Regional Workshop:

“Advancing satellite-based crop monitoring to increase resilience in the face of global food insecurity.”

2-5 July, 2024, Abuja Nigeria

Country Profile: CAMEROON
Crop Monitoring: Cameroon AgriCulture

By

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Plan

- Overview: Basics on Agriculture Development
- Crop phenology of main food crops
- Existing remote sensing agricultural projects
- Current Problem
- Requirements and Expectations
- Conclusion/Recommendation

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Country and AgriCulture statistics

<table>
<thead>
<tr>
<th>SN</th>
<th>Agro-ecological Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sudano-Sahelian Savannah</td>
</tr>
<tr>
<td>2</td>
<td>High Guinea Savannah</td>
</tr>
<tr>
<td>3</td>
<td>Western highlands unimodal rainfall</td>
</tr>
<tr>
<td>4</td>
<td>Humid forest unimodal rainfall</td>
</tr>
<tr>
<td>5</td>
<td>Humid Forest Bimodal Rainfall</td>
</tr>
</tbody>
</table>

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### Agro-ecological Zones - Characteristics

<table>
<thead>
<tr>
<th>SN</th>
<th>Sudano Sahelian Savannah</th>
<th>High Guinea Savannah*</th>
<th>Western highlands unimodal RF*</th>
<th>Humid forest unimodal rainfall**</th>
<th>Humid Forest Bimodal Rainfall *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area km²</td>
<td>10,0353</td>
<td>12,3077</td>
<td>31,192</td>
<td>45,658</td>
<td>16,5770</td>
</tr>
<tr>
<td>Rainfall mm/year</td>
<td>400-1200</td>
<td>1500 rainy days: 150</td>
<td>1500-2000 Rainy-days: 180</td>
<td>2500-4000 Mono-modal</td>
<td>1500-2000 Distinct wet season</td>
</tr>
<tr>
<td>Soil type</td>
<td>Ferroigneous vertisols, lithosoiis, Alluvial, hydromorhic</td>
<td>Porus to water moderate retention, ferralic / hydromorhic</td>
<td>Young soils on slopes, prone to erosion, very fertile</td>
<td>Volcanic slopes, coastal sediments</td>
<td>Ferralitic, acidic, clayed, low water retention</td>
</tr>
<tr>
<td>Crops</td>
<td>Cotton, millet, sorghum, onion</td>
<td>Maize, cotton, Yams, Irish, Sorghum</td>
<td>Coffee, Maize, Irish beans, Garden crops</td>
<td>Tree crops, White pepper, Cassava,</td>
<td>Tree crops, Maize, Pineapples</td>
</tr>
<tr>
<td>Major Towns</td>
<td>Maroua</td>
<td>Ngoundere</td>
<td>Bamenda</td>
<td>Douala</td>
<td>Yaoundé</td>
</tr>
</tbody>
</table>

*Tree crops: Banana, cocoa, Plantains, oil Palms, Mangoes, Pear
*: Agro-zones best suited for maize/rice crops
**: Agro-zones well suited for cassava crop

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Agro-ecological Zones-crops cultivated

**Sudano-Sahelian Savannah**
- *Cereals/Grains
- Oil seeds
- Garden crops (onion)
- Fruits: Mango, cashew Nut, citrus

**High Guinea Savannah**
- Cereals/Grains
- Oil seeds
- *Roots/Tubers
- *Garden crops (.greens
- Beverages
- Fruits: Mango, Pear, citrus, pineapples, Plantain/Banana, wild fruits

**Western highlands unimodal rainfall**
- Cereals/Grains
- Roots/Tubers
- *Garden crops (.greens
- Beverages
- Fruits: Mango, Pear, citrus, pineapples, Plantain/Banana, wild fruits

**Humid forest unimodal rainfall**
- Cereals/Grains
- *Roots/Tubers
- Beverages
- *Fruits: Mango, Pear, citrus, pineapples, Plantain/Banana, oil palms, wild fruits

**Humid Forest Bimodal Rainfall**
- Cereals/Grains
- Roots/Tubers
- Garden crops
- *Beverages
- Fruits: Mango, Pear, citrus, pineapples, White pepper, Papaya, oil palms, wild fruits

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### Major Food crops cultivated

<table>
<thead>
<tr>
<th>Category</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legumes/grains</td>
<td>Beans, <em>Groundnuts</em>, soya beans, cowpea, sesame seeds</td>
</tr>
<tr>
<td>Roots</td>
<td><em>Cassava</em>, potatoes, cocoyam/taro,</td>
</tr>
<tr>
<td>Tubers</td>
<td>Potatoes, <em>Yams</em></td>
</tr>
<tr>
<td>Cereals</td>
<td>Maize, <em>Sorghum</em>, <em>Rice</em>, millet</td>
</tr>
<tr>
<td>Oils</td>
<td>oil palm, <em>cotton</em></td>
</tr>
<tr>
<td>Others: Fruits, Beverages..</td>
<td>Plantains/Bananas, Coffee, Cocoa, White pepper, coconuts, Papaya, Sugar cane, pineapples, oranges, Mangoes, plums, Cashew nuts</td>
</tr>
<tr>
<td>Garden crops (Vegetable green species)</td>
<td>Tomatoes, Cabbages, Carrots, Watermelons/ Melons, Onion, huckleberry, Vernonia amydalina (bitter leaf, water leaf, okra, chilli, pumpkin, egussi, bell peppers...)</td>
</tr>
</tbody>
</table>

Source: Adopted from IRAD, Crop Watch Abuja 2–5, 2024
Cropping System Disposition

Farmlandscapes / Some crop associations

**Home Gardens** near the home
- Market Gardens use swamps in dry season
- Subsistence Rainfed

**Perennial Plantations** greater distance
- Agro-business farms non-use of hills/Mts.
- Producers organization Rainfed

**Shifting Cultivation** away from dwelling
- Sequential-multiple, multi-storey rainfed
- Fallow

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Sugar-cane Plan. Nkoteng
- 1. Mono-cropping
- 2. Multiple cropping
- 3. Fallow in Rotation

Palms Plan. Limbe
- 1. Rice, Pineapple, carrot
- 2. Maize/pea
- 3. Pepper/cassava

Banana plan. Njumbe

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<table>
<thead>
<tr>
<th>Crop Calendar</th>
<th>Major food crop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize, millet sorghum*(N unimodal)</td>
<td>J</td>
</tr>
<tr>
<td>Cassava*(north unimodal)</td>
<td></td>
</tr>
<tr>
<td>Muskuwarasi sorghum(north unimodal)</td>
<td></td>
</tr>
<tr>
<td>Maize, rice*(central main)</td>
<td></td>
</tr>
<tr>
<td>maize*(Central secondary)</td>
<td></td>
</tr>
<tr>
<td>Sorghum, millet(central, main)</td>
<td></td>
</tr>
<tr>
<td>Maize*(south main)</td>
<td></td>
</tr>
<tr>
<td>Maize*(south secondary)</td>
<td></td>
</tr>
</tbody>
</table>

Source: Adopted FAO/GIEWS 2023
Constraints of Cameroon agriculture sector

Land Tenure

- Limited access/skills to modern techs.
- Rights to land for agricultural is given only to village kin/individuals (fragmented)

Cropping/ system

- Mixed cropping, traditional system

Skills

- Technical know How

Pest/Disease

- No government subsidies/support

Climate, Soil, population

- Decline in precipitation, violent winds
- Increase average annual Temp
- Resurgence of extreme events
- Droughts, floods
- Rural exodus
- Soil degradation

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Phenology for major Food crops

Cereals (Maize crop phenology)

Stages of ear development:
- **R1**: Silking
- **R2**: Kernel blister
- **R3**: Kernel “Milk”
- **R4**: Kernel “Dough”
- **R5**: Kernel “Dent”
- **R6**: Physiological maturity

Phases of crop development:
- **VE**: Emergence
- **V1**: First leaf collar
- **V3**: Third Leaf collar
- **V7**: Seven Leaf collar
- **VT**: Tasselling
- **R1**: Silking
- **R6**: Physiological maturity

Crop phases:
- **Sowing**
- **Growing**
- **Harvesting**

Ag. Calendar:
- **March**
- **April**
- **May**
- **June**
- **July**
- **August**
- **September**

Source: Adopted FAO/GIEWS 2023

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Phenology for major Food crops

Root/tubers—Cassava crop

Phenology *north unimodal (Douala)

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>Planting of cuttings</td>
</tr>
<tr>
<td>2/3</td>
<td>Development of primary adventitious roots/bud</td>
</tr>
<tr>
<td>4</td>
<td>Emergence</td>
</tr>
<tr>
<td>5/6</td>
<td>Leaf development, root system formation</td>
</tr>
<tr>
<td>7/8</td>
<td>Photosynthesis, leaf growth</td>
</tr>
<tr>
<td>9</td>
<td>Replacement of adventitious roots</td>
</tr>
<tr>
<td>10</td>
<td>Maximum Growth Rate</td>
</tr>
<tr>
<td>11</td>
<td>Translocation</td>
</tr>
<tr>
<td>12</td>
<td>End of vegetative growth</td>
</tr>
<tr>
<td>13</td>
<td>Beginning of dormancy</td>
</tr>
</tbody>
</table>

Cassava Plant (*Manihot esculenta*)

Source: Adopted FAO/GIEWS 2023

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Existing remote sensing agricultural projects

Trend of Remote sensing

Agriculture Sector:

- Crop monitoring technologies in Cameroon is still in its infancy phase in Cameroon Agriculture:
  - As Banana, Palms plantation farming is limited to the use of aerial images for monitoring

Others Sectors:

- Surveillance at distance by the aid of drones in the national forestry parks.
- Monitoring of Mount Cameroon for volcanic eruption: University of Buea

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## Current status of Crop Monitoring: Problems

<table>
<thead>
<tr>
<th><strong>Strengths</strong> (to leverage)</th>
<th><strong>Weaknesses</strong> (to correct)</th>
</tr>
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<tbody>
<tr>
<td>1. Diversity data set: different crops produced in all five agro-ecological zones</td>
<td>1. Limited access to High tech technologies resources for crop monitoring.</td>
</tr>
<tr>
<td>2. Existing research potential: Evenly distribution of research stations</td>
<td>2. No existing, Regulations, Legislations and appropriate policies on crop monitoring techs.</td>
</tr>
<tr>
<td>3. Existing Monitoring skill and techs in the Agro-plantation farm system.</td>
<td>3. Little research/infrastructure investments/funding in new technologies</td>
</tr>
<tr>
<td>4. The existing Agriculture development strategic document encourages innovative second generation agriculture.</td>
<td>4. Only Spatial variable data outcomes for agro-plantation monitoring techs.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Obstacles</strong> (turn into opportunities)</th>
<th><strong>Threads</strong> (to mitigate)</th>
</tr>
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<tbody>
<tr>
<td>2. Most agricultural actors face limitations to explore monitoring techs which requires some competence.</td>
<td>2. Agriculture is mostly subsistence thus requires monitoring techs that incorporates such complexities simultaneously.</td>
</tr>
</tbody>
</table>

**Prospects**

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Requirements and Expectations

Requirements

Considering that crop monitoring in the Cameroon Agriculture sector is still at infancy stage, there is need for:

- Policy/Legislation-Regulations support in crop monitoring
- Capacity Building
- Market Access
- Stakeholder engagement
- Environmental protection
Requirements and Expectations

Expectations

Through this workshop training expectation are the acquisition of skills and knowledge in domains:

- Customize sustainable crop monitoring tech for Cameroon cropping system
- Access/ and explore some crop monitoring technologies;
- Application of crop monitoring results to make decisions that inform Cameroon food security policies;
- Adoption of crop monitoring techs.
- Collaborative partnership in remote sensing micro-projects to response to specific requirements of the diverse agriculture landscape

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Conclusion: it is clear that crop monitoring technologies in Cameroon is New;

- At infancy stage, but research suggests a need for a revolutionized agricultural engineering industry;

  - The first adopters are more likely Agro-Plantations enterprises to boost agribusiness, competitiveness opportunities;

  - Capacities building on crop monitoring Apps remain preliminaries for all agricultural actors.
Conclusion and Recommendation

**Recommendations:** Since crop monitoring presents a useful Farm management tool now and in the near future, it is a necessity to provide:

- **Maps:** yield, soil grid treatment, pest/disease for evident decision-making
- **Market access:** to boost Cameroons’ Crop monitoring sector

**Access**

**Invest**

- For Research and Development
- For Policies, legislation, Regulatory Reforms

**Partnership**

- For Technology transfer
- To boost Food insecurity

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Thank You!