Crops and Land Use Data in CAST

NOVEMBER 1, 2022

AGRICULTURE MODELING TEAM

JESSICA RIGELMAN, J7 CONSULTING LLC
HELEN GOLIMOWSKI, DEVEREUX CONSULTING

Creating Ag Land Uses

- Assign Ag Census crop, hay, and pasture acres to the initial land use to get county acres for the land use
- 101 crop, hay, and pasture types assigned to 11 land uses

Land Use	Number of Crops
Ag Open Space	1
Full Season Soybeans	1
Grain with Manure	2
Leguminous Hay	6
Other Agronomic Crops	8
Other Hay	10
Pasture	2
Silage with Manure	2
Small Grains and Grains	8
Specialty Crop High	47
Specialty Crop Low	14

Modeling Crop Rotations in an Annual Model

January

January

January

Year 1 | Year 2 | Year 3

winter | spring | summer | fall

Crops used for double cropping

Crop	Percentage of Acres available to double cropping	Double Crop Group
alfalfa hay	25	Early
barley for grain	100	Early
other haylage; grass silage and greenchop	100	Early
small grain hay	100	Early
wheat for grain	100	Early
corn for silage or greenchop	100	Late
sorghum for grain	100	Late
soybeans for beans	100	Late

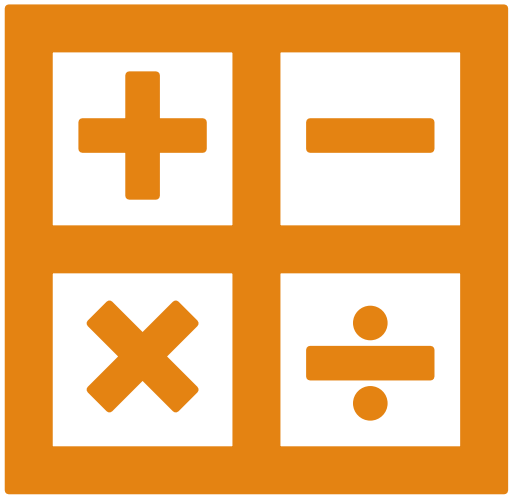
Delaware example, other states have different crops/seasons

A. Each state has specified a set of crops and a percentage of those crop acres to be used for double cropping for an early and late group.
   Early = May-Sept
   Late = Oct-April
B. For each county, the acres needed for double cropping from the summer and winter crops are then subtracted from their initial land use and assigned to the double crop land use.

Data and Method

- Data Needed
  - Ag Census harvested cropland area –> total cropland area
  - Ag Census individual crops area –> summed for a total of all crops planted
  - Ag Census early crop and late crop areas (Group 1 & 2)
    - Group 1 & 2 crops were determined by each state
    - Group 1 is primarily corn, sorghum, and soybeans
    - Group 2 is primarily small grains
- Method
  - Actual double cropped area is the minimum of:
    - Area of crops in excess of the total cropland
    - Group 1
    - Group 2
  - These calculations are performed at the county scale for each year.

Example



Harvested Crop Land Area = 5,000 acres (harvested cropland acres)

Sum of area of all crops = 8,000 acres (sum of crops)

- 8,000 – 5,000 = 3,000 (area needed to be double cropped)
- Crop Group 1 (corn, beans) = 2,500 acres
- Crop Group 2 (winter grains) = 3,000 acres

Double cropped area is 2,500. Adjusted double crop acres because not enough to double crop 1 and 2.

Each crop within its group is apportioned to the 2,500 acres using the original proportions of the crop types.

Assign appropriate plant and harvest dates and application timing to those double cropped crops.

Splitting grain and silage land use into with and without manure

1. Initially all the corn and sorghum for grain and silage are assigned the land uses grain and silage with manure.
2. Grain is split into with and without manure using the following equation:
   - Manured Fraction = (0.1311*LOG(Animal Units in the County/Harvested Cropland Acres)) + 0.5196
   - It has a minimum of 0.18 and a maximum of .81
   - Initial acres of grain with manure * (1-manured fraction) = acres subtracted from grain with manure and assigned to grain without manure
3. Silage is split into with and without manure using the following equation
   - Initial acres of silage with manure * 0.15 = acres subtracted from silage with manure and assigned to silage without manure

Animal	Sq. Ft. Per Animal Count
pullets	0.44
turkeys	1.00
hogs and pigs for breeding	13.55
beef	82.33
broilers	0.13
dairy	125.50
hogs for slaughter	4.84
horses	294.68
layers	1.74
other cattle	103.89
sheep and lambs	25.00
goats	14.98

Calculating Feed Space Acres

Feeding space is the production area of a farm, such as the animal feeding area

Animal counts from the Ag Census at the county scale are multiplied by the average square feet per animal and are converted to acres.

This ensures there is feeding space in each county where there are animals

Splitting county level land use acres to modeling segments

a. The Land Use Workgroup provides the data used for this process.
b. Included are the fraction of a county's cropland, pastureland and total ag land in each land river segment in that county.
c. The cropland fraction is used for:
    - Full Season Soybeans
    - Grain with Manure
    - Grain without Manure
    - Silage with Manure
    - Silage without Manure
    - Small Grains and Grains
    - Double Cropped Land
    - Specialty Crop High
    - Specialty Crop Low
    - Other Agronomic Crops
d. The pastureland fraction is used for:
    - Ag Open Space
    - Leguminous Hay
    - Other Hay
    - Pasture
e. The total ag land fraction is used for:
    - Feed space acres
    - Some states have submitted data detailing the fraction of a county's animals in and out of the watershed which is used to modify the fraction used.

Contact Information

Jessica Rigelman
jrigelman@j7llc.com
410-991-0719