Ground data for monitoring croplands for large regions

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RS/GIS Lab
Outline

• Ground data

• Methods of ground data collection

• Available ground data
Need of Ground data?

Work flow: land use / land cover & changes

- Image pre-processing (Sentinel and MODIS)
- Preliminary classification
- Ground-truth
- Land use / land cover classification
- Accuracy assessment
- Seasonal rice maps with various ecosystems

Ancillary data
Ideal Geo-referenced data

• Homogeneous crop / inter crops

• Sample size (10-15)
Required information for LULC

- GPS Coordinates
- Crop calendar
- Crop intensity (single, double and triple crops)
- Cropping pattern (Previous/present including season wise)
- Crop growth / crop health
- Irrigation techniques / watering methods
Ground data collection methods

• Traditional methods

• Mobile apps
Traditional method

ArcPad software

Laptop

GPS

GPS Download Cable

Laptop Car Charger

Complete Online

Pre-classification (.sid)
MrSid geo-cover (.sid)
Road maps/towns (.shp)
High resolution maps (.sid)
# Ground survey data form

<table>
<thead>
<tr>
<th>LOCATION PARAMETERS</th>
<th>LULC PARAMETERS</th>
<th>CROP PARAMETERS (fractions in 200m X 200m sample size)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.G.T Point. No.</td>
<td>Cover %</td>
<td>Area % (ha) 7. Cultivated land</td>
</tr>
<tr>
<td>1.3 Country</td>
<td>6.1 Farm Land</td>
<td>7.1 Major crops</td>
</tr>
<tr>
<td>1.4 Province</td>
<td>6.2 Fills</td>
<td></td>
</tr>
<tr>
<td>1.5 District</td>
<td>6.3 Roads</td>
<td></td>
</tr>
<tr>
<td>2.1 Latitude</td>
<td>6.4 Longitude</td>
<td>7.2 Other crops</td>
</tr>
<tr>
<td></td>
<td>6.5 Longitude</td>
<td></td>
</tr>
<tr>
<td>2.2 Projection</td>
<td>6.6 Datum</td>
<td></td>
</tr>
<tr>
<td>2.3 Date of</td>
<td>6.7 Soil</td>
<td></td>
</tr>
<tr>
<td>Collection (MM/DD/YY)</td>
<td>6.8 Soil</td>
<td></td>
</tr>
<tr>
<td>3.1 Scale of</td>
<td>6.9 Rockiness</td>
<td></td>
</tr>
<tr>
<td>Extent of class</td>
<td>6.10 Sandy</td>
<td></td>
</tr>
<tr>
<td>3.1 Scale of</td>
<td>6.11 Silted</td>
<td></td>
</tr>
<tr>
<td>Extent of class</td>
<td>6.12 Skilled</td>
<td></td>
</tr>
<tr>
<td>3.1 Surface of</td>
<td>General description of the area (physical environment): (e.g. irrigated-surface water (SW)-double crop (DC), crop-1-crop-2-dual crop LAU scale (LS))</td>
<td></td>
</tr>
<tr>
<td>4. Crop Latitude</td>
<td>8.1 Soil moisture %</td>
<td>8.1.2 Soil type</td>
</tr>
<tr>
<td></td>
<td>8.1.1 Water %</td>
<td>High</td>
</tr>
<tr>
<td>4.1 Single</td>
<td>8.1.3 Fertilizer</td>
<td></td>
</tr>
<tr>
<td>4.2 Double</td>
<td>8.2 Weather</td>
<td></td>
</tr>
<tr>
<td>5. Irrigation Pattern</td>
<td>8.3 Moist</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td>8.4 Day</td>
<td>Kid</td>
</tr>
<tr>
<td>5. Crop Irrigation</td>
<td>8.5 Harvesting</td>
<td></td>
</tr>
<tr>
<td>6.1 Crop 1</td>
<td>10. Crop Pattern</td>
<td></td>
</tr>
<tr>
<td>6.2 Crop 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.3 Crop 3</td>
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<td></td>
</tr>
<tr>
<td>6.4 Crop 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Crop Growth</td>
<td>11. Irrigation Pattern</td>
<td></td>
</tr>
<tr>
<td>7.1 Upland</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.2 Mediana Upland</td>
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<tr>
<td>7.3 Lowland</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.1 Rainfall</td>
<td>12. Crop growth</td>
<td></td>
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<tr>
<td>8.2 Harvesting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.3 Crop Heads</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.4 Crop Vignette</td>
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</tr>
</tbody>
</table>
Farmer interactions during ground survey
Mobile application for ground data collection

iCrops Mobile application

• Android mobile application

• Captured geo-tag photo’s

• Freely available software

• Data can be used for training and validation
Data collection: Methods and Approaches

- Geographical locations
- Cropping pattern
- Irrigation source
- Crop intensity
Field-plot data: Asia and Africa

Legend

Field plot data
- Class labeling
- Accuracy assessment

Ground-truth for class labeling

Ground-truth for accuracy assessment

Thanks to IWMI and IRRI
Crop dominance and crop type map

Note: SW = surface water; GW = groundwater; SC = Single crops; DC = double crops

01. Wheat
02. Chickpea
03. Mustard
04. Wheat/mustard/chickpea
05. Pea / mustard
06. Other LULC
07. Shrublands/forest
08. bunds/trees/shrubs
09. Built-uplands/fallows/openlands
10. Builtup/shrublands/barrenlands
11. Waterbodies
12. Grasses/fallows
13. Other LULC

Legend:
- 21. Rainfed-DC-sorghum-chickpea/fallow
- 22. Rainfed-SC-pulses
- 23. Rainfed-SC-fallow-chickpea
- 24. Rainfed-groundnut
- 25. Mixed crops
- 26. Other LLULC

States
Scale issues (ex: Rabi 2019)

Crop dominance map @ 250m

High resolution image

Crop type map @ 10m

Wheat

Mustard / Wheat
Geospatial products: Cloud based algorithms

- Field Data
- Image Processing
- Google Earth Engine

Products:
- Climate Change
- Crop type / intensity maps
- Land use changes
- Length of growing periods
- Crop intensity
- Spatial modelling
- Abiotic stresses
- End Uses:
  - Adaptation Strategies
  - Shift in climate tolerance crops
  - Quantitative crop damage
  - Optimizing Irrigation Scheduling
  - Crop Insurance
  - Policy makers
  - Agricultural expansion
  - Food security
  - Farmer’s Resilience
  - Risk Management

- Crop type
- Abiotic stresses
- Spatial modelling

- Land Degradation

- Climate Change

- End Uses:

- Geospatial products: Cloud based algorithms
Acknowledgements

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Thank you!