



# DRAWDOWN GA

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## Agriculture Sector

### Local GHG Emissions Tracker

Technical Documentation  
Figures for Major Data Sources  
and Emissions Calculations



# Agriculture sector emissions

# Agriculture data sources

1. EPA State Inventory Tool (**SIT**) for statewide agriculture emissions in three categories:
  - a. Agricultural soil management (**ASM**)
  - b. Enteric fermentation (**EF**)
  - c. Manure management (**MM**)
2. NOAA 1990-2020 station-level climatology with number of growing degree days (**GGDs**) between 50 and 86 degrees F
3. US Department of Agriculture (**USDOA**) Census of Agriculture data for 2002, 2007, 2012, and 2017 for area of harvested **cropland** and **animal inventory counts** by county
4. US Department of Agriculture “Animal Feeding Operations” webpage on **animal unit** definitions
5. US Department of Agriculture “Agricultural Waste Management Field Handbook” on **manure generation** values per animal unit

# Agriculture basic strategy

1. Download USDOA Census county-level values for harvested cropland, layer chickens, broiler chickens, dairy cattle, beef cattle, and hogs; interpolate annual values between Census years
2. Calculate county annual shares of cropland; distribute to months based on GDDs for ASM shares
3. Calculate each county's share of cattle for EF shares
4. Divide animal inventory counts by animal unit factors, multiply times manure generation factor, sum across animal types, calculate county shares of statewide manure for MM shares
5. Read SIT values for three agricultural emissions categories (ASM, EF, and MM), use 2009-2018 linear trend to forecast 2019-2021 values
6. Multiply SIT statewide ASM, EF, and MM values by shares of cropland, cattle, and manure generated; add county emissions from agricultural distillate fuel for total county agriculture sector emissions

# EPA State Inventory Tool for Georgia

## Agriculture Emissions in MMTCO<sub>2</sub>e

Emissions by Sector	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
<b>Energy</b>	191.21	188.49	190.81	176.97	167.23	176.31	160.59	140.25	138.24	142.76	140.30	140.12	138.15	137.54	89%
CO <sub>2</sub> from Fossil Fuel Combustion	186.77	184.32	186.86	173.34	163.85	172.97	157.47	137.36	135.39	139.91	137.60	137.42	135.57	134.96	87%
Stationary Combustion	0.88	0.88	0.89	0.81	0.77	0.85	0.78	0.66	0.71	0.77	0.66	0.67	0.61	0.62	0%
Mobile Combustion	2.11	1.86	1.62	1.38	1.18	1.05	0.90	0.79	0.70	0.64	0.60	0.59	0.53	0.52	0%
Coal Mining	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0%
Natural Gas and Oil Systems	1.44	1.44	1.44	1.44	1.44	1.44	1.44	1.44	1.44	1.44	1.44	1.44	1.44	1.44	1%
<b>Industrial Processes</b>	4.66	4.98	5.20	5.65	5.92	6.20	6.38	6.51	6.59	6.88	7.00	6.96	7.03	7.13	11%
<b>Agriculture</b>	7.62	7.69	7.93	7.52	7.40	7.13	6.80	7.15	7.26	7.35	7.57	7.19	7.25	7.07	5%
Enteric Fermentation	2.15	2.11	2.10	2.02	1.97	1.92	1.87	1.90	1.86	1.90	1.89	1.99	1.99	1.92	1%
Manure Management	1.67	1.65	1.71	1.67	1.60	1.58	1.62	1.63	1.62	1.66	1.71	1.72	1.72	1.75	1%
Agricultural Soil Management	3.77	3.79	4.00	3.81	3.80	3.56	3.24	3.58	3.74	3.75	3.94	3.45	3.51	3.38	2%
Rice Cultivation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0%
Liming	0.03	0.12	0.10	-	-	0.03	0.05	-	-	-	-	-	-	-	0%
Urea	0.01	0.01	0.02	0.02	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0%
Burning of Agricultural Crop Waste	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%
<b>LULUCF</b>	(48.77)	(49.14)	(49.37)	(49.65)	(49.93)	(50.71)	(51.63)	(52.49)	(53.13)	(53.88)	(53.17)	(52.59)	(51.89)	(51.19)	-33%
<b>Waste</b>	5.92	5.26	5.26	5.32	5.73	5.05	4.72	3.82	3.90	4.11	3.79	3.83	3.84	2.68	2%
Municipal Solid Waste	4.91	4.22	4.20	4.25	4.65	3.98	3.65	2.74	2.81	3.00	2.67	2.70	2.69	1.52	1%
Wastewater	1.01	1.04	1.06	1.07	1.08	1.07	1.07	1.09	1.10	1.11	1.12	1.14	1.15	1.16	1%
<b>Indirect CO<sub>2</sub> from Electricity Consumption*</b>	89.93	91.95	94.02	88.30	81.42	87.56	79.49	70.98	69.78	71.67	68.36	66.08	61.29	61.80	40%
<b>Gross Emissions</b>	209.40	206.42	209.20	195.46	186.29	194.69	178.50	157.73	155.99	161.09	158.66	158.10	156.27	154.42	
<b>Sinks</b>	(48.77)	(49.14)	(49.37)	(49.65)	(49.93)	(50.71)	(51.63)	(52.49)	(53.13)	(53.88)	(53.17)	(52.59)	(51.89)	(51.19)	-33%
<b>Net Emissions</b>	160.63	157.27	159.83	145.81	136.36	143.98	126.87	105.24	102.86	107.21	105.49	105.51	104.38	103.23	

# USDA animal units

- An animal unit is defined as an animal equivalent of 1000 pounds live weight and equates to

1000 head of beef cattle,

700 dairy cows,

2500 swine weighing more than 55 lbs,

125 thousand broiler chickens, or

82 thousand laying hens or pullets

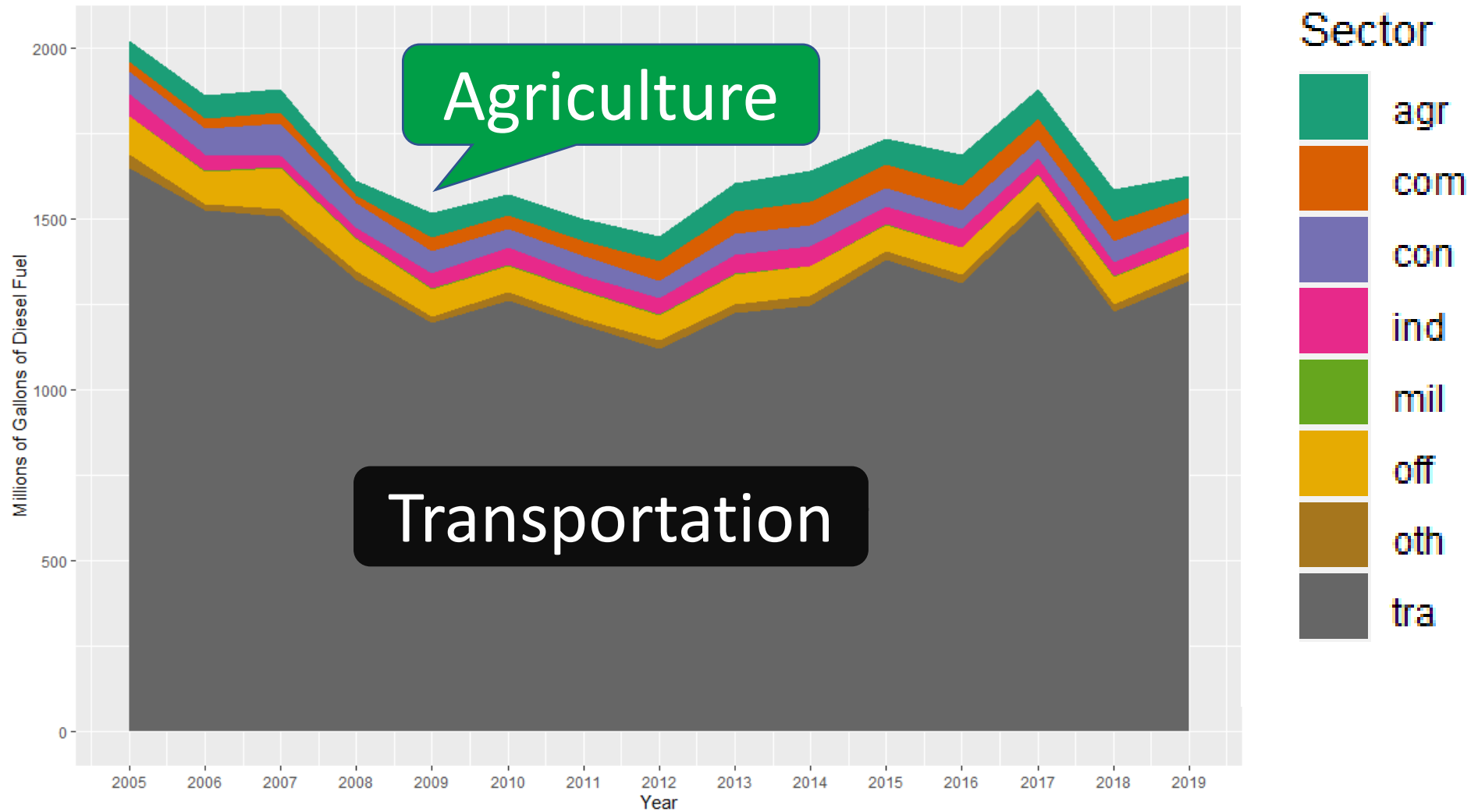
# USDA manure generation by livestock type

<b>Livestock type</b>	<b>Total manure</b>	<b>Nitrogen</b>	<b>Phosphorus</b>
	----- lbs/day/1000-lb animal unit -----		
Beef <sup>1</sup>	59.1	0.31	0.11
Dairy <sup>2</sup>	80.0	0.45	0.07
Hogs and pigs <sup>3</sup>	63.1	0.42	0.16
Chickens (layers)	60.5	0.83	0.31
Chickens (broilers)	80.0	1.10	0.34
Turkeys	43.6	0.74	0.28

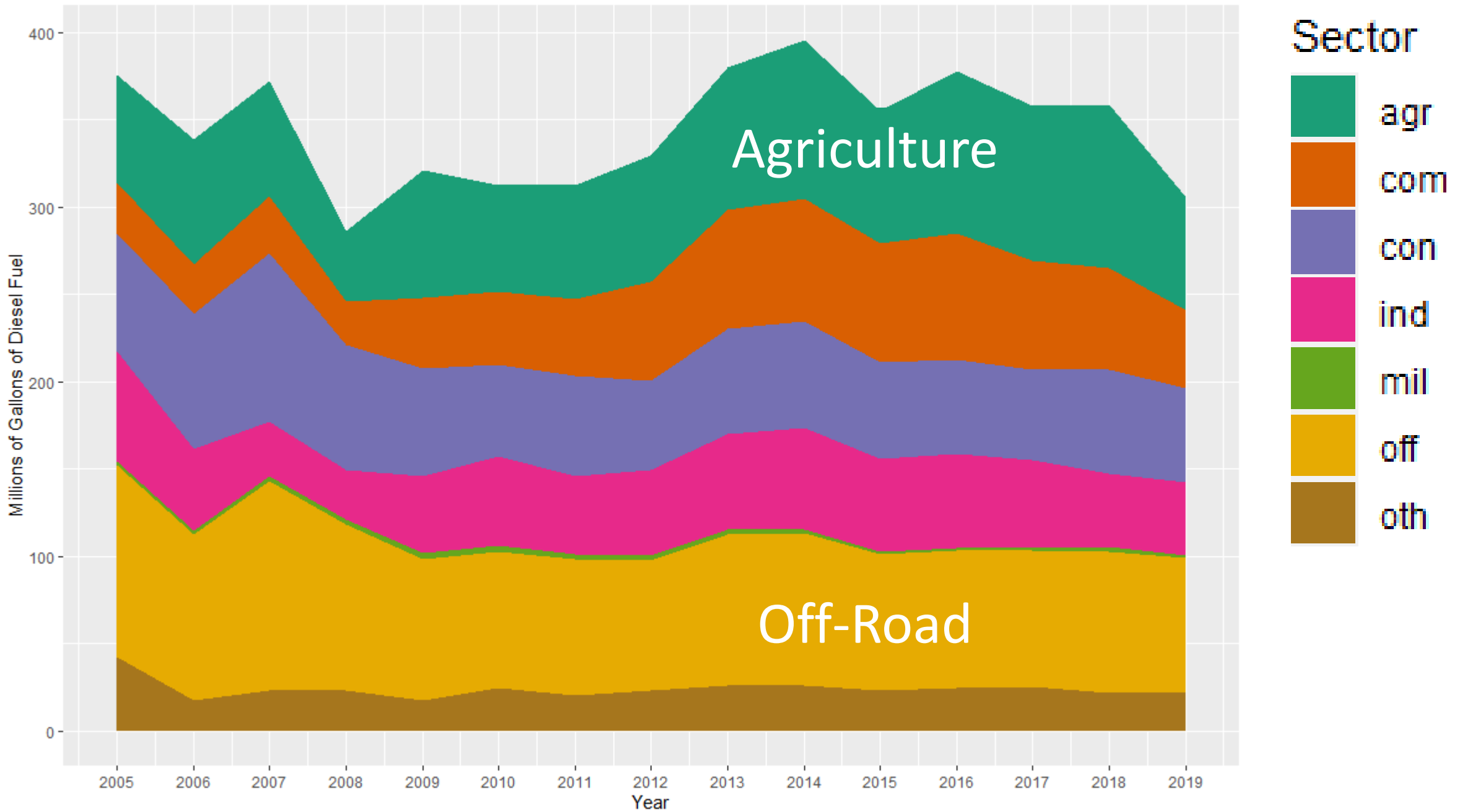
<sup>1</sup>High forage diet. <sup>2</sup>Lactating cow. <sup>3</sup>Grower.

Source: USDA Natural Resources Conservation Service. Agricultural Waste Management Handbook (1992)

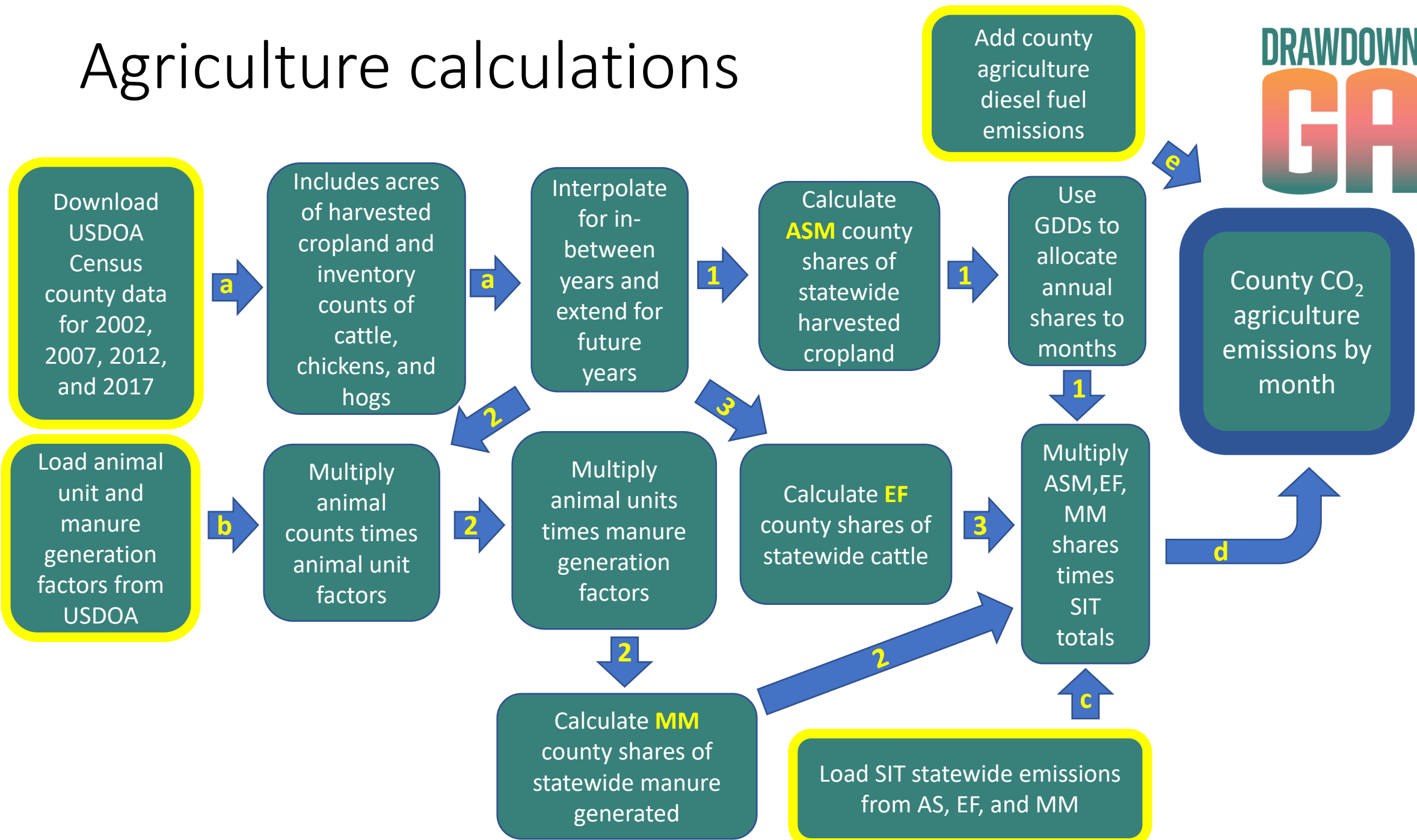
# Georgia Diesel Fuel Consumption by Sector



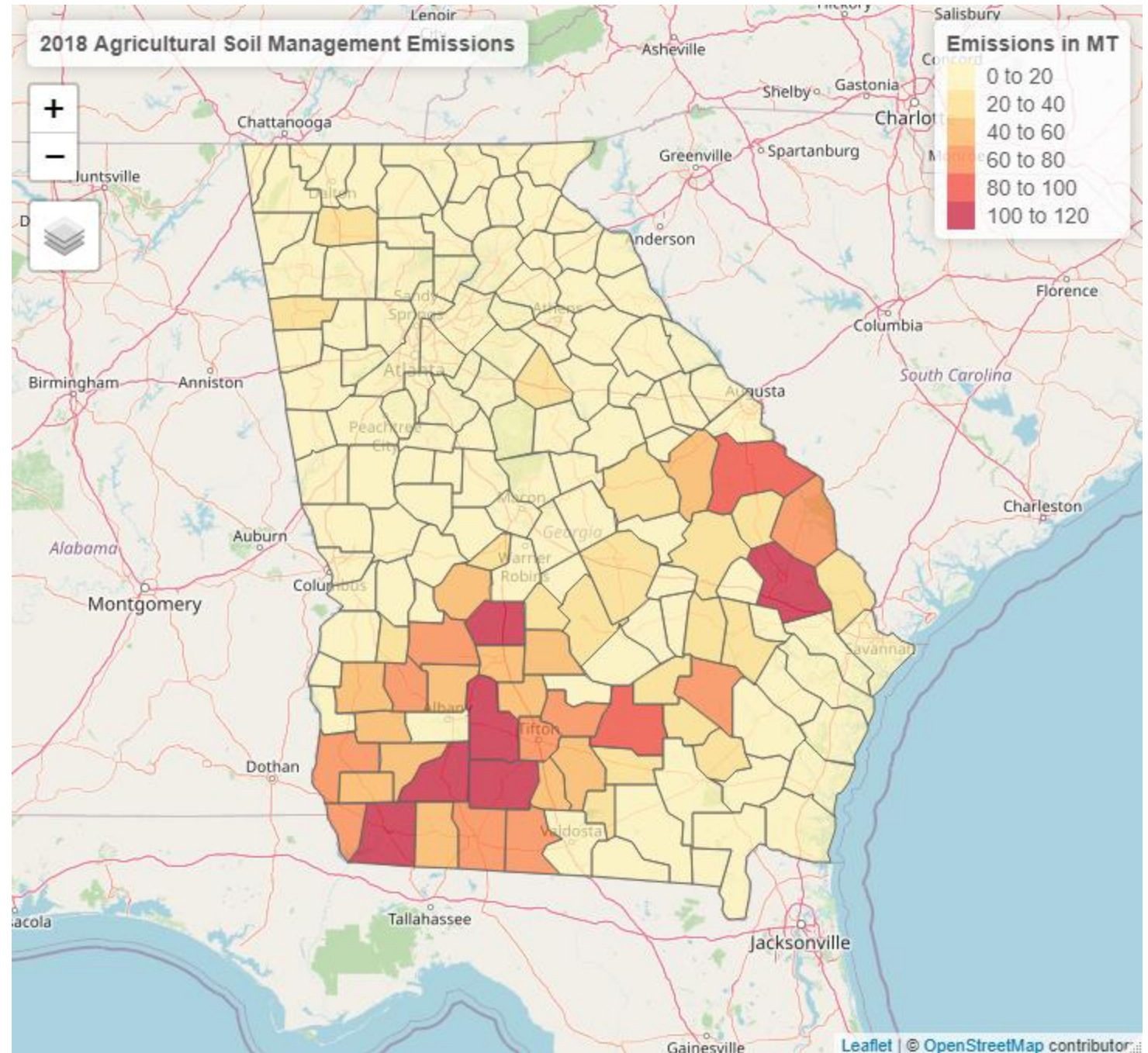




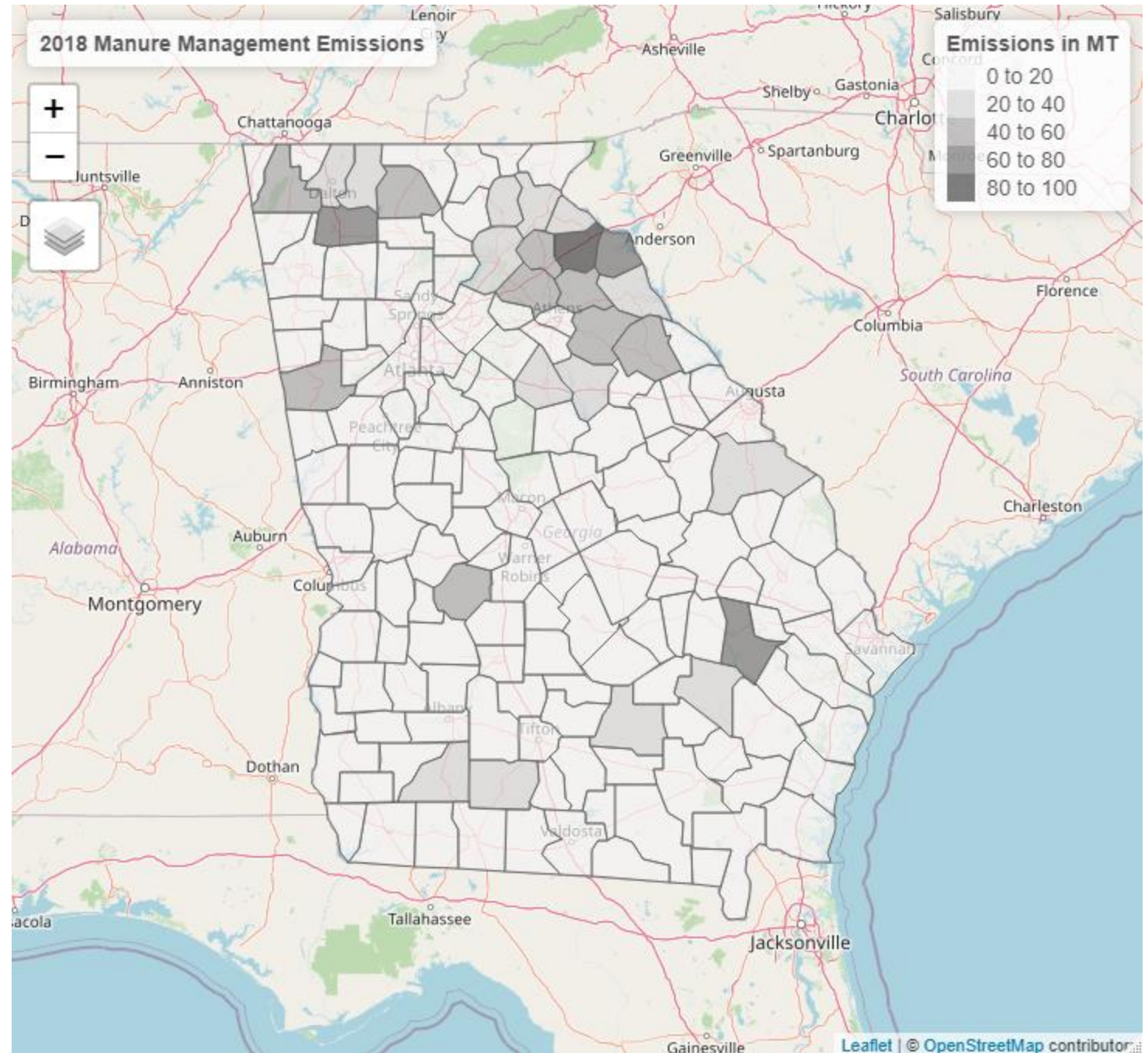
# Agriculture calculations



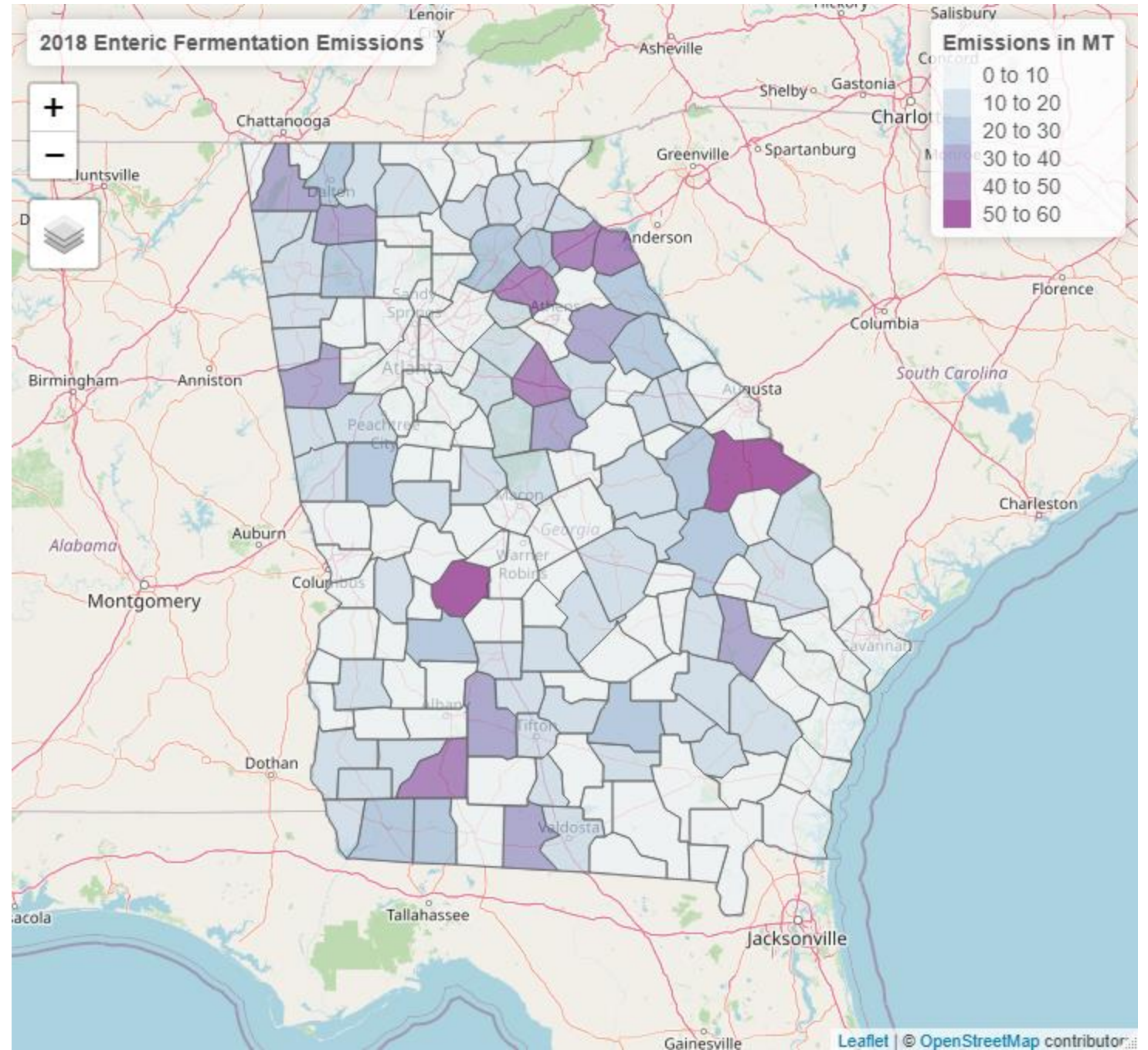
Total 2018  
agricultural soil  
management  
emissions in  
metric tons of  
CO<sub>2</sub>e



Total 2018  
**manure  
management**  
emissions in  
metric tons of  
CO<sub>2</sub>e



Total 2018  
**enteric  
fermentation**  
emissions in  
metric tons of  
 $\text{CO}_2\text{e}$



**Total** 2018  
agricultural  
emissions in  
metric tons of  
CO<sub>2</sub>e

