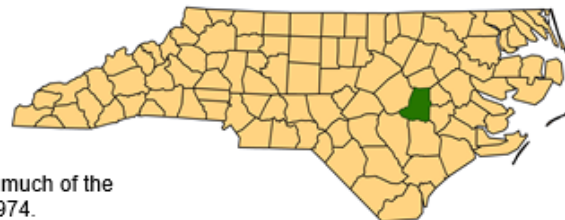
*The Center for Environmental Farming Systems develops and promotes just and equitable food and farming systems that conserve natural resources, strengthen communities, improve health outcomes, and provide economic opportunities in North Carolina and beyond.*

<https://cefs.ncsu.edu/>

## CHERRY RESEARCH FARM (NCDA&CS)

### Location

City: Goldsboro  
County: Wayne



### Background:

- Initial acquisition by the state around 1915; much of the property was transferred to NCDA&CS in 1974.
- Records of breeding research dating to 1947 provide an irreplaceable source of information on genetics of dairy herd improvements
- Portions of the farm were designated in 1994 as the CEFS Field Research, Education, and Outreach Facility. The Center for Environmental Farming Systems (CEFS) provides for collaboration between NCDA&CS, North Carolina State University, and North Carolina Agricultural and Technical University focusing on sustainable agriculture.

---

### Unique Characteristics:

- Initiation of long term, large scale interdisciplinary research to develop profitable farming systems that protect our environment and enhance rural communities.
- Location along the banks of the Neuse and Little River provides an excellent opportunity to evaluate the impact of diverse cropping systems on water quality.

---

### Station Statistics

**Staff:** NCDA&CS Full Time = 24, NCDA&CS Part Time = 6, NCA&T Full Time = 2, NCSU Full Time = 1

**Management Units:** Livestock (Dairy 300 head, Beef 175 head, Swine 50 head), Field Crops, Horticultural Crops, Agroforestry, Small Farm Unit, Farming Systems Research Unit.

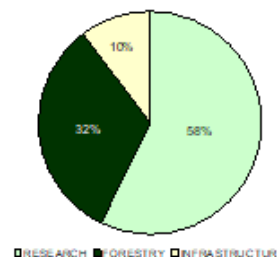
**Buildings:** 41

### Research Program

Project Leaders (#): 25  
Ongoing Projects (#): 30  
Focus: Dairy, Beef, Swine, Corn, Soybeans, Cotton, Horticultural Crops, Specialty Crops, Organic Production, Small Farm Production, Agroforestry, Long Term Integrated Systems Studies.

### Acres:

Station Total:	2250
Field Crops	615
Horticultural Crops	20
Specialty Crops	5
Buffers	15
Organic Production	25
Pasture/Hay	550
Irrigation Ponds	1
Woodlands	790
Infrastructure	230



---

### Station Improvements:

- Adoption and use of field assistance technology
- Ongoing establishment of long-term agroforestry projects

# Field Research



Farming Systems Research Unit



Pasture-Based Dairy Unit



Pasture-Based Beef Unit



Organic Research Unit



Small Farm Unit



Alternative Swine Unit



Amazing Grazing



CEFS Farm to School



Community Food Strategies



NC Choices



NC 10% Campaign



Food Youth Initiative



Committee on Racial Equity in the Food System

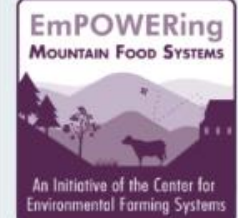


NC Farm to Early Care and Education



An initiative of the Center for Environmental Farming Systems

Farm to Senior Services



An Initiative of the Center for Environmental Farming Systems

EmPOWERing Mountain Food Systems

# What is Multifunctional Agriculture?


- Use **existing resources** on farm and in the community.
- **Create values and benefits beyond traditional food, fiber, and services**
  - Why is it important? The traditional agriculture need to change the way of doing business!
  - Example - COVID

# Diversification ≠ Multifunction

- **Diversification**
  - Production oriented
- **Multifunctional Agriculture**
  - Resource oriented (what we already have)
  - Change the composition of input/output (what we can do that would be different and exciting)
  - Production + management + marketing + finance + risk + waste + energy + ... (as a system approach)



# Definition of Multifunctional Agriculture in Our Research Funded by USDA NIFA 2011-2015

 **Agritourism (Broadening)** – pick your own, recreation service, entertainment, bed and breakfast, tour, and educational workshop.

 **Value added production (Broadening)**

 **Direct and intermediary sales (Deepening)**

- institutions (schools, hospitals, government agencies)
- **Community Supported Agriculture (CSA)**
- farmers' markets and farm stands
- wholesale venues, large grocery chain stores (Wal-Mart, Kroger, Price Chopper, etc.), and producer/consumer cooperatives.

 **Off farm income (Re-grounding)**



# Production Diversification



# Vertical Diversification

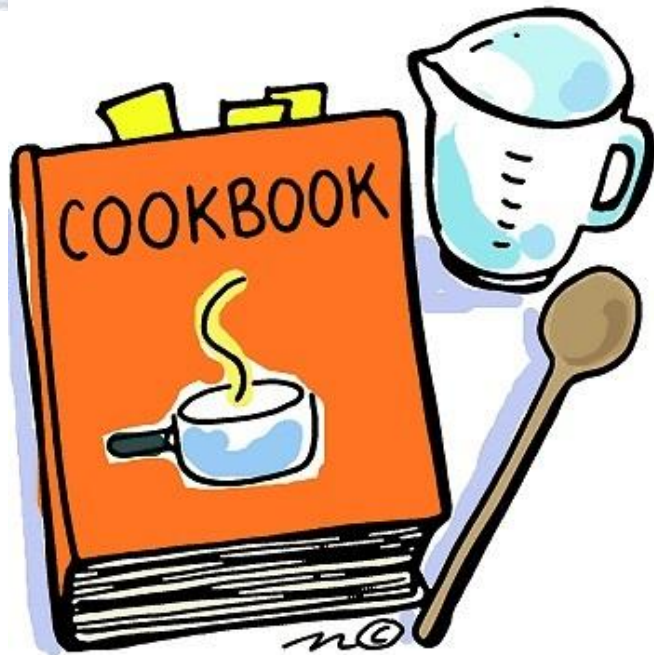


Farm → Harvest → Handling → Distribution

# Horizontal Diversification



# Multifunctional Agriculture



# From Production Perspective



## **Grow something to serve multiple purposes.**

- Use conservation practices to improve soil health, reduce water dependency, and generate circular bioenergy systems.
- Increase income from selling multiple products from one crop.
- Support pollination and natural habitat.



## From Niche Market to Marketing

**Grow new crops for niche market such as medicinal purposes, cultural diversification, health for ecosystem.**





**How do we help people know and use new crops?**

**Are there new markets that we could work with?**

**Bio-industries!**



# Bioeconomy

Animals

## Biotechnology

### Bioeconomy

How the Federal Government Regulates Biotech Plants

Biotechnology Frequently Asked Questions (FAQs)

Biotechnology Glossary

Roles of USDA Agencies in Biotechnology

Advisory Committee on Biotechnology & 21st Century Agriculture (AC21)

Biotechnology and Climate Change

Broadband

Conservation

Coronavirus

On September 12, 2022, the Biden-Harris Administration announced key steps to advance biotechnology and biomanufacturing in the United States through the Executive Order on Advancing Biotechnology and Biomanufacturing Innovation for a Sustainable, Safe, and Secure American Bioeconomy. USDA supports the development of circular bioeconomies, where agricultural resources are harvested, consumed, and regenerated in a sustainable manner. This approach can also create new revenue streams for agricultural producers and ensure that wealth and other economic benefits in the form of jobs and other opportunities are created, and stay, in rural communities.

USDA released a fact sheet outlining the [Department's 2023 bioeconomy accomplishments](#) (PDF, 128 KB), which include \$772 million in investments for research, development and infrastructure involving biofuels, fertilizer production, crop innovations, biobased products and more.

### Enabling the American Bioeconomy Through Building a Resilient Biomass Supply

President Biden's [Executive Order](#) charged USDA with delivering a plan to support the resilience of the U.S. biomass supply chain for domestic biomanufacturing and biobased product manufacturing, while also advancing food security, environmental sustainability, and the needs of underserved communities. Secretary Vilsack announced the report, "[A Plan to Enable the Bioeconomy in America: Building a Resilient Biomass Supply](#)" (PDF, 2.8 MB)," in March 2024.

In developing the Plan, USDA consulted with public stakeholders — as well as federal partners in the Departments of Defense, Energy, Commerce, and Transportation, as well as the National Science Foundation, National Aeronautics and Space Administration, and the Environmental Protection Agency.

**Rural Development (RD)** RD invested over **\$200 million** in bioeconomy projects, including advanced biofuels, biofuel infrastructure, renewable fertilizer production, and biogas and biomass projects; as well as greatly expanded the BioPreferred® Program:

**Research, Education, and Economics (REE)** USDA National Institute of Food and Agriculture and USDA Agricultural Research Service programs invested over **\$500 million** in new research and development to advance the Nation's bioeconomy. Programs include the Bioproduct Pilot Program, the Agriculture and Food Research Initiative, and the Biomass Research Centers and Utilization Centers in a wide range of topics

**Natural Resources and Environment (NRE)** The USDA Forest Service made catalytic investments in the wood-based bioeconomy to support land management, wildfire risk reduction, climate adaptation, and local economies, **totaling \$72 million** across 160 projects to support innovation, market development, and new and expanded manufacturing capacity to bolster the critical connection between healthy and resilient Federal, State, Tribal, and private forests and the wood products economy

**Farm Production and Conservation (FPAC)** The USDA Risk Management Agency adopted new flexibilities to insure double-crop soybeans in approximately 845 additional counties, or on roughly 32 percent more acres in 2023 when compared to prior years (2014-2022). The agency also expanded insurance for camelina and carinata in 10 States, enabling farmers to supply these oilseed crops to meet increasing demand for biofuels.



## **From Lifestyle and Community Perspective**

**Engage community organizations  
Offer tours, events, training, internship, cooking demonstration  
key resources to help people make better decisions!**

# SOUTHEASTERN VEGETABLE EXTENSION WORKERS



SOUTHEASTERN U.S.

# 2024

## VEGETABLE CROP HANDBOOK

"Everything you need  
on the dashboard of your truck."



## Vegetable Production Information Web Sites

### ALABAMA

Alabama SARE Program  
<http://www.southernsare.org/SARE-in-Your-State/Alabama>  
Alabama Cooperative Extension System  
<http://www.aces.edu>  
AU Plant Diagnostic Lab  
<http://offices.aces.edu/plantdiagnostics/>  
AL IPM Newsletter  
<http://www.aces.edu/ipmcommunicator>  
Vegetable IPM Info  
<http://www.aces.edu/vegetableipm>  
Alabama Beginning Farms Program  
<http://www.aces.edu/beginningfarms>

### ARKANSAS

Arkansas Cooperative Extension Service  
<http://www.uaex.edu>  
Arkansas Fruit, Vegetable, and Nut Update, UA CES Blog  
<http://www.uaex.edu/hortblog>  
UA CES Commercial Vegetable Production  
<https://www.uaex.edu/farm-ranch/crops-commercial-horticulture/horticulture/vegetables.aspx>

### FLORIDA

University of Florida Cooperative Extension Service  
<http://edis.ifas.ufl.edu>

### GEORGIA

University of Georgia Cooperative Extension Service  
<http://extension.uga.edu>  
UG Fruits & Vegetable Info  
<http://extension.uga.edu/agriculture/ag-fruits-vegetables>  
University of Georgia College of Agriculture and Environmental Sciences Publications  
<http://www.caes.uga.edu/publications>

### KENTUCKY

University of Kentucky Cooperative Extension Service  
<http://ces.ca.uky.edu/ces>  
UK Ag Center for Crop Diversification  
<http://www.uky.edu/Ag/CCD>  
Kentucky Vegetable Integrated Pest Management Program  
<http://ipm.ca.uky.edu/>  
UK Vegetable Crops Extension and Research  
<https://vegocrops.ca.uky.edu>  
UK Plant Pathology  
<https://plantpathology.ca.uky.edu>  
UK Horticulture  
<https://www.uky.edu/hort>  
UK Entomology  
<http://entomology.ca.uky.edu/>

### LOUISIANA

Louisiana SARE Program  
<http://www.southernsare.org/SARE-in-Your-State/Louisiana>  
LSU AgCenter  
<http://www.lsuagcenter.com>  
LSU Horticulture Pathology  
<http://www.lsuagcenter.com/hortpathology>

### MISSISSIPPI

Mississippi State University Extension Service  
<http://extension.msstate.edu>  
MS Greenhouse Tomato Production FAQ  
<http://extension.msstate.edu/crops/commercial-horticulture/greenhouse-tomatoes>  
Mississippi Commercial Horticulture Information  
<http://extension.msstate.edu/agriculture/crops/commercial-horticulture>  
Farmers' Markets  
<http://extension.msstate.edu/agriculture/local-flavor/farmers-markets>

### NORTH CAROLINA

North Carolina Cooperative Extension Service  
<http://www.ces.ncsu.edu>  
Information on Herbs, Organics, & Specialty Crops  
<http://ncherb.org>  
NCSU Vegetable Pathology  
<http://go.ncsu.edu/veggiepathology>  
NCSU Extension Plant Pathology Portal  
<http://plantpathology.ces.ncsu.edu/>  
NCSU Plant Disease and Insect Clinic  
<http://www.cals.ncsu.edu/plantpath/extension/clinic/>  
NCSU Entomology Portal  
<http://entomology.ces.ncsu.edu/>  
NCSU IPM Portal  
<http://ipm.ces.ncsu.edu/>  
North Carolina Pest News  
[http://ipm.ncsu.edu/current\\_ipm/pest\\_news.html](http://ipm.ncsu.edu/current_ipm/pest_news.html)  
Horticulture Information  
<https://www.ces.ncsu.edu/categories/agriculture-food/commercial-horticulture-nursery-turf/>  
NCSU Extension Growing Small Farms  
<https://growing-small-farms.ces.ncsu.edu/>  
Wolfpack Weeds  
<http://wolfpackweeds.com/>  
Fresh Produce Safety  
<http://ncfreshproducesafety.ces.ncsu.edu/>

### OKLAHOMA

Oklahoma Cooperative Extension Service  
<http://www.oces.okstate.edu>  
OK Dept. of Horticulture Vegetable Fact Sheets  
<http://pods.dashr.okstate.edu/docushare/dsweb/View/Collection-338>  
OK Dept. of Horticulture Vegetable Variety Trial Info  
<http://www.hortia.okstate.edu/outreach/vegetables/trial-reports>

### SOUTH CAROLINA

Clemson University Cooperative Extension Service  
<http://www.clemson.edu/extension>  
Clemson Coastal Research & Education Center  
<https://www.clemson.edu/cafrs/research/coastal/>  
Clemson Edisto Research and Extension Center  
<https://www.clemson.edu/cafrs/research/edisto/>  
SC Growers F&V News  
<https://scgrower.com/>

### TENNESSEE

University of Tennessee Extension  
<https://utextension.tennessee.edu/>  
UT Vegetable Production  
<https://utvegetable.com/>

### TEXAS

Texas Agricultural Extension Service  
<http://aglifelineextension.tamu.edu>

### VIRGINIA

Virginia Cooperative Extension  
<http://www.ext.vt.edu>  
Virginia Tech Vegetable Entomology Facebook  
<http://www.facebook.com/VirginiaTechVPRlab>  
Virginia Tech Vegetable Pathology  
<http://www.facebook.com/vtesarecpp>  
Virginia Tech Extension Shore AREC  
<https://www.arec.vaes.vt.edu/arec/eastern-shore.html>

<https://content.ces.ncsu.edu/southeastern-us-vegetable-crop-handbook>

# https://www.nal.usda.gov/farms-and-agricultural-production-systems/raising-specialty-crops



## Raising Specialty Crops



Specialty crops are defined by law as fruits and vegetables, tree nuts, dried fruits and horticulture and nursery crops, including floriculture — the cultivation of flowers. On this page, find resources and information about various specialty crops, most from universities and extension services.

### Learn about Specialty Crops

Growing specialty and value crops is a good way to diversify a farming operation or urban farm.



Check the [List of Alternative Crops and Enterprises for Small Farm Diversification \[usda.gov\]](#) to find Extension sources that help evaluate and start non-conventional farming enterprises using alternative crop and livestock species and related enterprises.



Browse the [Henry G. Gilbert Nursery and Seed Catalog Collection \[archive.org\]](#) from the late 1700s to present to find historic and heirloom varieties.

### Search the NAL Collection

[Agroforestry research developments.](#)

[How does agroforestry help crop pollination?](#)

[Biofuel crop sustainability.](#)

[Switchgrass : a valuable biomass crop for energy.](#)

[Let's grow mushrooms!](#)

[Modern mushroom cultivation.](#)

# https://www.ams.usda.gov/

The screenshot shows the USDA Agricultural Marketing Service website. The header includes the USDA logo and the text "Agricultural Marketing Service U.S. DEPARTMENT OF AGRICULTURE". The navigation bar contains links for "HOME", "MARKET NEWS", "RULES & REGULATIONS", "GRADES & STANDARDS", "SERVICES", "RESOURCES", and "COMMODITY PROCUREMENT". A search bar is located on the right side of the navigation bar. A dropdown menu is open under "MARKET NEWS", listing various categories: "Market News", "Cotton and Tobacco", "Dairy", "Livestock, Poultry, and Grain", "Specialty Crops", "Local & Regional Food Marketing" (highlighted), "Organic", "Retail", "Run a Custom Report", "Contacts", and "Search Market News". Below the navigation bar, there is a large image of dairy products (cheese, milk, butter) with a text overlay that reads "Dairy products can be reimbursed for their dairy product and food waste." Below this image is a search bar with the text "I'm looking for" and a dropdown menu labeled "Select an Option". At the bottom of the page, there is a paragraph of text: "The Agricultural Marketing Service (AMS) administers programs that create domestic and international marketing opportunities for U.S. producers of food, fiber, and specialty crops. AMS also provides the agriculture industry with valuable services to ensure the quality and availability of wholesome food for consumers across the country and around the world." The browser's address bar shows "https://www.ams.usda.gov/market-news/local-regional-food". The Windows taskbar is visible at the bottom of the screen, showing the time as 12:19 PM on 10/25/2021.

The Agricultural Marketing Service (AMS) administers programs that create domestic and international marketing opportunities for U.S. producers of food, fiber, and specialty crops. AMS also provides the agriculture industry with valuable services to ensure the quality and availability of wholesome food for consumers across the country and around the world.

# Finding Prices

- Show types of specialty fruit and vegetable
- Test knowledge of selling unit – each, oz, lb?
- Choose the closest market as the base price.

<https://www.ams.usda.gov/>



United States Department of Agriculture  
Agricultural Marketing Service

Market News

AMS Home Newsroom Opportunity Online Forms About



## Browse by Commodity: VEGETABLES

### A - B

- Alfalfa Sprouts
- Aloe Leaves
- Arrow Root
- Arrowhead
- Artichokes
- Asparagus
- Bamboo Shoots
- Banana Flowers
- Bean Sprouts
- Beans
- Beet Tops
- Beets
- Bittermelon
- Bok Choy
- Broccoli
- Broccoli Rabe (Rappini)
- Brussels Sprouts

### C - D

- Cabbage
- Cabbage Sprouts
- Cactus Leaf (Nopales)
- Calabaza
- Cardoon
- Carrots
- Cauliflower
- Celery
- Chayote
- Chinese Artichoke (Crosnes)
- Chinese Cabbage
- Chinese Celery
- Chinese Chives
- Choy Sum
- Chrysanthemum Leaves (Tung Ho)
- Collard Greens
- Corn Stalks
- Corn-Sweet
- Cucumbers
- Daikon
- Dandelion Greens
- Dasheen
- Dau Mue (Pea Tips)
- Donqua (Winter Melon)

### E - G

- Eggplant
- Endive
- Escarole
- Fiddle Head Ferns
- Fiddle Head Ferns
- Field Cress
- Frisee
- Gai Choy (Chinese Mustard)
- Gailon
- Galanga (Siam, Thai Ginger)
- Garlic
- Ginger Root
- Gobo
- Greens

### H - L

- Hanover Salad Greens
- Huauzontle
- Huauzontle
- Jerusalem Artichokes
- Lettuce, Boston
- Lettuce, Boston, Red
- Lettuce, Green Leaf
- Lettuce, Iceberg
- Lettuce, Romaine
- Lettuce, Ruby Romaine
- Lettuce, Russian Red Mustard
- Lettuce-Other



# Summary of Today's Topics as Creative Strategies

**Are we all selling the same things?**

**Can we differentiate our products?**

**Is it really bad to lose money?**

**What makes me and my products special?**

**Are we setting price against larger groceries?**

**What can we do to showcase quality?**

**Can our customers count on us?**

**Am I protecting soil and environmental health?**

**Do we have proper networks to support each other?**

**Who should I call when I have problems?**

**Are we all working together to share information and resources?**

# CEFS



NC STATE | NC A&T | NCDA&CS

*The Center for Environmental Farming Systems is a partnership of North Carolina State University, North Carolina Agricultural and Technical State University, and the North Carolina Department of Agriculture and Consumer Services.*

[Home](#) [About](#) [Field Research](#) [Food System Initiatives](#) [Extension & Outreach](#) [Academics & Education](#) [Youth](#) [Publications](#) [Resources](#) 



Join us for a Field Day at the [Small Farm Unit](#) to learn about our work with specialty vegetable crops, summer cover crops and soil building practices, high tunnel, IPM and beekeeping projects. We will have equipment demonstrations geared toward improving small farm efficiency. Lunch will be provided.

## Details

**Start:**

[July 11 @ 1:00 pm](#)

**End:**

[July 12 @ 2:00 pm](#)

**Event Category:**

CEFS

**Website:**

<https://www.eventbrite.com/e/small-farm-unit-field-day-registration-824506129027?aff=oddtcreator>

## Organizer

<https://cefs.ncsu.edu/event/small-farm-unit-field-day-2024/>