



Precision
Sustainable
Agriculture



DECISION SUPPORT TOOLS

Conservation Agronomy Program



@NCSUConservationAgronomy



@NCEXConAgronomy



@ncsu_conservation_agronomy



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Conservation Agronomy

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NC STATE

EXTENSION



MANAGEMENT DECISIONS

IT DEPENDS...

LOCATION

ROTATION

SOIL

CLIMATE

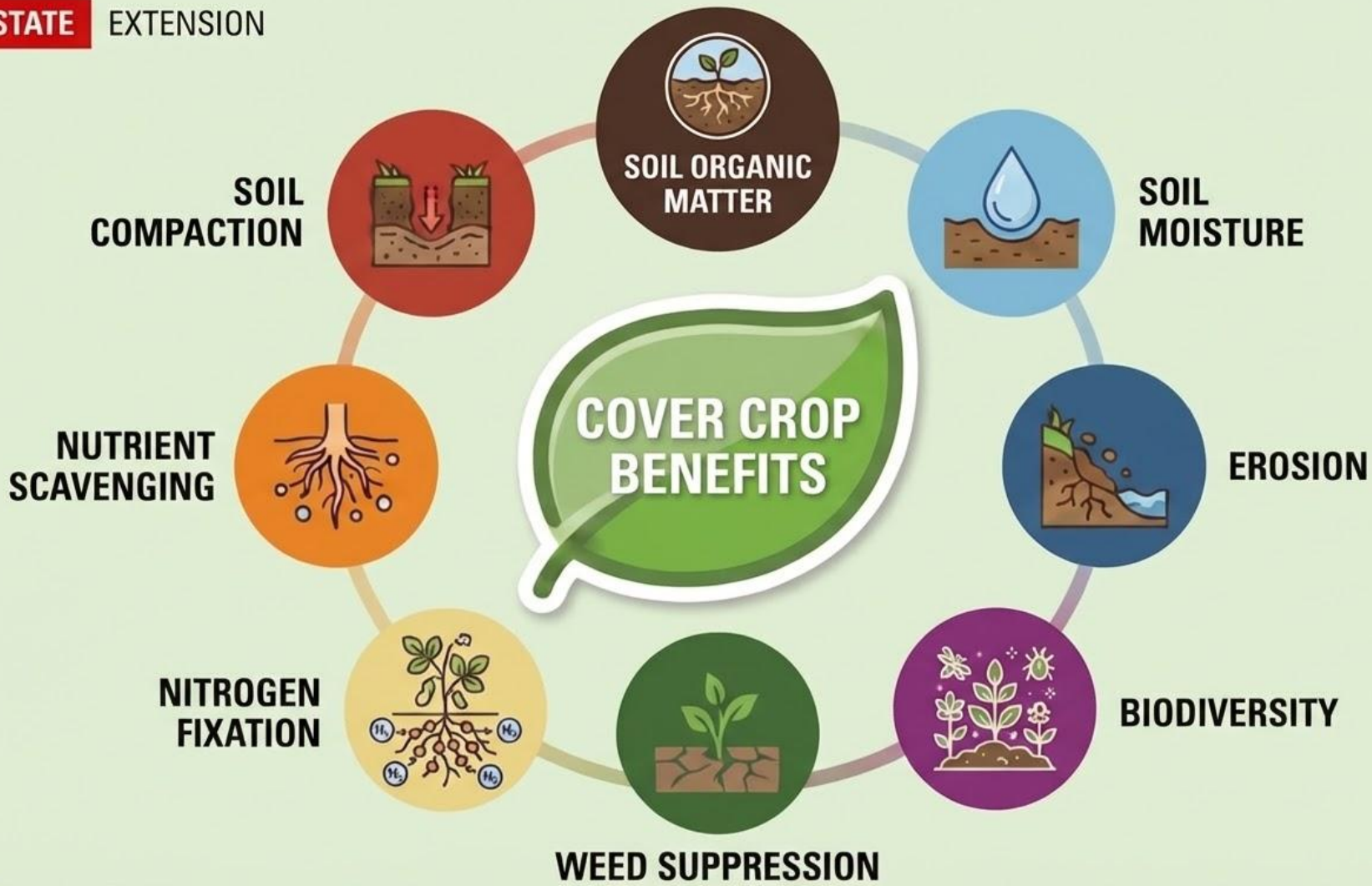
EQUIPMENT

BUDGET

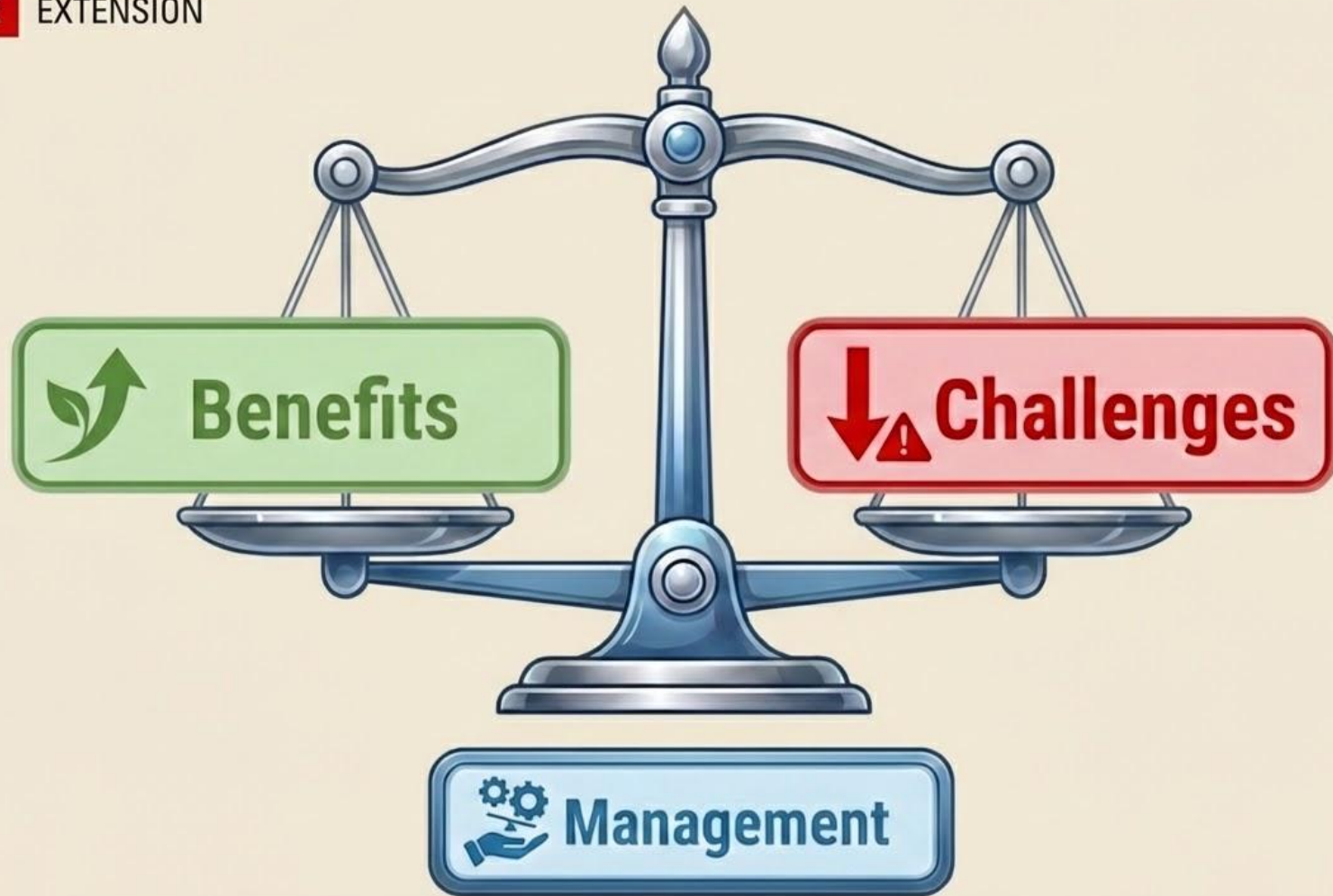


A green tractor is shown in a field of harvested corn, with a large red-bordered white box containing the text "TRADE-OFFS" overlaid on the image. The tractor is positioned on the left side of the frame, moving towards the right. The field is covered in dry corn stalks and husks. In the background, there are trees and a cloudy sky.

TRADE-OFFS







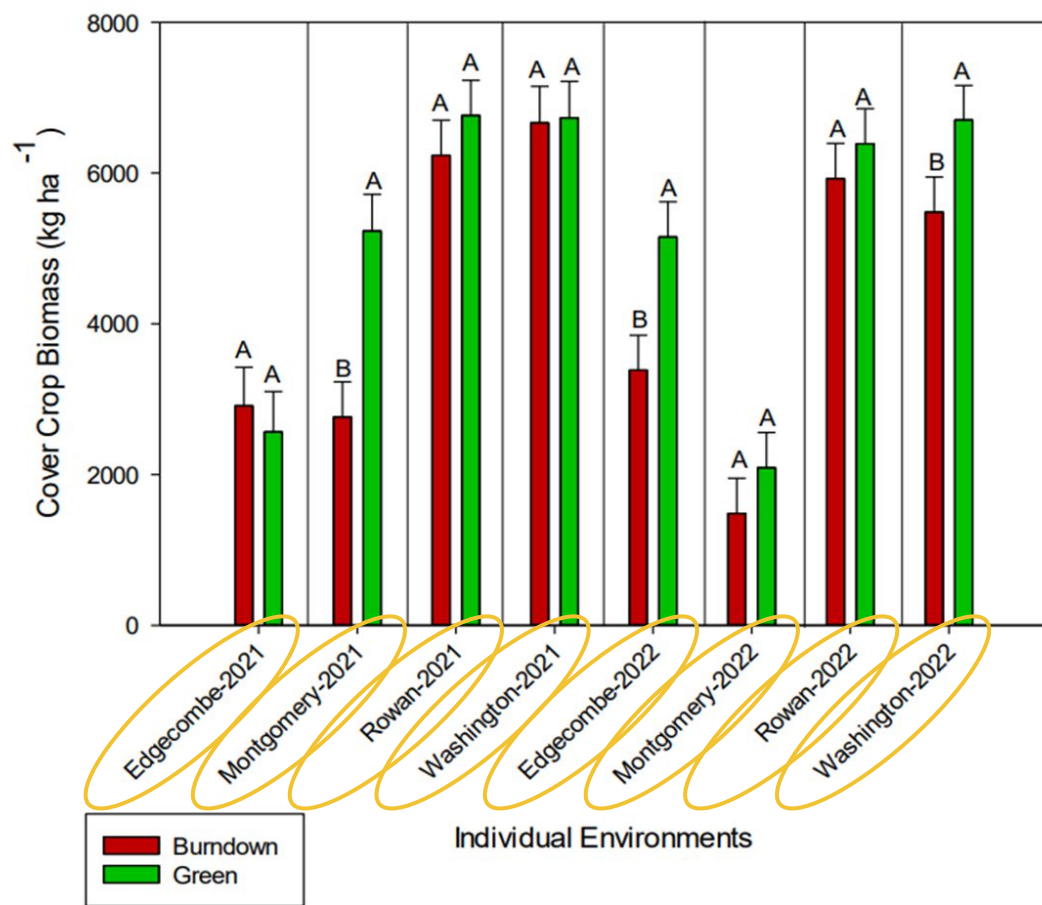
IMPORTANCE OF BIOMASS

Positively correlated to benefits

- More: weed suppression, nitrogen fixation, organic matter
- Less: nutrient scavenging, erosion

Positively correlated to many challenges.

- Cost, N immobilization, planting
- Green bridge, soil moisture



NC State Study

- Massengill (2023).
- Edgecombe, Montgomery, Rowan, Washington
- Cereal rye

Figure 1. Effect of cover crop termination timing on biomass production across environments. Means of biomass values across eight environments with standard error bars. Letter groupings are specific to individual environments. Burndown indicates terminating cover crops four weeks before soybean planting. Green indicates terminating cover crops at soybean planting.

C:N RATIO

Ideal microbial diet: C:N Ratio = 24:1

Above this ratio

- Slower decomposition
- Nitrogen immobilization

Below this ratio

- Faster decomposition
- Nitrogen mineralization

MANAGEMENT DECISIONS

Species Selection

Planting Dates

Planting Methods

Seeding Rates

Termination Method

Termination Timing





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**SPECIES
SELECTOR**



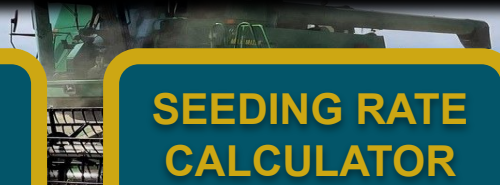
**NITROGEN
CALCULATOR**



**SEEDING RATE
CALCULATOR**



**ECONOMIC
DECISION TOOL**



DECISION SUPPORT TOOLS

**SPECIES
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**ECONOMIC
DECISION TOOL**



Inputs:

- Location
- Field Conditions
- Goals
- Cash Crop Window
- Cover Crop Group
- Env Tolerance
- Growth Traits
- Soil Conditions
- Planting Traits

Outputs:

- Benefit Performance
- Planting Dates
- Challenges
- Seeding Rates
- Planting Methods
- Termination Timing
- Termination Methods
- Extended Comments

SPECIES SELECTOR TOOL

<https://covercrop-selector.org>



DECISION SUPPORT TOOLS

**SPECIES
SELECTOR**



**NITROGEN
CALCULATOR**



**SEEDING RATE
CALCULATOR**



**ECONOMIC
DECISION TOOL**





NITROGEN CALCULATOR

Inputs:

- Location
- Soil Conditions
- Cover Crop Species
- Dry Biomass
- Water Content
- Nitrogen Content
- Cash Crop Species
- Planting Date
- Nitrogen Rate

Outputs:

- Residue Decomposition
- Nitrogen Availability



NITROGEN CALCULATOR

<https://covercrop-ncalc.org>



DECISION SUPPORT TOOLS

**SPECIES
SELECTOR**



**NITROGEN
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**SEEDING RATE
CALCULATOR**



**ECONOMIC
DECISION TOOL**





SEEDING RATE CALCULATOR

Inputs:

- Location
- Species
- Planting Method
- Seed Tag Info

Variable Inputs:

- Single Species Rate
- % of Mix
- Total Mix Rate

Outputs:

- Mix Ratio
- Lbs per acre
- Seeds per sq foot



SEEDING RATE CALCULATOR

<https://covercrop-seedcalc.org>



DECISION SUPPORT TOOLS


**SPECIES
SELECTOR**



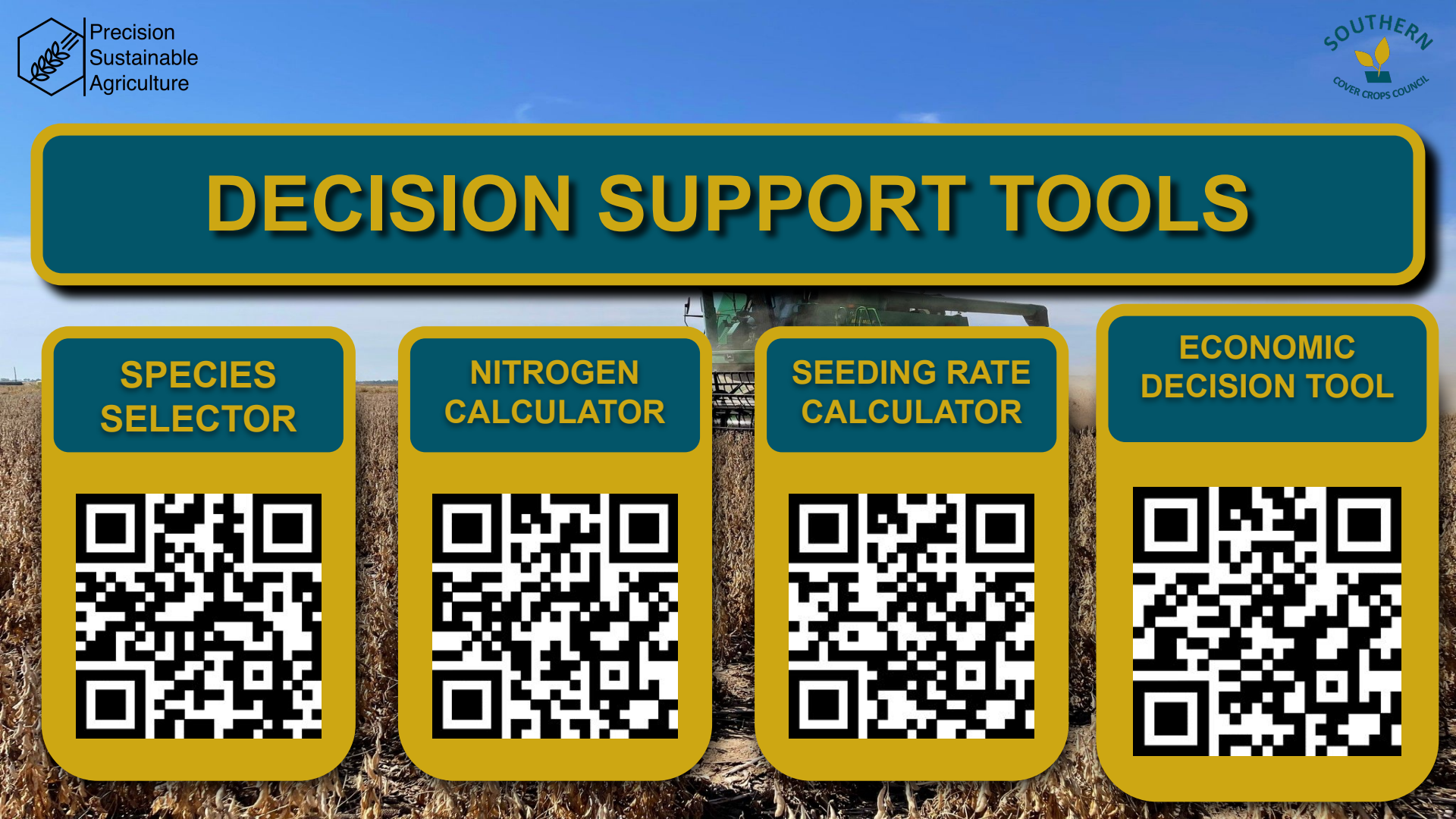

**NITROGEN
CALCULATOR**



**SEEDING RATE
CALCULATOR**



**ECONOMIC
DECISION TOOL**





SARE: The Economics of Cover Crops (2019).

- **Median Total Cost:** \$37 per acre
 - **Seed Cost:** \$10 to \$50 an acre
 - **Seeding Cost:** \$5 to \$18 an acre
 - **Termination Cost:** up to \$10 an acre



ECONOMIC DECISION TOOL

Inputs

- **Field Location (Acres)**
- **Labor Value**
- **Diesel Costs**
- **Cover Crop Seed Costs**
- **Seedbed Preparation Costs**
- **Planting Costs**
- **Termination Costs**
- **Tillage Costs**
- **Fertility Costs**
- **Herbicide Costs**
- **Erosion Control Costs**
- **Grazing**
- **Incentive Payment**
- **Yield Impacts**

Outputs

- **Changes in Costs**
- **Changes in Revenue**
- **Captures Market-Based Benefits**
 - **Yield, Contributions, Incentive Payments**
- **Cannot Capture Non-Market-Based Benefits**
 - **Soil Retention**
 - **Soil Health**



ECONOMIC DECISION TOOL

<https://covercrop-econ.org>



MANAGEMENT DECISIONS

Species Selection

Planting Dates

Planting Methods

Seeding Rates

Termination Method

Termination Timing



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