Climate-Smart Practices For Peanut Production System In South Carolina

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Climate-Smart Peanut Extension Associates

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Peanut Climate-Smart Team

- ❑ Jay Crouch, Clemson Extension Agronomic Crops Program Team Leader
- ❑ Daniel Anco, Clemson Extension Peanut Specialist
- ❑ Bhupinder S. Farmaha, Nutrient Management Specialist
- ❑ Nathan Smith, Clemson Extension Economist
- ❑ Sruthi Narayanan, PES Associate Professor
- ❑ Kelly Flynn, Climate-Smart Project Implementation Coordinator
- ❑ Paula Agudelo, Climate-Smart Lead Project Administrator

Role of the Extension Associates

- ❑ Assist farmers enrolled in the Climate-Smart project
- ❑ Act as the direct contacts between farmers and other teams in the project
- ❑ Conduct multiple farm visits
- ❑ Facilitate participant training and education

Goals

- ❑ Gain a comprehensive understanding of the project and farmer enrollment
- ❑ Equip participants with the knowledge and skills required to implement climate-smart practices effectively in their peanut farming systems
- ❑ Encourage the exchange of experiences and knowledge among the participants

Outline

1. Introduction
2. Importance of Climate-Smart practices in peanut production systems
3. Market development team
4. Residue and tillage management
5. Cover cropping
6. Conservation tillage & planting applications
7. Farmer-to-farmer knowledge and experience sharing
8. Rainfall simulator demonstration

Conclusions and next steps

What is Climate-Smart?

Definition of climate-smart practices:

"The production of an agricultural commodity using conservational agricultural (farming, ranching, or forestry) practices that reduce greenhouse gas emissions or sequester carbon"

Why are climate-smart practices important for SC?

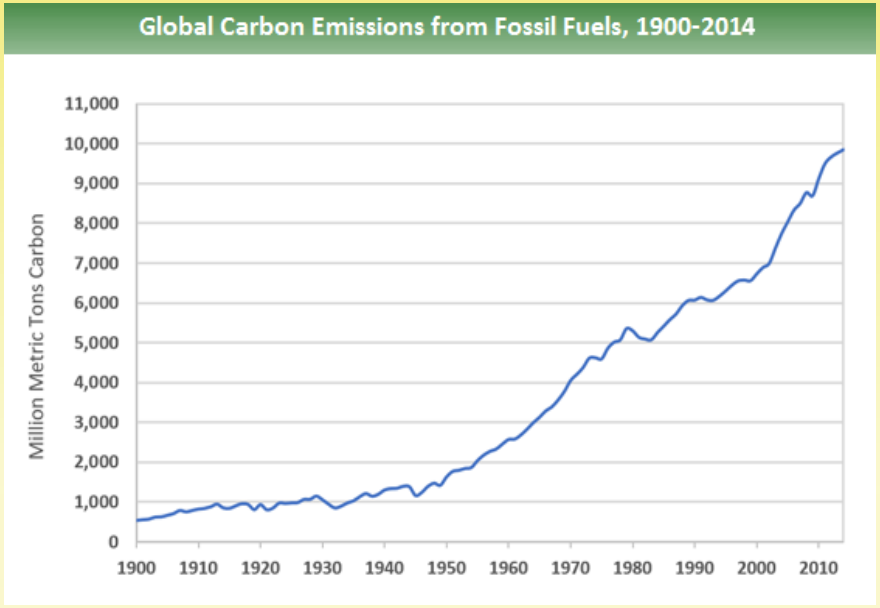
-Conservational practices are low in SC

USDA-NRCS gave $70M to the Partnership of Clemson University and SC State

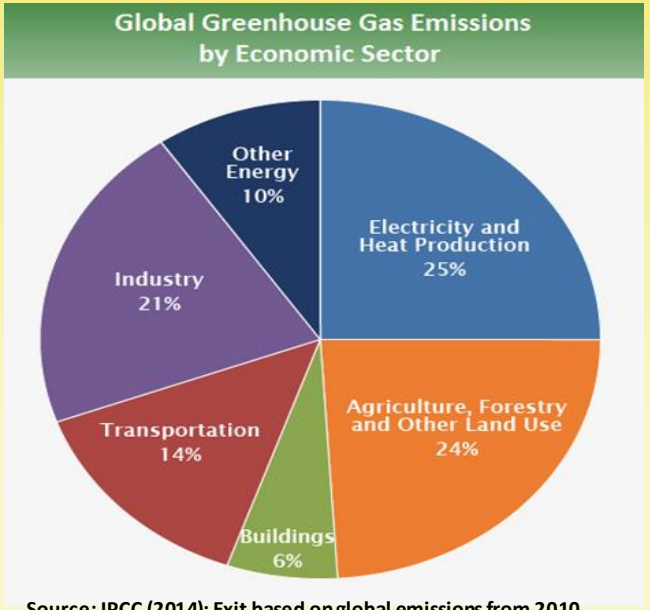
- US government climate-smart task force and climate-smart initiative
- Climate change is an increasing issue in the US
- This project is a step towards improving our future

Climate Change: Greenhouse Gases

EPA estimates that agriculture accounted for 11.2% of U.S. greenhouse gas emissions in 2020



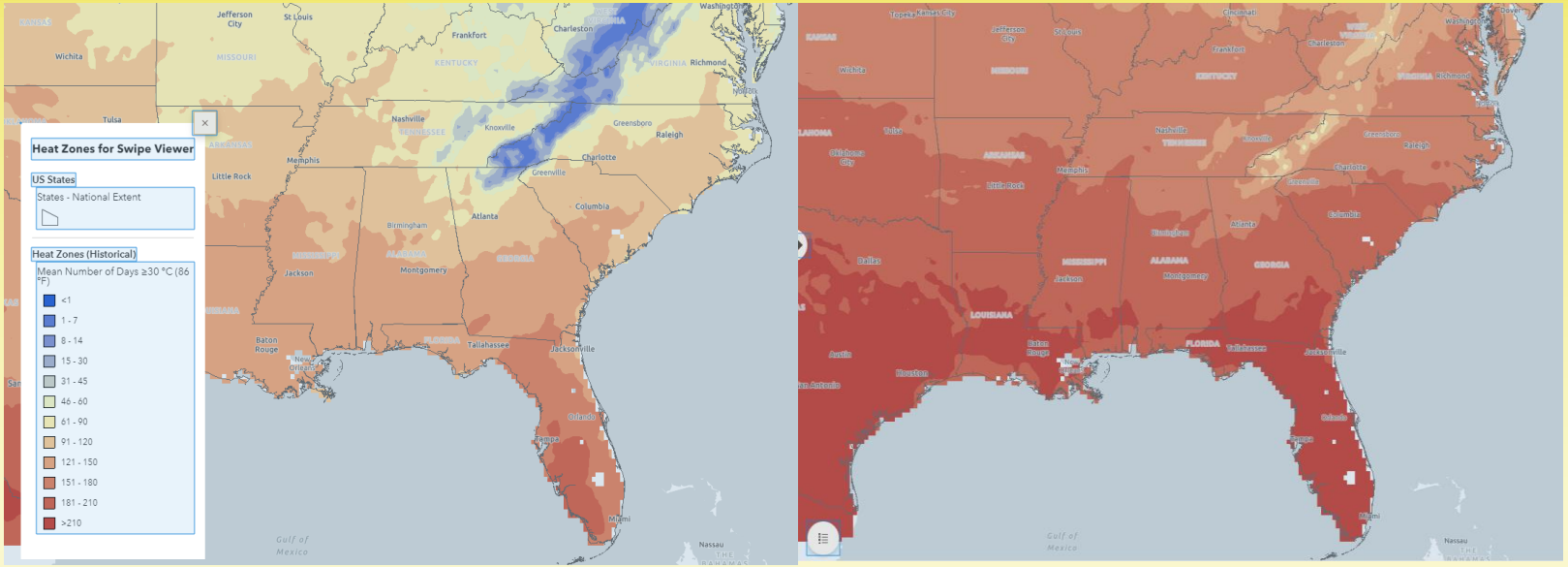
Source: Boden, T.A., Marland, G., and Andres, R.J. (2017). Global, Regional, and National Fossil-Fuel CO2Emissions. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., U.S.A.doi 10.3334/CDIAC/00001_V2017.



Source: IPCC (2014); Exit based on global emissions from 2010. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.

Direct on-farm employment accounted for only 1.3% of U.S. employment (source: USDA ERS - Ag and Food Sectors and the Economy)

Climate Change in the Southeast

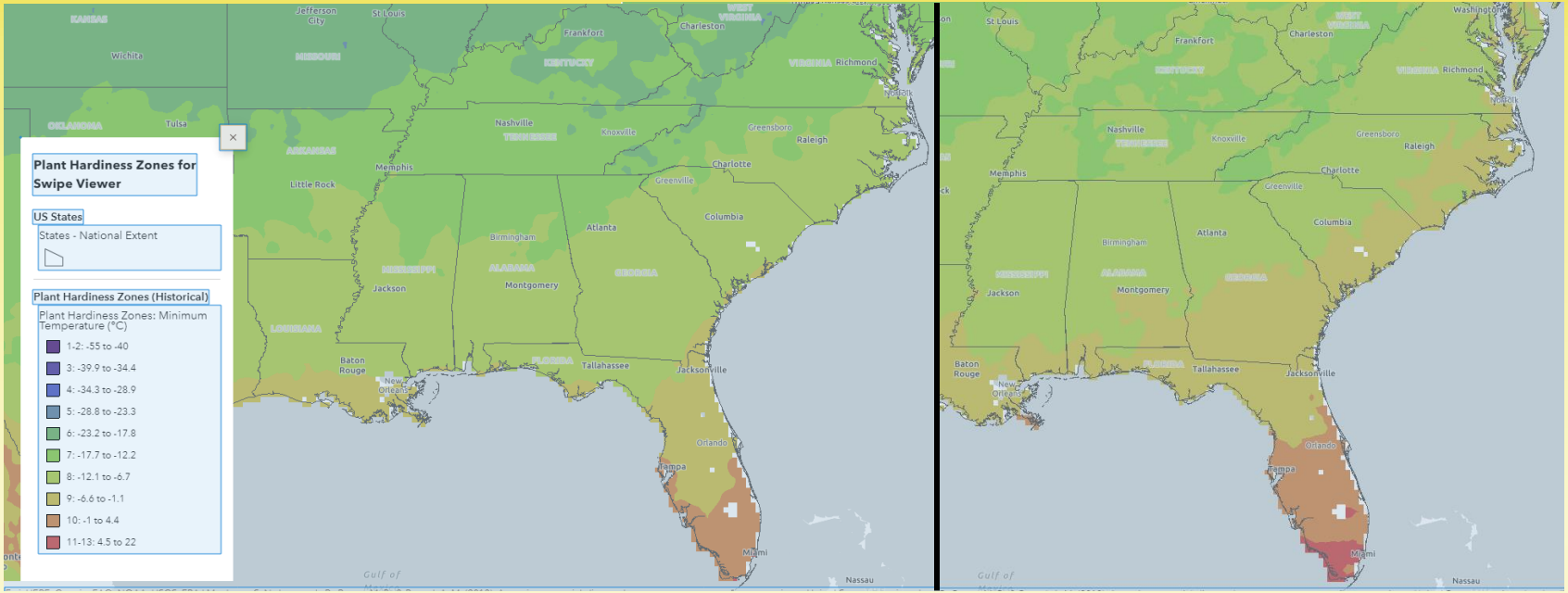


Heat Zones: Left Side (1980–2009) ↔ Right Side: (2070–2099)

- **Projected South Carolina 2070-2099 mean days > 86 ºF = 181-210 days**
- **Increased 32-58 days from the year 2009**

USDA: https://storymaps.arcgis.com/stories/9ee0cc0a070c409cbde0e3a1d87a487c

Climate Change in the Southeast



Plant Hardiness Zones: Left Side (1980–2009) ↔ Right Side: 2070–2099)

SC 2070- 2099: Upper half = -6.6 to –1.1 ºC

Lower half = -1 to 4.4 ºC

USDA: https://storymaps.arcgis.com/stories/9ee0cc0a070c409cbde0e3a1d87a487c

(Summary) How Climate Change Affects Ag

Impacts On Agriculture:

- Above-normal max temps in July and August have led to decreases in crop productivity
- Dry summers & wet fall seasons stress crops and reduce yields
- Extreme rain events and drought will be more common
- The ability to grow the same varieties is changing
- Reduced freeze seasons will impact flower timing and late frosts will cause crop failures
- Reduced freeze seasons will influence pest pressures

The higher the greenhouse gas emissions > more intense these outcomes will become

Climate-Smart Program Overview

Main Project Goals:

- ❑ Implement & increase the acreage of conservation agricultural practices on current peanut production systems
- ❑ Grant will take place for 5 years
- ❑ Serves underserved & new beginner farmers

Climate-Smart Practices & Requirements

Practice	Incentive	Cultural Requirements
Cover Crops	$100 / acre	Select and plant single or multiple species of cover crops that include grasses, legumes, and Brassicas to establish a seasonal vegetative cover
Residue & Tillage Management	$50 / acre	Crop residue is left in the field year-round to limit soil disturbing activities; soil disturbance at crop row is acceptable (i.e., strip-till)

Requirements for Participation:

- Acreage may not be enrolled in other NRCS cost-share program for the same practices
- Consultation with technical assistance partner
- Participation in related practice training
- Enroll minimum 10 to maximum 200 acres
- Implement practice within 1 year of enrollment
- Participate for at least 3 consecutive years
- Peanuts must be planted within the 3-year window

CLIMATE-SMART GROWN IN SC

SC STATE UNIVERSITY 1896

Numbers of Enrolled Farmers

Peanuts (Year 1)	Confirmed Producers	Signed Producers	% Signed
Grand Total	46	45	97.8%
Clemson	32	31	96.9%
SC State	14	14	100%

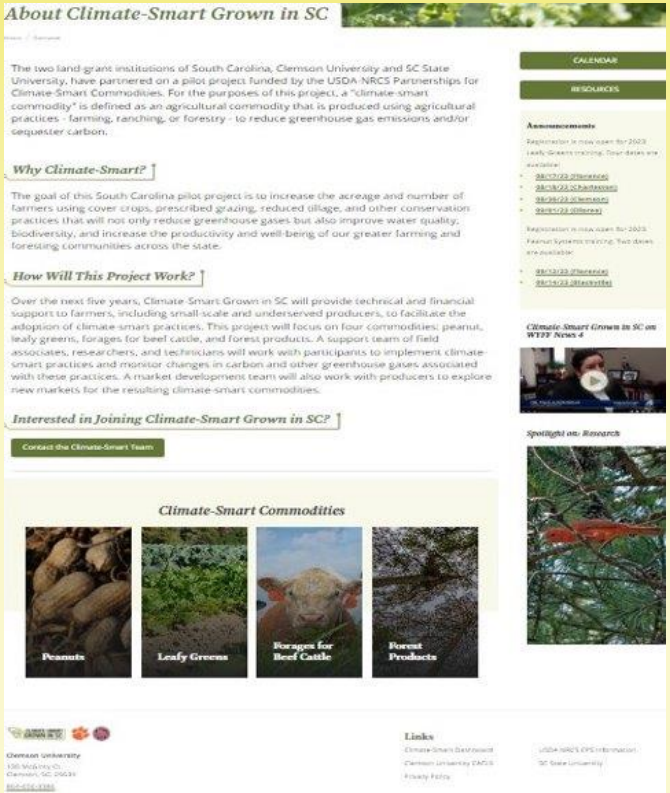
Cover Crops (Confirmed)	Cover Crops (Signed)	Residue & Tillage (Confirmed)	Residue & Tillage (Signed)
7,229	7,029	7,129	6,929
5,396	5,196	5,196	4,996
1,833	1,833	1,933	1,933

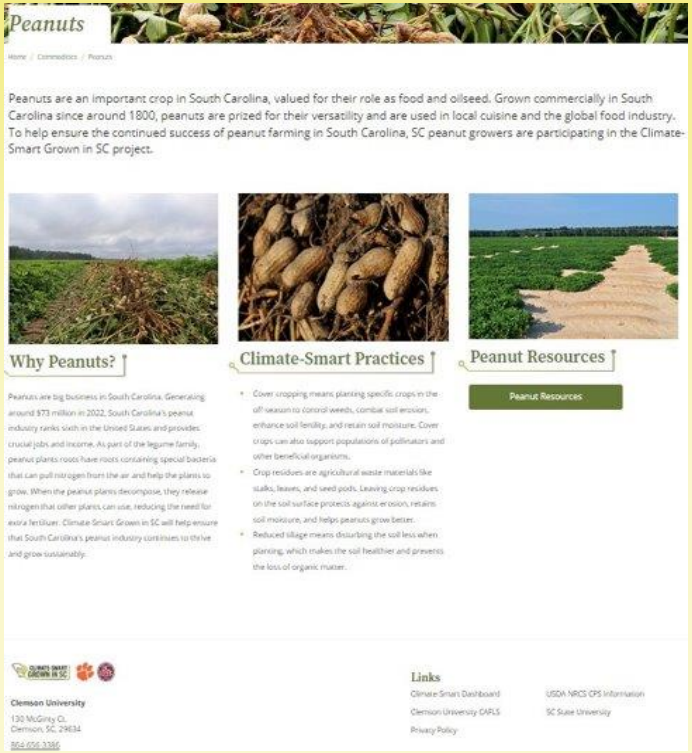
Climate-Smart Acres	Unit Cost	Units Year 1	Units Year 2	Units Year 3	Units Year 4	Units Year 5	Max Acres
Clemson	$150	5000	5000	6000	6000	6000	200 Acres/Grower
SC State	$150	2400	3000	3600	4200	4800	200 Acres/Grower

CLIMATE-SMART GROWN IN SC

Program Website

www.climatesmartsc.org





CLIMATE-SMART GROWN IN SC

Participation Agreement

Climate-Smart Grown in SC Pilot Project

Participation Agreement for Farmers

I. Goal of Climate-Smart Grown in SC

The goal of the *Climate-Smart Grown in SC* Pilot Project is to increase the number of acres and number of farmers using climate-smart practices in South Carolina by providing technical assistance and financial incentives to farmers. Additionally, this project will employ marketing specialists to analyze potential market opportunities for the resulting products.

II. Purpose of this Participation Agreement

This participation agreement outlines the responsibilities of the Climate-Smart Grown in SC project team and farmers participating in one of the four commodity programs. The agreement is between the enrolled farmer and the coordinating institution. The coordinating institution will be responsible for enrollment of the farmer in the institutional vendor system for distribution of incentive payments.

III. Participant Information

Name of Grower:

Commodity Program: Peanut Systems

Coordinating Institution:

Phone Number:

Mailing Address:

Farm Address:

IV. Acreage and Practice Information

The above-named farmer is enrolled in *Climate-Smart Grown in SC* Pilot Project for the acreage and climate-smart practices listed below. The farmer will only be eligible for incentive payments after implementing these practices on the acres enrolled.

PLEASE NOTE: Acreage maximums have changed in certain commodities. The number of acres provided below is the actual number of acres enrolled in the program, which may be different from previously confirmed numbers.

Climate-Smart Practice	Description	Acres Enrolled in Practice	Incentive (Per Acre Per Year)
Cover Crops	Plant recommended cover crops compatible with production system	85	$100
Residue & Tillage Management	Crop residue left in the field and soil disturbing activities are limited	85	$50

V. Acknowledgement of Enrollment

Official enrollment in *Climate-Smart Grown in SC* shall commence upon the acknowledgement and return of this agreement. To complete this acknowledgement: phone, and both mailing and farm address information must be filled out, "Farmer Requirements" must be initialed, and the document must be signed by the farmer.

If you are completing this document online, a copy will automatically be sent to Climate-Smart Grown in SC and to you for your records. Agreements received via postal mail can be scanned and emailed to climatesmart@clemson.edu or mailed to "Climate-Smart Grown in SC" 113 Poole Ag Center, 130 McGinty Court, Clemson, SC 29634.

All agreements must be received by **Monday, June 26th.** Failure to remit acknowledgement of this agreement by the due date could result in removal from the program.

VI. Term of Agreement

Farmers are asked to remain enrolled in their program for at least 3 years. The agreement will cease when the farmer discontinues implementation of the climate-smart practices or when *Climate-Smart Grown in SC* Pilot Project concludes after a period of no longer than 5 years. This is not a binding agreement and farmers may discontinue participation in the program at any time. *Climate-Smart Grown in SC* also reserves the right to make changes to the terms of participation, add, and/or remove participants from the program.

VII. Roles and Responsibilities for All Participants

To receive incentive payments, farmers must fulfill specific requirements outlined by the pilot project. It is understood that both the enrolled farmer and *Climate-Smart Grown in SC* acknowledge responsibility and cooperate to fulfill the goals of this pilot project. Climate-Smart Program responsibilities and farmer requirements and responsibilities are as follows:

A. Requirements

The following requirements are necessary to remain enrolled in the pilot project AND receive incentive payments.

The farmer will: (please initial next to each requirement)

___ Fulfill all USDA-NRCS requirements for participation in Climate-Smart projects. *A separate email/letter will be provided with detailed information on meeting these requirements.* The requirements include:

- Provide the FSA farm number, tract, and field number(s) associated with the enrolled acreage to the project coordinator. If these numbers have not been generated or are not readily available, the farmer will request the information from FSA
- Have forms AD-2047 and AD-1026 on file with FSA
- Obtain a Producer Subsidiary Print from FSA office annually and provide to the project coordinator. **Subsidiary prints must reflect farmers are in compliance with FSA requirements.** Farmer who are non-compliant cannot receive incentive payments and will be removed from the program.
- Report specific information on marketing activities, requested by the program, annually

___ Complete enrollment in the vendor payment system for the coordinating institution (either SCSU or Clemson University) to receive incentive payments (further instructions will be provided)

___ Complete all surveys and/or requests for additional information by Climate-Smart Grown in SC within the specified timeline which will be provided

___ Coordinate with climate-smart personnel to acquire baseline soil samples of enrolled acreage. *All farmers must provide an initial soil sample collected by program personnel. A small group of participants will be asked to voluntarily allow additional research activities on your farm in a separate communication

___ Attend at least one [1] mandatory technical training coordinated by *Climate-Smart Grown in SC* each enrolled year. Details on training opportunities will be made available on the program website and via upcoming program communication.

___ Implement selected climate-smart practices in accordance with program guidelines within one year of official enrollment in the program and every consecutive year enrolled in the program

___ Coordinate with program personnel to verify practices and acreage ahead of receiving incentive payments

B. Responsibilities

Climate-Smart Grown in SC and participating farmers commit to cooperating with one another to address any issues as they arise and to resolve them based on the agreements stated in this participation agreement.

***Climate-Smart Grown in SC* will:**

a) Communicate key program information to participants via www.ClimateSmartSC.org, emails, postal mail, and/or phone calls
b) Provide technical support to participating farmers via trainings, on-farm consultation, and other resources
c) Coordinate with and obtain permission from participating farmers for all on-site visits
d) Keep participant information secure (protect and manage data, provide research information on request, maintain transparency and privacy, de-identify information)
e) Process incentive payments within 30 days of verification of implementation of practices
f) Provide 1099 forms and any other documentation associated with incentive payments to participants

Participating Farmers will:

a) Cooperate and coordinate with Climate-Smart program personnel for the purpose of on-site visits for data collection, technical support, or verification of practices
b) When applicable, obtain and review soil samples and familiarize themselves with recommendations that may impact the ability of crops to grow successfully on the enrolled acreage
c) Stay informed by regularly checking the website, emails, and voicemails for updates on key program information
d) Use technical service providers and other educational resources to best implement climate-smart practices
e) Maintain records that may be needed to verify practices, including but not limited to receipts, photographs, contact records
f) Not enroll acreage currently enrolled in other cost share program for the same practices
g) Enroll in the Sustainable U.S. Peanuts Initiative https://sustainableuspeanuts.org/sustainable-us-peanuts-initiative/

VIII. Signatures

Participating Farmer	Climate-Smart Grown in SC
	Climate-Smart Grown in SC
Name	Name
06/19/23	June 12, 2023
Date	Date

All agreements must be received by **Monday, June 26th**. Failure to remit acknowledgement of this agreement by the due date could result in removal from the program. If you are completing this document online, a copy will automatically be sent to Climate-Smart Grown in SC and to you for your records. Agreements received via postal mail can be scanned and emailed to climatesmart@clemson.edu or mailed to "Climate-Smart Grown in SC" 113 Poole Ag Center, 130 McGinty Court, Clemson, SC 29634.

HANDOUT-IMPLEMENTATION REQUIREMENTS FOR FARMERS

- **Forms to be filled** : Provide the FSA farm number, tract, and field number(s) associated with the enrolled acreage Have forms AD-2047 and AD-1026 on file with FSA
- **Participation agreement** must be signed and submitted annually
- **Producer Subsidiary Prin**t must be obtained from FSA office annually.
- **Report specific marketing activities** information, requested by the program (annually)
- **Complete vendor payment system** enrollment for the coordinating institution (either SCSU or Clemson University) to receive incentive payments
- **Complete all surveys / requests for additional information** by Climate-Smart Grown in SC
- Coordinate with Climate-Smart personnel to acquire baseline soil samples on enrolled acreage.
- Some participants will be asked to voluntarily allow additional research activities on your farm
- **One Mandatory technical training** coordinated by Climate-Smart Grown in SC must be attended each enrolled year.
- **Implement Climate-Smart practices within one year** of official enrollment and every consecutive year after.
- **Coordinate with program personnel** to verify practices and acreage

How Do You Get paid? (HANDOUTS)

CLEMSON
PROCUREMENT AND BUSINESS SERVICES

Climate-Smart Supplier Registration Assistance
(Individual receiving >$600 will receive a Business/Individual Invitation)

If you are going to be paid by Clemson University, you will need to register in our eProcurement system (aka buyWays/Jaggaer formerly Sciquest).

1. You will receive an email from support@sciquest.com with a link to register.
2. Click "Register Now"
3. You will be directed to the registration site. Click "Continue with Registration"
4. Enter your contact information, email, password and read terms and conditions, then click "Create Account" (REMINDER: All questions with an asterisk (*) require an answer)
5. Welcome to Supplier Registration page –
   a. Legal Company Name – For suppliers that are Individuals/Sole Proprietors and operate under their own names, the proper format is "Last Name, First Name" (Example: Smith, Joe). Click Next.
6. Company Overview Tab -
   a. Reminder – only the asterisk (*) fields are required.
   b. Fill in country of origin, legal structure (individual/sole proprietor), tax id type (social security number), then add your social security number. Click NEXT.
7. Business Detail Tab –
   a. NAICS Codes – click edit, search 111998. Click on 111998 – All Other Miscellaneous Crop Farming.
   b. Local Counties Services – click on edit, click whichever applies, then done.
   c. Click next.
8. Addresses Tab –
   a. Click add address, label it "farm" or whatever you'd like, click next.
   b. Check "Take Orders", "Receives Payment" and "Other" checked. Click next.
   c. Fill in all of the required (*) information. Click save changes.
   d. Click next.
   e. Enter new contact. Check ALL the boxes in the contact types (takes orders, receives payment, other and po failure). When you check all these boxes, you will skip the next "contact" section. Click save changes.
9. Contacts Tab –
   a. Will already be pre-populated from the address tab. Click next.
10. Diversity Tab –
    a. Click "Add Diversity Classification"
    b. Choose which is applicable or decline to answer then Done.
    c. Click next.
11. Payment Information Tab –
    a. Click "Individual Instructions" at the top tab.
    b. Click add payment information, choose Clemson TigerPay in dropdown.
    c. Fill in the details, click save changes.
    d. Payment Terms – click Net 30.
    e. Click the box next to the electronic payment confirmation.
    f. Click next.
12. Tax Information Tab –
    a. Click add tax document, then W-9.
    b. Add this year, then "download pre-populated tax document", this will autofill all the information you've entered.
    c. E-sign or print/sign/upload the signed W-9.
    d. Save Changes, then Proceed to Certify and Submit.
13. Certify and Submit Tab –
    a. Click the certification box, then submit.
    b. That's it – you will get an email saying you've completed the registration.
    c. Your registration now will be vetted/approved – which typically takes 3-5 days.
    d. Questions? Email supplier@clemson.edu or disbursements@clemson.edu

SC STATE UNIVERSITY

SC State University
Procurement Services Vendor's Application

Name of company:
Phone: State of SC Vendor #
Business License Number:
Website:
Doing Business As :
Address to which bids/quotes and purchase orders are to be mailed:

E-Mail address to place orders:

Fax number to place orders:
Accept P-cards (credit cards): Yes ☐ No ☐

Type of organization

Individual ☐ Corporation ☐ Non-Profit ☐
If corporation indicate which state

Name of officer(S), owner(s) and contact(s) in your organization

President		Products are sold:		
Vice President		Delivered	FOB	(If so FOB point)
Secretary		Invoice Terms (min. net 30)		
Treasurer				
Owner/Partner		Net Worth:		

Person authorized to sign bids, offers, quotes and contracts

Name:	Official Capacity:	Phone:	Fax:
Name:	Official Capacity:	Phone:	Fax:

List type of equipment, supplies, material, and/or service on which you desire to receive bid solicitations:

Type of Business

Category (check one)			
Manufacturer	☐	Regular Dealer	☐
Service Establishment	☐	Surplus Dealer	☐
Construction Concern	☐	Governmental	☐
Wholesale	☐	Educational	☐
Others	☐		

Business Enterprise (mark all that Apply)			
Small Business	☐	Minority	☐
Woman Owned	☐	African-American Owned	☐
Asian-American Owned	☐	Hispanic Owned	☐
Native American Owned	☐		

Are you certified? Yes ☐ No ☐
If yes, list agency and certification number

I certify that information supplied herein is correct and neither the Applicant nor any person in any connection with the applicant a principal or officer, so far as is known, is now debarred, suspended or otherwise declared ineligible by any agency of the Federal Government, agencies of the State of South Carolina or by South Carolina State University

Authorized signature:

Complete, Sign and Submit the following with this Application:
IRS W-9 form and SCSU Vendor Conflict of Interest Disclosure Form

Date:_____ Printed Name of Authorize
Signature:

Climate-Smart Measurement Technicians

Clemson & SC State Data Collection:

- Random select number of farms
- Data collected over the next 5 years

Measurements: How practices affect greenhouse gas emissions, soil, and forests

- Soil analysis (Baseline soil profiles, Soil health assessment, Soil microorganism activity)
- Greenhouse gas emissions
- Methane emissions
- Forest ecosystem carbon fluxes
- Ecological impacts

Market Development Team

Dr. Nathan Smith
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229-392-4938

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803-480-5345

The Market Research Team

Dr. Nathan Smith
Associate Professor and
Extension Economist
--Peanuts

Dr. Michael Vassalos
Associate Professor
--Consumer demand

Dr. Anastasia Thayer
Assistant Professor
-- Livestock

Dr. Felipe Silva
Assistant Professor
--Leafy greens

Activities and Tasks

- Enrolled producer survey
- Yearly follow-up survey
- Exit survey

Data collection for enterprise budget creation

Enterprise Budgets

Short list:

- Inputs
- Yield pre and post implementation
- Crop mix/Rotation

Detailed production practices from soil prep to harvest

Stay tuned for more information

Enterprise Budgets

Short list:

- Fertilizer application (rate, price, treatment, machinery and implement details, dates)
- Pesticide/herbicide/fungicide application (rate, price, treatment, machinery and implement details, dates)
- Labor

Detailed production practices from establishment to harvest

Stay tuned for more information

COOPERATIVE EXTENSION
College of Agriculture, Forestry and Life Sciences

PEANUTS-RU - NON-IRRIG

PEANUTS-RU-NI								
REVENUE			**UNIT**	**QUANTITY**	**$/UNIT**	**$/ACRE**	**$/LB**	**YOUR FARM**
	FUTURES PRICE	*MRKT*	LB		$0.2500			
	HARVEST BASIS		LB		$0.0000			
	EXPECTED CROP REVENUE			**4,000**	**$0.2500**	**$1,000.00**	**$0.25**	
	MARKETING FEES/CHARGES		LB	4,000	-$0.0015	-$6.00	$0.00	
	CHECKOFF	*$2/TON*	$	2.00	-$2.000	-4.00	-0.001	
	EXPECTED CROP REVENUE					**$990.00**	**$0.25**	
DIRECT EXPENSE			**UNIT**	**QUANTITY**	**$/UNIT**	**$/ACRE**	**$/LB**	**YOUR FARM**
	SEED		ACRE	1	$130.50	$130.50	$0.03	
	FERTILIZER		ACRE	1	$70.21	$70.21	$0.02	
	CROP PROTECTION		ACRE	1	$233.98	$233.98	$0.06	
	CROP INSURANCE	*MPCI RP NON IRRIG 65%*	ACRE	1	$6.73	$6.73	$0.00	
	DRYING/CLEANING		LB	4000	$0.0072	$28.60	$0.01	
	CUSTOM HIRE		ACRE	1	$22.00	$22.00	$0.01	
	SUPPLIES		ACRE	1	$0.00	$0.00	$0.00	
	LABOR							
	MACHINE LABOR		HRS	1.41	$12.50	$17.67	$0.00	
	OTHER LABOR						$0.00	
	MACHINERY OPERATING							
	FUEL		GAL	10.05	$4.67	$46.88	$0.01	
	LUBE, FILTERS		%	15%	$46.88	$7.03	$0.00	
	REPAIRS & MAINTAINCE		ACRE	1.00	$38.31	$38.31	$0.01	
	OTHER							
	INTEREST ON OP. CAP.		DOL.	$300.96	7.0%	$21.07	$0.01	
	TOTAL DIRECT EXPENSES					**$622.98**	**$0.16**	
RETURN AVAILABLE FOR OVERHEAD, DEBT SERVICE, & MANAGEMENT						**$367.02**	**$0.09**	
FIXED COSTS			**UNIT**	**QUANTITY**	**$/UNIT**	**$/ACRE**	**$/LB**	**YOUR FARM**
	LAND RENT		ACRE	1	$45.00	$45.00	$0.01	
	DEPRECIATION, TAXES, & INSURANCE							
	PREHARVEST MACHINERY		ACRE	1	$20.75	$20.75	$0.01	
	HARVEST MACHINERY		ACRE	1	$102.04	$102.04	$0.03	
	GRAIN DRYING		ACRE	1			$0.00	
	GENERAL OVERHEAD		% OF DIRECT	$622.98	5%	$31.15	$0.01	
	TOTAL FIXED COSTS					**$198.94**	**$0.05**	
	TOTAL COST					**$821.92**	**$0.21**	
RETURN AVAILABLE FOR DEBT SERVICE & MANAGEMENT						**$168.08**	**$0.04**	

CLIMATE-SMART GROWN IN SC

COOPERATIVE EXTENSION
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PEANUTS-RU - NON-IRRIG

PEANUTS-RU-NI							PAGE 2
SEED			UNIT	QUANTITY	$/UNIT	$/ACRE	0.00
	PEANUTS-RU		LBS	120.00	0.93	$111.60	$0.03
	PEANUTS-INOCULENT		OZ	14.00	1.35	$18.90	$0.00
TOTAL SEED						$130.50	$0.03

FERTILIZER	COMMON NAME	DESCRIPTION	UNIT	QUANTITY	PRICE	PER ACRE	0.00
	NITROGEN	46% UREA	LBS	0.00	$0.98	$0.00	$0.000
	PHOSPHORUS	46% SUPERPHOSPHATE	LBS	0.00	$1.11	$0.00	$0.000
	POTASSIUM	60% MURATE OF POTASH	LBS	0.00	$0.75	$0.00	$0.000
	BORON	BORON	LBS	0.50	$9.37	$4.69	$0.001
	MANGANESE	MANGANESE	LBS	0.20	$20.00	$4.00	$0.001
	SULFER	100% SULFUR	LBS	0.00	$0.60	$0.00	$0.000
	LIME	LIME BULK	TON	0.50	$50.03	$25.02	$0.006
	SPREADING	FERTILIZER SPREADING	ACRE	1.00	$10.00	$10.00	$0.003
	GYPSUM	GYPSUM BULK	TON	0.75	$22.00	$16.50	$0.004
	SPREADING	FERTILIZER SPREADING	ACRE	1.00	$10.00	$10.00	$0.003
	CU SOIL TEST	CLEMSON (10 ACRES PER SAMPLE)	ACRE		$0.60	$0.00	$0.000
TOTAL FERTILIZER						$70.21	$0.02

HERBICIDES	COMMON NAME	DESCRIPTION	TRIPS	UNIT	RATE	PRICE	PER ACRE	0.00
	glyphosate	GLYPHOSATE	1.00	QT	1.00	$15.00	$15.00	$0.004
	2,4-D	2, 4-D AMINE	1.00	PT	1.50	$2.40	$3.60	$0.001
	pendimethalin	PROWL H20	1.00	PT	2.00	$4.19	$8.38	$0.002
	flumioxazin	VALOR SX	1.00	OZ	3.00	$2.38	$7.13	$0.002
	imazapic	CADRE	1.00	OZ	4.00	$1.76	$7.03	$0.002
	paraquat	GRAMOXONE SL 2.0	1.00	PT	0.75	$3.88	$2.91	$0.001
	S-metolachlor	DUAL MAGNUM	2.00	OZ	16.00	$0.47	$15.12	$0.004
	storm	STORM	1.00	GAL	1.00	$0.00	$0.00	$0.000
	2, 4-DB	2, 4-DB 200	1.00	PT	12.50	$3.09	$38.59	$0.010
	lactofen	COBRA	1.00	OZ	8.00	$1.76	$14.06	$0.004
	clethodim	CLETHODIM 240	1.00	OZ	1.00	$0.98	$0.98	$0.000
			0.00		0.00			
TOTAL HERBICIDE							$112.80	$0.03
INSECTICIDES	COMMON NAME	DESCRIPTION	TRIPS	UNIT	RATE	PRICE	PER ACRE	0.00
	lambda-cyhalothrin	KARATE(hygrm Lambda-Cyhalothrin 1EC)	1.00	OZ	1.60	$1.09	$1.75	$0.000
	phorate	THIMET 20-G LrL	1.00	LB	5.00	$3.58	$17.90	$0.004
			0.00		16.00			
			0.00		0.00			
			0.00		0.00			
			0.00		0.00			
			0.00		0.00			
			0.00		0.00			
TOTAL INSECTICIDE							$19.65	$0.00
FUNGICIDES	COMMON NAME	DESCRIPTION	TRIPS	UNIT	RATE	PRICE	PER ACRE	0.00
	chlorothalonil	BRAVO	4.00	PT	2.00	$4.06	$32.52	$0.008
	prothioconazole+tebuconazole	PROVOST OPTI	3.00	OZ	10.00	$1.57	$47.01	$0.012
	flutolanil	CONVOY	2.00	OZ	16.00	$0.69	$22.00	$0.006
			0.00		0.00			
			0.00		0.00			
			0.00		0.00			
			0.00		0.00			
			0.00		0.00			
TOTAL FUNGICIDE							$101.53	$0.03
OTHER	COMMON NAME	DESCRIPTION	TRIPS	UNIT	RATE	PRICE	PER ACRE	0.00
			0.00		0.00			
			0.00		0.00			
			0.00		0.00			
			0.00		0.00			
			0.00		0.00			
			0.00		0.00			
			0.00		0.00			
			0.00		0.00			
TOTAL OTHER							0.00	$0.00
	TOTAL CROP PROTECTION:						$233.98	$0.06

CLIMATE-SMART GROWN IN SC

COOPERATIVE EXTENSION
College of Agriculture, Forestry and Life Sciences

PEANUTS-RU - NON-IRRIG

PEANUTS-RU-NI					PAGE 3
CUSTOM HIRE	UNIT	QUANTITY	PRICE	PER ACRE	0.00
HAULING	LB	4000	$0.003	$12.00	0.00
CROP SCOUTING	ACRE	1.00	$10.00	$10.00	0.00
TOTAL CUSTOM HIRE				$22.00	

SUPPLIES	UNIT	QUANTITY	PRICE	PER ACRE
	ACRE	1.00	$0.00	$0.00
	ACRE	1.00	$0.00	$0.00
TOTAL SUPPLIES				$0.00

MACHINERY & LABOR

Preharvest Operations

Drawn Implement with Tractor/Power Unit	Acres/Hour	Number of Times Over	Labor Use** (hrs/ac)	Fuel Use (gal/ac)	Repairs ($/ac)	Fixed Costs ($/ac)
ST Plant Rigid 8R-36 with Tractor (200-249 hp) MFWD 225	9.2	1.00	0.14	1.26	$3.37	$10.07
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
Total Preharvest Implement w/ Tractor/Power Unit			0.14	1.26	$3.37	$10.07

Self-Propelled Preharvest Equipment	Acres/Hour	Number of Times Over	Labor Use** (hrs/ac)	Fuel Use (gal/ac)	Repairs ($/ac)	Fixed Costs ($/ac)
Sprayer 600-825 gal 90' 250 hp	88.1	6.00	0.09	0.90	$1.24	$10.68
						$0.00
						$0.00
						$0.00
						$0.00
Total Self-Propelled Preharvest			0.09	0.90	$1.24	$10.68

Harvest Operations

Operation	Acres/Hour	Number of Times Over	Labor Use** (hrs/ac)	Fuel Use (gal/ac)	Repairs ($/ac)	Fixed Costs ($/ac)
Peanut Dig/Inverter 6R-36 with Tractor (180-199 hp) MFWD 190	5.3	1.00	0.23	1.83	$ 9.57	$ 21.62
Pull-type Peanut Combine 6R-36 with Tractor (180-199 hp) MFWD 190	3.3	1.00	0.38	2.99	$ 18.76	$ 66.07
Peanut Wagon 21' with Tractor (120-139 hp) 2WD 130	2.2	1.00	0.57	3.07	$ 5.37	$ 14.35
				0.00		$ -
				0.00		$ -
				0.00		$ -
				0.00		$ -
Total Harvest Implement w/ Tractor/Power Unit			1.19	7.88	$ 33.70	$ 102.04

Self-Propelled Preharvest Equipment	Acres/Hour	Number of Times Over	Labor Use** (hrs/ac)	Fuel Use (gal/ac)	Repairs ($/ac)	Fixed Costs ($/ac)
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
Total Self-Propelled Harvest			0.00	0.00	$0.00	$0.00

CLIMATE-SMART GROWN IN SC

Expected Output

Production Information:

- Enterprise budgets to help inform adoption and decision-making
- Fact sheets and trainings with Extension teams and producers.

Market Information:

- Consumer willingness-to-pay for “climate-smart” commodities
- Barriers to industry (restaurants, specialty stores, etc.) purchase of “climate-smart” commodities

27 Project Partners Statewide

CLIMATE-SMART GROWN IN SC

Project Coordination Team

	Clemson University	SC State University
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QUESTIONS?

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Website: www.climatesmartsc.org


CLIMATE-SMART
GROWN IN SC
SC
STATE
UNIVERSITY
1896
Residue and Tillage Management

Peanut Season (2023)

- ❑ How many people are still planting their peanuts conventionally?
- ❑ How many people are planting fall cover crops prior to planting peanuts?
- ❑ How many people strip tilled their field before planting peanuts?

What is Residue and Tillage Management?

- The Practice of managing the amount, orientation, and distribution of crop and other plant residue on the soil surface year-around, while limiting soil-disturbing activities used to grow and harvest crops

- Tillage applications should only be performed to manage crop residue if it is necessary, and evaluation of all Climate-Smart aspects should be considered prior to implementation

Why is This Practice Being Considered for Peanuts in SC?

- ❑ To gain knowledge of Climate-Smart practices
- ❑ Provide research and data
- ❑ Adoption of Climate-Smart practices
- ❑ Serve our small and underserved farms

Residue and Tillage Management

Climate-Smart Goals:

- ❑ Evenly distribute plant residue on the soil surface year-around
- ❑ Don’t incorporate residue in the soil
- ❑ Try to reframe from performing a tillage operation on the harvest residue

Soil and Environmental Benefits

❑ Soil Benefits:

- ✓ Maintains or increases soil health & organic matter content
- ✓ Improves soil tilth and aggregate stability
- ✓ Increases or maintains organic matter content
- ✓ Sequesters additional carbon in the soil

❑ Other Benefits include:

- Reduces sheet, rill, & wind erosion & excessive sediment in surface waters
- Reduces tillage-induced particulate emissions
- Reduces energy use (fuel)

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Planning Stages & Evaluation

What stage of the growing season are we in currently ?

<u>Operations to be thinking about:</u>

- Crop residue management/ Fall cover crop selection
- Orientation of strips and timely Planting
- Crop selection for the spring
- Weeds and pest threshold levels

Planning well in advance is essential to being successful

Residue Management Considerations For SC

?

Residue Management Recommendations for SC

All Crop Residues: (Peanuts, Corn, Cotton, etc.)

- ❑ Proper combine size (header width) and adjustment
- ❑ Install straw choppers/ spreaders on combine
- ❑ Adjust combine header height (6-15” stubble)
- ❑ Mow cotton stalks to proper height
- ❑ Roll cotton stalks (front mounted)
- ❑ Clean combines/pickers between fields

CLIMATE-SMART GROWN IN SC

What Not To Do When Managing Residue

- ❑ Residue should not be burned
- ❑ Residue should not be plowed using heavy tillage
- ❑ Residue should not be removed by baling or grazing
- ❑ Residue should not be shredded after harvest




CLIMATE-SMART GROWN IN SC

What if Crop Residue is Too Heavy?

What if Crop Residue is Too Heavy?

Is it acceptable to have a tillage operation after peanuts (or other cash crops) once harvest operations end?

YES, If it's Necessary or is the Only Option

Acceptable Tillage & Other Methods Used to Manage Difficult Plant Residue

- ❑ Leveling disk (tandem disk), chisel plow, field cultivator
- ❑ Vertical tillage tool/ turbo till
- ❑ Flail mower, rotary mower, or crop shredder
- ❑ Physical removal



Closing Residue and Tillage Remarks

- ❑ Each residue management technique is going to differ between farms
- ❑ It's important to always align your techniques with practices that are outlined in the Climate-Smart grant

Key Take-Aways:

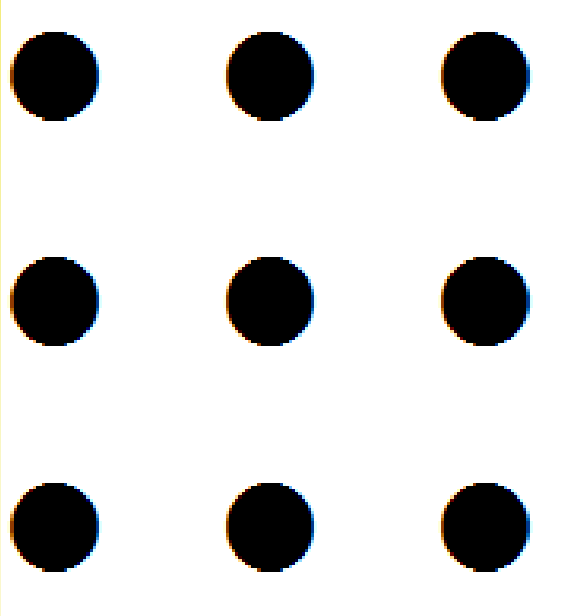
- Increase and allow plant residue to remain on the soil surface year-round and reduce tillage applications
- Plan and evaluate all residue management operations in advance during the growing season - this is key to being successful in this project
- Clemson and SC State are here to serve you!

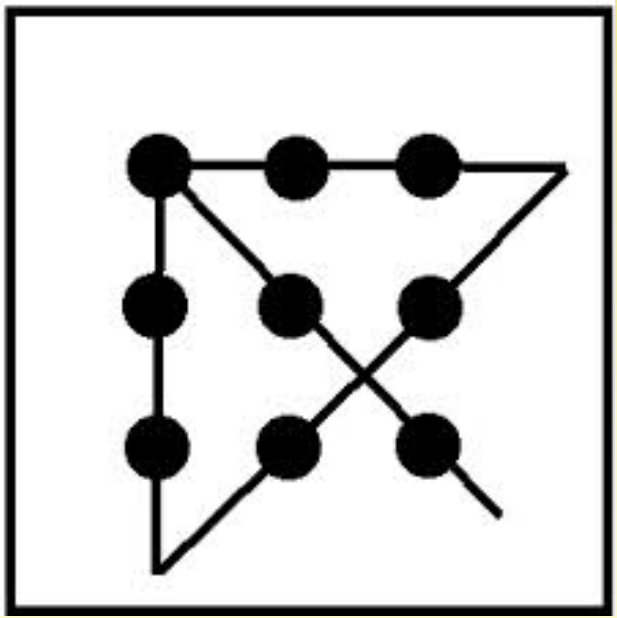
QUESTIONS?

Email: climatesmartpeanut@clemson.edu

Website: www.climatesmartsc.org

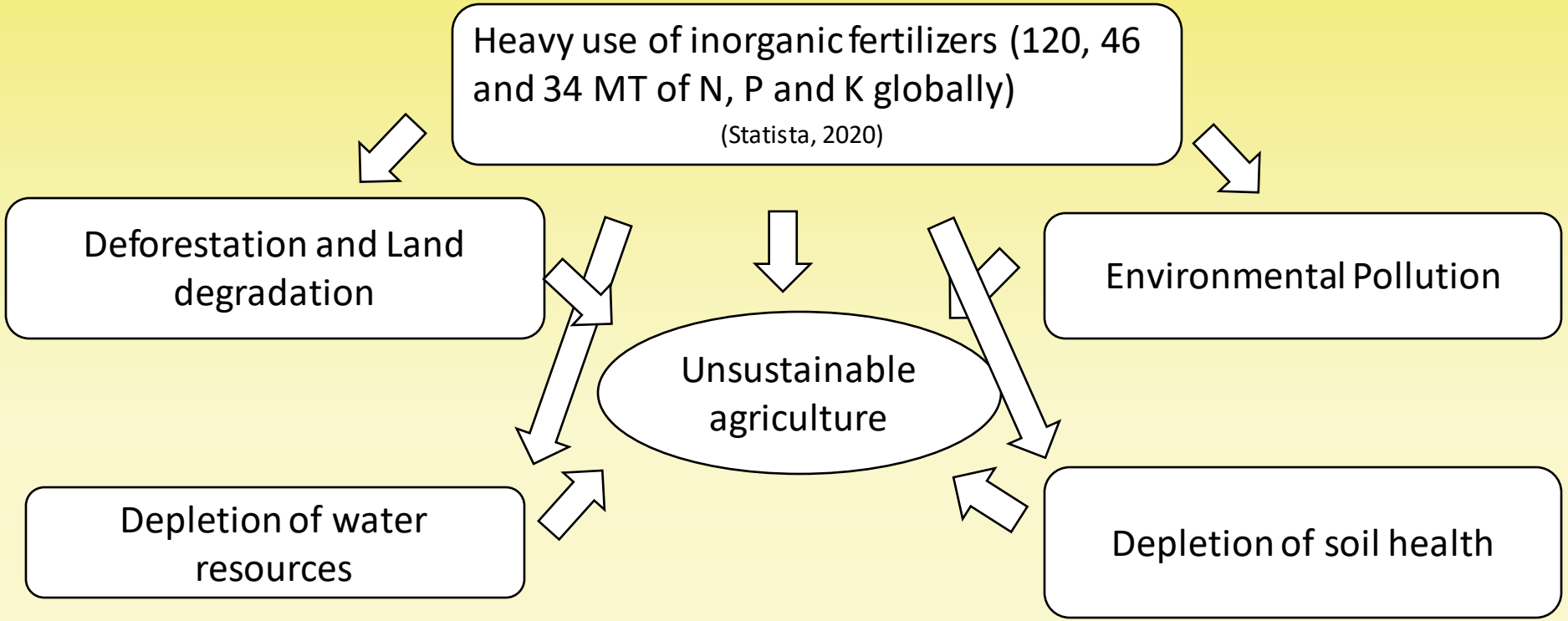
9 Dots Riddle





How to connect these 9 dots with 4 straight lines without lifting the pen?

Modern Agriculture Trends



Credit: Dr. Bhupinder S. Jatana

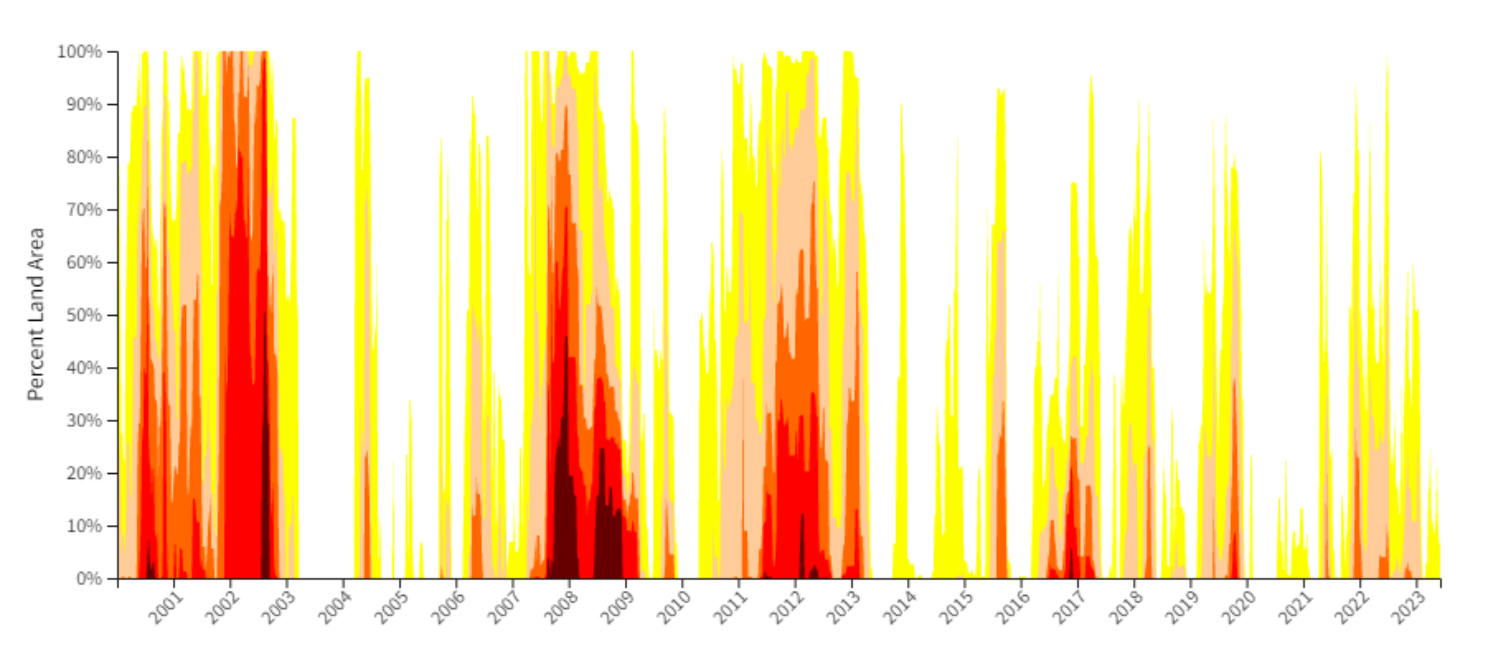
This soil is naked, hungry, thirsty and running a fever!

Ray Archuleta, 2007

Production issues in Southeast Agriculture

- ❑ Highly degraded agricultural soils in the Southeast
- ❑ Low OM content (**< 1%** most soils)
- ❑ Limited water holding capacity
- ❑ Poor soil structure and fertility
- ❑ Climatic conditions (Intense and poorly distributed rainfall)
- ❑ Compacted soils (limit root penetration and encourage drought stress)
- ❑ Intensive tillage (↓OM, ↑production cost)
- ❑ Drought vulnerability

Drought Vulnerability in SC



Drought is becoming the NEW NORMAL

CLIMATE-SMART GROWN IN SC

Cover Cropping

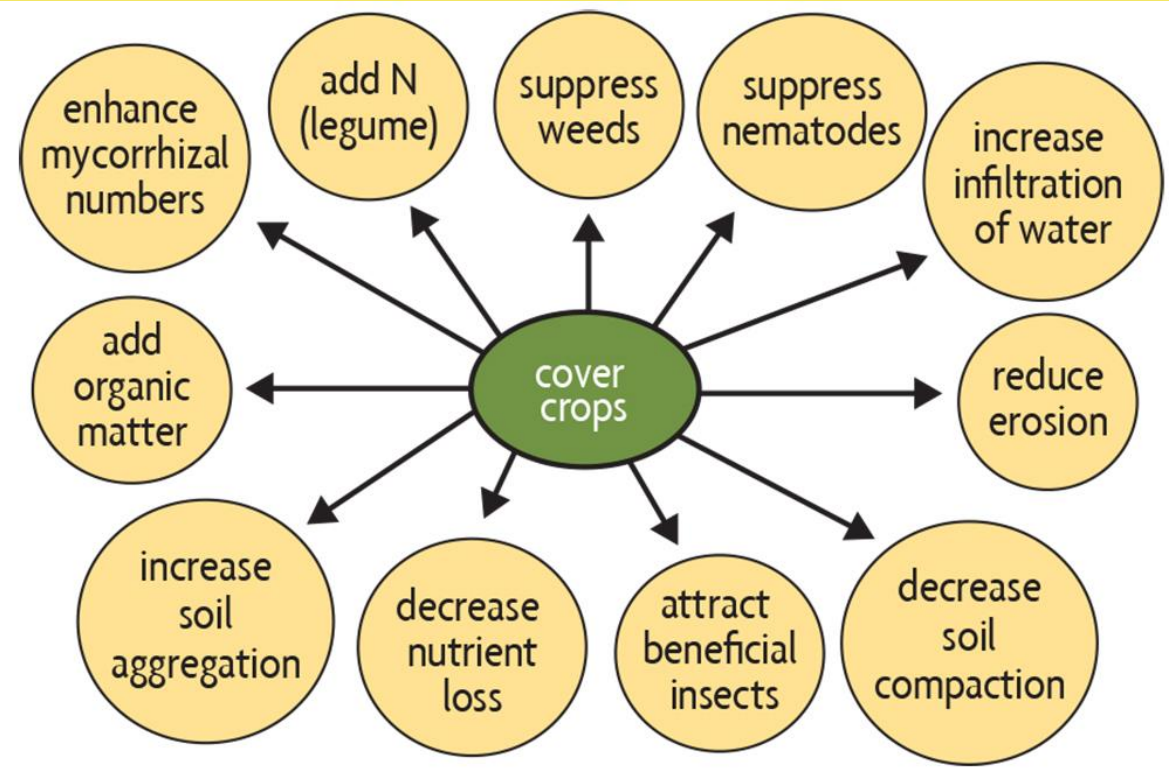
Photo Credit: From Ricardo St Aime PhD research

What is the Definition of a Cover Crop?

A cover crop in Agriculture is a type of plant that is Intentionally grown between main crops to cover the soil rather than for the purpose of harvesting. (Sustainable Agriculture Research & Education, 2015).

Cover crops extend the *green period* and reduce the brown gap or fallow period in agricultural fields

What Can They Do For You?



Cover crops can do ALL THESE THINGS

Source: SARE- Building Soils for Better Crops, 2020

Types of Cover Crops

Types of Winter Cover Crops

Small gains /Grass

- ❑ Winter rye
- ❑ Oats
- ❑ Wheat
- ❑ Triticale
- ❑ Barley
- ❑ Annual ryegrass

Grasses provide biomass for organic matter and late fall or early spring livestock grazing.

Brassicas

- ❑ Radish
- ❑ Turnips
- ❑ Mustard
- ❑ Rapeseed (Canola)

These plants grow rapidly after fall planting to suppress weeds and break up soil compaction.

Legumes

- ❑ Crimson clover
- ❑ Austrian winter pea
- ❑ Hairy vetch
- ❑ Common vetch

These plants can achieve biological nitrogen fixation. Avoid legumes if there is not at least a 2-year peanut rotation.

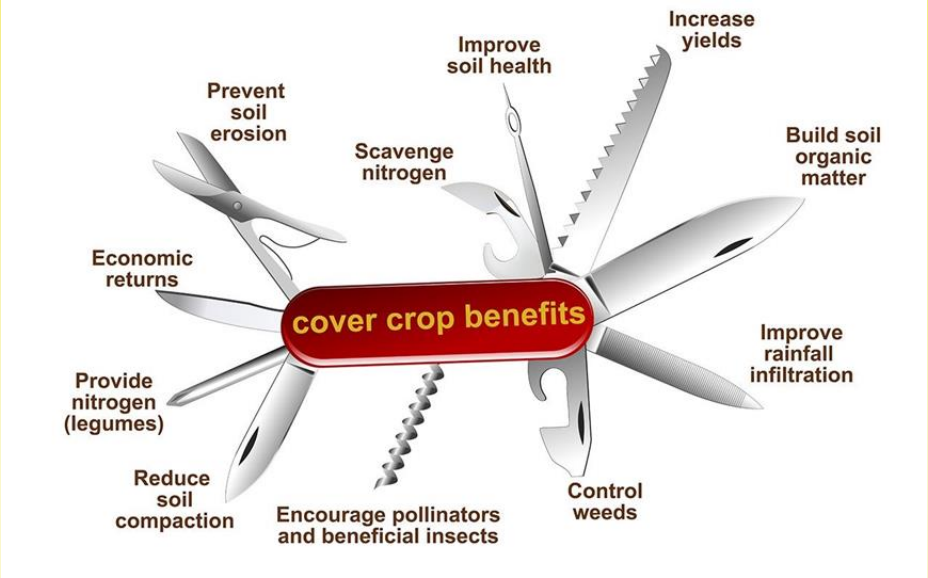
CLIMATE-SMART GROWN IN SC

Common Cover Crop Varieties

Winter Cover Crop Types		Common Varieties (Year Released)
Functional group	**Species**	
Small grains/ Grasses	Cereal rye	Elbon (1956), FL401 (1986), Wrens Abruzzi (1970), Maton II (2007)
	Oats	Coker 277, Graham (CU), Horizon 720
	Winter wheat	AGS 2033 , Pioneer 26R94, SS8641
	Barley	Amaze 10, Secretariat, Thoroughbred, Marouetta
	Black oats	SoilSaver
	Triticale	FL08128 triticale, NF 201, Trical 342
	Ryegrass	Gulf , Big Boss , Attain, Marshall, Credence, Earlyploid
Brassicas (Often part of mixtures)	Radish	Aerifi, Daikon, Smart, Sod buster, Nitro , Nematode, Defender
	Turnip	Purple Top- White G, Jackpot, GO-TRT
	Rapeseed / Canola	Hekip
	Mustard	Florida Broadleaf, Southern Giant Curled
Legumes (Often part of mixtures)	Crimson clover	Dixie (1953) , AU Sunup (2012) , AU Sunrise (2000), AU Robin (1991), Kentucky Pride (
	Austrian winter pea	Fenn, Romack, Specter CAH-11, Survivor, Whistler, Forstmaster
	Hairy vetch	Villana, Lana Woolypod (1960), AU Early Cover, AU Merit, Purple Bounty

Source: Managing Cover Crops Profitably, 3rd Edition / Southern Cover crop Council

There are no “do-it-all” cover crops!



No single cover crop species will be APPROPRIATE and EFFECTIVE to meet <u>all</u> your OBJECTIVES

Choosing Cover Crops

1. What are your goals, based on the needs of the field/farm?
   - Different cover crop species provide different benefits…
2. What is your current cropping/tillage system?
   - Which crops precede and follow your cover crops?
   - How much time can your cover crop can grow?
   - Herbicide carryover species?
3. Where are you located?
   - Location, climate, soil (type, pH), and other growing conditions (soil nutrient and water)?
4. What is your experience level?

Is Your Goal to Build Soil?

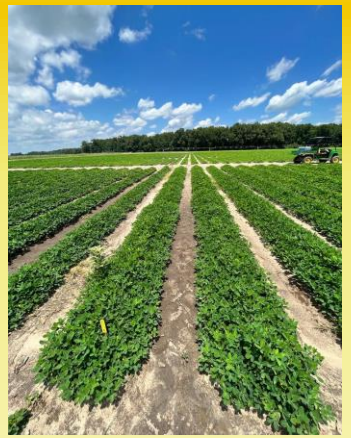
Grass /Small grains

- ❑ Cereal Rye
- ❑ Wheat
- ❑ Barley
- ❑ Triticale

Brassicas

- ❑ Radish
- ❑ Mustard

Cover crops shall be planted as early as possible and terminate as late as practical.



Cornfield which has been impacted by over an inch of rain. This shows the impact cover crops can have on soil structure, soil protection, and reduction of runoff and soil erosion.
Image Credit: S. Duiker, Penn State Extension.

CLIMATE-SMART GROWN IN SC

Is Your Goal to Scavenge Nutrients?

Grass /Small grains

- ❑ Cereal Rye
- ❑ Oats
- ❑ Wheat
- ❑ Barley

Brassicas

- ❑ Radish
- ❑ Turnip
- ❑ Rapeseed

Terminate these cover crops as late as practical to maximize plant biomass production and nutrient uptake

Photo by Kritsanee Iamjud

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What is the Grower Experience Level?

- ❑ **New to cover crops** = wheat (grass) + brassicas
- ❑ **Some experience** = rye + brassicas
- ❑ **A lot of experience** = multi-species mixtures

“Just try something: Start small and build from there.”

What is Your Cash Crop?

- ❑ **Peanuts :** any small grain **(rye usually the best) / mixtures of grass + brassicas**
- ❑ **Corn:** **small grains, legumes, or both**
- ❑ **Cotton:** **cereals, legumes, or both**
- ❑ **Vegetables:** **most winter cover crops, legumes, brassicas**

Select species compatible with other components of your cropping system

Cover Crop Goals

Winter Cover Crop Types		Goals						
Functional group	**Species**	**Residue persitence**	**Erosion control**	**Weed suppression**	**Soil building**	**Compaction reduction**	**Nematode control**	**Nitrogen production**
Small grains/Grasses	Cereal rye	Excellent	Excellent	Excellent	Excellent	Good	Good	Poor
	Oats	Good	Very good	Excellent	Good	Fair	Poor	Poor
	Winter wheat	Good	Very good	Very good	Very good	Fair	Fair	Poor
	Barley	Excellent	Excellent	Very good	Very good	Fair	Fair	Poor
	Black oats	Good	Very good	Excellent	Very good	Fair	Excellent	Poor
	Triticale	Excellent	Excellent	Excellent	Very good	Fair	Good	Poor
	Ryegrass	Very good	Very good	Good	Very good	Fair	Good	Poor
Brassicas (Often part of mixtures)	Radish	Fair	Very good	Excellent	Very good	Very good	Very good	Poor
	Turnip	Fair	Very good	Very good	Very good	Very good	Very good	Poor
	Rapeseed / Canola	Good	Very good	Very good	Good	Good	Very good	Poor
	Mustard	Fair	Very good	Very good	Very good	Good	Very good	Poor
Legumes (Often part of mixtures)	Crimson clover	Good	Very good	Very good	Very good	Fair	Fair	Excellent
	Austrian winter pea	Fair	Very good	Good	Good	Fair	Good	Excellent
	Hairy vetch	Fair	Good	Good	Very good	Fair	Fair	Excellent

Source: Managing Cover Crops Profitably, 3rd Edition / Southern Cover crop Council

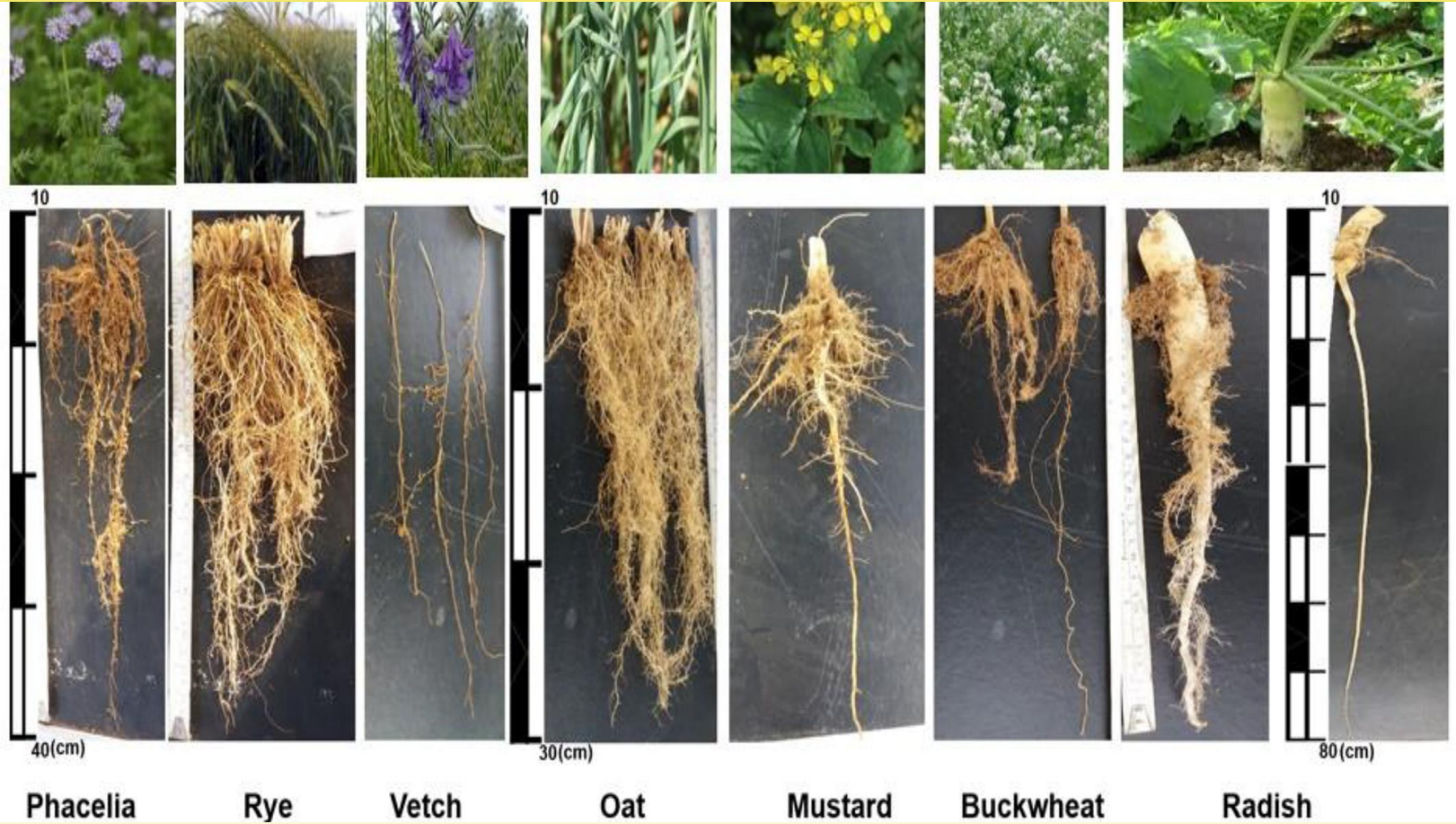
CLIMATE-SMART GROWN IN SC

Cover Crop Potential Advantages

Winter Cover Crop Types		Potential Advantages				Notes
Functional group	**Species**	**Nitrogen scavenger**	**P&K scavenger**	**Attracts beneficials**	**Quality grazing**	
Small grains/Grasses	Cereal rye	Excellent	Very good	Fair	Good	
	Oats	Very good	Fair	Poor	Good	
	Winter wheat	Very good	Very good	Fair	Very good	
	Barley	Very good	Good	Good	Very good	
	Black oats	Very good	Fair	Poor	Good	Coastal plain species
	Triticale	Very good	Good	Poor	Good	
	Ryegrass	Very good	Good	Fair	Excellent	Difficult to terminate
Brassicas (Often part of mixtures)	Radish	Excellent	Very good	Fair	Good	
	Turnip	Good	Very good	Fair	Good	
	Rapeseed / Canola	Very good	Fair	Good	Good	
	Mustard	Good	Good	Good	Good	
Legumes (Often part of mixtures)	Crimson clover	Good	Good	Very good	Excellent	Dixie variety can host some pests
	Austrian winter pea	Fair	Fair	Very good	Very good	30-40lbs in mixtures
	Hairy vetch	Fair	Good	Excellent	Good	

Source: Managing Cover Crops Profitably, 3rd Edition / Southern Cover crop Council

Cover crops are ALL about the ROOTS



Planting Cover Crops: Considerations

Ideal Cover Crop (Management or Selection) Criteria

- Plant cover crop as early as possible (inter-seeding)
- Use multi-species blend that is already adopted in your region
- Produces large amounts of biomass in a short period **(benefits)**
- Consider avoiding species that can be a host for pests and diseases of cash crops
- Use easily terminated species – mechanically or chemically
- Fits into your rotation schemes
- Is economically viable

Cover Crop Management

Timing, timing, timing…

- ❑ Cover crop planting
- ❑ Cover crop termination
- ❑ Cash crop planting

Establishing and Managing Cover Crops

For establishing proper stand :

- ❑ Maintain soil fertility and pH at optimum levels **(routine soil tests)**
- ❑ Plant **good-quality** seed at the **recommended seeding rate**
- ❑ Plant your cover crop **early and when adequate moisture is available**
  (2- 4 weeks before 1st frost)
- ❑ **Achieve good seed-to-soil contact**
- ❑ **Fertilize:** **Apply 30 lb. N/ac in early fall or spring**

Rye biomass in early March.
Left side: fertilized in fall
Source: SARE-Conservation tillage systems in the Southeast, 2020

Planting Methods

- **Drilling :** Better seed-to-soil contact
  - Planting depth: 1-1.5 inches
  - Row spacing: 7.5 inches
- **Broadcast:** Faster but need more seeds
  - Success depends on timely rainfall
- **Aerial seeding:** Option to plant before cash crop harvest for lager fields

"It doesn't matter how you plant your cover crop as long as you get them planted"

Steven Godwin, Jay, FLA


No-till Grain drill


Spreader

Ensure Successful Planting with Drill

- ❑ **Check the seed boxes and drop tubes**.
- ❑ **Consult the rate chart and calibrate**
- ❑ After calibration, check that **seed is dropping from all the tubes** at the **correct depth,** and the **furrow is being closed**
- ❑ **Adjust for proper seed depth**

No-till drill

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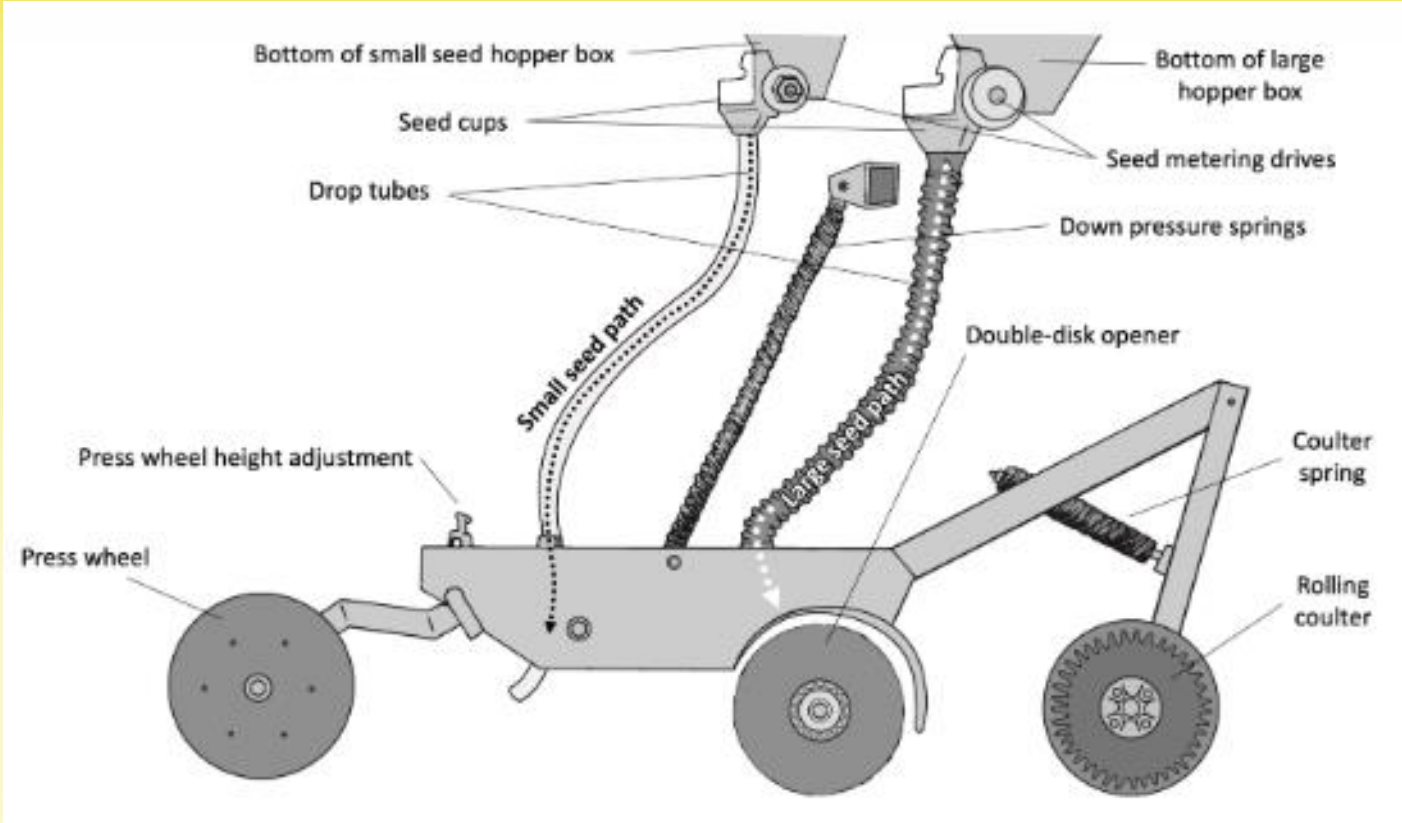
Planter Setup and Maintenance Checklist



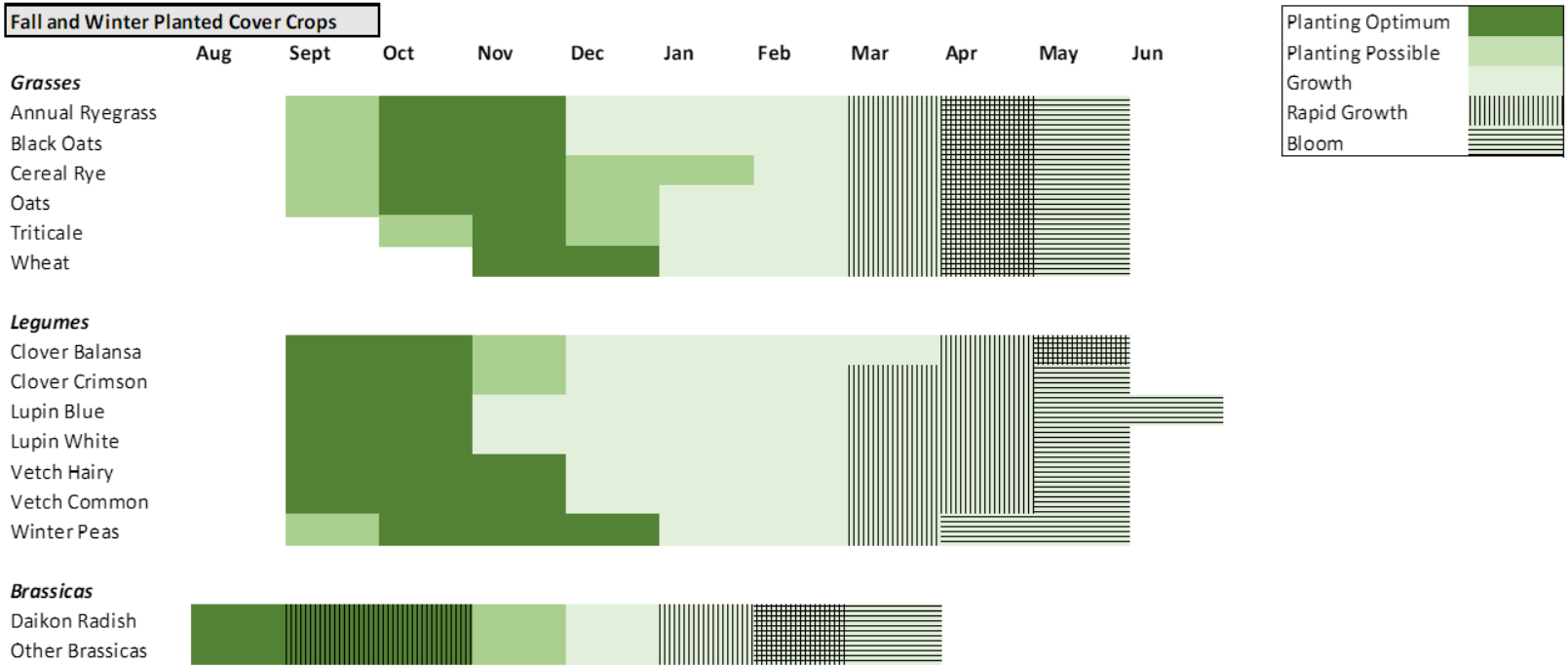
Ensure Successful Planting with Spreader

- ❑ Check soil moisture
- ❑ Increase seeding rates
- ❑ Take caution when mixing with other products
- ❑ Calibrate
- ❑ Incorporate seed

CLIMATE-SMART GROWN IN SC

Planting Dates

Cover Crop Planting, Growth and Bloom Windows for Row Crop Production in the Coastal Plain



SC Seeding Rates, Depths, and Planting Methods

Cover Crop Seeding Rates and Planting Dates

Winter Cover Crop Species	Seeding rate (lb/A, for monocultures)			Seeding depth (inches)	Planting date range	
	Drilling	Broadcasting	Aerial seeding		Piedmont	Coastal plain
Cereal rye	60-120 **(100)**	90-160	150	¾–2	Sept. 15 - Oct. 15 **(Early Oct.)**	Sept. 1 - Oct. 15 **(Mid-Oct.)**
Oats	60-100 **(100)**	110-120	N/A	½–1½	Sept. 15 - Oct. 15 **(Early Oct.)**	Sept. 30 - Dec. 15 (**Mid-Oct.)**
Winter wheat	60-120 **(100)**	60–150	N/A	½ -1½	Sept. 15 - Oct. 15 **(Early Oct.)**	Oct. 15 - Nov. 1
Barley	50-100 **(100)**	80-125	N/A	¾ – 2	Sept. 15 - Oct. 15 **(Early Oct.)**	Oct. 15 - Nov. 1
Black oats	50-70 **(60)**	100	N/A	1 - 1½	Sept. 15 - Oct. 15 **(Early Oct.)**	Mid-October
Triticale	60-100	90-120	N/A	1 - 2	Sept. 15 - Oct. 15 **(Early Oct.)**	Mid-October
Ryegrass	10-20	20-30	30-50	0 – ½	Sept. 15 - Oct. 15 **(Early Oct.)**	Mid-October
Radish	8-13 **(10)**	8-20	N/A	¼ - ¾	Aug.1 - Oct. 1 **(Late Sept.)**	Aug. 15 – Oct. 15 **(Early Oct.)**
Turnip	5-12	8-15	N/A	¼ - ¾	Aug.1 - Oct. 1 **(Late Sept.)**	Aug. 15 – Oct. 15 **(Early Oct.)**
Rapeseed / Canola	5-10	8-14	N/A	¼ - ¾	Aug.1 - Oct. 1 **(Late Sept.)**	Aug. 15 – Oct. 15 **(Early Oct.)**
Mustard	5-12	10-15	N/A	¼ - ¾	Aug.1 - Oct. 1 **(Late Sept.)**	Aug. 15 – Oct. 15 **(Early Oct.)**
Crimson clover	15–20 **(18)**	20–30	N/A	¼ – ½	Aug. 25 - Oct. 1 **(Late Sept.)**	Sept. 1 - Oct. 15 **(Early Oct.)**
Austrian winter pea	50–90 **(70)**	*90-100* ***(but not recommended)***	N/A	1½ - 3	Aug. 25 - Oct. 1	Sept. 1 - Oct. 15 **(Early Oct.)**
Hairy vetch	15–20	25–40	N/A	½ - 1½	Aug. 25 - Oct. 15	Sept. 1 - Oct. 15 **(Early Oct.)**

(optimum rates and dates in bold)

Source: Managing Cover Crops Profitably, 3rd Edition / Southern Cover crop Council

CLIMATE-SMART GROWN IN SC

Select species and planting dates that will not compete with the production crop yield or harvest

Cover Crop Mixtures

- ❑ Combination of two or more species
- ❑ Address multiple benefits together at once
- ❑ Adapt to different soil fertility levels
- ❑ Nutrient management:
  - N leaching in winter months
- ❑ Management: **Challenging!**
  - Planting method and optimum date range / Uniform stand
  - Termination timing and methods / Decomposition rate
- ❑ Cash crop rotation:

Plant mixtures that benefit your cash crop and soil biology

Hairy vetch, cereal rye, blue lupins, crimson clover, and daikon radish cover crop mix grown in a cotton field at Edisto Research and Education Center, Blackville, South Carolina.

Image credit: Mandeep Singh, Clemson University.

CLIMATE-SMART GROWN IN SC

When Designing Cover Crop Mixtures, CONSIDER:

- ❑ Maximum diversity
  - **Complementarity and synergy**
- ❑ Species growth form and habits
  - **Similar maturity for proper termination**
- ❑ Planting method
  - **Cover crop species are not all suitable for all planting methods**
  - **The bigger the seed, the more seed-to-soil contact is important**
- ❑ Soil fertility
- ❑ Seeding rates
  - **Divide full stand seeding rate for each species by the number of species in the mixtures**
  - **Avoid species dominance in mixtures (cereal rye)**
- ❑ Termination timing

Combination of herbicides / similar reproductive stage for roller/crimping

- ❑ Cost : **Create economical mixes (large acreage)**

Cover crop mixture of legume, grass and brassica species established at the Macon Ridge Research Station, Winnsboro, Louisiana.

Photo by Kritsanee Iamjud

Some Questions About Cover Crop Mixes

1. Can a mix of species with different seed sizes and optimum planting depths be planted successfully?

Seed distribution will not be perfect, but it will be reasonable

2. What equipment was best for seeding?

Several options possible, but no-till drills seem to have the best success

3. Is there difference in aboveground biomass of mixes compare to single-species cover crops?

In general, aboveground biomass is the same overall although variation can be observed by field and year

Growing cover crop mixtures are more sustainable than single cover crop in a peanut production system

CLIMATE-SMART GROWN IN SC

Cover Crop Termination Considerations

When Should I Terminate My Cover Crop?

- ❑ Cash crop planting time?
  - **•Terminate cover crops before crop emergence.**
  - **•if dry conditions arise near termination time, Terminate earlier to conserve moisture**
- ❑ How wet is the soil ?
- ❑ Most cover crops are terminated most easily when they have begun to bloom **(In March and April)**

Terminate before cash crop planting

CLIMATE-SMART GROWN IN SC

How Should I Terminate My Cover Crop?

- ❑ Spraying with herbicides (burndown herbicide)
- ❑ Rolling/ crimping
- ❑ Mowing
- ❑ **Winter kill (frost kill)**
- ❑ **Heavy grazing (Hay/Silage)**
  - **As long as the planned amount is available at the time of termination to meet the purpose**

Effective cover crop termination is IMPORTANT

Burndown Herbicides

- ❑ Burndown herbicides: **Highly effective**
  - ✓ **Cover crop species, height, and growth stage**
  - ✓ **Following cash crops**
  - ✓ **Appropriate herbicide rate**
  - ✓ **Weather conditions**
- ❑ Broad-spectrum herbicides
- ❑ Grass and broadleaf herbicides
- ❑ Rotate your modes of actions to prevent weed resistance
- ❑ Before the boot stage or once seedheads are visible **(no seeds, no weeds)**

Termination Method : Herbicide burndown
Source: Southern cover crop Council

Scout the field to ensure SUCCESSFUL termination of cover crop

CLIMATE-SMART GROWN IN SC

Mechanical Termination

Effective Rolling/Crimping

- ❑ For tall cover crops
- ❑ Appropriate growth stage
  (soft dough stage for rye)
- ❑ Appropriate height (> 4 ft for rye)
- ❑ Firm soil surface
- ❑ Should be done approximately 3 weeks before planting a cash crop
- ❑ Parallel to planting direction (mat)
- ❑ Can be combined with herbicide spraying

Termination Method : Rolling/Crimping
Source: Claudio Rubione, University of Delaware

Rollers for Terminating Cover Crops

Experiment with different Rollers/crimpers and recurrent rolling

Two-stage roller/crimper.
Kornecki, 2011. US patent no.: 7,987,917 B1.

Four-stage roller/crimper. Adopted by an organic farm in Great Britain. Kornecki, 2011, US patent no.: 7,987,917 B1.

Spiral roller/crimper.

Smooth drum roller /w glyphosate.

Termination rates for rye rolled 3-times one week after rolling (rye biomass: 9750 kg ha^{-1})

Two-stage roller/crimper; four stage roller/crimper; curved roller/crimper and smooth drum roller with herbicide sprayer.

Credit: USDA-ARS, National soil Dynamics Lab, Auburn, AL

Mechanical Termination

Mowing: After flowering stage

- Manages large amount of biomass quickly
- Fast residues break down
- May affect planting equipment
- Cut must be below all growing points of the plants
- Less effective than roller/crimping
  (regrowth of some species)

Termination Method : Mowing
Source: Southern cover crop Council

Winter or Frost Kill

- ❑ Black oats **(<19°F)**
- ❑ Oats **(<10°F)**
- ❑ Radishes **(<25°F)**

Winter-killed radish.
Credit: Sjöerd Duiker, Penn State University

None of these cover crops reliably winterkill in the Coastal Plain

“Go-to”- Cover Crop Options for SC Peanut Production

“Go-to” Cover crop mixtures	Seeding rates (lb./Acre)
Fall/Winter season Mixture	
Oats, Daikon radish	50, and 6 respectively
Rye and clover before cotton (Godwin Steven, Jay, FLA)	12 and 10 respectively
Single oats before peanuts (30 units of nitrogen as fertilizers in Feb.)	120
Daikon radish (6 lbs. in blend mixture for a better establishment)	20
Oats, rye, ryegrass (after peanut harvest) before cotton (Grazing)	50, 20, and 10
Rye, oats, ryegrass, and crimson clover (early grazing before cotton)	100, 100, 20, and 20 respectively
Rye, Oats, vetch, crimson clover, daikon radish, and rapeseed before corn	18, 12, 4,5,2, and 1 respectively
Rye, vetch, clover, winter pea, and radish (before cotton)	25, 5, 8, 12, and 1.5 respectively
Rye and lupine	30, and 15 respectively
Rye (30 units of nitrogen as fertilizers in Feb.)	100

Avoid legumes if it will be less than two years until peanut will be planted in that field

CLIMATE-SMART GROWN IN SC

"Go-to" Cover crop mixtures	Seeding rates (lb./Acre)
Fall/Winter season Mixture	
Cereal rye, oats, wheat, daikon radish, and purple top turnip	10, 10, 10, 2, and 2 respectively
Rye, Oats, Vetch, Turnip, Austrian Peas, and Daikon Radish	12, 13, 5, 2, 15, and 2, respectively
Cereal Rye, Crimson Clover, White Cahaba Vetch, and Daikon Radish	20, 4, 6, and 2, respectively
Rye, Oats, Crimson Clover, Vetch, Rapeseed, and Daikon Radish	8, 8, 6, 6, 1, and 1, respectively
Crimson Clover, Vetch, and Austrian Peas	5, 5, and 25, respectively
Spring/Summer Season Mixture	
Sorghum Sudangrass, Daikon Radish, and Cowpeas	10, 2, and 15, respectively
Pearl Millet, Peredovik Sunflower, and Cowpeas	8, 2, and 35, respectively
Cowpeas and Forage Soybeans	20 and 20, respectively
Single Species: Sunn hemp	15

From Cover crops for weed and nutrient management, Clemson Extension
Dr. Bhupinder S. Farmaha, Udayakumar Skaran, and Michael W. Marshall

CLIMATE-SMART GROWN IN SC

Moving Forward with Cover Crops

Cover Crop Implementation Plan

- ❑ Field number and acres
- ❑ Species of plant(s) to be established
- ❑ Seeding rates
- ❑ Seeding dates
- ❑ Establishment procedure
- ❑ Rates, timing, and forms of nutrient application (if needed)
- ❑ Dates and method to terminate the cover crop
- ❑ Other information pertinent to establishing and managing the cover crop

CLIMATE-SMART GROWN IN SC

Timing of cover crops in SC peanut system

	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	Jun.
Planning Evaluate cover crop strategy	Before planting a cover crop, evaluate your primary goals and strategy, and carefully consider the location where you plan to plant it											
	Discuss with fellow growers who are experienced with cover crops to explore different choices and find alternatives											
	Select and purchased the desired seeds											
	Choose planting and termination methods											
Planting date range Piedmont: Sept. 15 - Oct. 15 Coastal: Sept. 30 - Dec. 15			Plant the cover crops within 2 weeks of predicted rainfall. If possible, irrigate to aid in their establishment.									
Growth												
Termination								Early-season termination				
									Mid-season termination			
										Late-season termination		
Cash crop growing season												

Adapted from Cover crop Best Management Practices in Almond

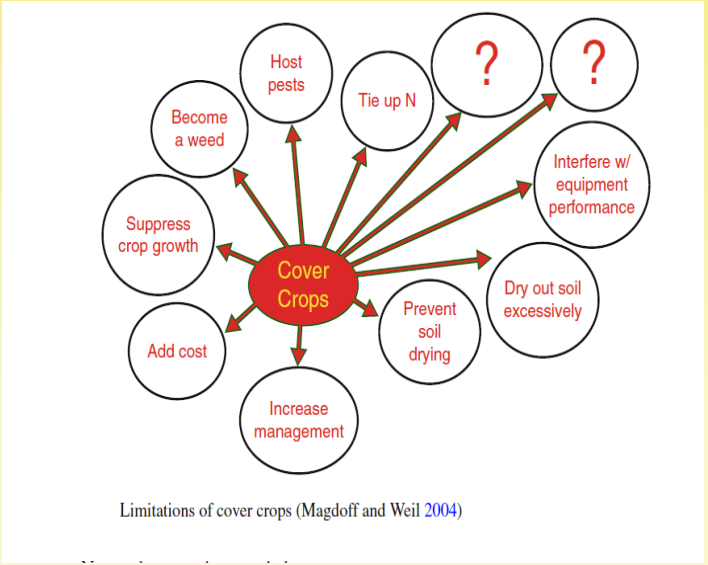
Common Cover Crop Mistakes

Why Do Cover Crops Sometimes Fail?

- ❑ Not having GOALS : Wrong cover crop(s) selected
- ❑ Improper timing
- ❑ Not using the right planting method, seeding rate, and/or equipment
- ❑ Planting a monoculture vs mixtures
- ❑ Ignoring herbicide residues
- ❑ Not knowing proper termination methods and timing
- ❑ No cover crop rotation:

  Different functional group and different species
- ❑ Poor cover crop management
- ❑ Not being patient:

Cover crops take time - Do not expect a miracle in the first year!



Limitations of cover crops (Magdoff and Weil 2004)

“DO NOT’S” with Cover Crops

- ❑ **DO NOT** burn cover crop residue
- ❑ **DO NOT** harvest cover crops for seed **(weed issues)**
- ❑ **DO NOT** go beyond your recommended speed when planting
- ❑ **DO NOT** road travel with filled seed box **(fill them at the field)**

NOTE: Herbaceous wind barriers or nurse crops to protect insured crops are not “Cover crops”

Cover Crop Verification for This Project

- ❑ Assessment of cover crop presence (stand 80% min. recommendation)
- ❑ Cover crop species selection (type or variety)
- ❑ Planting dates and techniques
- ❑ A minimum of 120-day growth period for cover crops
- ❑ Enrolled acreage verification
- ❑ Data collection if applicable

Cover Crop Verification for This Project

- ❑ Farmer feedback
- ❑ Adaptation to field conditions
- ❑ Soil samples baseline taken
- ❑ Meet technical training and vendor documentation requirements
- ❑ Maintain records
- ❑ Documentation (photos, map location, cover estimation)

Seed vendor	Address	Contact
SC crop improvement Association (small grains)	191 Old Cherry Rd., Clemson, SC 29634	864-506-5384
Mixon Seed Co	1438 Joe S Jeffords Hwy, Orangeburg, SC 29115	803-531-1777
Little Mill Seed Co.	367 Arnette Rd, Dillion SC 29536	843-841-7373 littlemillseed@gmail.com
Seedway Southeast Farm seed Sales	170 Regional Parkway, Orangeburg, SC 29118	803-585-7501 864-993-5145 (Phil Perry)
Scout Seed Co.		843-992-3593 doug@scoutseedco.com
Dillon Seed and Supply Co	1602 US-301, Dillon, SC 29536	800-282-4769 843- 774-2494
Meherrin Ag & Chemical	7904 Charleston Hwy, Bowman, SC 29018	803-829-2601
Meherrin Ag & Chemical	508 Trojan Rd, Ridge Spring, SC 29129	803-685-5361
Meherrin Ag & Chemical	102 Florence St., Scotia SC 29939	803-625-5691
Meherrin Ag & Chemical	89 Daley Rd., Estill, SC 29918	803-625-5691
Meherrin Ag & Chemical	429 Wisacky hwy, Bishopville, SC 29010	803-483-0177
Meherrin Ag & Chemical	60 County Camp Rd, Kingstree, SC 29556	843-382-4012
Meherrin Ag & Chemical	309 S Park St, Mullins SC 29574	843-464-9551
Carolina Seed systems	2200 Pocket Rd, Florence, SC 29506	843-702-7430
Wyatt-Quarles Seed Company	730 HWY 70W, Garner NC 27529	919-772-4243 1-877-SOW-SEED
Southeast Agriseeds	**257 Pinson Rd Rome, Georgia, 30161**	**(706) 528-4806** **seoffice@southeastagriseeds.com**
Adams-Briscoe Seed Co.	**325 E. 2nd St. Jackson, GA 30233**	**1-877-775-7826**

Summary

- ❑ Your **goals** should guide your cover crop selection
- ❑ Consider **diverse** varieties/species that fit the Southeast region and work toward your **goals** **(find ALL the right cover crops)**
- ❑ Cover crops offer **environmental, production,** and **economic benefits** in a conservation tillage system
- ❑ Maximum **biomass** means maximum **benefits**
- ❑ **MANAGEMENT** is the **KEY** to your **SUCCESS**

CLIMATE-SMART GROWN IN SC


CLIMATE-SMART
GROWN IN SC
SC
STATE
UNIVERSITY
1896
Conservation Tillage & Planting
Applications

What is Conservation Tillage & Planting?

- Operation of removing residue directly from the seeding or transplanting area prior to or as part of the planting operation.
- This practice only involves an in-row soil disturbance operation during strip tillage, the planting operation, and a seed row/furrow closing device.

Conventional Tillage to Conservational Tillage

Edisto REC Study

Table 11. Description of tillage treatment operations.

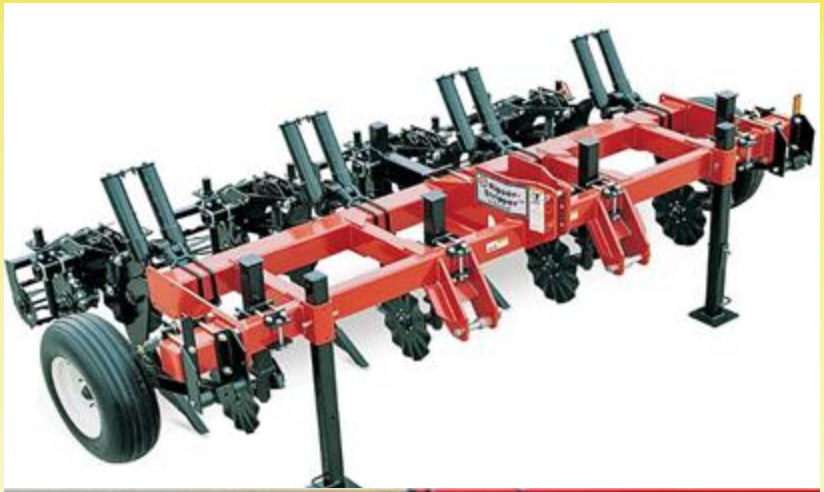
TrtNum	TrtName	Operations	Cost
1	StripTill	StripTill,Plant	16.7
2	Disk	Disk(x2),Plant	25.2
3	Turn+Disk+Strip	TurnPlow+Disk(x2)+Strip+Plant	81.7
4	Disk+Bed	Disk(x2),Bed,Plant	25.2
5	Turn+Disk+Bed	Turn,Disk(x2),Bed,Plant	65
6	Disk+Strip	Disk(x2),Strip,Plant	41.9

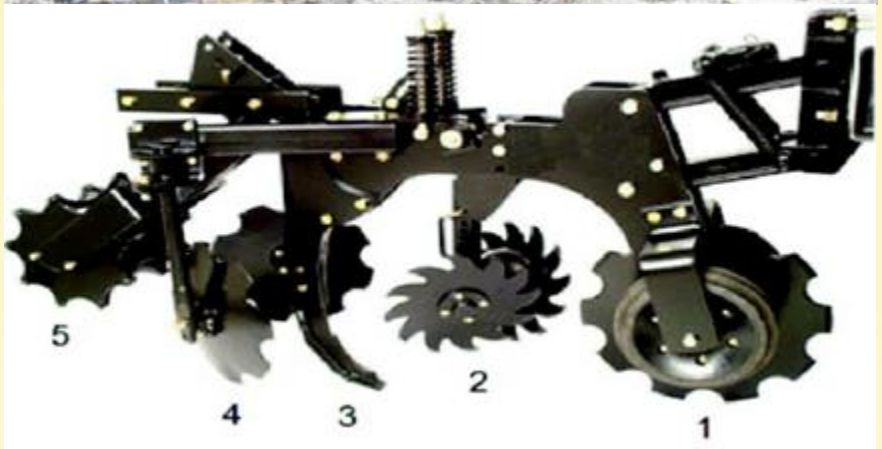
Table 12. 2020 tillage trial results, Emery peanut planted in Blackville.

Treatment	TSW incidence	Yield (lb/A) deer damage plots removed	Yield (lb/A) all plots	Acre value ($/A, excluding deer damaged plots)	TSMK	ELK	Tillage cost ($/A)†	Return ($/A, excluding deer damaged plots)
Disk	5.8%	5716	5388	$1,005	11.0%	10.9%	$25.20	$980
Disk_Bed	3.1%	5478	5480	$940	11.1%	11.0%	$25.20	$915
Disk_Strip	3.3%	5568	5571	$941	11.3%	11.1%	$41.90	$899
Strip	4.7%	5667	5661	$970	11.5%	11.3%	$16.70	$953
Turn_Disk_Bed	7.9%	5599	5377	$949	10.9%	10.8%	$65.00	$884
Turn_Disk_Strip	3.1%	5808	5818	$998	11.7%	11.6%	$81.70	$916
P value	0.0594	0.3769	0.4548	0.3751	0.3906	0.3914	--	0.1885

†Source of tillage price estimates: https://farmdocdaily.illinois.edu/2020/08/cost-management-tillage-operations.html price includes estimated costs of equipment ownership and operation. For the purposes of the price estimates here, the cost of bedding was subsidized.

Strip Till Rigs & Other Implements





Conservation Tillage & Planting Preparation For SC

❑ Strip Till Implements Not Attached To The Planter:

- Timing of operations is important
- Possibly need two tractors
- Proper adjustment & management of equipment essential

❑ Strip Till Implement Attached To The Planter:

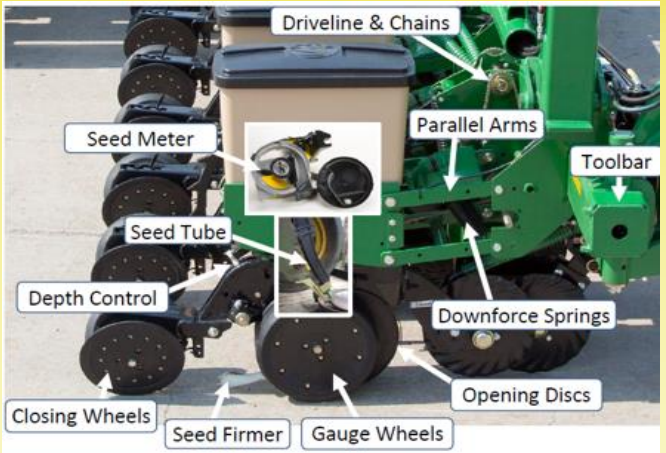
- Timing not as much of a factor
- Rows tilled and planted in one pass
- Option for managing heavy cover crop residue

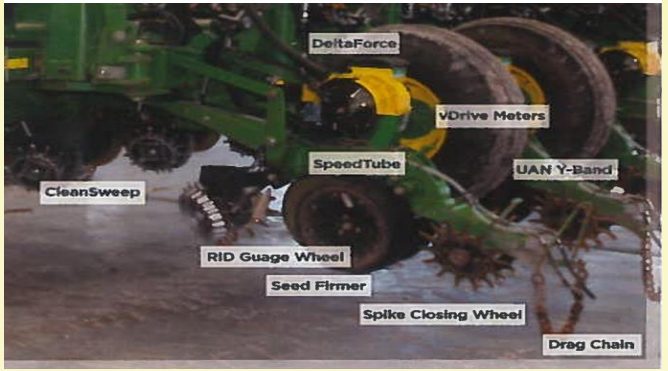
❑ Other Planting Preparations:

- Peanut variety selection
- Proper adjustment & maintenance to planter
- Pesticide and inoculum treatments

Planter Setup

- Make sure planter is level (or couple of degrees nose up)
- Add row cleaners to manage residue in the row **(Should barely be touching the soil)**
- Opener blades should be sharp
- Properly adjust downforce pressure
- Adjust pressure on closing wheels (press wheels)
- Choose the closing wheel that best suits your farm





CLIMATE-SMART GROWN IN SC

GPS Guidance

Strip tillage benefits from the use of RTK GPS signal and auto steer

- ❑ Accurate row spacing between tilled strips
- ❑ Ability to follow same rows if operations are separate (strip till & planter)
- ❑ Maintain the same row if two strip till applications are needed
- ❑ Ability to keep peanut digger centered on rows (especially with twin rows)
- ❑ Average 10 % yield benefit with GPS / Autosteer

Fertilization

- Fertilizer, pesticides, and inoculum can be knifed in behind the shank
- Direct fertilization is no different for strip till vs conventional tillage
- Lime should be applied well in advance of planting if subsoil is very acidic or should be incorporated prior to planting cover crops in the fall.
  - **(pH 5.8 - 6.5 is best)**

Best Climate-Smart Option

Another option is 3-In-1

CLIMATE-SMART GROWN IN SC

Strip-Till & Planting Considerations For Peanuts in SC

- ❑ Strip till peanuts are planted flat without beds
  - Covering discs can be adjusted to make a slight planting bed

- ❑ Planting between previous rows is recommended to minimize roots and stalks in the pegging zone

Strip Till Planting Methods:

- **Single Rows:** Strips tilled 7-10” wide, single row peanuts planted on 36” or 38” rows
- **Twin rows:** Strips tilled 7-10” wide, twin row peanuts, 7” apart planted 36” from outside row to outside

Strip-Till & Planting Rates For Peanuts in SC

- Single Rows = 6 seed/ ft of row (Runners and Virginia types)
- Twin Rows = 3 seed/ ft of row (in each row)
- A stand of 4 plants/ ft of row is critical for areas with TSWV
- Ideal Seeding depth is 1.5”

Weeds, Pest, & Disease Control Under Conservation Tillage

<u>Same in strip-tilled peanuts as it is in conventional peanuts</u>

- ❑ Chemically terminating cover crops & weeds 3-4 weeks ahead of planting is essential for a competitive advantage
- ❑ Fewer insect problems in strip till, but burrower bug injury risk is greatest in strip tillage under severe drought stress
- ❑ Good crop rotations, ideal planting date window, and selecting resistant varieties are the best economical management strategy for controlling pests, nematodes, and diseases

Peanut Harvest with Conservation Tillage

No difference in harvesting between strip-tilled and conventionally tilled peanuts

Frequently asked Famer Questions:

1. Will the residue from the previous crop interfere with digging?
2. Will there be more foreign material in the harvested peanuts?

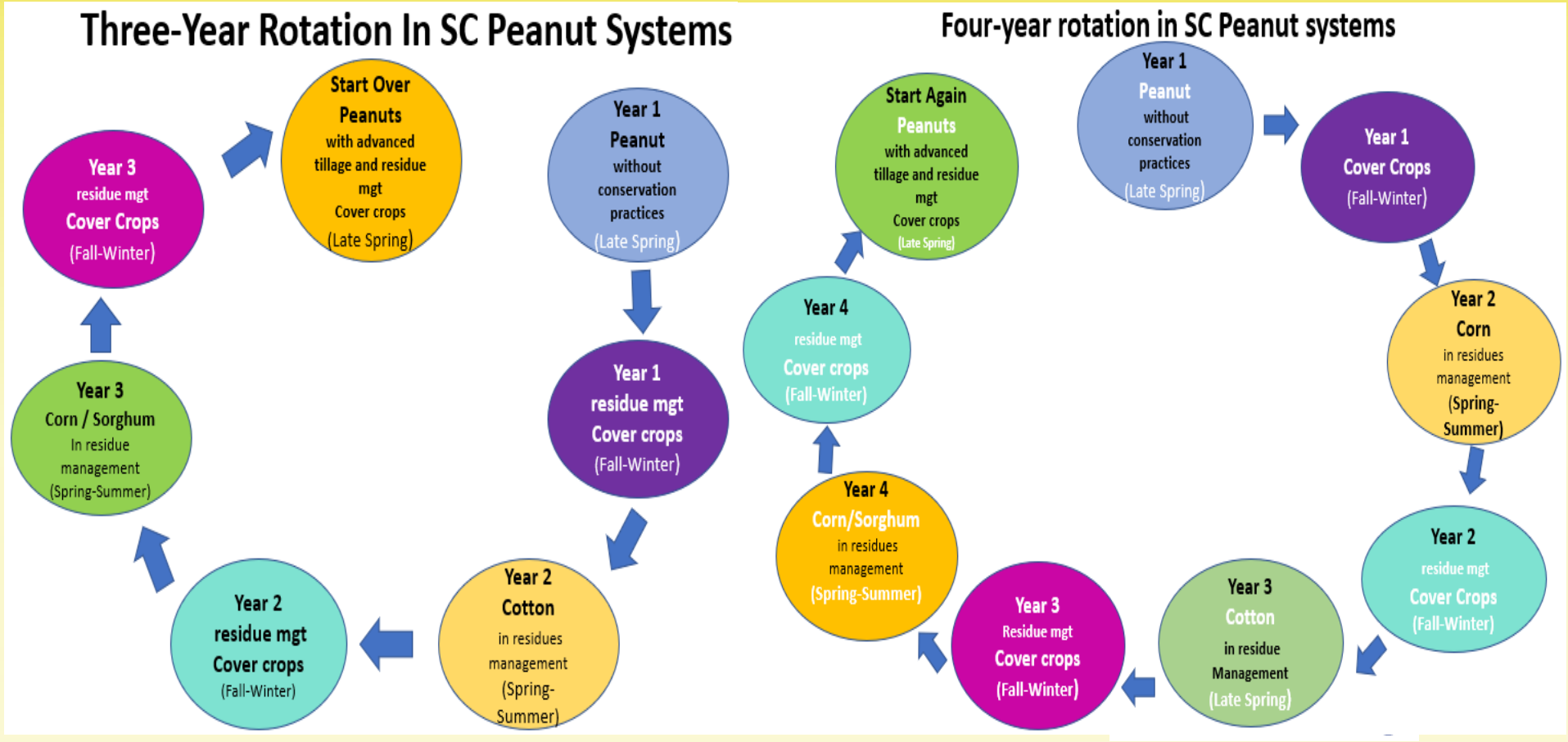
The Answer to both is No

Moving Forward With Crop Rotation

Good rotations increase crop yields, reduce pests, and recycle nutrients

- ❑ Peanuts do best after grass crops
- ❑ Legumes are not recommended in a peanut rotation
- ❑ Peanuts never follow peanuts
- ❑ Cover crop mixtures could change with rotations each year

Moving Forward With Crop Rotation



QUESTIONS?

Email: climatesmartpeanut@clemson.edu

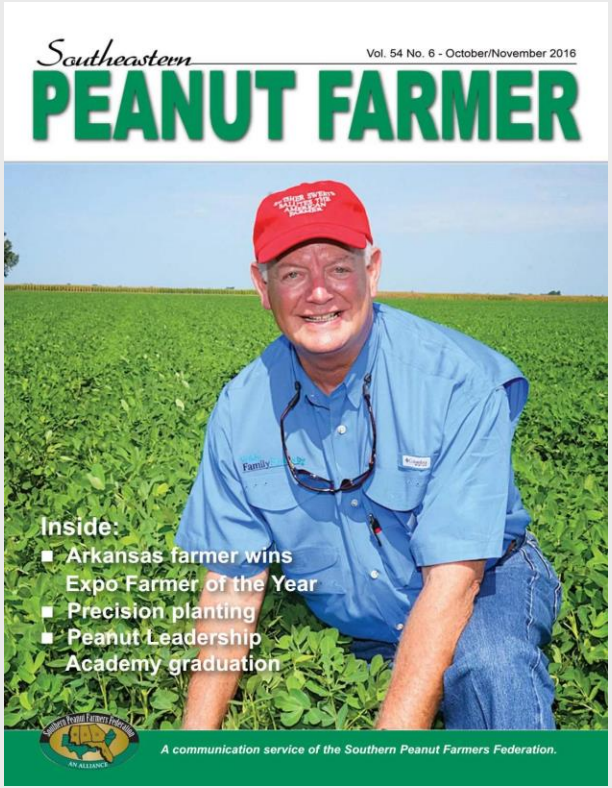
Website: www.climatesmartsc.org

Rainfall Simulator Demonstration

Beau J. Sorenson
Grazing Plan and Outreach Specialist
SC Forage and Grazing Lands Coalition

Farmer-to-Farmer
Knowledge & Experience Sharing

Value of Peer Group & Knowledge
“All My Friends”



CLIMATE-SMART GROWN IN SC

Questions to Encourage Sharing

1. Cover cropping

- ❑ Have you implemented cover crops in your peanut production? If so, which cover crops have you found most effective, and why?
- ❑ What challenges, if any, have you faced with cover cropping, and how have you overcome them?
- ❑ Can you share any tips for successfully integrating cover crops into a peanut production system?

Questions to Encourage Sharing

2. Residue management

- ❑ What residue management practices do you use in your peanut fields after harvest? How do they benefit the soil and subsequent crops?
- ❑ How do you deal with potential challenges, such as residue that is too heavy to plant directly into? Are there any practices you use to manage plant residue that doesn't involve tillage?
- ❑ Have you observed any changes in soil quality or pest incidence since adopting residue management practices?
- ❑ What are some lessons learned from your experiences with residue management in peanut production?

Questions to Encourage Sharing

3. Conservation tillage

- ❑ Do you use conservation tillage methods in your peanut fields? What are the primary reasons for adopting these practices?
- ❑ How has conservation tillage affected your peanut yields and overall farm productivity?
- ❑ What types of equipment or modifications do you use to facilitate conservation tillage in your farm operations?

Questions to Encourage Sharing

4. Climate-smart practices

- ❑ Have you noticed any cost savings or economic benefits from implementing these practices?
- ❑ What are some of the challenges you've faced in adopting climate-smart practices, and how have you overcome them?
- ❑ Are there any resources or support systems you found helpful in transitioning to more climate-smart peanut production?

Thank You!

QUESTIONS?

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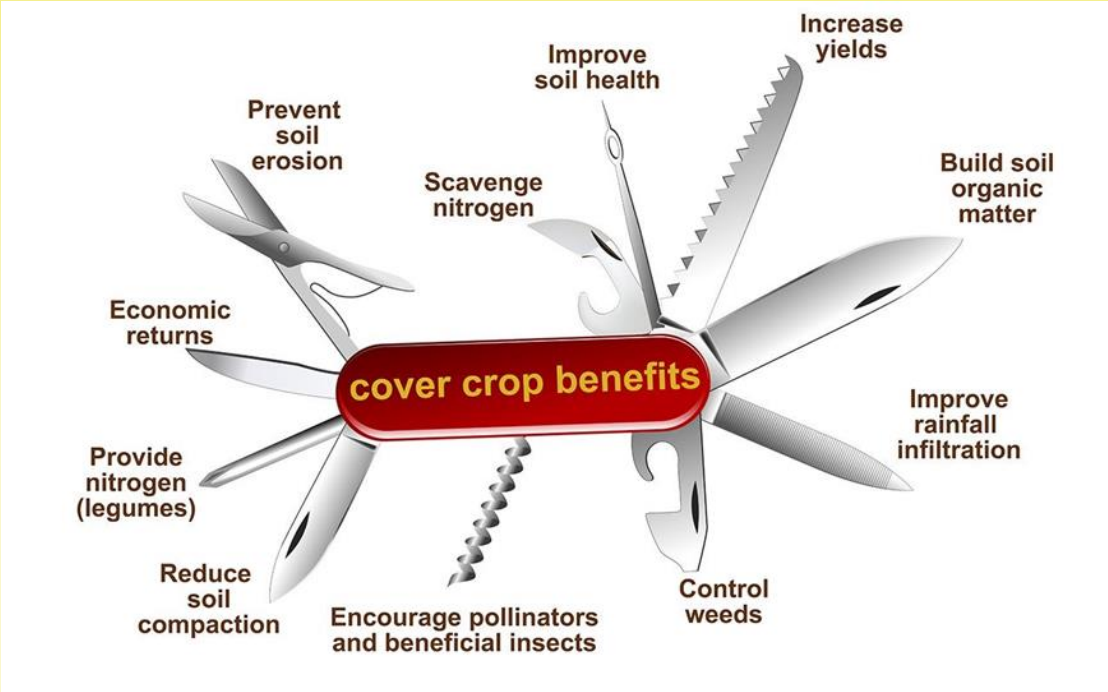
Remember:

Cover cropping, residue and reduced tillage management are TOOLS



Conclusion

- Thank you for participating in Climate-Smart Grown in SC
- Planting cover crops, managing residue, and strip-till plant peanuts can bring many benefits to your farming operation
- It is important to plan and evaluate each production step and to perform the operations in a precise and timely manner
- **Our jobs moving forward:** Help create scientific understanding and increase conservation agricultural practices among peanut growers in South Carolina