

USDA FD-CIC USER GUIDE



U.S. DEPARTMENT OF AGRICULTURE

Introduction

The U.S. Department of Agriculture's (USDA) Office of the Chief Economist (OCE) issued a final rule titled, "Technical Guidelines for the Production of Regenerative Agricultural Biofuel Feedstocks." The USDA Feedstock Carbon Intensity Calculator (USDA FD-CIC) tool is referenced in the final rule and allows users to estimate the carbon intensity (CI) in carbon dioxide equivalent (CO₂e) emissions per bushel of their corn, soybeans, sorghum, and spring canola based on user-supplied nutrient management data and user-supplied selections of specific regenerative and low-carbon agriculture practices, including no-till, reduced-till, and cover crops.

USDA FD-CIC estimates GHG emissions of feedstock production. Feedstock emissions sources vary in USDA FD-CIC depending on farming practices employed and include soil organic carbon (SOC) sequestration and nitrous oxide (N₂O) emissions. This user guide provides guidance on how to use the tool to generate a CI score for the feedstocks produced using different sets of management practices. It includes step-by-step instructions for getting started with the calculator and entering operation-specific details.

Any hidden sheets or rows included in USDA FD-CIC may include outdated, legacy, or placeholder numbers or text that are not part of the USDA FD-CIC methodology and may have uncertain origin. These hidden sheets or rows are not visible to the public to prevent confusion or inadvertent use.

Step-by-Step Interface User Instructions

Getting Started

Users begin by selecting the tab "Crop Inputs". Users do not need to use any other tab to run USDA FD-CIC, although tabs entitled "Glossary" and "Guidance on N test results" are also available for guidance. An "Instructions" tab is also available that provides much of the information found in this User Guide.

To get started using the USDA FD-CIC tool, please ensure that Excel is functioning properly by following these steps:

1. Ensure that the tool is saved on your device in a desktop or documents folder.
2. Open the Excel workbook from the saved location.
3. If you see a security warning, select "Enable Content" or "Yes". Users should enable macros prior to using the workbook.
4. Click into the 'Crop Inputs' tab. In cell C5, change the value to "2".

If new content appears in column D (see below), Excel is functioning properly.

Figure 1: The "Crop Inputs" Tab. Change cell C5 to "2" to ensure that Excel workbook is functioning properly.

USDA FD-CIC																										
Legend/Key: <table border="1"> <tr> <th>Cell Color</th> <th>Description</th> </tr> <tr> <td>Yellow</td> <td>Required User Input Cells</td> </tr> <tr> <td>Blue</td> <td>Optional User Input Cells</td> </tr> </table>		Cell Color	Description	Yellow	Required User Input Cells	Blue	Optional User Input Cells	Date: 6/17/2026 Crop to Model: Corn Number of Management Units to Model: Reset Inputs on All MUs 1																		
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Figure 2: If new content appears in column D (the MU #2 column), Excel is functioning properly.

USDA FD-CIC																																										
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Expected yield per acre (bushels/acre)				0																																						
Total Synthetic N Applied Per Acre (lbs/acre)				0																																						

If the input number of management units did *not* expand to additional input columns, you will need to adjust a setting in Excel to enable the "macros" feature. **To enable macros in Excel, please follow these steps:**

1. Confirm that the tool is saved on your device in a desktop or documents folder.
2. Open the Excel workbook from the saved location.
3. If you see a security warning, select "Enable Content" or "Yes" (see example Security Warning dialogue image)
4. Alternatively, go to File > Info > Security Warning > Enable Content > Advanced Options to enable macros for one session.
5. To enable macros more permanently, go to Excel Options > Trust Center > Macro Settings and activate the "Enable VBA Macros" option

For more information, follow the “Enable or disable macros in Microsoft 365 files” instructions here: <https://support.microsoft.com/en-us/office/enable-or-disable-macros-in-microsoft-365-files-12b036fd-d140-4e74-b45e-16fed1a7e5c6>

Once the second MU column appears when you change cell C5 (indicating the Excel macros are working) please reset the tool by clicking the "Reset Inputs on All MUs" button in cell B5 or manually changing the cell C5 back to "1".

Crop and Management Unit Options Section

In the 'Crop Inputs' tab, cells highlighted in pale yellow are required user inputs. Please ensure all pale-yellow cells are filled in. All pale blue cells are optional user entry cells.

Figure 3: The Legend below shows the pale-yellow cells are required user input cells and the pale blue cells are optional users input cells

Legend/Key:	
Cell Color	Description
	Required User Input Cells
	Optional User Input Cells

In the ‘Crop Inputs’ tab, users must first enter the date in cell C3. Users will then select the crop to model by clicking on the “*Crop to Model*” input cell (C4), the down-select grey arrow will appear to the right of C4, and using the down-select grey arrow the user should select the feedstock from the options provided in the drop-down tab: *corn*, *sorghum*, *soybean*, or *canola*. USDA FD-CIC can only generate CI scores for one crop at a time. See Figure 4 below.

Figure 4: Select corn, sorghum, soybean, or canola for the "Crop to Model" cell (C3)

USDA FD-CIC			
1			
2			
3	Legend/Key:	Date:	6/17/2026
4	Cell Color Description	Crop to Model:	Corn
5	Required User Input Cells	Number of Management Units to Model: Reset Inputs on All MUs	2
6	Optional User Input Cells		

Users will then click on the “*Number of Management Units to Model*” cell (C5) and enter the number of management units that are used to produce the selected crop that will be used as biofuel feedstocks in USDA’s rule. A **Management unit** is defined as a field, group of fields, or other land units having the same land use and the same management.

Figure 5: Enter the number of management units to be modeled in cell C5

USDA FD-CIC		
1		
2		
3	Legend/Key:	Date: 6/17/2026
4	Cell Color Description	Crop to Model: Corn
5	Required User Input Cells	Number of Management Units to Model: Reset Inputs on All MUs 1
6	Optional User Input Cells	

Upon selection of the “Crop to Model” and “Number of Management Units to Model”, USDA FD-CIC will automatically generate columns corresponding to the number of management units to be modeled. Each column contains options for selecting the relevant regenerative and low-carbon practices implemented in that management unit and for entering nutrient management information including synthetic N applied, manure, and nitrification inhibitors. If the user is modeling more than two management units, additional columns will be added to the sheet for each management unit to be modeled.

All management units growing the crop specified in Cell C3 that will be used as reduced-CI feedstocks as defined in 7 C.F.R. § 2100 should be included.

Management Unit Location Section

Users will have the option of labeling or describing their management units in Cell Row 9 for their own tracking purposes. For Management Unit #1, this cell corresponds to cell C9. In each management unit column, users should identify the location of the management by selecting “Location – State” and “Location – County” from the drop-down lists. For Management Unit 1, these cells correspond to cells C10 and C11, respectively. When these cells are clicked, down-select arrows appear to the right of each cell. Additionally, users will need to type in the number of acres for the management unit in the “Management Unit Size (acres)” cell in C13. See Figure 6 below.

Figure 6: From the drop-down options, the user selects the state and county that the management unit is in and then manually enters the size of the management unit in acres.

7	Print Out Form		MU #1	Reset MU #1 Inputs
8		Management Unit Name (optional):		
9	Go to Instructions	Location - State	None	
10		Location - County	None	
11	Go to Glossary	Management Unit Size (acres)		0

7	Print Out Form		MU #1	Reset MU #1 Inputs
8		Management Unit Name (optional):		
9	Go to Instructions	Location - State	None	
10		Location - County	None	
11	Go to Glossary	Management Unit Size (acres)		0



7	Print Out Form		MU #1	Reset MU #1 Inputs
8		Management Unit Name (optional):		
9	Go to Instructions	Location - State	None	
10		Location - County	None	
11	Go to Glossary	Management Unit Size (acres)		0
12		Actual average yield per acre (bushels/acre)		0
13		Expected yield per acre (bushels/acre)		0
14		Total Synthetic N Applied Per Acre (lbs/acre)		0

Actual and expected yield per acre (bushels)

Users will enter their actual average yield per acre (in bushels) for each management unit that is being modeled in the “*Actual average yield per acre (bushels)*” cell. (To make this selection, select C14 for Management Unit 1).

Users will then enter their expected yield per acre in the “*Expected yield per acre (bushels/acres)*” cell in C15. Expected yield per acre is defined as either:

1. For farm producers holding a crop insurance policy covering the reduced-CI crop for the current crop interval, farm producers must provide the yield used to establish coverage on their crop insurance policy; or
2. For farm producers that do not hold a crop insurance policy, a farm producer may utilize the transitional yield or Agriculture Risk Coverage (ARC) County Benchmark yield for their county published by the USDA Risk Management Agency (RMA) or Farm Service Agency (FSA).

Figure 7: Enter the actual average yield per acre in bushels for each management unit being assessed in C14. Enter the expected yield per acre in bushels for the management unit in C15.

7	Print Out Form		MU #1	Reset MU #1 Inputs
8		Management Unit Name (optional):		
9	Go to Instructions	Location - State	None	
10		Location - County	None	
11	Go to Glossary	Management Unit Size (acres)		0
12		Actual average yield per acre (bushels/acre)		0
13		Expected yield per acre (bushels/acre)		0
14		Total Synthetic N Applied Per Acre (lbs/acre)		0

Total Synthetic N Applied Per Acre

Users will fill in the total synthetic nitrogen applied per acre (lbs) for the “*Total Synthetic N Applied Per Acre (lbs)*” cell. The “total synthetic N applied” is the N applied from all inorganic sources from the time immediately following harvest or termination of the preceding cash crop through harvest of the reduced CI crop, including any inorganic N applied to fallow or cover crops during that crop interval.

To make this selection, users will type the number of pounds per acre in C18 for Management Unit 1. See Figure 8 below.

Figure 8: Users will need to fill in the total pounds of synthetic N applied per acre in Cell 18.

7	Print Out Form Go to Instructions Go to Glossary			MU #1	Reset MU #1 Inputs
8		Management Unit Name (optional):			
9		Location - State		None	
10		Location - County		None	
11		Management Unit Size (acres)			0
12		Actual average yield per acre (bushels/acre)			0
13		Expected yield per acre (bushels/acre)			0
14					
15					
16					
17					
18					0

Conservation Practice Option Selection

Once management unit information for all mandatory cells (pale yellow shading) is entered by the user, users may then select applicable additional management practices for each management unit. If crops are grown on management units without the management practices included in the tool (rows 29 through 56), users should leave the default selections unchanged.

Management Practice: Cover Crops

If applicable, users will indicate cover crop use by choosing between the drop-down option choices “cover crop”, “cover crop with grazing,” or “No cover crop”. To make this selection, click on C29 for Management Unit 1. The down-select arrow will then appear to the right of C29, and the user should click one of the three options listed to correspond to the practice used on that management unit. Use the same procedure for additional management units. See Figure 9 below.

Figure 9: Choose between the drop-down options of Cover Crop, Cover Crop with Grazing, or No Cover Crops in Row 29 for each management unit.

28	Management Practices		
29	1) Cover Crop	No cover crop	▼
30			
31	2) Tillage Practice	None of the above	
32			
33	3) Percent of synthetic N receiving Nitrification Inhibitors (0%-100%)		0%
34			

Management Practice: Tillage Practice

If applicable, users will indicate use of conservation tillage by choosing between the drop-down option choices “Reduced till”, “No till”, or “None of the above”. To make this selection, click on C31 for Management Unit 1. The down-select arrow will then appear to the right of C31, and the user should click one of the three options listed to correspond to the practice used on that management unit. Use the same procedure for additional management units. See Figure 10

below. The tillage designation should be based on results of USDA’s T-DISC calculator, found on the USDA website at www.usda.gov/t-disc.

Figure 10: Choose between the drop-down options choices of Reduced till, No till, or None of the above in cell C31 for Management Unit 1.

28		Management Practices	
29		1) Cover Crop	No cover crop
30			
31		2) Tillage Practice	None of the above
32			
33		3) Percent of synthetic N receiving Nitrification Inhibitors (0%-100%)	0%
34			

Management Practice: Percent of Synthetic N receiving Nitrification Inhibitor

If applicable, users will enter the percent of Synthetic N applied with Nitrification Inhibitors. For the percent of N receiving nitrification inhibitors, the response should be entered into cell C33 as a value between 0% and 100% of applied synthetic fertilizer.

Figure 11: If applicable, users will fill in the percent of synthetic N applied jointly with nitrification inhibitors in Cell 33 (as a value between 0% and 100%).

28		Management Practices	
29		1) Cover Crop	No cover crop
30			
31		2) Tillage Practice	None of the above
32			
33		3) Percent of synthetic N receiving Nitrification Inhibitors (0%-100%)	0%
34			

Management Practice: Applied Manure

If applicable, users will go through the applied manure scenarios listed under the “*Applied Manure*” cell. Users will have the option to select the type of applied manure used in a management unit, selecting from options provided in the down-select grey arrow to the right of the cell (cell 36). These options include the following: Beef Cattle Manure (solid or liquid), Dairy Cattle Manure (solid or liquid), Swine Manure (solid or liquid), and Poultry Manure (solid or liquid).

After selecting the manure type for each manure applied to the management unit, users will need to enter the amount of manure (either in units of tonnage for solid manure or 1,000 gallons for liquid manure) applied per acre for the management unit in cell 37.

Note: Solid and liquid manure can be applied either in combination or individually. The amount of solid manure applied should be entered in tons of solid manure per acre while liquid manure should be entered into units of 1,000 gallons per acre. So, for instance, the application of 4,000 gallons of liquid manure per acre would be entered numerically into the spreadsheet as 4 (i.e., 1,000 gallons per acre were applied four times).

Users then need to enter the total N content of manure as shown on a manure test in cell 38. Units should correspond to the pounds of N per ton if the manure is solid, or pounds N per 1,000 gallons if the manure is liquid. See Figure 12 for a complete view of the “*Applied Manure*” section.

Additional guidance on interpreting N content from manure testing is available in Appendix 1 of this user guide.

Figure 12: For each type of manure applied to the management unit, select the manure type, then fill in the amount of manure applied and the N content of the manure.

28		Management Practices	
29		1) Cover Crop	No cover crop
30			
31		2) Tillage Practice	None of the above
32			
33		3) Percent of synthetic N receiving Nitrification Inhibitors (0%-100%)	0%
34			
35		4) Applied Manure	
36		4.1) Manure applied, Type 1	None
37		Amount of type 1 manure applied (1,000 gal/acre or ton/acre)	0
38		N content of type 1 manure (lbs/ton or lbs/1,000 gal)	0
39		4.2) Manure applied, Type 2	None
40		Amount of type 2 manure applied (1,000 gal/acre or tons/acre)	0
41		N content of type 2 manure (lbs/ton or lbs/1,000 gal)	0
42		4.3) Manure applied, Type 3	None
43		Amount of type 3 manure applied (1,000 gal/acre or tons/acre)	0
44		N content of type 3 manure (lbs/ton or lbs/1,000 gal)	0
45			

Results Table

The results table starts at row 66 and provides the management unit CI score, in grams CO₂ equivalent (CO₂e) per bushel. The estimated national average CI score is also displayed for reference. For more information on what each element of the carbon intensity score represents, see the Glossary tab. Figure 14 presents a visual example of the Results Output.

Figure 14: Example Results Table

66		Results (g CO ₂ e/bushel)	MU #1	Estimated National Average
68		Corn Carbon Intensity (CI) Score (g CO₂e/bushel)	5,974	6,031
69		Carbon Intensity Score Elements (g CO ₂ e/bushel)		
70		Emissions from manufacture and transportation of N fertilizer	1,206	1,286
72		Soil carbon emissions/removals	0	N/A
81		Total N ₂ O emissions	2,955	2,918
82		Emissions from on-farm energy consumption	818	818
83		Emissions from manufacture and transportation of other chemicals	472	472
84		CO ₂ emissions from urea/lime	522	537
86		(click to navigate to terms Glossary)		
96				
97		<u>CI score relative to estimated national average:</u>		
98		% change in g CO ₂ e/bushel	-0.9%	0.0%
99		Absolute change in g CO ₂ e/bushel	-57	0

USDA FD-CIC also generates the percentage (%) and absolute changes in total CI score (per bushel) for each management unit compared to the estimated national average CI score for the feedstock. These cells correspond to C98 and C99, respectively, for Management Unit 1.

Saving, Printing, and Resetting Results

Saving and Printing Results

Users can save their results by either generating a PDF copy OR by saving a copy of the tool to your computer. To generate a printable form, click the 'Print out Form' button in cell B7 and save or print the generated PDF.

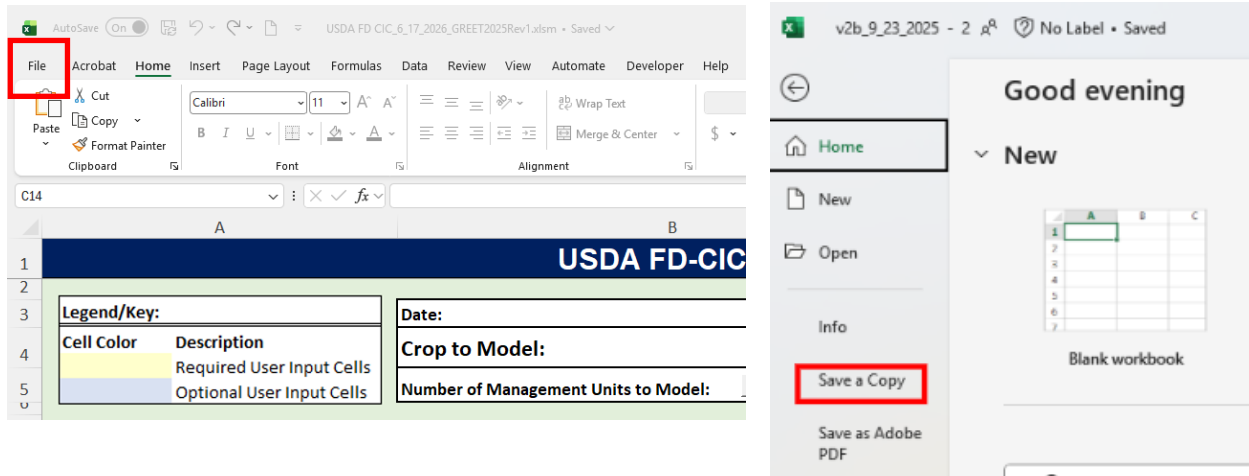
Figure 15: Click the 'Print out Form' to create a printable copy of the results. Then, save or print the generated PDF.

USDA FD-CIC		
Legend/Key:		Date: 6/17/2026
Cell Color	Description	Crop to Model: Corn
Yellow	Required User Input Cells	Number of Management Units to Model: 1 Reset Inputs on All MUs
Blue	Optional User Input Cells	
Print Out Form Go to Instructions Go to Glossary		MU #1 Reset MU #1 Inputs Management Unit Name (optional): Location - State IL Location - County Jackson Management Unit Size (acres) 100 Actual average yield per acre (bushels/acre) 180

Another saving option is to save the tool file as a new name in a user designated folder location to be accessed at another time or shared with others.



Figure 16: To save the file, in the top left corner of the Excel browser, click "File." From the menu that appears, select "Save a Copy." A pop-up menu will appear, allowing you to save this version of the file to your computer.



Resetting USDA FD-CIC

To start over, use the Reset button to reset USDA FD-CIC. Scrolling back up to the top of the 'Crop Inputs' tab, identify the gray button in cell B5 that reads 'Reset Inputs on All MUs'.

Figure 17: Cell B5 provides a 'Reset MU #1 Inputs' button to reset the entire USDA FD-CIC Tool

	A	B	C
1	USDA FD-CIC		
2			
3	Legend/Key:	Date:	6/17/2026
4	Cell Color Description	Crop to Model:	Corn
5	Required User Input Cells	Number of Management Units to Model:	1
6	Optional User Input Cells	Reset Inputs on All MUs	

Users can also reset just one management unit's input data in row 8, using the corresponding 'Reset MU Inputs' button.

Figure 18: Each management unit column has a 'Reset MU Input' Button in Row 8.

USDA FD-CIC		
Legend/Key:	Date:	6/17/2026
Cell Color Description	Crop to Model:	Corn
Required User Input Cells	Number of Management Units to Model:	1
Optional User Input Cells	Reset Inputs on All MUs	
Print Out Form	Management Unit Name (optional):	MU #1 Reset MU #1 Inputs
Go to Instructions	Location - State	IL
Go to Glossary	Location - County	Jackson
	Management Unit Size (acres)	100

Reporting USDA FD-CIC Inputs and Outputs

If adhering to the voluntary guidelines established in 7 C.F.R. Part 2100 “Technical Guidelines for the Production of Regenerative Agricultural Biofuel Feedstocks”, farm producers must keep records (as defined in 7 CFR Part 2100.031) that include USDA FD-CIC inputs and outputs. To provide documentation of the USDA FD-CIC calculation for each management unit, users may take a screenshot, print out, or save a PDF showing USDA FD-CIC inputs and outputs on the **USDA ‘Crop Input’** tab.

Appendix 1: Guidance on interpreting N content from manure testing

- **Type of N reported:** If the manure nutrient report provides Total N, that value should be used directly in USDA FD-CIC. If the manure nutrient report provides separate values for Total Kjeldahl N, nitrite N, and nitrate N, the Total N must be calculated from those values using the following equation:

$$\text{Total N} = \text{Total Kjeldahl N} + \text{Nitrite N} + \text{Nitrate N}$$

If the manure test provides only Total Kjeldahl N (TKN), or Total Kjeldahl N broken out by Organic N and ammonium, Total Kjeldahl N (the sum of Organic N and ammonium N) may be entered into the Total N input cell.

- **As-sampled versus dry weight results:** Most agricultural labs report manure testing results on an as-sampled basis that can be entered directly into USDA FD-CIC. If the results are reported on a dry-weight basis the analyses will have to be converted back to as-sampled to be entered into USDA FD-CIC. (If it is unclear from the laboratory report if the results are reported on an as-sampled basis, contact the laboratory for clarification.) To convert nutrient content from a dry-weight basis back to an as-sampled basis, use the following equation:

$$\text{Nutrient content (as-applied basis)} = \text{nutrient content (dry basis)} \times [1 - (\text{moisture content (\%)} \div 100)]$$

- **Conversion of units for N content:** Units for N content of manure should be entered as lbs N/ton for solid manures and lbs N/1000 gals for liquid manures. It may be necessary to convert units appearing on the manure nutrient test. Some relevant conversions appear in the table below:

	Starting unit	Multiply By	To get (desired unit)
Solid manure	%	20	lbs/ton
	ppm	0.002	lbs/ton
Liquid manure	%	83.4	lbs/1000 gallons
	ppm	0.00834	lbs/1000 gallons

- **Sample calculations:**
 - If analysis results are % dry weight (dwt) and need to be converted to lbs N/ton as sampled for a solid manure:

$$\text{lb N/ton (as sampled)} = ((1 - \% \text{ Moisture}) / 100) \times (\% \text{ N in dwt} / 100) \times 2000 \text{ lb/ton}$$
 - If analysis results are % dry weight (dwt) and need to be converted to lbs N/1000 gallon as sampled for a liquid manure:



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$$\text{lb N/1000 gal (as sampled)} = ((1 - \% \text{ Moisture})/100) \times (\% \text{ N in dwt}/100) \times (8.34 \text{ lb/gal} \times 1000)$$

- (c) If analysis results are ppm dry weight (dwt) and need to be converted to lbs N/ton as sampled for a solid manure:

$$\text{lb N/ton (as sampled)} = ((1 - \% \text{ Moisture})/100) \times (\text{ppm N in dwt}/1000000) \times 2000 \text{ lb/ton}$$

- (d) If analysis results are ppm dry weight (dwt) and need to be converted to lbs N/1000 gallon as sampled for a liquid manure:

$$\text{lb N/1000 gal (as sampled)} = ((1 - \% \text{ Moisture})/100) \times (\text{ppm N in dwt}/1000000) \times (8.34 \text{ lb/gal} \times 1000)$$

Appendix 2: Definitions of Low-Carbon Practices

If adhering to the voluntary guidelines established in 7 C.F.R. Part 2100 “Technical Guidelines for the Production of Regenerative Agricultural Biofuel Feedstocks”, farm producers must meet all of the applicable practice standards as follows:

- For reduced till or no-till, 7 C.F.R. § 2100.051 Tillage management.
- For cover crops, 7 C.F.R. § 2100.052 Cover crop management.
- For synthetic N applied, 7 C.F.R. § 2100.060 General nutrient management
- For nitrification inhibitors, 7 C.F.R. § 2100.061 Nitrification inhibitor standards.
- For applied manure, 7 C.F.R § 2100.062 Manure application standards.