Document Objectives
This document aims to address the following questions in order to guide Climate TRACE program strategy within the domain of agriculture.

- What are the primary sources of greenhouse gas (GHG) emissions within the domain?
- Where are the opportunities to leverage satellite remote sensing in order to produce timely, accurate estimates of GHG emissions from the primary sources?

Definition of Primary Sources (Emissions Subdomains)
Following the terminology introduced by the UN FAO, we will refer to the primary sources of GHG emissions as the *emissions subdomains* within the domain of agriculture. As a starting point for our investigation, we focus on the 2020 UN FAOSTAT emissions dataset covering national and global agricultural emissions through 2017. The three year delay between the most recent estimates and their release presents significant margin for improvement, assuming baseline estimates can be derived from spaceborne observations.

UN FAO Emissions Subdomains
The following is a ranked list of emissions subdomains in descending order of CO2 equivalent emissions worldwide for the year 2017. The rank order was derived from the FAOSTAT emissions estimates.

- **Enteric fermentation**
- **Manure Left on Pasture**
- **Synthetic Fertilizers**
- **Rice Cultivation**
- **Manure Management**
- Burning of Savannas
- Crop Residues
- Manure Applied to Soils
- Cultivation of Organic Soils
- Burning of Crop Residues

The FAOSTAT emissions estimates are computed by following the Tier 1 IPCC 2006 guidelines for national greenhouse gas inventories and leveraging the requisite national estimates needed to execute these estimation protocols. To scope our investigation, we will focus on the top five emissions subdomains highlighted above in bold that cover 84% of global agricultural emissions according to the Tier 1 estimates for 2017.

Tier 1 versus Tier 2/3 Estimation

Tier 1 estimation provides a baseline estimation technique with the minimum data requirements necessary to generate emissions estimates. When more detailed data is available to support Tier 2/3 estimation, particularly in circumstances where the emissions subdomain is a *key category* in the total emissions profile, more refined estimation is considered *good practice*. Therefore examining whether satellite remote sensing offers a pathway to meaningfully advance Tier 1 estimation should be viewed as only a first step in the overall assessment.

Tier 1 Data Requirements By Emissions Subdomain

Enteric Fermentation

- Average annual livestock population sizes by animal category

  Manure Left on Pasture
  Synthetic Fertilizers
  Rice Cultivation
  Manure Management

- Average annual livestock population sizes by animal category
- Manure management systems employed
- Average annual livestock population sizes subject to each type of manure management system
- Average annual temperature in the region

For which subdomains is Tier 1 estimation considered good practice?

Enteric Fermentation