Environmental Data Sampling Report: Tamil Nadu Crop Analysis

**Prepared By:** [Your Name]  
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1. **Study Area & Sampling Design**

* **Region:** Tamil Nadu, India
* **Bounding Box:** 78.5°E, 10.2°N to 79.8°E, 11.2°N
* **Grid Resolution:** 49×49 points (2,401 total)
  + Longitude step: 0.027° (≈3 km)
  + Latitude step: 0.0204° (≈2.3 km)
* **Variables Sampled:**
  + Elevation (DEM), Land Use/Land Cover (LULC), Seasonal Rainfall, Seasonal Temperature

2. **Climate Seasons & Crop Alignment**

Analysis focused on **two biologically critical seasons** for Tamil Nadu crops:

| **Season** | **Months** | **Key Crops Supported** | **Rationale** |
| --- | --- | --- | --- |
| **May-Sep** | Pre-monsoon + SW monsoon | Banana, Sugarcane, Coconut, Tomato, Betelvine | Captures irrigation-sensitive establishment phase (May) & peak growth (Jun-Sep). |
| **Jun-Oct** | SW monsoon + NE onset | Paddy, Cotton, Pulses, Groundnut, Bhendi, Brinjal | Covers monsoon-dependent growth for 80% of listed crops. |

*Excluded cross-year seasons (e.g., Aug-Jan) due to misalignment with regional crop calendars.*

3. **Data Sources & Processing**

Static Variables:

* **Elevation (DEM):**
  + Source: USGS/SRTMGL1\_003 (30m resolution)
  + Units: Meters
* **Land Cover (LULC):**
  + Source: ESA WorldCover 2020 (10m resolution)
  + Codes: 10 (Cropland), 20 (Woodland), 40 (Urban), etc.

Climate Composites (2019–2020):

| **Dataset** | **Source** | **Processing** | **Units** | **No-Data Value** |
| --- | --- | --- | --- | --- |
| **Rainfall** | CHIRPS Daily | Seasonal cumulative sum | mm | -9999 |
| **Temperature** | ERA5 Daily | Seasonal mean (converted K → °C) | °C | -9999 |

4. **Output Data Structure (CSV Columns)**

Exported point data includes:

| **Column Name** | **Description** | **Example Value** |
| --- | --- | --- |
| **UNIQUE\_ID** | Grid point identifier (0–2400) | 0, 1, 2 |
| **lat**, **lon** | Latitude/Longitude (WGS84) | 10.2208, 78.5000 |
| **elevation** | Elevation in meters | 136, 140 |
| **Map** | ESA WorldCover LULC code | 10 (Cropland) |
| **[0-3]*Rain*[season]\_[year]** | Seasonal rainfall (mm) per point | 1157.11 (Jun-Oct 2019) |
| **[0-3]*Temp*[season]\_[year]** | Seasonal temperature (°C) per point | 28.73 (Jun-Oct 2019) |
| **system:index**, **.geo** | Earth Engine metadata (safe to ignore) | N/A |

*Season-Year Key:*

* 0: Jun-Oct 2019
* 1: May-Sep 2019
* 2: Jun-Oct 2020
* 3: May-Sep 2020

5. **Validation & DiagnosticsData Coverage:** All 2,401 points retained post-sampling.

* **Climate Band Names:** Confirmed 8 bands (4 seasons × 2 variables).
* **Test Point ([79.0, 10.7]):**
  + Rainfall: 1,157–1,219 mm (consistent with Tamil Nadu monsoon range).
  + Temperature: 28.7–30.9°C (typical for tropical agro-zone).

6. **Key Insights for Crop Modeling**

1. **May-Sep** data captures critical pre-monsoon stress periods for perennial crops (e.g., Coconut, Sugarcane).
2. **Jun-Oct** aligns with monsoon-driven crop phenology (e.g., Paddy transplantation, Cotton flowering).
3. Urban areas (LULC 40) show elevated temperatures vs. croplands (10), highlighting heat island effects.

7. **Data Outputs**

All data exported to SENTINEL\_EXPORTS in Google Drive:

| **File Type** | **Description** | **Resolution/Scale** |
| --- | --- | --- |
| DEM\_Image.tif | Elevation raster | 30m |
| LULC\_Image.tif | Land cover raster | 10m |
| Rainfall\_Seasonal\_Composite.tif | Seasonal rainfall (2019–2020) | 5.5km |
| Temperature\_Seasonal\_Composite.tif | Seasonal temperature (2019–2020) | 31km |
| Environmental\_Samples\_CSV.csv | Sampled point data | N/A |